Alaska Department of Transportation & Public Facilities

Research Development & Technology Transfer
2023 & 2024 Research Projects

Anna Bosin, P.E.
Research Program Manager

Research Development & Technology Transfer (RD&T2)

Mission – Projects that can be implemented and continuously improve our infrastructure and procedures

- Research (Universities, consultants, in-house, pooled funds, UTCs)
- T2- Training (managed by Cina Fisher in ANC)
- Manage Innovation-STIC & EDC
- TRB & AASHTO

I have an idea!

Goals: Support DOT &PF through research, training & technical assistance. Facilitate Implementation of research

RD&T2 Staff

- Mike San Angelo, Chief-Anchorage
  - Anna Bosin, Research Program Manager-Anchorage
    - Vacant, Research Engineer-Fairbanks
    - Shane Moller, Research Engineer-Juneau
    - Cina Fisher, LTAP Program Coordinator- Anchorage
      - Grace Allers, Training Specialist I-Fairbanks

  Research, Development & Technology Transfer Homepage

  http://dot.alaska.gov/stwddes/research/index.shtml

  http://list.state.ak.us/mailman/listinfo/dot-research-notification

RD Mission & Money

$$ STIP line annually-$<mark>2.9M FFY23</mark>

    -Mandatory National Dues- ~500K

    -Pooled Funds~200K

    -Rapid Research ~100K

    -Administration ~150K

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*~$5M = "big" research projects

Previous FAST Act moneys included

Mission: Projects that can be implementable and continuously improve our infrastructure

2020-2023 Alaska Statewide Transportation Improvement Program
2020-2023 Amendment 3; Approved November 23, 2021

Need ID: 6451
Title: Statewide Research Program
Region: Headquarters
Place Name: Statewide

Project Description: Federally funded research projects are selected by the Statewide Research Board to improve the quality and efficiency of Alaska's Transportation network. Example: Improve pavement materials to reduce rutting due to studded tires. This also pays for dues to other research entities that that the State of Alaska is required to participate in.

Phase	Fund	FFY20	FFY21	FFY22	FFY23
Planning & Research	RES	1,976,000	2,015,520	2,055,832	2,096,948
Planning & Research	SM	494,000	503,880	513,958	524,237
	Totals:	2,470,000	2,519,400	2,569,790	2,621,185

What is Research?

- Applied Research- Solves a DOT&PF highway transportation problem, improves efficiency, evaluates an innovation, or improves policies and operations.

- Hire experts to complete research:
  - Universities
  - University Transportation Centers (UTC)
  - Consultants
  - In-House

- **What research *isn't*:**
  - Updating department manuals
  - Routine software licenses, database management
  - Proprietary technology purchasing
  - Construction nor maintenance
  - Equipment purchases

❖Individual Projects
- ▪ <mark>Bigger, multi-year projects</mark>.

❖Rapid Research
- ▪ Lit review, lab testing, field testing, etc.

❖Experimental Features
- ▪ Tied to a construction project. Pays for monitoring.
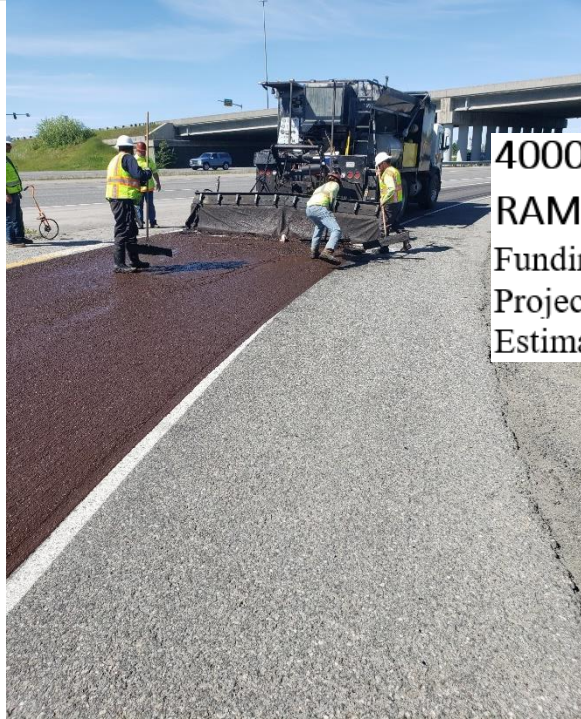
❖Deployment
- ▪ <mark>Outreach</mark>, <mark>trainings</mark>, <mark>implementation</mark>, peer-exchange, bringing experts/national research to AK

