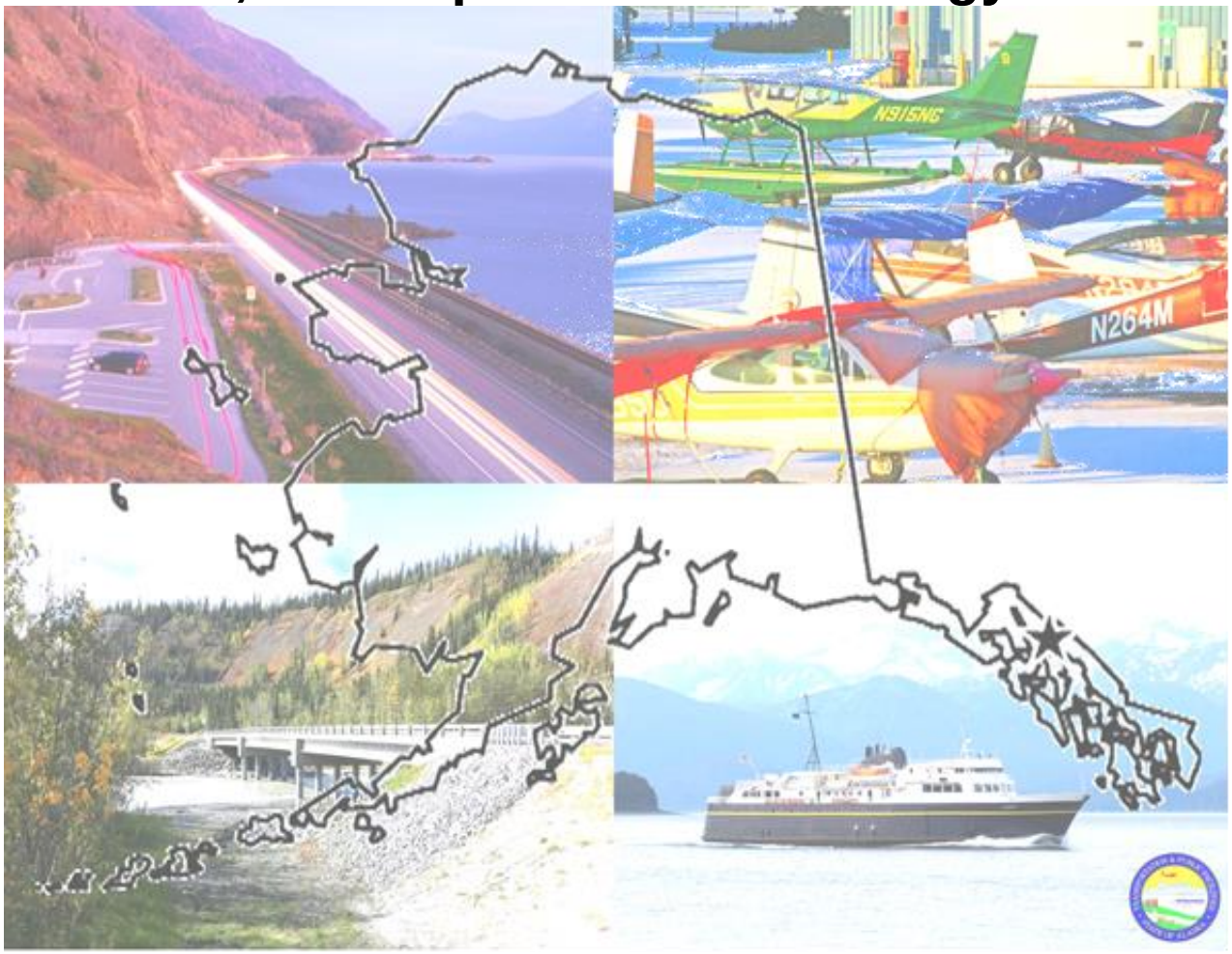
Alaska Department of Transportation & Public Facilities

Research, Development & Technology Transfer



Annual Report FFY 2016

Research Development and Technology Transfer
Alaska Department of Transportation & Public Facilities

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 (ADOT&PF) provides research management, maintains online library, technical assistance, training, and technology deployment services to ADOT&PF, local transportation agencies, and their partners.

RD&T2 provides services largely through the collaborative relationships with and financial support from the Federal Highway Administration. By leveraging resources and developing partnerships with a variety of transportation organizations and professionals. RD&T2 taps into a vast network of expertise and resources and eliminates duplication of effort. RD&T2 also provides an avenue for multidisciplinary support from a network of engineering, management, leadership, law, planning, and the environment.

This is a report of the research, development, and technology transfer activities carried out by the ADOT&PF and its partners. This report covers federal fiscal year 2016, beginning October 1, 2015, and ending September 30, 2016. The Research & T2 section began 11 projects during FFY 16, this added to the already 37 active Research and T2 projects started between FFY10 through FFY15. Nine projects were closed in FFY16.

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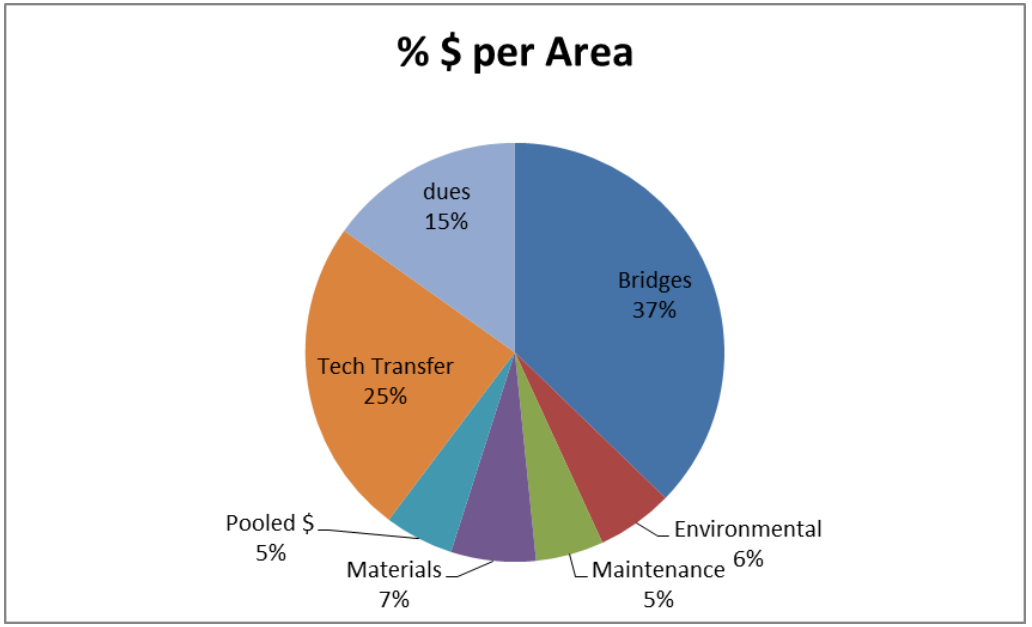
Program Summaries

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) and the FWHA's Transportation Pooled Fund Program. There are other State Transportation Projects that have some research elements. These projects are not included in the fiscal summary

FFY 2016 RD&T2 Fiscal Summary		2016
Revenues		
SP&R Program Funds (STIP ID#6451)	$	2,200,000
NHI Funds (STIP ID#6452)	$	350,000
State Funds (outside of match $)	$	0
Local Technical Assistance Program	$	300,000
Other States	$	200,000
Reinvested Project Closures	$	45,000
Total	**$**	**3,095,000**
Expenditures & Obligations		
NCHRP Dues	$	351,999
TRB Core Services	$	110,024
Pooled Fund Studies	$	163,000
Subtotal for Pooled Funds		
Technology Transfer / LTAP	$	650,000
Research Project (old projects increases)	$	380,000
Research Project Programming (New Obligations)	$	1,396,000
Total	**$**	**3,051,023**

Research Funding Distribution in FFY16

Research Funding Distribution Category	*Total*
Administration & Policy	$0
Alaska Marine Highway System	$0
Bridges	$1,136,000
Environmental	$180,000
Geotechnical & Foundations	$0
Hydraulics & Hydrology	$0
Maintenance & Operations	$160,000
Materials & Construction	$200,000
Pooled Fund Studies	$163,000
Safety & Traffic	$0
Technology Transfer Training (LTAP, Deployment & NHI)	$750,000
TRB & NCHRP Contributions	$462,023
Grand Total	**$3,051,023**



Acronyms

ADOT&PF	Alaska State Department of Transportation & Public Facilities
AUTC	Alaska University Transportation Center
CRREL	Cold Regions Research & Engineering Laboratory
FHWA	Federal Highway Administration
GF	General Fund (State of Alaska)
LTAP	Local Technology Assistance Program
M&O	Maintenance & Operations
MSU	Montana State University
NCHRP	The National Cooperative Highway Research Program
NCSU	North Carolina State University
NHI	National Highway Institute
PacTrans	Pacific Northwest Transportation Consortium
RD&T2	Research, Development & Technology Transfer
SHRP	Strategic Highway Research Program 2
SP&R	(FHWA) State Planning & Research
STIP	Statewide Transportation Improvement Program
STP	(FHWA) Surface Transportation Program
TRB	Transportation Research Board
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
UofI	University of Idaho
WTI	Western Transportation Institute

