Research Project Quarterly Progress Report

Date: 11/7/2023 **Project Number:** TPF-5(430) SUPPL. #46

Project Title: ILDOT Steel Railing, Type SMX

Principal Investigator: Faller, Rosenbaugh, and Bielenberg

Principal Contact Information Email: srosenbaugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Report Period:

July 1, 2023 to September 30, 2023

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% Work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
Project Planning, CAD, and Communications	$19,489	100%	$1,153	$1,153	10%	$18,336
Fabrication of Test Article	$111,818	0%	$0	$0	0%	$111,818
Crash Test MASH 3-11	$73,768	0%	$0	$0	0%	$73,768
Repair of Test Article	$21,830	0%	$0	$0	0%	$21,830
Crash Test MASH 3-10	$58,108	0%	$0	$0	0%	$58,108
Removal, Disposal, and Site Restoration	$15,026	0%	$0	$0	0%	$15,026
Final Reporting and Filing FHWA Eligibility Letter	$19,424	0%	$0	$0	0%	$19,424
Total	$319,463	-	$1,153	$1,153	1%	$318,310

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter including meetings, work plan status, significant progress, etc.)

A project kickoff meeting between ILDOT and MwRSF personnel was held on August 30. At the meeting, the proposal and scope fo the project were discussed. Additional information pertaining to the bridge decks in which the steel railing would be attached to were requested from ILDOT. These details were provided in September.

MwRSF is currently working on assembling CAD details for the test installation.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budget numbers presented herein include labor charges through September 2023.

Although the initial proposal had a start date of December 2022, the contract through NDOT was not finalized until July 2023, and the project did not become active until August 2023. Due to the delay in getting the project active, the end date was pushed back until 2026.

Anticipated Work Next Quarter:

The CAD details for the test assembly will be completed and sent to ILDOT for review and comment. Following ILDOT's review, material acquisition and construction may commence.

Total Percentage of Project Completion:

1%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. 27 – FY22-IND-1-PCB _ Phase I

Project Title: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt-Anchored Configurations, and Transitions

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning, CAD, and Reporting	$8,122.00	7.0	$567.00	73.9	$2,121.00
2. Full Scale Crash Testing	$99,975.00	0	$0.00	76.8	$23,215.00
3. Reporting and Project Deliverables	$7,705.00	0	$0.00	0	$7,705.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

1. Project Planning, CAD, and Reporting: MwRSF received fianlization of the original contract in July 2023. Rescoping of the research effort was completed in August 2023. MwRSF is awaiting awarding of the contract in order to proceed.

2. Full Scale Crash Testing: Test no. INPCB-1 was documention continued.

3. Reporting and Project Deliverables: None

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Based on the failure of the full-scale crash test of the free-standing INDOT PCB, INDOT has requested that the project be rescoped to modify the barrier to meet MASH. MwRSF will attempt to rescope the effort to meet these goals in the upcoming quarter. It should be noted that the contract agreement for this research has was just officially completed in mid July 2203, and the rescope effort had to await the completion of the original contract so that a revised contract can be created with the rescope agreement.

The rescoped research effort was submitted in August 2023. MwRSF is awaiting final contract awarding prior to moving forward on the research. It is anticipated in 4Q 2023.

Anticipated Work Next Quarter:

1. Project Planning, CAD, and Reporting: MwRSF will begin work on the rescoped Phase I research effort.
2. Full Scale Crash Testing: None.
3. Reporting and Project Deliverables: None

Total Percentage of Project Completion:

71.5%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. 27 – FY22-IND-1-PCB _ Phase II

Project Title: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt Anchored Configurations, and Transitions

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning, CAD, and Reporting	$8,122.00	0	$0.00	0	$8,122.00
2. Full Scale Crash Testing	$126,812.00	0	$0.00	0	$126,812.00
3. Reporting and Project Deliverables	$7,705.00	0	$0.00	0	$7,705.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

1. Project Planning, CAD, and Reporting: None
2. Full Scale Crash Testing: None
3. Reporting and Project Deliverables: None

Note that Phase II will not be initiated until the successful evaluation of the barrier system in Phase I.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Note that failure of the free-standing PCB crash testing in Phase I of the effort has led to a rescoping of the project. As such, funds may be diverted from the Phases II and III research efforts to accommodate the rescope and project timelines and tasks may be adjusted accordingly.

Anticipated Work Next Quarter:

1. Project Planning, CAD, and Reporting: None
2. Full Scale Crash Testing: None
3. Reporting and Project Deliverables: None

Note that Phase II will not be initiated until the successful evaluation of the barrier system in Phase I.

Total Percentage of Project Completion:

0.0%

Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. 27 – FY22-IND-1-PCB _ Phase III

Project Title: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt-Anchored Configurations, and Transitions

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning, CAD, and Reporting	$17,433.00	0	$0.00	0	$17,433.00
2. Design and Analysis	$37,592.00	0	$0.00	0	$37,592.00
3. Full Scale Crash Testing	$202,961.00	0	$0.00	0	$202,961.00
4. Reporting and Project Deliverables	$13,704.00	0	$0.00	0	$13,704.00
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

1. Project Planning, CAD, and Reporting: None
2. Design and Analysis: None
3. Full Scale Crash Testing: None
4. Reporting and Project Deliverables: None

Note that Phase III will not be initiated until the successful evaluation of the barrier system in Phase I.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Note that failure of the free-standing PCB crash testing in Phase I of the effort has led to a rescoping of the project. As such, funds may be diverted from the Phases II and III research efforts to accommodate the rescope and project timelines and tasks may be adjusted accordingly.

Anticipated Work Next Quarter:

1. Project Planning, CAD, and Reporting: None
2. Design and Analysis: None
3. Full Scale Crash Testing: None
4. Reporting and Project Deliverables: None

Note that Phase II will not be initiated until the successful evaluation of the barrier system in Phase I.