- <mark>Innovation</mark>: State Transportation Innovation Council, Every Day Counts Initiatives

Some Active Research Projects

4000181 EXPERIMENTAL FEATURE MINNESOTA DRIVE
RAMP MICROSURFACING MONITORING
Funding: $125,000
Project Manager: Drew Pavey (SP&R)
Estimated Completion: December 2022

000S936 MINI ROAD WEATHER INFORMATION
SYSTEMS PILOT PROJECT
Principal Investigator: Billy Connor
Funding: $112,484 (SP&R)
Project Manager: Erin Anderson
Estimated Completion Date: March 2022

4000197 LOW TEMPERATURE PERFORMANCE
FRICTION PENDULUM BEARING INUDATED WITH ICE
Principal Investigator: Keri Ryan (UNR)
Funding: $300,000 (SP&R)
Project Manager: Anna Bosin
Completion Date: December 2022
Closure Date: June 2024

Process for "Big" Research Projects

- RAB meeting at end of September-set goals
- Research Open House to discuss ideas was held virtually in November, 2021.
- Solicited Research Needs over winter
- RNS were due March 1st. Reviewed and compiled for this meeting
- RAB meeting May 5th reviewed project score and recommendations
- RAB followed by FHWA approved 2-year work plan
- October 1, 2022 projects start for FFY23

Need Statement Summary

Category	# Need Statements
Administration & Policy	4
Bridges & Structures	11
Design	2
Survey	3
Hydraulics & Hydrology	1
Materials	3
Experimental Feature	1
Maintenance & Operations	1
Traffic & Safety	2
Innovation	3+1*
Environmental	1

Total 32

Integrity · Excellence · Respect

Research Projects Selected for FFY23

All the projects are funded by 80% Federal (SP&R-B) and 20% State match for the combined totals shown. All projects are total project costs. Completion dates and durations are estimates.

Title	Champion(s)	Researcher(s)	Est. Comp. Date
Implicit Safety Benefits for Vulnerable Road Users	Matt Walker Mary McRae	Dr. Nathan Belz, UAF	1 year 11/2023
Alaska's transportation workforce detours: Maximizing training opportunities and outcomes in DOT&PF's key industries	Katherine Keith, Aaron Nickols, Cina Fisher	Katherine Keith, ISER/UAA	1 year 11/2023
Alaska Low Emission Ferries Pilot Program	Katherine Keith	Katherine Keith, SEC	6 months 5/2023
DOT&PF Image Server deployment	David Oliver Jeremey Arnold Adam Rolfe Ryan Marlow	TBD	11/2023
Remote Management of Facilities and Assets with Digital Twins Digitalization of Remote Assets (STIC)	Ryan Marlow Vine Yelmene, Troy Hicks, Jillian Nicolazzo	In-House	10/2023

