

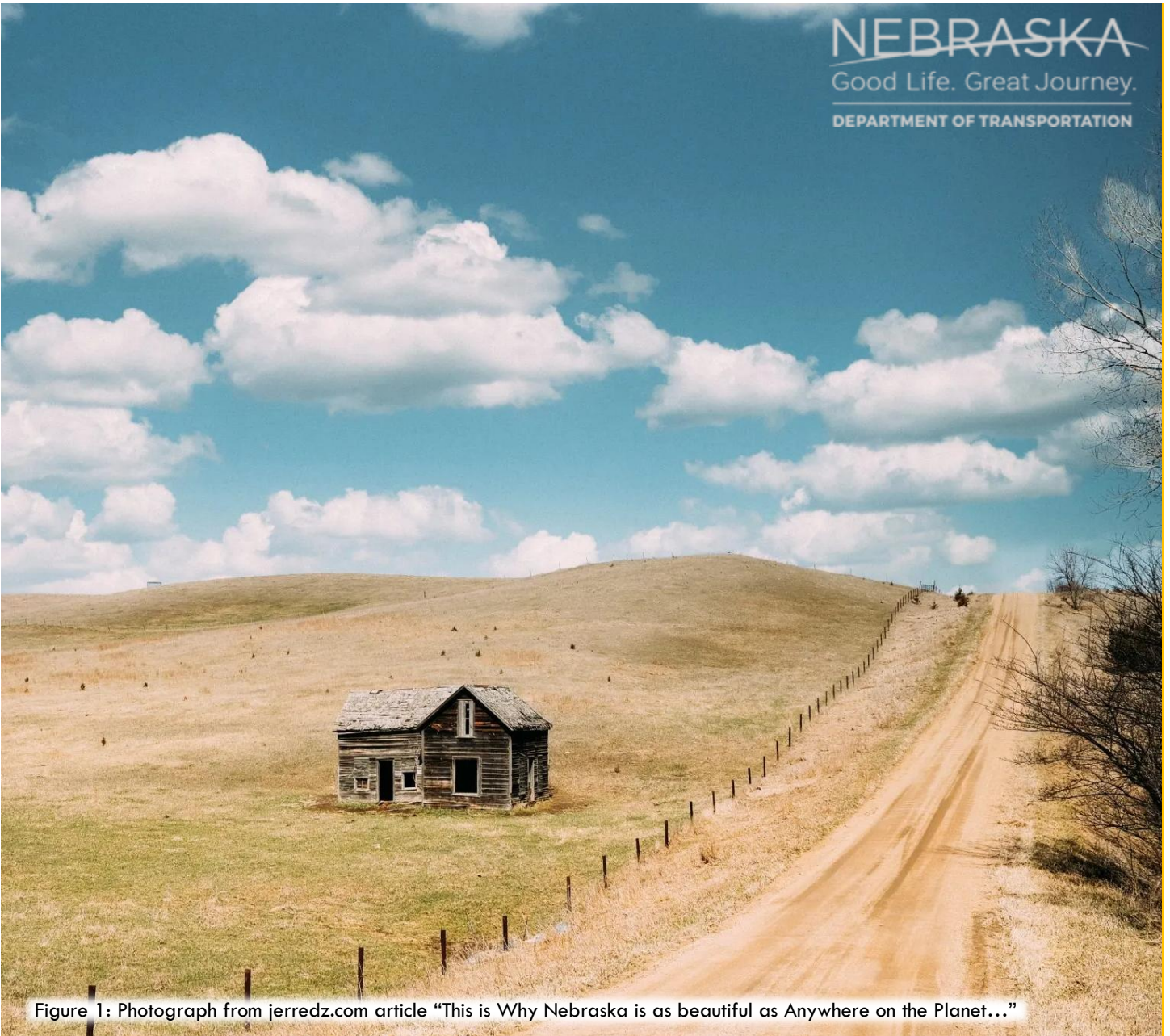


Figure 1: Photograph from jerredz.com article “This is Why Nebraska is as beautiful as Anywhere on the Planet...”

NEBRASKA RESEARCH WORK PROGRAM

FISCAL YEAR 2026

July 1, 2025 – June 30, 2026

PREPARED BY NDOT RESEARCH SECTION

Submitted:



WORK PROGRAM OVERVIEW

The Nebraska Department of Transportation (NDOT) Materials and Research (M&R) Division administers the Research Program. The Research Program's mission is to provide more complete knowledge of the basic characteristics of highway geometrics, traffic flow, safety, structural capabilities, economics, financing, administration, and their effectiveness within the total transportation system. The Research Program's primary objectives are:

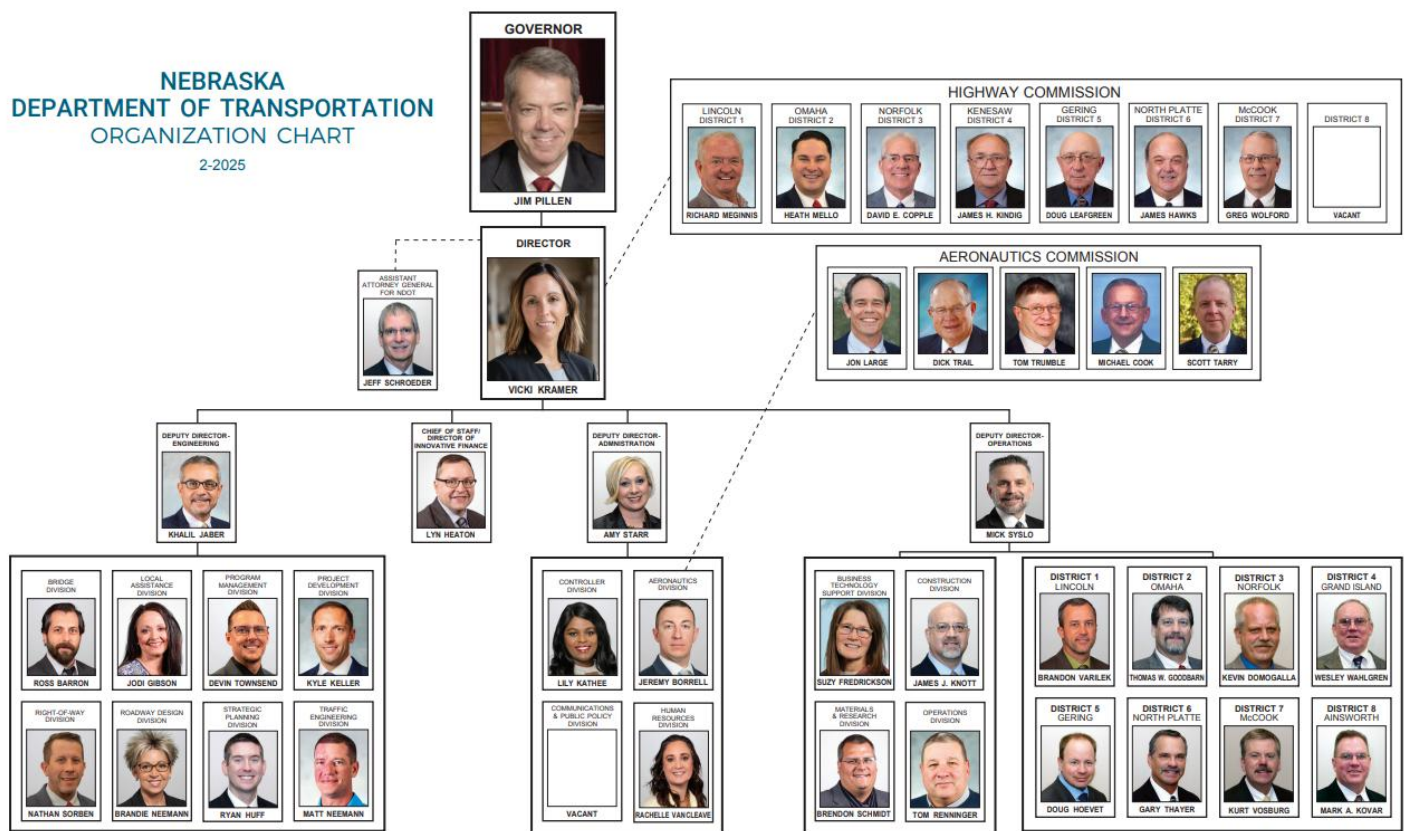
-  Reduce highway construction and maintenance costs.
-  Improve the quality of service to the transportation user.
-  Increase the planning, operations, and administrative efficiency of various transportation modes.
-  Reduce accidents and accidents severity.
-  Encompass the interrelationship of socioeconomic, environmental, and technological factors in the transportation system.

TYPICAL NDOT FEDERALLY FUNDED RESEARCH CYCLE

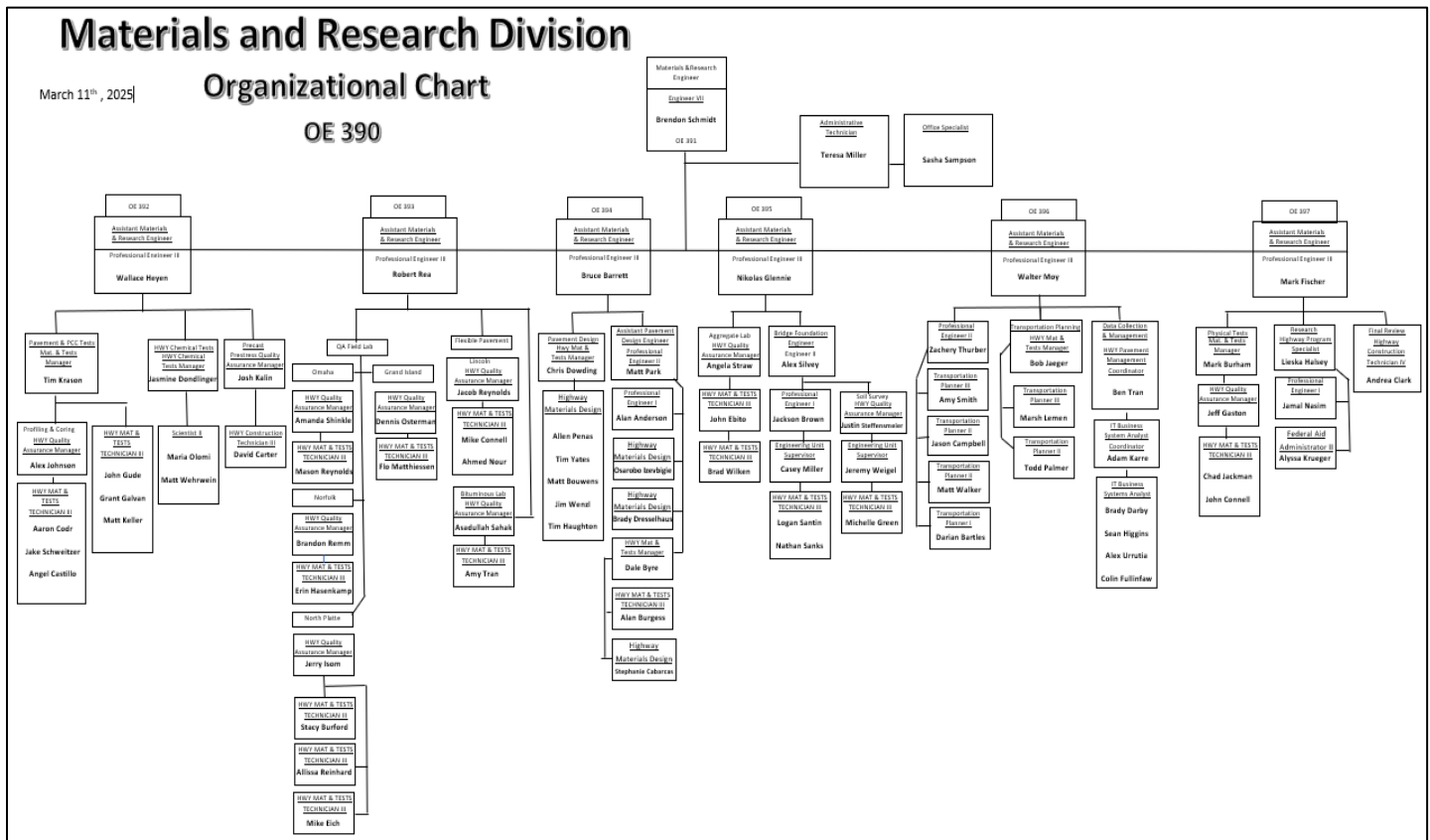


NEBRASKA DEPARTMENT OF TRANSPORTATION ORGANIZATION CHART

NEBRASKA DEPARTMENT OF TRANSPORTATION ORGANIZATION CHART 2-2025



NEBRASKA DEPARTMENT OF TRANSPORTATION



ACCOMPLISHMENTS FY-2025 TO DATE

- July to September 2024, the solicitation for Statements of Need was made to the entire State of Nebraska for FY-2026 funding.
- Forty (40) Statements of Needs were received.
- Virtual meetings via WebEx were hosted by each Focus group in early October, Nebraska Department of Transportation personnel, industry leaders, contractors, city and county representatives, and the Statement of Need presenters:



Materials, Pavements, Maintenance, and Construction



Traffic, Safety, Planning, and Technology



Structures and Geotechnical



Roadway, Hydraulics, and Environmental

- The Nebraska Transportation Research Council (NTRC) prioritized/selected twenty-one (21) Statements of Need from all focus groups.
 - October 31 through November 22, 2024, NDOT's Research Section organized and held 21 framework review meetings placing technical experts with the researchers to develop a proposal to help accomplish the department's mission.
 - On January 24, 2025, NDOT's Research Section conducted the RAC meeting and added 14 new SPR projects with a total budget of \$2,198,853 .
 - NDOT expended approximately \$1,288,052 so far in FY-2025 for all on-going research projects and provided financial support to TRB and NCHRP.
 - Post-NTRC survey to establish Statement of need slides, hosting platform, and highlighting completed projects as a standard practice.
- Throughout the year, the Research Staff has held numerous Technical Advisory Committee meetings on active research projects.
- NDOT continues to be the lead state for the Midwest States Regional Pooled Fund Program. TPF-5(193) and TPF-5(430) are in the process of closing. FY25 saw the start of TPF-5(533) and is still needing states to transfer funding to start on research projects.
- Completed 14 projects and shared results with the Nebraska Local Technical Assistance Program (LTAP). The University of Nebraska houses a complete archive of NDOT Research Reports in their digital commons. Where all research projects are downloaded from all over the world.
- Established a "Research Pays off" Seminar every 6 (six) months, highlighting Completed projects worth 1(one) Professional Development Hour for NDOT employees
- Collaborated with UNL to provide Transportation Seminars (worth 1 (one) Professional Development Hour to NDOT Personnel) with completed projects as topics within Structure and Traffic focuses.
- On July 23, 2024 NDOT and UNL held an in person Research Summit at NDOT headquarters. Researchers were able to present research ideas and NDOT staff were able to present on their research interests.

RESEARCH WORK PROGRAM GOALS

FY-2026

- Establish the FY-2027 Research Program.
- Monitor research projects and assist Technical Advisory Committees.
- Assist with implementation of research results and added the completed projects a SharePoint site for their follow up.
- Work closely with principal investigators on:
 - Submission of quarterly reports and final reports
 - Presentations to department personnel
- Administration of Regional Pooled Fund Program activities, which are conducted at the University of Nebraska – Midwest Roadside Safety Facility.
- Compile an Annual Work Program Report to be distributed via the research section website to the public.
- Uploading all Federal Funded Research into the Transportation Research Information Services (TRIS) for new projects and Transportation Research International Documentation (TRID) for all completed projects.
- Continue to collect implementation plans from the lead technical advisory committee member and ask for technology transfer from Principal Investigators. Distribute, collect, and publish evaluations on each completed project.
- Continue to share the Technology Transfer efforts from the current funded projects.
- The Research Program Administrator and Project Manager will continue participation in the research program management software tool (TPF-5(467)) and western states research consortium (TPF-5(526) pooled funds.
- The 2025 peer exchange is scheduled as part of the TPF-5(526) and will be held in Austin, TX on May 20 – May 22, 2025. 14 other state DOT's will have their research staff attend the multi-day peer exchange and annual pooled fund meeting. The themes are Measuring Research Success, Pooled Fund Management, and Regional Research Impact.
- Research Project Management Software (TPF-5(467)) is currently being beta tested and implementation hopefully in the winter of 2025/2026.
- Continuing the Research Pays off bi-annual Webinar, with completed Research Projects as topics providing 1 PDHs for NDOT Engineers
- Continue to partner with University of Nebraska Lincoln to provide Transportation Seminars for NDOT Personnel and Students and provide 1 PDH's to NDOT Engineers.
- Research Summit 2025 is in the planning process with UNL.

Figure 3: Stock Image



CURRENT FUNDING OBLIGATIONS

Midwest Roadside Safety Facility (MwRSF) Pooled Fund Midwest States Pooled Fund Crash Test Program



Nebraska's Lead State Pooled Fund

TPF-5(193) CONTROL NO.: 00778
TPF-5(430) CONTROL NO.: 01010
TPF- 5(533) CONTROL NO.: 01010A

Active Projects

TPF-5(193) CONTROL NO.: 00778				
SUPPLEMENT NUMBER	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
CURRENT PROJECTS				
#128	Dynamic Testing and Evaluation of a New York State DOT Transition between Boxed Guardrail Under AASHTO MASH 2016 TL-3 Guidelines	\$236,626	\$218,024	\$18,602
#135	MASH 2016 Safety Hardware Evaluation	\$1,033,463	\$1,002,509	\$30,954
#144	Midwest Pooled Fund MASH Hardware Clearinghouse	\$51,206	\$11,411	\$39,795
#154	MASH Testing of Single Sign Support	\$750,000	\$680,597	\$69,403
Totals		\$2,071,295	\$1,912,541	\$158,754

1. Budget Numbers as of 03/31/2025
2. Budget shows expenses that may not be entered into FMIS

TPF-5(430) CONTROL NO.: 01010

	SUPPLEMENT NUMBER	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
CURRENT PROJECTS					
FY2020 Year 1	#2	PPF-20-AGT-1: Additional Retrofit Options for Post Conflicts within AGTs (New Jersey)	\$251,429	\$141,563.56	109,865.44
	#4	RPPF-2--TERM-1: Further Evaluation of the End Terminals Adjacent to Curb (New Jersey)	\$257,208	\$179,996.58	\$77,211.42
	#5	RPPF-20-SR-1: Development of a Short-Radius Guardrail for Intersecting Driveways or Roadways (New Jersey)	\$251,031	\$165,386.47	\$85,645.53
	#9	Contingency FY20 (PF Yr 30) - Year 1	\$11,043	\$0	\$11,043
	#12	*MASH 2016 TL-3 Evaluation of Drop-Arm Road Closure Gate (Wyoming)	\$299,396	\$101,781.58	\$197,614.42
FY2021 Year 2	#15	RPPF-21-CABLE-1: Redesign of the High-Tension Cable Median Barrier – Phase II	\$253,893	\$234,562.91	\$19,330.09
	#16	RPPF-21-CONC-2: Anchoring Temporary Barrier to Asphalt Pavement Phase II (Wisconsin)	\$224,325	\$189,968.85	\$34,356.15
	#17	RPPF-21-CONC-3: MASH TL-3 Portable Barrier System (Nebraska/Wyoming)	\$148,296	\$57,710.81	\$90,585.19
	#18	RPPF-21-AGT-1: Approach Guardrail Transition behind Curb and Elevated Sidewalk (Indiana)	\$146,141	\$69,685.38	\$76,455.62
	#20	RPPF-21-SIGN-1: Breakaway Systems for Ground-Mounted, Large Steel Sign Support Structures (New Jersey)	\$77,740	\$74,895.86	\$2,884.14
	#21	RPPF-21-POLE-1: Breakaway Pole Research (Wisconsin)	\$269,455	\$167,019.86	\$102,435.14
	#22	RPPF-21-CONSULT: Annual Consulting Services Support	\$61,446	\$21,060.48	\$40,385.52
	#23	RPPF-21-MPFW: Midwest Pooled Fund Website	\$18,573	\$13,079.56	\$5,493.44
	#25	Contingency FY21 (PF Yr 31) - Year 2	\$1	\$0	\$1
	#26	*RPPF-FY2022-WISDOT-1: Reduced Grading for the MGS Long-Span Guardrail System – Phase I	\$219,891	\$0	\$219,891
FY2022 Year 3	#27	FY22-IND-1-PCB: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt Anchored Configurations, and Transitions	\$530,131	\$84,530.16	\$445,600.84
	#28	RPPF-FY2022-MGS-4: Evaluation of Increased Block out Depth with the Midwest Guardrail System	\$262,851	\$67,299.52	\$195,551.48
	#29	RPPF-FY2022-MGS-5: Surface Mounted Strong-Post MGS	\$217,840	\$62,234.26	\$155,605.74
	#30	RPPF-FY2022-AGT-3: Median Approach Guardrail Transition to Concrete Median Barrier	\$233,888	\$1,763.86	\$232,124.14
	#31	RPPF-FY2022-WZ-2: MASH TL-3 Portable Barrier System – Phase II	\$331,619	\$325.75	\$331,293.25
	#32	RPPF-FY2022-WZ-3: Midwest PCB – Anchored Median Installations	\$155,262	\$72,306.44	\$82,925.56
	#33	RPPF-FY2022-CONSULT: Annual Consulting Services Support	\$65,000	\$51,371.51	\$13,628.49
	#34	RPPF-FY2022-MPFW: Midwest Pooled Fund Website	\$12,111	\$1,296.12	\$10,814.88
	#35	RPPF-FY2022-LS-DYNA: LS-DYNA Modeling Enhancement Support	\$40,000	\$31,381.48	\$8,618.52
	#36	Contingency FY22 (PF Yr 32) - Year 3	\$46,459	\$0	\$46,459
PAGE SUBTOTAL			\$4,385,030	\$1,930,601.77	\$2,454,428.23

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4. * Projects developed with other State's funds through interagency agreement

TPF-5(430) CONTROL NO.: 01010					
	SUPPLEMENT NUMBER	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
CURRENT PROJECTS - Continued					
FY2023 Year 4	#37	RFPF-FY2023-MGS-1: Modification and Evaluation of the MGS Long Span with Increased Span Length	\$377,870	\$1,212.76	\$376,657.24
	#38	RFPF-FY2023-AGT-1: Guidelines for Flaring Thrie-Beam Approach Guardrail Transitions - Phase IV (Continuation)	\$310,591	\$108,334.46	\$202,256.54
	#39	RFPF-FY2023-GET-1: Generic End Terminal – Further Development and Evaluation	\$437,226	\$47,233.65	\$389,992.35
	#40	RFPF-FY2023-MWQA-1: Continued Revisions to MwRSF Pooled Fund Q & A Website	\$45,421	\$4,735.74	\$40,685.26
	#41	RFPF-FY2023-AUTO-1: Coordination and Collaboration with Vehicle Manufacturers and Automotive Industry	\$56,219	\$20,619.08	\$35,599.92
	#42	RFPF-FY2023-CONSULT: Annual Consulting Services Support	\$65,000	\$690.16	\$64,309.84
	#43	RFPF-FY2023-MPFW: Midwest Pooled Fund Website	\$12,868	\$0	\$12,868
	#44	RFPF-FY2023-LS-DYNA: LS-DYNA Modeling Enhancement Support	\$40,000	\$12,215.65	\$27,784.35
	#45	Contingency FY2023 (PF Yr 33) - Year 4	\$19,805	\$0	\$19,805
	#46	MASH TL-3 Evaluation of Illinois DOT's Steel Railing, Type SMX	\$319,463	\$19,588.94	\$299,874.06
	#47	*MnDOT MASH TL-3 THRIE BEAM BULLNOSE INSTALLATION MANUAL	\$110,761	\$7,665.02	\$103,095.98
	#48	*FY2023-WisDOT-Slope-1: Guidance for MGS Installed Adjacent to Steep Slopes at Variable Offsets-Phase I	\$239,647	\$9,913.83	\$229,731.17
FY2024 Year 5	#49	*WISDOT MASH TL-3 Evaluation Of New Jersey Shape Parapet With 3-in. Overlay; State to state Agreement	\$251,591	\$0	\$251,591
	#50	*FY2024-WY-1-BOX: Development and Evaluation of Box-Beam Barrier Configuration for Shielding Fixed Objects and Bridge Ends in Medians	\$799,998	\$0	\$799,998
	#51	MASH Evaluation of Florida Single Post Signs Phase II	\$750,000	\$42,129.91	\$707,870.09
	#52	*FY2024-WISC-CONC-1: Anchoring Temporary Barrier to Asphalt Phase III	\$167,436	\$0	\$167,436
	#53	RFPF-FY2024-CONC-3: Grade-Separated Concrete Median Barrier	\$213,580	\$0	\$213,580
	#54	RFPF-FY2024-CONC-5: Guidelines for Concrete Median Barrier Anchorage to Slabs	\$309,915	\$0	\$309,915
	#55	RFPF-FY2024-MGS-1: W-Beam and Thrie Beam Splice Joint Redesign – Phase I	\$86,092	\$0	\$86,092
	#56	RFPF-FY2024-MGS-3: Reduced Grading for the MGS Long-Span Guardrail System	\$322,730	\$0	\$322,730
	#57	RFPF-FY2024-THRIE-1: Development of a Limited Deflection MASH TL-4 Thrie-Beam Guardrail	\$184,262	\$0	\$184,262
	#58	RFPF-FY2024-GET-1: Development of a Generic End Terminal - Phase IV	\$138,529	\$0	\$138,529
	#59	RFPF-FY2024-AUTO-1: LS-DYNA Investigation of Electric Vehicles and Roadside Hardware	\$142,319	\$3,764.18	\$138,554.82
	#60	RFPF-FY2024-CONSULT: Annual Consulting Services Support	\$65,000	\$0	\$65,000
	#61	RFPF-FY2024-MPFW: Midwest Pooled Fund Website	\$12,571	\$0	\$12,571
	#62	RFPF-FY2024-LS-DYNA: LS-DYNA Modeling Enhancement Support	\$40,000	\$0	\$40,000
	#63	RFPF-FY2024-BR-TRAINING: Implementation of MASH Bridge Railing and Deck Overhang Research	\$45,488	\$0	\$45,488
	#64	RFPF-FY2024-CALTRANS-LS-DYNA: LS-DYNA Simulation Consulting Support	\$30,000	\$0	\$30,000
	#65	*RFPF-FY2024-WISC-CONC-2: Portable Concrete Barrier Anchorage with Removeable Anchors	\$130,000	\$0	\$130,000
PAGE SUBTOTAL			\$5,724,382	\$278,103.38	\$5,446,276.62
TOTAL TPF-5(430) ACTIVE PROJECTS			\$10,109,412	\$2,208,705.15	\$7,900,704.85

