

# Research Project Quarterly Progress Report

**Date:** 1/31/2021                      **Project Number:** TPF-5(430) Suppl. #1, RPFP-20-MGS-2  
**Project Title:** MGS with Reduced Embedment and Post Spacing over Low-Fill Culverts  
**Principal Investigator:** Faller, R.K., Bielenberg, R.W., Lechtenberg, K.A., Rosenbaugh, S.K., Mojdeh Pajouh  
**Principal Contact Information Email:** mojdeh.pajouh@unl.edu                      **Phone:** 402-472-0920  
**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 Expenses to Date	Total % of Task Completed	Remaining Budget
1. Project Planning & Management & CAD	\$16,853.00	0.0%	\$0.00	\$7,525.00	44.7%	\$9,328.00
2. Dynamic Bogie Testing	\$78,032.00	8.0%	\$6,257.00	\$34,057.00	43.6%	\$43,975.00
3. Dynamic Bogie Testing	\$61,310.00	0.0%	\$0.00	\$0.00	0.0%	\$61,310.00
4. Reporting and Project Deliverables	\$29,717.00	0.0%	\$0.00	\$0.00	0.0%	\$29,717.00
5.						
6.						
8. Total	\$185,912	-	\$6,257.00	\$41,582.00	22.4%	\$144,330.00

**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, MwRSF had started the research effort by conducting six (6) bogie tests to evaluate post behavior through a range of reduced embedment depths. All tests were conducted with W6x8.5 posts. Two tests were performed at each reduced embedment increment of 4 in. from the standard 40 in. MGS post embedment, to a minimum of 28 in. (embedment depths of 28 in., 32 in., and 36 in.). The data from these tests was analyzed and compared with previous testing of guardrail posts at the standard embedment depth of 40 in. The data will also be used to develop post-soil resistance input for computer simulation.

Additional bogie testing was conducted. Analysis of the initial bogie tests found that the post soil interaction forces were limited by yielding of the W6x8.5 post used in the first six bogie tests. In order to isolate the soil response at lower embedments, a second set of three bogie tests was conducted with W6x16 posts at 40 in., 34 in. and 28 in. embedments. The data from these tests was further utilized to characterize the post response for shallow embedments.

In this quarter, MwRSF continued development of models of the bogie tests in LS-DYNA to develop accurate post-soil models for further MGS system analysis with shallow embedments. Models of both the W6x8.5 and W6x16 dynamic component tests were developed. The W6x16 models are being calibrated to provide accurate soil response. The soil models used in the W6x16 post in soil models are then being applied to a model of W6x8.5 posts in soil with various embedment depths and compared with the previous component tests to ensure that the LS-DYNA models will produce the proper response when used to model the MGS with shallow embedment depths.

**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 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 upcoming quarter, MwRSF will continue to develop validated models of the post-soil interaction with reduced embedments and begin simulation analysis of potential MGS design alternatives.

**Total Percentage of Project Completion:**

22.4%

# Research Project Quarterly Progress Report

**Date:** 1/30/2021                      **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:** 10/1/2018                      **Project Completion Date:** 12/31/2021

<b>Report Period:</b>	<b>Due Date:</b>
<input type="checkbox"/> Quarter 1 (July 1 – September 30)	October 31
<input checked="" type="checkbox"/> Quarter 2 (October 1 – December 31)	January 31
<input type="checkbox"/> Quarter 3 (January 1 – March 31)	April 30
<input type="checkbox"/> 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. <b>Planning &amp; Correspondence</b>	\$27,155	100%	\$4,461	\$7,926	40%	\$19,229
2. <b>Design and Analysis</b>	\$106,064	0%	\$0	\$0	0%	\$106,064
3. <b>Bogie Testing</b>	\$99,897	0%	\$0	\$0	0%	\$99,897
4. <b>Reporting and Deliverables</b>	\$18,311	0%	\$0	\$0	0%	\$18,311
5.						
6.						
7.						
8.						
9. <b>Total</b>	\$251,429	-	\$4,461	\$7,926	8%	\$243,503

**Progress and Accomplishments this Quarter:**

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

A survey was created to gather information from the sponsoring DOTs and was sent out September 23<sup>rd</sup>. It asked for current AGT standard details, information on post installation issues, and any photos of installation issues. 11 State DOT responded and indicated that the most common issues preventing AGT post installation are drainage structures, utility lines, and wingwalls/bents. Posts were also commonly found on or adjacent to steep slopes. Some posts were installed in pavements. Details on the survey results were presented to the project sponsors at the mid-year meeting of the Midwest Pooled Fund. A few design ideas were discussed, and the consensus was to develop top-mounted posts for the AGTs. These posts would be 6x15 posts mounted to the top of a concrete slab. This concept would address all ground obstructions and possible even the issue of slopes.

A literature review was also completed on previous AGTs and guardrail retrofits.

**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 do not include labor charges from December of 2020 as those expenditures had not yet been charged to the project.