Total Percentage of Project Completion:

0.0%

Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) SUPPL. #47–FY22-MNDOT-1

Project Title: MASH TL-3 Thrie Beam Bullnose Installation Manual

Principal Investigator: Robert Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$36,540.00	0.0		8.8	$33,328.00
2. Design and Analysis	$62,171.00	4.0	$2,511.00	4.0	$59,660.00
3. Reporting and Project Deliverables	$12,051.00	0		0	$12,051.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

1. Project Planning and Correspondence - MwRSF worked on coordinated a meeting with MnDOT and bullnose installers for 11/9/23.

2. Design and Analysis - MwRSF continued development of a rough draft of the manual and has been compiling relevant information for each section of the manual. Additionally, MwRSF is developing schematic drawings and 3D CAD views of critical components.

3. Reporting and Project Deliverables - None

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Delays occurred on the administrative side of the project related to the initiation of the project. The contract officially started in December 2022, but the contract was not awarded until July of 2023. As such, the contract award date was shifted from 12/2/2022 to 12/31/2026.

Note that the first QPR was not turned in as the contract was not awarded. Thus, this QPR covers the period of the research effrot from 12/2/2022 to 6/30/2023.

Anticipated Work Next Quarter:

1. Project Planning and Correspondence - MwRSF will meet to discuss the manual layout and bullnose installation procedures on 11/9/23.

2. Design and Analysis - MwRSF will continue development of manual content as well as seeking further input from the relevant parties.

3. Reporting and Project Deliverables - None

Total Percentage of Project Completion:

5.2%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #2

Project Title: Additional Retrofit Options for Post Conflicts within AGTs

Principal Investigator: Faller, Rosenbaugh, Rasmussen, Bielenberg, Lechtenberg, Reid, Stolle

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022 (12/31/2023)

Report Period:	**Due Date:**
☒ Quarter 1 (July 1 – September 30)	October 31
☐ Quarter 2 (October 1 – December 31)	January 31
☐ Quarter 3 (January 1 – March 31)	April 30
☐ Quarter 4 (April 1 – June 30)	July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☒ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning & Correspondence	$27,155	0%	$0	$16,177	60%	$10,978
2. Design and Analysis	$106,064	100%	$914	$72,176	80%	$34,802
3. Bogie Testing	$99,897	0%	$0	$48,330	60%	$51,567
4. Reporting and Deliverables	$18,313	0%	$0	$0	0%	$18,313
5.						
6.						
7.						
8.						
9. Total	$251,429	-	$914	$136,683	65%	$114,746

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Following the 2nd round of dynamic component testing, a W6x15 post with 1.25" x 3" long slots cut into both sides of the compression flange was selected as the post to replicate a W6x15 transition post embedded 54 in. in compacted soil. The post was welded to a 1" thick baseplate and anchored with 7/8" diameter anchor rods.

With the post configuration selected, design efforts have been focused on the evaluation of the concrete footing/slab necessary to support the surrogate posts. A review of previous top-mounted systems with minimal footings was conducted to establish points of reference. Soil mechanics analyses were then used to estimate strength/stability for various concrete foundations and various numbers of posts. This analysis is ongoing.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budgets herein include labor charges through September 2023.

The project was behind schedule, and a request for a no-cost extension was submit in late 2022. The NCE was granted and the new end date is 12/31/2023

Anticipated Work Next Quarter:

Design requirements for the concrete slab/foundation to support the retrofit transition posts will developed and evaluated.

Total Percentage of Project Completion:

65%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #3, RPFP-20-AGT-2

Project Title: Guidelines for Flaring Thrie-Beam Approach Guardrail Transitions - Phase II

Principal Investigator: Scott Rosenbaugh, Faller, Bielenberg, et al.

Principal Contact Information Email: srosenbaugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31)---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30)---------- July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning & Correspondence	$12,644.00	0%	$0.00	100%	$0.00
2. Full-Scale Crash Testing	$278,516.00	100%	$6,218.00	85%	$41,145
3. Reporting	$11,623.00	0%	$0.00	50%	$2,042.00
4.					
5.					
6.					
7.					
8.					
9. Total	$302,783.00		$6,218.00	85%	$43,187.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Previously, test no. FLAGT-3 was conducted on the Flared AGT with the 2270P Pickup truck inpacting the 20:1 flared AGT at a speed of 62.6 mph and an approximate angle of 25 degrees relative to the roadway (effectively 27.9 degrees from the face of the guardrail). The system captured and redirected the pickup truck with minor system deflections and deformations. However, the right-front (impact side) wheel was disengaged from the vehicle during the impact event. As the vehicle exited the system, the absence of the right-front tire allowed the vehicle to continue its roll toward the system. Eventually, the vehicle rolled onto its side, slid downstream, and finally rolled completely over (360 degrees) before coming to rest in an upright position.

During post-test reviews of the system, the middle corrugation was found to contain localized deformations and gouging between posts 16 and 20 that were likely the result of contact with the wheel rim. This rim gouging led to the wheel disengagement. There were not any contact marks on the posts below the rail or on the concrete buttress that would indicate wheel snag on these elements. Similar tests of 2270P vehilces impacting flared corrugated guardrail has resulted in rim gouging and test failures.

The test results were presented to the project sponsors, and a survey was sent to each sponsor asking for input on the desired modification to the system. The most desired modification was to further reduce the flare rate to 25:1. This flare matches the aceptable flare rates for terminals as recommended within the Roadside Design Guide.

The test installation was redrawn in CAD to reflect this change in flare rate, and the connection plate assembly use to anchor the thrie beam to the buttress was modified to account for the 25:1 flare rate. All system components were purchased and the test installation is currently being constructed at the MwRSF testing grounds.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Tests FLAGT-1 through FLAGT-3 failed to meet MASH performance criteria. As such, the project has had to be rescoped and system has had to be redesigned and the tests re-run. Additional project funds were necessary to complete the full-scale testing on flared AGTs. A Phase III of this project has already been approved as part of the FY 2021 program, but Phase II was aimed at additional testing required on the upstream end of the AGT. A Phase IV of the project was funded in FY 2023 to fund retesting of the modified AGT on the downstream end near the buttress.

