# ENABLING DATA-DRIVEN TRANSPORTATION SAFETY IMPROVEMENTS IN RURAL ALASKA

**FINAL PROJECT REPORT**
**September 30, 2019**

**by**

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**for**

rural · isolated · tribal · indigenous

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**16. Abstract**

Safety improvements require funding. A clear need must be demonstrated to secure funding. For transportation safety, data, especially data about past crashes, is the usual method of demonstrating need. However, in rural locations, such data is often not available, or is not in a form amenable to use in funding applications. This research aids rural entities, often federally recognized tribes and small villages acquire data needed for funding applications. Two aspects of work product are the development of a traffic counting application for an iPad or similar device, and a review of the data requirements of the major transportation funding agencies. The traffic-counting app, UAF Traffic, demonstrated its ability to count traffic and turning movements for cars and trucks, as well as ATVs, snow machines, pedestrians, bicycles, and dog sleds. The review of the major agencies demonstrated that all the likely funders would accept qualitative data and Road Safety Audits. However, quantitative data, if it was available, was helpful.

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# SI* (MODERN METRIC) CONVERSION FACTORS

## APPROXIMATE CONVERSIONS TO SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| **LENGTH** | | | | |
| in | inches | 25.4 | millimeters | mm |
| ft | feet | 0.305 | meters | m |
| yd | yards | 0.914 | meters | m |
| mi | miles | 1.61 | kilometers | km |
| **AREA** | | | | |
| $in^2$ | square inches | 645.2 | square millimeters | $mm^2$ |
| $ft^2$ | square feet | 0.093 | square meters | $m^2$ |
| $yd^2$ | square yard | 0.836 | square meters | $m^2$ |
| ac | acres | 0.405 | hectares | ha |
| $mi^2$ | square miles | 2.59 | square kilometers | $km^2$ |
| **VOLUME** | | | | |
| fl oz | fluid ounces | 29.57 | milliliters | mL |
| gal | gallons | 3.785 | liters | L |
| $ft^3$ | cubic feet | 0.028 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.765 | cubic meters | $m^3$ |
| | NOTE: volumes greater than 1000 L shall be shown in $m^3$ | | | |
| **MASS** | | | | |
| oz | ounces | 28.35 | grams | g |
| lb | pounds | 0.454 | kilograms | kg |
| T | short tons (2000 lb) | 0.907 | megagrams (or "metric ton") | Mg (or "t") |
| **TEMPERATURE (exact degrees)** | | | | |
| °F | Fahrenheit | 5 (F-32)/9 or (F-32)/1.8 | Celsius | °C |
| **ILLUMINATION** | | | | |
| fc | foot-candles | 10.76 | lux | lx |
| fl | foot-Lamberts | 3.426 | candela/$m^2$ | cd/$m^2$ |
| **FORCE and PRESSURE or STRESS** | | | | |
| lbf | poundforce | 4.45 | newtons | N |
| $lbf/in^2$ | poundforce per square inch | 6.89 | kilopascals | kPa |

## APPROXIMATE CONVERSIONS FROM SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| **LENGTH** | | | | |
| mm | millimeters | 0.039 | inches | in |
| m | meters | 3.28 | feet | ft |
| m | meters | 1.09 | yards | yd |
| km | kilometers | 0.621 | miles | mi |
| **AREA** | | | | |
| $mm^2$ | square millimeters | 0.0016 | square inches | $in^2$ |
| $m^2$ | square meters | 10.764 | square feet | $ft^2$ |
| $m^2$ | square meters | 1.195 | square yards | $yd^2$ |
| ha | hectares | 2.47 | acres | ac |
| $km^2$ | square kilometers | 0.386 | square miles | $mi^2$ |
| **VOLUME** | | | | |
| mL | milliliters | 0.034 | fluid ounces | fl oz |
| L | liters | 0.264 | gallons | gal |
| $m^3$ | cubic meters | 35.314 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.307 | cubic yards | $yd^3$ |
| **MASS** | | | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.202 | pounds | lb |
| Mg (or "t") | megagrams (or "metric ton") | 1.103 | short tons (2000 lb) | T |
| **TEMPERATURE (exact degrees)** | | | | |
| °C | Celsius | 1.8C+32 | Fahrenheit | °F |
| **ILLUMINATION** | | | | |
| lx | lux | 0.0929 | foot-candles | fc |
| cd/$m^2$ | candela/$m^2$ | 0.2919 | foot-Lamberts | fl |
| **FORCE and PRESSURE or STRESS** | | | | |
| N | newtons | 0.225 | poundforce | lbf |
| kPa | kilopascals | 0.145 | poundforce per square inch | $lbf/in^2$ |

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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# EXECUTIVE SUMMARY

Safety improvements require funding.  A clear need must be demonstrated to secure funding.  For transportation safety, data, especially data about past crashes, is the usual method of demonstrating need.  However, in rural locations, such data is often not available, or is not in a form amenable to use in funding applications. This research aids rural entities, often federally recognized tribes and small villages acquire data needed for funding applications.

In the United States, rural areas account for 20% of the US population but 50% of road fatalities. Federally recognized tribes and indigenous populations often inhabit rural areas.  There are many sources of funding to improve the roads and other transportation infrastructure in the rural US.  Some of this funding targets recognized tribes.  However, all funding requires the establishment of a need and proposed solutions that ameliorate that need.  The standard algorithm for establishing need is to use crash data from the current situation, calculate how much that situation would be improved with some improvement to the infrastructure, estimate the cost of the various improvements, then use a benefit/cost analysis to choose the best.  For many rural areas in Alaska, there is little crash data; further, many crashes involve modes other than cars and trucks, such as snow machines and ATVs.  In addition, many crashes and other accidents occur on trails and unimproved roads.

This project, *Enabling Data-Driven Transportation Safety Improvements in Rural Alaska*, funded by the Center for Safety Equity in Transportation (CSET), was granted to improve the funding opportunities of rural Alaska entities.   Two aspects of the work product are the development of a traffic counting application for an iPad or similar device, and a review of the data requirements of the major transportation funding agencies.  The traffic-counting app, UAF Traffic, demonstrated its ability to count traffic and turning movements for cars and trucks, as well as ATVs, snow machines, pedestrians, bicycles, and dog sleds.   The review of the major agencies demonstrated that all the likely funders would accept qualitative data and Road Safety Audits.  However, quantitative data, if it was available was helpful. An Expert Task Group of four experts in rural Alaska transportation aided the project researchers.

The app, UAF Traffic, was developed to obtain traffic counts for all types of conveyances in rural Alaska, as well as monitoring turning movements.  The app is designed to work on an iPad or similar device. The final product supports non-traditional vehicles common in Alaska, allows data collection on up to five vehicles at a time, and can handle 2-, 3-, and 4- way traffic intersections. Its ease-of-use supports future STEM/STEAM education efforts.  The design effort was successful, and the complete app is ready for field-testing in a rural setting

Examining the data requirements of agencies required review of plausible funders, then closer examination of 12 agencies or programs by phone and email interviews with agencies and clients and by detailed Internet research.  This task was integrated with an earlier task of examining Road Safety Audits (RSAs) as a means for satisfying agencies' requirements for verification of need.  We learned that RSAs provide a formal outline of one method of obtaining qualitative data, but similar processes are often acceptable.  Table 4-1 of the report summarizes the 12 funding sources, and details of each are provided in Appendix B.  Of these, 11 fund some safety-related projects.  The requirements for data are varied, but most do not require crash data such as the DMV crash data on which most highway projects are based. For example, we have summarized the data requirements for three agencies shown in Table 4-1 as:

1. Must demonstrate that safety will be improved; no specific requirements.
2. Crash and traffic data is expected, in order to provide B/C analysis, although RSA information can be used to show potential safety benefits of a proposed project.
3. Not required. Many requests include crash data, especially fatalities. Some reference data in RSA's. Safety criterion asks for information on how project will reduce accidents.

In general, our review demonstrated that more data is better, but agencies are amenable to accepting data from sources other than DMV crash data. Data sources include:

- Accident and traffic data at the Division of Motor Vehicles and Department of Transportation and Public Facilities
- Alaska Trauma Registry
- Alaska Highway Safety Office, both statewide, as well as some regional, statistics
- Media reports, especially in newspapers in smaller rural communities
- Local input such as planning commissions, maintenance and operations departments, and
- Testimony by individuals and groups at various local gatherings.

For many RSAs conducted in rural areas, reliable crash data are not available. Anecdotal information (e.g., from maintenance, enforcement call logs, landowners) and evidence of conflicts and crashes (e.g., skid marks and fence strikes) help to create a more complete picture of potential hazards but cannot be quantified with any certainty. In these cases, the likely frequency and severity of crashes associated with each safety issue are qualitatively estimated, based on the experience and expectations of RSA team members. Expected crash frequency can be qualitatively estimated based on exposure (how many road users would likely be exposed to the identified safety issue?) and probability (how likely was it that a collision would result from the identified issue?).

With respect to the UAF Traffic app, we can conclude that it is possible to replace or complement specific traffic counting tools for nontraditional vehicles using mobile devices. It can also give the ability for small towns and villages with no previous means to collect data to record information that can be included with requests for traffic improvement projects. We also can extend this work to create an automatic ingest feature to a centrally managed repository. We believe this capability must ensure that any organization manages their own data. We also think that small tools like these can be highly maintainable when kept reasonable in scope.

Effective traffic and accident data gathering is especially challenging in rural areas for many reasons, including frequent personnel changes, multiple responsibilities among personnel, language barriers, and lack of understanding of the importance of having such data. However, we highly recommend consulting and informing local, tribal leadership with respect to any activities undertaken in their village or region, especially in the collection and storage of any kind of data.

# CHAPTER 1.    INTRODUCTION

## 1.1.  Purpose of CSET (Center for Safety Equity in Transportation)

This project was funded by the Center for Safety Equity in Transportation, in furtherance of its mission to "to provide everyone with fair and equitable access to a safe transportation system" (Alaska University Transportation Center, 2019).  The Center's research, education and outreach emphasize "culturally sensitive safety efforts that focus on preservation of heritage" (*ibid*).  Locales that are paramount in the Center's programs are depicted as RITI: rural, isolated, tribal and indigenous.

## 1.2.  Project initiation and support

The proposal, Enabling Data-driven Transportation Safety Improvements in Rural Alaska, was approved for $60,000 of funding by the CSET Executive Committee. Work began on September 1, 2018.  The proposed research focused on the CSET Outcome:  Collecting or obtaining data that has not previously existed or been used. In addition, it focuses on understanding safety issues within a RITI context, especially in cases where there is no system or process in place to capture current safety data.

## 1.3.  Expert Task Group:

In accordance with the project's guidelines, we established an Expert Task Group.  Such an organization is an ad hoc group of subject matter experts formed to advise the researchers on the project's information sources, methods, and conclusions.  Specifically, for this project, we held three meetings, in February, July and September 2019 to:

1) Acquaint members with the project's objectives and proposed methods.
2) Solicit suggestions for funding agencies and programs that might assist in providing information on the use of data to support safety improvement funding requests.
3) Respond to interim project progress reports with advice on future directions.
4) Review the final report, especially its sections on conclusions and recommendations.

We were fortunate to gather a group of four professionals with wide experience in rural transportation and great interest in improving transportation safety in rural areas, especially in Alaska.  Our members included

Table 1-1. Expert Task Group Members

| | |
|---|---|
| Steve Becker, CEP | Senior Project Manager, Brice Environmental, San Marcos, CA |
| Pam Golden, P.E. | Northern Region Traffic & Safety Engineer, Alaska Department of Transportation and Public Facilities, Fairbanks |
| Randy Kinney, P.E. | Member, Kinney Engineering LLC, Anchorage and Fairbanks |
| Adison Spafford | Director of Planning and Community Development, Red Plains Professional, Inc., Anchorage |

## 1.4.  Main objectives

The project worked towards four primary objectives, as follows:

1. Assist rural entities in obtaining funding for transportation safety improvements and funding agencies in making informed, justifiable, and equitable decisions regarding funding.
2. Develop an app for obtaining traffic volumes for rural locations that includes provision for counting non-highway vehicles.
3. Review and summarize information about all likely funders and their data requirements.
4. Identify commonly used data requirements that do not include numerical crash statistics.

# CHAPTER 2.    BACKGROUND

In the United States, rural areas account for 20% of the US population but 50% of road fatalities.  The CSET consortium states (Alaska, Hawaii, Washington, and Idaho) also account for 59% of federally recognized tribes and indigenous populations, most of which inhabit rural areas.  There are many sources of funding to improve the roads and other transportation infrastructure in the rural US.  Some of this funding targets recognized tribes.  However, all funding requires the establishment of a need and proposed solutions that ameliorate that need.

In traditional highway funding, the need and the costs of the safety improvements are calculated based on available data about traffic volume, crashes, and accidents.  Procedures for acquiring crash data and calculating the costs and benefits of safety improvements are formalized and required for most highway funding.  For example, in Alaska, the Department of Motor Vehicles (DMV) accumulates data about crashes; the data are transferred to the Alaska Department of Transportation and Public Facilities (ADOT&PF); the ADOT&PF's engineers calculate Safety Performance Functions (SPF) -- of intersections for example. Then, Crash Modification Factors (CMFs) are applied for each of several possible countermeasures, and those are inserted into a cost benefit analysis to determine the feasibility of each safety improvement.

In urban US, there exists a robust set of crash and safety data for highways and roadways. Likewise, in the populous areas of Alaska, the funding process becomes routine. In rural areas, however, the data are much less robust.  For example, in rural areas, the use of non-highway modes of transportation such as all-terrain vehicles (ATV's) and snow machines is quite common.  Little or no data exists on the extent and frequency of use (i.e., traffic counts) of these mode types, or in many cases, of even cars and trucks.

In these rural settings, the volume of traffic needed to produce an average annual daily traffic (AADT), a very fundamental parameter for SPF and CMF, is often unknown and difficult to obtain, as well as inherently more complex, due to the variety of vehicle types used in bush transportation. The limited roads are integral with trail systems as well as air and water transport systems.  The crash data for an ATV accident on a trail may not belong in the DMV database, and the law enforcement and community administrative functions might focus on emergency care and search and rescue, paying little attention to crash-report paperwork.

While the definition of "rural" might vary with the region, in Alaska there is a definite divide between regions "on the highway system," such as Fairbanks, "rural hubs," such as Nome, and "bush communities." Bush communities may have several hundred residents or far fewer.   Hubs are remote, but they have asphalt runways, local asphalt roads, short highway systems, and uniformed local police, and thus are not "isolated." All the bush communities are truly "isolated," although the degree of isolation varies.

While the general nature of the safety issues involved in crashes in these isolated communities may be well known, this qualitative knowledge cannot be utilized directly in the quantitative analysis required to fund transportation safety improvements.  In a recent research project (Belz, et al., 2018), we compared accident-reporting data from the DMV database, the State of Alaska Trauma Registry, and local newspapers for two smaller communities that are rural hubs.  Even in these rural hubs, we found discrepancies in the data from these three sources.

Funding is sometimes available for safety improvements in rural areas, but this funding is tied to quantified accident experience records.  For example, the federally funded Highway Safety Improvement Program (HSIP) requires funding set aside for High Risk Rural Roads (HRRR) (USDOT Federal Highway Administration, 2018).  A HRRR could meet a standard functional definition, such as "collector," but such definitions would be hard to apply in the Alaska bush communities.  The federal law allows an HRRR to be a rural local road with significant safety risks, and then allows the state to define those risks in the state strategic highway safety plan (SHSP).  Alaska's SHSP then identifies, as eligible for funding:

> "A rural local road which ranks in the top 10 percent by rate of fatal plus major injury crashes per mile. Rate is measured using an average of 5 years crash data over the length of the functional class segment, with crashes at crossings and entering route intersections excluded when those crashes are not attributed to the HRRR." (AKDOT&PF, 2018)

Thus, funding might be available to small remote villages via the HRRR portion of the HSIP, but in order to secure the funding, five years of crash data would be required.  Such data is not often available in rural areas, and it would need to include snow machine and ATV crash data as well. Note that the DMV crash data should report a crash between an ATV and vehicle on a highway, but not if the ATV crash was off the highway.

Other agencies and programs might fund safety improvements to bush transportation; for example, the Federal Lands Highways program (FLH), especially the Western Region of that program, has some funding available to support rural projects.  Their mission:

> "FLH is enabled and entrusted to administer many different programs and types of funds to facilitate transportation improvements for the many Federal Land Management Agency Partners such as: the National Park Service (NPS); USDA Forest Service (Forest Service); U.S. Fish and Wildlife Service (USFWS); Bureau of Indian Affairs (BIA) and Tribal Governments; Bureau of Land Management (BLM); Department of Defense (DOD); U.S. Army Corps of Engineers (USACE); and the Bureau of Reclamation (BOR)." (USDOT FHWA Office of Federal Lands Highway, 2018)

Note that "federally-recognized tribes" inhabit many remote Alaska communities. While the funding requirements would vary with the agency, all would require some basic data to support their proposed projects.  The FHWA's Tribal Technical Assistance Program (TTAP) is another possibility for safety funding and support.

What are the data requirements for funding by these agencies?  Are there other funding agencies and what are their data requirements?  Indeed, many agencies might fund a transportation safety improvement in rural Alaska.  In the body of this report, we summarize and review those agencies. Next, we consider the data sources.

Above we mention the DMV database.  Accident data are reported by police or other responders, in some cases the drivers, and stored at the DMV.  The ADOT&PF can extract that data, clean it, and use it in the formal analysis mentioned above.  However, what are some other data sources?

We also mention the Alaska Trauma Registry and local newspapers in rural regions.  The National Highway Traffic Safety Administration has State Traffic Safety Information (STSI) with information for Alaska that separates urban and rural data. The Bureau of Transportation Statistics within the federal

DOT has Vehicle Miles Traveled for each state, by urban, suburban, and rural.  The Federal Motor Carrier Safety Administration has data on trucks and large vehicles.  The Center for Disease Control in the Public Health Service has a database of fatal injuries.   Alaska itself has relevant data, for example citation and court records.  While there are many data sources "out there," it would be rare for data to apply to a particular unsafe road or transportation.  So, relevant data to the issue is needed.

Average annual daily traffic (AADT) is a fundamental parameter in all the safety algorithms. There is little AADT data available in rural Alaska – especially in the smaller villages. A hand-held application that provides a low-cost counting technique, carefully deployed, would gain better data on all modes of transportation use. As an example, simple car counting applications on an iPad could be used and efficiently transferred to UAF researchers in real-time. A future use case could enable end users to utilize their own database to capture data for later analysis and use to seek safety improvement funding or other data-oriented community enhancements. Besides supporting funding requests, this information can be used in the classroom as an applied exercise in traffic engineering.  A functional device might gather the data, which would be timestamped and list the vehicle type, incoming intersection direction, and outgoing intersection direction. The user would record data by graphically dragging and dropping icons of vehicles in the direction they are traveling.

Collecting rural data has many difficulties.  There are changes in administration – tribal administration staff changes constantly and many do not have a good filing or documentation system in place. There are often language barriers.  Often one person must do too many jobs.  Often the tribal administrator is acting as the Tribal Transportation Coordinator, when in addition that administrator is also responsible for training, health care, village safety, police officers, and many other programs being administered by a tribe.  The state is required to spend funding on National Highway System (NHS), the largest program, leaving little funding for rural projects. Tribal administrators often lack understanding of the importance of collecting and reporting crash data (Spafford, email communication, 2018).

The Road Safety Audits (RSA) process provides a method of identifying safety projects without a suite of historical crash data. Road Safety Audits (RSAs) are a valuable tool for evaluating road safety issues and for identifying improvement opportunities. The Federal Highway Administration (FHWA) defines an RSA as a "formal safety performance evaluation of an existing or future road or intersection by an independent, multidisciplinary team" (FHWA, 2014). A qualified audit team will have a clear understanding of safety issues arising from the design -- and the interaction of road users with the design -- and will be able to predict accurately where crashes have the potential to occur independent of the availability of any crash data.

The key concept is that RSAs are proactive, compared with a reactive approach to road safety based mainly on the analysis of existing crash data.  A reactive approach to road safety is associated with the identification of locations experiencing safety problems (screening), problem definition (diagnosis), and the identification and implementation of countermeasures (cure).  A proactive approach to road safety is associated with the prevention of safety problems before they manifest themselves in the form of a pattern of crash occurrence (USDOT Federal Highway Administration, 2006).

RSAs examine these conditions in detail by pulling together a multidisciplinary team that looks at the issues from different perspectives – perspectives that are often not a part of a traditional safety review (*ibid*). The audit is essentially qualitative, and it is broad enough to consider the safety of all road users of the facility.

Typically, the facility or project owner identifies the location(s) to be reviewed during the RSA.  In addition to vehicular traffic safety issues, RSAs can also be oriented to specific user groups such as pedestrians and bicyclists. The RSA would still consider all potential users, but may have a particular consideration for the needs of a specific group.  Common factors leading to RSA requests for existing roads include high crash frequencies, high-profile crash types or the wielding of political influence, and significant changes in traffic characteristics (current or expected).