11 New Projects Starts in FFY2016 using SP&R Funds					
Title	Fed Project #	Category	Federal $	State $	Total $ Project Funding
Technology Transfer Program CY2016 (LTAP)	LTAP039	Training & Tech Transfer	270,000	30,000	300,000
National Highway Institute (NHI) CY2016	2016001	Training & Tech Transfer	280,000	70,000	350,000
Pile Length Determination at Unknown Bridge Foundations	000S875	Bridges & Structures	80,000	20,000	100,000
High Friction Surface Treatment (HFST) Material Monitoring	000S882	Materials	124,000	31,000	155,000
Durability of Grouted Shear Stud Connections at Low Temperatures	4000162	Bridges & Structures	201,600	50,400	252,000
Transverse Seismic Design of Bridges with Pre-Cast Deck/Girder Elements	4000161	Bridges & Structures	201,600	50,400	252,000
Deployment FFY16/18	4000164	Training & Tech Transfer	80,000	20,000	100,000
Steel Fiber Rubberized Concrete Material Monitoring Experimental Feature	4000165	Materials	36,000	9,000	45,000
AASHTO MASH Compliant Two-Tube Metal Bridge Rail	4000169	Bridges & Structures	465,600	66,400	532,000[1]
Catastrophic Icefall Hazard Assessment, Avoidance Procedures, and Mitigation Strategies Phase 2	4000168	Maintenance	128,000	32,000	160,000
Bald Eagle Nesting During Construction Research	4000167	Environmental	144,000	36,000	180,000

[1] $200K 100% federal funds from S Dakota for a total project cost of $532K.

14 Active Projects Started in FFY2015 using SP&R Funds

Title	AKSAS Project #	Category	Federal $	State $	Total Project Funding $
Optimizing Highway Patrol Investments	63068	Safety	56,000	14,000	70,000
Frequency and Potential Severity of Red Light Running in Anchorage2	76293	Safety	96,000	24,000	120,000
Field Evaluation of Precut Thermal Cracks	76291	Materials & Construction	57,600	14,400	72,000
Dust Control Product Mix Design & Quality	76307	Materials & Construction	115,200	28,800	144,000
Use of Steel Fiber Reinforced Rubberized Concrete in Cold Regions	76319	Materials & Construction	72,000	18,000	90,000
Pile Extension Pushover Software	76287	Bridges & Structures	57,600	14,400	72,000
Catastrophic Icefall Hazard Assessment	76317	Maintenance	40,000	10,000	50,000
Developing Guidelines for 2-Dimensional Model Review	76289	Hydraulics & Hydrology	48,000	12,000	60,000
Paperless NEPA	76283	Environmental	96,000	24,000	120,000

10 Active Research Projects Started in FFY2014				
Title	T2 Project #	AKSAS Project #	Category	Total Current Project Funding $
Experimental Feature Spray Applied MMA Bridge Deck Waterproofing Membrane	T2-14-06	64317	Bridges & Structures	29,000
Experimental Feature Wavetronic Radar Detection through Experimental Features	T2-14-07	64321	Safety & Traffic	35,000
Seismic Load Path Effects in RC Bridge Columns	T2-14-09	64203	Bridges & Structures	365,000
Geotechnical Asset Management Thermal Modeling	T2-14-11	64230	Geotechnical & Foundations	145,000
Characterization of Alaska Hot-Mix Asphalt containing Reclaimed Asphalt Pavement (RAP)	T2-14-12	64234	Materials & Construction	155,000
Underwater Pile Driving Noise Study	T2-14-13	64236	Environmental	240,000
Haines Debris Flow Source Study	T2-14-14	64238	Geotechnical & Foundations	143,000
Modeling Passing Lane Behavior on Two Lane Highways	T2-14-16	83980	Safety & Traffic	340,000
Seismic Repair of Reinforced Concrete Bridge Substructures	T2-14-17	83974	Bridges & Structures	280,000
AASHTOWare Investigation	T2-14-18	83988	Administration & Policy	650,000

10 Active Research Projects Started in FFY2013				
Title	Comments	AKSAS Project #	Category	Total Current $ Project Funding
Transportation Asset Management Program	T2-13-03	80880	Administration & Policy	1,333,078 (STIP)
Rapid Technology Transfer	T2-13-06	76550	Technology Transfer Training	190,000 (State)+ 185,000 (State
Unstable Slope Management - Phase II	T2-13-08	62467	Geotechnical and Foundations	1,700,000 (STIP)
Experimental Feature Tencati Wicking Fabric Design	T2-13-10	64319 (61105)old	Materials & Construction	30,000 (SP&R)
Reinforced Concrete Filled Pipe Piles in Soils	T2-13-11	62725	Bridges & Structures	330,000 (SP&R)
Evaluate Pre-sawn Transverse Thermal Cracks 3-yr monitoring	T2-13-13	63031	Materials & Construction	75,000 (SP&R)
Wicking Fabric Design Specification	PCF signed 12 28 16	4000130	Materials & Construction	125,000 (SP&R)
Value of Depressed Medians on Divided Highways in Alaska	T2-13-15	63039	Safety & Traffic	150,000 (SP&R)
Geotechnical Asset Management - Stage II	T2-13-18	63076	Geotechnical and Foundations	80,000 (STIP)
Experimental Feature: Polyester Concrete For Approach Slabs	T2-13-19	61105	Materials & Construction	51,000 (SP&R)

3 Active Research Projects Started FFY2010 - FFY2012				
Title	T2 Project #	AKSAS Project #	Category	Total Current Project Funding
Maintenance Decision Support System (MDSS)	T2-12-13	80839	Maintenance & Operations	225,000 (SP&R) +26,585 (State)
Geotechnical Asset Management Program	T2-12-21	80900	Geotechnical & Foundations	$1,933,055 (STIP)
Phase II: Development of an Unstable Slope Management Program Research	T2-10-04	63440	Geotechnical & Foundations	$1,150,000 (STIP)

Project Completed in FFY16. Project Completion Form Signed.

Title	AKSAS Project #	Category	Total Current Project Funding
RWIS Power Sources, Phase 2	76321	Administration & Policy	50,000
Technology Transfer Program CY2015 (LTAP)	60537	Training & Tech Transfer	300,000
National Highway Institute (NHI) CY2015	63990	Training & Tech Transfer	350,000
Rapid Research Response FFY 2014-16 Bald Eagle Monitoring Completed in FY15	64006	Environmental	33,000(SP&R)
Peer Exchange – NEPA Assignment	76285	Environmental	30,000(SP&R)
Improving Quality Workshop	60541	Administration & Policy	30,000 (SP&R) 30,000 (AUTC)
Testing & Screening Surfacing Materials for Alaska's Yukon River Bridge	60533	Bridges & Structures	137,000 (SP&R) 50,000 (M&0) 30,000 (SP&R)
Evaluate Pre-Sawn Transverse Cracks	63031	Materials & Construction	50,000 (SP&R)
Rapid Research Response FFY 2014-16 Fly Ash Mix Design	64006	Materials & Construction	26,000(SP&R)

Projects

T2-13-03 Transportation Asset Management

There are two research projects associated with TAM

Transportation Asset Management Information System
Principal Investigator: Cambridge Systematics, Inc.
Funding: $1,333,078
Project Manager: Carolyn Morehouse, P.E.
Completion date October 2015

This research project was established to have an outside entity make recommendations for planning and implementing a Transportation Asset Management System and Data Solution to support an Asset Management program in the Department.

Benefits to the State: This project made recommendations for improved data management for the department. These recommendations can lead the department toward creating a system that all employees can easily use and for the department to maintain. It will strengthen the ability of data programs to support core business functions of the department. It will improve the data quality throughout the organization. Short term benefits include the drafting of a data and information technology policy and procedure and associated manuals. Cambridge also completed an asset management information system maturity assessment that will help in drafting our TAM Plan for FHWA.

Predictive Pavement Modeling
Principal Investigator: APTech, Inc.
Funding: $60,000
Project Manager: Carolyn Morehouse, P.E.
Completion date December 31, 2018

This project also includes hiring APTech to develop and calibrate performance prediction models for statewide pavement management that consider Alaska conditions and pavement/treatment types.

Benefits to State: The updated model will allow for improvement in predictive capability of pavement conditions on state roads.

T2-13-21 Improving Quality Workshop

Principal Investigator: Billy Connor (UAF – AUTC)
Funding: $40,000 SP&R + ($40,000 AUTC)
ADOT&PF Project Manager: Carolyn Morehouse, P.E.
Completion Date: November 2015
This project consists of a series of webinars on Pavement Design and Construction followed by a Workshop to discuss best practices and recommendations for Materials.
Benefits to the State: This collaborative project supports and promotes a partnership with the Alaska University Transportation Center (AUTC) to identify and promote additional opportunities for the partnership to support ADOT&PF's core value of Improving Quality as defined in its "Strategic Plan".