Due to the three failed crash tests and the corresponding redesign and retrofit activities, the project is behind schedule. An extension was required to continue the project, and a no-cost extension was granted extending the close date to 12/31/2023.

The budget numbers presented herein include labor charges through September 2023.

Anticipated Work Next Quarter:

Construction of the test article will be completed, and test FLAGT-4 will be conducted on the downstream end of the flared AGT in accordance with MASH test 3-21. If the system passes MASH criteria, additional MASH testing may commence.

Total Percentage of Project Completion:

90%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #4, RPFP-20-TERM-1

Project Title: Further Evaluation of the End Terminals Adjacent to Curb

Principal Investigator: Robert Bielenberg and Cody Stolle, Faller, et al

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2023

Report Period: **Due Date:**

- ☐ Quarter 1 (July 1 – September 30) ---------- October 31
- ☒ Quarter 2 (October 1 – December 31)---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30)---------- July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning & Correspondence	$19,248.00	0%	$0.00	65.3%	$6,679.00
2. Full-Scale Crash Testing	$176,505.00	0.3%	$460.00	93.6%	$11,234.00
3. Design & Analysis	$39,381.00	0%	$0.00	61.8%	$15,049.00
4. Reporting & Deliverables	$22,074.00	0%	$0.00	0%	$22,074.00
5.					
6.					
7.					
8.					
9. Total	$257,208.00	0.3%	$460.00	78.6	$55,036.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF worked on completion of the summary report for the research effort.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Currently, the full-scale testing may be delayed due to its status in the MwRSF testing que. COVID-19 has reduced avaiable staff at the outdoor test facility, created increased employee leave, and created material procurement issues. These issues have created a backlog of testing ath the facility. MwRSF is trying our best to resolve the test backlog, but delays are currently expected for most projects. We will continue to update the status of the full-scale testing and its effect on the overall project timeline.

Due to other project constraints and measurement errors in film analysis of the testing, MwRSF will not finish the summary report for the research effort by the current end date. MwRSF has requested and recceived approval for a NCE until 12/31/23 as funding remains available in the project.

Anticipated Work Next Quarter:

in the next quarter, MwRSF will continue work on the summary report.

Total Percentage of Project Completion:
78.6

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430)_Suppl5_RPFP-20-SR-1

Project Title: Development of a Short-Radius Guardrail for Intersecting Driveways or Roadways

Principal Investigator: J. Reid, R. Faller, R. Bielenberg, K. Lechtenberg, S. Rosenbaugh

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 1/16/2020 **Project Completion Date:** 12/31/2023

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31)---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30)---------- July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$30,952.00	0.0%	$0.00	38.3%	$19,096.00
2. Design and Analysis	$177,021.00	2.2%	$3,833.00	63.7%	$64,252.00
3. Reporting and Project Deliverables	$43,059.00	0.0%	$0.00	0.0%	$43,059.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF continued simulations of a short-radius system that dissipates energy through inertial resistance. The simulation effort started with modification of the MGS system with inertial posts to determine the feasibility of using inertial posts for vehicle redirection. Effects of inertial post geometry and inclusion/exclusion of beam slots were explored this quarter.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Due to other project constraints, MwRSF will not finish the research effort by the current end date. MwRSF has requested and received approval for a NCE until 12/31/23 as funding remains available in the project.

Anticipated Work Next Quarter:

MwRSF will make additional progress on simulation of the inertial post short-radius concept. Simulation results will be evaluated to determine the feasibility of the concept and reviewed with sponsors. Simulations evaluating the effects of inertial post geometry and inclusion/exclusion of beam slots will be further investigated this quarter.

Total Percentage of Project Completion:

49.6%

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. #15, RPFP-21-CABLE-1

Project Title: Redesign of the High-Tension Cable Phase II

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Rosenbaugh, Steelman, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	10/31/23

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Plan/Corresp, CAD, Material Certs	$16,861.00	1%	$211.00	90%	$1,131.00
2. Full-Scale Crash Testing	$217,148.00	30%	$77,000.00	85%	$16,213.00
3. Reporting & Project Deliverables	$19,887.00	0%	$0.00	0%	$19,887.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Analyze and document test MTP-3. Rebuild the system. Prepared to conduct next test in the project

On August 4, MwRSF conducted the test on the non-proprietary high-tension 4-cable median barrier according to MASH 2016 test designation 3-11. We impacted the system at 12" upstream from post no. 17 at a speed of 62.4 mph and an angle of 25.0 deg. The vehicle encountered only minimal roll and pitch and remained upright as the system safely redirected and captured the vehicle. All occupant risk values were found to be within the limits. Minimal occupant compartment deformation was found. Therefore, test no. MTP-4 was determined to be acceptable according to the MASH 2016 safety performance criteria for test designation no. 3-11.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

.None

Anticipated Work Next Quarter:

Analyze and document test MTP-4.

Begin writing the summary report.

Total Percentage of Project Completion:

75%

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Supp#16 - RPFP-21-CONC-2

Project Title: Anchoring of Temporary Barrier to Asphalt - Phase II

Principal Investigator: Faller, Bielenberg, et al.

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	7/31/23

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$13,939.00	0	$0.00	34.1	$8,824.00
2. Design and Analysis	$59,224.00	0	$0.00	94.7	$3,145.00
3. Full-Scale Crash / Bogie Testing	$122,413.00	4.3	$5,316.00	90.4	$11,799.00
4. Reporting and Project Deliverables	$29,295.00	0	$0.00	0	$29,295.00
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF worked toward the completion of the summary report detailing the design, simulation, and full-scale crash testing.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforeseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

In the next quarter, MwRSF will work towards completion of the summary report.

Total Percentage of Project Completion:

76.3%

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl#17 - RPFP-21-CONC-3

Project Title: MASH TL-3 Portable Barrier System

Principal Investigator: Faller, Bielenberg, et al.