This research report addresses the following contradiction:  While the RSA is essentially a qualitative process – the experts review the location and provide an evaluation – the experts do receive what data is available.  For example, from the Toolkit (*ibid*):

> "[The owner should] Communicate any other matters of importance to the RSA team. If possible, the owner and/or design team should provide data describing the existing and planned conditions (if applicable) as well as the existing safety performance (e.g., crash records/data, traffic volumes, etc.)."

Thus, quantitative data, if available, are input into the audit team's investigation, but the team is not strictly bound to limit its conclusions to that data.  Thus, what data are available is important to the RSA via two routes: 1) in the initial assessment of the need for an RSA, and 2) in the preliminary work-up to the field RSA.

Nevertheless, what data might the RSA team acquire, or might the eventual funder require, especially in rural areas where reliable crash data are not available? The following from (USDOT FHWA Plan Toolkit, 2019)  is insightful:

> "Anecdotal information (e.g., from maintenance, enforcement call logs, land owners) and evidence of conflicts and crashes (e.g., skid marks and fence strikes) help to create a more complete picture of potential hazards, but cannot be quantified with any certainty. In these cases, the likely frequency and severity of crashes associated with each safety issue are qualitatively estimated, based on the experience and expectations of RSA team members. Expected crash frequency can be qualitatively estimated on the basis of exposure (how many road users would likely be exposed to the identified safety issue?) and probability (how likely was it that a collision would result from the identified issue?). Expected crash severity can be qualitatively estimated on the basis of factors such as anticipated speeds, expected collision types, and the likelihood that vulnerable road users would be exposed. These two risk elements (frequency and severity) are then combined to obtain a qualitative risk assessment."

However, note that while this discussion indicates the data are "qualitative," it nonetheless asks for "estimates" and "expected" factors.  Thus, the more quantitative data the RSA Auditor has, the more reliable these estimates are likely to be.

The following chapter set forth the methods used in this study to respond to some of the situations and concerns outlined above.

# CHAPTER 3.    METHODS

## 3.1.  UAF Traffic App and Back-end Development

UAF Traffic is a traffic-counting app for Apple iOS devices. Figure 3-1 shows the app counting screen where the user can drag and drop icons from the originating traffic junction to the target traffic junction.
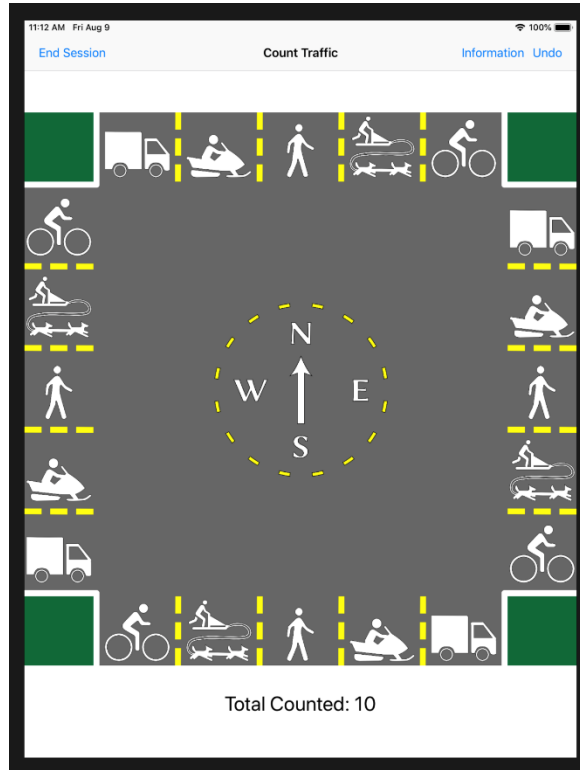


Figure 3-1. UAF Traffic App Screenshot.

### 3.1.1.    Development Process

We utilized the Agile development methodology (Beck, et al., 2001) to represent the guiding principles behind the design of this software. We used a Kanban board (Wikipedia Contributors, 2019) as the project management methodology for all tasks. A Kanban board allows all the requirements of the software to be divided into cards that become the *product backlog*. The cards get put into several columns. The first is the backlog, the second is the in progress work, and the last contains finished tasks. We select a few cards at a time from the backlog that we will focus on during a short time period called a *sprint*. At the end of the sprint, we have functional software. We then move these cards into the done pile and repeat. At the end of each sprint, we would ensure that stakeholders accepted the work reprioritizing work as design specifications changed over time.

Before development began, we did some research on prior art or methods. We wanted the software developers to understand how traffic counting works. For example, automated methods include using pneumatic road tubes with a data collection device called an automated traffic recorder (ATR). Other methods include having a traffic engineer utilize a Turning Movement Counter (TMC) at an intersection or by watching a video where they can scrub quickly through a video. For mobile tablets and phones,

some commercial TMCs have been created, but their designs are primarily geared toward traffic engineers and do not include non-traditional vehicles such as ATVs or snow machines.

Once we understood how traffic data is collected, we decided on several features that we could prioritize. The features that were ultimately decided to include are:

- Support for non-traditional vehicles common in Alaska
- Allow data collection on up to five vehicles at a time
- Ease-of-use to support future STEM/STEAM education efforts
- 2-, 3-, and 4- way traffic intersections
- Save and Load prior sessions
- Save sessions to CSV files for future analysis
- Record metadata such as latitude/longitude
- Support a future upload feature with a back-end service

For applications like ours, we typically divide development into a front-end and a back-end. The front-end is essentially the main interface and logic with which the user interacts. The back-end is where the data gets stored. The front-end will make requests to the back-end to retrieve information it needs. For example, your bank will have a website that you interact with while the back-end handles requests such as bank transfers or account updates. For the UAF Traffic App, the front end handles all the traffic counting and other main features. The back-end is a prototype of what a data repository would look like to make permanent records of the data recorded by the app. At this point, the front-end is standalone and can be used without a back-end, but in the future, we will want to allow anyone to create their own repository to store their own data.

### 3.1.2. Front-End Implementation

We used Apple XCode, GitHub, PHP, Sqlite, and Adobe Illustrator to develop the software. We used Swift, which is Apple's current preferred iOS language, to develop the application. We hosted the source code on GitHub, a software revision repository system based on Git (Torvalds & Hamano, 2005). We used a MacBook Pro for development of the software and various Linux machines for backend development.

We designed it initially for larger iPad devices, but were able to make it a universal app, which enables the app to be used on smaller iPhone devices as well. To avoid scaling issues with the graphics, we utilized vector graphics to encode the icons for the vehicles and backgrounds. We used Adobe Illustrator for creation and management of the graphics for the app. We used layers to ensure that the icons would line up in the app. This made adjustments significantly easier because we could export our graphics to PDF format. We also were able to have black-on-white and white-on-black graphics, which are needed to properly display information to the user. For example, in menus, black graphics are easier to see and on the road, white graphics are easier to see.

While the UAF Traffic app is not a game, developers used gamification principles (Deterding, et al., 2011), which utilize game concepts in non-game contexts, to allow the application to be used by non-specialists. For example, we use audio and visual feedback when dragging and dropping icons so the user knows if and what data is recorded. These additional features are also important for people who may suffer from disabilities (Wilke, et al., 2009). Therefore, while a traffic engineer might be expected to

have a certain training level, the app requires very little. This ease of use principle was also used to determine how to share data.

The app utilizes its own internal format for storing data by using the Apple encoding application programming interface to serialize internal data structures. We use the term *session* to describe all the data around a single traffic data collection. The user can add, remove, or manage existing sessions. Each session has metadata that is common to that intersection. This includes session name, latitude, longitude, north-south road name, east-west road name, and a description field. The traffic data points are recorded by storing the type of vehicle, date and time of traffic turn, and from and to nodes. This data format is easily used by the application, but we needed another format for sharing data.

The app utilizes the Comma Separated Values (CSV) format for exporting data. Any standard spreadsheet software can read the CSV format. The file format is text based and uses commas to separate cell data. More complex cells (such as cells using commas) use quotation marks to delimit them. We enabled the files capability in the app so that it can use the standard Apple interface to copy data between applications. The files divide the data in two parts: Summary and Detail information. The summary data stores metadata for the session and the sum of traffic traveling in each direction. The detail section records the detailed traffic turn information as described earlier. In the future, we would like to design an easy to deploy a back-end service to automatically collect data from several iPads.

### 3.1.3.  Back-End Prototype

The back-end server prototype was created with PHP 7 and Sqlite software packages on a Linux server. The purpose of the back-end server is to allow several iPads to automatically send their recorded sessions to one central repository. The data is recorded into a SQL database and each session can be deleted or downloaded. The authentication system is designed so that a PIN can be used to upload the appropriate session data within a certain period.

We envisioned a use case for a STEAM setting where several students would be given iPads to record data at a traffic intersection. Afterwards, this data can be collected and automatically uploaded by university personnel. This would allow the instructor to supervise students in a non-internet environment. This could also be used by department of transportation personnel since mobile internet connections are not necessarily available in rural areas.

The back-end data is a service that needs to be deployed easily. The reason we do not incorporate this as a main feature in the mobile application is because the app will be widely distributed and users may want to have their own data management service. However, we tested the proof of concept and in future work, we may enable the service again when it is easy to deploy a new server in a cloud environment. The main requirement is to have a Linux based server with PHP 7 and Sqlite packages installed. The service allows management of users and data and we have limited collection of data to avoid privacy concerns; therefore we record only name and email addresses for user accounts. Administrator users have the ability to disable or delete accounts.

To avoid having to authenticate with a username or password when uploading data, we create a temporary PIN which is available for five minutes. The app is configured with a server URL and then sends the data via secure communication with the PIN. Duplicate data is not recorded. The back end user interface allows this data to be exported to CSV files for analysis.

### 3.2. Review of transportation safety improvement funding agencies and programs

This review was conducted using three basic approaches, as follows:

#### 3.2.1. Interviews

In-person and telephonic interviews with agency/program personnel, including those attending the 2019 Alaska Tribal Transportation Symposium and professionals at the Alaska Department of Transportation and Public Facilities (AKDOT&PF), Federal Highway Administration and Bureau of Indian Affairs were conducted.

#### 3.2.2. Internet searches

Researchers reviewed voluminous information on transportation safety improvement programs in Federal agencies and various sections within AKDOT&PF.

#### 3.2.3. Email queries

Researchers had direct contact with knowledgeable agency/program personnel for clarification of information from their websites, suggestions for information sources, and requests for review of materials developed during this study.

### 3.3. Contributions from villages and tribal entities

In addition to information from and about those who provide funds, we gathered and utilized samples of funding requests from those who sought the funding

### 3.4. Expert Task Group:

As noted previously, this ad hoc assembly met three times to assist with identifying funding sources, providing direction for the research and reviewing the report.  An especially valuable contribution was their involvement in the recommendations for further study based on the progress made during this first phase. Notes from the Expert Task Group's three meetings are included in Appendix C.

# CHAPTER 4.    RESULTS

Based on the methods described above, we report the results discussed below.

## 4.1.   Application to Obtain Rural AADT

### 4.1.1.    Description of Final Product

UAF Traffic is a traffic counting app for Apple iOS devices designed to be an easy to use tool for anyone to collect traffic data.  Figure 4-1 shows an example of the counting screen where the user can drag and drop icons from the originating traffic junction to the target traffic junction. The application is limited to showing five types of user transportation but can store information for several more kinds. Therefore, to get around this limitation, the user can modify the configuration of the session to choose the vehicle types they are currently tracking. The current options include Pedestrian, Bicycle, Dog-Sled, All-Terrain Vehicle, Snow Machine, Passenger Vehicle, Large Truck, and Unknown. The road can be configured so that unavailable directions can be turned off. This would be useful for three-way intersections. All the data for a single session may be exported as a CSV file that can be used in the user's choice of spreadsheet program (such as Microsoft Excel, LibreOffice Calc, Apple Numbers, etc.).
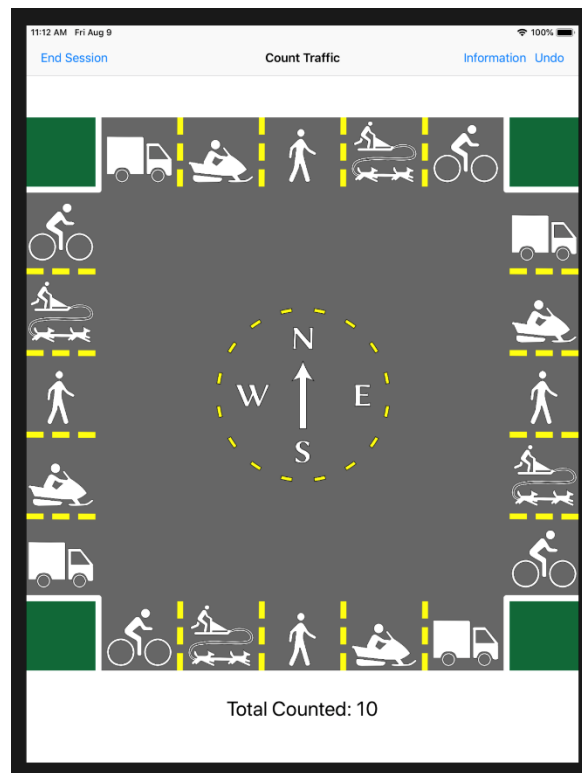


Figure 4-1. UAF Traffic App Screenshot

### 4.1.2.    Training Required

Please see Appendix A for the user's manual for the application.

### *4.1.3. Testing*

The project utilized standard software testing techniques to verify that the application operates as a typical user might expect and that the designed operations perform correctly. Testing confirmed that the app could work in a non-Internet environment, that it could export data in the common CSV format, and that the user could select the road configuration and vehicles they want to use. We also tested to see if the user could create, delete, or manage session details. For example, if the user decided that they wanted to see snow machines rather than ATVs, they could do that via the Manage Session or Information options and preserve the data they already collected.

We also tested whether the data could post information to the prototype back-end server we created, and this was successful. Because we have not yet decided the best way to ship the back-end server and because server administration is considered an advanced task for the intended user, we have turned this feature off and will leave this as future work.

## 4.2. Review of Agencies

This section references details about several programs identified through this project that provide funding for rural transportation safety improvements, with emphasis on infrastructure improvements, as well as other programs not likely to support such projects.

The following table contains a summary of twelve agencies studied, including a brief description of the mission and data use. The first ten are potential sources of funding for rural infrastructure safety improvement projects; the last two were found to be unlikely sources, Appendix B provides details about each agency.

Table 4-1. Summary of Agencies Reviewed

| Agency/Program | Description | Typical Data |
|---|---|---|
| **Programs that fund infrastructure safety improvements:** | | |
| AK DOT&PF Community Transportation Program (CTP) | Projects proposed and administered by <u>communities</u> to meet local needs: e.g., bicycle & pedestrian paths, bridges, road upgrades. | Long-term fatality or major injury patterns or potential for such are scored higher in the safety category. |
| AK DOT&PF Highway Safety Improvement Program (HSIP) | Federally mandated, data-driven program for major infrastructure safety improvements, based on a detailed analysis, ranking and selection process. Also includes enforcement, education & emergency services. | Crash data from emergency responder reports + self-reported data. Traffic data from AK DOT&PF. |
| AK DOT&PF Transportation Alternatives Program (TAP) | Program to fund "alternative" projects for non-motorized travel, e.g., pedestrians, bicycles | Documented cyclist and/or pedestrian crash history. Reliable data are scored higher. |

| Agency/Program | Description | Typical Data |
|---|---|---|
| **Programs that fund infrastructure safety improvements:** | | |
| AK DOT&PF High Risk Rural Roads (HRRR) | Federal program that requires any state whose fatality rate on rural roads increased over the most recent two-year period to obligate specific amounts of funds to improve rural road safety. | Similar to HSIP; same selection process |
| Alaska Highway Safety Office (AHSO) Alaska Highway Safety Grant Program | A program of primarily non-infrastructure projects (e.g., impaired driving, distracted driving, police traffic services, speed and aggressive driving), with some transfer funds available for infrastructure safety improvements. Funding through National Highway Traffic Safety Administration. | Minimum 3 years crash data. AHSO website contains much useful Alaska crash and other data. |
| US DOT Better Utilizing Investments to Leverage Development (BUILD) | Merit-based program to support surface transportation infrastructure projects that will have a significant impact throughout the country | Not required. Many requests include crash data, especially fatalities. Some reference data in RSA's. Safety criterion asks for information on how project will reduce accidents. |
| Federal Lands Access Program (FLAP) | Improves state and county transportation facilities that provide access to high-use recreation sites and economic generators within Federal lands | Must demonstrate that safety will be improved; no specific requirements. |
| Federal Lands Transportation Program (FLTP) | Provides funding for the management and upkeep of approximately 50,000 miles of federal public roads and other assets comprising partners' Federal lands transportation facility inventory | Hard data not required. Anecdotal information sometimes used successfully in funding requests. |

| Agency/Program | Description | Typical Data |
|---|---|---|
| **Programs that fund infrastructure safety improvements:** | | |
| Nationally Significant Federal Lands and Tribal Projects Program (NSFLTP) | Discretionary funding for construction, reconstruction, and rehabilitation of nationally significant projects within, adjacent to, or accessing Federal and tribal lands. Funding limited to projects that have an estimated construction cost of at least $25 million. | Crash and traffic is expected, in order to provide B/C analysis, although RSA information can be used to show potential safety benefits of a proposed project. |
| Tribal Transportation Program Safety Fund (TTPSF) | Provides safe and adequate transportation and public road access to and within Indian reservations, Indian lands, and Alaska Native Village communities. Supports safety plan development, revision, and safety-related infrastructure improvement projects. | Crash and traffic data from Alaska DMV & DOT&PF; Trauma Registry, media reports. Data in RSA's and local safety plans often used as support. |
| | | |
| **Programs not likely to fund infrastructure safety improvements:** | | |
| Indian Highway Safety Program (IHSP) | Mission is "To reduce the number and severity of traffic crashes in Indian Country by supporting Education, Enforcement, and Engineering, as well as Safe Tribal Community Programs" | Data is required and is obtained from multiple sources. |
| Economic Development Administration (EDA) | Invests in projects that foster economic growth, working directly with communities and regions to help them build the capacity for economic development, including infrastructure capacity. | Crash data unlikely to be relevant to these projects |

## 4.3. Road Safety Audits (RSA's)

To assist rural entities in utilizing RSA's in their quest for safety improvement funding, we review RSA's in general and how the RSA might relate to the data requirements of a funding agency. The following is largely taken from two documents: FHWA Road Safety Audit Guidelines (USDOT Federal Highway

Administration, 2006) and Road Safety Audit Toolkit for Federal Land Management Agencies and Tribal Governments (USDOT Federal Highway Administration, 2010).

The Federal Highway Administration (FHWA) defines an RSA as a "formal safety performance evaluation of an existing or future road or intersection by an independent, multidisciplinary team." The owner of a road requests and pays for an RSA. Common factors leading to requests for RSAs for existing roads include high crash frequencies, high profile crash types or political influence, and significant changes in traffic characteristics (current or expected). The RSA team considers the safety of all road users, qualitatively estimates and reports on road safety issues and opportunities for safety improvement.

The RSA team will have individuals with the following expertise:

- Road Safety

- Traffic Operations

- Road Design

- Transportation Planning

- Enforcement/Emergency Medical Service (EMS)

- Public Health

- Human Factors

- Maintenance

- Tribal Culture/Natural Preservation

- Community Organizations

- User Groups (pedestrians, bikers, ATV users)

Depending on different needs, the RSA team could include other specialists to ensure that all aspects of safety performance of the given facility can be adequately assessed.

An RSA is a formal safety performance examination of an existing or future road or intersection by an independent audit team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users.

A number of reports suggest that the RSA process is cost-effective, although most reference qualitative rather than quantitative benefits. Establishing and meeting a target benefit/cost ratio for RSAs is not the motivating factor behind support for RSAs at state agencies. These agencies suggest that the benefits of RSAs are substantial, but largely immeasurable.

> At the start of the RSA process, the team will gather all the data available, including: existing and planned conditions (if applicable) as well as the existing safety performance (e.g., crash records/data, traffic volumes drawings, aerial photos, etc.). Then the RSA team conducts an analysis to identify safety issues based on data from the field visit and preliminary documents. The RSA team, based on the perceived risk, may prioritize the safety issues. The RSA team might

include data on all four "E's" Engineering, Education, Enforcement, and EMS (emergency medical services). (USDOT Federal Highway Administration, 2010)

For many RSAs conducted in rural areas, reliable crash data are not available. Anecdotal information (e.g., from maintenance, enforcement call logs, landowners) and evidence of conflicts and crashes (e.g., skid marks and fence strikes) help to create a more complete picture of potential hazards, but cannot be quantified with any certainty. In these cases, the likely frequency and severity of crashes associated with each safety issue are qualitatively estimated, based on the experience and expectations of RSA team members. Expected crash frequency can be qualitatively estimated based on exposure (how many road users would likely be exposed to the identified safety issue?) and probability (how likely was it that a collision would result from the identified issue?). Expected crash severity can be qualitatively estimated based on factors such as anticipated speeds, expected collision types, and the likelihood that vulnerable road users would be exposed. These two risk elements (frequency and severity) are then combined to obtain a qualitative risk assessment. Note that even this qualitative analysis implies the need for AADT or similar use data.