83988 AASHTOWare Investigation

Principal Investigator:
Funding: $650,000 SP&R
Project Manager: Jaclyn Elmes
Completion Date: December 2017

AASHTOWare Preconstruction is software packaged designed for transportation agencies. The software allows for automating processes during the planning, design and construction of a project. This project will test and evaluate AASHTOWare modules to determine if DOT&PF should implement statewide. Use project information from each region to evaluate pros and cons for a transition to AASHTOWare from current systems.

Benefits to the State: DOT&PF can reduce data entry time by connecting systems for reporting. Data can be entered once during the life of a project and used in different modules.

76321 RWIS Power Sources Phase 2

Principal Investigator: TBD
Funding: $50,000 SP&R
Project Manager: Carolyn Morehouse, P.E.
Completion Date: April 2016

Six Road Weather Information System (RWIS) stations' environmental sensors have been using propane generators for the past 12 years. The generators and electronics have failed. Phase 1 completed last year research options for remote power for these sensors. The objective of this phase 2 is to design, build, deploy and evaluate an off grid power source prototype. The power source will be evaluated for performance, maintenance, operations and sustainability.

Benefits to the State: Improved efficiency by reducing power module as compared to the power module propane generators. The new power sources will provide opportunity for strategic deployment at known weather problem areas.

T2-13-11 Reinforced Concrete Filled Pipes in Soils

Principal Investigator: Billy Connor, P.E. & Dr. Mervyn J. Kowalsky (NCSU, UAF & AUTC)
Funding: $330,000 (SP&R)
Project Manager: Janelle White
Completion Date: Completed December 2016

The use of reinforced concrete filled steel pipe piles is common in Alaska and is gaining acceptance across the nation. It is often a preferred support system for bridges as these piles provide good seismic performance and can be driven rather than drilled in resulting in reduced construction cost and environmental impacts. This project supplements the T2-08-02 Plastic Strain Limits by conducting large scale testing of reinforced concrete filled pipe piles in soil media and structural analysis. The project will evaluate the impact of relative soil-pile stiffness on pipe pile strain limits, plastic hinge length and deformation characteristics.

Benefits to the State: This research will provide experimental validation of proposed models for concrete filled steel tubes forming pipe-soil systems, allowing Bridge engineers in Alaska and nationwide improved confidence in the structural analysis and use of these cost effective bridge support systems.

T2-14-06 Experimental Feature: Spray Applied MMA Bridge Deck Waterproofing Membrane

Principal Investigator: Richard Pratt, P.E., Chief Bridge Engineer, Statewide
Funding: $29,000 (SP&R)
Project Manager: Carolyn Morehouse, P.E.
Estimated Completion Date: December 2017

This experimental feature evaluates spray applied methyl methacrylate (MMA) waterproofing membrane on the new bridge deck of the Phelan Creek Bridge under the Richardson Highway MP 201 Phelan Creek Bridge Replacement project. The post construction report submitted to FHWA in Dec 2014 evaluated bid cost, constructability, and effectiveness of the MMA membrane system compared to the currently used mastic asphalt membrane. One year post monitoring report is due Jan 2016. Two more years of monitoring will follow.

The MMA system provides a seamless membrane that readily accommodates variations in surface profile. It can be applied with temperatures as low as 32°F. The resins do not react with moisture. Consequently, it can be applied as long as the surface is “surface dry” and above the dew point. The system is applied in two contrasting color coded coats, which reduces flaws and improves quality control. The system features rapid installation. It is cured and load resistant within 1 hour. The MMA system has been successfully incorporated on many bridge decks around the world. Many locations have similar conditions and climates as Alaska. The durability of the system is further evidenced through its use on railway bridges where the ballast directly bears on the MMA membrane without failure.

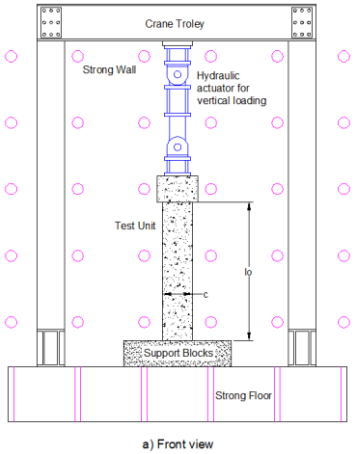
Benefits to the State: If the MMA membrane performs as planned, it could save millions in traffic control costs and impacts to the traveling public on future bridge deck projects due to its shortened cure time, even when compared to the higher unit cost for the membrane. It also has potential to significantly save on bridge life cycle costs if it provides better deck coverage and longer lasting waterproofing than current methods.

T2-14-09 Seismic Load Path Effects in RC Bridge Columns

Principal Investigator: Billy Connor, P.E., Dr. Mervyn J. Kowalsky & Dr. James M Nau (NCSU, UAF & AUTC)
Funding: $365,000 (SP&R)
Project Manager: Janelle White
Estimated Completion Date: June 2017

The project studies the impact of multi-directional loading which could lead to adjustments in unidirectional strain limits proposed for seismic design on reinforced concrete bridge columns. The project includes a literature research, load path testing and analysis, model calibration and investigation of load path effects of wall piers.

Benefits to the State: Revisions to wall pier design for the existing model. The research will account for out of plane displacement which can be used to determine minimum wall pier thickness requirements for given in plane and out of plane deformation demands.



Proposed wall prism test setup.

T2-14-17 Seismic Repair of Reinforced Concrete Bridge Substructures

Principal Investigator: Rudolf Seracino, Mervyn Kowalsky, and James M. Nau
Funding: $280,000 (SP&R)
Project Manager: Janelle White
Estimated Completion Date: May 2018

The objective of this research is to develop a rapidly deployable post-earthquake repair technique for typical Alaska bridges that could provide extensive economic benefits by saving bridges that would otherwise be demolished after an earthquake.

Bridge column repair has been studied for some time with several established techniques for repair for shear and confinement critical columns. However, there is little data available on repair of columns that are otherwise designed to modern standards. Similarly, there is little data available on developing an understanding of when repair is truly needed, and when repair is truly no longer feasible.

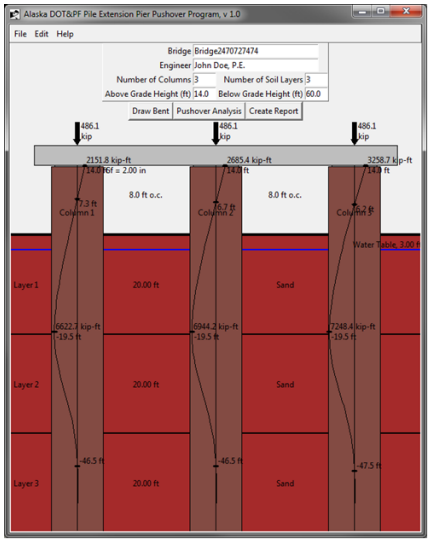
Benefits to the State: The bridge design engineer will have access to pre-qualified repair techniques that could be rapidly deployed according to the damage level observed after an earthquake. The cost savings to the State of Alaska will be significant when bridges that would otherwise need to be replaced can be repaired. Further, the indirect economic and social impacts of not rapidly returning a bridge to service following an extreme event will be many times greater than the direct replacement cost, particularly considering the lack of redundancy in the Alaskan road transportation network.

76287 Pile Extension Pier Pushover Software

Principal Investigator: Michael Scott (Oregon State University)
Funding: $72,000 (SP&R)
Project Manager: Janelle White
Completion Date: Completed December 2016

The objective of this research is to revise version 1.0 of the pushover software. Version 1.0 of the software requires a number of fixes, enhancements, and increased functionality in order to expand its range of application, increase productivity and reduce design and construction costs.

Benefits to the State: Increased functionality for design activities. By combining previously disparate analysis components in a single package, the software has proven, since its adoption by AKDOT&PF bridge engineers, to save time and money in the analysis and design of Cast In Shell Steel bridge bents.

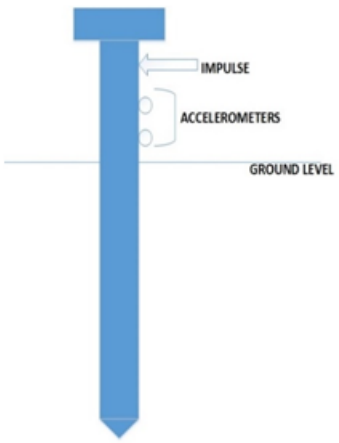


000S875 Pile Length Determination at Unknown Bridge Foundations

Principal Investigator: Murthy Guddati (NC State University)
Funding: $100,000 (STIP)
Project Manager: Janelle White
Estimated Completion Date: September 2018

The objective of this research is to develop and implement a non-destructive testing technique to determine the length of piles supporting bridge substructures.