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	July 2023 - September 2023	10/31/2023

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$33,717.00	0	$0.00	18.9	$27,337.00
2. Design and Analysis	$81,642.00	0.0	$184.00	39.6	$49,312.00
3. Reporting and Project Deliverables	$32,937.00	0	$0.00	0	$32,937.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF continued simulation of the preferred barrier concept. Alternative reinforcement conceps were further investigated. Limited progress was made due to other project priorities. It is anticipated the research effort will accelerate in the 4Q of 2023.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforeseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

In the next quarter, MwRSF will continue analysis of the staggered, interlocking PCB concept. This will include surveying the DOTs regarding reinforcement level and segment length and investigating the effect of gaps between the barrier segments.

Total Percentage of Project Completion:

26.1%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #18, RPFP-21-AGT-1

Project Title: Approach Guardrail Transition Behind Elevated Sidewalk

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Rosenbaugh, Steelman, and Stolle

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) — October 31
- ☐ Quarter 2 (October 1 – December 31) — January 31
- ☐ Quarter 3 (January 1 – March 31) — April 30
- ☐ Quarter 4 (April 1 – June 30) — July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning and CAD	$27,125	0%	$0	$4,652	15%	$22,473
2. Design and Analysis	$87,468	100%	$4,963	$29379	40%	$58,089
3. Reporting and Project Deliverables	$31,548	0%	$0	$0	0%	$31,548
4.						
5.						
6.						
7.						
8. Total	$146,141	-	$4,963	$34,028	25%	$112,113

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Work this quarter was focused on assembling various models for use in the LS-DYNA study. The 2270P pickup truck model from NCHRP Project 22-39 was obtained. Details for both MASH TL-2 and a TL-3 crashworthy AGTs were obtained and modeled within LS-DYNA. Simulations are now being performed with the vehicle impacting the AGT models to validate these models

.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budget numbers presented herein include labor charges through September 2023.

This project was proposed and budgeted with the understanding that the vehicle and tire models had to be updated as part of a different project prior to conducting simulated crash tests as part of this project. As such, the project was put on hold until Spring of 2023.

Anticipated Work Next Quarter:

The model validations will be completed and impacts into the AGT behind curb will begin to be simulated.

Total Percentage of Project Completion:

25%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #19, RPFP-21-AGT-3

Project Title: Guidelines for Flaring AGTs, Phase III

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Rosenbaugh, Steelman, and Stolle

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) — October 31
- ☐ Quarter 2 (October 1 – December 31) — January 31
- ☐ Quarter 3 (January 1 – March 31) — April 30
- ☐ Quarter 4 (April 1 – June 30) — July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning and CAD	$4,705	100%	$53	$495	0%	$4,210
2. Design and Analysis	$109,854	0%	$0	$0	0%	$109,854
3. Reporting and Project Deliverables	$6,748	0%	$0	$0	0%	$6,748
4.						
5.						
6.						
7.						
8. Total	$121,307	-	$53	$0	0%	$120,812

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Work on this phase of the project, Phase III, has yet to begin as the research efforts are still being conducted on the previous phase of this project – see project TPF-5(430)_Supplement 3 for details on Phase II efforts of the Flared AGT research project.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

During Phase II of the project, tests FLAGT-1 through FLAGT-3 failed to meet MASH performance criteria. As such, the project has had to be re-scoped and system has had to be redesigned and the tests re-run. Additional project funds were necessary to complete the full-scale testing on flared AGTs. A Phase III was approved as part of the FY 2021 program, and Phase IV of the project was funded in FY 2023.

Due to the three failed crash tests and the corresponding redesign and retrofit activities, the project is behind schedule.

The budget numbers presented herein include labor charges through September 2023.

Anticipated Work Next Quarter:

Work on this project will begin once all of the Phase II tasks have been completed and funds have been exhausted.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. #20, RPFP-21-SIGN-1

Project Title: Breakaway Systems for Ground Mounted, Large Steel Sign Support Structures

Principal Investigator: Joshua S. Steelman, Ph.D., P.E.

Principal Contact Information Email: joshua.steelman@unl.edu **Phone:** (402) 472-1972

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Plan/Corresp, Lit search, survey	$21,681.00	5	$0	100	$0.00
2. Sign Configuration Analysis & Selection	$28,702.00	35	$0	50	$5,165
3. Research Report & Deliverables	$27,357.00	20	$94	35	$8,331
4.					
5.					
6.					
7.					
8.					
9. TOTAL	$77,740.00	21	$94	57	$13,496

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Task 1 – No progress.

Task 2 – No progress.

Task 3 – Continued documentation of findings from Task 1.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None.

Anticipated Work Next Quarter:

No significant progress anticipated for the next quarter (Oct – Dec 2023). The subsequent quarter (Jan – Mar 2024) will see resumption of activity and progress:

Task 1 – Review state responses to survey. Extend literature review, if deemed necessary.

Task 2 – Analyze signs identified in Task 1 to identify critical configurations.

Task 3 – Extend documentation to include survey results and preliminary analysis findings.

Total Percentage of Project Completion:

57%

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl#22 / RPFP-21-CONSULT

Project Title: Annual Consulting Services Support

Principal Investigator: Faller, Bielenberg, et al.

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	July 2023 - Sept 2023	10/30/2023

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$61,446.00	12.6	$7,768.00	91.8	$4,985.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

This project allows MwRSF to be a valuable resource for answering questions with regard to roadside safety issues. MwRSF researchers and engineers are able to respond to issues and questions posed by the sponsors during the year. Major issues discussed with the States have been documented in our Quarterly Progress Reports and all questions and support are accessible on a MwRSF Pooled Fund Consulting web site.

In the past quarter MwRSF has responded to a series of state inquiries. The Quarterly Progress Report summarizing these responses has been attached to this document. The summary will also be available for download at the recently completed MwRSF Pooled Fund Consulting web site - http://mwrsf-qa.unl.edu/

We are continuing to work with and improve the MwRSF Pooled Fund Consulting web site as our experience with it grows. We would ask that all Pooled Fund member states use the new site from this point forward for their inquiries and to contact us with any issues they experience with the web site.

The summary of the consulting effort for this quarter is attached with the progress update.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward

Anticipated Work Next Quarter:

MwRSF will continue to answer questions and provide support to the sponsors during the upcoming quarter.