Title	Champion(s)	Researcher(s)	Duration/Date
Structural Adequacy of Culverts in Poor Condition	Dr. Paul Janke, Jake Ciufo, Jeff Stutzke, Bob Trousil	Ken Karle, Hydraulic Mapping and Modeling	3 years 10/2025
Avalanche Detection and Warning System Using an Infrasound Monitoring Network along Thane Road, Juneau AK.	Pat Dryer	Pat Dryer, Snowbound Solutions	4/2023
Use of Polymer Fluids in Stabilized Base Courses	Steve Saboundjian, Jeff Currey	Billy Connor, UAF	1 year 11/2023
Hydroacoustic Down-the-Hole Drilling Noise Study	Doug Kolwaite	Illingworth & Rodkin, Inc. James Reyff	2 years 10/2024
Computer Vision Tools for Bridge Inspections and Reporting	Elmer Marx, Larry Owen and Nicholas Murray	Dr. Mostafa Tazarv, South Dakota State University	2 years 10/2024
Seismic Behavior of Hider Wing-Walls	Elmer Marx and Nick Murray	Dr. Mervyn Kowalsky, NCSU	40 months 4/2026
Weldability of Bridge Steel with Protective Coatings	Leslie Daugherty	Carolin Fink, Ohio State Univ.	2 years 10/2024
Roadway foundation cooling using structured foam layers	Mathew Billings, Jeff Currey, Steve Saboundjian	Douglas J. Goering, PhD, PE UAF	2 years 11/2024
Shake Table Tests of Grade 80 Piers	Elmer Marx and Nick Murray	Dr. Mervyn Kowalsky, NCSU	27 months 2/2025
Capacity and Acceptance Criteria of Welded Splices in Cold-Bent Reinforcing Steel	Leslie Daugherty	Carolin Fink, Ohio State	18 months 6/2024
Research Administration FFY23/24	Anna Bosin	N/A	24 months
Rapid Research & Deployment FFY23/24	Anna Bosin	Varies	24 months
Grand Total		$3,273,000	

Research Projects Selected for FFY24:

All the projects are funded by 80% Federal (SP&R-B) and 20% State match for the combined totals shown. All projects are total project costs. Completion dates are estimates.

Title	Champion	Researcher(s)	Est. Comp. Date
Alaska DOT&PF Equity Sample Review of Programming and Policies	Rashaud Joseph, Judy Chapman, James Marks	TBD	18 months 6/2026
Evaluation of Low Earth Orbit Broadband	Vince Yelmene Ryan Marlow	TBD	15 months 3/2026
Alaska DOT&PF Human Trafficking Data Collection and Strategic Recommendations	Troy LaRue, Dylan Blankenship, John Clendenin	TBD	18 months 6/2026
Alaska Transportation Systems Management & Operations Strategic Plan	Pam Golden	TBD	9 months 8/2025
Innovation Corridors	Anna Bosin	TBD	3 years 10/27
Statewide GNSS Network	Travis Test, Troy Hicks, Hans Pederson	TBD	5/2025
Estimating inelastic displacement demands for bridges under seismic forces	Elmer Marx, Nick Murray	Dr. Mervyn Kowalsky, NCSU	42 months 4/2028
Analysis of existing aufeis data near bridge embankments collected by airborne surveys	Mike Knapp	Horacio Toniolo, UAF	2 years 10/26
Decked Bulb Tee Girder – Loss of pre-stress validation	Elmer Marx, Nick Murray, Douglas Gelineau	Dr. Andrew Metzger and Billy Connor, UAF	12/2025
Next Generation of Reinforced Concrete Structure: Electric Energy Storing, Self-Sensing Reinforced Concrete Elements	Elmer Marx	Dr. Mohammad Pour-Ghaz, NCSU	42 months 4/2028

DOT&PF Work Plan FFY 2023-24

Camera Based Computer Vision Measurements for Bridge Field Testing	Elmer Marx, Larry Owen and Nicholas Murray	Dr. Mostafa Tazarv, South Dakota State University	2 years 11/2026
AI Tools for Rapid Post-Earthquake Damage Assessment of Bridges with Standard and Substandard Columns	Elmer Marx and Nick Murray	Dr. Mostafa Tazarv, South Dakota State University	2 years 11/2026
Seismic Detailing of Steel H-Pile Connections	Elmer Marx and Nick Murray	Dr. Mervyn Kowalsky, CSU	42 months 4/2028
Improved modeling for ACE and ventilated shoulder design	Mathew Billings, Jeff Currey, Steve Saboundjian	Douglas J. Goering, UAF	1 year 11/2025
Grand Total		$2,765,000	

TBD – To be determined. No identified person/institution at this time.

