Research Project Quarterly Progress Report

Date: 7/30/2023 **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	0.0	$0.00	66.9	$2,687.00
2. Full Scale Crash Testing	$99,975.00	14.7	$14,744.00	76.8	$37,959.00
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: Rescoping of the research effort was not completed as MwRSF was awaiting finalization of the original contract. The original contract was finalized in mid-July, so rescoping of the effort and submission of the revised reseach plan will take place in August 2023.

2. Full Scale Crash Testing: Test no. INPCB-1 was documented and analyzed, including film analysis, data processing and other test documentation tasks. Additionally, test stie cleanup was performed.

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.

Anticipated Work Next Quarter:

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

Total Percentage of Project Completion:

71.0%

Research Project Quarterly Progress Report

Date: 7/30/2023 **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: 7/31/2023 **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: 7/31/2023 **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	8.8		8.8	$33,328.00
2. Design and Analysis	$62,171.00	0		0	$62,171.00
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 conducted an initial kickoff meeting with the sponsor that outlined the basic bullnose manual setup and reviewed the major tasks in the project.

2. Design and Analysis - MwRSF developed 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. MwRSF has discussed setting up a meeting for next quarter with MNDOT personell and contractors to get general feedback as well as detailed information on the order of which the various system components are installed and the installation methods used. This meeting will be set for 3Q 2023.

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 setup a meeting with MNDOT personell and contractors.

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:
2.9%

Research Project Quarterly Progress Report

Date: 8/1/2023 **Project Number:** TPF-5(193) Suppl. #142; RPFP-19-TERM-1

Project Title: Generic End Terminal - Phase II

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

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

Project Start Date: 10/1/2018 **Project Completion Date:** 6/30/2023

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 & CAD	$40,364.00	0	$0.00	100	$0.00
2. Concept Refinement & Simulation	$95,701.00	0	$0.00	100	$0.00
3. Dynamic Bogie Tests	$153,861.00	0	$0.00	100	$0.00
4. Report	$35,467.00	17	$14,226.99	100	$0.00
5.					
6.					
7.					
8.					
9. Total	$325,393.00	5%	$14,226.99	100%	$0.00

Progress and Accomplishments this Quarter:

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

Three summary reports were completed and submitted to the MwRSF Pooled Fund state DOTs for review. Comments received were implemented into the reports. The reports will be published during 2023 Q3. An end anchor pull capacity test was drafted in CAD in preparation for PF Year 2023 project, which will begin during the third quarter 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.)

The COVID-19 pandemic and business responses affected project completion. Early in the project progress, MwRSF was partially shut down in response to national response to COVID. The partial closure continued through 2020 and continued ramifications have been experienced through 2021. MwRSF accommodated with a project extension and completed the Phase II project in June 2023.

Anticipated Work Next Quarter:

N/A - Phase II is completed. Phase III will begin during FY quarter 1 (2023 calendar year Q3).

Total Percentage of Project Completion:

100%

Research Project Quarterly Progress Report

Date: 7/30/2023 **Project Number:** TPF-5(193) Suppl. #144, RPFP-19-MASHHC-1

Project Title: Midwest Pooled Fund MASH Hardware Clearinghouse - Phase 1

Principal Investigator: Faller, Bielenberg, Lechtenberg, Rosenbaugh, Schmidt, Stolle

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

Project Start Date: 10/1/2018 **Project Completion Date:** 6/30/2023

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 Planing & Correspondence	$6,627.00	2%	$126.00	32%	$4,471.00
2. Survey, Website Development & Population	$40,185.00	25%	$9,900.00	50%	$19,547.00
3. Research Deliverables	$4,394.00	0%	$0.00	0%	$4,394.00
4.					
5.					
6.					
7.					
8.					
9. Total	$51,206.00	20%	$10,026.00	42%	$29,769.00

Progress and Accomplishments this Quarter:

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

Continued programming of new clearinghouse website.

Continue to review prototype website, provide feedback to programmer

Presented clearinghouse to member states.

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.

Note the programmers will invoice once the work is completed.

Anticipated Work Next Quarter:

Continue programming prototype of new clearinghouse website

Total Percentage of Project Completion:

40%

Research Project Quarterly Progress Report

Date: 8/2/2023 **Project Number:** TPF-5(193) Suppl. #145 - RPFP-19-MWQA-1

Project Title: Q&A Website Improvement

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

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

Project Start Date: 10/1/2018 **Project Completion Date:** 6/30/2023

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	$4,242.00	0%	$0.00	100%	$0.00
2. Website Design and Improvement	$22,800.00	0%	$0.00	100%	$0.00
3. Reporting and Project Deliverables	$3,810.00	10%	$68.47	100%	$0.00
4.					
5.					
6.					
7.					
8.					
9. Total	$30,852.00	5%	$68.47	100%	$0.00

Progress and Accomplishments this Quarter:

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

Additional website updates and Q&A downloads were copmleted. Project funds were exhausted and the project was closed June 30 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.)