We would ask that all questions be submitted through the web site so that they can be answered and archived therein.

http://mwrsf-qa.unl.edu/

Total Percentage of Project Completion:
91.8

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. #15, RPFP-21-MPFW

Project Title: Midwest Pooled Fund Website

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Rosenbaugh, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	10/31/23

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Website Develop, Populate, and Host	$18,573.00	10%	$2,026.00	35%	$12,286.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Continue maintenance, repair, and upkeep of the website. Update research hub with new completed projects.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

This is continuation funding until the funds from Project No.: RPFP-20-PFCHS – TPF-5(430) Supplement #7, Project Title: Pooled Fund Center for Highway Safety have been exhaused.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

Troubleshooting and fixing any issues that have occurred during the transition. Continue maintenance, repair, and upkeep of the website. Update research hub with new completed projects.

Total Percentage of Project Completion:

35%

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #24, RPFP-21-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Faller, Bielenberg, et al.

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	July 23 - Sept 23	10/31/2023

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. LS-DYNA Modeling Enhancement	$43,823.00	2.5	$1,093.00	44.8	$24,191.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF researcher used the LS-DYNA funding to continue to investigate the use of new soil modeling techniques. Suspension refinements and adjustments to the wheels and tires of the Ram 1500 vehicle model were also implemented with portion of this funding.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

MwRSF will continue to use the LS-DYNA funds to support modeling needs in ongoing Midwest Pooled Fund Projects. This may include the following.

1. MwRSF has recently done an extensive amount of research in advance soil modeling techniques for use in modeling dynamic post in soil interactions. These models have been primarily developed on a component level. Research is needed to more fully developed these advanced soil modeling techniques and incorporate them into existing roadside hardware models to improve our model fidelity and allow improved investigation of soil parameters effects on roadside hardware such as post embedment, slopes, and other factors.
2. MwRSF has recently developed advanced steel fracture parameters for the GISSMO material failure command in LS-DYNA. This allows users to relate the stress state of the material to the failure strain in order to aid in predicting failure under multiple types of loading conditions. To date, the research in this area has focused mainly on the simulation of coupon samples used to develop the failure parameters. Research is needed to incorporate this steel failure methodology into existing guardrail and roadside hardware models.
3. MwRSF sees a need for advancement in concrete modeling methods. Currently several concrete material models exists and previous research at MwRSF has investigated the material models themselves. However, further research is needed to investigate the incorporation of reinforcing steel and in the concrete material and ensuring effective load transfer through the reinforcing steel. Additional investigation of bonding and development of the reinforcement is needed as well.
4. Vehicle model improvements are a constant need for Midwest Pooled Fund research efforts. Currently needed vehicle model improvements include more refined tire models, enhanced suspension models with suspension failure, and upgrades to existing TL-4 single unit truck and TL-5 tractor-trailer models. Additionally, George Mason University (GMU) plans to release a new 1100C vehicle model based on the Hyundai Accent. Conversion and troubleshooting of this new 1100C vehicle model will require a considerable effort. However, it is believed that the new vehicle model could provide much improved 1100C simulation results as the current 1100C vehicle is a 2010 Toyota Yaris that has been discontinued and is not used in MASH crash testing.

5. MwRSF sees the need for development of an improved model of the MGS. The current model is based on older modeling techniques and was validated with older vehicle models that are being phased out. It is believed that its use for studying more complex impact events and system modifications could be significantly improved if the model were updated with the new soil and steel fracture models discussed previously.

Total Percentage of Project Completion:

44.8%

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. 28, RPFP-FY20220-MGS-4

Project Title: Evaluation of Increased Blockout Depth with the Midwest Guardrail System

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	10/31/23

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning, Correspondence, CAD, Material Certs	$25,679.00	0%	$0.00	0%	$25,602.00
2. Design & Analysis	$18,893.00	90%	$17,260.00	90%	$1,633.00
3. Full-Scale Crash Testing	$203,413.00	0%	$0.00	0%	$203,413.00
4. Reporting & Deliverables	$14,866.00	0%	$0.00	0%	$14,866.00
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Reviewed previous literature of systems with blockouts deeper than 12".

Selected 24" blockout depth.

Creation of system detail drawing.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Signed contracts for the project were not received until July 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

complete system detail drawings.
Acquire system materials
Potentially begin system construction

Total Percentage of Project Completion:

5%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #29

Project Title: Surface Mounted Strong-Post MGS

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Stolle, Rosenbaugh, Perry, and Steelman

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Report Period:	**Due Date:**
☒ Quarter 1 (July 1 – September 30)	October 31
☐ Quarter 2 (October 1 – December 31)	January 31
☐ Quarter 3 (January 1 – March 31)	April 30
☐ Quarter 4 (April 1 – June 30)	July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning & Correspondence	$44,669	100%	$0	$172	0%	$44,497
2. Design and Analysis	$69,511	0%	$0	$0	0%	$69,511
3. Bogie Testing	$75,357	0%	$0	$0	0%	$75,357
4. Reporting and Deliverables	$28,303	0%	$0	$0	0%	$28,303
5.						
6.						
7.						
8.						
9. Total	$217,840	-	$0	$172	0%	$217,668

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status,

Work on this project has not yet begun. After many delays, MwRSF received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in August of 2023. Thus, the project has only been open for a month and efforts were focused on other Pooled-Fund projects with higher priority.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budgets herein include labor charges through September 2023.