STIC in Alaska

STIC Co-Chairs:
Ryan Anderson-Alaska DOT&PF Commissioner
Sandra Garcia-Aline - FHWA Division Administrator
https://www.fhwa.dot.gov/innovation/stic/
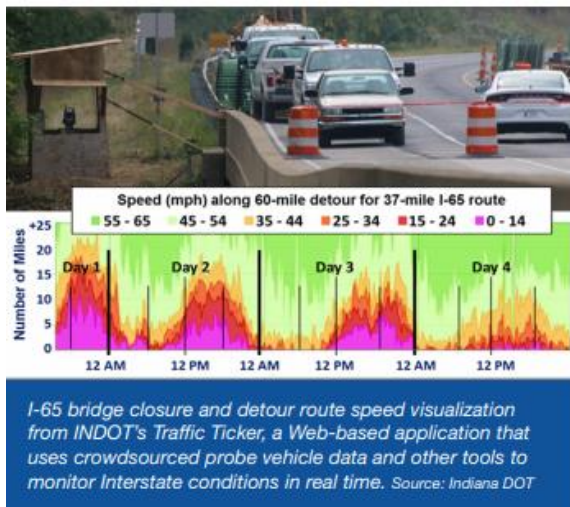
Plow Route Navigation App
2022 STIC Project Selected - Congratulations NR M&O!

Navigator
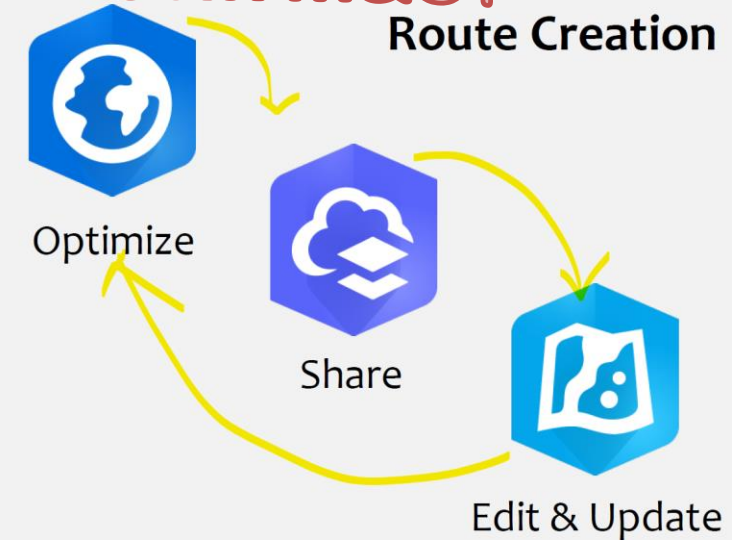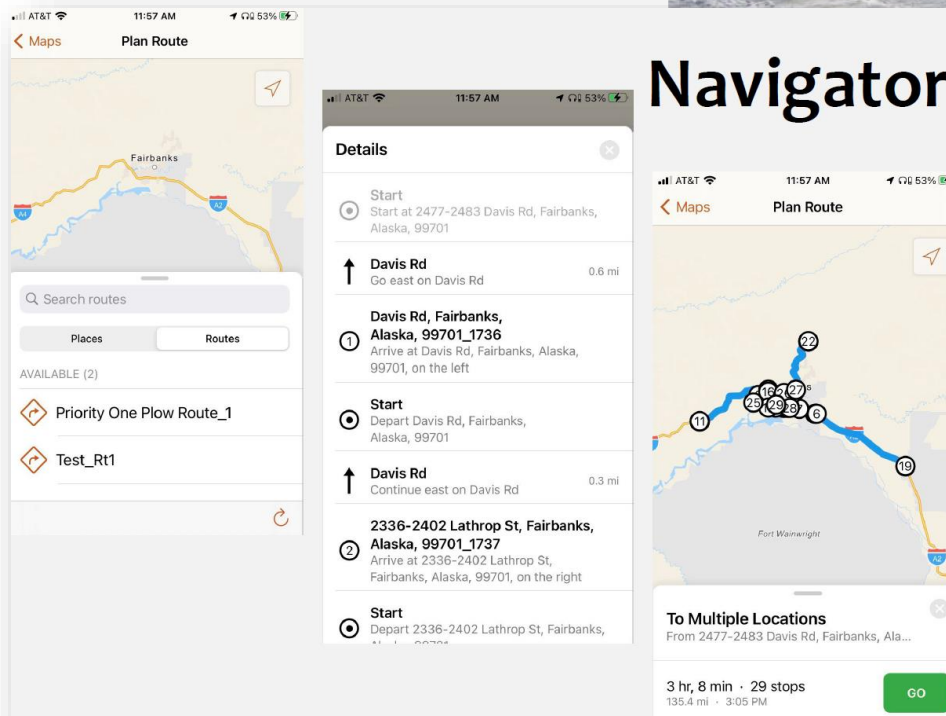
✓ Safety
✓ Optimize
✓ Faster onboarding
✓ Collaboration