Transition to upgraded web platform has taken more time than expected. Some additional maintenance work is ongoing to support functionality and security.

Anticipated Work Next Quarter:

None. Additional funded efforts will occur in additional, future pooled fund efforts.

Total Percentage of Project Completion:

100%

Research Project Quarterly Progress Report

Date: 8/2/2023 **Project Number:** TPF-5(193) Suppl. #146 - RPFP-19-MWQA-2

Project Title: Revisions to Midwest Pooled Fund Q&A Website Technical Information

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: 10/9/2018 **Project Completion Date:** 6/30/2023

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	$4,785.00	0%	$3,578.00	100%	$0.00
2. Website Design and Improvement	$41,130.00	50%	$13,688.00	90%	$0.00
3. Reporting and Project Deliverables	$3,830.00	70%	$1,246.00	75%	$1,839.00
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.)

All Q&A databases were sorted by content and new recommended filter categories were applied to all questions. Additional background research were collected to support guardrail-related questions. A review of guardrail-related questions was completed for all MGS, W-beam, and thrie beam-related questions through 2014 prior to the completion of the Year 29 project. New filters were applied on those Q&A responses. A series of performance recommend

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.

MwRSF requested and received an NCE until 6/30/23 to compete this effort.

Anticipated Work Next Quarter:

Further Q&A review and revision will occur under the new PF Year 2023 effort.

Total Percentage of Project Completion:

100%

Research Project Quarterly Progress Report

Date: 7/31/2023 **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%	$5,920	$71,262	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	-	$5,920	$135,769	65%	$115,660

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, which was completed in the first quarter of 2023, 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. The test site was cleaned up after the noted testing, and materials were disposed of

Design focus the switched to the evaluation of the concrete footing/slab necessary to support the surrogate posts. This involves an evaluation of structural stability and soils engineering to prevent footing/slab movement during impact events. This evaluation began with a review of previous top-mounted systems with minimal footings. Simple analysis were then used to estimate strength/stability for 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 June 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

The COVID-19 pandemic and business responses may play a factor in future efforts. 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:

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: 7/312023 **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	20%	$1,644.00	100%	$0.00
2. Full-Scale Crash Testing	$278,516.00	80%	$7,026.00	85%	$47,363.00
3. Reporting	$11,623.00	0%	$0.00	50%	$2,042.00
4.					
5.					
6.					
7.					
8.					
9. Total	$302,783.00		$8,670.00	85%	$49,405.00

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 the previous quarter, 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.

The middle corrugation contained 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.

Through discussions with the project sponsors, it was decided 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. The CAD details for the connection plate were send out to fabircators and other post and rail material were ordered.

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 will be 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 redisgn and retrofit activities, the project is behind schedule. An extension was required to continue the procted, and a no-cost extenstion was granted extening the close date to 12/31/2023.

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

The COVID-19 pandemic and business responses may play a factor in future efforts. The pandemic has resulted in material shortages and work backlogs, which has caused the cost of vehilces and construction supplies to increase. This has resulted in increased costs for crash testing. MwRSF will work carefully in an attempt to keep the project within budget.

Anticipated Work Next Quarter:

A survey will be sent out to the project sponsors will proposed modification options. Bsed n the sponsors feedback. a system modification will be selected for further crash testing.

Total Percentage of Project Completion:

85%

Research Project Quarterly Progress Report

Date: 7/30/2023 **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:** 12/31/2022

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	$19,248.00	0%	$0.00	65.3%	$6,679.00
2. Full-Scale Crash Testing	$176,505.00	0%	$0.00	93.4	$11,694.00
3. Design & Analysis	$39,381.00	9.2	$3,612.00	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	9.2	$3,612.00	78.4	$55,496.00

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:
78.4

Research Project Quarterly Progress Report

Date: 7/30/2023 **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	9.9%	$17,547.00	61.5%	$68,085.00
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 an short-radius system that disspates energy through interial resistance. The simulation effort started with modification of the MGS system with interial posts to determine the feasiblity of using inertial posts for vehicle redirection. That effort is still underway.

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 interial post short-radius concept. Simulation results will be evaluated to determine the feasibility of the concept and reviewed with sopnsors. Simulations of impact outside the radiused nose of the system and including the 1100C vehicle will be investigated.