Benefits to the State: The field testing would lead to EDAR replacing the expensive borehole testing to estimate the length of the piles leading AKDOT&PF to reduce current operational costs and perhaps facilitate more frequent testing leading to improved safety and reduced maintenance costs.



4000(162) Durability of Grouted Shear Stud Connections at Low Temperatures

Principal Investigator: James Nau (NC State University)
Funding: $252,000 (SP&R)
Project Manager: Janelle White
Estimated Completion Date: May 2019

The objective of this work is to optimize grout properties through material testing. The project will use weathered and un-weathered full size connection specimens to develop recommendations to maximize the durability of the shear stud connection. The behavior of full-scale connection subassemblies in as-built unweathered condition and in weathered condition following freeze-thaw cycles characteristic of expected field conditions will be evaluated at temperatures as low as -40$_{o}$ C.

Benefits to the State: Bridge design engineers will gain knowledge on the durability of the grouted shear stud connection with regard to freeze-thaw resistance, and an understanding of connection performance at low temperatures typical in Alaska. The performance under simulated field conditions is essential in developing confidence in the design of this new alternate connection.

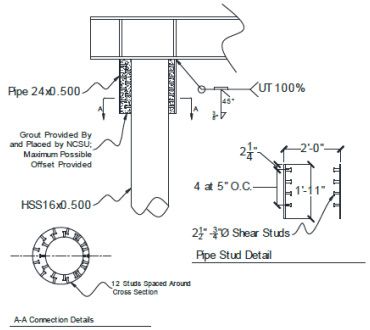


Figure 1: Grouted Shear Stud Connection

4000(161) Transverse Seismic Design of Bridges with Pier Cast Deck Girder

Principal Investigator: Mervyn Kowalsky (NC State University)
Funding: $252,000 (SP&R)
Project Manager: Janelle White
Estimated Completion Date: May 2019

The objective of this research is to develop guidelines for the modeling and design of the longitudinal joints between precast girders under transverse seismic response. A bridge structure utilizing these connections was recently damaged in Alaska by an ice-flow event. The impact of the ice resulted in approximately one foot of lateral displacement of one column, while other columns did not deform. As a consequence, the bridge superstructure was deformed laterally between bents which resulted in minor damage to the grouted shear connections. Examination of this real life case study will be helpful in the development of the research plan for this project.

Benefits to the State: Bridge design engineers will be able to confidently predict lateral displacement profiles for these bridges, which is an essential component of the AASHTO seismic design and DDBD process. The existing practice of the AKDOT will either be verified by full scale data, or revised to ensure that damage in the deck does not occur under moderate to large earthquakes. Correlation of experimental data obtained as part of this research to field case studies of previously damaged bridges will also be possible.

4000(169) Two-Tube Metal Bridge Rail Compliance Testing

Principal Investigator: William Williams (Texas A&M Transportation Institute)
Funding: $532,000 (SP&R)
Project Manager: Janelle White
Estimated Completion Date: December 2019

The objective of the test the current bridge rail to the "new" AASHTO MASH level 4 requirements so that the Department may continue to use the current two-tube railing on FHWA funded projects. The safety of a TL-4 will increase as a result of compliance with the new AASHTO standard. The FHWA requires that crash-tested bridge rail be used on the NHS. Without an approved TL-4 bridge rail, the Department may risk losing federal funds.

Benefits to the State: The new railing will be incorporated into new bridge designs as soon as it has been accepted by the FHWA. New standard drawings will be prepared and the Alaska Bridge and Structures Manual will be updated accordingly.

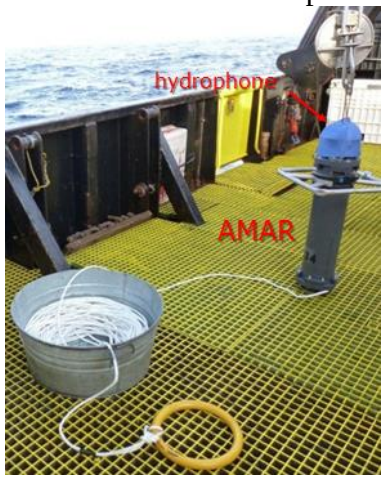
T2-14-13 Underwater Pile Driving Noise Study

Principal Investigator: Melanie Austin, JASCO Inc.
Funding: $65,000 FFY 2014 & $130,000 FFY 2015
Manager: Janelle White
Champion: Taylor Horne

Completion Date: Completed December 2016

Pile installation activities can exceed levels deemed harmful to species protected under the Endangered Species Act and the Marine Mammal Protection Act. For FFY14 Conduct literature review, develop an auditory test pile program approved by NOAA, NMFS and DOT&PF. For FFY15 conduct acoustic monitoring for pile installation to determine the hazard area for behavioral harassment. Date gathered from the auditory program will provide scientifically based observations pertinent to DOT&PF pile installation projects.

Benefits to the State: Coordination of DOT&PF, NOAA and NMFS to collect actual underwater pile driving and background noise levels which are applicable to current and future marine mammal protection requirements.



76283 Paperless NEPA

Champion: Taylor Horne, Statewide Environmental Manager
Principle Investigator: TBD
Funding: $120,000 (SP&R)
Project Manager: Carolyn Morehouse, P.E.
Completion Date: Fall 2018

Many states have comprehensive environmental approval and tracking systems. Alaska DOT has no system for tracking, securing and archiving environmental approvals and documents. The research objective is to coordinate with stakeholders and perform a literature search recommendation report for a paperless NEPA system. The system would be implemented by using a STIP project.

Benefits to the State: Reduce the time needed to complete environmental documents during project development. Reduce the potential for errors. Secure document approval hierarchy. Produce smart forms to reduce time and effort developing environmental documents.

4000(167) Bald Eagle Nesting During Construction

Champion: Taylor Horne, Statewide Environmental Manager
Principle Investigator: Jordan Muir, USFWS
Funding: $180,000 (SP&R)
Project Manager: Janelle White
Completion Date: Fall 2018

Collect field data on DOT&PF projects. Compare nest occupancy, productivity, and fidelity between impact and control nests. If significantly different, determine at what distance impacts occur. If not significantly different, USFWS may recommend DOT&PF not obtain Bald Eagle permits for certain activities.

Benefits to the State: Discuss and implement policy modifications with USFWS based on findings. Use information to determine if USFWS Eagle Take Permit is recommended for ADOT road maintenance activities.
If permit is recommended, use information to determine at what distance permit needed.

T2-10-04 Phase II: Development of an Unstable Slope Management Program

Principal Investigator: Lawrence Pierson, Landslide Technology, Inc., & Peter Hardcastle, R&M Consultants, Inc.
Funding: $1,150,000 (STP) total funding $4,000,000
Project Manager: Barry Benko, C.P.G.
Completion Date: December 2017

This project built upon a preceding project (FHWA-AK-RD-09-04, Unstable Slope Management Program, Phase I) that established structural guidelines for the USMP in AKDOT&PF. This (Phase II) project initiated inventory population efforts, identified a "Top 100"list of unstable slopes, and created a webpage portal to the data.

By the end of FFY16, the USMP inventory comprised 1,003 rock slopes and 633unstable soil slopes and embankments.

Research and development for a fully functional, transportation asset management- compatible USMP is being completed under a companion project (R,D&T2 Project No. T2-13-08). Under that project, investigators are refining the ratings system and incorporating asset management features into the USMP.

Benefits to the State:
The USMP, now part of the overall Geotechnical Asset Management Program, focuses on one class of geotechnical assets: soil and rock slopes. With this knowledge base represented in the USMP, the Department can move ahead to monitoring slope condition over time and managing these assets on a lifecycle cost basis to optimize performance in support of our transportation system.

Drilling of the soil and rock slope on Glenn Highway Photo: Terry Barber

T2-12-21 Geotechnical Asset Management

Principal Investigator: Various
Funding: $1,933,055 Research out of $2,700,000 (STIP)
Project Manager: Barry Benko, C.P.G.
Completion Date: December 2017

This effort will create Geotechnical Asset Management (GAM) program architecture, research and develop: performance measures, methods for predicting future performance of assets, and analysis methods. Create inventory and condition survey for assets. Monitor performance of assets over time and compare to performance measures. Provide decision-making support to agency management on maintenance, repair and rehabilitation alternatives.

Significant progress was made in FFY16, including;

- Completion of GAM Plan, prepared as an adjunct to the Department's Transportation Asset Management (TAM) Plan;

- Completion of draft report detailing the technical components of the GAM Program development research;
- Completion of GAM pilot study for Tongass Highway, which established a Corridor Health Index, incorporating geotechnical and core assets into a single metric describing transportation corridor performance;
- Life cycle cost analysis, to compare investment alternatives at different levels of funding;
- Release of a webpage (ESRI Story Map®) that displays examples of asset information interactive maps along with descriptive narrative that includes links to associated detailed reports on various GAM program elements.