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:**

Conceptual design of possible retrofits will commence along with basis structural analysis.

**Total Percentage of Project Completion:**

8%

# Research Project Quarterly Progress Report

**Date:** 1/30/2021                      **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:** Jennifer Rasmussen (Schmidt), Reid, Faller, et al.  
**Principal Contact Information Email:** jennifer.rasmussen@unl.edu                      **Phone:** (402) 472-0870  
**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. <b>Project Planning &amp; Correspondence</b>	\$12,644.00	0%	\$0.00	32%	\$8,644.00
2. <b>Full-Scale Crash Testing</b>	\$278,516.00	100%	\$20,257.00	10%	\$237,895.00
3. <b>Reporting</b>	\$11,623.00	0%	\$0.00	0%	\$11,623.00
4.					
5.					
6.					
7.					
8.					
9. <b>Total</b>	\$302,783.00		\$20,257.00	10%	\$258,162.00

**Progress and Accomplishments this Quarter:**

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

All materials were collected for the test articles. Construction of the system has begun and is approximately 50% completed.

Efforts were also made to complete the Phase I report, which focused on the simulation of various flare rates and the selection of the 15:1 flare for further evaluation.

**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 do not include labor charges from December of 2020 as those expenditures had not yet been charged to the project.

A request was submitted to utilize funds from the Year 28 project "MASH Evaluation of Steel Post Bullnose" to partially fund this project. The Bullnose project was complete and set to close December 2020, but they were nearly \$200,000 in remaining funds in the project. To utilize so of these funds, the first few tests of the flared AGT system (this project) may be funded with these leftover contingency funds from the Bullnose project.

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. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

**Anticipated Work Next Quarter:**

Full-scale crash testing will begin.

**Total Percentage of Project Completion:**

10%

# Research Project Quarterly Progress Report

**Date:** 1/29/2021                      **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. <b>Project Planning &amp; Correspondence</b>	\$19,248.00	40%	\$6,369.00	43	\$12,528.00
2. <b>Full-Scale Crash Testing</b>	\$176,505.00	1%	\$268.00	1%	\$176,237.00
3. <b>Design &amp; Analysis</b>	\$39,381.00	0%	\$0.00	0%	\$39,381.00
4. <b>Reporting &amp; Deliverables</b>	\$22,074.00	0%	\$0.00	0%	\$22,074.00
5.					
6.					
7.					
8.					
9. <b>Total</b>	\$257,208.00		\$0.00		\$256,857.00



**Progress and Accomplishments this Quarter:**

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

Survey questions completed and sent to state DOTs to respond. Additional questions for manufacturers were considered and sent for review, regarding the use of end terminal hardware in this project. Simulations previously conducted on behalf of Wisconsin DOT performing preliminary investigation of end terminals adjacent to curbs were reviewed and updated to the most recent version of DYNA. Minor modifications to the baseline models were implemented to improve stability. Designs of W-beam end terminals which have been successfully crash-tested to MASH were summarized and compression designs were selected for further consideration.

**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. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

**Anticipated Work Next Quarter:**

Using results of the state DOT and manufacturer surveys, configurations for full-scale testing will be recommended. Test plans will be started for investigating end terminal performance in conjunction with curbs. Pre-test evaluations will be conducted to investigate vehicle stability when traversing non-level terrain, before installing the guardrail system. Once completed, survey results, test plans, and recommendations will be submitted to Midwest Pooled Fund state DOTs for review and approval before proceeding.

**Total Percentage of Project Completion:**

5%

# Research Project Quarterly Progress Report

**Date:** 1/31/2021                      **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:** 12/31/2022

**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. <b>Project Planning and Correspondence</b>	\$30,952.00	4.8%	\$1,495.00	5.9%	\$29,130.00
2. <b>Design and Analysis</b>	\$177,021.00	0.0%	\$0.00	0.0%	\$177,021.00
3. <b>Reporting and Project Deliverables</b>	\$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, reviewed the results of the survey regarding site conditions for treatments for intersecting roadways and potential short-radius guardrail systems. Information was gained regarding site constraints and geometries, clear zones, and grading. It was noted that MwRSF will attempt to address as many of these issues as possible with the new design, but that there may be limits to what can be achieved.

MwRSF also worked on a review of existing and previous short-radius guardrail research and a review of previous design concepts developed at MwRSF.

**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:**

MwRSF will review the previous design concepts and develop new concepts for the short-radius guardrail design.