> The objective of project data review is to gain insight into the project or existing road, prepare for the field visit and identify areas of safety concerns. The field visit is used to get further insight into the project or existing road and to further verify/identify areas of safety concern.  An experienced and qualified audit team will have a clear understanding of safety issues arising from the design-and the interaction of road users with the design-and will be able to predict accurately where crashes have the potential to occur independent of the availability of any crash data (USDOT Federal Highway Administration, 2006).

Crash data may be helpful as well, especially for rehabilitation/reconstruction projects. For new construction, crash data for the surrounding road network are not as important; however, they may provide insights into prevailing crash patterns and safety issues in the study area.

How might a village or tribal entity get started with an RSA? The Federal DOT has a program that provides assistance.  The Road Safety Audit Peer Assistance program of the FHWA's Office of Safety established the Roadway Safety Peer to-Peer (P2P) Program to provide technical assistance on a broad range of safety topics including RSAs (USDOT Federal Highway Administration, 2019). Of special note in Alaska is a project in the *Organized Village of Kasaan*, located on the Prince of Wales Island.  The Village wanted to use the RSA to be proactive in their attempts to improve the safety of their rural roads due to lack of proper signage, potential roadside hazards, and poor delineation on horizontal curves.

> "In addition to the Peer, the RSA team members included the Bureau of Indian Affairs, the Alaska Tribal Technical Assistance Program (TTAP), and the Organized Village of Kasaan. Crash and traffic data were provided by the Alaska Department of Transportation (DOT) and the Alaska State Patrol provided valuable information and insight into crash experience on the two reviewed road sections. On Kasaan  Road, RSA recommendations included updated signing, improved guardrail, removal or  shielding of roadside obstacles and enhanced delineation along horizontal curves. Hydaburg  Highway recommendations included upgrading signs according to 2009 MUTCD guidance,  shielding roadside hazards, enhancing delineation at bridges, and providing a uniform treatment  of horizontal curve delineation….Since specific crash data was not available for the roadways under review, the RSA  team relied on general crash data from the Alaska DOT, as well as their own knowledge and  experience identifying safety issues on

rural roads. This is why it was especially important that the selected Peer was so knowledgeable in rural road safety." (USDOT Federal Highway Administration, undated)

An RSA will highlight the "egregious potential" of a condition – its potential to lead to catastrophic accidents.  This in turn may lead to HSIP funding.

## 4.4. Tribal/Village Safety Plans

A valuable means for compiling and presenting traffic and crash data for rural areas is often the Tribal Safety Plan.  In the same way that states develop and use safety plans, so also do tribal entities.  Over 60% of federally recognized Tribal governments have developed strategic transportation safety plans (Tribal Transportation Safety Program, 2019).  In this context, such a plan is defined as follows: "A Transportation Safety Plan is a collaborative and comprehensive document that identifies transportation safety issues and strategies to address them. Effective Transportation Safety Plans lead to projects that make the transportation system safer." (USDOT FHWA, 2017)

The Tribal Transportation Safety Program requires a tribal safety plan to be in place before a tribe can be awarded a grant for safety improvements to its transportation infrastructure. The program provides funding for the development of these plans.

Many resources are available to assist tribes in developing these plans (USDOT FHWA Plan Toolkit, 2019; USDOT FHWA, 2017).  A template is available to assist in the writing process.

The elements expected in a plan include an introduction, the tribe's vision, safety partners, the process, existing efforts, a data summary, emphasis areas, and evaluation and implementation.  With regard to the data summary section, the instructions suggest

> "Use the best available incident data to look for similarities between incidents.  The best available data may be anything from complex police crash database to a public involvement process depending on what is available for your community.  Many transportation safety plans will include Data Improvement as an emphasis area.
> Note any trends shown by the available incident data and additional questions prompted by the data.  Data Analysis involves looking for patterns in crash type, driver factors, roadway features, vehicle factors, or environmental condition." (USDOT FHWA Plan Toolkit, 2019; USDOT FHWA, 2017)

An Alaskan example of a Tribal Safety Plan is the one prepared for the Craig Tribal Association (MG Tech Writing, LLC, 2015).  It contains an extensive ten-page Data Summary section, with helpful tables and graphs, plus additional data in appendices.  It indicates that crash data were obtained from nine different agencies for Prince of Wales Island.  In sum, for the period 2000 to 2011, the island experienced 5 fatalities, 32 serious injury accidents, 95 minor injury accidents, and 157 property damage only accidents.

## 4.5. Current Bush Practice

As noted above, collecting rural data has many difficulties.  Our earlier research describes the incongruities between the DMV data, the hospital admissions data, and data gleaned from newspaper records (Belz, et al., 2018). How might this be improved?  Above we develop an app that will help

keeping records.  However, for the longer term, a culture change regarding record keeping will help.  For this, meeting with local official and leaders will help.  Often the first step is to meet with leaders to clarify and expand objectives and gather their "permission to enter."  Later, when meeting with a broader audience, a careful explanation of you are doing is essential: planning projects to improve roadway safety.  Many safety issues in rural Alaska need attention, such a school safety, but we must be clear that our interest is limited to roadway and transportation safety.

# CHAPTER 5.    CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE EFFORTS

## 5.1. Conclusions

### 5.1.1.    UAF Traffic App

The UAF Traffic app illustrates that it is possible to replace or complement specific traffic counting tools for nontraditional vehicles using mobile devices. The app can also give small towns and villages, with no previous means to collect data, the ability to record information that can be included with requests for traffic improvement projects. We also have the ability to extend this work to create an automatic ingest feature to a centrally managed repository. We believe this capability must ensure that any organization manages their own data. We also think that small tools like these can be highly maintainable when kept reasonable in scope. The UAF Traffic Project utilized the efforts of half a dozen student computer programmers and is currently maintained by faculty at the University of Alaska.

### 5.1.2.    Data to Support Funding Requests

As to the portion of the study related to data gathering and use to support funding requests:

1) In support of funding requests, agencies expect, and requesters utilize, a primarily qualitative approach, with generally little use of benefit/cost analyses, performance factors, or other types of "hard" data.  In some cases, this approach is effective in garnering the requested funds.

2) Notwithstanding the above conclusion, data provision practices vary widely, with some programs and agencies insisting on small to large amounts of quantitative data.

3) When hard data are utilized as evidence of need, such evidence is a valuable element of support for the request.  The data makes it easier for an applicant to compete for funding.

4) "Data" of many kinds are utilized, including, among others,

- Accident and traffic data at the Division of Motor Vehicles and Department of Transportation and Public Facilities
- Alaska Trauma Registry
- Alaska Highway Safety Office, both statewide, as well as some regional, statistics
- Media reports, especially in newspapers in smaller rural communities
- Local input such as planning commissions, maintenance and operations departments, and testimony by individuals and groups at various local gatherings.

5) Note that various types of data are often contained within Road Safety Audits and Village or Tribal Safety Plans and are included in funding requests.

6) Effective traffic and accident data gathering is especially challenging in rural areas for many reasons, including frequent personnel changes, multiple responsibilities among personnel, language barriers, and lack of understanding of the importance of gathering and using such data.

## 5.2. Recommendations for Future Efforts

### 5.2.1. UAF Traffic App

With respect to the UAF Traffic app, we recommend in future work to:

1. Use the app in several rural villages to test it.
2. Have the local population gain familiarity with it and provide high school and university transportation engineering students practical experience with a valuable "real life" device application.
3. Enhance the app so that its summary reports can be recorded in community or locally managed data repositories.
4. Coordinate with Alaska Department of Transportation to determine policy that may affect the usefulness of the UAF Traffic App or to utilize an automatic ingest into state traffic management databases.

### 5.2.2. Data to Support Funding Requests

In relation to data use in supporting funding requests,

1. Develop a manual and/or checklist for use in rural areas to assist in identifying transportation infrastructure safety improvement funding sources and providing guidance in the preparation of requests for funding.
2. Assure that all Road Safety Audits include any available traffic and accident data.
3. Design a modest repository for accident and traffic data that is sufficient and useful for rural areas and includes agreed-upon common data fields.
4. Launch a concerted effort to educate rural entities on the importance of collecting data and its value in support of funding requests.
5. Provide guidance for situations in which RSA's and other types of safety reviews are appropriate.

### 5.2.3. General Recommendations

Finally, in implementing any of these recommendations in rural settings, we emphasize the need to

1. Utilize a lead agency in the implementation of any of these future actions,
2. Be aware of, and cooperate with, other organizations and programs that are involved with traffic safety data activities so as to assist and support each other and not duplicate efforts unnecessarily, and
3. Consult and inform local, tribal leadership with respect to any activities undertaken in their village or region, especially as regards collection and storage of any kind of data.

**APPENDIX A.   UAF TRAFFIC**

## 1.1.   Getting Started

When preparing to record data for an intersection or stretch of road, you should first ensure that the *iPad* or other *iOS* device you will be using for recording purposes has sufficient power to remain charged for the expected duration of the vehicle counting session.  You should also ensure that the UAF Traffic app is installed on the device (it should be a white icon with 6 purple and orange arrows coming out from the bottom of it, as depicted in Figure A-1.
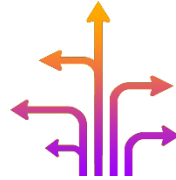


Figure A-1. UAF Traffic App Icon.

Once at the intersection or stretch of road intended for study, turn on the device and tap on the UAF Traffic app icon identified previously.

## 1.2.   Creating a New Session

Once you have tapped on the app, you should be at the main menu, depicted in Figure A-2:
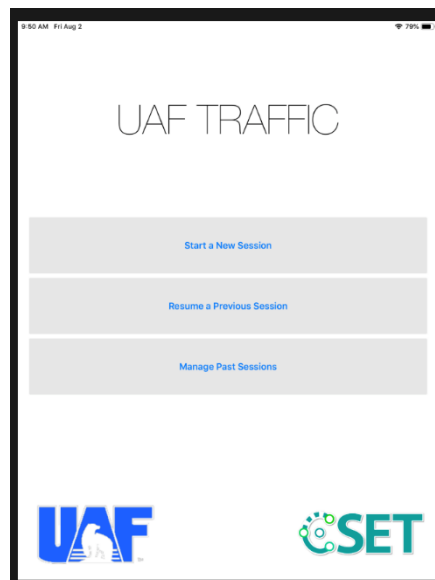


Figure A-2. UAF Traffic Main Menu Screen.

Tap on the topmost button, labeled "Start a New Session."  You should now see the Direction Select screen, depicted in Figure A-3.
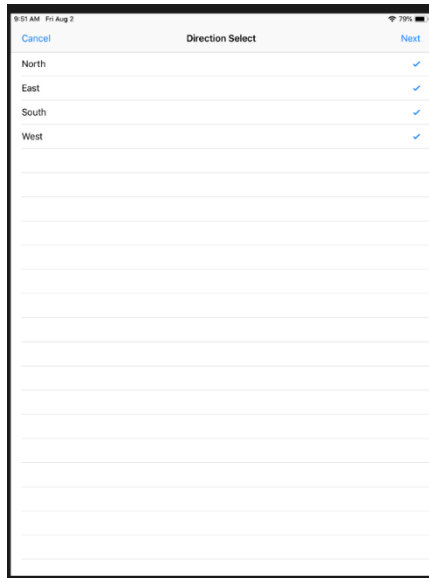
Figure A-3. Direction Selection Screen.

The checkmarks next to the directions signify that those directions are present in the intersection or stretch of road being recorded.  Tapping on any of the directions will remove the checkmark, signifying that the direction in question is not present in the intersection or stretch of road being studied.  Tapping on a previously tapped direction will place the checkmark back on, in case a mistake was made in the initial tap.  It is not possible for fewer than two directions to be present in a site being studied, so no more than two directions can be removed from the studied site at any time.  Once the directions with checkmarks next to them accurately represent the site being studied, click the "Next" button at the top right of the screen to proceed.

The Vehicle Select page, shown in Figure A-4, should now appear on your device:



Figure A-4. Vehicle Selection Screen.

Tapping on the symbols depicted will place a checkmark next to them, symbolizing that the vehicle represented by that symbol is expected to be seen at the location being studied.  Tapping on a symbol with a checkmark next to it will remove the checkmark, in case the symbol was not intentionally tapped on.  No more than five symbols may have checkmarks next to them at a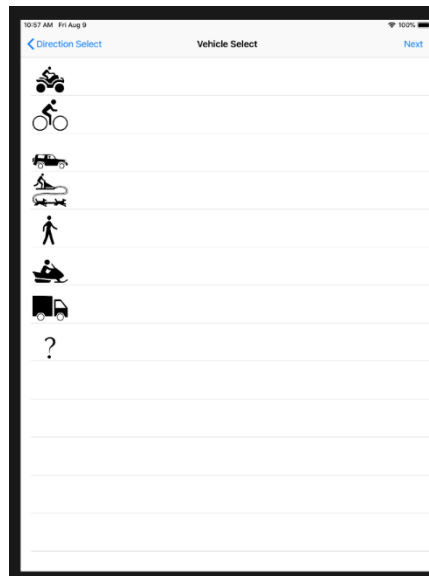ny time.  Once the list of vehicles with checkmarks next to them is satisfactory, tap the "Next" button at the top right once more to proceed.  You will now be presented with a page dedicated to entering information about your session shown in Figure A-5.
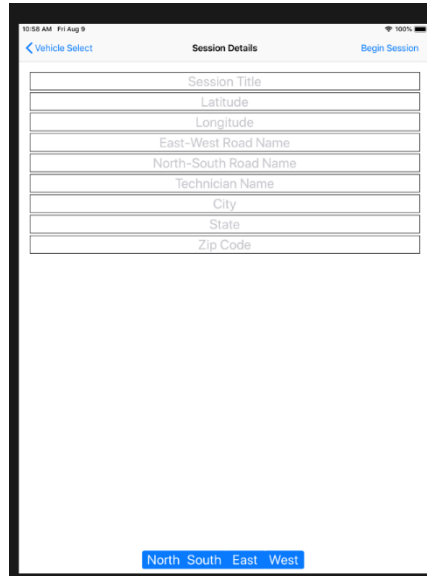


Figure A-5. Session Detail Screen.

Tap on a box to enter keyboard mode, then tap on the letters on the keyboard to add them to the box.  You can remove them again using the delete button, which appears as a house shape pointing left with an x in the middle of it.  Once you have entered the requested piece of information to your satisfaction, tap either the "return" button on the keyboard or another box to continue entering information about your session.  Additionally, if you changed your mind about the directions you selected for the intersection, you can tap on the direction names at the bottom of the screen to decide them again.  A direction is active if it is surrounded by a blue box and inactive if it is not.  Once you have entered all the session information you have, tap the "begin session" button at the top right corner of your screen to start collecting data.

## 1.3. Collecting Data

You should now see a screen like the "Count Traffic" screen depicted in Figure A-6.
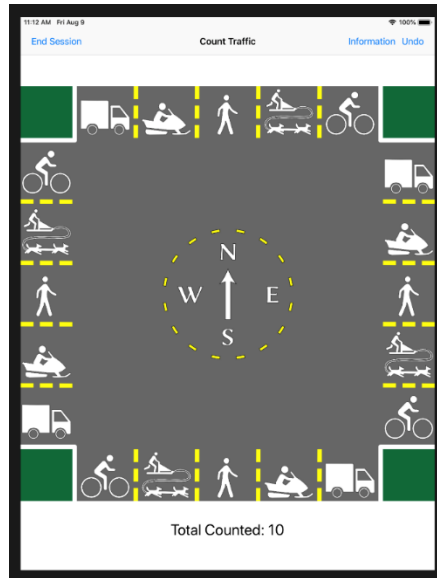
Figure A-6. Traffic Counting Screen.

As you observe vehicles traversing the intersection or stretch of road, place your finger on the symbol representing the vehicle you witnessed, drag your finger across the screen to the direction it went, and remove your finger from the screen to register the transition.  If the transition was registered correctly, the vehicle symbol will shrink down before reappearing at its point of origin.  If the transition was not registered correctly, the vehicle symbol will, instead, slide across the screen back to its point of origin.  If a crossing that did not occur is registered, press the "Undo" button in the top right corner of the screen to remove the crossing from the list of registered crossings.  If you want to modify the information you entered about the session, tap the "Information" button to the left of the "Undo" button to return to the session details page from which you can press the begin session button to resume the session currently in progress.  Once you have completed the session, press the "End Session" button in the top left corner of the screen to return to the main menu.

## 1.4.   Resuming a Prior Session

If a session is incomplete, you can access it again by tapping on the "Resume a Previous Session" button, the second button from the top, to access the "Resume Session" screen shown in Figure A-7.
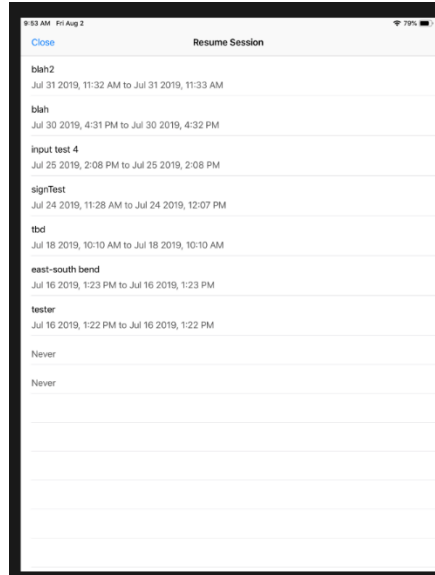
Figure A-7. Resume Session Screen.

Tap on a session name to access the "Count Traffic" screen for that session, at which point you can track crossings in it in the same manner as was done previously. Tap the "Close" button at the top left of the screen to return to the main menu instead.

## 1.5. Managing Past Sessions

Now that the session has been saved, you can access its data by tapping the "Manage Past Sessions" button, the third one down. On the "Manage Sessions" screen, shown in Figure A-8.
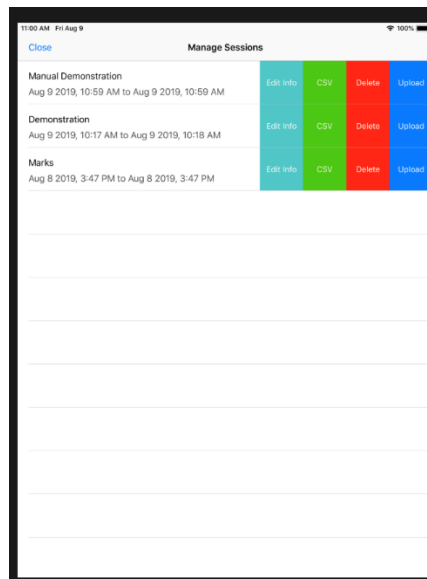


Figure A-8. Manage Sessions Screen.

You can tap on a session name to see the data recorded as shown in Figure A-9.
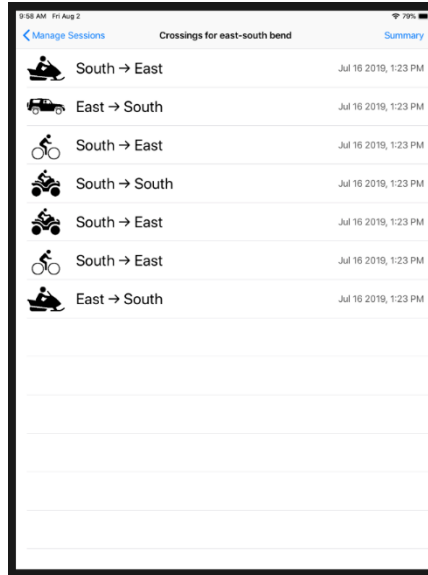
Figure A-9. Session Details Data Display Screen.

You can also tap on the delete button if the session should need to be deleted, the csv button to export the data as a spreadsheet for personal analysis, the edit info button to change the information you entered about the session and optionally resume the session directly, or the upload button to sync the data with the collection website.  To return to the "Manage Sessions" screen from the session data screen tap on the "Manage Sessions" button at the top left of the session data screen.  To return to the main menu, tap the "Close" button at the top left of the "Manage Sessions" screen.

## 1.6.  Exporting Data

When the app includes the back-end data export feature, then we have implemented an interface for allowing you to upload the data. The person designated as administrator for that system will would supply  a PIN code to enter in order to upload your data using the screen shown in Figure A-10.
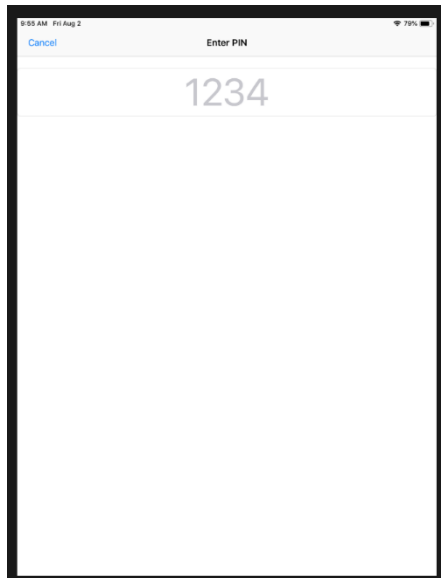
Figure A-10. PIN & Data Upload Screen.