Benefits to the State: The GAM program is an important element of the overall implementation of best TAM practices for AKDOT&PF. The GAM program defines the role that geotechnical assets take in both primary roles like rock slopes, and in supporting roles such as embankments supporting pavement structure. The research for this project will take the Department many steps forward in understanding the characteristics of geotechnical assets as to the length of service life, condition during service, appropriate service levels and performance measures, incorporation of risk management, determination of life cycle costs, identification of critical data elements required, and development of the means to store and use the data in support of a decision-support framework for managing our transportation system.

T2-13-08 Unstable Slope Management – Stage II

Principal Investigator: Darren Beckstrand Landslide Technology
Funding: $1,700,000 (STIP)
Project Manager: Barry Benko, C.P.G.
Estimated Completion Date: December 2017

This effort will complete the development of the Unstable Slope Management Program (USMP), initiated in 2009 and featuring a baseline inventory effort that commenced in 2010 (see R, D&T2 Project T2-10-04.

Under the scope for this research project, the investigators will finish the architecture of the database system and continue populating the inventory by adding the remaining unstable slopes in the road network, with key transportation corridors receiving priority in the work sequencing. Asset management elements will be incorporated into the USMP in the areas of service life prediction, establishing service levels and performance measures and initiating development of analysis tools to determine life cycle cost of slopes in support of decision-making for transportation corridors. This research project is closely paired with associated projects *T2-12-21 Geotechnical Asset Management* and *T2-13-18 Geotechnical Asset Management - Stage II*

A significant advance for the project in FFY16 included deployment of a digital tool for tracking adverse events at slopes and other geotechnical asset sites. The *Geotechnical Event* compiles the frequency and extent of resources applied by Maintenance operations, which will help the Department to track the work activities at – and costs expended for –

geotechnical assets, and also to estimate level of risk at individual sites or routes or corridors.

Benefits to the State: Unstable slopes along the State's routes present critical risks to safety and mobility in the transportation system. This research effort will enable the realization of sound asset management, resulting in the most economic allocation of resources to unstable slopes.

T2-13-18 Geotechnical Asset Management - Stage II

Principal Investigator: Various
Funding: $80,000, (Other STIP project)
Project Manager: Barry Benko, C.P.G
Completion Date: December 2017

The project supports four research contracts for developing Geotechnical Asset Management (GAM) concepts for state Departments of Transportation: GAM plan development; a risk management framework for GAM; Service life, service level, performance measures and condition indices; and Life Cycle Cost Analysis for geotechnical assets.

The Federal Highway Administration (FHWA) is participating in funding these GAM-related research projects through an Infrastructure Research & Technology (IRT) program allocation to research and develop Geotechnical Asset Management principles and practices for eventual deployment in Alaska and other state or local government transportation agencies. An important aspect of the project is that the findings and deliverables are extended to an audience beyond AKDOT&PF...

Deliverables will include:

- An executive level summary,
- Individual graphics suitable for use in FHWA publications and pamphlets,
- PowerPoint presentation slides,
- Other deliverables that may be developed during the course of the work and the execution of the project's Communication Plan.

In FFY16, the research contractors produced the component contents for each of those deliverable types. Communication plans were developed largely on the guidelines in NCHRP Report 610, "Communicating the Value of Transportation Research.

Benefits to the State:
This project brings the participation of FHWA – including funding and a technical advisory role – to development of GAM for the State.

Z642300000 GAM through Thermal Modeling of Highway Embankments for Dalton Highway Reconstruction Projects (T2-14-11)

Principal Investigator: Steve McGroarty and Jeff Currey
Funding: $145,000
Manager: Anna Bosin, P.E.
Estimated Completion Date: December 2019

Road embankments constructed on permafrost must be thermally stable in order to minimize long-term maintenance costs. Past thermal modeling studies have determined that the most critical model input parameter are soil surface

temperatures. Typically, site-specific soil temperatures are not available and are estimated using air temperature records and a modifying *n*-factor. Material type, vegetation cover, and snow cover all affect *n*-factors and need additional site-specific studies under Alaskan conditions.

Leverage an upcoming reconstruction project on the Dalton Hwy to design thermally stable embankments with thermal monitoring instrumentation to study performance of insulation board. Will also determine site-specific thermal model n-factors for future thermal modeling, and develop relationship between snow depth and winter n-factors. Results will be used to improve thermal models.

Benefits to the State:
This project will help refine thermal modeling to design future embankments constructed, or existing embankments reconstructed, on permafrost to facilitate design of the least expensive thermally stable embankment. This will reduce maintenance.

64238 Haines Highway Debris Flow Source Study (T2-14-14)

Principal Investigator: Drs. Ronald Daanen and Gabriel Wolken, DGGS
Funding: $63,000 FFY 2014 (SP&R)& $80,000 (STIP) FFY 2015
Manager: Anna Bosin, P.E.
Estimated Completion Date: Project Complete FFY14. Waiting to financially close, delay in processing invoices.

Debris flow events are occurring with increasing frequency within the Haines Highway Debris Flow Corridor (MP 16- 24). M&O expended approximately $335,000 on equipment and labor responding to debris flow events in this highway segment in 2013 alone. DOT lacks baseline data characterizing the upslope source areas. Produce high resolution orthophoto and detailed DSM of the two most active sites (MP 19 and 23). Deploy and ground temp sensors. Conduct a repeat aerial survey, creation of orthophoto and DSM, which will enable researchers to quantify and map the total amount of debris movement and to portray source material origination. Results will be crucial to design of future mitigation of debris flow hazards.

Benefits to the State: Reduction of hazard to the travelling public, reduction of risk to the Department, maintaining consistent mobility.

76289 Developing Guidelines for 2-Dimensional Model Review and Acceptance

Principal Investigator: Horacio Toniolo, (UAF)
Funding: $60,000 (SP&R)
Project Manager: Janelle White
Completion Date: October 2017

The research team from UAF will use SRH-2D, RAS-2D and IRIC to model two projects. The primary numerical models will be used in two different morphological settings: moderate and significant contractions. Results between the various models will be compared. Guidelines for preferred model will be prepared.

Benefits to the State: Guidelines will be prepared which will define what is “acceptable” or “comparable” when reviewing 2-D modeling results.

76317 Catastrophic Icefall Hazard Assessment (Literature Review Only)

Principal Investigator:David Scapato (Scarptec Inc)
Funding: $50,000 (SP&R)
Project Manager: Anna Bosin
Estimated Project Completion: February 2016

This is the first phase of for Scarptec to review AKDOT&PF historical icefall documentation from events at 7 locations within DOT&PF highway ROW and complete a literature review of national and international practices and products. Lastly, the Contractor will conduct a web-based meeting to the Department staff that describes the project, results, and recommendations for implementation
Benefits to the State: Icefall on roads can be dangerous to drivers. This is the first stage to combine all the research to date to determine if further research is this area is needed.

T2-12-13 Maintenance Decision Support System (MDSS)

Principal Investigator: Billy Connor, P.E. (UAF & AUTC) in Partnership with the National Center for Atmospheric Research (NCAR)
Funding: $225,000 (Planning SP&R) + 26,585 FFY15(State)
Project Manager: Ocie Adams
Completion Date: December 2015

The project evaluated and refined a software system to help roadway maintenance personnel optimize their snow and ice control operations. The system analyzed historical weather conditions and forecast data and prescribed optimal strategies for plowing snow and applying anti-icing treatments to roadways based on weather and pavement condition observation and forecasts. The ADOT&PF's Fairbanks maintenance district piloted the technology along roadway corridors with various weather microclimates in an effort to fine tune the predictive capabilities of the software and data collection system.

Benefits to the State: By improving weather and roadway condition assessment during winter storms and then optimizing snow and ice control efforts, ADOT&PF and local transportation agencies should be able to provide safer road conditions while minimizing costs. Additionally, minimizing the use of deicing and anti-icing agents promises environmental benefits and reduced impacts to roadway users. Deliverable: web-based only Fairbanks pilot. This project has already saved Maintenance money. A larger project is being funded out of HSIP for the Kenai area.

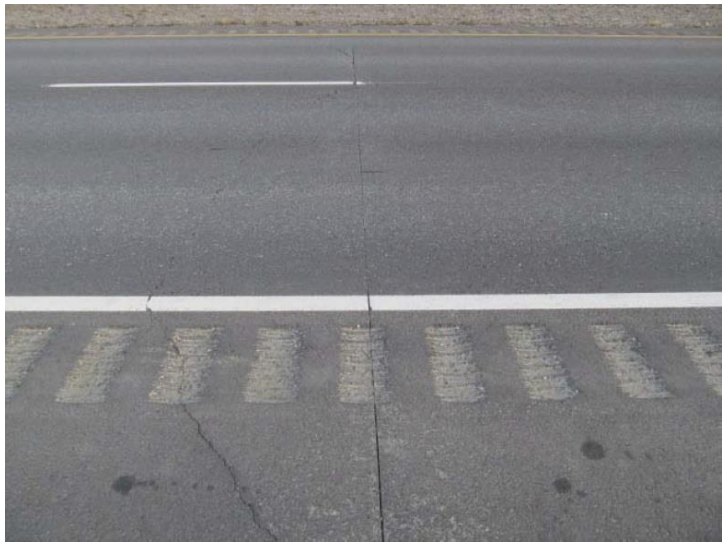


Photo: Pre-cut pavement section on the Richardson Highway near Moose Creek. Photo credit Bob McHattie and Dr. Jenny Liu.