Route Creation

Optimize

Share

Edit & Update

FHWA Every Day Counts

Traffic Incident — **Traffic Operation Center** — **Real-time Driver Data**

Speed (mph) along 60-mile detour for 37-mile I-65 route
55 - 65   45 - 54   35 - 44   25 - 34   15 - 24   0 - 14

I-65 bridge closure and detour route speed visualization from INDOT's Traffic Ticker, a Web-based application that uses crowdsourced probe vehicle data and other tools to monitor Interstate conditions in real time. Source: Indiana DOT

https://www.fhwa.dot.gov/innovation/everydaycounts/about-edc.cfm

EDC-6 Innovations (2021-2022)

Crowdsourcing for Advancing Operations

Crowdsourced data can be obtained whenever and wherever people travel, allowing agencies to capture in real time what happens between sensors, in rural regions, along arterials, and beyond jurisdictional boundaries. Agencies at all levels can use crowdsourced data integrated from multiple streams to optimize roadway use for reduced congestion and increased safety and reliability.

e-Ticketing and Digital As-Builts

Converting paper-based materials ticketing systems and as-built plans into electronic (e-Ticketing) workflows and digital as-builts enhances the accessibility of highway project data. e-Ticketing improves the tracking, exchange, and archiving of materials tickets. Digital information, such as 3D design models and other metadata, enhances the future usability of as-built plans for operations, maintenance, and asset management.

Next-Generation TIM: Integrating Technology, Data, and Training

Traffic Incident Management (TIM) programs aim to shorten the duration and impact of roadway incidents and improve the safety of motorists, crash victims, and responders. New tools, data, and training mechanisms are available that can benefit both new and existing TIM programs, including local agency and off-interstate applications.

Strategic Workforce Development

The demand for highway construction, maintenance, and operations workers is growing, while at the same time, emerging technologies require these workers to have new skills. The Highway Construction Workforce Partnership has developed new resources and innovative strategies for identifying, training, and placing individuals in the Contractors' workforce filling the construction jobs that support the Nation's highway system.

Targeted Overlay Pavement Solutions (TOPS)

Pavement overlays represent a significant portion of highway infrastructure dollars. State and local highway agencies can maximize this investment and help ensure safer, longer-lasting roadways by employing innovative overlay procedures that will improve pavement performance, lessen traffic impacts, and reduce the cost of pavement ownership.