Signed contracts for the project were not received until August of 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

The research team will begin the literature review on previous top-mounted guardrail systems. Additionally, a patent search will be conducted to identify any protected technologies that would not be available for use in this project.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #30

Project Title: Median Approach Guardrail Transition to Concrete Median Barrier

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Stolle, Rosenbaugh, Perry, and Steelman

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Report Period:	**Due Date:**
☒ Quarter 1 (July 1 – September 30)	October 31
☐ Quarter 2 (October 1 – December 31)	January 31
☐ Quarter 3 (January 1 – March 31)	April 30
☐ Quarter 4 (April 1 – June 30)	July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning & Correspondence	$42,550	100%	$0	$566	0%	$41,984
2. Design and Analysis	$42,083	0%	$0	$0	0%	$42,083
3. Full-Scale Crash Testing	$134,051	0%	$0	$0	0%	$134,051
4. Reporting and Deliverables	$15,204	0%	$0	$0	0	$15,204
5.						
6.						
7.						
8.						
9. Total	$233,888	-	$0	$566	0%	$233,322

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Work on this project has not yet begun. After many delays, MwRSF received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in August of 2023. Thus, the project has only been open for a month and efforts were focused on other Pooled-Fund projects with higher priority.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budgets herein include labor charges through September 2023.

Signed contracts for the project were not received until August of 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

The project will begin with a literature review of guardrail transitions (both roadside and median configurations), median W-beam guardrail, and concrete median barriers. The review will focus on MASH crash tested systems, but AGTs evaluated to NCHRP Report No. 350 standards may be included if more data is deemed necessary. Data collected from this literature review will be utilized to identify critical components and possible failure mechanisms for the median transition.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #31 - RPFP-FY2022-WZ-2

Project Title: MASH TL-3 Portable Barrier System – Phase II

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$25,089.00	0	$0.00	0	$25,089.00
2. Full-Scale Crash Testing	$291,118.00	0	$0.00	0	$291,118.00
3. Reporting and Project Deliverables	$15,412.00	0	$0.00	0	$15,412.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

1. Project Planning and Correspondence: None
2. Full-Scale Crash Testing: None
3. Reporting and Project Deliverables : None

Note that the current Phase I Design effort is underway (TPF-5(430) Suppl#17 - RPFP-21-CONC-3). The full-scale crash testing in this effort will begin once Phase I is completed.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0.0

Research Project Quarterly Progress Report

Date: 4/28/2022 **Project Number:** TPF-5(430)_Suppl. #32, RPFP-FY2022-WZ-3

Project Title: Anchoring Temporary Barriers to Asphalt in Median Installations

Principal Investigator: B. Perry

Principal Contact Information Email: brandon.perry@unl.edu **Phone:** (402) 472-0906

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Report Period: **Due Date:**

- ☐ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31)---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☒ Quarter 4 (April 1 – June 30)---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$38,845.00	0.6%	$231.37	12.47%	$34,000.56
2. Design and Analysis	$85,108.00	1.33%	$1,129.63	28.3%	$61,020.78
3. Reporting and Project Deliverables	$31,279.00	0.0%	$0.00	0.0%	$31,279.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

1. Project Planning, CAD, and Reporting: Internal meetings to discuss LS-DYNA results
2. Design and Analysis: LS-DYNA simulation development is nearly complete
3. Reporting and Project Deliverables: None

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None.

Anticipated Work Next Quarter:

MwRSF will finish LS-DYNA simulatuion development and validation, make progress on the development of CAD details for proposed designs, and a meeting will be schedule with the Midwest Pooled Fund member states to review and select proposed designs.

Total Percentage of Project Completion:

18.64%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #33 - RPFP-FY2022-CONSULT

Project Title: Annual Consulting Services Support

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Annual Consulting Services Support	$65,000.00	0	$0.00	0	$65,000.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

This project allows MwRSF to be a valuable resource for answering questions with regard to roadside safety issues. MwRSF researchers and engineers are able to respond to issues and questions posed by the sponsors during the year. Major issues discussed with the States have been documented in our Quarterly Progress Reports and all questions and support are accessible on a MwRSF Pooled Fund Consulting web site.

In the past quarter MwRSF has responded to a series of state inquiries. The Quarterly Progress Report summarizing these responses has been attached to this document. The summary will also be available for download at the recently completed MwRSF Pooled Fund Consulting web site - http://mwrsf-qa.unl.edu/

We are continuing to work with and improve the MwRSF Pooled Fund Consulting web site as our experience with it grows. We would ask that all Pooled Fund member states use the new site from this point forward for their inquiries and to contact us with any issues they experience with the web site.

The summary of the consulting effort for this quarter is attached with the progress update.

Note that no funds will be applied to this effort until the previous consulting funding from previous years is fully expended.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

MwRSF will continue to answer questions and provide support to the sponsors during the upcoming quarter.

We would ask that all questions be submitted through the web site so that they can be answered and archived therein.

http://mwrsf-qa.unl.edu/

Total Percentage of Project Completion:
0.0

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. #34, RPFP-YR2022-MPFW

Project Title: Midwest Pooled Fund Website

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	10/31/23

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Website Develop, Populate, and Host	$12,111.00	0%	$0.00	0%	$11,138.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9. Total	$12,111.00	0%	$58.00	0%	$11,138.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

None

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

This is continuation funding until the funds from Project No.: RPFP-21-MPFW – TPF-5(430) Supplement #23, Project Title: Midwest Pooled Fund Website have been exhaused.

Signed contracts for the project were not received until July 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #34 - RPFP-FY2022-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. LS-DYNA Modeling Enhancement	$40,000.00	0	$0.00	0	$40,000.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

MwRSF will use this research funding to further research efforts and advance modeling techniques with LS-DYNA.

Current efforts in this area are being funded using existing funds under TPF-5(430) Suppl. #24, RPFP-21-LS-DYNA. Once that funding is depleted, we will convert to using funds from this effort.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0.0

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. #37, RPFP-FY2023-MGS-1

Project Title: Modification & evaluation of the MGS Long Span with Increase Span Length

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Steelman, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 12/1/2022 **Project Completion Date:** 12/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	10/31/23

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Plan/Corresp, CAD, Material Certs	$28,003.00	0%	$25.00	0%	$27,978.00
2. Full-Scale Crash Testing	$331,604.00	0%	$0.00	0%	$331,604.00
3. Reporting & Project Deliverables	$18,263.00	0%	$0.00	0%	$18,263.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

None

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Signed contracts for the project were not received until July 2023.