76291 Field Evaluation of Precut Transverse Thermal Cracks

Principal Investigator: Juanyu "Jenny" Liu (UAF – AUTC)
Funding: $72,000 SP&R
ADOT&PF Project Manager: Anna Bosin, P.E.
Completion Date: December 2016

This project continues the research on Road-width thermal cracks. This project includes monitoring three locations for 2 years.

This research project will monitor and evaluate three locations: 1) Phillips Field Road, Fairbanks; 2) Richardson Highway MP 343-344; and 3) Parks Highway MP 245-252. Contract includes literature review, recording field observations and maps of cracks, cost analysis of the M&O savings for precutting compared with traditional thermal crack M&O, recommendations, and final report with web presentation to staff. Peers from Montana State University and Washington State University will provide support and review.

Benefits to the State: The ADOT&PF spends a significant amount of money each year crack-sealing pavements. This project will recommend a presawn crack design and details so Alaska saves pavement preservation dollars each year and contribute to better performance of Alaska's valuable pavement assets.

T2-13-14 Wicking Fabric Design Specification

Principal Investigator: Dr. Xiong Zhang (UAF & AUTC)
Funding: $125,000 (SP&R)
ADOT&PF Project Manager: Dave Waldo
Completion Date: December 2015

H2Ri wicking fabric is a new geotextile manufactured by TenCate Geosynthetics. Which is the same product used in T2-13-10. It contains both a high modulus polypropylene yarn for reinforcement and a nylon wicking yarn which can absorb and transport water for drainage under unsaturated conditions. Therefore the fabric can serve as reinforcement it has the potential to dehydrate the subgrade and base course and consequently improve the performance of pavements.

This research will build on the ongoing monitoring of the Dalton 9 Mile test section (project T2-13-10). It will develop design guidance, determine product limitations, and cost benefit values for engineers to use in deciding when and how to use the fabric.

In order to assess the fabric's ability to wick 73 feet, an indoor flume was assembled and instrumented at M&O warm storage in June of 2015. Data was gathered into the fall and the final report is expected to be completed on time.

Initial results indicated the fabric successfully transmitted water the length of the flume. Some decrease in wicking is occurring at the joints were the fabric is overlapped.

Benefits to the State: Use of this fabric may allow use of low quality, locally available materials to build roads and airport. It has the potential to bring significant savings in construction, maintenance and repair cost for roads in wet, swampy areas and areas of thawing permafrost. When properly used, it has proven to have the ability to wicking the water out of the pavement structure and eliminate the frost have and subsequent thaw weakening.

T2-13-10 Experimental Feature: Tencate Mirafi® H2Ri Wicking Fabric

Principal Investigator: Jeff Currey, NR Materials Engineer
Funding: $30,000 (SP&R)
ADOT&PF Project Manager: Dave Waldo
Completion Date: December 2016

The freezing of moisture in the ground can cause heaving. Under roads this can cause damage that leads to increased maintenance costs. ADOT&PF partnered with AUTC to research a possible solution. The use of the building fabric, Mirafi Nylon Wicking Fabric, could help prevent saturation of the ground that causes frost heave damage. The fabric is an impermeable much like a rain jacket. When installed properly it keeps much of the moisture out of the material that the road is built on. No moisture, no problem.

The fabric was installed by the Department's Contractor on the Dalton Highway MP 197-206 Reconstruction project. A post construction report was submitted to FHWA in 2013. Year 1 was not monitored and reported on but year 2 was. It will be monitored by ADOT&PF for one more year summer 2016. The results will help engineers design safer roads that require less maintenance. Preliminary field results show the fabric r is removing water from the embankment. The test section once a maintenance issue is now functioning well. Monitoring report due end of 2015.

Benefits to the State: The use of construction fabric in building roads in Alaska should extend road life, especially in areas particularly susceptible to frost heaving.

Photo: Wicking fabric installation at Dalton Highway MP 110.5 Beaver Slide. Photo credit AUTC.

76319 –Use of Steel Fiber Reinforced Rubberized Concrete in Cold Regions

Principal Investigator: Osama Abazza
Funding: $90,000 (SP&R)
Project Manager: Anna Bosin
Estimated Completion Date: December 2017

Studded tires can cause significant rutting issues in Alaska on asphalt pavement. This project will attempt to use a concrete mix design to preserve the road surface. This project will create material samples and test for rutting resistance, comprehensive strength, friction and freeze/thaw properties. Once the sample has passes these lab tests a test panel will be added to a Central Region Design project for field testing. The Principle investigator will monitor the panel installation and make recommendations for future monitoring.

Benefits to the State: Potential cost savings if this mix design lasts longer than conventional asphalt mix designs.

T2-13-19 Experimental Feature: Polyester Concrete Approach Slabs

Principal Investigator: Leslie Daugherty, P.E., Bridge Engineer, Statewide
Funding: $51,000 (SP&R)
Project Manager: Carolyn Morehouse, P.E.
Completion Date: December 2017

This experimental feature evaluates polyester concrete for approach slabs on the Parks Highway MP 239-252 Rehabilitation construction project. A post construction report was submitted to FHWA in Dec 2014 that compared structural performance of various types of slabs to include polyester concrete, Class-A concrete, and paved asphalt approaches without a slab. The polyester concrete is high-strength, rapid-setting, and water impermeable. The concrete provides protection from chlorides and other contaminants to help protect the steel reinforcement giving longer life. Superior abrasion and skid resistance allow for a safe and durable driving surface. With a rapid curing time, traffic was allowed to drive on the slab in about 4 hours which was beneficial on the Parks Highway during the middle of summer. Polyester concrete does not crack or delaminate even through extreme freeze/thaw cycles and has a higher compressive strength than conventional concrete. Year 1 monitoring is complete and a report was submitted to FHWA in Nov 2015.

Polyester concrete use in Alaska has been limited to a bridge deck overlay on the Susitna River Bridge. However, numerous states, such California, Washington, and Nevada, have used this system for bridge deck repairs and overlay projects on major highways. In states like Washington and California where traffic volume is high and this product has been used for

over a decade, results show the concrete is performing as expected with no major signs of wear.

Benefits to the State: This research will determine if polyester concrete may be a practical, cost saving alternative to traditional concrete methods for approach slab and deck construction. If the polyester concrete performs as planned, it could save millions in traffic control costs and impacts to the traveling public on future bridge retrofit and deck projects.

T2-14-12 Characterization of Alaska Hot-Mix Asphalt containing Reclaimed Asphalt Pavement (RAP)

Principal Investigator: Dr. Jenny Liu
Funding: $155,000
Manager: Anna Bosin, P.E.
Estimated Completion Date: June 2016

DOT&PF highway construction specification now allows up to 15% RAP in the wearing course of a roadway pavement, and up to 25% RAP in the binder or base course layer(s). The materials engineering properties of these HMA mixes specific to Alaskan materials containing RAP will be properly characterized for use in pavement design software. This project will prepare representative laboratory-mixed specimens using local materials and conduct laboratory performance test to determine the engineering properties of the mixtures. It will update the database of material properties in the "AK Flexible Pavement Design Manual" for use in the pavement design software, and a potential revision of the HMA specification to increase the limit of RAP in HMA.

Benefits to the State: A better understanding of RAP's engineering properties will improve pavement design and produce more reliable value engineering and life-cycle cost analysis. Increased use of RAP material will decrease construction costs, preserve virgin aggregate resources, and divert materials from the waste stream.

T2-14-15 Mix Design – Fly Ash Rapid Response Project

Principal Investigator: Cole Sonafrank, CEO Suitable Alaskan Materials, LLC
Funding: $26,000
Manager: Anna Bosin, P.E.
Final Results Received June 2015

Materials available for embankment construction in remote areas of Alaska are often highly frost-susceptible and are subject to rutting and pumping during spring break-up either wet or dry conditions. Geopolymer concretes and soil cements using coal fly ashes have been investigated and the chemistry proven. Field testing is needed to demonstrate value. Conduct optimization of mix design with alkali and fly ash materials with the local borrow sources in a Fairbank area laboratory.

Benefits to the State: Utilize a waste product to improve poor quality local embankment material. This project results showed that this is not viable option at the time.

76307 -Dust Control Product Mix Design

Principal Investigator: David L. Barnes, Ph.D., P.E.
Funding: $144,000 (SP&R)
Project Manager: Dave Waldo
Estimated Completion Date: December 2018

Develop a test method which will aid in the selection of palliatives, establish the mix design for site specific use of dust palliatives and liquid stabilizers, determine surface material requirements for their use, and recommend qualified product lists. Establish guidance for designers and a dust palliative construction specification laying out requirements and/or guidance for the various palliatives on the market, the mix design procedure, and other supportive information to support test protocols and design criteria.

Benefits to the State: A uniform lab and field testing procedure, as well as mix design procedures, will allow for widespread use of an assortment of dust palliatives and soil stabilizers for multiple transportation applications. This will ultimately reduce life cycle costs of our road system, improve road and runway safety, and improve quality of life and health for residents.

Benefits to the State: Knowing what acceptable fines content is for different materials in different settings will allow for less hauled material, saving the state money, without affecting road performance.

T2-13-15 Value of Depressed Medians on Divided Highways in Alaska

Principal Investigator: Dr. Ghulam Bahm & Dr. Osama Abaza (UAA – AUTC)
Funding: $150,000 SP&R
Project Manager: Anna Bosin, P.E.
Completion Date: December 2016

The population of Alaska is steadily increasing, especially in the city of Anchorage. As a result, traffic volume is higher, and the demand to add lanes to existing highways in order to relieve congestion is increasing. In Alaska, an expressway or freeway is a high-speed (≥ 50 mph), multilane, divided highway with partial access control. These divided highways typically utilize wide medians.

During the Alaskan winter, where snow accumulates in medians from October to April, drivers can lose control of their vehicles in slippery road conditions. Wide medians with heavy snow serve as a refuge to absorb the impact of a crash. However, in order to provide additional through lanes, cater to the needs of higher traffic, and keep traffic congestion to a minimum, these wide medians could be replaced with narrow ones which may reduce the median's ability to function as a safety cushion. These depressed wide medians also act as snow storage areas, allowing snow to be plowed on both sides of the road. Eliminating these medians will reduce the available snow storage space and require plowing all of the snow to the right, increasing the snow load to one side of the road.

The main objective of this project is to compare the benefits of depressed wide medians (vee ditch) with other types of medians (narrow medians and no snow storage) in terms of safety, operations and maintenance. This will include analysis of historical crash data along with snow storage observations and vehicle tracking observations after snowfall to evaluate non-crash reported run off the road type incidents. The researchers will compare known high speed urban arterials with narrow medians (no vee-ditches) and no snow storage and additional lanes to improve traffic flow.

Benefits to the State: The results of this research will be valuable in helping Alaska's highway designers to determining appropriate engineering alternatives to deal with increasing traffic volumes in Anchorage and the surround areas.

Photo: *The research team is compiling photos from car mounted GPS equipped video cameras to analyze runoff the road events. Photo taken on the Glenn Highway near Eklutna in December 2013 by Scott Thomas, ADOT&PF Traffic and Safety Engineer.*

63068 Optimizing Highway Patrol Investment Levels

Principal Investigator: Billy Connor (UAF – AUTC)
Funding: $100,000 SP&R
Project Manager: Anna Bosin, P.E.
Completion Date: December 2016

State crash data shows fatal crashes occur more often on rural high speed highways, and higher volume highways. The highest density of severe crashes occurs within the State's four designated Safety Corridors. There is a need to optimize highway enforcement performance levels (and in turn optimize the State's funding) so that highway travel is no longer a leading risk.

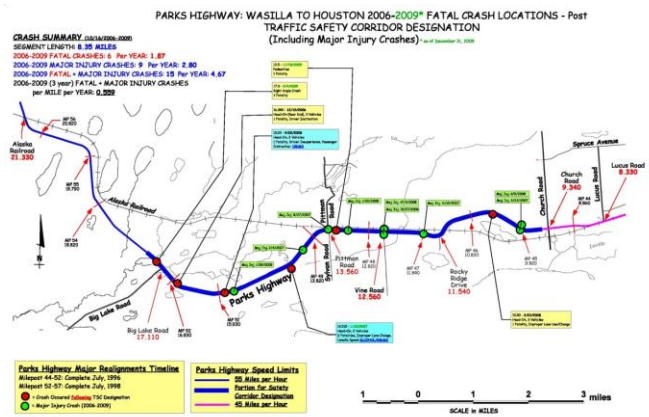
How can enforcement be directly linked to road safety when officers provide multiple duties away from roads? Reductions in citations or arrests could falsely indicate staffing reductions are possible when they may actually be needed to continue the trend.

This research project will focus on documenting the benefits of enforcement presence and the costs associated with enforcement presence on some of the higher risk road segments in Alaska. The study is expected to include the use of GPS based automated tracking technologies to quantify the presence of enforcement patrol vehicles in the Matanuska-Susitna area safety corridors. The study will develop a benefit/cost relationship for fatal and major injury crashes compared to the cost of the enforcement hours and produce a sensitivity analysis to optimize the cost vs benefit of reduced crashes.

Benefits to the State: Annual audits of the Traffic Safety Corridors emphasize the importance of increased enforcement to combat aggressive driving, DUls and speeding, but do not quantify how much additional enforcement is needed. This project's approach of tracking officer presence will provide a full picture of enforcement impacts on our highways.

Data collected could be presented graphically, comparing "hours" of police presence by year against crash experience by severity, citation, or aggressive/impairs violations. Having this information organized could reveal unrecognized correlations and permit a new level of decision-making to be applied to safety and enforcement efforts on State Highways, helping to optimize the State's investment in law enforcement

Photo: This map shows an analysis of fatal crash locations on a Parks Highway Safety Corridor, Graphic from the Alaska Highway Safety Office website
http://www.dot.alaska.gov/stwdplng/hwysafety/safety_corridors.shtml



T2-14-07 Experimental Feature: Wavetronix© Radar Traffic Detection

Principal Investigator: Sarah Schacher, P.E., Northern Region Preconstruction
Funding: $35,000 (SP&R)
Project Manager: Dave Waldo
Estimated Completion Date: December 2018

This experimental feature will test the effectiveness and constructability of Wavetronix© Radar on two major arterials (Johansen Expressway and Airport Way) in Fairbanks as compared to traditional in-ground loops and video detection currently employed at signalized intersections in Fairbanks

Wavetronix© radar is a radar based detection system for intersections that can effectively detect vehicles in weather conditions that can cause problems for typical video based detection systems. Because the detection uses radar and not light, like video detection, environmental factors like low light, shadows, and heavy ice fog don't have as pronounced of an effect on the system capability to detect vehicles.

The product was successfully installed at eight intersections on Airport Way in Fairbanks. Post Construction report was submitted to FHWA Jan 2015. To date there is a noticeable decrease in false calls due to environmental factors and the accuracy of detection has improved for all intersections, translating to improved cycle times in all directions. Year 1 report is due Jan 2016.

Devices were installed in the last four intersections on the Johansen Expressway in the fall of 2015, and will be monitored over the winter. A post construction report is due Jan 2016.

Benefits to the State: If the Wavetronix© system proves to be effective, it could replace in-ground loops and video detection for signal systems in Alaska. This is expected to provide significant maintenance cost savings and reduced impacts to the traveling public due to malfunction during commonly occurring weather

T2-14-16 Modeling Passing Lane Behavior on 2-lane Highways

This project will create design models to predict the passing risk level at a variety of configuration son two lane rural highways in Alaska. The following are two projects support the modeling effort.

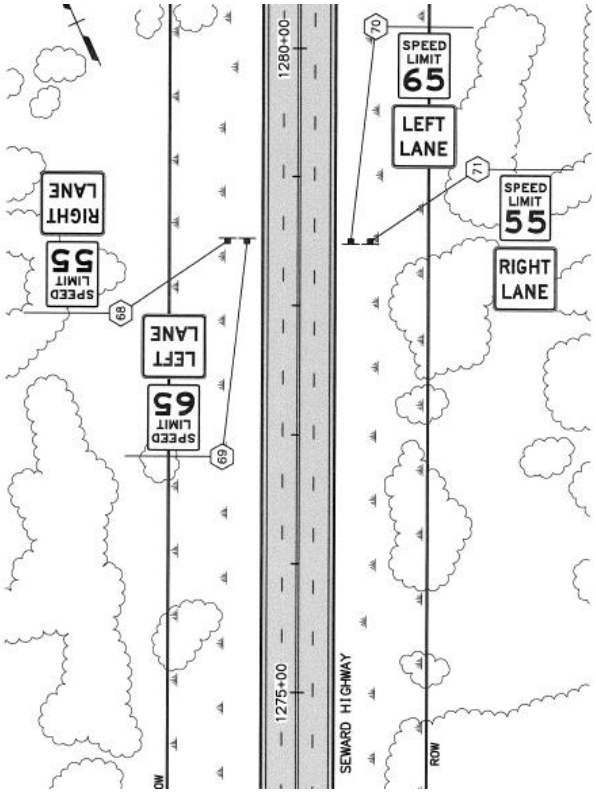
Analyzing Driver Behavior in Passing Zones with Differential Speed Limits

Principal Investigator: Ghulam Bham, Ph.D., Osama Abaza, Ph.D., (Co-PI)-UAA
Funding: $165,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion Date: June 2017

This project follows a previous AKDOT&PF funded driver simulation study that evaluated signing and striping scenarios in rural passing lanes to recommend optimal passing maneuvers. Implementation of that study's results followed by including a new signing configuration of differential speed limits for the passing lanes between MP 59-66 of the Seward Highway in the AKDOT&PF Central Region paving project during summer, 2015. This study will conduct a before/after analysis to examine the real-world effects of differential speed

limits on traffic flow characteristics, along with drivers' perception of this change.