To enter the PIN, tap on the grey "1234" located at the top of the screen, then tap the numbers on the keyboard, in a similar manner to when the session name was determined.  Upon entering four digits, the PIN will automatically enter itself, and either start to upload the data if the PIN was correct, or to clear the PIN code, allowing for re-entry of a code, and provide you with an error message shown in Figure A-11.
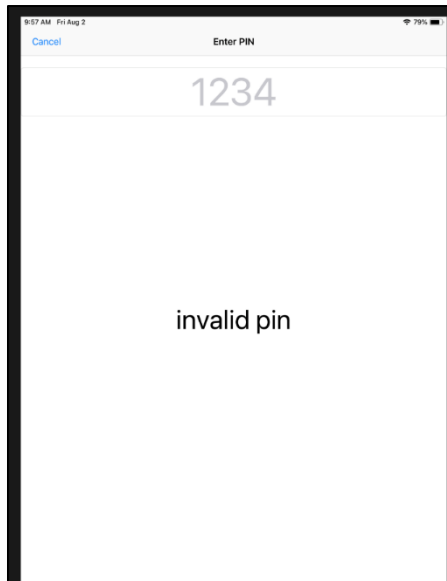


Figure A-11. Invalid PIN Screen.

Tap the "Cancel" button at the top left corner of your screen to return to the "Manage Sessions" screen.

## 1.7. Credits

### 1.7.1. Lead Developer and Designer

Dr. Jonathan Metzgar, Assistant Professor, University of Alaska Fairbanks

### 1.7.2. Software Developers

Brandon Abbott

Chris Bailey

Alan Carvajal

Cameron Titus

Joseph Wolf

# APPENDIX B.   REPORTS ON AGENCIES AND PROGRAMS

B1 – AK DOT&PF Community Transportation Program (CTP)

B2 – AK DOT&PF Highway Safety Improvement Program (HSIP)

B3 – AK DOT&PF Transportation Alternatives Program (TAP)

B4 – AK DOT&PF High Risk Rural Roads (HRRR)

B5 – Alaska Highway Safety Office (AHSO) Alaska Highway Safety Grant Program

B6 – Better Utilizing Investments to Leverage Development (BUILD)

B7 – Federal Lands Access Program (FLAP)

B8 – Federal Lands Transportation Program (FLTP)

B9 – Nationally Significant Federal Lands and Tribal Projects Program (NSFLTP)

B10 – Tribal Transportation Program Safety Fund (TTPSF)

B11 – Indian Highway Safety Program (IHSP)

B12 – Economic Development Administration (EDA)

## Appendix B1 COMMUNITY TRANSPORTATION PROGRAM

In addition to the National Highway System (roadways important to the nation's economy, defense, and mobility) and the Alaska Highway System (roadways that connect communities, resource development areas, and recreational areas), an important part of the overall transportation system are community transportation systems. These community transportation systems are supported by the Community Transportation Program (AKDOT&PF, 2019). Funding for this program comes from the Federal Highway Administration (FHWA) through an apportionment called the Surface Transportation Block Grant Program (STBGP or STP). CTP funds can be used for most types of transportation related projects. The selection criteria and process are similar to those for the Transportation Alternatives Program described previously.

The program is highly competitive and scored on a statewide basis. Due to a change in federal regulations that realigned much of the federal funding to the National Highway System, a call for project nominations has not occurred since 2011. A new call for project nominations is currently (2019) underway, having been announced in February 2019, with submittals due in September 2019.

Two sets of criteria apply to the current process, a set for Urban and Rural projects, and a set for Remote projects. For this purpose, communities not connected to the continental road network by road or ferry are to use the Remote criteria. All others will use the Urban and Rural criteria.

Important here is the significant role of underlined communities in proposing projects and administering approved projects and their funds. Participating communities are required to contribute federally mandated match monies; those contributing more than the minimum will receive extra points in the scoring process. Examples of Alaska projects completed during the program's most recent funding cycle include the following:

In the Remote category –

- Selawik – bridge rehabilitation
- Takotna – Gold Creek Bridge
- Hooper Bay – airport access road
- Ekwok – landfill access road

In the Urban/Rural category –

- Matanuska Susitna Borough – intersection realignment and signal
- Nome – streets rehabilitation
- Fairbanks – road upgrade
- Cordova – bike and pedestrian path

Those communities applying for this funding are asked to respond, in the safety section, to the following: "Will this project meet the goals or strategies listed in the Alaska Strategic Highway Safety Plan (SHSP)? Does this project propose mitigation that is recognized in practice to address safety issues? Is there a long-term pattern of fatal/major injury crashes, minor injury crashes, or property damage crashes? Is there a documented crash potential or risk between a non-motorized use facility and vehicular traffic? Please describe existing safety concerns and project's potential to mitigate those concerns. Provide any supporting documentation that is available." In addition, it is expected that

DOT&PF will supplement each application with the following safety data (shown in Figure B-1) when available:

*ADOT&PF Planner fill out this section –*
HSIP Cost/mile of project length
    a.  HSIP crash costs for total project: _____
    b.  Project Length:_____
HSIP Cost/mile (a ÷ b) : _____

Figure B-1. ADOT&PF Planner Application Safety Data.

Scoring criteria for <u>safety</u> are identical for both Urban/Rural and Remote community applications. Addendum B1A shows the criteria.  The weighting for safety for Remote projects is 5 out of a total of 46, or about 8% of the total; for Urban/Rural projects it is 5 out of 44.  According to Addendum B1A, the highest score for safety is 5, when there is documented fatal or major injury experience, a high potential for crashes between a major non-motorized use facility and vehicular traffic, or a record of high crash costs per mile.  Similar to the safety criteria for the Transportation Alternatives Program, the maximum of 5 can only be assigned if crash data are official from DOT&PF.  A difference is that anecdotal safety information from second-hand sources or data not recognized in practice can score 2 at most, not 3.

The schedule for the balance of the current nomination and selection cycle includes regional DOT&PF review and scoring in October 2019, statewide Project Evaluation Board final project selection in January 2020, and award announcements in March 2020, after which project agreements between DOT&PF and the sponsoring agencies will be initiated.  Selections will be limited to those highest ranked projects that fit within the total funds available of approximately $50,000,000.

As of this writing (July 2019), DOT&PF Planning Staff are receiving inquiries and expressions of potential interest in submitting applications by the September 2019 deadline.  Expressions of interest received to date for potential Northern Region community projects include Rural projects for access roads, road reconstruction, culvert replacements, resurfacing, pedestrian paths, and dust control. For most, the communities themselves are expecting to prepare proposals, with advice from DOT&PF.  For some others, DOT&PF will take the lead in preparing submittals.

| Urban and Rural Projects Criteria | | | | |
|---|---|---|---|---|
| | **Scoring Criteria** | | | |
| **Standards** | **(5)** | **(3)** | **(0)** | **(-3)** |
| **3. Safety** Meets goals or strategies listed in the Alaska Strategic Highway Safety Plan (SHSP). 5 Year Safety Historical Concentrations. | Proposes mitigation which is recognized in practice to address safety issues for a route that qualifies based on: A) a long term pattern of fatal or major (incapacitating) injury crashes; or B) a documented high crash potential or risk between a major non-motorized use facility and vehicular traffic; or C) HSIP* costs/mile of project length greater than $2.5 million per mile**. | Proposes mitigation which is recognized in practice to address safety issues for a route that qualifies based on: A) a long term pattern of minor injury or property damage crashes; or B) a documented moderate crash potential or risk between non-motorized users and vehicular traffic; or C) HSIP costs/mile of project length between $1.5 and $2.5 million per mile.** | No mitigation is demonstrated to address a crash problem or potential in other categories: A) historical crash patterns identified are less than 3 or more crashes per year. B) no demonstrated traffic conflicts between non-motorized users and vehicular traffic. | Proposes features which are recognized in practice to worsen highway safety such as a project that: A) would be contrary to a strategy of the SHSP in a significant manner; or B) proposes other work that is viewed as contrary to producing a safer roadway environment for motorized or non-motorized users. |
| Weighting: 5 | | | | |
| *Most recently available five year official ADOT&PF data. When using anecdotal crash information from first hand (EMS, Fire, Police, M&O - on-scene responsibility) = maximum score is 4 points. When using anecdotal safety information from second-hand sources (not on-scene responsibility) or data not recognized in practice = maximum score 2 points.* *\*Highway Safety Improvement Program (HSIP)* *\*\*The Department will provide the numerical analysis in (C) for project nominations that include a qualifying safety improvement.* | | | | |

Figure B-2. Community Transportation Program Scoring Criteria for Safety (for both Urban/Rural and Remote Projects)

**Appendix B2 HIGHWAY SAFETY IMPROVEMENT PROGRAM**

Similar to all US states, Alaska's Highway Safety Improvement Program (HSIP) is a federally mandated program whose overall purpose is "to reduce fatalities and serious injuries due to crashes on Alaska's roads." (AKDOT&PF, 2018). Managed by the Alaska Department of Transportation and Public Facilities, its original mandate focused on infrastructure improvements ("To construct highway improvements that maximize lives saved and serious injuries eliminated per dollar spent"). Since 2005, the mandate has been broadened to include, in addition to engineering countermeasures, the three other E's – enforcement, education and emergency services.

Selection of infrastructure projects for inclusion in any year's program is very much a data-driven process. This section describes the sources of such data, the process of identifying prospective projects and their eventual selection. It then illustrates the approach with several examples, focusing on the data used to drive the selection process.

Data Sources

Crash data for use in the HSIP selection process comeS from two original sources – 1) that reported by emergency response personnel (state troopers, city police, village safety officers, university police, etc.), and 2) self-reported data by those involved in crashes. Data from both sources are collected by the Alaska Division of Motor Vehicles in its TraCS (Traffic and Criminal Software) system. The AKDOTPF then extracts relevant portions of these data into an Oracle-based system, including geo-locations of crashes, for use in its analysis of prospective safety improvement projects. A 2018 report (Chang, et al., 2018) described some challenges involved in providing complete and consistent crash data, especially in rural Alaska.

Prospective Project Identification

Individual crashes are classified as to the type of injury on a KABCO basis – K – Fatality; A – Serious injury; B – Minor injury; C- Possible injury; O – No injury (property damage only). The analysis proceeds by focusing on those locations with fatal or serious injury (F & SI) crashes that occurred during the analysis period. Typically, a location or road segment that experienced one fatality and/or two serious injury crashes is considered a candidate for an improvement project at this stage.

After overlapping locations are combined to accumulate the crash numbers for each segment, crash costs per mile are estimated, a preliminary first-blush "fix" is suggested, and a final HSIP candidate project list is developed for each region. The High Crash Location Screening Process spreadsheet includes, for each route being considered, the route name, route designator, beginning and ending locations, crash costs, crash costs per mile, crashes per mile, crash counts for fatalities, serious injury crashes, minor injury crashes, and property damages only crashes, plus appropriate comments regarding on-going related projects, the nature of the segment's crashes and other relevant information. The template for the first page of this spreadsheet is shown in Addendum B2A.

Potential new projects are then scoped by identifying crash patterns, conducting field reviews, and determining those locations that are feasibly correctable. The cost of completing each candidate project is then estimated, and a benefit/cost ratio is calculated for each, using appropriate crash reduction factors to estimate the benefits (= savings in crash costs) likely to ensue due to the project.

The ultimate result of the analysis is a list of ranked projects, based on their crash costs per mile, plus a list of unranked projects. Locations may be excellent candidates for improvements but lack sufficient crash data, have no crash reduction factor associated with the proposed countermeasure, or have traffic

volumes so low that standard crash data would inaccurately represent hazard exposure.  In that case, they may be proposed even though unranked.

In each region, the screening results in up to fifty locations ranked by crash cost per mile for those locations with at least one fatal or two serious injury crashes. The number may be less than fifty if the region has fewer than fifty locations satisfying this criterion.  The regions' ranked listings are then forwardED to statewide.

Project Selection

The process described above is performed at the regional level for Alaska's three regions – Central, Northern, and South Coast.  The result of that part of the process is the nomination of projects by the regions to Headquarters Traffic and Safety, where regional projects are reviewed, discrepancies are clarified and appropriate revisions are solicited.  A statewide list is developed, including those ranked by B/C ratios and a list of unranked prospects, and submitted to the Chief Engineer.  Those projects approved by the Chief Engineer then become officially eligible to receive HSIP funding.

Regions then submit funding requests to Statewide.  Program Development provides further detailed analysis and ranking, and the selection process is complete. "Project prioritization is competitive based on each year's available funding and quality of projects. There are no hard and fast benefit-cost or duration thresholds that determine which projects receive funding." (AKDOT&PF, 2018).  The funding plan is finalized, regions submit Project Development Authorizations, and the projects are designed and constructed.

Representative HSIP Projects

We describe here several recent HSIP projects carried out by the Alaska DOTPF, emphasizing the data involved in the selection process.

### Chena Hot Springs Road Safety Improvements

During the five-year period between January 1, 2006 and December 31, 2010, 213 reported crashes occurred over the 56-mile length of Chena Hot Springs Road, located in the Northern Region east of Fairbanks.  Detailed analysis revealed 6 fatal, 6 major injury, 54 minor injury and 147 property damage only crashes.  Alcohol and/or drugs was a factor in all the fatalities but none of the major injury crashes.  Measured Average Daily Traffic in 2012 varied from 7,990 vehicles per day (vpd) over the first 1.25 miles to 380 vpd beyond mile 37.7.

Further analysis indicated the prevalence of run-off-the-road type crashes, classified as 3 fatal, 3 major injury, 18 minor injury and 58 property damage only crashes during the five-year analysis period. Engineering investigation suggested that new curve warning signs and delineators would have the greatest potential for reducing this crash experience.  Of the run-off-the-road crashes identified above, in-depth study of each indicated that the number that were susceptible to reduction if such improvements were implemented were estimated at 2 fatal, 3 major injury, 14 minor injury and 23 property damage only.

This data-driven approach then adopted the commonly agreed-upon crash reduction factor of 20% for such improvements.  Thus, for example, for the 14 minor injury crashes, it was estimated that such accidents would be reduced by .2(14) = 2.8, on average, over a five-year period.  A total estimated project cost of $1.035,000, plus annual maintenance and operation costs of $8,200, led to a benefit/cost ratio of 1.44:1, meaning that, on an annual basis, the reduction in crash costs would exceed the cost of

the project by 44%, sufficient to justify the project on a dollar basis.  Addendum B2B is included to show the detailed analysis for this project.

The project was designed and built, with completion in 2016.  Total actual cost for this HSIP project was approximately $500,000.

The HSIP project cycle includes an after-analysis that, following a sufficient number of data-gathering years after project completion, uses the crash experience and related cost reductions (or, possibly, increases) due to the project to calculate an actual benefit/cost ratio.  Such an analysis for this project is expected to be completed once 2019 crash data are finalized.

### Badger Road Two Way Left Turn Lane

Badger Road is a minor arterial roadway southeast of Fairbanks connecting Fort Wainwright with the North Pole area.  It intersects the Richardson Highway at both ends, 6 mile and 13 mile.  The 2013 Average Daily Traffic varied by location between 4066 and 9598 vpd.  Need for the proposed safety improvement project was identified in part by a Road Safety Audit that assessed the causes of observed crashes and recommended solutions. (AKDOTPF Northern Region, 2019).  The data-driven analysis first identified the large density of driveways and minor side streets – 22 per mile – over the nine-mile segment of roadway between Dennis Road and Hurst Road that was of concern.  A project to provide two left turn lanes was envisioned to assist in reducing the crash rate at those locations.

Since the major intersections are already provided with turn lanes and cannot be improved further, crashes that occurred at these intersections were removed from the analysis.  The result was that, during the five-year study period between January 1, 2008 and December 31, 2012, the relevant numbers of crashes were as follows: 1 fatality, 4 major injury crashes, 33 minor injury crashes, and 57 property damage only crashes.  Addendum B2C contains a map showing the locations of these crashes.

Installation of two-way left turn lanes on a two-lane road has an associated conservative 29% crash reduction factor.  When this factor is applied to the five-year crash data and the resulting expected reduced crash costs are combined with a project cost estimate of $19,980,000 and annual maintenance and operation costs of $600, the result is a benefit/cost ratio of 0.23:1.  On the basis of economics alone, the project cannot be justified.  However, the current threshold for nominating projects for the HSIP is 0.2:1, and other factors led to the decision to go ahead with the project.

Construction was begun in May 2019, with completion expected in the fall of 2019.

### Montana Creek Road Intersection Illumination

The intersection of Montana Creek Road and Back Loop Road in Juneau experienced nine crashes between 2005 and 2009, four of which occurred at night.  These nighttime crashes resulted in five minor injuries and one major injury.  The major injury was not included in the analysis because it was attributed to driver illness which could not have been alleviated with the proposed project.

The proposed project would install improved illumination at the intersection, with the goal of reducing crashes after dark and at other times of reduced visibility.   The estimated total project cost was $144,326.  Since no crash reduction factor exists for improved intersection illumination, the project became an unranked project.  In accordance with guidelines, a sensitivity analysis using crash reduction factors of 5% and 100% was performed, resulting in benefit/cost ratios of 0.3:1 and 6.7:1, respectively.  Engineering judgment determined that the project was justified, and it was designed and built in late 2014 for a total actual cost of $148,387.

### Glacier Highway Safety Improvements

On a 0.6-mile segment of the Glacier Highway north of Juneau, one fatality and one major injury crash occurred between 2008 and 2012. This minor arterial route has an Average Daily Traffic of 1120 vpd. Since both crashes were run-off-the-road crashes, the proposed mitigation was the installation of approximately 3000 feet of W-beam guardrail.

Consideration of potential crash reduction costs and the proposed project budget of $476,933 resulted in an expected benefit/cost ratio of 3.2:1. The actual project cost was $376,162, and it was completed successfully in 2016.

### Halibut Point Road and Peterson Avenue Intersection Safety Improvements

An interesting aspect of data collection to support one safety improvement project in Alaska's South Coast Region is the inclusion of findings by a Girl Scout troop that collected anecdotal comments, primarily from a pedestrian perspective, to support the installation of a rectangular rapid-flashing beacon (RRFB) at an intersection in Sitka. Average annual daily traffic for 2013 was 11,443 vpd for the main street and 2,390 vpd for the cross street. Of further interest is the timing of various aspects of the project planning process.

During the 2008 to 2012 study period, for which the latest data were available, there were no reported pedestrian crashes at this intersection and thus none of the fatal or serious injury type. Thus, for the "official" analysis, no benefit/cost ratio could be computed, and the proposal became an unranked project. Outside the 2008 to 2012 timeframe, there were two pedestrian crashes before 2008, one in 2000 and one in 2001; one was attributed to impaired driving. After 2012, a fatality occurred when a bicycle, its driver impaired by alcohol, entered the intersection and was struck by a motor vehicle. The Girl Scouts' survey results were reported in 2016.

This is an example of the importance of engineering judgment in arriving at project priority and in deciding what safety improvement elements should be included. Many comments, both from the Girl Scout survey and elsewhere, indicated a significant problem with deficient lighting. Further, there were anecdotal reports of near-misses between vehicles and pedestrians crossing the intersection.

In the end, the RRFB proposal was rejected in favor of additional illumination, a new two-stage crossing that includes a refuge island, improving sight distance, modifying a driveway entrance, and changing some signage. The project is in the design stage, with construction anticipated in 2020. The current estimated cost is $715,907 (consisting of construction and utility costs). Right-of-way costs are also expected but are not yet quantifiable because negotiations have not been completed.

### Challenges in Remote Area Crash Analysis

Crash data from remote sparsely populated areas tend to present special challenges. Current methodologies used for screening for potential HSIP projects identify those segments (roadways) with discernible patterns, but an important but small number of crashes occurring in dispersed locations in small villages may not be so identified. For example, in Anaktuvuk Pass, one fatal and three serious injury crashes occurred in a three-year period on a single street, and the route-based screening process did identify that street for further investigation towards a potential improvement project. However, Nuiqsut, Point Hope and Wainwright experienced two or more serious injury or fatal crashes over three years, but they were not identified in the current screening process because, even though the geographic area was small, they occurred on different roadways.

Recent advances in crash data mapping techniques offer opportunities for traffic engineers to identify small communities with crash problems.

<u>High Risk Rural Roads Program</u>

We include this discussion under our section on the Highway Safety Improvement Program because the selection process is the same, even though the funding obligation is specified more rigidly.

### HRRR Definition

Federal legislation requires that any state whose fatality rate on rural roads increased over the most recent two-year period must obligate a specific amount of funding toward High Risk Rural Roads (HRRR) safety projects in the next fiscal year. "Rural roads" are defined here as Rural Major Collector, Rural Minor Collector, or Rural Local Roads (AKDOT&PF, 2018). There is no specific set-aside of such funding, so those states so designated must utilize funds from non-HSIP moneys. Alaska defines an eligible HRRR as "any roadway segment functionally classified rural major collector, rural minor collector, or rural local road which ranks in the top 10 percent by rate of fatal plus major injury crashes per mile." (*ibid*)

### Alaska Eligibility

Alaska was notified in December 2018 that its recent rural road crash record is such that it must so obligate these funds (Alicandri, 2018). Because Alaska's fatalities on rural roads increased from an average of 1.7 per 100 million vehicle miles traveled in 2011-2015 to 1.9 in 2013-2017, it must obligate $900,000 to such projects in FY 2020.

### Representative Projects

An example of the application of HRRR funding is the easterly portion of the Chena Hot Springs Road project described above. Beyond Nordale Road, the road is classified as Rural Collector. The process of selecting the project was described previously and did not depend on the "rural" nature of the roadway. The cost of constructing the safety improvements on this portion was part of the state's required application of $900,000 to such projects in the year it was built, 2016.

Other examples are tree removal and other sight distance enhancements at intersections in the Central region.

## Addendum B2A

| User: | jtraffic |
|---|---|
| Analysis Type: | Overlapping Bucket Analysis |
| Data Source: | Alaska eCrash V2 |
| Start Date: | 01/01/2013 |
| End Date: | 12/31/2015 |
| Region: | Example Region |
| Return Top: | 100.00% |
| Bucket Size: | 2.00 |
| Bucket Size: | 2.00 |
| Step Size: | 1.00 |
| Fatal Weight: | 2003.00 |
| Serious Injury Weight: | 1001.00 |
| Minor Injury Weight: | 200.00 |
| No Injury Weight: | 20.00 |
| Percent To Return: | 100.00% |
| Minimum Crashes In Each Spot: | 1 |
| Minimum Fatal Crashes In Each Spot: | 1 |
| Minimum Serious Injury Crashes In Each Spot: | 2 |
| Minimum Minor Injury Crashes In Each Spot: | 0 |
| Use Crash Counts/Rates: | Counts |

Alaska DOT&PF
Highway Safety Improvement Program
**High Crash Location
Screening Process**

Screening Date
2/21/2018

NOTES:
1. Explanations are required in the "Comments" column for all segments including at least one fatal crash or two major injury crashes occurred, where improvements are not recommended.
2. The location screening process flags locations with one or more fatals and/or two or more serious injury crashes for further study.
3. Only locations meeting criteria are shown on this template.
4. The Crash Costs per Mile column is used to sort locations in descending order.

| Route Name | Route | FromMp | ToMp | Crash Costs (1000s) | Crash Costs / Mile (1000s) | Crashes / Mile | PDO Crash Count | Minor Injury Crash Count | Serious Injury Crash Count | Fatal Crash Count | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location 1 | CDS #1 | 3.00 | 5.00 | 8302 | 4151 | 69 | 116 | 19 | 2 | 0 | |
| Location 2 | CDS #2 | 3.00 | 5.00 | 6587 | 3294 | 8 | 8 | 2 | 4 | 1 | |
| Location 3 | CDS #3 | 4.00 | 5.07 | 6442 | 6016 | 84 | 74 | 14 | 2 | 0 | |
| Location 4 | CDS #4 | 2.00 | 4.00 | 6084 | 3042 | 27 | 41 | 11 | 1 | 1 | |
| Location 5 | CDS #5 | 6.00 | 8.00 | 5764 | 2882 | 28 | 44 | 9 | 1 | 1 | |
| Location 6 | CDS #6 | 2.00 | 4.00 | 4744 | 2372 | 13 | 17 | 7 | 1 | 1 | |
| Location 7 | CDS #7 | 2.00 | 4.00 | 4684 | 2342 | 10 | 14 | 2 | 4 | 0 | |
| Location 8 | CDS #8 | 1.00 | 3.00 | 4444 | 2222 | 14 | 21 | 5 | 1 | 1 | |
| Location 9 | CDS #9 | 4.00 | 6.00 | 4444 | 2222 | 15 | 22 | 5 | 1 | 1 | |
| Location 10 | CDS #10 | 7.00 | 8.04 | 4143 | 3986 | 47 | 42 | 6 | 0 | 1 | |
| Location 11 | CDS #11 | 3.00 | 5.00 | 4063 | 2032 | 15 | 21 | 8 | 0 | 1 | |
| Location 12 | CDS #12 | 10.00 | 12.00 | 3983 | 1992 | 10 | 9 | 9 | 0 | 1 | |

Figure B-3. High Crash Location Screening Process Spreadsheet Template

## Alaska DOT/PF
### Highway Safety Improvement Program
# Project Ranking Worksheet

Red fields are input fields.
Black fields are fixed, computed, or derived.

| HSIP Project Name: | 14NR05 CHSR Safety Improvements | | | |
|---|---|---|---|---|
| Analysis Period: | 1/1/06 to 12/31/10 | Form Completed by | Pam Golden | Date: 5/8/14 |

### Miscellaneous Data

| | |
|---|---|
| Rate of Return: | 3% |
| No of years of accident analysis | 5 |

### Accident Cost Data

| Accident Severity | Accident Cost |
|---|---|
| Property Damage Only: | $14,000 |
| Minor Injury: | $140,000 |
| Major Injury: | $702,000 |
| Fatality: | $1,404,000 |

### Predicted Change in Accidents due to Improvement(s)

| Imprv Type Num | Improvement | Type of Accident Susceptible to Reduction or Increase due to Improvement | Reduction Factor (+ or -) | No of Acc.s Susceptible to Reduction or Increase | | | |
|---|---|---|---|---|---|---|---|
| | | | | PDO | Min | Maj | Fat |
| 314 | New Curve Warning Signs and Delineators | All non-intersection crashes within the target curve | -20% | 23 | 14 | 3 | 2 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | Total Accidents Susceptible to Reduction or Increase: | | 23 | 14 | 3 | 2 |
| | | Predicted Change in Accidents: | | -5 | -2.8 | -0.6 | -0.4 |
| | | Predicted Change in Accident Cost ($1,000): | | -64 | -392 | -421 | -562 |

### Benefit/Cost of Improvements (Safety and M&O Benefits Only)

| Improvement | Total Proj Cost (K) | Ann M/O Cost (K) | Life of Impvt (yrs) | Predicted Change in Accidents | | | | Predicted Change in Accident Cost | Annualized Safety and M&O Benefits | Annualized Constr. and M&O Costs | Benefit Cost (Safety and M&O Benefits only) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PDO | Min | Maj | Fat | | | | |
| New Curve Warning Signs and | 1035 | 8.2 | 6 | -4.6 | -2.8 | -0.6 | -0.4 | -$1,439,200 | $287,840 | $199,218 | 1.4 : 1 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Subtotals: | | | | -4.6 | -2.8 | -0.6 | -0.4 | | | | |
| Totals/Averages: | 1035 | 8.2 | 6.0 | -8.4 | | | | -$1,439,200 | $287,840 | $199,218 | 1.44 : 1 |

### Benefit Cost Formula (Safety and M&O Benefits Only)

B/C Ratio = $\dfrac{\text{(Estimated Annual Reduction in Accident Cost)} + \text{(Decrease in Ann Maintenance Cost, 0 if increase)}}{\text{(Annualized Construction cost)} + \text{(Increase in Ann Maintenance cost, 0 if decrease)}}$

### Combined Effects of Multiple Countermeasures

$$ARF_{combined} = \left[1 - \left(1 - \frac{ARF_1}{100}\right)\left(1 - \frac{ARF_2}{100}\right)\ldots\left(1 - \frac{ARF_n}{100}\right)\right] \times 100$$

Compute a combined Accident Reduction Factor only for crash types jointly influenced by dissimilar improvements at the location of interest. Consider limitations of this formula as discussed in TRB Special Report 214 Designing Safer Roads, 1987, pg. 253-255.

Figure B-4. Project Ranking Worksheet – Chena Hot Springs Road Improvements

**Addendum B2C**
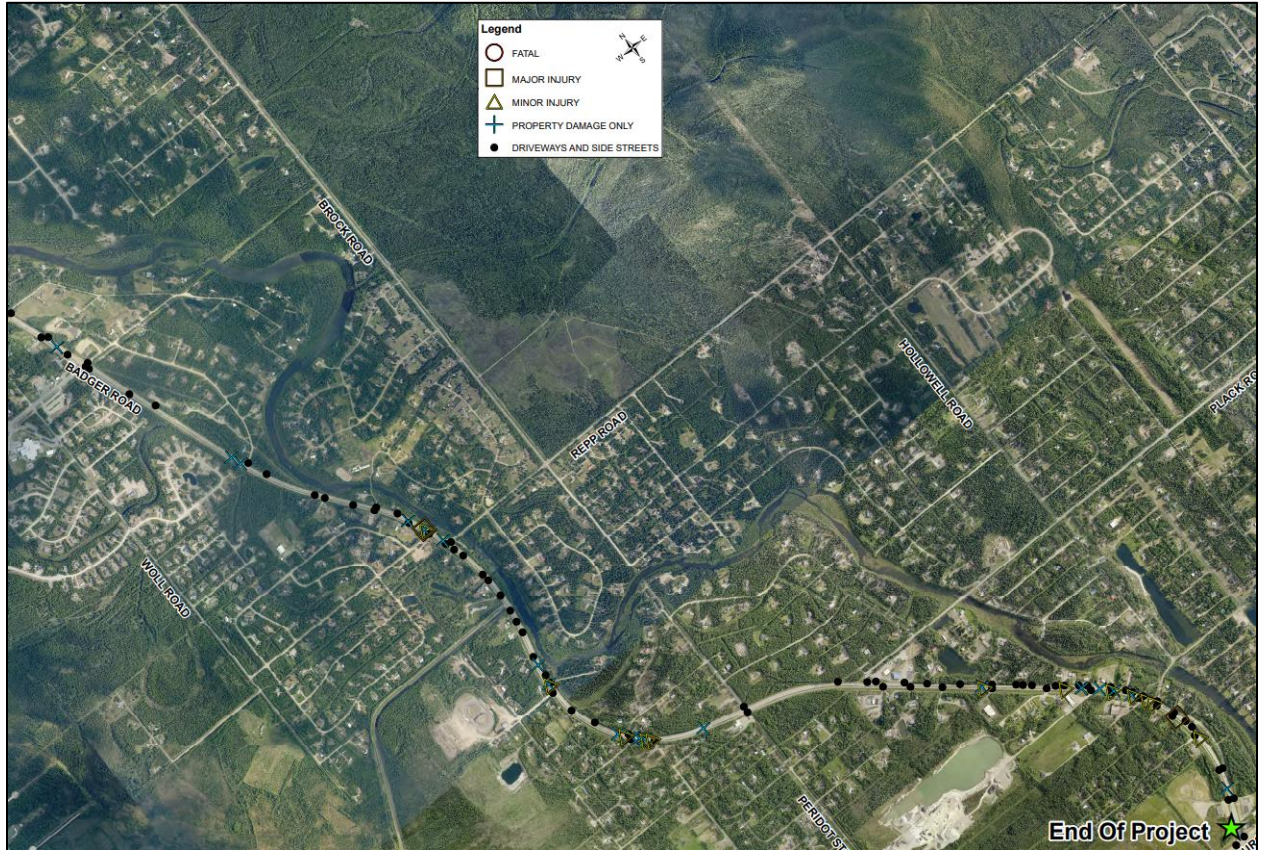


Figure B-5. Portion of Crash and Access Map – Badger Road Project

## Appendix B3 TRANSPORTATION ALTERNATIVES PROGRAM

Federal legislation provides funding to states for projects designated as "transportation alternatives." These projects plan, design and construct facilities for non-motorized travel by such users as pedestrians and bicyclists.  The Alaska DOT&PF website for this program indicates that the program can include "sidewalks, bicycle infrastructure, pedestrian and bicycle signals, traffic calming techniques, lighting and other safety related infrastructure, and transportation projects to achieve compliance with the Americans with Disabilities Act of 1990. Also eligible are infrastructure projects and systems that will provide for safe routes for non-drivers, including children, older adults, and individuals with disabilities to access daily needs." (AKDOT&PF, 2019). Available funds are defined by population, with locations with less than 5,000 population called rural, those between 5,000 and 200,000 defined as urban, and those greater than 200,000 as part of their own Metropolitan Planning Organization (Anchorage and Fairbanks) and not part of the Alaska DOT&PF process described here.  An additional category, "statewide," is not defined by population and is available for any area irrespective of size.

Examples of projects funded in prior years are sidewalks in Cordova, Kotzebue and Craig, street lighting in Russian Mission, a trail in Thorne Bay, a Safe Routes to School project in Homer, a bicycle traffic calming project in Anchorage, and a multi-modal safety pathway along 15 miles of the Seward Highway. Project budgets ranged between $7.480 and $7,141,929.

All Transportation Alternatives projects are required to be funded competitively.  In Alaska, each region develops its prioritized list of projects through a numerical ranking process., based on specific criteria. Final selection, statewide, is accomplished by a Project Evaluation Board that scores and evaluates the candidate projects submitted by the regions.

Twelve categories comprise the selection criteria, each with a specified weighting: health and quality of life (5), safety (5), local contribution to capital costs (5), maintenance and operation costs (4), public support (4), bridging of gaps or removing barriers between existing system or sites (4), connection with annual recreational, educational or tourism event or activity (2), various intrinsic qualities (2), stabilization or renovation of a historic transportation facility (3), cost effectiveness (3), capital cost or project complexity (3), and other factors (3).

Thus, out of a total of 43 weighting points, safety is weighted a 5, or about 12%, of the total.

In the safety section of the funding application form, applicants are guided as follows: "How will this project address the Alaska Strategic Highway Safety Plan (SHSP) goal of reducing the number of bicyclists and pedestrians killed or injured in vehicular crashes?"

Addendum B3A includes a description of the scoring guidelines for the safety category.  The importance of crash data in this process is apparent.  Note, for example, that, to be scored a full 5, the proposed project corridor must have "a known history of high collisions with cyclists and/or pedestrians AND is documented (two or more incidents in the last five years within project limits) and the project improvements are expected to help mitigate the existing safety concern."  Furthermore, the source of the data influences the maximum possible score – To be eligible for a full 5 points, the data must be the "most recently available five-year official DOT&PF data. When using anecdotal crash information from first hand (EMS, Fire, Police, M&O - on-scene responsibility) = maximum score is 4 points.  When using

anecdotal safety information from second-hand sources (not on-scene responsibility) or data not recognized in practice = maximum score = 3 points."

We cite as examples three of the projects selected in the 2019 cycle.

Of the ten projects for which funding was available, the Windfall Lake Trail in the South Coast Region was ranked highest, with a composite review board score of 167. This project was of the Small Urban project type. Regarding safety, the application narrative said, "The two major bridge's on the Windfall Lake Trail are failing. The trail is utilized by pedestrians and bicyclists. Replacing the bridges with new, longer and wider bridges will dramatically reduce the current risks to these user groups. If the second bridge replacement is not funded, the trail will need to be closed to all users. The new bridges will restore safe connections of (*the*) Windfall Lake Trail. They have been designed to be longer, wider, stronger, and have upgraded safety rails. They are designed to handle equipment for future maintenance, which also makes them more accessible."

Because the application's safety section used only "anecdotal safety information from second-hand sources or data not recognized in practice," it could be assigned a score of only 3. Other sections of the application were strong enough to overcome this weakness and result in the number one ranking.

In close second place was the Fairbanks North Star Borough Growden Area Accessibility Improvements project, another Small Urban project, with a final composite score of 162. The stated purpose of this project is "to improve safety and access and provide an important east-west transportation corridor for non-motorized travelers in an area adjacent to downtown Fairbanks… (It will) construct an eight-foot wide, asphalt-paved, ADA accessible path from the Chena Riverfront Path through Growden, Kiwanis, and Ringstad Parks (Growden Complex) to Denali Elementary School and the Ruth Burnett Fish Hatchery."

The application cited DOT&PF data in support of its safety category section – 4 reported bicycle crashes and 1 reported pedestrian crash in the last 5 years within 1/3 mile of the proposed facility. It is predicted that the improvements will reduce modal conflicts and mitigate three safety concerns by providing direct connections between local sidewalks and parks, formalized road crossings, and sufficient width to allow timely snow removal.

The strong section on safety led the regional staff to assign it a score of 5, the maximum allowed for this category.

The final example is a rural project, the Cordova Community Center Stairs, which achieved a composite evaluation board score of 138, placing it fifth overall out of ten funded projects and second of three in the rural category. In evaluating the potential safety improvements, the board had no crash or injury data to consider but found that it met two of the goals in the Alaska Strategic Highway Safety Plan. Some evaluators assigned a safety score of 2, while others rated it 3, out of a maximum of 5. The following narrative is copied from the safety section of the project evaluation:

**Project will improve safety by constructing important safety features such as traffic calming features, lighting, and other safety related infrastructure or providing for the collection of data.**

- The stairs provide a direct linkage between the library (in the Cordova Center) to the pool building which are both used as public school facilities.

- The stairway is to be covered and lighted thereby providing a clear access way in adverse weather. Cordova receives 162 inches of precipitation a year; the average winter temperature is 37°F thereby making Cordova winters a mixture of rain, snow, and ice.

- Furthermore pedestrians will no longer have to walk around through un-cleared parking lots and road shoulders as addressed in the *2013 AK SHSP* action items 1.2 and 2.1 below:

  **Action 1.2** seeks to increase the amount of safe walking trips to and from school and routes within a mile of schools. Both the elementary school and junior/senior high school are within a mile of the stairs. Removing the temptation to cross on a blind corner of Railroad Ave, climb through a snow dump and walk on treacherous footing will encourage parents and teachers to allow kids to walk to essential services creating the opportunity for safe walking trips.

  **Action 2.1** describes preserving the right of way for pedestrians during snow events due to increase in injuries and fatalities during winter months. It goes on to described that a lack of maintenance on walkways result in pedestrians using cleared roads instead of sidewalks. This can lead to increased conflicts with motorist and pedestrians. The stairs will construct an important safety feature that will remove pedestrians and bicyclist from sharing the road with vehicles. Additional safety features include a well-lit safe corridor free of ice and snow.

## Addendum B3A

| Standards | (5) | (3) | (0) | (-3) |
|---|---|---|---|---|
| 1. **Health and quality of life** (for example air and water quality, neighborhood continuity, accessibility) Weighting: 5 | This project provides a significant contribution to improved health or quality of life; or reduces or removes a significant existing negative factor. | This project provides a moderate contribution to improved health or quality of life; or reduces or removes an existing negative factor. | Project will have no effect either positive or negative on quality of life issues. | This project provides a significant degradation to health or quality of life. |
| *Examples include projects that provide mobility options for underserved populations, safe active transportation to schools and learning centers, and pedestrian mobility for seniors and disabled persons.* | | | | |
| 2. **Safety** Meets goals or strategies listed in the Alaska Strategic Highway Safety Plan (SHSP) related to bicyclists and pedestrians. Weighting: 5 | Project corridor has a known history of high collisions with cyclist and/or pedestrians AND is documented (two or more incidents in the last five years within project limits) and the project improvements are expected to help mitigate the existing safety concern. | Project will improve safety by constructing important safety features such as traffic calming features, lighting, and other safety related infrastructure or providing for the collection of data. | Project does not include a safety component. | Project will have a significant adverse effect on safety of pedestrians or bicyclists. |
| *Most recently available five year official DOT&PF data. When using anecdotal crash information from first hand (EMS, Fire, Police, M&O - on-scene responsibility) = maximum score is 4 points. When using anecdotal safety information from second-hand sources (not on-scene responsibility) or data not recognized in practice = maximum score 3 points.* | | | | |

Figure B-6. Transportation Alternatives Program Scoring Criteria for Safety Category

## Appendix B4 HIGH RISK RURAL ROADS PROGRAM

(Portion of Highway Safety Improvement Program in Appendix B2)

We include this discussion under our section on the Highway Safety Improvement Program because the selection process is the same, even though the funding obligation is specified more rigidly.

### HRRR Definition

Federal legislation requires that any state whose fatality rate on rural roads increased over the most recent two-year period must obligate a specific amount of funding toward High Risk Rural Roads (HRRR) safety projects in the next fiscal year. "Rural roads" are defined here as Rural Major Collector, Rural Minor Collector, or Rural Local Roads. (AKDOTPF 2018, pp 5). There is no specific set-aside of such funding, so those states so designated must utilize funds from non-HSIP moneys. Alaska defines an eligible HRRR as "any roadway segment functionally classified rural major collector, rural minor collector, or rural local road which ranks in the top 10 percent by rate of fatal plus major injury crashes per mile." (*ibid*)

### Alaska Eligibility

Alaska was notified in December 2018 that its recent rural road crash record is such that it must so obligate these funds (Alicandri, 2018). Because Alaska's fatalities on rural roads increased from an average of 1.7 per 100 million vehicle miles traveled in 2011-2015 to 1.9 in 2013-2017, it must obligate $900,000 to such projects in FY 2020.

### Representative Projects

An example of the application of HRRR funding is the easterly portion of the Chena Hot Springs Road project described above. Beyond Nordale Road, the road is classified as Rural Collector. The process of selecting the project was described previously and did not depend on the "rural" nature of the roadway. The cost of constructing the safety improvements on this portion was part of the state's required application of $900,000 to such projects in the year it was built, 2016.

Other examples are tree removal and other sight distance enhancements at intersections in the Central region.

**Appendix B5 ALASKA HIGHWAY SAFETY GRANT PROGRAM**

The Alaska Highway Safety Office (AHSO), a part of the Alaska Department of Transportation and Public Facilities (AKDOT&PF), provides grant funding to address certain stated traffic safety areas of concern. Its Grant Application Instructions (Alaska Highway Safety Office, 2019) list these priority areas as "Impaired Driving, Distracted Driving, Police Traffic Services, Speed and Aggressive Driving, Roadway Safety, Occupant Protection, Child Passenger Safety, Pedestrian and Bicycle Safety, Motorcycle Safety, Traffic Records, Distracted Driving [*sic*.], Nonmotorized and Community Traffic Safety."

Eligible Entities

Those entities eligible to receive grant funding under this program include "government agencies, political 'subdivisions' of the state and local government agencies, state colleges and state universities, school districts, fire departments, public emergency services providers, and certain qualified non-profit organizations …" (*ibid*.)  Awardees are required to provide a minimum hard dollar match of 20% of the project cost.

Examples of entities included in the 2018 Alaska Highway Safety Plan request for funding are the Alaska State Troopers, Fairbanks DUI Traffic Enforcement Unit, Alaska Crime lab, Alaska Safe Kids, Central Peninsula Hospital, Safe Kids (SK) Kenai Peninsula, Alaska Division of Public Health Injury Surveillance Program, and Homer Police Department (Alaska Highway Safety Office, 2017).

Funding Sources

Two programs within the current omnibus Federal Fixing America's Surface Transportation Act (FAST Act, 2015) provide funding for projects requested through the Alaska Highway Safety Office. Section 402, the State and Community Highway Safety Grant Program, supports programs related to speeding, occupant protection, impaired driving, motorcycle safety, unsafe driving behavior, driver improvement, law enforcement improvement, pedestrian and bicycle safety, traffic records improvement and commercial motor vehicles.  The other funding source, Section 405 – National Priority Safety Program, has a more limited focus, emphasizing occupant protection, traffic records, impaired driving, motorcycle safety and distracted driving (these five are similar to the Section 402 efforts), in addition to driver licensing laws and non-motorized safety.  The AHSO determines which of the two programs will be selected as the prospective funder (Alaska Highway Safety Office, 2016).

The 2018 Alaska Highway Safety Plan also provides that "One hundred percent of.…[certain]…. transfer funds will be used by the Department of Transportation and Public Facilities for eligible infrastructure-related projects as provided in the Section 164 and 154 regulation."  (AKDOT&PF Highway Safety Office 2017).  In the past, these funds have been used for infrastructure projects within the Highway Safety Improvement Program (M. Walker, Personal Communication, 2019), although the 2018 report on grants shows zero amounts for Alaska in these categories (NHTSA, 2018).

Funding Process

The annual funding cycle begins with the submission, no later than May 31, of Highway Safety Grant Applications from those entities seeking funding.  A committee evaluates and prioritizes the applications

and forwards its recommendations to the Alaska Highway Safety Office.  In the case of 405(c) grants for Traffic Safety Information Systems, for example, the reviewing group is the Alaska Traffic Records Coordinating Committee (ATRCC).

The ASHO reviews and decides upon the recommendations, adds other projects of its own, and includes the total request within its annual Alaska Highway Safety Plan (AKDOT&PF Highway Safety Office 2017). This document is the basis for the AHSO's request for Federal funding from the National Highway Traffic Safety Administration, submitted in July.  Applicants are notified in September as to whether their application was funded.  Grants are administered on a Federal fiscal year basis, with new projects beginning October 1.

In a recent funding cycle (FY2018), Alaska's share of the total $640,161,431.85 awarded to 57 states and other US jurisdictions was $2,905,883.59, including $2,087,232.37 under the 402 program and $818,651.22 under the 405 program (NHTSA, 2018).

Applying for AHSO Funding

The application form used by entities seeking funding includes, as part II, the Project Plan and Supporting Data (Alaska Highway Safety Office, 2019), The applicant is free to provide any appropriate data in the narrative.

The grant application instructions (Alaska Highway Safety Office, 2019) include, among six selection criteria, the following two that relate to data:

- Does the application provide sufficient supportive crash data to determine the extent of the traffic safety problem for the program area in which funds are being requested?
- Does the crash data provided in the application's "Statement of the Problem" document an existing traffic safety problem. (Citation data and survey results should also be used to document the problem.)

The detailed instructions relating to completion of the Statement of the Problem section include the following guidance:

> "Include a minimum of three years of complete crash data and a brief analysis of the data. When available, five years of data should be presented and analyzed."

The AHSO's website (AKDOT&PF Highway Safety Office 2016) provides a wealth of data on fatalities, both overall for the state and for various geographic areas.  Samples of this material, which can be used to support grant funding applications, are shown in Appendices GGG and HHH.
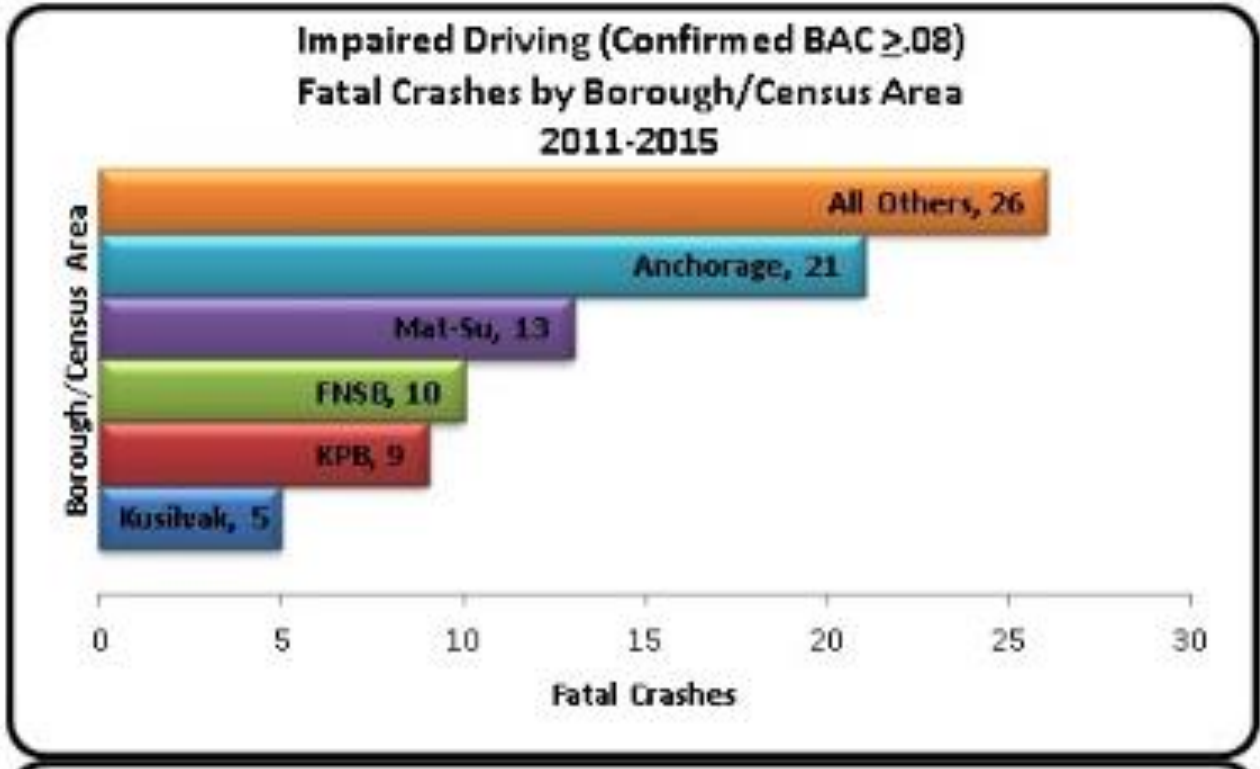
Figure B-7. Five years of Alaska Fatal Crash Data due to Impaired Driving
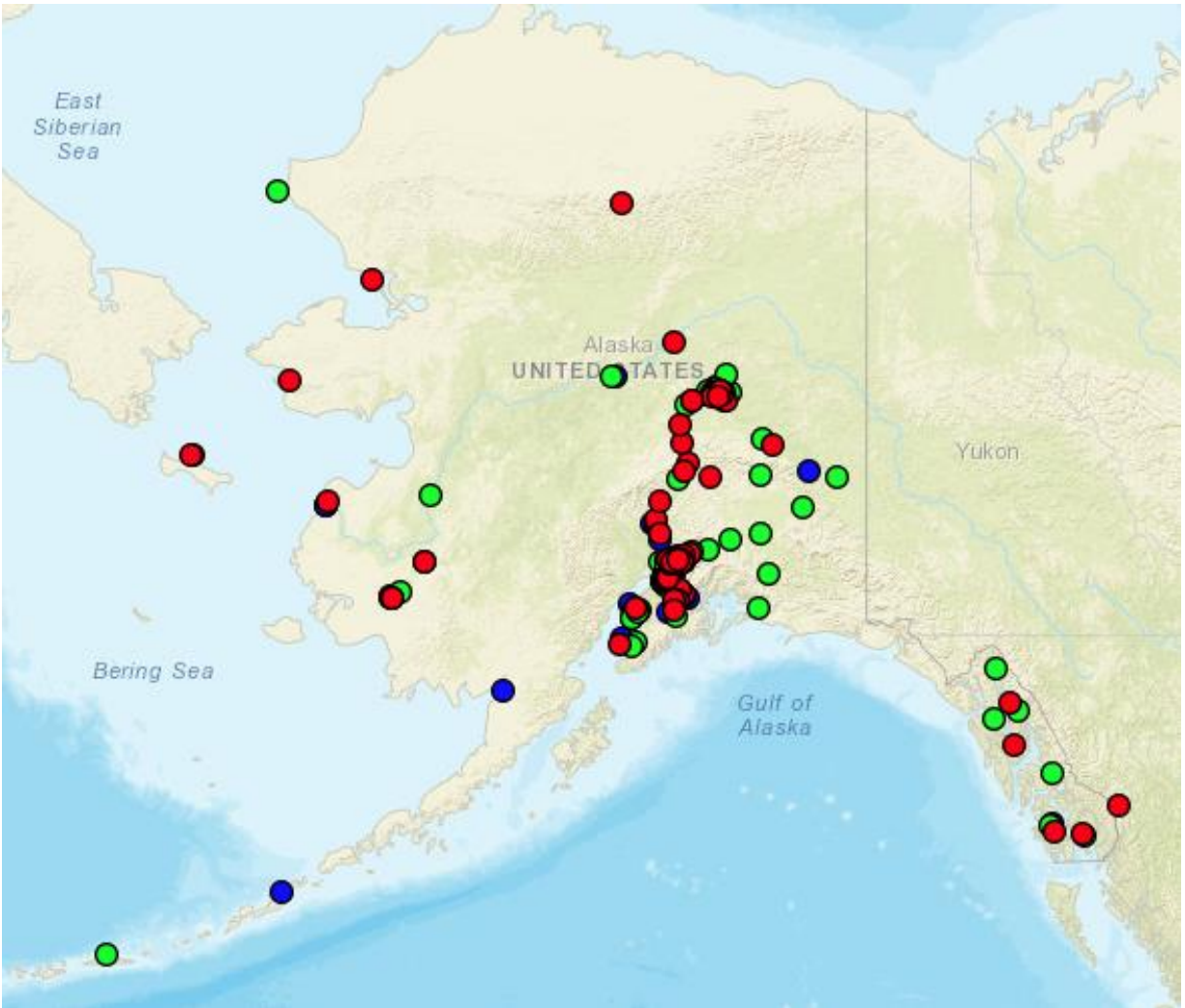
Figure B-8. Total Alaska Fatal Crashes for 2015 (blue), 2016 (green) and 2017 (red)

**Appendix B6 BETTER UTILIZING INVESTMENTS TO LEVERAGE DEVELOPMENT (BUILD)**

The DOT BUILD program would seem an excellent source of funding for rural Alaska projects.  The program is designed to provide funding for any entity, including tribal, ports, metropolitan planning agencies, for transportation-related projects.  Its scope is much greater than most DOT funding, which mostly goes for highways and transit agencies.  Since its scope includes rural needs, such as trails and multi-modal activities, BUILD funding might be "fit" rural Alaska in cases where other funding sources are too narrowly defined. Further, a portion of BUILD funding must be used for "rural" projects.  Although the definition of "rural" is quite broad – a census area population of under 200,000 (US Department of Transportation, 2019).

Our question is the extent of the data needs for a successful BUILD application.  We have not been able to get information directly from the DOT.  We have queried both copies of successful applications and overall selection procedures.  We have not heard back from the DOT.  However, a description of successful projects is available from the DOT, and we reviewed all the successful applications both from BUILD and the former TIGER program, which is essentially identical.  We reviewed all projects awarded between 2011 and 2018. We examined all the projects that were awarded to "tribes" or tribal entities, as well as all rural projects that featured safety and implied they were not on a major highway system. We also looked at all projects in Alaska, examining which seemed to involve crash data.

Here is a sample of information presented that relates to our task.

Use of RSA.

Only one project mentioned an RSA:  US 101 SMITH RIVER SAFETY CORRIDOR, Tribe of Smith River Rancheria, engaged in a partnership between a tribe, a state DOT, and USDOT to identify solutions using a Road Safety Audit. The project, pursued by the tribe, Caltrans, Del Norte County and Federal Highway Administration will fund needed safety improvements on a critical roadway that bisects tribal lands. Between 2005 and 2010 117 collisions that resulted in 9 fatalities occurred in the project area. Note this is an RSA, but had some definite crash data.

Several projects did mention crash data, usually fatalities:

17 MILE ROAD RECONSTRUCTION, Eastern Shoshone/Northern Arapaho Tribes Business Council. The Eastern Shoshone and Northern Arapaho Tribes project addresses critical design concerns on the major east-west highway corridor serving the Wind River Indian Reservation.  The project enhances safety along a corridor with the highest driver/pedestrian fatality rates in the state.  The existing roadway, a paved wagon trail, lacks critical safety features which contribute to crashes and fatalities along the corridor. The roadway has experienced a number of automobile accidents, roadway run-offs, and rollover crashes, resulting in 5 fatalities and 42 injuries within the last 10 years.

LEE COUNTY COMPLETE STREETS INITIATIVE, Lee County Metropolitan Planning Organization. Funds will be used to support bicycle and pedestrian transportation connections throughout Lee County.  Funds will improve safety in an area that is among the most dangerous for bicyclists and pedestrians. Safety benefits will be significant due to the dedicated bike facilities and intersection improvements, so that bicyclists will not have to compete with vehicles in an active roadway lane. Of roadway crashes, between 2000-2013 in Lee County, 22% involved injuries or fatalities to pedestrians or bicyclists, nearly

double the national average. During this time, 280 people died while walking or bicycling on Lee County's roadways.

Some projects offered a prediction of crash and fatality improvement, without numbers:

IHANKTONWAN TRANSIT FACILITIES PROJECT,Yankton Sioux Tribe. TIGER funds will build the Ihanktonwan Transit Facility. By providing safe transportation, the project sponsors estimate that, over a 20 year period, the service will avoid one fatality, six injury accidents, eleven non-injury accidents, and $285,000 in property damage.

Other projects stated specific unsafe conditions:

BIA ROUTE 7 TO US HIGHWAY 83 IMPROVEMENT PROJECT, Rosebud Sioux Tribe, SD Project Description This grant reconstructs approximately 16 miles of BIA Route 7 from the City of Rosebud to US 83 on the Rosebud Indian Reservation in South Dakota. The BIA Route 7 improvement project includes roadway reconstruction, intersection reconfiguration, construction of pedestrian infrastructure, and a wide range of safety enhancements.  The project increases safe, efficient regional connectivity between tribally owned farmland and private businesses. Reconstruction of this roadway will decrease the number of crashes, improve the response time of emergency services, and limit burdensome maintenance of vehicles traversing this currently deteriorated roadway.

Jack Rabbit Road Reconstruction Project – Phase 1 APPLICANT/SPONSOR: Turtle Mountain Band of Chippewa Indians.   This tribal project will reconstruct approximately five miles of Jack Rabbit Road. By addressing substandard road conditions, including damaged pavement, a narrow road top, steep ditch embankments, constricted road shoulders, and poor line of sight, the project will improve safety. [From next year's grant] The project extends the benefits of rehabilitating the first phase of Jack Rabbit Road. The project promotes a state of good repair by addressing substandard road conditions, including damaged pavement, a narrow road top, steep ditch embankments, and constricted road shoulders.

Some just stated safety in very general terms

SNAKE ROAD IMPROVEMENT, Seminole Tribe of Florida. The project will improve 2.25 miles of road on the Big Cypress Reservation in Hendry County, Florida. The existing road has two 10-foot lanes, with worn, unpaved shoulders. These improvements will reduce all-terrain vehicle, motor vehicle, and pedestrian crashes. Mobility will be expanded for all-terrain vehicle operators, pedestrians, bicyclists, and motorists.

ST. MICHAEL COMMUNITY STREETS, St. Michael IRA, The Native Village of St. Michael, a Federally Recognized Tribe, will re-contour and resurface existing roads. The project will improve safety, access, and mobility to the Community of St. Michael's transportation network.

BIA 7 - COLLEGE ROAD IMPROVEMENT S Turtle Mountain Band of Chippewa. TIGER funds will reconstruct 4.26 miles of the most heavily traveled road in the Turtle Mountain Band of Chippewa community. It will create a new bike and pedestrian lane, enabling local students and community members to commute more safely. In addition, it will provide safe access to the local hospital and all other municipal services for community residents.

IMPROVEMENTS TO BIA ROUTE Oglala Sioux Tribe TIGER funds will upgrade 17.6 miles of loose gravel road to a paved surface that will provide a critical arterial route in the Pine Ridge Indian Reservation,

one of the most economically distressed populations in the United States. The project improves safety and reduces fatalities and injuries on this stretch of highway, the majority of which is in poor condition.

Some had novel issues that relate to crashes, others novel crash issues

ALAKANUK COMMUNITY STREETS IMPROVEMENT. AVCP on behalf of Village of Alakanuk. TIGER funds will be used to pave almost three miles of gravel streets and earth roads in the Village of Alakanuk, Alaska. These repairs will enhance mobility and improve the quality of life in the village by making drainage improvements and reducing dust, a significant source of air pollution that coats the fish that residents dry in the sun. [Fish drying]

ST. MICHAEL COMMUNITY STREETS, St. Michael IRA. The Native Village of St. Michael IRA will re-contour and resurface the existing roads and construct new road extensions. The project will also construct new boardwalks and rebuild existing boardwalks. The complete project will make improvements to approximately 4.39 miles of road. [Boardwalks]

NELSON ISLAND ACCESSIBILITY AND TRANSPORTATION INFRASTRUCTURE VIABILITY ENHANCEMENT (N.A.T.I.V.E.) PROJECT, Nunakauyarmiut Tribe. The project will construct approximately 21 miles of multimodal trails comprised of above ground, synthetic Geocell mats with an open configuration to protect native vegetation, including necessary fish culverts and bridges, connecting Toksook Bay to Nightmute and Umkumiut. The tribal project improves existing trails rutted by ATV traffic and erosion that forces travelers to navigate undisturbed terrain surrounding the trails, including deep stream crossings. By improving the trail and streambed crossings, the project reduces the likelihood of fatalities and injuries caused by travel on undisturbed terrain. [Trails and ATVs]

GEAUGA COUNTY SAFETY IMPROVEMENT PROJECT, Northeast Ohio Areawide Coordinating Agency. The project will construct safety improvements to address conflicts between motorized vehicles and non-motorized buggies, including increasing shoulder widths to create non-motorized buggy lanes; implementing an advanced detection system to alert motorists of oncoming buggies; installing conflict warning systems with flashing beacons; posting school zone signs; and adding pedestrian warnings of buggies.

So, based on our review, BUILD could offer funding opportunities for rural Alaska entities for many types of transportation projects including trails, ATV roads, boardwalks, docks, as well as roads. It appears that crash data was not necessary – that is, not required for input into models of countermeasures and benefit-cost. However, it seems clear that if crash, especially fatality, data was available it was cited in the project application. A formal RSA was only noted once, in the several hundred rural projects reviewed. Many applications probably cited expert opinion or consultant reports, but these were not mentioned in the project summaries.

## Appendix B7 FEDERAL LANDS ACCESS PROGRAM (FLAP)

FLAP was established to improve state and county transportation facilities that provide access to, are adjacent to, or are located within Federal lands. It is one of several that are part of the Office of Federal Lands Highway (USDOT FHWA Office of Federal Lands Highway, 2019). The FLAP provides flexibility for a wide range of transportation projects in the 50 States, the District of Columbia, and Puerto Rico. FLAP supplements State and Local Agency resources for public roads, transit systems, and other transportation facilities, with an emphasis on Federal high-use recreation sites and economic generators. Improvements may include safety enhancements, and environmental mitigation. The flexibility of the program allows for support of unique federal lands access in a multi-modal approach.

Of the seven project selection criteria, one is devoted to safety: "Does the project improve safety while improving access to a Federal facility?"