Total Percentage of Project Completion:

48.1%

Pooled Fund
Research Project Quarterly Progress Report

Date: 7/30/2023 **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 4	4/1/23 - 6/30/23	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 Plan/Corresp, CAD, Material Certs	$16,861.00	10%	$200.00	90%	$1,342.00
2. Full-Scale Crash Testing	$217,148.00	30%	$63,120.00	55%	$93,213.00
3. Reporting & Project Deliverables	$19,887.00	0%	$0.00	0%	$19,887.00
4.					
5.					
6.					
7.					
8.					
9. Total	$253,893.00	25%	$63,320.00	55%	$114,442.00

Progress and Accomplishments this Quarter:

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

Completed system construction. Prepared to conduct first test in the project

On June 15, MwRSF conducted the test on the non-proprietary high-tension 4-cable median barrier according to MASH 2016 test designation 3-10. We impacted the system at a mid-span between two posts or 60" upstream from post no. 25 at a speed of 62.1 mph and an angle of 25.6 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. The back window fractured from cable contact. However, this does not violate the MASH criteria. Therefore, test no. MTP-3 was determined to be acceptable according to the MASH 2016 safety performance criteria for test designation no. 3-10.

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-3. Rebuild system. Prepare to conduct next test in the series.

Total Percentage of Project Completion:

45%

Pooled Fund
Research Project Quarterly Progress Report

Date: 7/30/2023 **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 4	4/1/23 - 6/30/23	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	25.3	$30,923.00	86.0	$17,115.00
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 reviewed the full-scale testing of the anchored PCB system in test no. WITD-4. MwRSF completed the test documentation and data analysis from the test. Test no. WITD-4 was successful and the retrofit design successfully mitigated the floopan deformations observed in previous crash tests of the asphalt anchored PCB. Significant door snag was noted on the steel joint cap, but the snag was not severe enough to cause a test failure. Note that because of the snag that occurred on the 2270P pickup truck, it is conceivable that snag would also occur with the 1100C small car. This was discussed at the Midwest Pooled Fund Program annual meeting in April.

MwRSF also worked towards completion of the summary report.

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:

74.0%

Pooled Fund
Research Project Quarterly Progress Report

Date: 7/30/2023 **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 4	April 2023 - June 2023	7/31/2023

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	7.5	$6,101.00	39.4	$49,496.00
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.

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:

26.0%

Research Project Quarterly Progress Report

Date: 7/31/2023 **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%	$22,413	$24,413	35%	$63,055
3. Reporting and Project Deliverables	$31,548	0%	$0	$0	0%	$31,548
4.						
5.						
6.						
7.						
8. Total	$146,141	-	$22,413	$29,065	20%	$117,076

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 had been on hold waiting for the vehicle and tire models get updated as part of NCHRP 22-39. During that project, the 2270P pickup model was significantly modified (tires, rims, springs, dampeners, and bump stops) and calibrated against physical trajectory data of a pickup traversing over 6-in tall curbs. Thus, research efforts can begin on this project with the newly updated vehicle model.

Work this quarter was focused on assembling various models for use in the LS-DYNA study. The 2270P pickup truck model from NCHRP 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 June 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 the beginning 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:

20%

Research Project Quarterly Progress Report

Date: 7/31/2023 **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%	$443	$443	0%	$4,262
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	-	$443	$0	0%	$120,864

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 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.)

The budget numbers presented herein include labor charges through November 2022.

The COVID-19 pandemic and business responses may play a factor in future efforts. Changes to businesses outside of MwRSF may lead to possible delays in material acquisition as well as other unforeseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

Work on this project will begin once Phase II of this project has been completed.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 8/10/2023 **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	$945	100	$0.00
2. Sign Configuration Analysis & Selection	$28,702.00	35	$8,000	50	$5,165.00
3. Research Report & Deliverables	$27,357.00	20	$14,462	35	$8,791.15
4.					
5.					
6.					
7.					
8.					
9. TOTAL	$77,740.00	21	$23,407	57	$13,956

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 – Summarized sign characteristics obtained from states. Developed and distributed survey to states.

Task 2 – Continued analysis of sign behavior using methods identified in literature, focusing on impulse-momentum approaches.

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:

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: 7/30/2023 **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 4	April 2023 - June 2023	7/30/2023

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	24.4	$15,005.00	79.2	$12,753.00
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:
79.2

Pooled Fund
Research Project Quarterly Progress Report

Date: 7/30/2023 **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 4	4/1/23 - 6/30/23	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. Website Develop, Populate, and Host	$18,573.00	1%	($4,875.00)	30%	$14,837.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9. Total	$18,573.00	1%	($4,875.00)	20%	$14,837.00

Progress and Accomplishments this Quarter:

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

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.