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 11/1/2023 **Project Number:** TPF-5(430) Suppl. #19, RPFP-21-AGT-3

Project Title: Guidelines for Flaring AGTs, Phase III

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Rosenbaugh, Steelman, and Stolle

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) — October 31
- ☐ Quarter 2 (October 1 – December 31) — January 31
- ☐ Quarter 3 (January 1 – March 31) — April 30
- ☐ Quarter 4 (April 1 – June 30) — July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning and CAD	$26,727	100%	$0	$98	1%	$26,629
2. Crash Testing MASH TL-3	$262,333	0%	$0	$0	0%	$262,333
3. Reporting and Project Deliverables	$21,531	0%	$0	$0	0%	$21,531
4.						
5.						
6.						
7.						
8. Total	$310,591	-	$0	$98	0%	$310,493

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Work on this project, Phase IV, has yet to begin as the research efforts are still being conducted on the previous phases of this project – see project TPF-5(430)_Supplement 3 for details on Phase II efforts and project TPF-5(430)_Supplement 19 for details on Phase III efforts of the Flared AGT research project.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

During Phase II of the project, tests FLAGT-1 through FLAGT-3 failed to meet MASH performance criteria. As such, the project has had to be re-scoped and system has had to be redesigned and the tests re-run. Additional project funds were necessary to complete the full-scale testing on flared AGTs. A Phase III was approved as part of the FY 2021 program, and Phase IV of the project was funded in FY 2023.

Due to the three failed crash tests and the corresponding redesign and retrofit activities, the project is behind schedule.

The budget numbers presented herein include labor charges through September 2023.

Anticipated Work Next Quarter:

Work on this project will begin once Phases II and III of this project have been completed.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 10/27/2023 **Project Number:** TPF-5(430) -Suppl #39

Project Title: PF23 GET-1: Generic End Terminal - Further Development and Evaluation

Principal Investigator: Cody Stolle

Principal Contact Information Email: cstolle2@unl.edu **Phone:** (402) 472-4233

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☒ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning & CAD	$43,537.00	5%	$4,919.00	5	$38,618.00
2. Analysis, Design, Sysetm Modifications	$21,150.00	0%	$0.00	0%	$21,150.00
3. Dynamic Bogie Tests	$93,155.00	0%	$0.00	0%	$93,155.00
4. Full-Scale Tests	$253,095.00	0%	$0.00	0%	$253,095.00
5. Report	$26,289.00	0%	$0.00	0%	$26,289.00
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Project continued where the PF Year 29 Phase II project ended. The research team developed full end anchorage and terminal copmonent plans including galvanization holes, connections, posts, and hardware selection. A preferred concept was selected for construction and testing. Two bogie test plans were drafted. The first consists of a "pull" test of the anchorage capacity using the recommended configuration of hardware pulled by a tension cable until the terminal releases. The second component testing plan of a "push" test consists of a non-compliant, 1100C small car which had previously been used in a crash test but is in good condition, impacting the terminal at 5 degrees and 62 mph. Two prototype, galvanized terminal heads were submitted for manufacturing and are anticiapted in November 2023.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

The "pull" and "push" tests of the terminal will be conducted. The research team will analyze results and determine if full-scale testing is ready or if additional modification or redesign are warranted. Full-scale system test plans will be developed.

Total Percentage of Project Completion:

0.5

Research Project Quarterly Progress Report

Date: 10/27/2023 **Project Number:** PF23 MWQA-1

Project Title: Continuted revisions to MwRSF Pooled Fund Q&A website

Principal Investigator: Cody Stolle

Principal Contact Information Email: cstolle2@unl.edu **Phone:** (402) 472-4233

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☒ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning & CAD	$6,815.00	0%	$0.00	0%	$6,815.00
2. Design and Analysis	$34,277.00	3%	$105.00	3%	$29,737.00
3. Reporting and Project Deliverables	$4,329.00	0%	$0.00	0%	$4,329.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

The University of Nebraska-Lincoln recently implemented a host of new security updates. During these updates, MwRSF has lost access to our website while on UNL campus, while the external link to the website remains functional. MwRSF is working to get a security exception for the MwRSF website for on-campus operations so that work on the MWQA project can resume.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

After the update of the security exception, MwRSF will resume where the MWQA-1 and 2 projects left off for PF Year 29. This will involve the completion of the W-beam Q&A response review and beginning work on thrie beam, AGT, cable, and permanent concrete barrier questions.

The research team will continouously monitor status on question review and accomplish review and update of as many questions as the fundingand time permit.

Total Percentage of Project Completion:

1.0

Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** RPFP-FY2023-AUTO-1

Project Title: PF23 AUTO-1: Coordination & Collaboration w/ Vehicle Manufacturers & Auto Industry

Principal Investigator: Bob Bielenberg, Cody Stolle, Ron Faller

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☒ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1.	$0.00	0	$0.00	0	$0.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

MwRSF continued collaboration with the Insurance Institute for Highway Safety (IIHS) including sharing crash test videos and data for roadside safety data collection. Through IIHS, contact was established with two electrical vehicle manufacturers and future collaboration and discussion are anticipated. Discussions also continue with General Motors on the innovation and design teams.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

MwRSF will discuss potential automotive research conference papers to submit and attend. Papers will focus and potential areas of overalp between roadside safety design and automotive safety as well as potential issues between EVs and current roadside hardware.

Total Percentage of Project Completion:

0.0

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #42 - RPFP-FY2023-CONSULT

Project Title: Annual Consulting Services Support

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Annual Consulting Services Support	$65,000.00	0	$0.00	0	$65,000.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

This project allows MwRSF to be a valuable resource for answering questions with regard to roadside safety issues. MwRSF researchers and engineers are able to respond to issues and questions posed by the sponsors during the year. Major issues discussed with the States have been documented in our Quarterly Progress Reports and all questions and support are accessible on a MwRSF Pooled Fund Consulting web site.

In the past quarter MwRSF has responded to a series of state inquiries. The Quarterly Progress Report summarizing these responses has been attached to this document. The summary will also be available for download at the recently completed MwRSF Pooled Fund Consulting web site - http://mwrsf-qa.unl.edu/

We are continuing to work with and improve the MwRSF Pooled Fund Consulting web site as our experience with it grows. We would ask that all Pooled Fund member states use the new site from this point forward for their inquiries and to contact us with any issues they experience with the web site.