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Completed Pooled Fund Research TPF-5(430) CONTROL NO.: 01010		
	SUPPLEMENT	STUDY TITLE
FY2020 Year 1	#1	Evaluation Of Midwest Guardrail System with Reduced Embedment And Reduced Post Spacing For Low-Fill Culverts And Other Applications
	#3	Guidelines for Flaring Thrie-Beam Approach Guardrail Transitions - Phase II
	#6	Annual Consulting Services Support
	#7	Pooled Fund Center for Highway Safety – Database
	#8	LS-DYNA Modeling Enhancement Support – Year 1
	#11	In-Service Performance Evaluation of KDOT's Cable Median Barrier
	#13	Crash Safety Evaluation of Concrete Barrier Sloped End Treatments (Iowa)
	#14	Evaluation Of Guidelines for Installing Cable Median Barrier in Kansas
FY2021 Year 2	#19	Guidelines for Flaring Thrie-Beam Approach Guardrail Transitions - Phase III
	#24	LS-DYNA Modeling Enhancement Support

TPF-5(533) CONTROL NO.: 01010A					
	SUPPLEMENT NUMBER	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
CURRENT PROJECTS					
FY2025 Year 1	#1	RFPF-FY2025-CABLE-1: Evaluation of Midwest High-Tension Cable Median Barrier in 6H:1V V-Ditch – Phase III	\$336,854	\$0	\$336,854
	#2	RFPF-FY2025-CONC-1: Strength Requirements for Concrete Median Barrier Anchorages	\$450,439	\$0	\$450,439
	#	RFPF-FY2025-MGS-6: Investigation of Guardrail Modifications to Accommodate Electric Vehicles	\$258,900	\$0	\$258,900
	#4	RFPF-FY2025-GET-1: Development of a Generic End Terminal – Phase IV – CONTINUATION	\$25,992	\$0	\$25,992
	#5	RFPF-FY2025-Q&A-1: Summary Report on MwRSF Q and A Site	\$98,906	\$0	\$98,906
	#6	RFPF-FY2025-CONSULT: Annual Consulting Services Support	\$67,955	\$0	\$67,955
	#7	RFPF-FY2025-MPFW: Midwest Pooled Fund Website	\$13,142	\$0	\$13,142
	#8	RFPF-FY2025-LS-DYNA: LS-DYNA Modeling Enhancement Support	\$41,818	\$0	\$41,818
	#9	RFPF-FY2025-LS-DYNA-EV: LS-DYNA Investigation of Electric Vehicles and Roadside Hardware – Supplemental Funding	\$62,274	\$0	\$62,274
	#10	RFPF-FY2025-CONTINGENCY: FY2025 Midwest Pooled Fund Program Contingency Funding	\$8,720	\$0	\$8,720
	#11	RFPF 2025: DEVELOPMENT OF SMALL WILDLIFE EXCLUSION FENCING INCORPORATED INTO GUARDRAIL (ODOT)	\$292,620	\$0	\$292,620
TOTAL TPF-5(430) ACTIVE PROJECTS			\$1,657,620	\$0	\$1,657,620

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The Transportation Pooled Fund (TPF) Program allows federal, state, and local agencies and other organizations to combine resources to support research into shared transportation priorities



Pooled Fund Projects and Other Contributions (100% Federally Funded)			
STUDY TITLES	FUNDING TYPE	EXPENDITURES FY25	Commitments for FY26
Solicitation 1562/TPF-5(347): Development of Maintenance Decision Support System	Y550	\$40,000	\$30,000
TPF-5(533)/TPF-5(430): Midwest Roadside Safety Pooled Fund Program (FY25-FY29)	Y550	\$65,000	\$65,000
TPF-5(544)/TPF-5(437): Technology Transfer Concrete Consortium (FY25-FY29)	Y550	\$12,000	\$12,000
TPF-5(545)/TPF-5(438): Smart Work Zone Deployment Initiative (FY25-FY29)	Y550	\$25,000	\$25,000
STPF-5(554)/TPF-5(447): Traffic Control Device Consortium	Y550	\$30,000	\$30,000
TPF-5(448): Improving Specifications to Resist Frost Damage in Modern Concrete Mixes	Y550	\$20,000	\$20,000
TPF-5(451): Road Usage Charge (RUC) America	Y550	\$25,000	\$25,000
TPF-5(465): Consortium for Asphalt Pavement Research and Implementation (CAPRI)	Y550	\$10,000	\$10,000
TPF-5(466): National Road Research Alliance- NRRRA (Phase II)	Y550	\$75,000	\$75,000
TPF-5(467): Project Management Software for Research	Y550	\$3,500	\$0
TPF-5(470): Guidelines for Determining Traffic Signal Charge and Clearance Intervals	Y550	\$30,000	\$30,000
TPF-5(479): Clear Roads Winter Highway Operations Phase III	Y550	\$25,000	\$25,000
TPF-5(480): Building Information Modeling (BIM) for Infrastructure	Y550	\$30,000	\$30,000
TPF-5(492): 2023 through 2025 Biennial Asset Management Conference and Training on Implementation Strategies	Y550	\$12,000	\$0
TPF-5(508): Concrete Bridge Engineering Institute (CBEI)	Y550	\$30,000	\$30,000
TPF-5(515): Evaluation of Low-Cost Safety Improvements	Y550	\$5,000	\$5,000
TPF-5(517): Performance Centered Concrete Construction	Y560	\$0	\$20,000
TPF-5(520): Improving Traffic Detection Through New Innovative i-LST Technology Demonstration Pilot Print	Y550	\$30,000	\$30,000
TPF-5(523): Building Information Modeling (BIM) for Bridges and Structures Phase II	Y550	\$20,000	\$20,000
TPF-5(526): Western States Consortium	Y550	\$25,000	\$15,000
TPF-5(536): Ahead of the Curve-Migration from NCHRP to AASHTO Technical Training Solutions	Y550	\$10,000	\$10,000
TPF-5(537): improving the Quality of Highway Profile Management	Y560	\$0	\$30,000
TPF-5(546): Transportation Materials Resource Center	Y550	\$40,000	\$40,000
TPF-5(550): Performance Based Specification of Fiber Reinforced Concrete	Y550	\$30,000	\$30,000
Solicitation 1620: Uncrewed Aircraft Systems (UAS) Standardization	Y550	\$25,000	\$25,000
Commitment for FY2026		\$617,500	\$632,000
Transportation Research Board (TRB) Annual Transfer	Y550	\$109,034	\$111,165
National Cooperative Highway Research Program (NCHRP) Annual Transfer	Y550	\$410,493	\$418,515
Total		\$1,137,027	\$1,161,680

*Solicitations are pooled funds pending approval before turning into a full project. Funds will not be used until the project is approved.



FHWA FEDERAL-AID DIVISION STATE PLANNING AND RESEARCH SUB-PART B (SPR-B) PROGRAM FUNDING



**In Progress Projects
and
New Projects**

IN-PROGRESS RESEARCH							
	CONTROL NUMBER	PROJECT NUMBER SPR-	FUNDING TYPE	STUDY TITLES and Transportation Research Board Research in Progress (RiP) link	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
FY 2021	01021B	FY21(003)	Y560	Effect of Antioxidant Recycling Agents of Asphalt Binders – Phase II	\$167,602	\$110,875.04	\$56,726.96
FY 2022	01034E	FY22(005)	Y560	Remote Sensing and Hydrologic Modeling to Reduce Hwy Flooding in the Sandhills	\$143,166	\$132,184.75	\$10,981.25
FY 2023	01046B	FY23(014)	Y560	Gravel Road Performance Enhancement	\$166,064	\$109,111.42	\$56,952.58
	01046C	FY23(015)	Y560	Application of Cementitious Materials and Fiber Reinforcement to Enhance Lime Stabilization for Nebraska Shale Soils	\$142,129	\$124,761.74	\$17,367.26
	01046D	FY23(016)	Y560	Nebraska Balanced Mix Design – Phase II	\$141,914	\$52,126.74	\$89,787.26
	01046G	FY23(019)	Y560	Minimizing take of threatened rattlesnakes and optimizing project review in SE NE	\$62,238	\$35,613.00	\$26,625.00
	01046J	FY23(021)	Y560	Impacts of Stream Bed Adjustments on Local Stream Morphology at Bridge Crossings	\$134,860	\$109,582.14	\$25,277.86
	01046K	FY23(022)	Y560	Air-coupled GPR and HD Imaging for High-Speed Evaluation of Concrete Bridge Decks with Asphalt Overlays	\$166,897	\$130,948.60	\$35,948.40
	01046L	FY23(023)	Y560	Regression Equation Update with NET and USGS	\$149,200	\$64,600.00	\$84,600.00
	01046M	FY23(024)	Y560	Repair/Preservation of Concrete Bridges Using Ultra-High-Performance Concrete	\$80,007	\$65,016.74	\$14,990.26
FY 2024	01057A	FY24(026)	Y560	Evaluation of Critical Shear Strength of Soils in Nebraska Based on Revised CPT	\$158,705	\$76,581.95	\$82,123.05
	01057B	FY24(027)	Y560	The Use of Recycled Plastic in Asphalt Pavements: Feasibility Study	\$148,484	\$24,944.35	\$123,539.65
	01057C	FY24(028)	Y560	Local Characterization of Unbound Materials Soils/Aggregates) for AASHTOWare Pavement ME Design in Nebraska	\$159,035	\$43,463.34	\$115,571.66
	01057D	FY24(029)	Y560	Assessment of Winter Maintenance Performance Objectives Using Maintenance Decision Support System	\$253,736	\$66,201.79	\$187,534.21
	01057E	FY24(030)	Y560	Development and Evaluation of Crashworthy Approach Guardrail Transition with Increased Span Length between Concrete Bridge Rail and First Transition Post: Phase I	\$175,145	\$16,078.91	\$159,066.09
	01057F	FY24(031)	Y560	Sediment Collection and Analysis of Sediment Contributing to State Storm Sewer Facilities	\$181,428	\$101,063.02	\$80,364.98
	01057G	FY24(032)	Y560	Update of Intersection/Interchange Guidelines for Rural Expressways in NE	\$179,316	\$55,136.59	\$124,179.41
	01057H	FY24(033)	Y560	Drainage Area Limitations for NDOT Hydrologic Computations	\$114,528	\$58,191.37	\$56,336.63
	01057J	FY24(034)	Y560	Ultra-High-Performance Concrete (UHPC) for Bridge Deck Overlay and Structural Deck Repair	\$152,761	\$96,065.78	\$56,695.22
	01057K	FY24(035)	Y560	Framework for Quantifying Benefits to Disadvantaged Communities: Application to Nebraska's National Electric Vehicle Infrastructure (NEVI) Plan	\$179,055	\$78,393.70	\$100,661.30
	01057L	FY24(036)	Y560	Assessment of Truck Parking Demand and Safety During Normal and Severe Weather Conditions in Nebraska	\$188,885	\$118,228.26	\$70,656.74
	01057M	FY24(037)	Y560	Guidance for Left-Turn Flashing Yellow Arrow (FYA) Implementation in Nebraska	\$177,066	\$65,466.75	\$111,599.25
PAGE SUBTOTAL					\$3,422,221	\$1,734,635.98	\$1,687,585.02

1. Budget Numbers as of 02/13/2025
2. Budget shows expenses that may not be entered into FMIS.
3. Only Active Projects are shown. Completed projects are not shown

IN-PROGRESS RESEARCH (cont.)							
	CONTROL NUMBER	PROJECT NUMBER SPR-	FUNDING TYPE	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
FY 2025	01071A	FY25(038)	Y560	<u>Electric Arc Furnace Slag as a Paving Material – Phase I: Physical, Chemical, Morphological and Mineralogical Characterization and Environmental Analysis</u>	\$151,272	\$2,824.29	\$148,447.71
	01071B	FY25(039)	Y560	<u>Evaluation of Low-Temperature Cracking (LTC) Performance Testing Methods to Assess Nebraska Asphalt Mixtures</u>	\$152,382	\$8,699.02	\$143,682.98
	01071C	FY25(040)	Y560	<u>The Utilization of Waste Plastic as a Polymer Modifier for Asphalt Binders</u>	\$141,874	\$0	\$141,874.00
	01071D	FY25(041)	Y560	<u>Effect of Nighttime Lighting on Construction Workers' Safety</u>	\$147,497	\$8,699.02	\$138,797.98
	01071E	FY25(042)	Y560	<u>Optimization of Energy Dissipation Using Staggered Weirs</u>	\$136,135	\$0	\$136,135.00
	01071F	FY25(043)	Y560	<u>Evaluation of NDOT's Construction Stormwater Detention Measures Using Full-Scale Testing Techniques</u>	\$199,999	\$0	\$199,999.00
	01071G	FY25(044)	Y560	<u>Integrated Bridge, Transportation Network, and Community Resilience Framework for Nebraska</u>	\$147,436	\$18,248.47	\$129,187.53
	01071H	FY25(045)	Y560	<u>Refined Analysis of Slab Bridges for Load Rating</u>	\$40,635	\$0	\$40,635.00
	01071J	FY25(046)	Y560	<u>Revised Curing Practices for NDOT Bridge Decks to Minimize Restrained Shrinkage Cracks</u>	\$165,460	\$23,884.15	\$141,575.85
	01071K	FY25(047)	Y560	<u>Effect of Bridge Width on Crashes in Nebraska</u>	\$152,230	\$0	\$152,230.00
	01071L	FY25(048)	Y560	<u>Development of Accurate and Reliable Average Annual Daily Traffic (AADT) Factoring Methods</u>	\$150,732	\$10,277.02	\$140,454.98
	01071M	FY25(049)	Y560	<u>Crash Modification Factor and Feasibility Analysis of Lighting Rural Intersections in Nebraska</u>	\$172,618	\$2,062.03	\$170,555.97
PAGE SUBTOTAL					\$1,758,270	\$74,694	\$1,683,576
BUDGET FOR IN PROGRESS PROJECTS					\$5,180,491	\$1,108,329.98	\$3,371,161.02

1. Budget Numbers as of 03/31/2025
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NEW FY2026 PROJECTS						
CONTROL NUMBER	PROJECT NUMBER SPR-	FUNDING TYPE	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
01078A	FY26(050)	Y560	<u>AI and Immersive AR/VR for Sustained Material and Construction Inspection Training</u>	\$142,359	\$0	\$142,359
01078B	FY26(051)	Y560	<u>Development of Reliable Wireless Connectivity in Support of e-Ticketing System in Nebraska Rural Construction Sites</u>	\$173,485	\$0	\$173,485
01078C	FY26(052)	Y560	<u>Alternative Pavement Rehabilitation Strategy Using a Geogrid Interlayer</u>	\$179,875	\$0	\$179,875
01078D	FY26(053)	Y560	<u>Characterization of Sediment Loads and Size Distribution in Nebraska Roadway Runoff- Phase II</u>	\$193,213	\$0	\$193,213
01078E	FY26(054)	Y560	<u>Development of a tool to Streamline and Expedite the General Permit Application</u>	\$180,000	\$0	\$180,000
01078F	FY26(055)	Y560	<u>Camber Control in Long Span Precast/Prestressed Concrete NU Girders</u>	\$85,575	\$0	\$85,575
01078G	FY26(056)	Y560	<u>Performance Evaluation of the First UHPC Bridge Project in Nebraska</u>	\$99,727	\$0	\$99,727
01078H	FY26(057)	Y560	<u>Assessment of Crash Reduction Traffic Control Measures at T-Intersections on Rural Highways</u>	\$175,616	\$0	\$175,616
01078J	FY26(058)	Y560	<u>Exploring Pathways for Innovative Finance Mechanisms to Empower Transportation Project Development in Nebraska</u>	\$176,164	\$0	\$176,164
01078K	FY26(059)	Y560	<u>Selection, Integration, and Effectiveness Study of Input Data for Nebraska Variable Speed Signs on I-80</u>	\$169,946	\$0	\$169,946
01078L	FY26(060)	Y560	<u>Evaluating the Interoperability of Connected and Autonomous Vehicles and Signal Phasing and Timing Infrastructure</u>	\$185,796	\$0	\$185,796
01078M	FY26(061)	Y560	<u>Review and Study of Dynamic Wireless Power Transfer Technology for In-Road Charging of Electric Vehicles</u>	\$79,954	\$0	\$79,954
01078N	FY26(062)	Y560	<u>Gravel Road Performance Enhancements – Phase II</u>	\$177,000	\$0	\$177,000
01078P	FY26(063)	Y560	<u>Development of ME Pavement Design for Cementitious Material Reinforced Subgrades</u>	\$180,143	\$0	\$180,143
BUDGET FOR NEW PROJECTS				\$2,198,853	\$0	\$2,198,853

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2. Only Active Projects are shown. Completed projects are not shown.

OTHER PROGRAM ITEMS						
CONTROL NUMBER	PROJECT NUMBER SPR-	FUNDING TYPE	STUDY TITLES	TOTAL STUDY BUDGET	EXPENDITURES	REMAINING BUDGET
			Rapid Response Research FY2023 Allocation	\$180,000	N/A	N/A
			Rapid Response Research FY2024 Allocation	\$35,000	N/A	N/A
			Rapid Response Research FY2025 Allocation	\$200,000	N/A	N/A
			Rapid Response Research FY2026 Allocation	\$140,000	N/A	N/A
Funds Allocated for Rapid Response Research				\$555,000	N/A	N/A
01057N	RRR (001)	Y560	<u>Low-Cement Concrete (LCC) Mixture for Bridge Decks and Rails</u>	\$13,200	\$9,917.41	\$3,282.59
01071N	RRR (002)	Y560	<u>Feasibility Study of Local Waster Plastic Materials in Concrete</u>	\$71,738	\$0	\$71,738
01071P	RRR (003)	Y560	<u>UHPC Decked I-Beam for Accelerated Bridge Construction</u>	\$48,992	\$0	\$48,992
TOTAL AVAILABLE FUNDS FOR RAPID RESPONSE RESEARCH				\$421,070	\$9,917.41	\$411,152.59
PROGRAM MANAGEMENT, IMPLEMENTATION, AND COORDINATION RESOURCES						
		Y560	Consultant use for Implementation and Research Coordination – FY25	\$25,000	\$0	\$25,000
		Y560	Consultant use for Implementation and Research Coordination – FY26	\$25,000	\$0	\$25,000
OTHER RESOURCES				\$50,000	\$0	\$50,000
Total New Projects and Other Program Items				\$2,363,853	\$0	\$2,363,853

1. Budget Numbers as of 03/31/2025
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IN PROGRESS RESEARCH PROJECTS DISCRIPTION

CONTROL NUMBER	01021B
PROJECT NUMBER	SPR-FY21(003)
PROJECT TITLE	Effect of Antioxidant Additives and Recycling Agents on Performance of Asphalt Binders and Mixtures – Phase II
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL and Robert Rea – NDOT Materials and Research
PROJECT START DATE	7/1/2020
PROJECT COMPLETION DATE	12/31/2024
TECHNICAL ADVISORY COMMITTEE	Robert Rea, Bruce Barrett, Jasmine Dondlinger, Kar Sia, and Matthew Park
PROJECT TOTAL COSTS	\$167,602
PROJECT EXPEDITURES TO DATE	\$132,966.89
NUMBER OF EXTENSIONS GRANTED	Two (2)
PERCENTAGE OF PROJECT COMPLETE	100%
STATUS	Complete – Waiting on Final Bill
FY-2026 BUDGET	\$34,635.11
FY-2026 TASKS TO BE COMPLETED	Project Complete, waiting on Final Bill

Background:

The use of recycling agents (RAs) (i.e., rejuvenators or softening agents) has gained significant attention from industry on a global scale. Its recent worldwide interest has grown as the world's population is placing a much larger focus on world climate, pollution, and ways to control the CO₂ excess through reduce, reuse, and recycle. The recycling of waste materials and reducing the carbon footprint of manufactured products through the conservation of energy and reduction on the use of raw materials has become a primary focus. The use of properly engineered RA's and mix designs can effectively recover the properties of the aged asphalt binders and provide equivalent and in some cases better performing pavements. Current research has found that RAs can improve the cracking resistance, while being capable of maintaining the rutting resistance of the mixtures. However, there are some concerns about the effect of RAs on the moisture damage resistance and the long-term performance (aging) of these additives.

The idea of modifying the properties of aged binders using RAs and providing long-term age resistance through the addition of antioxidants seems to be a viable solution. Based on the test results that the PI obtained from the previous research (funded proposal number: SPR-P1(20) M116), the combination of these technologies was proved effective and can bring significant pavement life cycle cost savings, provide longer lasting and more sustainable roadway pavements. However, the focus of this first phase of this research was to investigate if this chemistry combination would work, so it was tested on only one antioxidant, one unmodified asphalt binder and a selection of RAs.

Objective:

The second phase of this research will study the effect of various RAs and antioxidant additives and their performance with modified asphalt binders and mixtures. Various tests will be performed on different combinations of RAs and antioxidants containing virgin and RAP materials to characterize physical characteristics and rheological performances of the binders as well as mechanical properties of the mixtures.

Tasks and Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$16,968	100%
Task 2: Materials Selection	\$16,801	100%
Task 3: Laboratory Tests	\$58,119	100%
Task 4: Analysis of Test Results	\$33,555	100%
Task 5: Documentation and Presentation	\$19,796	100%

Deliverables:

Test results and findings will be used to provide implementation guidelines for common binder grades and mixes used in the central United States containing RAP materials. This research will also bring significant pavement life cycle cost savings, provide longer-lasting and more sustainable roadway pavements.

Performance:

Project is complete and Final Report Approved. Waiting on Final Bill.

CONTROL NUMBER	01034E
PROJECT NUMBER	SPR-FY22(005)
PROJECT TITLE	Application of Remote Sensing and Hydrologic Modeling to Reduce Highway Flooding in the Nebraska Sandhills
PRINCIPAL INVESTIGATOR	Aaron Mittelstet – UNL
PROJECT START DATE	07/01/2021
PROJECT COMPLETION DATE	12/31/2024
TECHNICAL ADVISORY COMMITTEE	Julie Ramirez; Kirk Harvey; Jason Dayton; Mary Schroer; Mark Kovar; Shuhai Zheng, Adele Phillips; Jamie Reinke; Anna Allen; Isabella Fleege; Ben Fischer – FHU engineering, Alex Roth – Schemmer, John Linbo – Lancaster NE
PROJECT TOTAL COSTS	\$143,166
PROJECT EXPEDITURES TO DATE	\$132,184.75
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	90%
STATUS	Behind Schedule
FY-2026 BUDGET	\$10,981.25
FY-2026 TASKS TO BE COMPLETED	Tasks 3, 4, 5, and 6

Background:

Hydrologic calculations for the Nebraska Sandhills (NSH) generally assume high infiltration, no runoff, and ignore subsurface runoff (groundwater and interflow). While these assumptions allow for the solution to a complex problem, they are not accurate representations of the complex movement of water in the region. Highways in the Sandhills region are a scarce and vital link that facilitate the movement of people and goods throughout the region. Understanding the Sandhills hydrology and highway flooding is extremely difficult because stream gages and monitoring wells are sparse. The thousands of lakes in the NSH provides an opportunity to develop a detailed monitoring system of surface and ground water. Combined with available climate information (snow melt, precipitation) the higher density of groundwater and surface water elevation measurements (or estimates) from this project will lead to improved estimates of lag times between hydrologic events and water level changes. This research will help NDOT quantify the frequency, duration and depth of highway flooding in the NSH and assist NDOT in identifying the location to place culverts under the highway and where to place the highway elevation relative to the groundwater elevation.

Objectives:

- 1) Identify the location, duration and frequency of highway flooding in the NSH.
- 2) Determine lag time and climatic conditions of highway flooding.
- 3) Identify frequency curves of highway flooding.
- 4) Prioritize highways based on frequency of flooding.

Tasks and Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Determine Highways that Flood	\$28,512	100%
Task 2: Duration and Depth of Flooding	\$20,020	100%
Task 3: Conditions and Lag Time of Flooding	\$31,328	90%
Task 4: Prioritize Highways Based on Frequency of Flooding	\$31,328	90%
Task 5: Identify Most Efficient and Informed Design to Prevent Future Flooding	\$19,136	90%
Task 6: Write Final Report	\$11,716	75%

Deliverables:

- A better understanding of how to prevent overtopping of state highways in the NSH will be gained by understanding the relationship of rainfall, surface storage, and groundwater depth. Understanding the elevation needs for the roadway profile and drainage structures will help keep roads open and minimize loss to the travelling public.
- Costs can be minimized by knowing the maximum elevation of surface water and minimizing the raise in roadway profile needed to prevent overtopping. By better understanding the hydrology, the number and size of culverts can be reduced, resulting in a reduction in costs.
- Reduction in road closures due to groundwater inundation.
- More efficient and informed hydrologic and hydraulic design processes can be applied to design in the NSH.

Performance: Project has an approved extension request, and waiting on Final Report and Presentation

CONTROL NUMBER	01046B
PROJECT NUMBER	SPR-FY23(014)
PROJECT TITLE	Gravel Road Performance Enhancements
PRINCIPAL INVESTIGATOR	Bora Cetin
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Nikolas Glennie, Brandon Varilek, Matt Park, Terry Rogers – Martin Mariette, Mitch Doht – LTAP, Larry Legg – Lancaster County, Bruce Filipi – Saline County, Don Robb – Hall County, Ann Chytka – Burt County, Gary Connot – Holt and Boyd County, Chris Jacobsen – Custer County, Tim Burgeson – Harlan County, Barb Keegan – Box Butte County, Steve Baird – Scottsbluff County
PROJECT TOTAL COSTS	\$166,064.00
PROJECT EXPEDITURES TO DATE	\$109,111.42
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	90%
STATUS	On Approved Revised Schedule
FY-2026 BUDGET	\$56,952.58
FY-2026 TASKS TO BE COMPLETED	Task 6

Background: Approximately 72,134 miles of gravel roads (39 miles state highway) exist in the 194,938-mile road network in the State of Nebraska. Two of the most common distresses for gravel roads are rutting and wash boarding. Rutting often occurs when the moisture content of gravel roads is high. These distresses are recurring across the state. The sustainability of granular roadways is very important to the rural economy since these roads provide access to rural land and enable the transportation of agricultural products. Many counties spend significant portions of their budgets on maintenance and rehabilitation of gravel roads. Opportunities exist to improve the performance of the gravel roads which would reduce the maintenance frequency and would yield significant cost savings. The proposed research project will examine several stabilization and construction methods that pose strong potential to minimize damages of gravel roads. A range of potential stabilization technologies to address these issues will be studied, including crushed rock embedment, gradation optimization, and the possible addition of angular material, and waste fines. The proposed study will conduct a comprehensive laboratory study to evaluate the efficiency of different treatment methods on improving the performance of granular road. Gravel road materials (along with the subgrades) will be collected from different locations in Nebraska that experienced significant road distresses. Data (e.g., resilient modulus, California bearing ratio (CBR), abrasion, freeze-thaw durability) will be measured and evaluated to quantify the treatment effectiveness. A primary outcome for this research is to optimize the NDOT gradation for gravel surfacing with materials that are locally sourced. In addition, this research will also develop a data-driven model to estimate the type and amount of materials to be added that would improve the performance of gravel roads via use of simple index properties

Objectives: The overall goal of this project is to develop, through rigorous laboratory tests, new guidelines for a wide range of Nebraska-specific gravel road materials and to develop a modeling tool to determine the optimized gradation to achieve a target gradation and plasticity and binding capacity, respectively, which will maximize the performance and durability of gravel roads. To accomplish this goal, the research team has established the following objectives:

1. Identify and review the current state of the practice for other state DOTs and industry (Midwest states in particular) via reports and an online survey/interview on the topic of gradation and stabilization guidelines used for gravel roads.
2. Conduct a thorough laboratory study to quantify the effects of variations in gradation and plasticity on the geo-mechanical characteristics of gravel road geomaterials.
3. Identify the optimum gradation and plasticity ranges that will lead to increased strength and reduced damage from freezing-thawing cycles.
4. Develop an optimized gradation modeling tool that uses laboratory index properties of aggregates to determine relative proportions of fresh aggregate, fines, and stabilizer materials to be added to achieve an optimized target gradation and plasticity.

Tasks and Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Kickoff Meeting	\$ 0	100%
Task 2: Literature Review & Survey	\$16,540.24	100%
Task 3: Sample Collection	\$11,026.82	100%
Task 4: Laboratory Testing	\$83,362.84	100%
Task 5: Data Analysis and Development of Tool and Guideline Update	\$33,080.46	100%
Task 6: Final Report	\$22,053.64	50%

Deliverables: The maintenance of gravel roads can consume significant portions of county budgets. Improving the longevity of granular roads by optimizing the performance of surfacing materials will reduce the consumption of virgin aggregate required for surfacing, as well as the frequency of required maintenance. As a result, counties will consume fewer aggregates which are finite natural resources, thus leaving more funds to devote to other pressing social, economic, and environmental needs. The project will generate more broadly applicable stabilization techniques, which county engineers can use to achieve such improved longevity of gravel roads.

Performance: Project has an approved Extension Request and will conclude in May of 2025.

CONTROL NUMBER	01046C
PROJECT NUMBER	SPR-FY23(015)
PROJECT TITLE	Application of Cementitious Materials and Fiber Reinforcement to Enhance Lime Stabilization for Nebraska Shale Soils
PRINCIPAL INVESTIGATOR	Seunghee Kim – UNL
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	12/31/2024
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Nikolas Glennie, Matthew Park, Brendon Schmidt, Alex Silvey, Madiha Alshammry – FHWA
PROJECT TOTAL COSTS	\$142,129
PROJECT EXPENDITURES TO DATE	\$124,761.74
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	95%
STATUS	On Approved Revised Schedule
FY-2026 BUDGET	\$17,367.26
FY-2026 TASKS TO BE COMPLETED	Tasks 3, 5, and 6

Background:

As the previous discussion, lime and cement can be mutually complementary. Lime alone has been ineffective in stabilizing several specific soils in Nebraska. In particular, lime has not been effective at stabilizing shale soils in northeast Nebraska. However, previous studies have found that by combining lime with fly ash, cement, or fiber reinforcement they can control shrinkage and swelling as well as increase strength and stiffness. This method of combining an additive with lime enhances the performance of the stabilization. However, NDOT has not tried varying proportions of additives with lime that provisions can be written, and construction practices developed for use in the field. Thus, a systematic study is warranted to help NDOT facilitate its usage for subgrade stabilization. It is needed to identify the effectiveness of mixing cementitious materials and fiber reinforcement to enhance lime stabilization and to prepare the design practice in Nebraska.

Objective:

The objectives of this research are to 1) Identify the effectiveness of mixing cementitious materials and fiber reinforcement to enhance lime stabilization and 2) evaluate the design properties of cementitious materials and fiber reinforcement to enhance lime stabilization for weak subgrade in Nebraska. Based on the expertise of the team, the scope of work includes:

1. Performing extensive literature review from other DOT's cases and practices that applied to mix cementitious materials and fiber reinforcement to subgrade stabilization,
2. Evaluating geotechnical properties of weak subgrade soils (e.g., Pierre Shale) treated and non-treated with cementitious materials and fiber reinforcement,
3. Assessing environmental resistance of treated soils with freezing-thawing cycles,
4. Analyzing the performance of treated and non-treated subgrades through Large-Scale Track Wheel (LSTW) test [evaluating k value, CBR, resilient (Mr) modulus],
5. Suggesting a design practice of lime, cementitious materials, and fiber mixture. The site-specific applicability and cost-effectiveness of treated and non-treated subgrade will be identified.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: TAC Meeting and Review of Literature	\$12,795	100%
Task 2: Geotechnical characterization	\$22,157	100%
Task 3: Freezing-thawing cycle test	\$64,043	90%
Task 4: Large scale tracking wheel test	\$29,483	100%
Task 5: Design recommendation	\$12,651	30%
Task 6: Final Report and TAC Presentation	\$1,000	0%

Deliverables:

The proposed research will provide mixing guidelines of lime and cementitious materials or lime and fiber reinforcement stabilization with weak soils for the roadway layers. Based on the results, the site-specific applicability of lime-cement or fiber-treated subgrades will be identified. The end results of this research project will contain a performance chart of lime, cement, or fiber stabilization with the selected sets of soil conditions, aggregate types, and the types and mixing ratio of the lime and cement or fiber stabilization.

Performance:

Project has an approved Extension Request and will conclude May of 2025

CONTROL NUMBER	01046D
PROJECT NUMBER	SPR-FY23(016)
PROJECT TITLE	Nebraska Balanced Mix Design – Phase II
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Robert Rea, Brendon Schmidt, Asadullah Sahak, Matthew Park, Zach Thurber, Ben Tran, Walter Moy, and Marsh Lemen
PROJECT TOTAL COSTS	\$142,129.00
PROJECT EXPEDITURES TO DATE	\$52,126.74
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	95%
STATUS	On Approved Revised Schedule
FY-2026 BUDGET	\$89,787.26
FY-2026 TASKS TO BE COMPLETED	Tasks 3, 4, and 5.

Background: The research team currently is performing a research project entitled “Nebraska Balanced Mix Design - Phase I” funded by Nebraska DOT to develop BMD method for Nebraska pavements. Phase I of this research project will ultimately define the Nebraska BMD method which considers 3 main distresses: rutting, fatigue cracking, moisture damage. To be able to fully implement the outcomes of this research, the field evaluation must be conducted, and field data must be collected to establish pass/fail thresholds for future quality assurance (QA) and acceptance (QC) purposes.

Objective: The aim of this research is to establish pass/fail thresholds for future QA/QC for the BMD mix design. To this end, several projects across the state will be selected, the condition of pavements before paving will be evaluated, and after paving will be monitored. In addition, mixes from each selected project will be collected and the BMD performance tests selected from the phase I of the BMD project will be carried out. The results of laboratory tests will be compared with field performance data to establish pass/fail thresholds.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: TAC Meeting and Review of Literature	\$17,494	100%
Task 2: Experimental Plan and Sample Collection	\$10,417	100%
Task 3: Laboratory Tests	\$41,593	95%
Task 4: Analysis of Test Results	\$50,548	90%
Task 5: Documentation and Presentation	\$21,863	90%

Deliverables: This study will improve the current mixture design method (i.e., Superpave) in Nebraska, where currently only volumetric characteristics are considered and the effects of additives such as recycling agents, antioxidants, polymers, and fibers cannot fully be addressed. More than that, the BMD method can be employed to design asphalt mixtures containing high RAP materials based on the fundamental properties of mixtures that can better address the main modes of distress: rutting, cracking, and moisture damage.

Performance:

Project has an approved Extension Request and will conclude May of 2025

CONTROL NUMBER	01046G
PROJECT NUMBER	SPR-FY23(019)
PROJECT TITLE	Minimizing take of threatened rattlesnakes and optimizing project review in SE Nebraska
PRINCIPAL INVESTIGATOR	Shaun Dunn – NE Game and Parks (Zoologist)
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	12/31/2024
TECHNICAL ADVISORY COMMITTEE	Ron Poe, Matthew Greiner, and Jason Jurgens
PROJECT TOTAL COSTS	\$62,238
PROJECT EXPEDITURES TO DATE	\$35,613.00
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	100%
STATUS	Waiting on Hard Copies
FY-2026 BUDGET	\$26,625.00
FY-2026 TASKS TO BE COMPLETED	Project Complete. Waiting for Report hard copies per contract

Background:

The western massasauga (*Sistrurus tergeminus*) and the timber rattlesnake (*Crotalus horridus*) are listed threatened snake species occurring in the southeast portion of Nebraska and protected under Neb. Stat. 37-801-811. A thorough review of the massasauga's life history can be found in Patten 2006 and Patten et al. 2016.

Recent studies (e.g., Fogell 2011) have shown these species are using green spaces in the right-of-way along several roads in Jefferson, Gage, Pawnee, and Richardson Counties which necessitates the need for added Environmental Review from Nebraska Department of Transportation (NDOT) staff and onsite surveys prior and during maintenance and construction to roadways.

Objective:

- Identify precise locations of western massasauga brumation sites.
- Map travel corridors from brumation site to active (summer) sites and explore how they relate to NDOT ROW.
- Develop standardized survey/search protocols.
- Document materials used by snakes as basking and/or refuge locations.
- Provide recommendations to avoid or minimize impacts to protected snakes for future NDOT maintenance and construction practices.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Data Collection & Supply Purchasing: initial ground surveys, mileage, Life Tags, CTT Locators, etc.	\$ 27,000	100%
Task 2: Snake surveys & Life Tag Attachment: ground surveys, snake capture and processing, mileage, etc.	\$ 10,886	100%
Task 3: Geolocate snakes: continue surveying for snakes but also establish routes to track tagged snakes.	\$ 8,600	100%
Task 4: Data analysis: office work with collected data including movement, material use, standard morphometric data, mapping, etc.	\$ 3,100	100%
Task 5: Second field season: largely repeat Tasks 2 and 3 using data from first season.	\$ 11,652	100%
Task 6: Final data analysis: analyze snake movements to accomplish grant Objectives and present final products to NDOT.	\$ 1,000	100%

Deliverables:

This research will result in the immediate benefits of increased knowledge of protected snake locations; thus, those data will immediately benefit project reviews, minimize the need for conservation conditions in some areas, and reduce the chances of take. Standardized protocols, recommended materials and construction practices will all be provided by Quarter 8 (see Schedule below) and can quickly be implemented into NDOT review process.

Performance:

Final Report accepted, on hold for printed copies per contract requirement

CONTROL NUMBER	01046J
PROJECT NUMBER	SPR-FY23(021)
PROJECT TITLE	Impacts of Stream Bed Adjustments on Local Bridge Morphology
PRINCIPAL INVESTIGATOR	David Admiraal – UNL
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Kirk Harvey, Jason Dayton, Fouad Jaber, Mark Kovar, Jason Lehn, Julie Ramirez, Ross Barron, Anna Allen, Jon Starr, Ben Fischer – FHU, Ricki Kuvach
PROJECT TOTAL COSTS	\$134,860.00
PROJECT EXPEDITURES TO DATE	\$89,365.99
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	90%
STATUS	On approved Revised Schedule
FY-2026 BUDGET	\$30,764.01
FY-2026 TASKS TO BE COMPLETED	Tasks 3, 5, 7, and 8

Background: The goal of this project is to synthesize a hydrodynamic model with improved methods of representing sediment transport to better predict short-term and long-term channel migration for aggraded sand-bed rivers. Our team can rapidly and reliably collect detailed flow and topographic data and incorporating that data into the model will provide results that are more accurate and more quickly implemented than previous efforts. In addition, the model will be developed at a bridge crossing (Highway 281 over the Niobrara River) with a strongly aggraded streambed, a crossing that is of particular interest to NDOT because of the potential for abutment undermining, scour issues, and ice damage. The result of the project will be a documented strategy for rapidly collecting relevant field data associated with channel bed migration predictions, a detailed plan for incorporating that data into a hydraulic model with new modules for accurately simulating sediment transport and bedforms and demonstrated short-term accuracy of the model at a field site that is of actual interest to NDOT. In addition, recommendations will be provided for collecting future data sets to validate the longer-term performance of the modeling approach. Along the way, channel migration concerns identified by the research team at the study site will be relayed to NDOT for possible mitigation efforts.

Objective: The objectives of the present work include:

1. To establish a measurement method for rapidly collecting detailed topographic, bathymetric, and flow data at bridge crossings.
2. To utilize the new method to collect multiple complete data sets at a bridge crossing with dynamic streambed conditions (The Highway 281 bridges downstream of the Spencer Dam site).
3. To develop a hydraulic modeling approach for predicting short- and long-term morphologic changes at the bridge crossing and to compare predicted results with observed data.
4. To refine the modeling and data collection methods for application at any bridge crossing with a dynamic streambed.

Tasks & Percentage Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Research Hydraulic Models and Data Collection	\$12,848	100%
Task 2: Collect and Process Initial Data Sets	\$26,883	100%
Task 3: Calibrate Hydraulic Model	\$12,921	95%
Task 4: Collect and Process Secondary Data Sets	\$22,921	100%
Task 5: Evaluate and Adjust Hydraulic Model	\$12,929	75%
Task 6: Collect and Process Final Data Sets	\$19,393	100%
Task 7: Complete Final Model Assessment	\$13,079	0%
Task 8: Completion of Final Report and Deliverables	\$14,179	0%

Deliverables: The primary outputs of this project will be two-fold: A detailed approach for collecting relevant channel and flow data at sand bed river sites with rapidly changing stream morphology and a hydraulic model that is capable of simulating stream morphology over short and long-time scales. In order to relay the information that we organize and the models that we develop over the course of the project, we will provide two detailed summary guides at the end of the project: (1) a guide on the methods used to collect aerial and flow data at sand bed river sites with rapidly changing bed morphology, and (2) a guide on applying an appropriate hydraulic model to predict changes at such sites

Performance: This Project has an approved extension requests and will conclude May of 2025.

CONTROL NUMBER	01046K
PROJECT NUMBER	SPR-FY23(022)
PROJECT TITLE	Air-coupled GPR and HD Imaging for High-Speed Bridge Deck Evaluation
PRINCIPAL INVESTIGATOR	Jinying Zhu – UNL
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	12/31/2024
TECHNICAL ADVISORY COMMITTEE	Fouad Jaber, Kent Miller, Babrak Niazi, Seth Brashears, Mike Vigil, Barbara Bevins, Ross Barron, Wally Heyen, and Ben Tran
PROJECT TOTAL COSTS	\$166,897.00
PROJECT EXPENDITURES TO DATE	\$130,948.60
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	90%
STATUS	On approved Revised Schedule
FY-2026 BUDGET	\$35,948.40
FY-2026 TASKS TO BE COMPLETED	Tasks 4 and 6

Background:

Asphalt overlay is increasingly applied on most Nebraska bridges. GPR is the only proven NDE technique for evaluation of bridge decks with asphalt overlays. The team has successfully developed data analysis software for ground-coupled GPR in previous projects and determined the threshold values through correlation with VEI and HCP data. However, the need of traffic control limits wide application of the ground-coupled GPR.

Air-coupled GPR and vehicle mounted HD imaging system may provide a solution for high-speed NDE of bridge decks. Because the current GPR analysis software has many limitations (proprietary, inconsistent threshold values, low spatial resolution etc.), we need to develop air-coupled GPR data analysis algorithms for evaluation of bridge decks with asphalt overlay. Data fusion analysis will be used to determine the threshold values for air-coupled GPR amplitude on bridge decks with and without asphalt overlays.

Objective:

The goal of this research project is to develop high-speed NDE technologies to evaluate bridge decks with asphalt overlays, using air coupled GPR and vehicle mounted HD imaging. Specific objectives include:

1. Develop data analysis algorithm for high-speed air-coupled GPR and establish reliable threshold values for asphalt overlaid bridge decks.
2. Fuse GPR data with high-definition surface images to improve spatial resolution.
3. Build correlation between surface defects (with HDI) and interior deterioration (with GPR) and evaluate performance of visual inspection based on HD images, which could be used as a screening tool for rapid bridge evaluation when detailed NDE may not be applied to all bridges.
4. Implement the proposed technology to Nebraska bridges and provide NDOT additional information for decision making.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: TAC Meeting and Review of Literature	\$ 10,483	100%
Task 2: Data Collection on NOBL Bridges	\$ 28,615	100%
Task 3: Air-coupled GPR and HD Data Analysis	\$ 38,538	100%
Task 4: Data Fusion Analysis	\$ 28,201	90%
Task 5: Field Demonstration	\$ 34,837	100%
Task 6: Final Report and TAC Presentation	\$ 26,222	30%

Deliverables:

Air-coupled GPR data and HD images will be collected from multiple bridges scheduled for rehabilitation during the project period. Data will be collected at all construction stages: before repair (with old overlay), during the repair (after removal of asphalt overlay), and after repair (after applying new membrane and overlay). Results and findings will be communicated to NDOT as quickly as possible through technical meetings and briefs. By the end of the project, the team will submit a final technical report and the developed data analysis software package.

Performance:

This project has an approved extension request and will conclude May of 2025

CONTROL NUMBER	01046L
PROJECT NUMBER	SPR-FY23(023)
PROJECT TITLE	Regression Equation Update
PRINCIPAL INVESTIGATOR	Kellan R. Stauch – USGS
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	07/01/2025 (Extension Requested to 7/1/2026)
TECHNICAL ADVISORY COMMITTEE	Kirk Harvey, Jason Dayton, Fouad Jaber, Julie Ramirez, Ross Barron, Jamie Reinke – DNR, Jared Ashton, Stefan Schaepe, Deanna Ringenberg, Brenda Desmore – USGS, Anna Allen, Ricki Kuvach
PROJECT TOTAL COSTS	\$149,200
PROJECT EXPEDITURES TO DATE	\$64,600.00
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	10%
STATUS	On Approved Revised Schedule
FY-2026 BUDGET	\$84,600.00
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, and 4.

Background: This project will implement StreamStats for Nebraska. StreamStats is an online mapping interface that is designed to provide a user-friendly tool that researchers, managers, and others can use to rapidly and easily compute basin characteristics, and flow statistics. These statistics describe the frequency of extreme conditions in streams and rivers and are valuable data that are routinely used by regulators, designers, builders, natural resource managers, biologists, and others. Estimates of peak flow statistics are often needed to fulfill design or regulatory requirements, however, without StreamStats, flow data are generally only available for locations where there is a long-term stream gage. Statistical regression analyses of peak flows at stream gage locations can be used to estimate flows at locations without stream gages by relating extreme flow to basin characteristics. A wide variety of professionals, including engineers, scientists, regulators, and natural-resources managers regularly compute and use streamflow statistics, such as the 1-percent annual exceedance probability flood statistic. These professionals must dedicate resources to determine drainage area, watershed boundaries and basin characteristics upstream from a site of interest for each project they work on, because there are no publicly available web tools such as StreamStats in Nebraska. Often the methods used to estimate the flows related to these events at un-gaged locations are time-consuming, resource-intensive and may generate non-reproducible results. These methods are seldom available to the public and non-hydrologists because they require considerable expertise and computer resources. This project would allow the public to gain access to a consistent, fast, and widely accepted method of estimating a variety of useful flow statistics. Statewide regression equations for peak-flow frequencies in Nebraska have been published previously, but since the last report was published many years of streamflow data have been collected, analysis techniques have changed, and geospatial datasets have improved. In addition, the Nebraska Department Natural Resources (NeDNR) is currently in the process of updating the geospatial datasets, peak streamflow statistics and regression equations for Nebraska. This project will integrate and process the Nebraska Department of Natural Resources updated geospatial datasets, peak streamflow statistics and regression equations into a free and readily available web-based application that would allow professional users and the public to quickly and easily access streamflow statistics at gaged and ungaged locations.

Objective: A process has been designed by the USGS national team for implementing the StreamStats tool, as has already been done in 43 other States. A national team at the U.S. Geological Survey (USGS) has developed the StreamStats user interface (Figure 1), but the web tool must be implemented on a state-by-state basis. This project will adapt StreamStats to Nebraska datasets, using the national implementation model to provide a web tool that will greatly reduce the amount of effort, time, and cost required for a user to estimate peak-flow statistics at user-selected points. To develop the StreamStats web tool, several tasks are required:

- 1.) Integrating NeDNR derived geospatial datasets into the StreamStats web interface.
- 2.) Review and approval of NeDNR peak streamflow statistics and regression equations. NeDNR peak streamflow statistics and regression equations will be analyzed for quality assurance to ensure that appropriate methods and procedures were used to develop accurate streamflow regression equations. Results of regression equations will also be compared to results calculated using StreamStats to ensure reproducibility of the solutions and identify and reconcile any possible discrepancies.
- 3.) Implementation and coding of regression equations into the StreamStats web tool.
- 4.) All data sets will be published in a permanent publicly available repository (e.g., Science base <https://www.sciencebase.gov/catalog/>) with associated complete metadata.

Tasks & Percentage Completed

Tasks	Budget by Task	Percent Completed
Task 1: StreamStats GIS development and implementation	\$34,800	40%
Task 2: Peak Flow regression equations review and approval	\$29,800	0%
Task 3: Peak flow regression equation implementation into StreamStats	\$36,600	0%
Task 4: Analysis and publication of datasets and metadata	\$48,000	0%

Deliverables: Direct measurable environmental benefits such as improved water quality are expected to result from the implementation of this tool arising from the ability of managers and decision-makers to better plan for extreme flow conditions. Frequencies of peak flows are important to understanding floodplain connectivity, wetlands dynamics, geomorphology, instream habitat and the impacts of human infrastructure on the environment during flooding.

Performance: Project has an approved extension request.

CONTROL NUMBER	01046M
PROJECT NUMBER	SPR-FY23(024)
PROJECT TITLE	Repair and Strengthening of Bridge Girders Using Ultra-High-Performance Concrete (UHPC)
PRINCIPAL INVESTIGATOR	George Morcous
PROJECT START DATE	07/01/2022
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Fouad Jaber, Wally Heyen, Wayne Patras, Kyle Zillig, Mike Vigil, Kellie Troxel, Ross Barron, and Lieska Halsey
PROJECT TOTAL COSTS	\$80,007
PROJECT EXPEDITURES TO DATE	\$65,016.74
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	95%
STATUS	On Approved Revised Schedule
FY-2026 BUDGET	\$14,990.26
FY-2026 TASKS TO BE COMPLETED	Tasks 3 and 4

Background:

The preliminary literature review has indicated a very limited but promising use of UHPC in the repair/preservation of concrete bridge components, such as piers, pier caps, and girder ends. Although UHPC has excellent mechanical and durability properties, there is lack of guidelines on the design approach and construction procedures for using UHPC as a repair material to encase deteriorated/damaged concrete components.

Objective:

The objective of this project is to develop procedures for using UHPC in the repair/preservation of concrete bridge components including the design and construction guidelines for immediate implementation. Two demonstration projects that include the repair of deteriorated concrete bridge pier and girder end will be conducted to help bridge engineers and contractors gain the design and construction experience of using UHPC in the repair/preservation. This will also include addressing issues like surface preparation, formwork design, placing and curing methods of UHPC, and installing interface anchors between UHPC and CC. The lessons learned from these two projects will be disseminated via presentations and publications for technology transfer.

Tasks & Percentage Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review of UHPC in Repair/Preservation	\$6,287	100%
Task 2: Design and Construction Guidelines	\$18,196	100%
Task 3: Demonstration Projects	\$37,630	90%
Task 4: Report, Presentation, and Technology Transfer	\$17,894	90%

Deliverables:

Two demonstration repair/preservation projects are expected to be implemented by NDOT during the project duration. Several candidate projects were studied, and two projects were tentatively selected for demonstration and technology transfer. Figure 5 shows an example of deteriorated concrete bridge pier to be repaired using UHPC jacketing, while Figure 6 shows another example of a deteriorated concrete bridge girder end to be encased in UHPC. Constructability issues, such as traffic control, repair duration, and cost will be also evaluated in these demonstrations.

Performance:

Project has an approved extension request and will conclude May of 2025.

CONTROL NUMBER	01057A
PROJECT NUMBER	SPR-FY24(026)
PROJECT TITLE	Evaluation of Critical Shear Strength of Soils in Nebraska Based on Revised CPT
PRINCIPAL INVESTIGATOR	Chung Song – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Nikolas Glennie, Bruce Barrett, Matthew Park, Alex Silvey, Brendon Schmidt
PROJECT TOTAL COSTS	\$158,705
PROJECT EXPEDITURES TO DATE	\$76,581.95
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	65%
STATUS	On Schedule
FY-2026 BUDGET	\$82,123.05
FY-2026 TASKS TO BE COMPLETED	Taska 3, 4, and 5

Background:

Multiple NDOT researchers confirmed that the back-calculated strength of soils at failed slopes in Nebraska was often much lower than the measured one in the design stage (Song et al. 2017, 2020). In some cases, the strength of soils at failure slopes was only 10% to 30% of the initial strength. Further study showed that this behavior was associated with the geological/geotechnical history of the region. And it is shared by the US, Canada, and several EU (European Union) countries. This shear strength is called "wet-drained-fully softened" shear strength by researchers. The laboratory testing techniques to obtain this critical strength, however, are not standardized. Furthermore, an easily applicable field-testing technique does not exist to the knowledge of this researcher. This research proposes an innovative CPT based testing technique that can obtain this critical strength of soils in the field conveniently. The following figure shows that the CPT equipment with the capability of water injection can penetrate the ground, inject water so that surrounding soils may be wet, then conduct the CPT test. Then the wet condition is obtained, the drained condition is obtained by incorporating the piezometer readings, and the fully softened condition is obtained by taking strength parameters from the skin friction of CPT. Consequently, the "wet-undrained-fully softened" strength is obtained. This technique is much quicker for testing than the currently available laboratory technique, and therefore, the cost is more economic. This research is innovative research, however, the UNL team has years of accumulated experience in exploring soil properties with this CPT. HPT is a recently developed device that can inject water into field soils and obtain hydraulic parameters of saturated and unsaturated soils. The team has full access to these devices so that this research can progress smoothly. HPT was developed by the CPT manufacturer, and it is a system that can be easily fitted to the existing CPT system.

Objective:

The objectives of this study are devising a method to obtain the wet-drained-fully softened shear strength of soils accurately and conveniently through following step by step procedure:

- 1) Develop a systematic wetting technique for field soils based on the revised CPT- HPT (Hydraulic Profiling Tool) equipment.
- 2) Develop a CPT testing mechanism to obtain "wet-drained-fully softened strength".
- 3) Verify the new testing method by comparing field CPT-HPT combo test results and other reference strengths.
- 4) Develop a test data reduction procedure to obtain CPT-HPT-based "wet-drained-fully softened strength", and incorporate the procedure in software so that the "wet-drained-fully softened strength" can be obtained easily by the NDOT crew

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature	\$17,128	100%
Task 2: Development/Modification of CPT	\$40,206	100%
Task 3: Verification of the Method	\$49,739	51%
Task 4: Recommendation for Field Application	\$31,566	23%
Task 5: Report Findings	\$20,066	33%

Deliverables:

This research is intended to solve a fundamental technical challenge in evaluating the critical strength of soils in Nebraska through the utilization devised technique. Therefore, the expected benefits are as follows:

- 1) Allow NDOT to obtain critical soil strength accurately and quickly.
- 2) Allow NDOT to selectively utilize materials invulnerable to substantial strength reduction.
- 3) Safer highways by reducing soil-related highway failure and troubles.
- 4) Reduced maintenance work and cost-saving by providing a more resilient highway system. Eventually, the structure designed based on this critical strength will less maintenance work.

Performance:

Project started on July 1st, 2023.

CONTROL NUMBER	01057B
PROJECT NUMBER	SPR-FY24(027)
PROJECT TITLE	The Use of Recycled Plastic in Asphalt Pavements: Feasibility Study
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Robert Rea, Matthew Park, Brendon Schmidt
PROJECT TOTAL COSTS	\$148,494
PROJECT EXPEDITURES TO DATE	\$24,944.35
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	90%
STATUS	On Schedule
FY-2026 BUDGET	\$123,539.65
FY-2026 TASKS TO BE COMPLETED	Tasks 3, 4, and 5.

Background:

Recently the world's population has been paying more attention to severe climate changes and environmental pollutions, by focusing primarily on ways to control and reduce the CO₂ through reusing and recycling a broad range of waste materials. The asphalt pavement industry has a long history of using recycled materials in asphalt mixtures to achieve engineering, economic, and environmental benefits. Besides reclaimed asphalt pavement (RAP) being recycled at a rate of approximately 94 percent, other recycled materials such as recycled asphalt shingles (RAS), recycled tire rubber (RTR), waste engine oils, steel slag, recycled glass, and many others have been and will continue to be used in some markets or applications. A recycled material that has recently gained attention for paving purposes is waste plastic residues (WPR).

The plastics industry has been actively exploring new end market opportunities for over 30 million tons of waste plastics generated yearly. One of the potential applications identified is asphalt pavements. In late 2016, media reports began suggesting the use of WPR in asphalt as an opportunity to improve the performance of asphalt pavements while eliminating the growing amount of waste plastics being landfilled or polluting the environment. However, using WPR in asphalt mixtures can be challenging due to variations in its composition and the presence of non-plastic contaminants. To ensure the quality of asphalt mixtures containing WPR, requirements are needed to specify the key properties of these materials and how they should be used to improve the overall pavement life cycle benefits while protecting the environment.

Therefore, the goal of this multi-phase study is to evaluate the feasibility of using recycled plastic in asphalt pavements by considering the effect of WPR addition on the rutting, cracking, moisture, and aging resistance of asphalt mixtures using well-established mixture performance test methods.

Objective:

The goal of this multi-phase study is to evaluate the feasibility of using recycled plastics in asphalt pavements by considering the effect of recycled plastics on the rutting, cracking, moisture damage resistance of asphalt mixtures through Balanced Mix Design (BMD) approach. More specifically, this study aims to:

- Identify waste plastics sources in Nebraska and select a few of them based on their physical chemical properties that are considered important for use in asphalt mixtures through the dry process.
- Develop a laboratory procedure for introducing selected waste plastics that can mimic the production of recycled plastic modified mixtures at asphalt plants.
- Evaluate the performance of plastic modified asphalt mixtures prepared with various sources and types of wastes plastics in the laboratory. The focus of this objective is on developing a mix design for plastic modified mixtures via a BMD approach.

Tasks & Percentage Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$14,849	100%
Task 2: Experimental Plan and Sample Collection	\$14,671	100%
Task 3: Laboratory Tests	\$48,781	95%
Task 4: Analysis of Test Results	\$48,432	90%
Task 5: Documentation and Presentation	\$21,761	65%

Deliverables:

The analysis of performance testing results of various asphalt mixtures produced with different WPR contents can lead to optimum blends that meet the short- and long-term performance requirements. The results can contribute to minimizing the consumption of natural resources for construction and potentially improve the durability of asphalt pavements, resulting in significant cost savings and more sustainable asphalt pavements. The successful development and implementation of this research in our state will also provide significant environmental benefits, such as preservation of limited natural resources, reduction of energy consumption, reduction of disposed and discarded solid waste, and reduction of emissions.

Performance:

Project started on July 1st, 2023.

CONTROL NUMBER	01057C
PROJECT NUMBER	SPR-FY24(028)
PROJECT TITLE	Local Characterization of Unbound Materials (Soils/Aggregates) for AASHTOWare Pavement ME Design in Nebraska
PRINCIPAL INVESTIGATOR	Jongwan Eun – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Brady Dresselhaus, Matthew Park, Nikolas Glennie, Alex Silvey
PROJECT TOTAL COSTS	\$159,036
PROJECT EXPEDITURES TO DATE	\$43,463.34
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	55%
STATUS	On Schedule
FY-2026 BUDGET	\$115,571.66
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, 4, 5, 6, and 7

Background:

Several states have started using the AASHTOWare Pavement ME Design (Pavement ME) for road design, and recently Nebraska DOT is also taking notice. What separates the Pavement ME (ME) from other design procedures is that this empirical-mechanistic approach considers the material's individual response to predict the overall pavement performance. In the ME, there are three different levels of input to meet accuracy, and they require a set of material properties. However, obtaining the input parameters is a time-consuming step that oftentimes limits the application of ME. The resilient modulus (M_r) is one of the key fundamental material properties required. To contribute to implementing ME in the design of Nebraska pavements, this study aims to (1) establish a large data set of localized M_r and characteristics of unbound materials in Nebraska, (2) develop a simple method to correlate the modulus with commonly used geotechnical properties. To meet the goal, we will conduct (1) an extensive literature review of ME and other state studies, (2) laboratory testing of selected unbound materials for physical-mechanical properties and investigation of the existing correlations between M_r and soil properties, (3) evaluation and calibration of M_r for selected unbound materials and verification of the correlation to estimate M_r using soils model, and (4) finite element modeling of flexible and rigid pavement employing stress-dependent model and evaluate the sensitivity analysis varying unbound materials. Unbound and subgrade materials will be sampled from at least five different areas including problematic soils, and various testing will be conducted to determine numerous properties and characteristics including materials classification (AASHTO and USCS), moisture-density relations, unconfined compressive strength, and resilient modulus. The resilient modulus test will be conducted according to AASHTO T 307 procedure equipped by the UNL. The resulting outcomes with statistical analyses will show the archive data set of NE unbound materials for implementing ME more optimally.

Objective:

The objectives of this research are to:

- 1) establish an extensive data set of localized M_r and other geotechnical characteristics of unbound materials for representative NE locations,
- 2) develop a simple and robust method to correlate the M_r with commonly used geotechnical properties that meet for Level 2 inputs, and
- 3) evaluate the effect of input parameters on the performance of the typical NE pavement structures.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Extensive Review	\$14,049	100%
Task 2: Material Sampling	\$21,214	75%
Task 3: Experimental Program	\$70,193	50%
Task 4: Develop correlations for M_r with other geotechnical properties	\$28,468	40%
Task 5: Sensitivity Analysis	\$16,620	10%
Task 6: Design Recommendation	\$8,491	10%
Task 7: Report	\$1,000	0%

Deliverables:

Based on the analyses of the data generated from this research, reliable experimental data to meet Levels 1 and 2 inputs will be prepared, and the resilient modulus models will be calibrated for local unbound pavement design. The extensive literature review (state DOT studies, national-international studies, etc.), laboratory testing, and finite element modeling simulation will provide recommended practices for roadway design in the future. Successful accomplishment of this research will provide a good level of confidence that NDOT can save costs due to more optimized pavement design. These advantages can lead to reducing long-term maintenance costs and enhancing the performance and design life of new and rehabilitated pavements.

Performance:

Project started July 1st, 2023

CONTROL NUMBER	01057D
PROJECT NUMBER	SPR-FY24(029)
PROJECT TITLE	Assessment of Winter Maintenance Performance Objectives Using Maintenance Decision Support System
PRINCIPAL INVESTIGATOR	Mark Anderson – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Mike Mattison, Tom Renninger, Korey Donahoo, James Laughlin, John Lutz, Ben Merchant, Helen Tran, Tim Byrne – LTU, Abe Anshasi - FHWA
PROJECT TOTAL COSTS	\$253,736
PROJECT EXPEDITURES TO DATE	\$66,201.79
NUMBER OF EXTENSIONS GRANTED	One (1) due to contract delay
PERCENTAGE OF PROJECT COMPLETE	65%
STATUS	On Revised Schedule
FY-2026 BUDGET	\$187,534.21
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, 5, and 6.

Background:

NDOT has made significant investments in winter maintenance operations including the procurement of a Maintenance Decision Support System, acquisition of dedicated weather operational expertise, and the development and refinement of a winter severity index. These resources have improved NDOT's internal operations, coordination with its partners, and its statewide level of service; however, specific quantification of performance is necessary to maintain and improve NDOT service to its customers. Historically, NDOT has used traffic mobility data to assess performance along the Interstate 80 corridor in terms of speed recovery after a winter storm. This metric has limitations in specifically quantifying NDOT's winter maintenance operations performance such as its responsiveness to the actions of adjacent state road closures (e.g., Wyoming) and the influence of commercial vehicle congestion when the road initially reopens. Other states have considered metrics such as friction measurements, leveraging camera images to identify time to bare pavement, road condition reports, and more. The proposed project seeks to provide strategic guidance to NDOT in the development of its own suite of performance metrics by conducting an inventory of available weather, mobility, and maintenance data that may be used to create various performance indicators. The project intends to produce sample metrics with the available data and make recommendations on best options and/or additional data needs NDOT may wish to pursue.

Objective:

The proposed project seeks to provide strategic guidance to NDOT in the development of its own suite of performance metrics by conducting an inventory of available weather, mobility, and maintenance data that may be used to create various performance indicators. The project intends to produce sample metrics with the available data and make recommendations on best options and/or additional data needs NDOT may wish to pursue.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$11,138	94%
Task 2: NDOT Data Inventory	\$23,775	95%
Task 3: Data Collection and Procurement	\$64,715	85%
Task 4: Performance Measure Development	\$71,902	60%
Task 5: Performance Measure Case Study Analysis and Validation	\$59,200	30%
Task 6: Quarterly Reports, Presentation, and Final Report	\$23,006	60%

Deliverables:

An assessment of winter maintenance performance objectives will allow NDOT to better understand its resource allocations during winter storms while combating challenges such as staffing shortages. Additionally, performance metrics can be an internal tool to enhance planning/scheduling activities and/or an external-facing tool to showcase how NDOT is servicing the public. Performance tracking may also assist with decisions on longer term NDOT investments such as physical equipment, maintenance assets, and service products. Overall, performance measures can provide an objective, independent baseline of NDOT winter maintenance activities and allow NDOT to identify subsequent actions to promote greater efficiency and effectiveness of its operations.

Performance:

Project started late due to contract delay. On revised Schedule.

CONTROL NUMBER	01057E
PROJECT NUMBER	SPR-FY24(030)
PROJECT TITLE	Development and Evaluation of Crashworthy Approach Guardrail Transition with Increased Span Length between Concrete Bridge Rail and First Transition Post: Phase I
PRINCIPAL INVESTIGATOR	Tewodros Yosef – UNL
PROJECT START DATE	7/1/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Austin White, Abe Anshasi – FHWA, Todd Hill
PROJECT TOTAL COSTS	\$175,145
PROJECT EXPEDITURES TO DATE	\$16,078.91
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	25%
STATUS	On Schedule
FY-2026 BUDGET	\$159,066.09
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4.

Background:

The Midwest Roadside Safety Facility (MwRSF) has recently conducted multiple research projects to develop crashworthy retrofits or design alterations for Approach Guardrail Transitions (AGTs) when the site conditions prevent the as-tested design configuration from being implemented. These research projects have mainly focused on issues that obstruct AGT posts from being properly installed (i.e., wing walls, drainage structures, utilities, and reduced grading). Most of these obstructions are located near the bridge railing end at the AGT's downstream region, where the posts are spaced closely together. Designing a new MASH crashworthy AGT that incorporates a large span length between the bridge rail end and the first transition post would avoid these obstructions and prevent the need for design retrofits. In 2020, a MASH TL-3 crashworthy AGT was created by the MwRSF for a steel-tube bridge rail for the Illinois and Ohio DOTs. This AGT had a 9-ft span length between the first bridge rail post and the adjacent transition post, which was designed to extend over ground obstructions near the bridge end. This AGT design used two HSS6x6x1/4 transition rail elements to match the specific steel-tube bridge rail configuration. However, a similar AGT could be developed using strong rail elements to prevent large deflections.

Objective:

The objective of this project is to develop and evaluate the standard 34-in. tall NDOT thrie beam MASH AGT system with increased span length between the concrete buttress end and the first transition post to accommodate a wide range of obstructions that prevent proper installation of posts, including bridge abutments and wing walls, as well as drainage and utility structures. The research and development effort will identify various critical obstructions near bridge ends through a survey of the NDOT district engineers and seek feedback on the desired maximum span length for the AGT. The project will develop numerous design concepts by exploring various mechanisms, such as surrogate post (i.e., continuous horizontal beam, cantilever beam, and grade mounted post), and stiffening and increasing moment capacity of AGT rail elements to mitigate large deflections, vehicle instabilities, pocketing, and snag associated with the increased span length. Evaluation of the 34-in. tall NDOT AGT with increased span length designs will include dynamic analysis of impacts near the upstream W-to-thrie beam stiffness transitions and the downstream thrie beam to rigid buttress transition using LS-DYNA finite element analysis computer program. The AGT system would be designed to meet the MASH TL-3 impact safety requirements. Full-scale testing may be recommended to evaluate the new AGT system in a follow-on phase of the research

Tasks & Percent Completed:

Task	Budget by Task	Percent Completed
Task 1: Project Planning and Correspondence	\$14,815	75%
Task 2: Concept Development	\$30,976	70%
Task 3: Engineering Analysis and Optimization of Selected Designs	\$84,051	0%
Task 4: Reporting and Project Deliverables	\$45,303	10%

Deliverables:

Development and evaluation of the 34-in. tall NDOT thrie-beam AGT system with increased span length between the concrete bridge end and the first transition post would provide NDOT with crashworthy and cost-effective solutions for avoiding installation issues adjacent to the bridge end where various obstructions (i.e., drains, foundations, utilities, etc.) could prevent proper post placement. The new AGT system would be developed to satisfy MASH TL-3 performance criteria while accommodating a wide range of obstructions by providing increased span length. Additionally, developing the AGT system with an increased span length will provide roadside designers with crashworthy solutions for non-ideal installation sites and reduce the costs associated with relocations of the previously noted obstructions.

Performance:

Project started Just 1st, 2023.

CONTROL NUMBER	01057F
PROJECT NUMBER	SPR-FY24(031)
PROJECT TITLE	Sediment Collection and Analysis of Sediment Contributing to State Storm Sewer Facilities
PRINCIPAL INVESTIGATOR	Bruce Dvorak
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Julie Ramirez, Anna Allen, Ron Poe, Brian D. Anderson, Jason Jurgens, Isabella Fleege, Tim M. Zach- LTU, Trevor Hansen – LTU, Mike Middendorf – LTU, James A Burroughs – City of Beatrice, Kyle Hall, Ben Fischer – FHU, Ricki Kuvach
PROJECT TOTAL COSTS	\$181,428
PROJECT EXPEDITURES TO DATE	\$101,063.02
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	66%
STATUS	On Schedule
FY-2026 BUDGET	\$80,364.98
FY-2026 TASKS TO BE COMPLETED	Tasks 4, 5, 6, and 8.

Background:

NDOT would like to implement SAFL Baffles and possibly other mechanical sediment trapping devices in future projects to address MS4 regulations. These devices require preliminary determination of runoff sediment characteristics including particle size distributions and concentrations. The required data are available in some other states but not in Nebraska. Using data obtained in other states will be inaccurate and will likely result in over- or under-design of the sediment trapping devices. Proper design of the trapping devices will optimize cost and efficiency of the devices. Measuring sediment size distributions and concentrations at multiple drainage sites in Nebraska municipalities is needed to provide defensible characterization of runoff sediment. Modeling of the sediment size distributions and concentrations is needed to extend measured results to similar drainages

Objective:

The overarching goal of this project is to establish reasonable estimates of particle size distributions and concentrations of sediment washed from roadways into storm sewers in Nebraska MS4 municipalities. These data are needed for proper sizing and maintenance scheduling of SAFL Baffles. To meet this goal, the following objectives have been identified:

1. Develop a thorough understanding of existing roadway sediment runoff data including concentrations and sediment distributions.
2. Establish a rigorous and defensible methodology for collecting roadway runoff sediment data that is representative of MS4 communities in Nebraska.
3. Collect a complete set of roadway sediment runoff data for a two-year period that includes multiple seasons.
4. Produce a model and guidelines for extending the data to represent MS4 communities throughout Nebraska

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$13,385	100%
Task 2: Sampling Site Preparation	\$69,147	100%
Task 3: TAC 1 meeting – November 2023	\$0	100%
Task 4: Data Collection and Processing	\$47,508	58%
Task 5: TAC 2 meeting – May 2024	\$0	100%
Task 6: Develop Model/Guidelines	\$36,419	3%
Task 7: TAC 3 meeting – November 2024	\$0	0%
Task 8: Provide Final Recommendations	\$14,986	0%

Deliverables:

This research is straight forward, and the results will be directly utilized by NDOT in its MS4 program. The research will allow for inlet and manhole sump structure designs that are tailored specifically to Nebraska data. The data may also be utilized in design of other MS4 treatment methods by using the sediment concentration and particle size distributions to calculate expected sediment loads, potential settlement timing, and clogging potential on filtering systems.

Performance:

Project started July 1st, 2023

CONTROL NUMBER	01057G
PROJECT NUMBER	SPR-FY24(032)
PROJECT TITLE	Update of Intersection/Interchange Guidelines for Rural Expressways in Nebraska
PRINCIPAL INVESTIGATOR	Aemal Khattak – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Alan Swanson, Harrison Redepinning, Matt Neemann, Don Butler, Kyle Christensen, Alison Koch – FHWA, Abe Anshasi - FHWA
PROJECT TOTAL COSTS	\$179,316
PROJECT EXPEDITURES TO DATE	\$55,136.59
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	58%
STATUS	On Schedule
FY-2026 BUDGET	\$124,179.41
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, 4, 5, 6, and 7

Background:

NDOT staff frequently deals with the decision to change an existing two-way STOP-controlled expressway intersection to either a signalized intersection or an interchange. Current guidelines for such decisions are in the "Interchange vs. at-grade intersection on rural expressways" report No. TRP-02-25-91, May 1992. This report deals with conversion of two-way STOP-controlled intersections to either a signalized intersection or a full diamond interchange with STOP-controlled off ramps. The report is dated and NDOT staff needs guidance on additional options (e.g., roundabouts, RCUT) besides the two mentioned in the report. This research is proposed to update the guidance in the report using the latest cost components (e.g., crash costs) and newer methodology that incorporates additional options besides the original two (signalized intersection and full diamond interchange). The proposed research would consist of updated methodology for three major components: 1) Assessment of operational efficiency and associated costs based on current state-of-art method adjusted to Nebraska conditions, 2) Safety and associated cost estimations based on recent crash data, and 3) Construction cost assessment based on recent market values and practices. The original research relied on the Highway Capacity Software (HCS). The proposed research will also utilize calibrated and validated microsimulation models for Nebraska conditions to assess in-depth operational impacts. The research will update and supplement existing guidelines.

Objective:

The proposed research has the following objectives.

- Assess the operational and safety performance and associated costs of different alternative design options available for reconfiguring rural two-way stop-controlled expressway intersections based on the current state-of-the-art method adjusted to Nebraska conditions.
 - Assess the construction and maintenance cost of different options that are available for intersections/interchanges based on recent market values and practices.
 - Develop rural expressway intersection reconfiguration guidelines based on benefit/cost analysis of the alternative design options.
- This research will focus on the following intersection options: two-way stopped-controlled (TWSC) intersections, signalized intersections, diamond interchange, DDI, RCUT, and roundabouts. The analyses will include both four-legged and three-legged facilities, as appropriate. As part of the operational analyses, this research will develop 1) deterministic models (e.g., HCS) to assess the operational impacts of at-grade intersections and interchanges and 2) microsimulation models calibrated and validated for Nebraska conditions to assess in-depth operational impacts of location-specific facilities. Note that these models will be accessible to NDOT, if they wish to use them.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: TAC Meeting and Review of Literature	\$ 30,745	100%
Task 2: Data Collection	\$ 36,068	98%
Task 3: Operational Analysis and Associated Cost Estimation	\$ 21,963	70%
Task 4: Safety Analysis and Associated Cost Estimation	\$ 24,270	55%
Task 5: Construction and Maintenance and Associated Cost Estimation	\$ 24,270	25%
Task 6: Benefit/Cost Analysis and Establish Guidelines	\$ 19,872	15%
Task 7: Final Report and TAC Presentation	\$ 22,127	5%

Deliverables:

The proposed research project will not only update existing guidelines utilizing the latest information available but also include new options for dealing with rural expressway intersections controlled by two-way stop signs. This will enable NDOT staff to make more informed decisions well into the future and improve expressway intersection operation and safety in Nebraska. The eventual benefits will be efficient operation and improved expressway intersection safety in Nebraska.

Performance:

Project started July 1st, 2023.

CONTROL NUMBER	01057H
PROJECT NUMBER	SPR-FY24(033)
PROJECT TITLE	Drainage Area Limitations for NDOT Hydrologic Computations
PRINCIPAL INVESTIGATOR	Rollin H. Hotchkiss – Brigham Young University (BYU)
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Julie Ramirez, Anna Allen, Kyle Hall, Jason Dayton, Kirk Harvey, Isabella Fleege, Alison Koch – FHWA, Madiha Alshammry – FHWA, Matt McConville – HDR, Ricki Kuvach
PROJECT TOTAL COSTS	\$114,528
PROJECT EXPEDITURES TO DATE	\$58,191.37
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	60%
STATUS	On Schedule
FY-2026 BUDGET	\$56,336.63
FY-2026 TASKS TO BE COMPLETED	Task 4, 5, 6, 8, and 9.

Background:

There is a lack of performance-based guidance on drainage area-based use of hydrologic methods to predict peak discharge. Specifically, a lack of guidance when using SCS curve number-based methods leaves designers with less confidence about the applicability decisions.

Objective:

The objectives of this study are to

- Compare estimates of peak discharge using SCS curve number methods to those from smaller gauged watersheds to determine a logical lower and upper limit for drainage area applicability.
- Apply recently developed hydrologic methods that provide long-term simulations for gaged and un-gaged areas and apply flood frequency estimates derived therefrom to those from gage records and curve number results.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Continue the literature review of both traditional and next gen methods for calculating peak discharge	\$ 8,000	100%
Task 2: Assemble all available streamflow records from smaller drainage areas from the U.S. Geological Survey and cooperative agencies that collect streamflow data	\$10,000	100%
Task 3: Perform standard flow frequency analyses for all streamflow records	\$10,000	100%
Task 4: Calculate peak flow estimates using the Rational Method (drainage areas less than 1 sq. mile), SCS curve number methods and the National Water Model for all selected gaged watersheds.	\$15,000	80%
Task 5: Calculate flow frequency for several ungaged areas using the same three methods and regression equations.	\$19,000	20%
Task 6: Analyze all results to determine drainage area limitations and guidelines.	\$32,000	64%
Task 7: Meet with the TAC members throughout the life of the project	\$0	0%
Task 8: Produce a final report and technical brief and provide training for project implementation to NDOT designers	\$20,000	15%

Deliverables:

Achieving the study objectives will

- Provide designers better guidance on the application of available hydrologic methods for calculating peak discharge, which will provide additional consistency and uniformity when sizing hydraulic structures.
- Increase skill levels using more sophisticated computational approaches such as the Watershed Modeling System (WMS).
- Allow designers to consider new methods for predicting peak discharge.
- Share results at Transportation Research Board and/or National Hydraulic Engineering Conference
- Lead the way in considering the power of recent and ongoing hydrologic research

Performance:

Project started July 1st, 2023

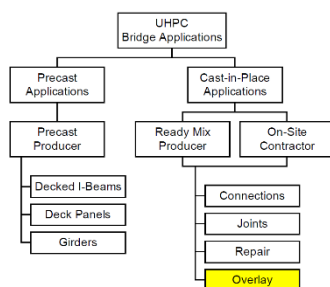
CONTROL NUMBER	01057J
PROJECT NUMBER	SPR-FY24(034)
PROJECT TITLE	Ultra-High-Performance-Concrete (UHPC) for Bridge Deck Overlay and Structural Deck Repair
PRINCIPAL INVESTIGATOR	Jiong Hu – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Ross Barron, Fouad Jaber, Wally Heyen, Kyle Zillig, Kent Miller, Lieska Halsey, Ben Ricceri – NEBCO, Michael Willman - GCP, Madiha Alshammry – FHWA, Dale Burkhead – Simon
PROJECT TOTAL COSTS	\$152,761
PROJECT EXPEDITURES TO DATE	\$96,065.78
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	85%
STATUS	On Schedule
FY-2026 BUDGET	\$56,695.22
FY-2026 TASKS TO BE COMPLETED	Tasks 3, 4, and 5.

Background:

Recently developed NDOT non-proprietary UHPC mixture for precast and cast-in-place applications does not meet the specific requirements for deck overlay (e.g., interface bond with existing deck, high thixotropy, workability retention, sloped construction, and increased fiber content). As shown in Figure 2, the current project will, therefore, primarily focus on bridge Deck overlay and Structural deck repair, which completes the NDOT roadmap for promoting the use of UHPC in bridge applications.

Objective:

The objective of this project is to develop an NDOT UHPC mixture specific for overlay and structural deck repair applications using local materials, evaluate its fresh, mechanical, and durability properties using laboratory testing and mockup specimens, and implement it in demonstration projects



Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$ 10,574	100%
Task 2: Mixture Development	\$ 28,899	100%
Task 3: Performance Evaluation	\$ 68,843	85%
Task 4: Mockup and Demonstration	\$ 34,554	60%
Task 5: Document and Presentation	\$ 9,891	30%

Deliverables:

Through bridge deck overlay and structural deck repair, UHPC is expected to improve the long-term performance of NDOT bridge decks and have a lower life-cycle cost than conventional materials due to their durability and structural performance. It is expected to extend the service life of the overlay beyond the 75-year service life of the bridge structure. This project will be a key component of the NDOT Roadmap of UHPC. The success of this project will provide the necessary knowledge for UHPC as an overlay or structural repair material for bridge decks, which will greatly encourage producers and contractors to adopt this innovative approach.

Performance:

Project started July 1st, 2023.

CONTROL NUMBER	01057K
PROJECT NUMBER	SPR-FY24(035)
PROJECT TITLE	Framework for Quantifying Benefits to Disadvantaged Communities: Application to Nebraska's National Electric Vehicle Infrastructure (NEVI) Plan
PRINCIPAL INVESTIGATOR	Li Zhao – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	01/31/2026
TECHNICAL ADVISORY COMMITTEE	Curtis Nosal, Ryan Huff, Walter Moy, Harrison Redepenning, Kimberly Baker, Amy Starr, Justin Luther – FHWA
PROJECT TOTAL COSTS	\$179,055
PROJECT EXPEDITURES TO DATE	\$78,393.70
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	77%
STATUS	On schedule
FY-2026 BUDGET	\$100,661.30
FY-2026 TASKS TO BE COMPLETED	Tasks 5, 6, and 7.

Background:

The Bipartisan Infrastructure Law (BIL) created the National Electric Vehicle Infrastructure (NEVI) Formula Program that will give NDOT access to \$30.2 million over the five-year span (2022 - 2026) of the program to strategically install Electric Vehicle Supply Equipment (EVSE) around the State. The Formula Program is subject to the Justice40 directive which states that 40% of the overall benefits from Federal covered programs need to be distributed to disadvantaged communities (DACs). Under the Justice40 directive, each agency is required to establish a methodology for calculating the benefits that (1) flow from each applicable covered program, and (2) accrue in DACs from each covered program. The NEVI Formula Program is one of many Justice40-covered programs as announced by the White House on August 18, 2022. The Justice40 directive does not require NDOT to place 40% of the EVSE in the DACs, and it would not be appropriate to do so given where the DACs are in the State. Thus, quantifying the 40% or higher benefits to DACs is not a straightforward task. To date, the Joint Office (Energy and Transportation) has not provided NDOT and other State DOTs specific guidance on how to measure benefits to DACs. This project proposes to assist NDOT in developing a set of indices (e.g., EVSE accessibility index) that can be used to compare EVSE deployment benefits to DACs and non-DACs. A crucial element of the proposed project is the method/procedure to easily collect the necessary data for calculating the indices. The indices developed from this project can be used and applied by NDOT to other Justice40-covered programs.

Objective:

This project aims to assist NDOT in complying with Justice40 initiative by providing a tool that can be used to quantify benefits to DACs from the selected locations for installing EV charging stations. The primary work is the development of a set of practical metrics that consider transportation, energy, economic, environmental, and health of communities. There are three measurable objectives that drive this project.

- (1) Develop a set of metrics based on data to analyze the impact of an EV charging station on transportation accessibility, energy efficiency, economic growth, and environmental and health improvements.
- (2) Develop a framework that provides an aggregate measure of benefits from the various metrics developed in Objective 1. The aggregate measure considers the relative importance of a benefit to a particular DAC based on its type.
- (3) Develop a scenario planning tool to allow NDOT to examine different deployment strategies, such as evaluating the effect of choosing one location versus another and the effect of installing a station earlier or later than another

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Search	\$16,651	100%
Task 2: Community Engagement Survey	\$29,431	100%
Task 3: Data Collection and Synthesis	\$33,276	100%
Task 4: Metric Determination and Calculation	\$39,653	100%
Task 5: Benefit Measure Modeling	\$26,354	90%
Task 6: Scenario Planning Tool Development	\$26,615	45%
Task 7: Final Report and Presentation	\$17,075	0%

Deliverables:

This project will provide the following key benefits to the stakeholders in Nebraska and beyond.

- A set of practical equity metrics that can be incorporated into any project funded by a covered program.
- A scenario planning tool to support decision making by allowing agencies to investigate various scenarios and their tradeoffs.
- Ensure compliance with the Justice40 directive and support the implementation of Nebraska NEVI Program (as an application) and other Justice40-covered programs.

Performance:

Project started July 1st, 2023.

CONTROL NUMBER	01057L
PROJECT NUMBER	SPR-FY24(036)
PROJECT TITLE	Assessment if Truck Parking Demand and Safety During Normal and Severe Weather Conditions in Nebraska
PRINCIPAL INVESTIGATOR	Nathan Huynh – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Ryan Huff, Jarrod Walker, Walter Moy, Don Butler, Justin Luther – FHWA, Stephanie Camerone, Abe Anshasi – FHWA
PROJECT TOTAL COSTS	\$188,885
PROJECT EXPEDITURES TO DATE	\$118,228.26
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	45%
STATUS	On Schedule
FY-2026 BUDGET	\$70,596.74
FY-2026 TASKS TO BE COMPLETED	Tasks 4, 5, 6, and 7.

Background:

MAP-21 included a provision requiring truck drivers to use an Electronic Logging Device to record their compliance with Hours-of-Service (HOS) requirements. This mandate, effective as of December 2017, requires commercial drivers to stop and rest after 11 hours of driving. Around the same time this mandate became effective, NDOT completed its first State Freight Plan. Through the planning process and discussions with the trucking industry and other stakeholders, the topic surrounding the availability of safe and convenient truck parking came to the fore, with truck drivers, motor carriers, and safety officials in Nebraska expressing concerns and seriousness of this issue. Commercial drivers seeking to comply with HOS regulations often park illegally, creating unsafe conditions for motorists and other commercial drivers. The extent of the problem in Nebraska is unknown and evidence is often anecdotal. For these reasons, the State Freight Plan recommended that NDOT develop an asset-based approach to understand how truck parking deficiencies affect safety and operations on its highway network.

To assess truck parking at the state level, this project proposes to develop a method to scan the entire State using satellite imagery to (1) determine truck parking lot occupancy, and (2) identify locations where trucks have parked illegally. In collecting this information over 10 years, trends and projections can be made to inform policy and provide factual data to guide discussions with NDOT's freight partners.

Objective:

To accomplish the goals stated above, the project team will work in consultation with the Technical Advisory Committee (TAC) to accomplish the following research objectives.

1. Use publicly available sources to create a complete inventory of public and private truck parking facilities along I-80 in Nebraska and the number of available parking spaces at each facility.
2. Analyze 2022 year-long truck GPS data from the American Truck Research Institute (ATRI), supplemented with satellite imagery data, to determine actual truck parking demand at all public and private facilities along I-80 in Nebraska and identify truck parking hotspots.
3. Objective 2 will provide NDOT with very accurate information regarding truck parking demand and utilization at each facility. However, the information will be limited to the year 2022. To provide NDOT with the ability to estimate the occupancy of truck parking areas in future years, a model will be developed to provide this information.
4. Identify undesignated truck parking clusters in inclement weather to determine where best to provide emergency parking.
5. Conduct an exploratory analysis of crashes that were likely due to truck parking shortages

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Conduct Literature Review	\$14,910	100%
Task 2: Obtain and Process Truck GPS Data and Crash Data	\$66,214	100%
Task 3: Determine Truck Parking Supply and Demand	\$27,994	100%
Task 4: Develop a Model to Estimate the Occupancy of Truck Parking Areas	\$25,139	25%
Task 5: Identify Undesignated Truck Parking Clusters in Inclement Weather	\$20,663	0%
Task 6: Determine the Number of Crashes Associated with Truck Parking Shortages	\$18,155	0%
Task 7: Prepare Final Report and Presentation	\$15,811	0%

Deliverables:

The primary benefit of this project to NDOT is having factual data about truck parking supply and demand in Nebraska. The secondary benefit is understanding the extent of crashes that were most likely due to truck parking shortages. These data can be incorporated into the next update of the State Freight Plan and provide a basis for meaningful dialogues with the trucking industry and related stakeholders.

This project could potentially lead to more truck parking facilities across the state due to the business opportunities identified in this project for the private sector. Should that take place, it will make travel through the State safer for truck drivers and other travelers, reduce unnecessary travel and fuel consumption by trucks searching for a parking spot, and improve the efficiency of commercial vehicle operations. The providing lists the benefits of providing more truck parking by stakeholders (MnDOT, 2019)

Performance: Project started July 1st, 2023.

CONTROL NUMBER	01057M
PROJECT NUMBER	SPR-FY24(037)
PROJECT TITLE	Guidance for Left-Turn Flashing Yellow Arrow (FYA) Implementation in Nebraska
PRINCIPAL INVESTIGATOR	Aemal Khattak – UNL
PROJECT START DATE	07/01/2023
PROJECT COMPLETION DATE	05/31/2025
TECHNICAL ADVISORY COMMITTEE	Alan Swanson, Don Butler, Bryan Guy – City of Omaha, Nicholas Gordon – City of Omaha, Garret Schram – City of Omaha, Andy Jenkins – City of Lincoln, MyungWoo Lee – City of Lincoln, Abe Anshasi – FHWA, Alison Koch – FHWA, Dan Fuchs – Iteris
PROJECT TOTAL COSTS	\$177,066
PROJECT EXPEDITURES TO DATE	\$65,466.75
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	70%
STATUS	On Schedule
FY-2026 BUDGET	\$111,599.25
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, 4, 5, 6, and 7.

Background:

In recent years, various municipalities in Nebraska have transitioned to the use of the flashing yellow arrow (FYA) for permissive left-turns in accordance with MUTCD guidelines. A preliminary study conducted by the University of Nebraska Lincoln and City of Lincoln (S 27th & J-St, S 33rd & Pioneer, S 84th & Firethorn, Wedgewood & O-St) during 2019-2020 provided some evidence that the new protocols are working well. The FYA provides safety benefits while providing more flexibility and versatility in field operation (e.g., phasing sequences, modes, and displays). However, the best practice of FYA arrangement (e.g., phasing, signing) remain unclear. Inappropriate combinations of the FYA display mode may lessen the effectiveness of the FYA application.

This study will examine before-after safety of a sample of signalized intersections where changes from solid green ball to FYA installations were made for left turns. Cross-sectional field study on FYA operations will be conducted to evaluate the effectiveness of the left-turn FYA indication at signalized intersections. Specially focus on the investigation if signal display arrangement (e.g., lead/lag phasing, supplemental signing, varying time-of-day operations) had a significant effect. Guidelines on optimal implementation of the FYA considering different traffic conditions (e.g., turning movement, intersection geometry, driver comprehension, etc.) will be developed for transportation agencies.

Objective:

This study will investigate the effect on safety and traffic operation of upgrading the permissive left-turn indication from CG to FYA at signalized intersections in Nebraska. Guidelines will be developed to provide NDOT and city traffic engineers with knowledge for safer and more efficient application of left-turn FYA signal configuration and arrangement in Nebraska. Specifically, the objective of this project will be to:

1. Develop an evaluation framework for the effectiveness of the left-turn FYA indication at signalized intersections to assess both safety and operational performance and investigate if the display arrangement (e.g., supplemental sign, lead/lag phasing) has a significant effect.
2. Identify significant factors (e.g., geometric, speed, volume, signal design) that cause an increase in crashes at a particular location after conversion to left turn FYA to assess the suitability of lead/lag phasing and develop safety improving mitigation measures for existing locations with lead/lag phasing that may be experiencing higher than expected crashes, while retaining the lead/lag operation.
3. Develop a guideline for efficient utilization and implementation of left-turn FYA indication at signalized intersections for comparing efficiency (e.g., delay reduction) and safety of left-turn FYA given different left-turn FYA settings.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Search and TAC Meeting	\$18,985	100%
Task 2: Crash Data Analysis	\$33,167	95%
Task 3: Data Collection and Field Study	\$26,844	95%
Task 4: Cross-sectional analysis with/without FYA supplemental signs	\$27,042	90%
Task 5: Lead/Lag and Safety Improving Measures	\$24,056	90%
Task 6: Guideline Development	\$23,036	20%
Task 7: Final Report and Presentation to NDOT	\$23,937	0%

Deliverables:

1. Identify the efficacy of the left turn FYA indication at intersections under different types of protocols.
2. Provide guidance for the appropriate implementation of left-turn FYA displays (e.g., supplemental sign, lead/lag phasing) and safety improving measures for locations with lead/lag phasing experiencing higher than expected crashes.
3. Development and consistent usage of the FYA guidelines for Nebraska

Performance:

Project started July 1st, 2023.

CONTROL NUMBER	01071A
PROJECT NUMBER	SPR-FY25(038)
PROJECT TITLE	Electric Arc Furnace Slag as a Paving Material – Phase I: Physical, Chemical, Morphological, and Mineralogical Characterization and Environmental Analysis
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Nikolas Glennie, Brendon Schmidt, Matt Park, Lieska Halsey, Wally Heyen
PROJECT TOTAL COSTS	\$151,272
PROJECT EXPEDITURES TO DATE	\$2,824.29
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	29%
STATUS	On Schedule
FY-2026 BUDGET	\$147,447.71
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

NDOT is interested in exploring the utilization of Electric Arc Furnace Slag (EAF) as an alternative for soil stabilization. This research initiative holds the potential to diminish the necessity for commercial stabilizing agents like hydrated lime or Portland cement, consequently, contributing to a reduction in CO2 emissions and offering a sustainable solution for pavement construction in Nebraska. The application of slags for soil stabilization has become a prominent topic within the pavement community. It presents an opportunity to enhance pavement performance, leading to longer-lasting roads by improving soil engineering properties. Simultaneously, it addresses the growing accumulation of materials in landfills while reducing carbon emissions.

Objective:

The primary objectives of this research are to:

1. Conduct a bibliometric analysis aimed at identifying key national and international studies, alongside research institutions, focusing on the utilization of slag specifically for pavement applications.
2. Gather and synthesize technical reports and U.S. state agency specifications, with a specific emphasis on delineating the prerequisites necessary for employing slag as a material for pavement applications. Characterize development behavior and required embedment lengths for full development of GFRP bars in UHPC.
3. Identify the main sources of slags in Nebraska and characterize them in terms of physical, chemical, mechanical, mineralogical, and morphological characteristics that are considered important for stabilization of soils.
4. Verify if the addition of slags can pose environmental concerns due to leaching of hazardous heavy metals in comparison with traditional stabilizing materials.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$ 5,749	95%
Task 2: Sample Collection and Preparation	\$6,296	30%
Task 3: Experimental Plan (Slag Characterization and Environmental Analysis)	\$68,860	10%
Task 4: Examination of Feasibility and Potential Implementation	\$36,094	0%
Task 5: Documentation and Presentation	\$34,276	10%

Deliverables:

This study will enrich the state-specific soil stabilization strategies and pavement sustainable solutions. Successfully accomplished research will show if the EAF slag is technically and environmentally suitable for paving application. With the success of this initial stage laboratory-based research, the research team plan to move to a second phase focused on soil-slag mechanical characterization and field evaluation. A procedure manual for using EAF/caster slags will be prepared and delivered to NDOT at the end of multi-phase study. Those results will be suggested to be incorporated into the NDOT Standard Specifications for Highway Construction, which can be used for statewide and countywide implementation.

Performance:

Project Started on July 1st, 2024.

CONTROL NUMBER	01071B
PROJECT NUMBER	SPR-FY25(039)
PROJECT TITLE	Evaluation of Low-Temperature Cracking (LTC) Performance Testing Methods to Assess Nebraska Asphalt Mixtures
PRINCIPAL INVESTIGATOR	Chun-Hsing Ho – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Robert Rea, Bruce Barrett, Brendon Schmidt, Matt Park, Lieska Halsey, Madiha Alshammry - FHWA
PROJECT TOTAL COSTS	\$152,382
PROJECT EXPEDITURES TO DATE	\$8,699.02
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	32%
STATUS	On Schedule
FY-2026 BUDGET	\$143,682.98
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, 4, and 5.

Background:

NDOT has embarked on the development of balanced mix design (BMD) method with the two previous NDOT-funded research projects, Phase I (SPR-FY22 (002)) and Phase II (SPR-FY23(016)) that considers 2 main distresses: rutting and mid-temperature cracking. Although the research outcomes show that the proposed BMD methods are practically efficient and implementable, they are limited and do not assess low temperature cracking resistance of asphalt mixtures, which is considered as one of the main concerns in cold climate states like Nebraska. Based on the NCHRP 20-07(406) report, there are three states (Iowa, Minnesota, and Missouri) in the mid-US regions that require a thermal cracking test in their mix design specifications [1]. The report further indicated that among state DOTs and asphalt contractors, the most commonly used thermal cracking tests were the Semi-Circular Bend Test (SCB), the Disc-Shaped Compact Tension Test (DCT), the Indirect Tensile (IDT) Creep Compliance and Strength Test, the Thermal Stress Restrained Specimen Test (TSRST), the Illinois Flexibility Index Test (I-FIT) and Bending Beam Rheometer (BBR) test (Figure 1).

Objective:

The primary objectives of this research are to:

1. Conduct LTC tests on the different binders and mixtures collected from Nebraska field projects to verify the sensitivity and reproducibility of suggested tests from literature. The selected mixtures will include various binder PG grade, source, and content, aggregate types (virgin and RAP) and nominal maximum aggregate size.
2. Verify the LTC sensitivity to mixture volumetrics. Plant collected mixtures will be lab compacted at different levels of air voids to verify LTC test susceptibility to this mixture parameter.
3. Compare results from the two scales (binder & mixture) of material testing with results obtained from samples collected from NDOT paving projects approved by NDOT TAC members.
4. Establish preliminary pass/fail thresholds based on the obtained results and comparison with literature for future QC and acceptance purposes

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$ 45,507	100%
Task 2: Experimental Plan	\$19,462	50%
Task 3: Lab Test	\$31,803	10%
Task 4: Data Analysis	\$54,509	0%
Task 5: Documentation and Final Report	\$1,100	0%

Deliverables:

This study will contribute to the implementation of Nebraska Balanced Mix Design (BMD). Currently, only volumetric characteristics are considered in the design of Nebraska asphalt mixtures, and the effects of new materials such as recycling agents, antioxidants, polymers, waste plastics, and/or high RAP materials cannot be fully addressed. Furthermore, the addition of an NDOT project with a focus on LTC (Low Temperature Cracking) is a critical need that will allow the determination of the most suitable LTC test method to be incorporated into the Nebraska BMD approach. In this way, fundamental properties of mixtures can better address the effects of low temperature, such as thermal cracking and mixture interactions during freeze-thaw conditions.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071C
PROJECT NUMBER	SPR-FY25(040)
PROJECT TITLE	The Utilization of Waste Plastic as a Polymer Modifier for Asphalt Binders
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Robert Rea, Bruce Barrett, Brendon Schmidt, Matt Park, Madiha Alshammry – FHWA, Lieska Halsey
PROJECT TOTAL COSTS	\$141,874
PROJECT EXPEDITURES TO DATE	\$
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	25%
STATUS	On Schedule
FY-2026 BUDGET	\$141,874
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

Polymer-modified asphalt (PMA) has shown great promise in improving the performance of flexible asphalt pavements at low, intermediate, and high temperatures by increasing pavement resistance to permanent deformation, thermal cracking, and fatigue cracking. Recently, waste plastics (WPs) have been explored for making PMAs and incorporating them in asphalt binder through wet processes due to WP abundance and their ability to act as bonding enhancers. NDOT is interested in exploring the use of WP as an alternative sustainable material for binder modification. This research effort can contribute to reducing, reusing, and recycling waste plastic materials while providing enhanced binders and asphalt mixtures.

Objective:

The primary objectives of this research are to:

1. Evaluate the effect of PE WP size on asphalt's storage stability. We will vary the WP sizes from millimeter (mm) to micrometer (mm) and nanometer (nm) ranges. We will determine the storage stability of the modified asphalt binder using a globally established separation tube test (also called the cigar tube test).
2. Determine the distribution and aggregation behavior of WPs (of different composition and size) in the asphalt binder. We will use time-resolved dynamic light scattering technique that provide time-dependent measurement and information about particle aggregation behavior in a liquid dispersion media (here the binder).
3. Verify the rheological properties of single and hybrid PMAs with and without the use of surfactants subjected to short- and long-term aging. We will test the WP/Surf incorporated PMAs using dynamic shear rheometer and bending beam rheometer.
4. Compare the results from hybrid PMA with commercial highly polymer modified base binders used in Nebraska.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$ 11,838	70%
Task 2: Waste Sampling and Characterization	\$ 17,669	40%
Task 3: PMA Laboratory Tests (Blends and Tests)	\$ 42,816	0%
Task 4: Analysis of Test Results	\$ 37,403	0%
Task 5: Documentation and Presentation	\$ 31,149	15%

Deliverables:

This research is expected to develop a stable polymer modified asphalt (PMA) with improved storage stability and rheological properties compared to the commercial PMAs that are currently in use. The project targets the production of PMAs using waste plastics - that will reduce the overall cost of productions for PMAs and will provide long-term stability to the asphalt pavement. The research project will also develop information about WPs characteristics that will provide the best performing and highly stable PMA without increasing the cost of the PMA production and application. The micro- and nanoscale WPs are also expected to enhance the durability and crack-resistance or prevention of crack-initiation of the asphalt pavements through bridging between aggregates.

Performance:

Project Started July 1st, 2024.

CONTROL NUMBER	01071D
PROJECT NUMBER	SPR-FY25(041)
PROJECT TITLE	Effect of Nighttime Lighting on Construction Workers' Safety
PRINCIPAL INVESTIGATOR	Chun-Hsing Ho – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Jim Knott, Lorraine Legg, Cameron Craig, Lieska Halsey, Abe Anshasi - FHWA
PROJECT TOTAL COSTS	\$147,497
PROJECT EXPEDITURES TO DATE	\$8,699.02
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	25%
STATUS	On Schedule
FY-2026 BUDGET	\$138,797.98
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, 4, 5, and 6.

Background:

Current roadway lighting is designed specifically to provide illumination for vehicles and pedestrians in support of residential street and highway operations. However, the illumination levels are usually less than 20% of what is required for work operations [1] and do not take nighttime construction operations into consideration. Many states Departments of Transportation (DOT) use some form of nighttime work zone lighting based on the Federal Highway Administration's Nighttime Lighting Guidelines [2] and NCHRP's Illumination Guidelines [3] to conduct construction and maintenance activities on or near the travel portion of the road system. However, in the past 10 years, light emitting diode (LED) technology has evolved, and the illuminance of lighting sources has been increased; the resources for nighttime lighting design from the two national guidelines have been outdated and need improvements and updates. More recently, Indiana DOT [4] and Virginia DOT [5] have conducted research projects about the glare assessment based on the lighting system's parameters and luminance levels of lighting sources, but their demonstration settings were performed in a controlled environment and no real field test was used to assess the effectiveness of the proposed lighting set-ups. The geometry and characteristics of construction operations and highway profiles vary by place, so lighting arrangements should be conducted in a practical way that would be suitable for the structure of highways in Nebraska. Therefore, this proposal is prepared to provide NDOT, construction organizations (e.g., Associated General Contractors of America, AGC Nebraska Chapter), and contractors with a list of recommendation of nighttime lighting arrangements for construction operations at night as well as to supplement informed knowledge about construction lighting setups and update guidelines to the NDOT "Standard Specifications for Highway Construction".

Objective:

The primary objectives of this research are to evaluate the effect of lighting on work zone safety, taking the perspectives of construction workers and motorists into consideration for nighttime lighting arrangements, including:

1. the effect of lighting (i.e., glare/luminance/visibility) on the visual performance of construction workers.
2. the effect of orientation and placement of light towers on the perception of construction workers and motorists.
3. the identification of unsafe conditions due to inadequate lighting arrangements at nighttime work zones

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$ 24,557	100%
Task 2: Survey	\$18,087	60%
Task 3: Experimental Plan and Prototyping	\$28,613	20%
Task 4: Data Analysis	\$69,636	0%
Task 5: Field Test and Assessment	\$5,504	0%
Task 6: Documentation and Final Report	\$1,100	0%

Deliverables:

This study will contribute to the state-of-the-practice nighttime lighting guidelines by conducting a series of field prototyping on glare and luminance assessments through a variety of lighting arrangements. The proposed project is prepared based on glare and luminance assessments from the perspectives of construction workers and motorists in nighttime work zones. We will evaluate factors influencing the safety of nighttime construction work zones such as orientation of lights, placement of light towers, type of lights, etc. and provide a list of recommended arrangement of lighting systems for future nighttime construction planning. Specifically, the project will focus on the effect of glare/luminance/visibility on the perception of motorists, the visual performance of construction workers, the interference of construction workers and equipment/vehicles, and the identification of unsafe conditions at nighttime work zones on I-80. The implementation of an NDOT project with a focus on lighting arrangements is a vital addition to be incorporated into NDOT's daily construction operations, roadway design, and traffic control measures.

Performance:

Project started July 1st, 2024

CONTROL NUMBER	01071E
PROJECT NUMBER	SPR-FY25(042)
PROJECT TITLE	Optimization of Energy Dissipation Using Staggered Weirs
PRINCIPAL INVESTIGATOR	David Admiraal – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Julie Ramirez, Kyle Hall, Anna Allen, Lieska Halsey, Jason Dayton, Kirk Harvey, Isabella Fleege, Jordon Sanford, Ben Fischer – FHU, Ricki Kuvach
PROJECT TOTAL COSTS	\$136,135
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	20%
STATUS	On Schedule
FY-2026 BUDGET	\$136,135
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, 5, 6, and 7.

Background:

Energy dissipation at culvert outlets is necessary for preventing excessive scour that can result in damage to the outlet structure, adjacent roadway, or downstream channel. Energy dissipation basins have long been used for this purpose because of their simple design and effectiveness, but these basins take a lot of space and result in stagnant water pools. Improvements to dissipation structures can help reduce the size of these basins, which results in reduced project cost and helps eliminate stagnant pools.

Objective:

The objective of the proposed research is to optimize the staggered weir so that it maximizes flow energy dissipation to minimize downstream erosion. In the research process, we will both:

1. optimize the geometry of the staggered weir to improve its effectiveness and
2. extend its range of applicability by modifying the testing system so that we can investigate a much wider set of inlet Froude numbers and inflow conditions.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature and Design Process Review	\$ 6,386	75%
Task 2: Model Revisions	\$41,437	75%
Task 3: TAC 1- Data Collection Strategy	\$0	0%
Task 4: Test Data One (Variable Geometry Data)	\$47,639	0%
Task 5: TAC 2- Review Variable Geometry Data	\$0	0%
Task 6: Test Data Two (Follow-up Tests)	\$6,514	0%
Task 7: TAC 3- Review Follow-up Data	\$0	0%
Task 8: Design Integration	\$11,715	0%
Task 9: Report Preparation	\$13,072	0%
Task 10: Final Presentation, Draft Revisions, and Reporting	\$9,372	0%

Deliverables:

There will be three primary outputs of this project: (1) A thorough description of the test procedure to determine the optimal staggered-weir geometry and the result, (2) a detailed dataset for the optimal staggered-weir geometry, and (3) integration of test results into spreadsheets and/or software for simplified design of staggered-weir dissipation structures.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071F
PROJECT NUMBER	SPR-FY25(043)
PROJECT TITLE	Evaluation of NDOT's Construction Stormwater Detention Measures Using Full-Scale Testing Techniques
PRINCIPAL INVESTIGATOR	Michael A. Perez – Auburn University
PROJECT START DATE	07/1/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Jason Jurgens, Ronald Poe, Lieska Halsey, Kyle Hall, Julie Ramirez, Ricki Kuvach
PROJECT TOTAL COSTS	\$199,999
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	23%
STATUS	On Schedule
FY-2026 BUDGET	\$199,999
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, 4, 5, 6, and 7.

Background:

Earthmoving activities associated with highway construction create increased risk of downstream pollution from stormwater runoff. Rainfall dislodges sediment and runoff mobilizes soil particles and other pollutants that can cause significant risk to receiving water bodies. Excessive sediment in waterways can harm aquatic life by increasing turbidity, reducing fish habitats, as well as increasing the risk of flooding by reducing the flow capacity of rivers and streams. The cost of sediment in surface waters is drastic, with the cost of sediment pollution being estimated at \$16 billion in 1998, including the physical, biological, and chemical damages caused by unmanaged or improperly managed stormwater discharges.

Objective:

The objective of this proposed research is to evaluate NDOT's standard silt trap and sediment trap used to facilitate impoundment and capture sediment. This study is divided into three primary objectives:

1. Develop a full-scale testing methodology that allows for the performance comparison of construction stormwater detention practices,
2. Evaluate construction stormwater detention practices and modified installations through full-scale testing at the AU-SRF that mimics conditions found on a NDOT highway construction project, and
3. Develop implementable design guidance and comparisons on the use of detention practices on construction projects, including performance, costs, installation, maintenance requirements, etc.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Kickoff Meeting	\$1,000	100%
Task 2: Literature Review	\$16,000	30%
Task 3: Design Experimental Detention Measures/Develop Testing Methodology	\$12,000	50%
Task 4: Construction of Experimental Detention Measures	\$40,000	55%
Task 5: Conduct Full-Scale Testing	\$103,000	8%
Task 6: Data Analysis	\$12,000	0%
Task 7: Final Report	\$15,999	0%

Deliverables:

This study is expected to provide immediate implementable results for NDOT. A complete report containing an executive summary and complete record of the project, including methods, data collection and analysis will be provided. In addition, a technology transfer brief will be created to summarize key findings. Design recommendations for evaluated stormwater detention practices will be developed for NDOT implementation consideration. This guidance will include clear specifications, drawings, and language for stormwater detention practices that may be considered for future stormwater management plans.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071G
PROJECT NUMBER	SPR-FY25(044)
PROJECT TITLE	Integrated Bridge, Transportation Network, and Community Resilience Framework for Nebraska
PRINCIPAL INVESTIGATOR	Christine Wittich – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Ryan Huff, Ross Barron, Fouad Jaber, Tom Renninger, Walter Moy, Emilie Hudon, Lieska Halsey, Kirk Harvey, Jason Dayton
PROJECT TOTAL COSTS	\$200,877
PROJECT EXPEDITURES TO DATE	\$18,248.47
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	20%
STATUS	On Schedule
FY-2026 BUDGET	\$129,187.53
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

Climate-related disasters, such as flooding, routinely damage infrastructure, weaken economies, and significantly impact communities within the country and within Nebraska. Since 1980, 338 climate-related disasters in the United States have incurred damage exceeding \$1 billion (NOAA 2022). The average number of billion-dollar disasters per year has more than doubled from 7.7 events to 17.8 events over the past 5 years and is expected to continue to increase. The State of Nebraska Long-Term Recovery and Resilience Plan specifically identifies efficient assessment, restoration, and revitalization of infrastructure systems as a priority, and the state transportation network is critical to state climate resilience. NDOT's Long-Range Transportation Plan (LRTP) identified "secure and resilient transportation" as one of its six overarching goals to achieve by 2040. Climate-related disasters, such as flooding, can have initially catastrophic impacts, such as structural collapse, critical route closures, and casualties; however, the impacts can also cascade due to the interdependencies of modern communities. Given the anticipated increased frequency of major flood events combined with the potentially devastating impacts, it is critical for the state of Nebraska and the Department of Transportation to increase resilience to future hazards.

Objective:

Given the critical need to evaluate and quantify resilience considering the integrated Nebraska transportation network and broader community, the following technical objectives guide the proposed work:

1. Develop a framework for quantifying resilience considering an integrated state transportation and community model.
2. Validate the developed resilience framework using the floods of 2019.
3. Demonstrate the use of the resilience framework for prioritization and planning for future hazards.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review and Survey	\$ 29,624	90%
Task 2: Development of Resilience Model	\$47,008	25%
Task 3: Validation of Resilience Model	\$48,276	0%
Task 4: Case Study Demonstration	\$37,235	0%
Task 5: Final Reporting	\$38,734	0%

Deliverables:

The primary outcomes of this project will be:

- 1) a validated flood resilience model which can be used by NDOT for prioritizing maintenance and recovery planning; and,
- 2) prioritization of potential resilience improvement projects. The implementation of the latter is straightforward, where NDOT can elect to implement the considered projects with known improvements to transportation resilience. Implementation of the resilience model is a focus of the project's third objective. The resilience model will be developed in Python, such that the state-of-the-art IN-CORE platform can be leveraged. The PIs will work with the TAC to demonstrate the model's usage within ongoing scenario-planning efforts or other current and future projects that may benefit from resilience quantification, which will be documented in detail in the final technical report.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071H
PROJECT NUMBER	SPR-FY25(045)
PROJECT TITLE	Refined Analysis of Slab Bridges for Load Rating
PRINCIPAL INVESTIGATOR	Marc Maguire - UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Fouad Jaber, Babrak Niazi, Ross Barron, Emilie Hudon, Lieska Halsey, Matthew Wieseler
PROJECT TOTAL COSTS	\$40,635
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	40%
STATUS	On Schedule
FY-2026 BUDGET	\$40,635.00
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, and 3.

Background:

NDOT has approximately 100 slab bridges in its inventory that were originally built as early as the 1930's. Material strengths were relatively low, e.g., $f_y = 33$ ksi, and $f'_c = 3000$ psi or less. These structures often fail to pass load rating procedures and Super load (NDOT's) automated Routing and Rating System that uses LARS/Super load and LFR employing a beamline approach. Beamline analysis

requires a distribution width E (the lane's width to support one or two lanes of trucks). The load demands are inversely proportional to E , i.e., a refined finite element analysis (FEA) might increase E by 20%, so the load demands decrease by 20%. Better analysis can potentially economize bridge operations and allow vehicles to cross these structures safely. The process might allow increasing or removing the posting sign for any posted structures.

Objective:

Provide a method for computing refined effective widths for load rating slab bridges. The primary objectives of this research are to:

1. Develop a finite element application that analyzes slab bridges to determine the response, specifically longitudinal bending moments.
2. Use the response to compute and report effective widths.
3. Validate the application with static checks and comparisons with LRFD and LFD equations.
4. Write output graphics and reports that aid the validation of computations and permit checking.
5. Document where the results may be entered into AASHTOWare BrR to create bridge/structure alternatives
6. Demonstrate using the bridge alternative for different operational use cases.
7. Create a short video on the use of the application
8. Provide a webinar to NDOT for engineers interested in using this application

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Application Development	\$27,422	15%
Task 2: Implementation	\$6,419	7%
Task 3: Final Report	\$6,794	0%

Deliverables:

This study will enrich the state-specific load rating strategies for slab bridges and help develop better load rating solutions. Comsol has a tool to develop the user interface. The finite element tool and application development are tightly integrated and are unique to the industry. The Comsol tool is then used to compile the interface and the interface to Comsol runtime modules. (Similar to almost all Windows applications that use Microsoft's runtime DLLs.) The runtime can be embedded into an executable application file (.exe), or the application can address a runtime downloaded separately. The end user does not have to purchase a Comsol license, and Comsol has no claim on these applications, royalties, etc. NDOT can share this application with their consultants, and others as they wish.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071J
PROJECT NUMBER	SPR-FY25(046)
PROJECT TITLE	Revised Curing Practices for NDOT Bridge Decks to Minimize Restrained Shrinkage Cracks
PRINCIPAL INVESTIGATOR	Jiong Hu – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Fouad Jaber, Wally Heyen, Ross Barron, Kyle Zillig, Kent Miller, Madiha Alshammry – FHWA, Maher Tadros – e. Construct, Emilie Hudon, Lieska Halsey
PROJECT TOTAL COSTS	\$165,460
PROJECT EXPEDITURES TO DATE	\$23,884.15
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	30%
STATUS	On Schedule
FY-2026 BUDGET	\$141,575.85
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, 5, and 6.

Background:

Due to their high cement content and low water-to-cement ratio, cast-in-place concrete bridge decks are particularly susceptible to early-age cracking. This is often exacerbated by the shrinkage of the concrete when constrained by supporting girders. Such cracks can lead to significant issues, such as rebar corrosion and delamination, posing a primary concern for the Nebraska Department of Transportation (NDOT). Recognizing this challenge, recent and ongoing research initiatives at NDOT, including projects SPR-FY22(001)1 and SPR-P1 (19) M0832, as well as ongoing studies at NDOT Materials & Research (M&R), have identified promising strategies to mitigate this issue. These strategies include internal curing, reduction in cementitious material content, and the use of innovative admixtures (e.g., E5® Internal Cure admixture), all aimed at reducing shrinkage-related cracking in bridge decks. The previous projects exemplify a successful approach for reducing free and restrained shrinkage strains in concrete bridge decks by reducing cementitious material content by 50, 100, and 150 lbs. per cubic yard and optimizing aggregate gradation. This approach is expected to significantly lower the likelihood of shrinkage cracking in concrete bridge decks. Despite the progress in reducing concrete shrinkage, there remains a gap in understanding regarding the feasibility of shortened curing durations when using lower-shrinkage mixtures.

Objective:

The proposed study seeks to establish revised NDOT bridge deck curing practices based on evaluating the effects of varying curing durations on the shrinkage and crack potential of different concrete mixtures, particularly in the context of typical bridge girder restraints. This research is intended to guide the development of more effective and efficient curing protocols, aligning them with the specific characteristics of various concrete mixtures used in bridge construction. The study's specific objectives are as follows:

1. Review existing curing practices and criteria for concrete shrinkage for bridge deck applications, drawing insights from other Departments of Transportation (DOTs).
2. Conduct an in-depth evaluation of early and long-term concrete shrinkage under various curing methods and practices.
3. Numerically and experimentally assess the cracking potential of newly developed low shrinkage mixtures under different curing conditions when subjected to typical bridge deck restraints.
4. Revise NDOT guidelines for bridge-deck curing practices when adopting lower-shrinkage mixtures.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$8,158	85%
Task 2: Concrete Shrinkage Evaluation	\$40,185	35%
Task 3: Analytical Investigation	\$17,219	0%
Task 4: Cracking Potential Assessment	\$74,749	0%
Task 5: Guideline Development	\$7,014	0%
Task 6: Documentation and Presentation	\$18,135	0%

Deliverables:

The proposed study has great potential to be implemented by NDOT. If the revised curing practices demonstrate feasibility through various laboratory tests, analytical investigations, and mockup trials, NDOT may opt for a field demonstration project. This project would validate bridge decks' performance against premature cracking, utilizing the newly revised curing protocol. Such a practical application will be pivotal in confirming the effectiveness of these updated practices in real-world scenarios.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071K
PROJECT NUMBER	SPR-FY25(047)
PROJECT TITLE	Effect of Bridge Width on Crashes in Nebraska
PRINCIPAL INVESTIGATOR	Aemal Khattak – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Don Butler, Mick Syslo, Steve McCullough, Ross Barron, Fouad Jaber, Emilie Hudon, Lieska Halsey
PROJECT TOTAL COSTS	\$152,230
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	8%
STATUS	On Schedule
FY-2026 BUDGET	\$152,230
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, 5, and 6.

Background:

Bridges and bridge approaches sometimes are changed to accommodate increased traffic volume, lane expansion, maintaining adequate clearance, non-motorized accommodation, or for construction and maintenance cost optimization. Such changes may alter the relationship between bridge and approach widths and may impact the safety of the travelling public. The Nebraska Department of Transportation (NDOT) "Bridge Office Policies and Procedures," initially published in January 2000 and revised in December 2016, serves as the reference and design guideline for NDOT bridge engineers, designers, detailers, and consultants working with the NDOT bridge office. However, NDOT staff lacks comprehensive guidelines regarding the impact of bridge and approach widths on crash frequencies and severities. A comprehensive research-based study is required to determine how bridge widths should be designed in relation to approach widths, while considering crash prevention and ensuring motorists have unrestricted mobility between bridge lanes.

Objective:

1. Investigate crash frequencies and severity across various bridge width intervals, such as 1-20 ft, 20-24 ft, 24-30 ft etc. Emphasis will be placed on assessing how safety is impacted when bridge widths exceed 30 ft. Gather and synthesize technical reports and U.S. state agency specifications, with a specific emphasis on delineating the prerequisites necessary for employing slag as a material for pavement applications. Characterize development behavior and required embedment lengths for full development of GFRP bars in UHPC.
2. Examine variations in crash frequencies and severity based on relative bridge-roadway width intervals. This will involve studying the effects of different relative bridge-roadway width ranges, including 9 ft or narrower, 7-8 ft narrower, and so forth, up to 1-2 ft wider, 3-4 ft wider, etc., on crashes.
3. Perform a multivariate analysis on crash frequency and severity in relation to bridge width intervals and other relevant factors including but not limited to as bi-directional travel vs divided multilane travel, posted speed limits, traffic volume, bridge type and inside shoulder width, crash temporal aspects, work zone conditions, road surface conditions and bridge safety countermeasures.
4. Perform a multivariate analysis on crash frequency and severity in relation to bridge-roadway relative width (difference in bridge and approach roadway width) intervals and other relevant factors, including, but not limited to, posted speed limits, bridge type and geometric aspects, crash temporal aspects, road surface conditions, work zone conditions, bridge safety countermeasures, lane configuration, and traffic volume.
5. Forecast future crash frequency and severity resulting from various bridge widths across Nebraska's highway system bridges by developing robust statistical models for predicting both crashes and their severity. Additionally, this will involve estimating separate models for work zones on bridges.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: TAC Meeting and Literature Review	\$ 17,421	60%
Task 2: Data Collection	\$24,008	5%
Task 3: Data Aggregation, Processing, and Exploration	\$24,805	5%
Task 4: Multivariate Analysis	\$26,292	0%
Task 5: Predictive Analysis (Statistical Modelling)	\$30,112	0%
Task 6: Final Report and TAC Presentation	\$29,592	0%

Deliverables:

The research will be implemented and utilized through collaboration with NDOT Traffic Engineering, Highway Safety, and the Roadway Design Divisions. The research team can provide NDOT with comprehensive guidelines for conducting safety and operational studies related to bridge width decisions. Additionally, we will actively share our findings through presentations and publications at local, regional, and national forums to disseminate the valuable insights gained from this research.

Performance:

Project started on July 1st, 2024.

CONTROL NUMBER	01071L
PROJECT NUMBER	SPR-FY25(048)
PROJECT TITLE	Development of Accurate and Reliable Average Annual Daily Traffic (AADT) Factoring Methods
PRINCIPAL INVESTIGATOR	Li Zhao – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Nam Nguyen, Matt Neemann, Alan Swanson, Don Butler, Kar Sia, Walter Moy, Abe Anshasi – FHWA, Lieska Halsey, Scott Sorenson
PROJECT TOTAL COSTS	\$150,732
PROJECT EXPEDITURES TO DATE	\$10,277.02
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	20%
STATUS	On Schedule
FY-2026 BUDGET	\$140,454.98
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

According to the Federal Highway Administration (FHWA), “Annual Average Daily Traffic (AADT) estimates, with as little bias as possible, the mean traffic volume across all days for a year for a given location along a roadway”. AADT provides crucial information about road activity in terms of vehicular volume (i.e., vehicles per day) on specific road segments. As such, it plays a pivotal role in supporting highway agency activities that include planning, design, maintenance, operations, safety, environmental analysis, finance, engineering economics, and performance management. Moreover, AADT serves as a key parameter for the allocation of funds to state Departments of Transportation (DOTs). Nebraska DOT (NDOT) is required to collect and report AADTs to the FHWA annually as part of the Highway Performance Monitoring System program, as well as make these data publicly available. This is because AADTs are used by a wide range of stakeholders in Nebraska, including NDOT divisions, city traffic engineers, and private consultants. Therefore, providing accurate AADTs is imperative, while using inaccurate AADTs in one or more of the mentioned studies would result in direct economic losses for the state.

Objective:

The primary objective of this project is to determine the most appropriate temporal adjustment factor for estimating AADT on the Nebraska highway systems. To accomplish this, the team will undertake a rigorous and comprehensive evaluation of the current AADT factor compared to alternative factors. The specific goals are to identify the most effective temporal adjustment factors among various options such as month of the year, week of the year, day of the week, and their combinations. It should be noted that the scope of this research is limited to NDOT-managed highway systems excluding interstates and local functional roads. In other words, the AADT factoring study in this project is limited to FHWA functional classes 2 to 6.

Tasks & Percent Completed:

Task	Budget by Task	Percent Completed
Task 1: Literature Review	\$27,606	50%
Task 2: Preliminary Data Study	\$30,460	40%
Task 3: Adjust Factor Calculation	\$42,968	10%
Task 4: Spreadsheet Tool Development	\$25,787	0%
Task 5: Final Report and Presentation	\$23,911	0%

Deliverables:

If NDOT's current AADT estimation method needs to be updated, this project will create a tool to facilitate implementation. The tool will be developed using Microsoft Excel and Visual Basic for Applications (VBA). Input from the NDOT traffic analysis team will be sought to ensure that the tool aligns with their usage needs and preferences. It is expected that the NDOT traffic analysis team will be able to use the developed tool immediately upon the completion of this research project. The project team is committed to offering ongoing support for the tool beyond project completion.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01071M
PROJECT NUMBER	SPR-FY25(049)
PROJECT TITLE	Crash Modification Factor and Feasibility Analysis of Lighting Rural Intersections in Nebraska
PRINCIPAL INVESTIGATOR	Aemal Khattak – UNL
PROJECT START DATE	07/01/2024
PROJECT COMPLETION DATE	05/31/2026
TECHNICAL ADVISORY COMMITTEE	Alan Swanson, Matt Neemann, Don Butler, Abe Anshasi – FHWA, Bryce Hallmark – HDR, Lieska Halsey, Dave Hansen, Kris Fornoff, Scott Sorenson
PROJECT TOTAL COSTS	\$172,618
PROJECT EXPEDITURES TO DATE	\$2,062.03
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	9%
STATUS	On Schedule
FY-2026 BUDGET	\$170,555.97
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, 5, 6, and 7.

Background:

Intersection lighting is an important countermeasure intended to enhance safety for drivers during nighttime. According to the National Highway Transportation Safety Administration (NHTSA), nighttime driving conditions account for more than 40% of fatalities, although only 27% of crashes occur at night (NHTSA, 2012). Federal Highway Administration (FHWA) reported that the number of fatal crashes occurring in daylight is about the same as those that occur in darkness. However, the nighttime fatality rate is three times greater than the daytime rate because only 25% of vehicle miles traveled (VMT) occur at night (FHWA, 2023). FHWA and other studies reported that installing lights at the intersection may reduce accidents by around 30% to 40% (FHWA, 2023; Bruneau and Morin, 2005).

Objective:

The primary objectives of this research are to:

1. Document current intersection lighting practices and CMFs nationwide.
2. Develop Nebraska-based CMF for lighting rural intersections.
3. Conduct Nebraska-based benefit-cost trade-off analysis for lighting rural intersections.
4. Develop guidelines for best practices of rural intersection lighting.

Tasks & Percent Completed:

Task	Budget by Task	Percent Completed
Task 1: Literature Review	\$ 18,072	70%
Task 2: Nationwide Intersection Lighting Practices and Reported CMFs	\$21,982	10%
Task 3: Data Collection	\$26,083	5%
Task 4: Nebraska Rural Intersection and Driver Behavior	\$27,645	0%
Task 5: Determination of Nebraska-based CMF	\$27,343	0%
Task 6: Feasibility Analysis and Guidelines	\$24,160	0%
Task 7: Final Report	\$27,333	0%

Deliverables:

intersections. The guidelines will aid in finding best practices for lighting rural intersections with respect to types of intersections (i.e., 3-legged, 4-legged), traffic conditions (i.e., AADT, truck percentage), and illumination configuration. The research team can offer software tools/models to NDOT to conduct benefit-cost analysis. The results of this project will be added to the FHWA's CMF Clearinghouse and submitted for consideration to include in future editions of the HSM. Implementation and utilization of the research will be via NDOT Traffic Engineering, District staff, and Roadway Design Divisions. The research team will make presentations and publications of the research results at various local, regional, and national forums.

Performance:

Project started July 1st, 2024.

CONTROL NUMBER	01057P
PROJECT NUMBER	SPR-RRR(001)
PROJECT TITLE	Low-Cement Concrete (LCC) Mixture for Bridge Decks and Rails
PRINCIPAL INVESTIGATOR	Wally Heyen and Lieska Halsey – NDOT
PROJECT START DATE	07/28/2023
PROJECT COMPLETION DATE	09/30/2025
TECHNICAL ADVISORY COMMITTEE	Ross Barron, Fouad Jaber, Wally Heyen, Kyle Zillig, Kent Miller, Kellie Troxel, and Lieska Halsey
PROJECT TOTAL COSTS	\$13,200
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	One (1)
PERCENTAGE OF PROJECT COMPLETE	75%
STATUS	On Revised Schedule
FY-2026 BUDGET	\$13,200
FY-2026 TASKS TO BE COMPLETED	Tasks 2, 3, and 4.

Background:

The Materials and Research PCC Engineer is proposing to perform mixes UNL completed under project number FY22(001) using a ready mixed to confirm the mechanical and durability properties. As well as, introducing E5 Internal Cure and E5 Liquid Fly Ash for the of placement improving workability, longer window for finishing, minimal bleed rate, consistence air entrainment and enhancing cement/paste reduction.

Objective:

- 1) To evaluate LCC concrete mixes for mechanical properties and durability characteristics that are compatible with NDOT requirements for a good performance mix design from a ready-mix concrete.
- 2) To ensure workability and constructability so that the mixes can be easily used in engineering applications.
- 3) To evaluate the use of E5 Internal Cure and E5 Liquid Fly Ash by validating the benefits of the admixture by improving workability, longer window for finishing, minimal bleed rate, consistence air entrainment and enhancing cement/paste reduction.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Evaluate Mechanical and Durability Properties from 8 cubic yards of concrete	\$9,917	100%
Task 2: Additional testing for Durability testing to evaluate curing	\$0	75%
Task 3: Data Analysis and Presentation	\$0	50%
Task 4: Report and Documentation	\$1,000	0%

Deliverables:

Improving and proving a more sustainable 47BD mix design by reducing cement content in bridge deck mixes will reduce the concrete cost, improve durability due to less shrinkage cracking and will reduce carbon footprint, which are significant economic and environmental advantages.

Performance:

Project started July 28, 2023

CONTROL NUMBER	01071N
PROJECT NUMBER	SPR-RRR(002)
PROJECT TITLE	Feasibility Study of Local Waste Plastic Materials in Concrete
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL and George Morcous – UNL
PROJECT START DATE	02/28/2025
PROJECT COMPLETION DATE	03/31/2026
TECHNICAL ADVISORY COMMITTEE	Wally Heyen, Robert Rea, Lieska Halsey, Brendon Schmidt, Bruce Barrett, and Matthew Park
PROJECT TOTAL COSTS	\$71,738
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project started on February 28 th , 2025
FY-2026 BUDGET	\$71,738
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

The cement and concrete industries have been under tremendous pressure to reduce their carbon footprint, which forces them to explore alternative ways to reduce the carbon footprint in the transportation industry. Solid waste is one of the many factors that negatively affect the environment. Problems stem from factors such as the difficulty of waste recycling and limited reuse. Plastic is an important type of solid waste with a strong environmental impact. This study aims to investigate the effects of utilizing recycled plastic (RP) in concrete. The investigation will aim to look at plastic waste: i) As a partial substitute for coarse and/or fine aggregates in concrete, and ii) As fiber reinforcement (plastic strands) in concrete for crack control.

Objective:

This study aims to investigate the feasibility of utilizing RP as a partial substitute in concrete and its effects on the physical and mechanical properties of concrete.

Investigate the performance of concrete mixtures containing RP by casting several slab and beam specimens using ready-mixed concrete (4 cu.yd each) to determine the behavior of fresh and hardened concrete in terms of workability, unit weight, temperature, air content, set time, compressive strength, flexural strength, modulus of elasticity, and tensile strength. Investigate factors that need to be considered when designing concrete mixtures containing this waste material and develop guidelines for successfully producing, placing, and curing concrete that meets NDOT's specifications for concrete construction.

Tasks & Percent Completed:

Tasks	Budget by Task	Percent Completed
Task 1: Literature Review	\$23,512	0%
Task 2: Experimental Plan and Sample Collection	\$11,475	0%
Task 3: Experimental Evaluation	\$10,513	0%
Task 4: Examination of Feasibility and Potential implementation	\$9,342	0%
Task 5: Documentation and Presentation	\$16,896	0%

Deliverables:

The information collected from this project will significantly encourage the development and adoption of this new “green

Performance:

Project began on February 28th, 2025

CONTROL NUMBER	01071P
PROJECT NUMBER	SPR-RRR(003)
PROJECT TITLE	Implementation Follow Up - UHPC Decked I-Beam For Accelerated Bridge Construction
PRINCIPAL INVESTIGATOR	George Morcoux – UNL
PROJECT START DATE	To Be Determined
PROJECT COMPLETION DATE	To Be Determined
TECHNICAL ADVISORY COMMITTEE	Wally Heyen, Fouad Jaber, Emilie Hudon, Ross Barron, Matthew Wieseler, Kyle Zillig, Kellie Troxel, Lieska Halsey, and Babrak Niazi
PROJECT TOTAL COSTS	\$48,992
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	In Environmental Review
FY-2026 BUDGET	\$48,992
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4

Background:

Belvidere North is the first UHPC bridge in Nebraska that was bid in April 2024 and expected to be constructed in 2025. This project is a result of a collaborative research effort between NDOT and UNL over the last four years, which led to developing non-proprietary UHPC mixture and decked I-beam superstructure system for durable, economical, structurally efficient, and accelerated bridge construction. The uniqueness of this construction material and developed system require additional resources to document production procedures, conduct quality assurance testing, and evaluate the performance of the decked I-beams, with respect to bond, shrinkage, and creep. In addition, observations on two-stage casting of decked I-beams, post-curing thermal treatment, and handling methods need to be reported for possible improvements in future projects.

Objective:

The main objective of this project is to ensure the successful production of the newly developed UHPC decked I-beams for the construction of Belvidere North Bridge. This includes conducting necessary QA procedures during beam production to confirm that the material used and girder fabricated meet the specified design criteria. The secondary objective of this project is to provide detailed and comprehensive documentation of the production procedures and challenges as well as lessons learned for possible improvements in future projects.

Tasks & Percent Completed:

Tasks	Budget by Task	Percentage Completed
Task 1: QA Testing and Training	\$12,182	0%
Task 2: Instrumentation and Measurements	\$12,182	0%
Task 3: Production Observations	\$11,032	0%
Task 4: Final Report and Presentation	\$13,595	0%

Deliverables:

Documentation of precast operations and quality assurance procedures for development of future reports. It's expected that this is in the form of write-ups, technical data, material data, procedures of operations, challenges realized in process and associated solutions developed to resolve the challenges. Also, the write-up will include the instrumentation of the actual precast UHPC girder at the precast yard (Gage Brothers, Sioux falls, SD) during girder production and the data results comparison of the shrinkage, temperature, and strands bond (field test results VS lab test results).

Performance:



NEW FY26 RESEARCH PROJECT DESCRIPTIONS

CONTROL NUMBER	01078A
PROJECT NUMBER	SPR-FY26(050)
PROJECT TITLE	AI and Immersive AR/VR for Sustained Material and Construction Inspection Training
PRINCIPAL INVESTIGATOR	Kyungki Kim – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Jim Knott, Lorraine Legg, Cameron Craig, Andy Dearmont, Shawn Jording, Mitch Dohrt and Drew Wilson (NDOT)
PROJECT TOTAL COSTS	\$142,359
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$75,685
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4.

Background:

To ensure the long-term performance of roadway infrastructure, it is essential for highway agencies to adopt innovative strategies to address two interconnected challenges: knowledge retention and knowledge transfer. Knowledge retention refers to the ability to preserve the wealth of inspection knowledge accumulated over decades, while knowledge transfer focuses on effectively training new inspectors to bridge the knowledge gap left by departing staff.

Objective:

This project leverages advancements in Large Language Models (LLMs), such as OpenAI's ChatGPT, which can understand and generate human-like responses using extensive data. LLMs have demonstrated proven capabilities in related areas, such as contextual knowledge retrieval, interactive training, and generating domain-specific insights, making them highly suitable for addressing challenges associated with inspection training and knowledge retention.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Literature Review and Inspection Training Material Collection	\$20,019
Task 2: Development of InspectionGPT Chatbot	\$32,817
Task 3: Development of pilot VR Training Module	\$25,633
Task 4: Integration of InspectionGPT with VR Module	\$33,594
Task 5: Analysis and Discussion	\$15,349
Task 6: Documentation and Demo Sessions	\$14,946

Deliverables:

The proposed project is expected to deliver several direct benefits:

- AI-driven knowledge management.
- Interactive knowledge access.
- Immersive and personalized training.
- Sustainable knowledge retention and training

Performance:

Project will begin on July 1st, 2025.

CONTROL NUMBER	01078B
PROJECT NUMBER	SPR-FY26(051)
PROJECT TITLE	Development of Reliable Wireless Connectivity in Support of e-Ticketing System in Nebraska Rural Construction Sites
PRINCIPAL INVESTIGATOR	Chun-Hsing Ho – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Jim Knott, Andy Dearmont, Tyler Carlson, Alicea McCluskey, John Lehn, and Drew Wilson
PROJECT TOTAL COSTS	\$173,485
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$172,336
FY-2026 TASKS TO BE COMPLETED	Taska 1, 2, 3, and 4

Background:

As of 2020, 24 state DOT agencies have been using e-ticketing, with 13 piloting it before the construction season and 11 starting during the season. Additionally, five agencies were preparing for or considering pilot projects. However, the implementation of the e-ticketing system has faced challenges including lack of internet connectivity in rural areas, missing data, and the need for quality control processes specific to e-Ticketing.

Objective:

The objectives of Site-Net are cost-efficiency and automation. Cost efficiency will ensure the low cost of capital expenditure for the whole system and can be applied to various scenarios. Automation will ensure that the network will operate automatically without human intervention in the field. The Site-Net includes multiple components, i.e., one cellular base station with an embedded omnidirectional antenna, one embedded core network, a LEO backhaul, and multiple mobile devices. The design and development of Site-Net will leverage the unique experiences of Husker-Net (deployed by the research team), which is the first-ever campus-scale private 5G network in Nebraska.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Literature Review	\$32,200
Task 2: Site Survey and Needs Assessment	\$29,957
Task 3: Network Design, Configuration, and Prototyping	\$49,487
Task 4: Integration of Wireless Network with e-Ticketing System	\$60,692
Task 5: Monitoring, Maintenance, and Technical Support	-
Task 6: Documentation and Final Report	\$1,150

Deliverables:

The following outcomes will be anticipated after completion of the proposed project:

- 1 Reliable and cost-effective wireless network: Site-Net will be available to enable seamless data access and transmission to databases.
- 2 Seamless e-Ticket transfer: The integrated wireless network (Site Net and LoRa) will enhance contactless data entry systems without unnecessary physical contact, reducing waiting time and promoting safety at rural construction sites.
- 3 In addition to e-ticketing, the proposed wireless network will be beneficial to the following construction projects including intelligent compaction wireless concrete testing protocol, etc.

Performance:

Project will begin on July 1st, 2025.

CONTROL NUMBER	01078C
PROJECT NUMBER	SPR-FY26(052)
PROJECT TITLE	Alternative Pavement Rehabilitation Strategy Using a Geogrid Interlayer
PRINCIPAL INVESTIGATOR	Jamilla Teixeira – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Matthew Park, Nicholas Glennie, Kevin Domogalla, Rob Davis and Brendon Schmidt
PROJECT TOTAL COSTS	\$179,875
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$154,298
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

The major distress affecting the performance of AC-PCC composite pavements is reflective cracking - a phenomenon of propagation of cracks from an existing cracked pavement surface into and through the newly laid overlay due to traffic and/or temperature induced stresses. The distress due to reflective cracking can be retarded by the installation of different interlayer systems, which can improve the performance of the asphalt overlays by providing stress relief, reinforcement and moisture control.

Objective:

The overarching goal of this study is to explore one alternative rehabilitation strategy using geogrid reinforcement in HMA overlays considering the typical Nebraska asphalt mixture (SLX) in the composite design. This project will assess whether the proposed approach meets performance and design life goals by:

- Aim 1: Conduct an extensive literature review on the state-of-art and state-of-practice on geogrid application for pavement rehabilitation.
- Aim 2: Develop a framework to evaluate the performance of lab-compacted geogrid reinforced composite samples in laboratory.
- Aim 3: Verify the effects of geogrid strength and asphalt overlay thickness on the overall composite flexural (cracking) resistance.
- Aim 4: Perform an initial assessment of field surface cracking potential and pavement strain response considering two rehabilitated sections (with and without geogrid).

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Literature Review	\$13,059
Task 2: Sample Collection and Preparation	\$13,045
Task 3: Experimental Program	\$34,778
Task 4: Analysis of Laboratory Test Results	\$28,051
Task 5: Field Implementation and Monitoring	\$65,365
Task 6: Documentation and Presentation	\$25,578

Deliverables:

The anticipated scientific contributions of this research involve enhancing Nebraska's rehabilitation strategies to improve pavement construction and maintenance in Nebraska.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078D
PROJECT NUMBER	SPR-FY26(053)
PROJECT TITLE	Characterization of Sediment Loads and Size Distributions in Nebraska Roadway Runoff – Phase II
PRINCIPAL INVESTIGATOR	Bruce Dvorak – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Julie Ramirez; Anna Allen, Ronald Poe, Brian Anderson, Jason Jurgens, Kirk Harvey, Kyle Hall, Ricki Kuvach
PROJECT TOTAL COSTS	\$193,213
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$123,285
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5

Background:

In 2023, a research project was initiated to measure sediment concentrations, sediment size distributions, and flow rates from roadways and roadway drainages. The goal was to collect data for better design of inline sediment removal equipment in MS4 cities. The target sediment removal tool was a device called the SAFL baffle, but the information provided by the project will prove useful for a much wider range of applications.

Objective:

Objective 1. Identify four sampling sites that will represent the variability in Nebraska's Revised. 2021 MS4 communities in terms of soil types, storm drainage systems, traffic flow, and communities.

- Objective 2. Modify our roadway runoff sediment collection methods and equipment to operate efficiently in locations remote from Lincoln.
- Objective 3. Collect a complete set of roadway sediment runoff data during the two-year grant period that includes multiple seasons.
- Objective 4. Update our model and guidelines to better represent the broader range of MS4 communities in Nebraska.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Sampling Site Preparation	\$61,226
Task 2: Data Collection and Processing	\$80,478
Task 3: Literature Review Update	\$9,986
Task 4: Revise Phase 1 Model with Expanded Dataset	\$31,056
Task 5: Final Products	\$10,467

Deliverables:

1. Sediment characterization models, including models for size and concentration distributions, based on data from eight test sites, including four new test sites located throughout Nebraska. In combination with data from the previous project, we will provide a thorough analysis of sediment runoff findings for the state.
2. Improved sizing of SAFL Baffles for inline sediment removal, resulting in optimized design and maintenance costs. Additional sediment data and wider geographical coverage will complement guidelines developed during the first study.
3. A detailed guide of how to implement results from both project phases using existing inline sediment separation design software.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078E
PROJECT NUMBER	SPR-FY26(054)
PROJECT TITLE	Development of a Tool to Streamline and Expedite the General Permit Application
PRINCIPAL INVESTIGATOR	Nathan Huynh – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Jason Jurgens and Benjamin Trenne (NDOT), Jake Smith and Sumalatha Poda (NEDS), Charlene Shaw, Clair Inbody (NDOT), Brett Harbison and Jeremy Grauf (Army Corp of Engineering)
PROJECT TOTAL COSTS	\$180,000
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$102,595
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, and 3

Background:

The Nebraska Department of Transportation (NDOT) plays a vital role in developing and maintaining infrastructure projects that often intersect with environmentally sensitive areas such as wetlands and rivers. These projects are governed by Section 404 of the Clean Water Act, which requires permits for discharging dredged or fill material into waters of the United States. Compliance with this regulation is essential to ensure responsible stewardship of aquatic ecosystems and adherence to federal environmental standards.

Objective:

The primary goal of this study is to develop and implement an e-permitting tool that streamlines and accelerates the Section 404 general permit application process for NDOT. This tool will be developed initially using Survey123 to expedite the development process to demonstrate how it and AI capabilities can reduce inefficiencies in the current manual system, ensuring more consistent, accurate, and timely submissions. Throughout the development process, the project team will work with NDOT's IT division, BTSD, in coordination with Project Development Division to investigate how the e-permitting tool can be integrated into NEDS or whether the tool should be implemented in NEDS before it is rolled out to consultants.

Tasks & Percent Completed:

Task	Budget by Task
Task 1: Needs Assessment and Research	\$27,248
Task 2: Tool Development	\$50,231
Task 3: Testing and Validation	\$50,231
Task 4: Implementation and Training	\$28,027
Task 5: Final Report and Presentation	\$24,262

Deliverables:

The implementation of the proposed e-permitting tool will deliver transformative benefits to NDOT, consultants, regulatory agencies, and the public by addressing inefficiencies in Section 404 general permit application process. These benefits include:

1. Increased Efficiency
2. Cost Savings

3. Enhanced Compliance and Accuracy

In addition to the final project report, the project will deliver two primary outputs: E-Permitting Tool Software and User Manual and Training Materials

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078F
PROJECT NUMBER	SPR-FY26(055)
PROJECT TITLE	Camber Control in Precast/Prestressed Concrete NU Girders
PRINCIPAL INVESTIGATOR	George Morcoux – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Emilie Hudon, Fouad Jaber, Ross Barron, Matt Weissler and Kent Miller
PROJECT TOTAL COSTS	\$85,575
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$58,218
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5.

Background:

Recently, NDOT conducted an internal study to better predict camber at release and revise camber tolerance. The study proposed modifications to camber prediction at release as well as an updated camber tolerance. These modifications include using 1.5 ksi higher compressive strength at release than specified, corrected unit weight based on the final compressive strength, and K1 factor equal to 1.0 for aggregate when calculating initial MOE (Eci). The updated camber tolerance is considered the larger of $\pm 1/8$ inch per 10 ft of the length up to 1.0 in. and $\pm 30\%$ of the camber listed in the plans.

Objective:

1. Develop procedures to predict and control shipping and erection cambers of NU girders. This includes considering the effect of dunnage location during storage and accounting for a wide range of girder age for predicting camber at shipping and erection rather than constant value.
2. Measure the actual modulus of elasticity of the self-consolidating concrete (SCC) mixtures commonly used in NU girder production to have more realistic estimates than those of the AASHTO equation that depends on the compressive strength, unit weight, and aggregate type modification factor.