Note the amount spent was negative as some of the charges in the previous quarter were for the clearinghouse website. Thus, those funds were move that project in this quarter.

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:

20%

Pooled Fund
Research Project Quarterly Progress Report

Date: 7/30/2023 **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 4	April 23 - June 23	7/31/2023

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	10.6	$4,644.00	42.3	$25,284.00
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 investigate the use of new soil modeling techniques. Simulation models of multiple closely spaced posts and posts with reduced embedment were developed and analyzed.Improvements were discussed for further soil model development.A model of the MGS with one of the new soil models was also developd that compared well with existing test data. Further refinements and additional soil model options are planned.

LS-DYNA support funds were also used as part of the modeling effort on short radius guardrail in FY2020 (Year 30)

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:

42.3%

Pooled Fund
Research Project Quarterly Progress Report

Date: 7/30/2023 **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 4	4/1/23 - 6/30/23	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, Correspondence, CAD, Material Certs	$25,679.00	0%	$74.00	0%	$25,602.00
2. Design & Analysis	$18,893.00	0%	$0.00	0%	$18,893.00
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. Total	$262,851.00	0%	$74.00	0%	$262,774.00

Progress and Accomplishments this Quarter:

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

Work on this project has not yet begun as MwRSF just received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in July 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.)

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:

Initiate literature review on previous barriers systems with increased blockout depths greater than 12 inches.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 7/31/2023 **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%	$172	$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	-	$172	$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 as MwRSF just received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in July 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.)

The budgets herein include labor charges through June 2023.

Signed contracts for the project were not received until July 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: 7/31/2023 **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%	$566	$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	-	$566	$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 as MwRSF just received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in July 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.)

The budgets herein include labor charges through June 2023.

Signed contracts for the project were not received until July 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: 7/30/2023 **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	5.4%	$2,098.03	11.9%	$34,231.93
2. Design and Analysis	$85,108.00	16.5%	$14,040.63	27.0%	$62,150.41
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:

17.8%

Research Project Quarterly Progress Report

Date: 7/30/2023 **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: 7/30/2023 **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 4	4/1/23 - 6/30/23	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. Website Develop, Populate, and Host	$12,111.00	0%	$58.00	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

Work on this project has not yet begun as MwRSF just received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in July 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.)

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: 7/30/2023 **Project Number:** TPF-5(430) Suppl. #35 - 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

Research Project Quarterly Progress Report

Date: 7/31/2023 **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	1.1%	$2,178.00	80.9%	$39,171.00
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 working towards the completion of the summary report for the project.

Total Percentage of Project Completion:
77.5%

Research Project Quarterly Progress Report

Date: 7/31/2023 **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	3.8%	$290.00	52.56%	$8,301.50
2. Design and Analysis	$10,862.00	0.0%	$0.00	75.1%	$2,708.34
3. Full-Scale Crash Testing	$185,441.00	0.0%	$0.00	43.6%	$104,527.00
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.)

Following the failure of the ffirst full-scale crash test of the system, WYDOT was presented with several options for moving forward.

1. WYDOT can choose continue moving forward with the higher speed tests. If those tests pass, they could choose to self-certify the road closure gate based on limited concerns for occupant risk in the low-speed test. This may not be the optimal path to take, but it has been chosen by some states. As such, I wanted to list it as an option.
2. MwRSF can suggest modifying the system to alleviate the windshield penetration and rerun test no. 3-60. Several options exist, including modifying the metal plate extension used for the gate arm guide U-bolt attachment to be shorter, have rounded edges, or to flare back the corners. These changes could reduce the potential for windshield penetration significantly. One could also consider redesign of the gate arm guide attachment to a c-clamp or other design that does not create the same windshield hazard. Design and retesting of the modified system would likely require additional funding at some point to complete the test matrix.
3. WYDOT could terminate the effort – although this may leave one without a crashworthy gate system.

WYDOT has indicated that they prefer option 2. MwRSF submitted an updated project budget and scope to WYDOT in 4Q 2021 and has been awaiting approval to proceed. MwRSF expects activation of the project in August 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.)

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 expects activation of the project in August 2023.

Note that the budget table with the progress report will be updated with the revised proposal costs in the next quarterly progress report.

Anticipated Work Next Quarter:

In the next quarter, MwRSF will await approval to proceed based on the revised project scope. Once approval is obtained. MwRSF will work on development of design modifications and re-testing of the gate system.

Total Percentage of Project Completion:

42.7%