UHPC for Bridge Preservation and Repair

Ultra-high performance concrete (UHPC) is a new material for bridge construction that has become popular for field-cast connections between prefabricated bridge elements. Bridge preservation and repair is an emerging and promising application for UHPC. UHPC-based repair solutions are robust, and offer superior strength, durability, and improved life-cycle cost over traditional methods. State and local agencies can deploy UHPC for bridge preservation and repair to maintain or improve bridge conditions.

Virtual Public Involvement (VPI)

Public engagement during transportation project planning and development helps agencies identify issues and concerns early in the process, which can ultimately accelerate delivery. Virtual public involvement strategies supplement traditional face-to-face information sharing with technology platforms that increase the number and variety of methods agencies use to inform the public, receive feedback, and collect and consider comments.
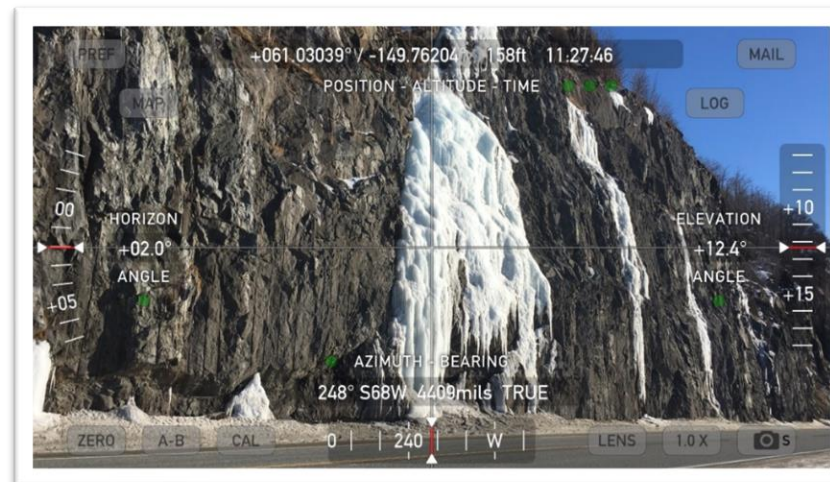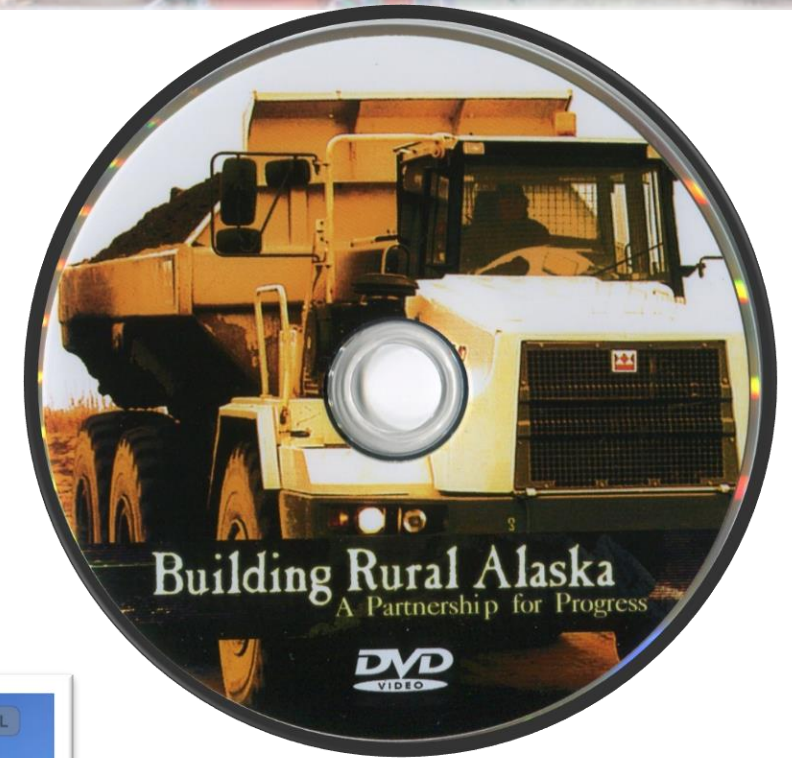
Implementation...via TRAINING!
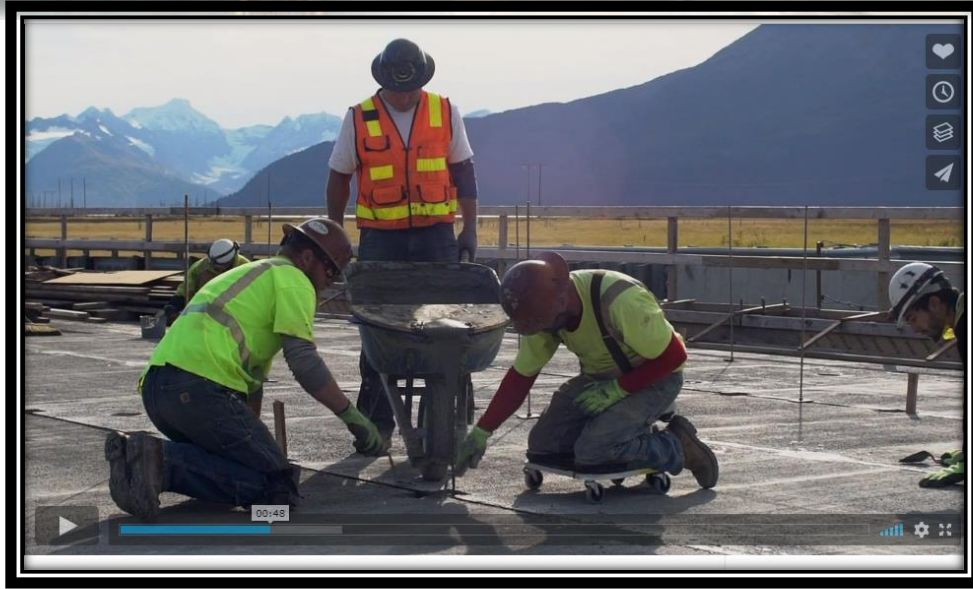
Deployment: Grout training video from UAF
https://vimeo.com/476024991

Local Technical Assistance Program

WHO?

- ==Cities, Counties/Boroughs, Tribes, Contractors== who work for these local agencies.
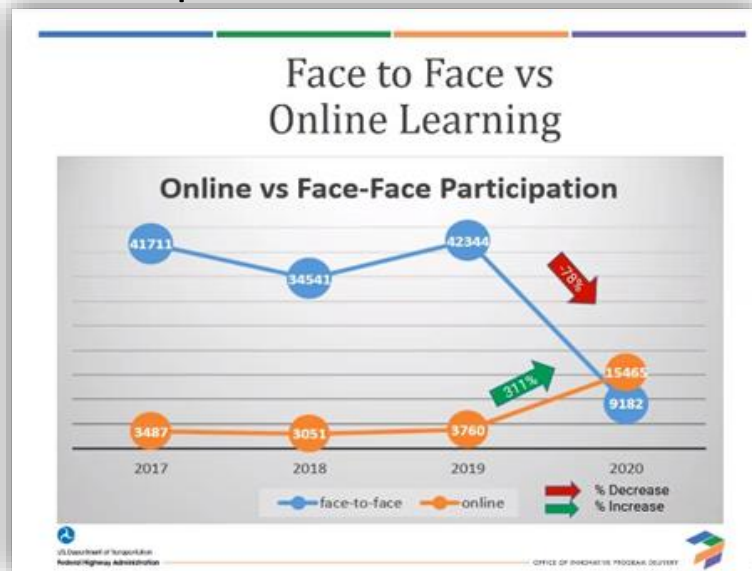
WHAT?

- Roadway related Training, connections, resources

WHY?

- Our Transportation Partners! Connects all Alaskans who maintain our transportation network

Heavy Equipment Grader Operator Training

QUESTIONS?