Alaska Iways Architecture Update

Task 2 (Part 1 of 6):
Chapter 1: User Needs

FINAL

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1 USER NEEDS

1.1 Introduction

The Alaska Department of Transportation and Public Facilities (ADOT&PF) is continually looking for ways to improve the efficiency, safety, and reliability of Alaska's surface transportation system. This effort includes the application of advanced communications, control, and information processing technologies including computer hardware and software at locations throughout the state. When used together, technologies like these form what is commonly referred to as an Intelligent Transportation System (ITS). To ensure that these relatively expensive technologies are implemented in an effective, coordinated, and cost-effective fashion the ADOT&PF developed the Alaska Statewide ITS Architecture or Alaska Iways Architecture. The term "Iways" is the state adopted label for ITS that stands for intelligence, integration, internet and information (the "I") for air, sea, and roadways (the "ways").

The following six chapters correlate to one of the six main phases undertaken to develop the Alaska Iways Architecture.

- Chapter 1: User Needs
- Chapter 2: User Services
- Chapter 3: ITS Long-Range Vision
- Chapter 4: Operational Concept
- Chapter 5: Physical ITS Architecture
- Chapter 6: Implementation Plan

The Alaska Iways Architecture began with the identification of user needs, the results of which are presented in this chapter. This step is perhaps the most important in that it acts as the foundation for all other activities undertaken as part of the Alaska Iways Architecture development effort. In other words, the results and findings documented in this chapter serve as the input needed to develop Chapters 2-6. These chapters (Chapters 2-6) were developed in an incremental fashion, providing a greater level of detail in the later chapters.

1.1.1 Purpose

The ITS solutions and operational strategies that have the greatest potential to enhance Alaska's transportation system can be identified so long as the needs of travelers and transportation service providers are well understood. This chapter documents the effort to develop this understanding. It also identifies and documents the unique transportation user needs and conditions in Alaska that have not yet been included in the National ITS Architecture and/or Standards program.

In Alaska, the efficient operation and regulation of commercial vehicles is an important issue. The ADOT&PF has developed a Commercial Vehicle Information System Network (CVISN). The ITS User Needs duplicates the earlier, on-going CVISN and Commercial Vehicle Operation (CVO) user needs. This chapter should be viewed as completing earlier CVISN and CVO work by summarizing the CVO needs that ITS can satisfy.

1.1.2 Data Collection Methodology

To identify the unmet operational needs of Alaska's transportation system professionals, the Project Team completed an intensive data collection effort. First, the team conducted a literature review of existing reports and studies for any previous statements of transportation system needs. Then workshops and interviews, both in person and via telephone, with management and operations staff from the following agencies were conducted.

- Alaska Department of Transportation and Public Facilities*
- Alaska Municipal League
- Alaska Railroad Corporation
- Alaska State Troopers
- Alaska Trucking Association
- Alaska Visitors Association
- