RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER

ANNUAL REPORT FEDERAL FISCAL YEAR 2022

ALASKA DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES

Unmanned Aerial Aircraft Collecting Data for Bridge Inspection - Texas A&M

The Research Development and Technology Transfer (RD&T2) Section, within the Division of Design and Engineering Services of the Alaska Department of Transportation & Public Facilities (DOT&PF), provides research management, maintains an online library, provides technical assistance, training, and technology implementation services to DOT&PF, local transportation agencies, and their partners.

RD&T2 provides services largely through the collaborative relationships and financial support from the Federal Highway Administration (FHWA). By leveraging resources and developing partnerships with a variety of transportation organizations, professionals and universities, RD&T2 taps into a vast network of expertise and eliminates duplication of effort. RD&T2 also provides an avenue for multidisciplinary support from a network of state agencies.

This is a report of the research, development, and technology transfer activities carried out by the DOT&PF and its partners. **This report covers federal fiscal year 2022, beginning October 1, 2021, and ending September 30, 2022**.

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FEDERAL FISCAL YEAR 2022 RD&T2 SUMMARY

RD&T2 received funding from the Federal Highway Administration's (FHWA) State Planning and Research Program (SP&R), Local Technical Assistance Program (LTAP), Surface Transportation Program (STP), and state matching funds (SM). Additionally, RD&T2 leverages funding with the Alaska University Transportation Center (AUTC), Pacific NW Transportation Consortium (PAC Trans), FHWA's State Transportation Innovation Council grant (STIC), FHWA's Technology Transfer training grant, and FWHA's Transportation Pooled Fund Program.   There are other individual State Transportation Projects that have some research and/or innovation elements. These projects are not included in the fiscal summary.

Funding Sources	2022
Revenues	
SP&R Program Funds (STIP ID#6451)	$ 2,569,790
NHI Training Funds (STIP ID#6452)	$ 350,000
AASHTO Technical Service Programs (STIP ID#25836)	$ 220,000
Local Technical Assistance Program (Grant)	$ 210,000
Total	**$ 3,349,790**
Expenditures & Obligations	
NCHRP Dues	$ 689,080
TRB Core Services	$ 139,086
AASHTO Technical Service Program	$ 696,585
Pooled Fund Studies	$ 194, 762
NHI/LTAP	$ 560,000
T2 SP&R Match for LTAP & Training	$ 670,711
Research Project (old projects increases-UAV Bridges& Structures $30K, Research Administration $30K, Exp. Features $75K)	$ 135,000
Research Project Programming (New Obligations)	$ 1,783,635
Total	**$ 4,868,859**

Revenues are what was programed in the STIP however, additional funds remain available from previous Federal fiscal years through deobligations. The expenditures & Obligations section reflects actual program costs for FFY22 utilizing all RD&T2 funding available.

RESEARCH & TRAINING PROJECTS STARTED IN FFY2022
10 New Training & Research Projects in FFY2022 using SP&R funds-Part B, LTAP and State match:

Title	FHWA Project # State Project #	Category	Federal $	State $	Total $ Project Funding
Impact of Response Spectra Definitions and Direct Displacement-Based Design Simplification for Multi-Span Bridges	4000(208) HFHWY00233	**Bridge**	211,811.60	52,952.90	**264,764.50**
Condition Dependent Performance-Based Seismic Design – Phase 1	4000(211) HFHWY00267	**Bridge**	170,353.92	42,588.48	**212,942.40**
Rapid Post-Earthquake Displacement-Based Assessment Methodology for Bridges	4000(210) HFHWY00268	**Bridge**	253,228.80	63,307.20	**316,536.00**
Aerial Infrared Scanning of Bridge Decks on Parks Highway to Map Delaminations	000S(960) HFHWY00270	**Bridge**	126,405.12	31,601.28	**158,006.40**
National Highway Institute CY22	2000(046) HFHWY00271	**Training & Tech Transfer**	652,796.64	0	**652,796.64**
Technology Transfer Program FFY22-23 (LTAP)	000S(962) HFHWY00272	**Training & Tech Transfer**	466,124.11	51,791.57	**517,915.68**
Cracking Resistance of Alaskan Asphalt with RAP Material	000S(963) HFHWY00273	**Materials**	156,541.44	39,135.36	**195,676.80**
Lightweight Deflectometer (LWD) Assessment for Quality Assurance	000S(964) HFHWY00274	**Materials**	174.958.08	43,739.52	**218,697.60**
Rectangular Rapid-Flashing Beacons Experimental Feature	000S(965) HFHWY00276	**Safety/Experimental Feature**	161,145.60	40,286.40	**201,432.00**
Low-Emissions Ferry Service Analysis	4000(213) HFHWY00281	**Innovation**	200,090.80	50,022.70	**250,113.50**
				TOTAL	**2,988,881.52**

12 POOLED FUNDED PROJECTS DOT&PF PARTICIPATED IN FFY2021 USING 100% FEDERAL SP&R FUNDS, PART B (NO STATE FUNDS):

Title	FHWA Project #	Category	Current $ Project Funding (100% federal)
Support Services for Peer Exchanges	TPF-5(301)	Research	4,762.00
Behavior of Soils and Liquefaction Hazards	TPF-5(485)	Materials	**40,000
Aurora (FY20-24)	TPF-5(290)	ITS	25,000
Avalanche Research	TPF-5(337)	Maintenance	25,000
Roadside Safety Research for MASH Implementation	TPF-5(343)	Safety	25,000
Clear Roads Phase II	TPF-5(353)	Maintenance & Operations	25,000
Protecting Bridge Girders Against Overheight Vehicles Impact	TPF-5(484)		50,000
Developing and Calibrating Fragmental Rockfall Models using Physics Engines	TPF-5(459)	Geology	*30,000
Assessment and Repair of Pre-Stressed Bridge Girders Subjected to Over-Height Truck Impacts	TPF-5(462)	Bridge	45,000
Connected Vehicles	TPF-5(389)	ITS	*25,000
NCHRP Dues- ALASKA	TPF-5(422)	National Dues	689,080
TRB Core Program Services for a Highway RD&T Program – Federal FFY22	TPF-5(496)	National Dues	139,086
		Total	**1,067,928**

FY22 contribution sent in *prior* fiscal year(s), not included in FFY22 total*

FFY21 & 22 contributions sent in FFY22**

ACTIVE PROJECTS STARTED PRIOR TO FFY2022

6 Active Training & Research Projects in FFY2021 using SP&R funds-Part B, LTAP and State match:

Title	FHWA Project # State Project #	Category	Federal $	State $	Total $ Project Funding
Seismic Behavior of High Strength Reinforcing Steel at Low Temps	4000(205) HFHWY00220	Bridge	294,976	73,744	368,720
UAV Bridges and Structures Condition Inspections	4000(206) HFHWY00221	Bridge	149,055.20	37,263.80	186,319
Research Administration FFY21-22	4000(207) HFHWY00222	Administration	125,700	31,425	157,125
Research Deployment FFY21-22	000S(945) HFHWY00223	Rapid Research	125,700	31,425	157,125
Landslide Collides with Highways: Measuring its Impact to Inform Future Mitigation	4000(139) HFHWY00212	Geotechnical	271,720	67,930	339,650
Left-Side Delineation for Blowing Snow	000S(949) HFHWY00227	Safety/Experimental Feature	100,560	25,140	125,700
				TOTAL	2,084,623

5 ACTIVE PROJECTS STARTED IN FFY2020 USING SP&R FUNDS-PART B AND STATE MATCH:

Title	FHWA Project # State Project #	Category	Federal $	State $	Total $ Project Funding
Evaluation of Liquefaction-Induced Lateral Spread	4000(200) HFHWY00198	GEOTECHNICAL	114,152	28,538	142,690
Optimized Decked Bulb-Tee Girder for Alaska	4000(202) HFHWY00201	BRIDGE	221,664	55,416	277,080

LED Traffic Signal Luminance	4000(203) HFHWY00202	TRAFFIC	203,655	50,913	254,569
Unmanned Aerial Systems Business Model Assessment for DOT&PF	000S(938) HFHWY00207	INNOVATION	120,000	30,000	150,000
Urban Workzone User Impacts (AC from FFY21)	000S(948) HFHWY00226	TRAFFIC	100,000	25,000	125,000

2 ACTIVE PROJECTS STARTED IN FFY2019 USING SP&R FUNDS-PART B AND STATE MATCH:

Title	FHWA Project # State Project #	Category	Federal $	State $	Total $ Project Funding
RCFST to Cap-Beam GSS Connection	4000(195) HFHWY00152	Bridges and Structures	320,000	80,000	400,000
Fish Passage Culvert Slip Linear Research	4000(198) HFHWY00182	Environmental	104,000	26,000	130,000

2 ACTIVE PROJECTS STARTED IN FFY2018 USING SP&R PART B FUNDS & STATE MATCH:

Title	FHWA Project # State Project #	Category	Federal $	State $	Total $ Project Funding
Minnesota Drive Ramp Microsurfacing Experimental Feature Monitoring	40000(181) HFHWY00123	Materials	100,000	25,000	125,000
Evaluation of Light Pole Foundation Embedment	4000(186) HFHWY00129	Geotechnical & Foundations	200,000	50,000	250,000

10 PROJECTS COMPLETED IN FFY2022 –PENDING FINANCIAL CLOSURE

Title	DOT&PF Project #	Federal Project #	Total $ Project Funding
Rapid Repair of Column to Footing – Phase 2	HFHWY00125	4000(184)	280,000
Monitoring Aufeis Under Bridges	HFHWY00124	4000(182)	150,000
Permafrost Protection Using ACE Shoulders	HFHWY00126	4000(185)	141,425
Incorporating Extreme Weather Events into the Alaska Hydraulic Manual*	HFHWY00183	4000199	140,000
Experimental Features	Z611050000	4000(113)	207,800
Alaska Connected and Autonomous Vehicle Strategic Plan	HFHWY00224	000S(946)	99,983.88
NHS Innovative Pavement Design Research for Pavement Management System	HFHWY00077	4000(174)	150,000
Mini Road Weather Information Systems Pilot Project	HFHWY00204	000S(936)	143,909
Technology Transfer Program FFY2021 (LTAP)	NFHWY00585	LTAP043	300,000
National Highway Institute CY2021 (NHI)	NFHWY00586	2020(002)	350,000
*=Discontinued			

DESCRIPTIONS FOR **NEW** PROJECT STARTS **AND** ACTIVE PROJECTS CONTINUING DURING FFY22

ADMINISTRATION & POLICY

000S945/ HFHWY00223 RESEARCH DEPLOYMENT FFY21-23

Principal Investigator: DOT&PF
Funding: $317,895
Project Manager: Anna Bosin, P.E.
Estimated Completion: September 2024 (Extended 1 FY)

This project is established to help DOT&PF research staff identify and facilitate deployment of promising state, national and international research products, services, programs and technologies within the Department. Tasks include necessary efforts such as technology transfer (education), marketing activities to implement completed research projects or products.

Benefits to the State: This funding supports integration of state and national research into DOT&PF business practices.

4000207/ HFHWY00222 RESEARCH ADMINISTRATION FFY21-23

Principal Investigator: DOT&PF
Funding: $350,049
Project Manager: Anna Bosin, P.E.
Estimated Completion: September 2024 (Extended 1 FY)

This project provides funding for staff salary and travel expenses to manage the statewide research program. This includes outreach to internal and external stakeholders and provides support for the State Transportation Innovation Committee (STIC), Everyday Counts Initiatives (EDC), and other innovations. Includes support for DOT&PF research project selection solicitation and approval, and program reporting. Also includes funding for rapid response research opportunities, workforce development and technology transfer.

Benefits to the State: This project enables the department to select the right research projects for the greatest benefit. It also funds other outreach and innovation opportunities.

PacTrans Advisory Board Meeting Fall 2022

BRIDGES & STRUCTURES

4000208 IMPACT OF RESPONSE SPECTRA DEFINITIONS AND DIRECT DISPLACEMENT-BASED DESIGN SIMPLIFICATION FOR MULTI-SPAN BRIDGES

Principal Investigator: Dr. Mervyn Kowalsky (NC State)
Funding: $264,764.50
Project Manager: Shane Moller
Estimated Completion: June 2025

The objective of this research aims to develop simplifications to the direct displacement-based design approach for multi-span bridges that will facilitate implementation into bridge design practice.

Benefits to the State: Data generated from the computational models will facilitate simplifications to the direct displacement based design approach by reducing the effort to define equivalent viscous damping, target displaced shape, and strength allocation to abutments versus columns.

4000195 REINFORCED CONCRETE FILLED STEEL TUBE TO CAP BEAM GROUTED SHEAR STUD CONNECTION

Principal Investigator: Dr. Mervyn Kowalsky, Giorgio Proestos (NC State)
Funding: $400,000
Project Manager: Shane Moller
Estimated Completion: June 2023

The purpose of this research is to develop Accelerated Bridge Construction connections for Reinforced Concrete Filled Steel Tube (RCFST) and Reinforced Concrete bridge systems that use "external socket" and "external pocket" connections. This is distinctly different from existing "pocket" and "socket" connections that are internal to the cap and can compromise seismic behavior. Lessons learned from the development of the steel bridge system (termed the "Grout Shear Stud (GSS) Connection") will be valuable as the connections described in this proposal are developed.

Benefits to the State:
If results prove to be beneficial, they could be implemented in further design options for GSS connections for RC and RCFST systems. Successful implementation will ideally result in more rapid construction which is an important consideration during Alaska's short construction season.

4000200 EVALUATION OF LIQUEFACTION-INDUCED LATERAL SPREAD FROM RECENT ALASKA EARTHQUAKES

Principal Investigator: Joey Yang (UAA)
Funding: $249,646.22
Project Manager: Andrew Pavey
Estimated Completion: May 2023

The objective of this study is to evaluate how the free-field lateral spread can be different for the Alaskan conditions, and how the pinning effects of abutments can be modeled when the crust is frozen.

Benefits to the State:
Recommend an empirical model and modification factor for lateral spread estimation for frozen ground conditions. Develop a framework and simple model for assessing the pinning effects of bridge abutments for frozen ground conditions.

4000201 OPTIMIZED DECKED BULB-TEE GIRDERS FOR ALASKA

Principal Investigator: Dr. Mervyn Kowalsky, Ranji Ranjithan, (NC State)
Funding: $277,080
Project Manager: Shane Moller
Estimated Completion: December 2023

Over the last 10 years, bridge girder cross sections have become regional in nature, with many state DOTs adopting their own unique sections at either the state or regional level. Historically, such cross sections were developed without any consideration of an 'optimized shape', or if optimization was employed, it was done so for girders without a deck.   The objective of this research is to develop an optimized deck girder cross section with a new shape using meta-heuristic global optimization techniques. It is envisioned that several different competing cross section alternatives that perform well structurally and economically will be first identified. Alternatives will be screened based on practical considerations to identify one new cross-section shape.

Benefits to the State:
Potential benefits to the department include the ability to span longer distances, reduced construction time, and more efficient use of resources.

4000205 SEISMIC BEHAVIOR OF HIGH STRENGTH REINFORCING STEEL AT LOW TEMPERATURES

Principal Investigator: Dr. Mervyn Kowalsky, Lina Espinosa, (NC State)
Funding: $368,720
Project Manager: Shane Moller
Estimated Completion: December 2024

This research is to study the impact of low temperatures on the seismic behavior of columns reinforced with A706 Grade 80 and 100 steel. This will be accomplished through the use of the Buckled Bar Tension test and large scale column tests, both conducted at low temperatures at the NC State Constructed Facilities Laboratory, as well as computational modelling of columns (and bridge systems) using stress-strain models and section hysteretic behavior observed during the conduct of the experiments.

Benefits to the State: Application of high strength steel can potentially reduce the steel content in structures which results in more easily and quickly built structures and can also reduce overall costs.

4000206 UAV BRIDGES AND STRUCTURES CONDITION INSPECTION

Principal Investigator: Dr. Surya Sarat Chandra Congress, (North Dakota State University)
Funding: $186,319
Project Manager: Shane Moller.
Estimated Completion: February 2024

Research tasks to address the safe and effective use of Unmanned Aerial Vehicle platform for performing routine bridge, tower, and public facility inspections. Tasks included are to develop UAV test protocols, supplement ten bridges, one high mast tower, and two public facility buildings inspections and rating surveys, determine what size or types of structures warrant the use of UAVs, and create a minimum specification for the hardware, software, UAV, and associated accessories that needed for inspections.

Benefits to the State: This research could minimize the risk and danger associated with manually inspecting structures and allow for

response inspection on structures in emergency situations such as earthquakes, floods, or slope failures that would otherwise be unsafe. This research could also allow for the ability to identify defects in large structures that might otherwise not be seen until the defect has grown or become problematic.

4000211 CONDITION DEPENDENT PERFORMANCE-BASED SEISMIC DESIGN – PHASE I

Principal Investigator: Dr. Mervyn Kowalsky, Moe Pour-Ghaz, (NC State)
Funding: $212,942.40
Project Manager: Shane Moller.
Estimated Completion: June 2025

This research project is the start of a multi-phase effort aimed at development of condition dependent performance based seismic design (CD-PBSD). Currently, bridge engineers design a structure assuming that the property of the materials and system remain unchanged and that its future seismic performance can be adequately predicted using its 'day one' properties.

Benefits to the State: This research aims to conduct large-scale tests on bridge columns with corroded reinforcing steel. The resulting tests will provide data for model calibration that can then be used in a future phase to conduct large-scale analysis to assess the impact of structural condition on response.

Dr. Congress collecting data with the Skydio S2 in Anchorage/ Shane Moller, DOT&PF

4000210 RAPID POST-EARTHQUAKE DISPLACEMENT-BASED ASSESSMENT METHODOLOGY FOR BRIDGES

Principal Investigator: Dr. Mervyn Kowalsky, Ashly Cabas, (NC State)
Funding: $316,536
Project Manager: Shane Moller.
Estimated Completion: June 2025

This research project aims to develop a rapid seismic bridge assessment method that can be used for planning, and for post-earthquake assessment (inspection prioritization). Unlike existing methods that can be largely probabilistic, and focus on high-level assessment, the proposed methodology is sufficiently versatile that it can provide a range of information, spanning from deterministic bridge specific performance, to probabilistic assessments of bridge vulnerability.

Benefits to the State: This research will produce detailed plans for development of a rapid assessment application that will be developed in a future Phase 2 of the research.

000S960 AERIAL INFRARED SCANNING OF BRIDGE DECKS FOR DETECTING AND MAPPING DELAMINATION
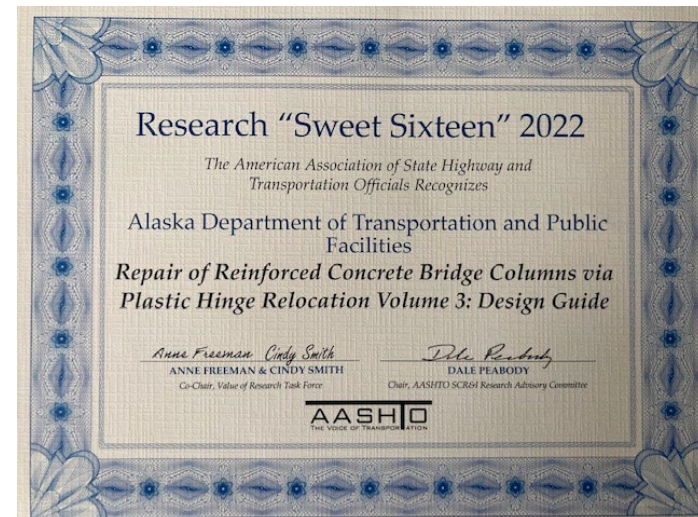
Principal Investigator:
Funding: $158,006.40
Project Manager: Shane Moller.
Estimated Completion: March 2023

This research project aims to evaluate the condition of Alaska DOT&PF bridge decks. The deck conditions will be evaluated using aerial infrared thermography (aerial IR) and corresponding visual imaging data collected from a fixed wing aircraft. The results of this project will include delamination quantities and supporting plan-view infrared and visual imagery then compared to a ground truth evaluation to verify accuracy and reliability of Aerial IR.

Benefits to the State: This research has the potential to increase efficiency of bridge deck condition data collection, cut down on personnel hours and costs, and improve safety by decreasing personnel exposed to traffic.

DOT&PF AASHTO Research Award received in 2022 at Fall Annual Meeting

ENVIRONMENTAL

4000198 FISH PASSAGE CULVERT SLIP LINER RESEARCH

Principle Investigator: Department of Fish and Game
Funding: $130,000
Project Manager: Shane Moller
Estimated Completion: December 2023

The goal of this research project is to work with Fish & Game to establish criteria for baffle design in liners. The project is a coordinated effort between DOT&PF and Fish & Game staff and will include technical transfer workshops. The project will integrate engineering topics with fish biology topics. The anticipated end result is an updated MOA between DOT&PF and Fish & Game.

Benefits to the State:
This research would benefit both agencies involved due to the fact that Fish & Game would have a clearer idea of what parameters would be required for culverts and slip liners. It would benefit DOT&PF as well to optimize these culverts for flow while also doing minimal damage to anadromous fish.

Slip lined culvert at 9-mile Creek in Juneau, AK where fish pass trials were conducted.

Tagging and releasing fish at 9-mile Creek in Juneau, AK.

GEOTECHNICAL

4000186 EVALUATION OF LIGHT POLE FOUNDATION EMBEDMENT

Principal Investigator: Joshua Steelman, University Nebraska Lincoln
Funding: $250,000
DOT&PF Project Manager: Anna Bosin, P.E.
Estimated Completion: December 2023

Research the impact of a vehicle on the light pole:
1. Survey how other DOTs handle this issue and provide similar guidance.
2. Provide a literature review of any similar studies that have already been undertaken.
3. Develop an analytical program to address the knowledge gaps and determine the acceptable risk of a base failing from a vehicle impact.
4. Perform crash testing to validate the analytical program for various soil conditions common in Alaska.

Benefits to the State:
Potential reduction in foundation size could result in huge cost savings to the Alaska DOT&PF since every light pole foundation developed by DOT&PF engineers or by consultants over the last six years has resulted in large pile foundations in Southeast Alaska.

HFHWY00151 MONITORING AND ANALYSIS OF FROZEN DEBRIS LOBES PHASE II

Principal Investigator: Margaret Darrow (UAF)
Funding: $339,650
Project Manager: Shane Moller
Estimated Completion: December 2023

Frozen debris lobes (FDLs) are landslides in permafrost located along the Dalton Highway corridor. The closest to the highway,

FDL-A, has demonstrated a steadily increasing rate of movement which resulted in the realignment of the Dalton Highway in 2016. Based on movement trends, it is anticipated that FDL-A will impact the old embankment by 2021.

The collision of FDL-A with the old embankment represents a unique opportunity to observe a landslide impacting infrastructure in a safe and controlled way and on a predictable schedule.
The objective of this study is to measure the pressure this moving landmass imparts to the embankment, and how the FDL deforms the existing embankment.

Benefits to the State:
The results of this study will help DOT&PF to develop mitigation measures that may slow or stop the movement of landslides in permafrost that threaten critical infrastructure.

Installing sensor equipment- Dalton Highway- Shane Moller, DOT&PF.

MATERIALS & CONSTRUCTION

000S963 CRACKING RESISTANCE OF ALASKAN ASPHALT WITH RAP MATERIAL

Principal Investigator: Billy Connor, (UAF)
Funding: $195,676.80
Project Manager: Andrew Pavey
Estimated Completion: December 2023

This research project aims to investigate the impact of RAP and rejuvenators on cracking performance of Alaskan HMA materials containing RAP and to develop a method to estimate RAP content for a given mix.

Benefits to the State: Potential cost savings of up to 36% could be achieved when using the correct RAP combinations.

4000181 EXPERIMENTAL FEATURE MINNESOTA DRIVE RAMP MICROSURFACING MONITORING

Principal Investigator: DOT&PF
Funding: $125,000
Project Manager: Andrew Pavey
Estimated Completion: December 2023 (extended 1 year)

During the summer of 2020, DOT&PF Central Region placed a highly modified microsurfacing treatment on Minnesota Drive ramps. This treatment is used by states in the lower 48 as a cost-effective way to extend the life of their roads. A post construction report will be completed by December 2020 after the construction is completed. There will be three additional years of monitoring to evaluate the materials performance. This will be the first application of microsurfacing by DOT&PF and will determine if the material can with stand the winter seasons and studded tire use.

Benefits to the State: If successful, this could save the state millions of dollars and improve safety in high pavement rutting locations.

000S964 LIGHTWEIGHT DEFLECTOMETER (LWD) ASSESSMENT FOR QUALITY ASSURANCE

Principal Investigator: Doug Simon, PE HDL Engineering
Funding: $218,697.60
Project Manager: Anna Bosin, PE
Estimated Completion: December 2023

LWD is proposed to replace nuclear gauge compaction testing. Tasks include: 1) Literature Review of current best practices using Lightweight Deflectometers for assurance and acceptance, 2) laboratory and field testing existing DOT&PF Capital Projects in Northern Region and Southcoast Region compared with nuclear testing and results, 3) draft LWD special provisions for DOT&PF quality control and acceptance of soils and aggregates, guidelines for DOT&PF project testing using LWD, 4) training materials for DOT&PF staff to use LWD

Benefits to the State: Potential cost savings with reduced safety/liability concern for workers who routinely use nuclear gauge testers for compacted subgrade acceptance in construction projects across the state.

SAFETY & TRAFFIC

4000203 LED TRAFFIC SIGNAL LUMINOSITY STUDY

Principal Investigator: Vinod Vasudevan
Funding: $254,569
Project Manager: Anna Bosin, P.E.
Estimated Completion Date: March 2023

Light-emitting diodes (LEDs) started replacing incandescent lamps in traffic signal heads approximately 15 years ago. Incandescent lamps normally provide the amount of light required by regulations until they burn out. In contrast, LEDs degrade over time and may appear working by having color output while the luminosity may fall below regulations.   The objective of this research is to carry out a life-cycle analysis and reconnaissance of the "degradation rate" of LED traffic lights in Alaska.

Benefits to the State: Based on the findings, create new recommended re-lamping schedule eligible for FHWA participation. Evaluate LED performance at first re-lamping interval.

000S949 LEFT-SIDE DELINEATION FOR BLOWING SNOW

Principal Investigator: Shane Moller
Funding: $125,700
Project Manager: Anna Bosin, P.E.
Estimated Completion Date: June 2023

Alaska's mainline highways traverse long distances with varying terrain between communities. In areas dominated by tundra, ground blizzards can pop up with no warning as there is no vegetation to block blowing snow. Communities in these areas are few and far between and communications are often limited to CB radio between vehicles. The Dalton Highway is most prevalent location where ground blizzards occur.

Using white delineators on both the right a left side of two lane rural roadways is a requirement of the Manual on Uniform Traffic Control Devices. However, in areas that experience ground blizzards and other blowing snow events as well as dense fog, it can be difficult for drivers to discern the right side from the left side white delineators.

Benefits to the State: Easy to perceive delineation is imperative to getting people, goods, and services safely to their destinations as well as protecting the environment from spills associated with trucks running off the road.

000S948 URBAN WORK ZONE USER IMPACTS

Principal Investigator: Kinney Engineering LLC
Funding: $125,000
Project Manager: Lauren Little, PE
Estimated Completion Date: December 2023

Projects in urban settings need an easy to use, repeatable, and unbiased decision-making tool to assist in the evaluation of road closures and lane restrictions to balance impacts to drivers (delay and safety), local access, work zone safety and construction schedules.

Benefits to the State: potential to be applied to make roadway construction and work zones more efficient to safe construction costs and improve network efficiency for the traveling public.

000S965 RECTANGULAR RAPID-FLASHING BEACONS EXPERIMENTAL FEATURE

Principal Investigator: Vinod Vasdevan, (UAF)
Funding: $201,432
Project Manager: Anna Bosin, P.E.
Estimated Completion Date: December 2025

This Experimental Features project aims to evaluate the effectiveness of rectangular rapid-flashing beacons (RRFBs) based on field data at the Dowling Road Roundabout Interchange. The effectiveness will be evaluated in terms of both motorist and pedestrian behaviors. Roundabout reconstruction began in Summer 2022 with the RRFBs to be installed Summer 2023. Pre and Post installation observation and data collection will be analyzed such as yield rates, speeds, pedestrian use of push buttons to activate the RRFBs. Data collection will be through the CR traffic data collection section, video capture, and field observations. Post construction report and 2 years of monitoring are included in this Experimental Feature Evaluation.