Many of the efforts supported by FLAP are joint efforts with other transportation agencies, as shown by the following Alaska example:

Sand Trail Parking Project, Chugach National Forest, Alaska The Sand Trail Parking Project, located 9.5 miles east of the City of Cordova along the Copper River Highway, provides a vehicle parking facility at the trailhead to enhance access to Chugach National Forest for recreation and subsistence purposes. Previously, there was no formalized parking available and trail users were parking on the road shoulder or other undesignated parking areas along the Copper River Highway and traversing back to the trailhead. This was causing inefficient and potentially unsafe conditions for users of the trail and highway travelers. Construction Administration was managed by the Native Village of Eyak, with funds from Forest Service, FLAP, and the Native Village of Eyak TTP.

**Appendix B8 FEDERAL LANDS TRANSPORTATION PROGRAM**

Another of the programs within the US DOT Office of Federal Land Highway, this program provides funding for the management and upkeep of approximately 50,000 miles of federal public roads and other assets comprising partners' Federal lands transportation facility inventory (USDOT FHWA Office of Federal Lands Highway, 2019). These partners include National Park Service (NPS), US Fish and Wildlife Service (FWS), USDA Forest Service (Forest Service), Bureau of Land Management (BLM), US Army Corps of Engineers (USACE), Bureau of Reclamation and independent Federal agencies with land and natural resource management responsibilities.

This program tends to support projects that are cooperative ventures among several funding sources. An example is the Windfall Lake Trail in Southeast Alaska, already described in Appendix B3 – Transportation Alternatives Program (TAP), as follows:

This project was of the Small Urban project type. Regarding safety, the application narrative said, "The two major bridges on the Windfall Lake Trail are failing. The trail is utilized by pedestrians and bicyclists. Replacing the bridges with new, longer and wider bridges will dramatically reduce the current risks to these user groups. If the second bridge replacement is not funded, the trail will need to be closed to all users. The new bridges will restore safe connections of (*the*) Windfall Lake Trail. They have been designed to be longer, wider, stronger, and have upgraded safety rails. They are designed to handle equipment for future maintenance, which also makes them more accessible."

One bridge was funded by FLTP, and the second was jointly funded by FLTP and TAP. Because the safety section in the TAP application used only "anecdotal safety information from second-hand sources or data not recognized in practice," it could be assigned a score of only 3. Ratings in other categories elevated the project to a point that it was funded.

**Appendix B9 NATIONALLY SIGNIFICANT FEDERAL LANDS AND TRIBAL PROJECTS (NSFLTP) PROGRAM**

Description of Program

> The Nationally Significant Federal Lands and Tribal Projects Program provides funding for the construction, reconstruction, and rehabilitation of nationally-significant projects within, adjacent to, or accessing Federal and tribal lands. This Program provides an opportunity to address significant challenges across the nation for transportation facilities that serve Federal and tribal lands. The NSFLTP Program provides discretionary funding for projects that have an estimated construction cost of at least $25 million. Construction projects with an estimated cost equal to and exceeding $50 million receive priority consideration in the selection process. (USDOT FHWA Office of Federal Lands Highway, 2019)

The dollar amounts specified limit the program to relativity large projects. In addition, the regulations specify that the funding is not to be used for design and other preconstruction costs, and the project must have the NEPA process complete before applying for the funding.

The novel aspect of the NSFLTP funding is that it is not limited to highways and may be part of a project of several owners, including tribal, state, and local governments (if they are sponsored by a federal or tribal agency), as well as various federal agencies. The project would always need to benefit the federal or tribal entities, but might benefit other entities. Cost share is an important part of the proposal scoring, although the federal share might be up to 90%.

The six projects funded in 2018-2019 averaged $53 million each. Since this represents only the FHWA share, clearly these are not small projects.

Application Process and Safety Data Requirements

The first of the review criteria is:

I. An analysis of the project's safety improvements compared to a baseline in which the project is not done. For more information, see Section 4.3, pages 13 through 15, of the DOT's Benefit-Cost Analysis Guidance for TIGER and INFRA Applications (USDOT Office of the Secretary, 2017). (Note this file is no longer available, but the new file, Benefit Cost Analysis Guidance for Discretionary Grant Programs (USDOT Office of the Secretary, 2018) has the same section 4.3 titled: Safety Benefits).

From that Guidance:

> To claim safety benefits for a project, applicants should clearly demonstrate how a proposed project targets and improves safety outcomes. The applicant should include a discussion about various crash causation factors addressed by the project and establish a clear link to how the proposed project mitigates these risk factors.

Also:

> For road-based improvements, estimating the change in the number of fatalities, injuries, and amount of property damage can be done using crash modification factors (CMFs), which relate

different types of safety improvements to crash outcomes. CMFs are estimated by analyzing crash data and types, and relating outcomes to different safety infrastructure.

Evaluation of the CMF's is standard traffic engineering and there are sufficient resources for most situations.   However, in order to evaluate the benefit of applying the CMF, historical crash data is needed:

To estimate safety outcomes from the project, the effectiveness rates of safety-related improvements must also be applied to baseline crash data. Such data are generally drawn from the recent crash history on the facility that is being improved, typically covering a period of 3-7 years. Applicants should carefully describe their baseline crash data, including the specific segments or geographic areas covered by that data; links to the source data are also often helpful, where they can be provided.

The guideline makes some allowance for absence of historical data regarding the severity of the crashes:

In some cases, the applicant may only have a single reported number of accidents in the area affected by a particular project, but have no injury and/or injury severity data for any of those accidents.

In order to complete the benefit cost analysis, the traffic volume must be known or estimated.

Therefore, as presented in the guidelines, it would be difficult for a small rural community to generate the data needed for a benefit cost analysis.  The authors wrote to Jeff Mann, Senior Program and Technical Manager, Office of Federal Lands Highway, and asked:

> Dear Mr. Mann, I'm researching availability and use of crash data in rural Alaska locations; many of these locations are predominantly inhabited by Alaska Natives and/or are federally recognized tribal areas.  Specifically, we are trying to determine what crash data is required by the various funding sources for safety-related grants.  Reviewing the FR announcement (Funding Opportunity for the Department of Transportation's Nationally Significant Federal Lands and Tribal Projects Program for Fiscal Year 2018), it requires an analysis of the project's safety improvements compared to a baseline in which the project is not done and then recommends section 4.3 of Benefit-Cost Analysis Guidance  for TIGER and INFRA Applications.  Such an analysis would seem to require a database of accurate crash data in order to compute Crash Modification Factors.  This would seem to preclude remote communities where accurate data is not available.  So, with that introduction, might a rural community without crash data, or very little data, be successful it they used an RSA, Road Safety Audit (or Assessment) in lieu of accurate crash data?

Mr. Mann answered:

> A rural community could be successful under the NSFLTP using an RSA to show potential safety benefits of its proposed project.

Therefore, lack of crash data would not preclude funding of a NSFLTP project, but of course a strong RSA would need the AADT and whatever crash data was available.  In addition, here, we have been using "crash data" in the generic sense.  Since preventing non-highway accidents may be part of the overall NSFLTP project, ameliorating other incidents that affect safety may be included in the proposal.

Since NSFLTP are relatively large projects and design fees are not included in the funding, the RSA would need to be done in the planning and project programing phase, before the proposal is submitted.  In addition, the NEPA documents must be approved before the proposal is submitted.  Thus, the entity proposing the project must invest resources from other sources before the proposal is submitted.  An RSA would be a key part of this pre-proposal effort.

**Appendix B10 TRIBAL TRANSPORTATION PROGRAM SAFETY FUND**

Program Description

The Tribal Transportation Program Safety Fund (TTPSF) is a function within FHWA's Office of Federal Lands Highway, Office of Tribal Transportation (USDOT FHWA Office of Federal Lands Highway, 2019). The overall mission of the FHWA Office of Tribal Transportation is stated as follows:

> Through mutual respect and understanding, enhance the quality of life in Tribal communities by supporting the Tribes' delivery of transportation programs.

Within this mission, the purpose of the Tribal Transportation Program is to provide safe and adequate transportation and public road access to and within Indian reservations, Indian lands, and Alaska Native Village communities.

Each year under the current Federal transportation program (Fixing America's Surface Transportation Act -- the FAST Act), 2% of the available Tribal Transportation Program funds are set aside to address transportation safety issues in Native America. In FFY2020, $505 million is programmed for this TTP purpose and after obligation limitation the safety set aside is around $9.1 million.

A competitive process makes funding available to federally recognized tribes. Selected projects are expected to address the prevention and reduction of death or serious injuries in transportation related incidents, such as motor vehicle crashes.

Eligible projects fall into three types:

- development and update of transportation safety plans
- crash data assessment, improvement, and analysis
- infrastructure improvements and other eligible activities

Application Process and Safety Data Requirements (USDOT FHWA Office of Federal Lands Highway, 2019)

For infrastructure projects, applicants are expected to provide

> An Online Application Form for Federal Assistance
> A project narrative
> Supporting incident data
> Supporting Safety Plan
> And any other applicable supporting documentations

As part of the narrative, a "brief description of the proposed work" will include, in addition to the proposed scope, a description of "the way in which this project addresses the safety needs, strategic goals or priorities of a Tribal Transportation Safety Plan or other strategic safety plan completed in the last 5 years, and how each of those strategic goals or priorities will be addressed by completion of the project."

Application instructions can vary from year to year but the FY19 NOFO gave guidance describing appropriate types of supporting data:

**"What is considered "data" for the purposes of a TTPSF application?**
The TTPSF application should include the best available incident data that accurately describes the transportation safety problems that will be addressed by the project. Although a listing of each crash in the data set may be provided as an appendix, the project narrative should summarize any crash history that is relevant to the project. Ideally, the crash data summary will describe:

- Quantity of crashes
- Time period during which crashes occurred
- Severity (fatal, injury, property damage only)
- Type of crashes, when relevant to the project
- Contributing factors that are relevant to the project (i.e. light conditions, weather, road condition, impaired driving, vehicle failure, etc.)

Source of crash data will vary greatly from one community to the next. Ideally, an enforcement agency or department of transportation can provide you a listing of crashes for a 3-5-year timeframe. In some cases, this information is not available and you may include emergency responder call logs, news articles, or statements about crashes that have been collected from the public.
Other non-incident data may also be beneficial to include when it helps to document a need for the project. Examples of non-incident data include seatbelt surveys, traffic volumes, pedestrian counts, citation records, and letters of support." (*ibid*.)

Project Selection Process

Five criteria are used in the selection process for infrastructure projects (USDOT FHWA OTT, 2019) –

> Data that demonstrate project need.
> Strategic planning documents that identify the proposed project
> Facility ownership – BIA/Tribe or not
> Comprehensive approach to safety including other safety efforts. This is being combined with criteria 2 in FFY20
> Prior awards – within last 5 years or not

For the first criterion, dealing with data, the description is as follows:

**"Summarize any data that clearly demonstrates the need for the project.**

Summarizing the best available data that demonstrates a history or risk of transportation incidents that are expected to be reduced by the proposed activity.

Average daily traffic volumes, pedestrian volumes, traffic citation statistics, public surveys, and sign inventories are examples of alternative safety data sources which could be used to supplement relevant incident history."

The rating guide states:

Highly qualified, if "Data included in the application that directly supports the project. This should be site-specific data that describes the crash history and directly demonstrates the safety need. "

Qualified, if "Some data included in the application that demonstrates risks and supports the project; This data could be an area-wide incident history (such as the results of a systemic safety study) or an explanation that an incident history is not available along with some supporting data from an alternative safety data."

Not qualified: "No data provided in the application to support the request." (*ibid*.)


TTPSF Funding and Safety Data in Alaska

In 2017-18, the Tribal Transportation Safety Program provided twenty-eight grants to Alaska tribes or native villages. Of these twenty-eight, twenty-three were for preparing new Transportation Safety Plans (18) or updating existing plans (5) (USDOT FHWA Office of Federal Lands Highway, 2019).

The remaining five grants were for various types of infrastructure projects. In this section, we list those five projects and provide a more detailed description of three of them, including a discussion of the data used to support the applications for funding.

Table 5-1. Huslia Village Shelter Cabin, Reflectors and Tripods Project (Huslia Tribal Transportation Department, 2017)

| Grant Recipient | Project Purpose |
|---|---|
| Huslia Village | Construct a shelter cabin and place visible reflectors and tripods on the winter trail between Huslia and the Selawik Hot Springs. The project will provide a beacon of safety and warmth during the harsh winters and prevent travelers from becoming lost, thus mitigating a history of hypothermia-caused deaths. |
| Native Village of Napaimute | Ice road safety project to provide trail marking and ice depth assessment data analysis in order to reduce injuries and fatalities along the frequently traveled transportation corridor of the Middle Kuskokwim River |
| Mentasta Traditional Council | Construct 0.19 miles of asphalt bicycle and pedestrian path that 52% of the village residents will use to access the post office, clinic, tribal community center and the school in order to eliminate pedestrian conflicts that have resulted in one known injury. |
| Birch Creek Tribe | Repair six street lights and replace the fluorescent bulbs with brighter, more efficient LED bulbs. |
| Organized Village of Kasaan | Install guardrail and terminal ends at three locations between MP 1.5 and 3.0 on Kasaan Road. |

This $60,000 project ($30,000 from the Federal TTP Safety Fund and $30,000 from the local village) is paying for material, labor and shipping for the construction of a shelter cabin on the trail between Huslia (population 260 on July 1, 2019 (AK HomeTownLocator, 2019)) and Selawik Hot Springs, located 65 miles

north of Huslia.  The trail traverses a prime caribou hunting area from which much of the village's winter food supply is harvested.

Also included is the installation of reflectors and tripods along the Huslia-Selawik Trail and other trails in the Huslia area.  These devices, some of which are already in place, provide an important measure of guidance during winter travel by snow machine.

The application for funding refers to the *Huslia Tribal Transportation Safety Plan – 2017* (Huslia Tribal Council, 2017), in which safety priorities are set forth in the categories of engineering, education, enforcement and emergency services.  The application emphasizes that all four of these safety priority categories will be enhanced by the successful completion of the project.

With regard to data to support the application, the narrative in the application and in the safety plan upon which the application is based, speaks urgently and convincingly about recent accidents that likely could have been prevented if a shelter and/or more adequate trail markings were in place:

> "There have been several deaths from hypothermia during the cold winters due to travelers getting lost during winter storms and having no warm shelter to seek. The most recent death had occurred in January 2017 along the Hot Springs Trail between Huslia and the Selawik Hot Springs. This death of a young man may have been prevented if there was a shelter cabin located along this trail, which emphasizes the crucial importance of the Huslia Winter Trail Safety Project." (*ibid.*)

<u>Native Village of Napaimute Ice Road Safety Project</u> (Native Village of Napaimute, 2017)

This project is the second in this village's three-phase effort called "Arrive Alive."  The first phase cooperated with several entities to set construction standards for ice roads on the Middle Fork Kuskokwim River, assess ice thickness on that corridor, mark hazards and safe locations and remove impassable ice jams and berms.  This second phase, Arrive Alive Phase II, is entitled "Integrating Technology with Traditional Knowledge to Improve Winter Travel Safety on the Kuskokwim River."  Lacking any traditional year-round roadway, residents of this area rely on the river for inter-community travel, by boats in the summer and snow machines and all-terrain vehicles in the winter.

The project's outcome will be an evaluation of ice penetrating radar as a means of determining ice thicknesses on this section of the river that connects the villages of Lower Kalskag, Upper Kalskag, Aniak, Chuathbaluk, Napaimute and Crooked Creek.  Comparisons will be made with thicknesses found from traditional auger methods.  In addition, the route on the river will be marked, and the markings maintained, during the winter season.

Napaimute's *Tribal Safety Plan*, adopted in 2017 and reviewed annually, (Napaimute Traditional Council, 2016) sets forth a detailed strategy for improving transportation safety through improved emergency response, engineering, enforcement and education.  Among the identified high priority efforts is this project to improve methods for determining ice thickness and mark those locations where it is safe to travel and those that are not safe.  The Tribal Transportation Program Safety Fund will supply $179, 655.22, and an additional $32,450.00 will be provided by the village as a match.

The application relies for data support on two types of sources – 1) State of Alaska incident data for traffic violations and vehicular crashes, and 2) a selection of media reports of crashes that occurred on the ice road.

A summary of incident citations for the years 2012 through 2017 for the villages of Aniak, Lower Kalskag, Tuluksak, Upper Kalskag, and Crooked Creek is shown in Table 5-2. Note that not all these incidents took place on the ice road that is the subject of this project.

Table 5-2. Summary of Incident Citations for 2012-2017 in Aniak, Lower Kalskag, Tuluksak, Upper Kalskg, and Crooked Creek

| | |
|---|---|
| Driving under the influence | 52 |
| Driving with suspended license | 8 |
| Failure to stop at stop sign | 1 |
| Inattention/distracted driving | 2 |
| Non-roadway motor vehicle crash | 1 |
| Roadway vehicle crash | 25 |
| Leaving the scene | 1 |
| Other traffic infractions | 7 |
| Total | 97 |

The use of media reports is important in this kind of analysis, as determined by a 2018 study reported by two of the authors of this current report (Belz, et al., 2018; Perkins, 2018). That study found a lack of consistency between Alaska Department of Motor Vehicles crash data, the State of Alaska Trauma Registry, and reports in the local media.  It suggested that, for small Alaska communities, the local newspaper is likely to provide more complete data relating to vehicular crashes.

Thus, the introduction to the section of this application containing media reports of crashes on the ice road is consistent with the above findings and is an important part of the application, as it argues that media reports should be seriously considered in such an analysis.  It states:

> "The Native Village of Napaimute's Road Safety Committee recognizes that most Ice Road accidents are not recorded by the Alaska State Troopers official traffic reports. People often go through the ice and are rescued by others, go through the ice and rescue themselves by walking to safety, and if an injury occurs, the nearest village clinic performs the life-saving procedures and the incident is recorded in medical charts and [there is] no citation or trooper involvement unless the individual dies. Many times when alcohol is involved in an accident, the person will show up at the clinic without an "official" explanation for their injuries. With only a few troopers responsible for covering a couple dozen small remote villages, they are only notified about loss of life accidents. Often response time to any incident is days away by the troopers, so local tribes and communities have to develop their own search and rescue organizations in order to facilitate a quicker immediate rescue." (Native Village of Napaimute, 2017)

Here are the titles of a selection of media reports that the application utilizes as "data" in support of its request for funding:

- Russian Mission man dies when snowmachine sinks in overflow (December 28, 2015)
- Man missing after breaking through Kuskokwim River ice (April 11, 2016) / Searchers attempt to recover remains of deceased Tuluksak man (April 15, 2016)
- Rollover – DUI Bethel, Alaska (March 16, 2017)

- BSAR [Bethel Search and Rescue] says close call happened near Bethel (December 5, 2015)
- Missing Akiak man found dead outside Bethel (January 27, 2017)

<u>Organized Village of Kasaan Guardrail Project</u> (Kasaan Application, 2017)

The Organized Village of Kasaan is a small village located on Prince of Wales Island near Ketchikan in Southeast Alaska.  As of July 1, 2019, it had a population of 50 (AK HomeTownLocator, 2019).  This project is to install 1605 feet of guardrail and six guardrail terminal ends at three locations between mileposts 1.5 and 3.0 on Kasaan Road in areas with steep side slopes.  This project was highlighted in both the village's Safety Plan (Kasaan Safety Plan, 2018) and its Road Safety Audit (RSA) conducted in 2010 (McDonald, 2010).

The RSA noted "Major crash causes on this road are impaired driving, excess speed, nighttime visibility, road width deficiencies, and driver error." (ibid.)

Funding for the project comes from three sources – Federal Lands Access Program (FLAP) -- $2,000,000; Tribal Transportation Safety Fund (TTSF) -- $110,000; and local 9.03% match by the applicant -- $198,000.

The Safety Plan (Kasaan Safety Plan, 2018)  makes a strong point about lack of official crash data, often cited by other rural villages, and the importance of alternate data sources, as follows:

> "In rural Alaska we have little to no crash data.  Although initial research of official crash reports suggested there is on average one reported accident year on the Kasaan to Goose Creek access road, the community is aware of many more incidents that have not been officially reported.  These numbers were proven to be way off.  With the help of the City of Thorne Bay's Public Works Director, OVK [Organized Village of Kasaan] Transportation Director, and Tracy Vaughn tow truck operator, we created a map [included in the Safety Plan but not in this Appendix] showing the accidents that we have been involved in helping or assisting people in over the last ten years.  These new numbers suggest that there are 14 accidents a year on this 17.2 mile stretch of roadway. Most accidents happen in the same location every year."

With respect to data to support the TTSF funding request, the application states, in response to the section summarize any supporting data that clearly demonstrates the need for the project, "Official crash data is not readily available for specific routes on Prince of Wales Island; however, general data was obtained from the ADOT. While the number of accidents varies from year to year, the data indicates a steady increase in the number of crashes reported for the island." (Kasaan Application, 2017)

Official data is supplied with the application, but it is not specific to this section of the island's roads.