Benefits to the State: Recommendations and a final report could help define optimal characteristics for passing lane efficiency.



Modeling Passing Zone Behavior and Sight Distance on Rural Two-Lane Highways

Principal Investigator: Billy Connor P.E. (UAF – AUTC), Nathan Belz, Ph.D. (UAF – AUTC)
Funding: $110,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion Date: December 2017

UAF researchers will conduct a driver-simulator-based study in partnership with University of Idaho to investigate passing maneuvers in two-lane rural highways under different geometric configurations and for different driver groups and for different vehicle types. Passing decisions will be modeled using data that are collected using scenarios modeled after segments of interest along the Seward Highway, Parks Highway, Glenn Highway, and Richardson Highway. Participants in the study will complete a driving simulator session and a questionnaire to further documenting the characteristics of their behavior. In addition to the driver simulator study, the researchers will use AASHTO SHRP2 naturalistic driver study data to validate the driver simulator study and model the passing maneuver based on this data.

Benefits to the State: The outcome of the project will provide the ADOT&PF's with models that can be used to predict the risk level on two-lane rural highway and may contribute to modifications to striping specifications and improved maintenance operations for rural highways in Alaska.

76293 Frequency & Potential Severity of Red Light Running in Anchorage

Principal Investigator:

Safety & Traffic

Funding: $80,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Project Completion June 2017

This study will evaluate a minimum of six intersections during fall and winter conditions. Will collect signal timing data and video at each location for analysis.

Benefits to the State: Reduce the number of crashes that occur relative to red light running

T2-14-04 Rapid Research Response FFY 2014-16

Principal Investigator: Various
Project Manager: Carolyn Morehouse, P.E.
Completion Date: Varies by project but all must be completed by December 2016

The Rapid Research Response program supports a portfolio of research projects, technology transfer, and workforce development activities to rapidly respond to opportunities to improve practices, procedures, and processes within the department as they arise and on an ad hoc basis. The account is funded through a revolving line item in the section's work program entitled "Rapid Research Response".

The research response project funds the following types of research activities:

•Generally short term, high priority research projects to provide or address urgently needed information and or problems.

•Augment existing research projects to take advantage of unforeseen opportunities where timing is of the essence. During the course of a research project, the researchers may identify a previously unforeseen opportunity or method worthy of exploration to enhance the research and provide more useful results. The "Rapid Response" funds allow timely response to such opportunities.

•Research coordination and advisory services with national, university, and other state research programs.

•Unique and timely research and technology demonstration efforts.

•Policy-related research to address the immediate needs of decision-makers.

Benefits to the State: DOT&PF can conduct research in a short period of time with quick results for immediate implementation.

Project Title	Project #	Amount	Contact
Fly Ash Mix Design	T2-14-15	$26,000	Anna Bosin, P.E.
Specialized Testing Asphalt/AKDOT&PF Asphalt Binders (AUTC/Queens University)	64006	$26,015	Anna Bosin, P.E.
Eagle Monitoring	64006	$33,000	Janelle White

4000164 Deployment FFY 2016-18

Principal Investigator: Various
Project Manager: Carolyn Morehouse, P.E.
Completion Date: Varies by project but all must be completed by December 2018

Deployment project facilitates identification and broad application of promising state and national research results. This supports efforts to get research "off the shelf" and into day to day staff to improve infrastructure and services to the State of Alaska.

Benefits to the State: DOT&PF can deploy research already completed.

Experimental Features Principal Investigator: Varies
Funding: $145,000 (Federal)
Project Manager: Carolyn Morehouse, P.E.
Completion Date: varies

The Federal Highway Administration (FHWA) Experimental Features Program encourages innovation in state highway design and construction. Experimental features incorporated into highway projects under this program are eligible for federal funding participation, which is normally limited to more proven and conventional items. Another advantage of the Program is that if an experimental feature fails for any reason, the FHWA will pay for its repair or replacement. Experimental features are often physical objects, however, can also be a new technique for using conventional materials. The RD&T2 Program maintains an account to support evaluations of Experimental Features for a time period requested by FHWA, normally 3-5 years.

Benefits to the State: DOT&PF can conduct research and evaluate experimental features during construction and monitor results.

Project Title (construction project)	Research Project #	Amount	Estimated Completion Date
Spray Applied MMA Bridge Deck Waterproofing (Rich MP 201 Phelan Cr Bridge)	64317	$29,000	Dec 31, 2018
Wavetronix Radar Detection (Johansen & Airport Way PM)	64321	$35,000	Dec 31, 2018
Polyester Concrete Approach Slabs (Parks MP 239-252)	T2-13-19	$51,000	Dec 31, 2017
Tencate Mirafi Wicking Fabric (Dalton 197-200)	T2-13-10	$30,000	Dec 31, 2016

Pooled Fund Studies FFY 2015
Principal Investigator: Varies
Funding: $179,000 (SP&R)
Completion Date: various

Benefits to the State: When significant or widespread interest is shown in solving transportation-related problems, research, planning, and technology transfer activities may be jointly funded by several federal, state, regional, and local transportation agencies, academic institutions, foundations, or private firms as a pooled fund study. The FHWA Transportation Pooled Fund (TPF) Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies. ADOT&PF participates in the following pooled fund studies. Details and status are available at http://www.pooledfund.org/.

Title	Study ID	Lead Agency	$	Project Website/ADOT&PF Technical Lead
FFY 2016 Funding using 100% SP&R funds				
Support Services for Peer Exchange (pooled fund)	TPF-5(301)	Oregon	25,000	http://www.pooledfund.org/Details/Study/301 Carolyn Morehouse
Simplified SPT Performance-Based Assessment of Liquefaction and Effects	TPF-5(296)	Utah Department of Transportation	13,000	http://www.pooledfund.org/Details/Study/538 David Hemstreet
Aurora Program	SPR-3(042)	Iowa Department of Transportation	25,000	www.pooledfund.org/Details/Study/189 Jill Sullivan
Validation of Tsunami Design Guidelines for Coastal Bridges	TPF-5(307)	Oregon Department of Transportation	25,000	www.pooledfund.org/Details/Solicitation/1332 Mike Knapp
Avalanche Research Pool	TPF-5(337)	Colorado	75,000	http://www.pooledfund.org/Details/Solicitation/1402 Jim Kennedy
Roadside Safety Research for MASH Implementation	TPF-5(343)	Washington	25,000	http://www.pooledfund.org/Details/Study/592 Jeff Jeffers
			163,000	

Title	Study ID		100% Federal $
TRB dues	TPF-5(298)	Training & Tech Transfer	110,024
NCHRP Dues ALASKA	TPF-5(415)	Training & Tech Transfer	351,999

Alaska Technology Transfer

Housed within ADOT&PF's Research Section, Technology Transfer (T2) provides support to federal, state, and local governments and other transportation personnel. We are comprised of three programs, integrated to provide a seamless training and technology transfer service.

Local Technical Assistance Program: $300,000
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. Each LTAP center adapts its program to address the unique challenges faced by the customers it serves. LTAP's primary focus is on:

- training events and programs
- newsletters and tech briefs
- library services.

National Highway Institute: $350,000
Provides transportation-related education programs to AK DOT&PF employees to help improve the quality of the state's highway system by enhancing economic growth, improving public safety and quality of life, and promoting environmental stewardship. This is accomplished by technology transfer to the planning, design, construction, and maintenance personnel working for Alaska's transportation infrastructure.

T2-13-06 Rapid Technology Transfer: $100,000
State of Alaska program designed to respond to high-value, un-programmed needs related to training and technology transfer. Funds are limited to courses, projects, programs, or equipment that will benefit the maximum number of stakeholders. Use of funds should result in cost savings, leveraging of external resources, or enhancement of partnerships. Program ends June 31, 2016.

T2 Highlights

- Completed Dust Control Field Guide for Gravel Driving Surfaces.
- Updating Training Management System to include a training plan development tool and a supervisor notification system.
- Working with regions and statewide sections to identify content for alternate delivery and just-in-time learning
- Established beta training portal by adding serval recorded web and VTC events.
- Developing on-line training program with eleven modules pertaining to gravel road design and maintenance. Partnering with UAF's Alaska TTAP - completion early 2016.
- Specialized training on gravel road inspection and maintenance planning to Fairbanks North Star Borough
- On-going management/delivery of the ATSSA and Alaska CESCL training programs.