Benefits to the State: RRFBs have the potential to reduce pedestrian crashes up to 47%, and increase motorist yielding rates up to 98%.

INNOVATION

4000213 LOW-EMISSIONS FERRY SERVICE ANALYSIS

Principal Investigator: Southeast Conference
Funding: $250,113.50
Project Manager: Katherine Keith, Change Management Director
Estimated Completion Date: September 2023

In this research project the Principal Investigator will examine the operational, technical, and financial feasibility, as well as the economic benefits associated with low-emission ferry operations within the Alaska Marine Highway System service area.

Benefits to the State: This project can include economic benefits such as federal financing of new port infrastructure development and new low emission vessels designed for Alaska ports.

000S938 UNMANNED AERIAL SYSTEMS BUSINESS MODEL ASSESSMENT FOR DOT&PF

Principal Investigator:
Funding: $150,000
Project Manager: Ryan Marlow
Estimated Completion Date: February 2023

Imagery and Survey data collection through small unmanned aerial systems (SUAS) is becoming increasingly efficient and accurate in the planning, design, construction, and maintenance of transportation infrastructure. The technology is advancing rapidly, and current efforts to augment surveying activities have demonstrated significant potential to reduce survey timeframes and costs while acquiring accurate and useful data. The majority of the survey work utilizing SUAS has been project specific demonstrations. This project will evaluate current state-of-practice SUAS camera data processing methods, conduct a formal analysis of ground control and air control methods to determine best practices for quality control and assurance of datasets, research and verify accuracy of using artificial light from unmanned platform for nighttime photogrammetry, and develop training materials to document data processing work flows.

Benefits to the State: Leveraging SUAS and imagery processing technologies has added the ability to do small site remote sensing on state interests such as highways, airports, and material sites. Time is saved by gaining valuable data that gets used by various users for land survey, civil design, and planning. To optimize the benefit of this it is important to both use time as efficiently as possible while also gaining the best possible information.

ALASKA TECHNOLOGY TRANSFER

Housed within DOT&PF's RD&T2 Section, the Technology Transfer staff (T2) provide resources and support to federal, state, and local governments and others working in surface transportation in Alaska. We are comprised of two programs, integrated to provide a seamless training and technology transfer service for Alaska's transportation workforce development.

Cina Fisher was hired in December 2022 as the new LTAP Coordinator. She replaces Dave Waldo who left State service in June 2022 after 20+ years with the Department. Cina is stationed in Anchorage and brings 20+ years of combined adult training from State of Alaska HHS and US military service to the Department- we are truly grateful to have her skills to shepherd the LTAP program adjacent to the new BIL/IIJA funding and initiatives for Alaska.

FFY 2022 PROGRAM DASHBOARD

- Total number of classroom training sessions: 41
- Total number of on-line courses completed: 20
- Total number of LTAP student participants: 168
- Total number of Tribal Employees participants:12
- Total number of FHWA participants: 10
- Total number of DOT employees: 1,062

LOCAL TECHNICAL ASSISTANCE PROGRAM

LTAP is a national network of centers funded by FHWA. LTAP's mission is to foster a safe, efficient, and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision makers. LTAP's primary focus:

- Training events, outreach among agencies and local governments
- Bring national trainings and technology experts to Alaska

NATIONAL HIGHWAY INSTITUTE

These STP funds provide transportation-related education programs to AK DOT&PF employees to help improve the quality of the state's highway system through technology transfer to: planning, design, construction, and maintenance personnel working for Alaska's transportation infrastructure.

T2 HIGHLIGHTS FFY2022

- NHI and FHWA Resource Center led trainings across the state
- Partnered with Alaska Municipal League to share training and technology resources during conference events.
- Heavy Equipment Operator Training held in 5 locations across state: trained 25 LTAP students
- Presented at BIA Providers Conference
- Hosted Alaska Unmanned Aerial Systems Workshop with FHWA in Anchorage.
- Hosted a Search and Rescue Virtual Peer Exchange

Grader Operator Training in Palmer, AK Summer 2022