The Road Safety Audit (McDonald 2010) reports average annual daily traffic (AADT) volumes collected by the Alaska Department of Transportation and Public Facilities for the Thorne Bay Road as 241 vehicles. No corresponding data is available for the road to Kasaan, but since access to Kasaan is via the Thorne Bay Road, it is likely that the AADT for the Kasaan Road is much less than 241.

Appendix C of the RSA contains voluminous official crash data for Alaska, including details for Prince of Wales Island, for the years 2004 to 2007.  The text includes a summary for the island in table form:

Table 1. 2004-2007 Prince of Wales Island crashes by severity

| Year | PDO | Minor Injury | Major Injury | Fatal | Total |
|------|-----|--------------|--------------|-------|-------|
| 2007 | 31  | 13           | 0            | 1     | 45    |
| 2006 | 35  | 11           | 1            | 0     | 47    |
| 2005 | 17  | 13           | 2            | 0     | 32    |
| 2004 | 6   | 8            | 1            | 1     | 16    |
| Totals | 89 | 45          | 4            | 2     | 140   |

PDO is Property Damage Only


Among the details, one learns that, in 2007, Prince of Wales Island's fatal vehicular accidents (1) were 1.22% of the state's 82 fatalities; whereas the island's total accidents (45) were 0.43% of the state's total (10,578).  In addition, the one fatal accident was 2.22% of the island's total of 45 accidents, whereas the 82 statewide fatalities were 0.77% of the state's total accidents (10,578).  (Nevertheless, … beware of conclusions based on small numbers!)

Finally, in 2014 as an inclusion in the Safety Plan (Kasaan Safety Plan, 2018), a search using Crime Star revealed a reported 45 motor vehicle accidents in 2012, of which 6 were injury accidents.  (We presume these numbers are for the Kasaan – Goose Creek Road.)  In 2015, the numbers were 31 total with 11 injuries, while in 2016 there were 42 accidents resulting in 2 injuries.

**Appendix B11 INDIAN HIGHWAY SAFETY PROGRAM (IHSP)**

The Indian Highway Safety Program is administered by the Bureau of Indian Affairs Office of Justice Services, with funding provided by the National Highway Traffic Safety Administration in a manner similar to that used by the Alaska Highway Safety Office to acquire and administer traffic safety improvement funding. The program's mission is "To reduce the number and severity of traffic crashes in Indian Country by supporting Education, Enforcement, and Engineering, as well as Safe Tribal Community Programs." (USDOI Indian Affairs, 2019)

Each year, the program solicits requests for highway safety improvement projects from tribes, to be compiled into a document that is submitted for funding to the National Highway Traffic Safety Administration.  Thus, the process is similar to that in the other 50 states, wherein entities present data-supported requests for safety improvements. High-ranking projects are chosen to be included in a safety plan that forms the basis for the funding request (BIA Office of Justice Services, 2016).

Although infrastructure projects may be undertaken with this funding, the main emphasis is on non-infrastructure efforts such as impaired driving, seat belt use and child safety (Robertson, 2019).

As with other NHTSA-supported projects, traffic and crash data are important elements of the application process.  Two statements about crash data from the 2017 Highway Safety Plan request (BIA Office of Justice Services, 2016) are relevant –

"Traffic safety crash data and injury data for NA/AN [Native Americans/Alaska Natives] is often difficult to obtain and incomplete.  To develop the Highway Safety Plan (HSP), the IHSP utilizes crash/fatality data and information contained in the NHTSA Fatal Analysis Reporting System (FARS), State data bases, tribal crash records, U.S. Census Data, list federally recognized tribes, FHWA and BIA road data and the Indian Country seatbelt observational survey."

"Because tribes are sovereign, they are not required to report motor vehicle crash information to other entities.  Since many either do not report or the information they report is not complete, obtaining accurate crash and injury data to identify traffic safety trends is difficult.  The IHSP uses multiple sources that include:

- NHTSA Fatal Analysis Reporting System
- Center for Disease Control (WTSQARS) population based fatalities
- United States Census Bureau – demographic data
- Traffic analysis reports and publications – vehicle, driver, and roadway
- Annual seat belt observational; survey
- Vehicle Miles Traveled (VMT) data is not available [*sic*.]
- Individual tribal data (injury data is only available at the tribal level)"

The 2017 Highway Safety Plan included no infrastructure projects and no funding of any kind for Alaska. However, a report for 2018 lists Alaska as one of sixteen states to receive IHSP funding (Robertson, 2018).

**Appendix B12 U.S. ECONOMIC DEVELOPMENT ADMINISTRATION (EDA)**

Description of Program

The federal Economic Development Authority funds ("invests" in) projects that foster economic growth. The focus for development is a particular community or region.

EDA works directly with communities and regions to help them build the capacity for economic development based on local business conditions and needs. EDA's grant investments in planning, technical assistance, and infrastructure construction are designed to leverage existing regional assets to support the implementation of economic development strategies that make it easier for businesses to start and grow (USDOC Economic Development Administration, 2019).

More specifically, their priorities are:

Recovery & Resilience: Projects that …include… long-term recovery from natural disasters and economic shocks….

Critical Infrastructure: Projects that establish the fundamental building blocks of a prosperous … economy…, including physical (e.g., broadband, energy, roads, water, sewer) and other economic infrastructure.

Workforce Development & Manufacturing

Exports & FDI: Primarily infrastructure projects that enhance community assets (e.g., port facilities) to support growth in U.S. exports and foreign direct investment (FDI)….

Opportunity Zones: Planning and implementation projects aimed at attracting private investment – including from Opportunity Funds – to grow businesses …

Since "roads" are specifically listed, as well as generic "infrastructure" some inquiry into the use of safety data is warranted. Infrastructure is addressed more specifically in EDA's Public Works program:

In 2018, EDA's Public Works program provide economically distressed communities and regions with comprehensive and flexible resources to address a wide variety of economic needs. Projects funded by these programs will support the DOC (commerce) Strategic Plan (2018-2022) by, among other things, leading to the creation and retention of jobs and increased private investment, advancing innovation, enhancing the manufacturing capacities of regions, providing workforce development opportunities and growing ecosystems that attract foreign direct investment (USDOC Economic Development Administration, 2019).

Further in the advertisement is a description of the program:

Through the Public Works program, EDA provides catalytic investments to help distressed communities build, design, or engineer critical infrastructure and facilities that will help implement regional development strategies … goals to promote regional prosperity. The Public Works program provides resources to meet the construction and/or infrastructure design needs of communities to enable them to become more economically competitive. Prior examples of investments EDA has supported through the Public Works program include projects supporting water and sewer system improvements, industrial parks, high-tech shipping and logistics facilities, workforce training facilities, business incubators and

accelerators, brownfield redevelopment, technology-based facilities, wet labs, multi-tenant manufacturing facilities, science and research parks, and telecommunications infrastructure and development facilities.

Application Process and Safety Data

An overarching concept in grant approval is the conformance of the application to the existing "EDA approved" development plans.  In Alaska, this is superintended by the Department of Commerce, Community and Economic Development (DCCED), Division of Economic Development.  In turn, DCCED works with regional economic development authorities [Alaska Regional Development Organizations – ARDORS].  For example, in the Fairbanks North Star Borough, 2011, Fairbanks North Star Borough; Comprehensive Economic Development Strategy, or in Bethel, the Association Village Council Presidents produced a Comprehensive Economic Development Strategy. Thus for transportation infrastructure safety would need to be identified in those plans.  In the state's overall plan and in those for FNSB and Bethel, there is no mention of safety as being a driver for the strategy.  Logically, if a road were unsafe, those economic development plans would evaluate road conditions as impeding development rather than fostering crashes.  Thus, crash data would not affect the development process directly.  It might and should concern the design of the infrastructure, but not the application process.

Based on talk with the Alaska EDA representative, EDA might fund a new road, for example to connect some resources that would improve development.  However, since this would be a new road, there would not be crash data to support the application or design.

We conclude that crash data would not be directly relevant to the EDA grant application process.

## APPENDIX C.   EXPERT TASK GROUP MEETING NOTES

C1 – Expert Task Group Meeting #1

C2 – Expert Task Group Meeting #2

C3 – Expert Task Group Meeting #3

## Appendix C1 EXPERT TASK GROUP MEETING #1

Enabling Data-driven Transportation Safety Improvements in Rural Alaska
Expert Task Group Meeting #1

<u>Meeting Notes</u>

Date and Time: Monday, February 25, 2019; 10:00 to 11:10 AM

Location: Duckering 245, UAF campus and by teleconference

Attending: Pam Golden, AK DOTPF
Randy Kinney, Kinney Engineering
Adison Spafford, Red Plains Professional
Bob Perkins, UAF Civil & Environmental Engineering
Larry Bennett, Bennett Engineering

Perkins welcomed the attendees, and each introduced her/himself.

The roster was deemed accurate, with a change in Kinney's job title.

Perkins reviewed the project's purpose and objectives and described the three tasks, based on handout materials.

Accomplishments to date:

Task #1: In the absence of Jonathan Metzgar, who was ill, Perkins reviewed the handout material describing the status of the development of UAF TRAFFIC, the app that will be used to record crash data and other relevant data in rural areas.  He noted that Professor Metzgar has engaged Computer Science students in the development of this app.

Kinney mentioned an app called Turncount, information on which he will send.  (Done- thanks Randy!)

Task #2: Bennett led a discussion of rural transportation safety improvement project funding sources, based on a handout spreadsheet of sources identified to date.  A helpful discussion ensued, including several other suggested funding sources, to wit –

- U S Army Corps of Engineers
- Economic Development Agency (? – Administration?) (Sherry Kelly)
- Denali Commission Transportation Program
- HUD Indian Community Development Block Grant (ICDBG) Program ref: 24CFR1003.201
- FEMA Pre-disaster Mitigation PDM) program
- Federal Land Access Program (FLAP)

Spafford will send information on the above six.  (Done – Thanks Adison!)

Task #3: Little progress on this task to date.  We had a far-ranging discussion on RSA's, including: distinctions from engineering safety analyses; usually not initiated by DOTPF; conducted by "outsiders" – more "objective;" tends to use less hard data, but uses hard data when available;

Golden will send Tazlina RSA (Done – thanks Pam!)

Comments/Suggestions/ General Dissuasion:

Possible information sources, support/linkages (and funding sources) –

1. Regional health organizations - Alaska Native Tribal Health Consortium (ANTHC), Yukon Kuskokwim Health Corporation (YKHC), Tanana Chiefs Conference (TCC), Southeast Alaska Regional Health Consortium (SEARHC), Maniilaq Association etc.
2. Tribal Transportation Consortiums (TTC) – Association of Village Council Presidents (AVCP), (Western Alaska Tribes), Tanana Chiefs Conference (Interior Tribes), Kawarek (Norton Sound Tribes), Northwest Arctic Borough (Northwest Tribes), Bristol Bay Native Corporation (Southwest Tribes), North Slope Borough (Arctic Tribes) Council of the Tlingit and Haida Indian Tribes of Alaska (Southeast Alaska Tribes). – They would be helpful with implementation of the app.
3. Tribal Transportation Program Coordinating Committee (TTPCC) (found later, after meeting)

   https://www.bia.gov/bia/ois/division-transportation/ttpcc
   "The Tribal Transportation Program Coordinating Committee is the recommending committee (25 CFR 170.135) established by federal regulations, to provide input and recommendations to the Bureau of Indian Affairs (BIA) and Federal Highway Administration (FHWA) concerning the Tribal Transportation Program as detailed in Title 23 U.S.C. 202. The committee consists of 24 Tribal regional representatives (two from each BIA region)."

Spafford will send materials on 1 and 2 above. (Done – Thanks Adison!)

Names:

- Clair Daniels (sp?) – Central Region DOTPF Traffic & Safety Engineer (?)
- Matt Walker – DOTPF Statewide Traffic Engineer
- Scott Thomas – DOTPF SHIP Engineer
- Dale Lewis – Red Plains Professional (re: Tazlina RSa)

Future directions:

- Drill down into information about funding sources
- Consider a "booklet" with a listing of funding sources and their application requirements
- During implementation, emphasize educating that capturing data is essential, even if not complete.
- The challenges of implementation could be aided with help from tribal organizations.

March 11-13 Tribal Transportation meeting in Anchorage – Spafford will attend. Perkins and Bennett will attend part time.

Next meeting of this Expert Task Group – Very tentative 3rd or 4th week of July. 10 AM Monday seems to work well.

Attachment – Very thoughtful thoughts and suggestions from Adison Spafford. Thanks Adison!

Notes by Bennett 28feb2019

e-mail to committee from Adison Spafford

Hi everyone,

Below are my notes from the call the other day. Thank you for allowing me to contribute to this very important effort for rural AK.

**These are my general thoughts for consideration/discussion:**

- link efforts with regional health organizations -  ANTHC, YKHC, TCC, SEARCH, Maniilaq Association etc.
- link efforts with Tribal Transportation Consortiums (TTC) – Association of Village Council Presidents (AVCP) (Western Alaska Tribes), Tanana Chiefs Conference (Interior Tribes), Kawarek (Norton Sound Tribes), Northwest Arctic Borough (Northwest Tribes), Bristol Bay Native Corporation (Southwest Tribes), North Slope Borough (Arctic Tribes) Council of the Tlingit and Haida Indian Tribes of Alaska (Southeast Alaska Tribes).
- Consider a tribal focus group for this effort. Need to have buy in from the local level before something like this is implemented.
- Need a lead agency to implement (phase 2). Maybe you have identified an agency for this already. When I think of a lead agency to help implement this, I think of Denali Commission, FHWA, DOT&PF, BIA, WFLHD
- State of Alaska Reports crash data. May want to include Scott Thomas, DOT&PF HISP Engineer – He has been working on bridging the gap between tribes and the State regarding crash data. Also, are we able to quantify the financial benefit resulting from rural communities reporting crash data on the DOT&PF website? http://www.dot.state.ak.us/12209V4/jsp/12209main.jsp. Is there a financial benefit to the state? Maybe a question for Pam?
- Intertribal Transportation Association – https://www.tribaltransportation.org/ - consider using this group as a vehicle to advance the project. I am on the ITA safety committee and can support advancing this topic.
- Dale Lewis conducted the RSA for Tazlina. His email is dale.lewis@red.plains.com in case there are questions about RSA's in rural AK.


**Funding agencies to include:**

- USACE
- EDA
- Denali Commission
- HUD ICDBG
- FEMA PDM
- FLAP

**Why is the data collection a challenge in rural AK?**

- Change in administration – tribal administration staff change constantly and many do not have a good filing or documentation system in place.
- Language barriers

- One person doing to many jobs. Typically, the tribal administer is acting as the Tribal Transportation Coordinator. They are also responsible for training, health care, village safety police officers, and many other programs being administered by a tribe.
- State is required to spend funding on NHS.
- Lack of understanding regarding why it is important to collect and report data. Reference note about state crash data above. I think it may be valuable to include discussion about why data collection is important to rural communities. What is in it for them? Will the State get more funding that can be spent in rural AK? Will rural AK communities receive more funding? Can this be quantified or can an example be provided? Just thinking out loud. ☺

Let me know if you have questions or would like to discuss any of the above further.

Adison

## Appendix C2 EXPERT TASK GROUP MEETING #2

Enabling Data-driven Transportation Safety Improvements in Rural Alaska
Expert Task Group Meeting #2

<u>Meeting Notes</u>

Date and Time:        Monday, July 22, 2019; 10:20 to 11:30 AM

Location:              Duckering 245, UAF campus and by teleconference

Attending:           Steve Becker, Brice Environmental
                          Pam Golden, AK DOTPF
                          Randy Kinney, Kinney Engineering
                          Adison Spafford, Red Plains Professional
                          Bob Perkins, UAF Civil & Environmental Engineering
                          Jonathan Metzgar, UAF Computer Science
                          Larry Bennett, Bennett Engineering

After a short delay due to teleconference confusion, Perkins began the meeting by welcoming attendees and asking each to (re)-introduce her/himself.

Perkins summarized some related previous projects and discussed the background and rationale for this project. We then turned to accomplishments to date –

Metzgar described the status of the app UAF TRAFFIC. It will be used on Apple devices. Its intended users will be both traffic engineers and other professionals and STEM high school students.

The app uses drop and drag techniques and can now handle 2- 3- and 4-way intersections. It distinguishes different types of vehicles. They are working to improve aesthetics – various icons, layout, and the like. A goal is to make it enjoyable for STEM students to use.

Data will be downloadable in CSV format and will be easily available for EXCEL.

**Metzgar will provide** screen shots of the app. (Done!)

Discussion ensued regarding coordination with users, such as DOTPF and tribes; what do they need, and in what form? (Further discussion on this topic later)

Bennett then reviewed our Working List of Funding Sources and Status. In addition to information on the list as distributed, the following were suggested:

- Indian Health Service – Probably not; they are more into water/sewer et al.
- FEMA Pre-disaster Mitigation – Relegate to bottom of list
- HUD Indian Community Block Grant -- **Spafford will provide** a sample solicitation.
- Economic Development Agency -- Changed name to <u>Shirley</u> Kelly. This is the Alaska Office of EDA and is worth pursuing.
- Alaska Highway Safety Office – Marcheta Moulton (465-8769) may be able to provide a sample solicitation for individual grants distributed by the AHSO.
- Alaska Transit Grant Program – Remove from list of prospects.

The discussion of data requirements then led to a question about where traffic data are stored. Answer: At least two state agencies – 1) Transportation and Public Facilities, and 2) Commerce Division of Community and Regional Affairs. We also wondered what types of crashes get into databases; e.g., 4 wheelers on trails?

**Idea**: A possible Phase 2 could include linking the UAF TRAFFIC database to state agencies.

We noted the [BIA's] Rural Inventory Field Data System (RIFDS) and the Integrated Transportation Information Management System (ITIMS).

(Note – post-meeting, I found the following on-line at https://itims.bia.gov/:

> ### Tribal Transportation Program (TTP):
> Road Inventory Field Data System (RIFDS) - a database of public transportation related facilities that a tribes defines as important to their local use and further defines the use of the funding made available through the TTP tribal share calculations. Current legislation refers to this inventory as the National Tribal Transportation Facility Inventory (NTTFI).
>
> ### Bureau of Indian Affairs - Division of Transportation (BIADOT):
> ITIMS Management (IM) - software that creates and stores account usernames, assigns module accesses and roles within each module, and identifies the location and/or six-code association with all users of the ITIMS environment.)

**Idea**: A key to successful collection and use of traffic and crash data may be a common set of agreed-upon data fields. Many grantors have rather vague requirements. We agreed that each ETG member will furnish her/his list of 10 to 15 suggested essential data fields. Our project report will compile such a list as one of the project's contributions. To benco@alaska.net, please. (Thanks for yours already, Pam!)

Becker urged, in the spirit of full disclosure, that tribes and rural villages must be informed about where any data collected in their areas is stored and used. Tribal consultation might occur at such meetings as the BIA Providers Conference.

**Next meeting** of this Expert Task Group – September 16, 2019 10 AM Alaska time (tentative).

Notes by Bennett 5 August2019

**Appendix C3 EXPERT TASK GROUP MEETING #3**

Enabling Data-driven Transportation Safety Improvements in Rural Alaska
Expert Task Group Meeting #3

<u>Meeting Notes</u>

Date and Time: Monday, September 16, 2019; 1:30 to 2:45 PM

Location:          Duckering 245, UAF campus and by teleconference

Attending:        Pam Golden, AK DOTPF
                   Randy Kinney, Kinney Engineering
                   Bob Perkins, UAF Civil & Environmental Engineering
                   Jonathan Metzgar, UAF Computer Science
                   Larry Bennett, Bennett Engineering

Perkins welcomed the group and made introductory remarks, noting that the final report is due September 30, two weeks from today.  The purpose of the meeting was to review the rough draft version of the report, to seek guidance on changes and additions, and to assign responsibilities for various as-yet-incomplete portions.

During the review, the following task list emerged:

Metzgar

•Assist with format cleanup (75% done – thanks!)
•Work on Table of Contents (good start – thanks!)
•Add a sentence in middle paragraph page 5 about "A future use case ….."
•Add a short explanation of front-end v. back-end to Development Process section
•Complete section of app results
•Add to Conclusions and Recommendations, as appropriate
•Add Appendix A (done – thanks!)
•Assist with references


Perkins

•Complete Technical Report Documentation Page, including abstract
•Add Executive Summary
•Consider paring some of the Background related to RSA's, so as not to repeat a lot that is in the Results
•In the RSA discussion in Results, cite some examples from rural Alaska and note what "data" they include.  (Pam sent Craig/Prince of Wales – thanks!)
•Write the section 4.5 – Current Bush Practice
•List references and citations from the sections he has written


Bennett

•Clean up some sub-headings, so the Table of Contents is cleaner.

•Add ACKNOWLEDGEMENTS section

•Close editing – typos, additions, wording changes, etc., following committee review

•Add transitions between chapters

•Clean up the table of agencies

•Add one more application discussion to Appendix B10 (Organized Village of Kasaan)

•Send ACVP letter on accident reporting to Perkins and ETG (done)

•Add these notes to Appendix C

•Everything else …..


We adjourned after thanking the Expert Task Group for its valuable contributions to the success of the project.


Notes by Bennett  17September2019

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