The summary of the consulting effort for this quarter is attached with the progress update.

Note that no funds will be applied to this effort until the previous consulting funding from previous years is fully expended.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

MwRSF will continue to answer questions and provide support to the sponsors during the upcoming quarter.

We would ask that all questions be submitted through the web site so that they can be answered and archived therein.

http://mwrsf-qa.unl.edu/

Total Percentage of Project Completion:
0.0

Pooled Fund
Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. #43, RPFP-FY2023-MPFW

Project Title: Midwest Pooled Fund Website

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 12/1/2022 **Project Completion Date:** 12/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 1	7/1/23 - 9/30/23	10/31/23

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Website Develop, Populate, and Host	$12,868.00	0%	$0.00	0%	$12,868.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9. Total	$12,111.00	0%	$58.00	0%	$11,138.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

None

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

This is continuation funding until the funds from Project No.: RPFP-22-MPFW – TPF-5(430) Supplement #34, Project Title: Midwest Pooled Fund Website have been exhaused.

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 10/30/2023 **Project Number:** TPF-5(430) Suppl. #44 - RPFP-FY2022-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Bob Bielenberg

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ Quarter 1	July 1 – September 30	October 31
☐ Quarter 2	October 1 – December 31	January 31
☐ Quarter 3	January 1 – March 31	April 30
☐ Quarter 4	April 1 – June 30	July 31
☒ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. LS-DYNA Modeling Enhancement	$40,000.00	0	$0.00	0	$40,000.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

MwRSF will use this research funding to further research efforts and advance modeling techniques with LS-DYNA.

Current efforts in this area are being funded using existing funds under TPF-5(430) Suppl. #24, RPFP-21-LS-DYNA and TPF-5(430) Suppl. #44, RPFP-FY2023-LS-DYNA. Once that funding is depleted, we will convert to using funds from this effort.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0.0

Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) – Suppl. #10 – FY20-WISC-1-MGS SLOPE HALF POST 1Q 2020

Project Title: MASH 2016 TL-3 Evaluation of the MGS with Half Post Spacing and 7-ft Posts Adjacent to Sl

Principal Investigator: R. Bielenberg and R. Faller,

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 1/16/2020 **Project Completion Date:** 12/31/2023

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31)---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30)---------- July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$10,490.00	0.0%	$0.00	81.2%	$1,968.00
2. Full-Scale Crash Testing	$193,277.00	0.4%	$831.00	81.3%	$36,162.00
3. Reporting and Project Deliverables	$16,441.00	0.0%	$0.00	35.7%	$10,574.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF worked towards the completion of the summary report for the project.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Note that the original start date for the project was listed as October of 2019 with an end date in the 3Q of 2021 (Sept. 30, 2021). Authorization of for the project was not received until January 2020, so the end date has been pushed back accordingly to end of December 2021.

Currently, the full-scale testing has been delayed due to its status in the MwRSF testing que. COVID-19 has reduced available staff at the outdoor test facility, created increased employee leave, and created material procurement issues. These issues have created a backlog of testing at the facility. MwRSF is trying our best to resolve the test backlog, but delays are currently expected for most projects. We will continue to update the status of the full-scale testing and its effect on the overall project timeline.

Due to the delays noted above, MwRSF has requested and received an NCE to extend the project end date to 12/31/2022

Additional project needs within MwRSF's operations delayed completion of the summary report this quarter. MwRSF has requested and received a NCE until 12/31/23 to complete the summary report. The draft is nearly complete and sufficient funding remains in the project.

Anticipated Work Next Quarter:

In the next quarter, MwRSF anticipates completion of the summary report for the project.

Total Percentage of Project Completion:
77.9%

Research Project Quarterly Progress Report

Date: 10/31/2023 **Project Number:** TPF-5(430) Suppl. 12 – FY20-WY-1-GATE: MASH 2016 Th 3

Project Title: Evaluation of Drop-Arm Road Closure Gate

Principal Investigator: R. Bielenberg and R. Faller,

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 2/26/2020 **Project Completion Date:** 5/9/2026

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31)---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30)---------- July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☒ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$17,507.00	2.6%	$290.00	55.2%	$7,839.00
2. Design and Analysis	$10,862.00	0.0%	$0.00	75.1%	$2,708.34
3. Full-Scale Crash Testing	$254,880.00	0.0%	$0.00	31.7%	$173,966.00
4. Reporting and Project Deliverables	$16,147.00	0.0%	$0.00	0.0%	$16,147.00
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

MwRSF submitted an updated project budget and scope to WYDOT in 4Q 2021 and has been awaiting approval to proceed. MwRSF revceived activation of the project in September 2023.

MwRSF is reviewing the material from the original crash test and will prepare a meeting with WYDOT in the upcoming quarter to restart the effort.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Currently, material shipping delays and delays to the overall MwRSF test que have put the project behind schedule. MwRSF will attempt to continue to meet the proposed schedule to the degree possible.

Currently, the full-scale testing has been delayed due to its status in the MwRSF testing que. COVID-19 has reduced avaiable staff at the outdoor test facility, created increased employee leave, and created material procurement issues. These issues have created a backlog of testing ath the facility. MwRSF is trying our best to resolve the test backlog, but delays are currently expected for most projects. We will continue to update the status of the full-scale testing and its effect on the overall project timeline.

Due to these delays, MwRSF has requested and received an NCE until 9/30/2022.

As noted previously, the failure of test no. WRCG-1 required revision of the scope and budget for the project. MwRSF revised these items and provided them to WYDOT for approval. MwRSF recevied activation of the project in September 2023.

Note that the budget table included has been updated with the revised scope and budget figures.

Anticipated Work Next Quarter:

In the next quarter, MwRSF will setup a meeting with WYDOT to discuss the project to date and discuss the path forward in terms of design changes.

Total Percentage of Project Completion:
33.0%