**Total Percentage of Project Completion:**

0.7%

# Research Project Quarterly Progress Report

**Date:** 1/31/2021                      **Project Number:** TPF-5(193) Suppl. #147 RPFP-19-CONSULT  
**Project Title:** Annual Consulting Services Support  
**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:** 1/21/2020                      **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. <b>Project Planning and Correspondence</b>	\$60,647.00	11.1%	\$6,760.00	11.1%	\$53,887.00
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 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:**

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:**

11.1%

# Research Project Quarterly Progress Report

**Date:** 1/31/2021                      **Project Number:** TPF-5(430) Suppl. #7, RPPF-20-PFCHS  
**Project Title:** Pooled Fund Center for Highway Safety  
**Principal Investigator:** Reid, Bielenberg, Faller, Holloway, Lechtenberg, Rosenbaugh, Rasmussen,  
**Principal Contact Information Email:** kpolivka2@unl.edu                      **Phone:** (402) 472-9070  
**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. Website Develop, Populate, and Host	\$14,330.00	20%	\$2,590.00	55%	\$6,162.00
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.)*

Troubleshooting and fixing any issues that have occurred during the transition.

Continued maintenance, repair, and upkeep of the website

Updated 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.: RFP-19-PFCHS – TPF-5(193) Supplement #148, Project Title: Pooled Fund for Highway Safety have been exhausted.

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. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

**Anticipated Work Next Quarter:**

Troubleshoot and fix any issues that have occurred during the transition.

Continued maintenance, repair, and upkeep of the website

Updated research hub with new completed projects.

**Total Percentage of Project Completion:**

50%



# Research Project Quarterly Progress Report

**Date:** 1/31/2021                      **Project Number:** TPF-5(430) Suppl. #8, RPPF-20-LS-DYNA  
**Project Title:** LS-DYNA Modeling Enhancement Support  
**Principal Investigator:** Reid, Faller, et al.  
**Principal Contact Information Email:** jennifer.rasmussen@unl.edu                      **Phone:** (402) 472-0870  
**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. <b>LS-DYNA Modeling Enhancement</b>	\$30,616.00	0.2%	\$55.00	0.4%	\$30,506.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9. <b>Total</b>	\$30,616.00		\$0.00		\$30,616.00

**Progress and Accomplishments this Quarter:**

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

The Year 30 LS-DYNA modeling enhancement support was initiated part way through the first quarter of 2020. Due to remaining funds in the Year 29 LS-DYNA modeling enhancement support, no funds will be utilized from this project until Year 29 modeling funds are depleted.

**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. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

**Anticipated Work Next Quarter:**

None - due to remaining funds in the Year 29 LS-DYNA modeling enhancement support, no funds will be utilized from this project until Year 29 modeling funds are depleted.

**Total Percentage of Project Completion:**

0.4%



**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, minimal work was completed on this effort. MwRSF previously completed the majority of the system fabrication for the barrier system including the slope formation and post installation. The system is currently behind several other systems in the testing que and will be tested as soon as possible.

**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.

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 anticipates conducting the full-scale crash testing of the MGS with 1/2 post spacing adjacent to slope.

**Total Percentage of Project Completion:**

15.3%



**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 received both the gate are and luminaire pole hardware for all three crash tests. The materials are currently in the full-scale test que at the MwRSF Outdoor Test Facility for conducting the three full-scale crash tests in the project. MwRSF will conduct these tests as soon as possible within the other existing tests scheduled at the site.

Note that onoging simulation modeling conducted at MwRSF with respect to breakaway luminaire poles may suggest which vehicle orientation is more critical for impacting the pole. If that research indicates a different orientation than currently planned, MwRSF would consult with WYDOT prior to moving forward.

**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 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 setup the poles for crash testing and potentially test the poles if possible given the currently testing que.

**Total Percentage of Project Completion:**

13.7%



**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 crash reports provided to MwRSF for divided freeways in Kansas were reviewed and classified. Analysis was performed to investigate factors which linked cross-median events (CMEs) and cross-median crashes (CMCs) to roadway, environmental, traffic volume, or locational factors to determine if updates were recommended to KDOT treatment strategies. Analysis of factors did not reveal any major trends and indicated that as traffic volumes increased, the likelihood of a cross-median event generally decreased, although when CMEs occurred at higher traffic volumes, cross-median crashes occurred at a higher rate. Overall, results were relatively random. Black spot analysis was started.

**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 have produced significant difficulties in scheduling and delays to date. Due to the sensitivity of crash report analysis work, no crash report data extraction was permitted during the period of remote work. Subsequently, a significant reduction of the student workforce required engineering faculty and staff to adapt and revise the analysis strategy for the crash reporting. The new techniques developed will greatly expedite project completion and are hoped to keep the project on track, but required more expense and faculty time to set up than were expected or budgeted. The research team has implemented measures to increase the efficiency of the project completion using computer coding and a specialized extracted data set, significantly decreasing the average amount of review time required per crash. The research team will continue to update KDOT in the event of project delays. Due to efficient completion of the analytical phase, costs have been significantly under expectations. The research team will recommend a no-cost extension to KDOT to perform additional, beneficial analysis on the provided dataset.

**Anticipated Work Next Quarter:**

All analytical work in regard to the original project scope will be completed. A technical summary report will be submitted to KDOT describing the literature review, crash analysis, benefit-to-cost analysis, and barrier installation recommendations. Further investigation of black spots and selected location recommendations will also be provided.

**Total Percentage of Project Completion:**

65%