Tasks & Percent Completed:

Tasks	Budget By Task
Task 1: Review State Practices	\$11,239
Task 2: MOE Testing and Analysis	\$19,522
Task 3: NU Girder Camber Parametric Study	\$14,990
Task 4: Camber Control Policy Procedure	\$14,990
Task 5: Camber Data Collection and Validation	\$15,940
Task 6: Report and Presentation	\$8,895

Deliverables:

This study is expected to provide immediate results that are implementable in the form of a policy, procedure, manual or guide that can be used by the precast producers, contractors, and NDOT inspectors without the need for additional research.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078G
PROJECT NUMBER	SPR-FY26(056)
PROJECT TITLE	Performance Evaluation of the First UHPC Bridge Project in Nebraska
PRINCIPAL INVESTIGATOR	George Morcoux – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Ross Barron, Fouad Jaber, Emilie Hudon, Wally Heyen, Matt Weissler, Babrak Niazi
PROJECT TOTAL COSTS	\$99,727
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$72,649
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4

Background:

The Belvidere North Bridge consists of three spans, 75-85-75 ft as shown in Figure 1. It is 42 ft-8 in. wide and consists of four girder lines at 10 ft-10 in. spacing. Each girder line consists of 54 in. deep NU Decked I-beam that has 10 ft-2 in. wide top flange and connected to the adjacent decked I-beam with 8 in. wide UHPC closure pours. The bridge is squared (no skew) and has 2% cross slope in one direction and 3.3% longitudinal slope. The bridge has 34 in. open concrete rails and no overlay. All the 12 decked I-Beams will be fabricated in two stages: a) pre-tensioned I-section using modified NU1100 forms; and b) reinforced deck section using special ribbed-slab forms manufactured specifically to optimize the use of UHPC.

Objective:

The objective of the proposed research project is to monitor and evaluate the construction and performance of the first UHPC bridge in Nebraska to ensure that it meets design criteria and performs as expected during the first year of operation. Since the construction of the bridge is expected to start during the summer of 2025, this project is timely and will cover both the construction and operation of the bridge for at least one year. It should be noted that monitoring and evaluating the production of NU decked I-Beam will be addressed in a different research project that will be conducted prior to this project to cover the production period, which is the spring of 2025.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Monitor Construction	\$16,329
Task 2: QA of CIP UHPC and Transverse PT	\$21,126
Task 3: Load Test and Analysis	\$27,344
Task 4: First Year Inspections	\$15,700
Task 5: Report and Presentation Preparation	\$19,228

Deliverables:

Ultimately this study will result in data and knowledge about the performance of the new UHPC Decked I-Beam system, leading to improved production practice, construction sequence, structural performance, and economy. This data will also be used to compare the new system to the conventional construction system of CIP deck on precast/prestressed concrete girders structurally and with respect to life-cycle cost. Collected data from load testing can be used to help load rating the new system.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078H
PROJECT NUMBER	SPR-FY26(057)
PROJECT TITLE	Assessment of Crash Reduction Traffic Control Measures at T-intersections on Rural Highways
PRINCIPAL INVESTIGATOR	Li Zhao – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Alan Swanson, Scott Sorensen, Don Butler, Kyle Christenson and Harrison Redepenning
PROJECT TOTAL COSTS	\$175,616
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$93,050
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4

Background:

NDOT has implemented several countermeasures, such as oversized stop signs, rumble strips, flashing beacons, and pavement markings, to mitigate risks at T-intersections. Despite these efforts, crashes continue to occur at a high rate. There is a significant need for further research to evaluate the effectiveness of various strategies under different conditions so that they can be optimized.

Objective:

The primary objective of this research is to enhance safety at rural T-intersections on highways by reducing crashes and fatalities through an evidence-based evaluation of current traffic control measures and the development of optimized strategies. To achieve this overarching goal, the project team will work in consultation with the Technical Advisory Committee (TAC) to accomplish the following specific objectives.

1. Identify High-Risk T-intersections
2. Analyze Driver Behavior and Stopping Patterns
3. Evaluate the Effectiveness of Current Countermeasures
4. Recommend Enhancements to Traffic Control Strategies

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Literature Review	\$17,461
Task 2: Inventory-crash data integration	\$43,754
Task 3: Field speed data collection	\$32,888
Task 4: Crash modeling	\$19,821
Task 5: Speed behavior study	\$26,551
Task 6: Traffic Control Guidelines	\$18,063
Task 7: Final Report and Presentation	\$17,079

Deliverables:

The findings of this research will be directly actionable and integrated into NDOT's existing safety and traffic management strategies. The implementation plan will focus on translating research outcomes into practical guidelines, tools, and updates to current traffic control standards for rural T-intersections. The key steps in implementation include:

- Development of Guidelines and Recommendations
- Updating NDOT's Traffic Control Standards

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078J
PROJECT NUMBER	SPR-FY26(058)
PROJECT TITLE	Exploring Pathways to Innovative Finance Mechanisms to Empower Transportation Project Development in Nebraska
PRINCIPAL INVESTIGATOR	Yunping Liang – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Lyn Heaton, Ryan Huff; Stephanie Camerone; Korey Donahoo, Lily Kathee-Harner, Devin Townsend, Jodi Gibson
PROJECT TOTAL COSTS	\$181,164
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$90,732
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, 4, and 5

Background:

Innovative finance mechanisms are expected to play a key role in supporting Nebraska's major transportation initiatives, including the Nebraska Expressway System. Authorized in 1988, the Expressway system was originally estimated to be completed by 2003. Now, Nebraska is entering the last stretch of the program. Moreover, innovative Revised. 2021 finance mechanisms are an integral part of the Infrastructure Investment and Jobs Act (IIJA), which presents significant opportunities for Nebraska. The IIJA allocates substantial federal funding to modernize transportation infrastructure, including roads, bridges, and public transit systems. This is crucial for Nebraska, where 8.8% of bridges are rated structurally deficient, and there is a pressing need to improve transportation networks to support economic growth, public safety, infrastructure resilience and efficiency, as well as improved quality of life for Nebraskans.

Objective:

The objectives of this project include:

- 1) Synthesizing best practices from state DOTs in utilizing innovative finance mechanisms, highlighting avoidable errors, and illustrating these through case studies. This will consider aspects such as utilization objectives, program development, risk management, and stakeholder engagement
- 2) Understanding NDOT's specific and pressing needs, readiness & challenges, concerns, and stakeholder landscape
- 3) Understanding other state DOT's transition journey through in-depth interviews and/or focus groups
- 4) Suggesting curated pathways for NDOT to utilize innovative finance, sticking with Nebraska contexts and representing nationwide state-of-practice
- 5) Delivering technical assistance sessions and materials to a wide range of stakeholders – including state and local governments, industry representatives, and civic organizations – for knowledge dissemination and consensus building

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Conduct a Literature Review and Synthesize lessons learned	\$28,953
Task 2: Develop a stakeholder outreach plan to understand NDOT's objectives, concerns, and challenges	\$14,477
Task 3: Interview with NDOT staff	\$23,961
Task 4: Develop a stakeholder outreach plan to understand the circumstances of leading state transportation agencies (STA)	\$14,477
Task 5: Interview with STA Staff	\$35,455
Task 6: Design pathways by qualitative comparative analysis	\$20,154
Task 7: Prepare a draft report	\$14,978
Task 8: Prepare deliverables and a final report	\$28,708

Deliverables:

The primary expected benefit of this project is to provide NDOT with specific, curated, and actionable recommendations to support its transition to a financing agency. The outcomes of this project can directly support NDOT's ongoing efforts related to RIA establishment and P3 implementation. The outcomes can inform forthcoming specifications related to alternative project delivery and innovative finance, as well as potential organizational changes for these purposes.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078K
PROJECT NUMBER	SPR-FY26(059)
PROJECT TITLE	Selection, Integration, and Effectiveness Study of Input Data for Nebraska Variable Speed Signs on I-80
PRINCIPAL INVESTIGATOR	Li Zhao – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Timothy Foss, Tom Renninger, Kathy Fischer, and David Hansen
PROJECT TOTAL COSTS	\$169,946
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$117,465
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4

Background:

Since 2024, the Nebraska DOT has been installing VSS along I-80 (from east to west). As of end of 2024, VSS has been installed in Districts 5 and 6 at around every 8 miles or less, located 1100 – 1200 feet beyond end of on-ramps. NDOT is planning to extend the installation of VSS along the entire I-80. Figure 1 shows the placement of VSS in the field. To capture drivers' attention, the signs are installed on both sides of the interstate, each paired with a flasher mounted on top. This research addresses these gaps (e.g., data inputs, sensor technologies, system performance under extreme conditions, and driver compliance) by systematically evaluating the difference data sources and associated sensors and equipment, and what combination of data is most effective for implementing VSS on I-80.

Objective:

The focus of this research project is to optimize the deployment and effectiveness of VSS along both directions of I-80 in Nebraska by improving the selection and integration of multi-sensor data and recommending appropriate safe speeds. The specific research objectives are as follows:

1. Identify and Evaluate Suitable Sensors
2. Develop and Implement Data Integration Methods
3. Assess System Effectiveness

Tasks & Percent Completed:

Tasks	Budget By Task
Task 1: Literature Search	\$22,311
Task 2: Sensor Performance Comparisons	\$30,299
Task 3: Field Test and Data Collection	\$33,855
Task 4: Evaluation of Advisory Speed Determination Algorithm	\$31,000
Task 5: Driver Compliance Study	\$31,350
Task 6: Final Report and Deliverables	\$21,131

Deliverables:

The research findings will support NDOT in prioritizing sensor technologies and algorithms and enhancing the operational effectiveness. This will ensure efficient use of resources for the full-scale implementation of VSS along I-80. Specifically, the benefits include:

1. Optimized Sensor Integration
2. Enhanced Advisory Speed Determination
3. Driver Compliance Understanding

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078L
PROJECT NUMBER	SPR-FY26(060)
PROJECT TITLE	Evaluating the Interoperability of Connected and Autonomous Vehicles and Signal Phasing and Timing Infrastructure
PRINCIPAL INVESTIGATOR	Chun-Hsing Ho – UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Matt Neemann, Scott Sorenson, Kevin Wray, Suzy Fredrickson
PROJECT TOTAL COSTS	\$185,796
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$95,266
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, and 3

Background:

NDOT's Traffic Division has embarked on implementing two SPaT corridors (US-6/N-31 in Gretna/Sarpy County and N-370 in Papillion/Bellevue) that are planned to contain connected vehicle technology (Figure 3). To prepare for SPaT-V2I communications on the two SPaT corridors, NDOT needs to assess the interoperability of CAV communication and SPaT infrastructure to enhance traffic safety and mobility. Therefore, this project proposes a series of vehicle-to-SPaT infrastructure tests using the UNL-owned autonomous vehicle (Figure 4) to facilitate the interoperability tests. The tests will focus on: (1) the interaction of CAVs with the new SPaT corridor communications infrastructure, and (2) the operational impact of the CAV infrastructure. The first focus will be on signal noise and reliability between the infrastructure and CAVs, while the second will examine the in-field operational impacts on the two corridors with and without the CAV infrastructure.

Objective:

The proposed project includes the following objectives:

1. Evaluate the quality of SPaT data
2. Assess the reliability of the success rate of SPaT data delivery to CAVs while considering factors such as the distance to the approaching CAVs, traffic density, and weather conditions.
3. Examine how CAVs dynamically adjust their approaching speed based on SPaT
4. Simulate different levels of CAV market penetration to evaluate the impact of SPaT data

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Literature Review	\$32,403
Task 2: Site Survey and SPaT Infrastructure Assessment	\$30,532
Task 3: Testing and Prototyping SPaT and CAV Communication	\$32,331
Task 4: Field Validation of SPaT and CAV Communication	\$77,880
Task 5: Monitoring, Maintenance and Troubleshooting	\$11,500
Task 6: Documentation and Presentation	\$1,150

Deliverables:

The expected outcomes of the project will help NDOT:

1. Ensure safety and mobility for CAV-SPaT infrastructure and the traveling public.
2. Prepare and develop its current workforce with its CAV-SPaT initiatives.
3. Determine the effectiveness of current SPaT communication infrastructure with CAV technology by analyzing SPaT communication and traffic mobility/environment data, including SPaT message transmission, signal noise and reliability, drive speed adjustment, weather conditions, stop and go decision, priority management of emergency vehicles, and queue warning in support of SPaT infrastructure and CAV communications.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078M
PROJECT NUMBER	SPR-FY26(061)
PROJECT TITLE	Review and Study of Dynamic Wireless Power Transfer Technology for In-Road Charging of Electric Vehicles
PRINCIPAL INVESTIGATOR	Liyan Qu- UNL
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Ryan Huff, Khalil Jaber, Bruce Barrett, Matthew Park, Brendon Schmidt, and Brandie Neemann
PROJECT TOTAL COSTS	\$79,954
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$61,221
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, 3, and 4

Background:

This research project proposes to address the questions and issues through a thorough literature study on the state-of-the-art inductive DWPT technology and its implementations in in-road charging systems, particularly the existing pilot in-road charging projects. The findings of this research project are expected to provide guidelines for designing the best pilot in-road charging system using the inductive DWPT technology for the NDOT project and help generate the best possible outcomes from the project.

Objective:

The objectives of the study are to address the questions and issues raised in the design and implementation of the DWPT-based in-road charging system through:

- a literature study on the current state of the art of the inductive DWPT technology and its implementations in in-road charging systems; and
- a study on the existing pilot in-road charging projects, in collaboration with the consulting team if possible.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Literature Search and Management	\$5,029
Task 2: Literature Review and Study	\$23,776
Task 3: Technical Report and Presentation	\$29,618
Task 4: Meetings with TAC Members throughout the life of the project	\$2,798
Task 5: Project Reporting	\$13,144
Task 6: Project Final Presentation, Final Report, and Deliverables	\$5,591

Deliverables:

The findings of this research project are anticipated to provide guidelines for the design and implementation of a viable, effective in-road charging system using the inductive DWPT technology and the evaluation of the system in terms of the performance metrics defined for the NDOT project. This will help eliminate the uncertainties and maximally mitigate the risks in the design and implementation of the in-road charging system, help save project time and cost and help generate best possible outcomes from the project.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER	01078N
PROJECT NUMBER	SPR-FY26(062)
PROJECT TITLE	Gravel Road Performance Enhancements – Phase II
PRINCIPAL INVESTIGATOR	Bora Cetin
PROJECT START DATE	07/01/2025
PROJECT COMPLETION DATE	05/31/2027
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Matthew Park, Nikolas Glennie, Brandon Varilek, Terry Rogers - Martin Marietta; Mitch Dohrt - LTAP; Larry Legg – Lancaster County, Bruce Filipi – Saline County; Don Robb– Hall County; Ann Chytka - Burt County; Gary Connot – Holt & Boyd County; Chris Jacobsen – Custer County; Tim Burgeson - Harlan County; Barb Keegan – Box Butte County; Steve Baird – Scottsbluff County, Robert Rankin, Andrew Buchmeier
PROJECT TOTAL COSTS	\$177,000
PROJECT EXPEDITURES TO DATE	\$0
NUMBER OF EXTENSIONS GRANTED	None
PERCENTAGE OF PROJECT COMPLETE	0%
STATUS	Project will start on 07/01/2025
FY-2026 BUDGET	\$90,092.43
FY-2026 TASKS TO BE COMPLETED	Tasks 1,2, 3, 4, 5, and 6.

Background:

The Gradation Optimization tool has been developed from Phase I research. Despite the tool having been used for various other types of aggregates, it is mainly based on stiffness and durability properties. While the higher these properties, the less road distresses one would observe (e.g., rutting, wash boarding, potholes, dust), it is important to verify these in the actual field conditions and tune the tool accordingly. In addition, the proposed study plans to quantify the long-term performance benefits of the test sites built via life cycle analyses (LCA).

Objective:

The proposed project will be a Phase II follow-on to Gravel Road Performance Enhancements-Phase I project, with a project goal of verifying and calibrating the accuracy of the Gradation Optimization tool by field testing in one of the counties in Nebraska. This will be achieved through the completion of four objectives:

- (1) Selection of the appropriate site for building test sections and collect both subgrade soils and gravel road materials (from the existing surface and nearby quarries,
- (2) Develop a viable design for test section for field construction via use of the developed model in the first phase;
- (3) Construct test sites with different blends (as well as control) and evaluate them geomechanically
- (4) Collect data and calibrate the model. In addition, light detection and ranging (LiDAR) will also be utilized to monitor the surface changes on the test sites; and
- (5) Analyze the benefits of material blends in terms of cost savings, long-term service life, and environmental impacts via LCA.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Kickoff Meeting	\$0
Task 2: Laboratory Testing	\$38,478.33
Task 3: Design and Construction of Test Sections	\$15,391.33
Task 4: Performance Monitoring and Field Testing after Spring Thaw(s)	\$38,478.03
Task 5: Life Cycle Analyses (LCAs)	\$23,087.00
Task 6: Final Report	\$61,565.32

Deliverables:

This study is expected to provide immediate implementable results for NDOT. A complete report containing an executive summary and complete record of the project, including methods, data collection, and analysis will be provided. In addition, a technology transfer brief will be created to summarize the findings. Gradation and construction guidelines will be developed for NDOT implementation consideration.

Performance:

Project will begin on July 1st, 2025

CONTROL NUMBER		01078P
PROJECT NUMBER	SPR-FY26(063)	
PROJECT TITLE	Development of ME Pavement Design for Cementitious Material Reinforced Subgrades	
PRINCIPAL INVESTIGATOR	Jongwan Eun – University of Maryland	
PROJECT START DATE	07/01/2025	
PROJECT COMPLETION DATE	05/31/2027	
TECHNICAL ADVISORY COMMITTEE	Bruce Barrett, Matthew Park, Brady Dresselhaus; Nikolas Glennie; Alex Silvey; Brendon Schmidt	
PROJECT TOTAL COSTS	\$180,143	
PROJECT EXPEDITURES TO DATE	\$0	
NUMBER OF EXTENSIONS GRANTED	None	
PERCENTAGE OF PROJECT COMPLETE	0%	
STATUS	Project will start on 07/01/2025	
FY-2026 BUDGET	\$51,317	
FY-2026 TASKS TO BE COMPLETED	Tasks 1, 2, and 3.	

Background:

This study focuses on cementitious materials aligns with sustainability goals by promoting resource efficiency and reducing greenhouse gas emissions associated with traditional construction methods (Bisht et al., 2019; Toohey et al. 2012; Van dam et al., 2015). Incorporating sustainable additives, such as fly ash, enhances soil performance while utilizing industrial byproducts, supporting circular economy practices. By advancing ME design protocols, this research contributes to infrastructure durability and environmental sustainability, providing Nebraska's roadway systems with a resilient and sustainable foundation to meet modern engineering demands.

Objective:

The primary objective of this study is to evaluate and optimize the design parameters of subgrade soils treated with cementitious materials, focusing on resilient modulus and environmental resistance of specimens subjected to freezing and thawing cycles and moisture changes. The goal is to develop best practices for subgrade stabilization tailored to Nebraska's soil conditions, enabling the efficient implementation of ME pavement design.

Tasks & Percent Completed:

Tasks	Budget by Task
Task 1: Extensive Review	\$13,463
Task 2: Material Sampling	\$18,964
Task 3: Experimental Program	\$47,223
Task 4: Develop Correlations of MR with other Geotechnical Properties	\$37,504
Task 5: Sensitivity Analysis	\$34,682
Task 6: Design Recommendation	\$18,000
Task 7: Report	\$10,306

Deliverables:

The proposed research will provide significant benefits to Nebraska's infrastructure by delivering practical tools and knowledge for enhanced subgrade stabilization. Key outcomes include:

- A robust dataset and calibrated input parameters for NDOT's use in AASHTOWare Pavement ME Design (PMED).
- Advanced laboratory testing studies to refine design practices.
- Cost-effective and durable pavement strategies tailored to Nebraska's soil conditions.
- Reduction in costs, time, and effort for roadway maintenance through optimized PMED implementation

Performance:

Project will begin on July 1st, 2025

JUST PUBLISHED

COMPLETED PUBLISHED PROJECTS TRANSPORT RESEARCH DOCUMENTATION (TRID) LINK AND NDOT RESEARCH WEBSITE

Project Number	Research Title with Links
M116	<i>Effect of Antioxidant Additives and Recycling Agents on Performance of Asphalt Binders and Mixtures - Phase I</i>
SPR-FY21(003)	<i>Effect of Antioxidant Additives and Recycling Agents on Performance of Asphalt Binders and Mixtures – Phase II</i>
SPR-FY21(004)	<i>Approach Guardrail Transition Retrofit to Existing Buttresses & Bridge Rails</i>
SPR-FY22(003)	<i>Asphalt Binder Laboratory Short-Term Aging – Phase II</i>
SPR-FY22(006)	<i>Evaluation of NDOT's Sediment Barrier Practices Using Performance Data</i>
SPR-FY22(008)	<i>Production of Cast-in-Place UHPC for Bridge Applications</i>
SPR-FY22(009)	<i>Accelerated Bridge Construction (ABC) Decision Tool</i>
SPR-FY23(013)	<i>High-Mast Tower Foundation – Phase II</i>
SPR-FY23(017)	<i>Development of the Nebraska Department of Transportation Winter Severity Index - Phase II</i>
SPR-FY23(018)	<i>Updating Rainfall Zones and Intensities in Nebraska for Improved Design of Non-Bridge Sized Drainage Structures: Phase I</i>
SPR-FY23(020)	<i>A Statewide Geographic Information System (GIS) as a Predictive Tool for Locating Deeply Buried Archeological Deposits in Nebraska: Phase III - The Sandhills Region</i>
SPR-FY23(025)	<i>Modeling Pedestrian and Bicyclist Crash Exposure with Location-Based Service Data</i>
SPR-FY22(008)	<i>Production of Cast-in-Place UHPC for Bridge Applications</i>

COMPLETED RESEARCH READINESS LEVEL (RRL) ASSESSMENT

- Research Readiness Level (RRL) Assessment identifies the immediate next steps for a research or technology development project by assigning an RRL number indicating how close to acceptance as standard practice the project is.
- The RRL Assessment provides a systematic method for identifying how NDOT can best support the development of research at various stages in the process.
- The RRL concept is based on the FHWA Technology Readiness Level Guide and was adapted to meet NDOT's specific needs.



**RESEARCH READINESS LEVEL
FOLLOW UP IMPLEMENTATION LINK**

COMPLETED RESEARCH READINESS LEVEL (RRL) ASSESSMENT

RRL 1 – Basic Research

FY22(009) Accelerated Bridge Construction (ABC) Decision Tool

RRL 2 - Applied Research/ Proof of Concept/ Laboratory Level

M104 Data Driven Prioritization and Empirical Predictions for Bridge Scour in Nebraska

M107 Outdoor Laboratory and Testbed for Bridge Health

M116 & FY21(003) Effect of Antioxidant Additives and Recycling Agents on Performance of Asphalt Binders and Mixtures - Phase I and Phase II

FY21(001) An Investigation of Water Obstructions and Related Weather Conditions for Nebraska Roadways

FY 21(009) Energy Dissipation Optimization for Circular Culverts

M087 Field Monitoring of Joint-less Curved Integral Abutment Bridge in Nebraska

FY22(002) Nebraska Balanced Mix Design — Phase I

FY22 (006) Evaluation of NDOT's Sediment Barrier Practices Using Performance Data

FY22(010) Application of Steel Sheet-Piles for the Abutment of Water-Crossing Bridges in Nebraska

FY 22(012) Inventory Operations and Safety at Free Right-Turn Ramps

FY2 2(003) Asphalt Binder Laboratory Short-Term Aging — Phase I and Phase II

RRL 3 - Development Field Standard Practice Level

FY 21-08 Estimating System and Traveler Costs Due to Lane Closures During Construction and Maintenance Operations

M111 and FY23(013) High Mast Tower Foundation — Phase I and Phase II

RRL 4 - Implementation with Follow-up

M106 - Settlement and Bumps at Bridge Approach

M108 - Cast-in-place and Precast Concrete Approach Slabs

FY21(010) Crashworthy Perforated Square Steel Tube (PSST) Mailbox Support — Phase I

M30 and FY22(011) Truck Platooning Effects on Girder Bridges - Phase I and II

FY22 (001) Low-Cement Concrete Mixture for Bridge Decks and Rails

FY22(004) Erosion Resistant Rock Shoulder

FY 23(025) Modeling Pedestrian and Bicyclist Crash Exposure with Location-Based Service Data

RRL 5 - Standard Practice

M090 Repair Practices of Damaged Precast/Prestressed Concrete Girders

FY21(008) Approach Guardrail Transition Retrofit to Existing Buttresses and Bridge Rails

M048, M100, and SPR-FY22(011) Statewide Geographic Information System (GIS) as a Predictive Tool for Locating Deeply Buried Archeological Deposits in Nebraska (PHASE I, Phase II and Phase III)

M058 and FY 21(011) Establishment of Wildflower Islands to Enhance Roadside Health, Ecological Value, and Aesthetics Phase I and Phase II



RESEARCH PAYS OFF WEBINAR SERIES



NDOT RESEARCH PAY OFF WEBINAR SERIES	
RECORDING TITLE	RECORDING DATE
<u>Energy Dissipation Optimization for Circular Culverts by Dr. David Admiraal</u>	11/2024



CONTACT

Materials & Research Headquarters

1400 Nebraska Parkway, Lincoln, NE 68509

Email: ndot.research@nebraska.gov

Phone: 402-479-4697

Website: [NDOT Research](https://ndotresearch.com)

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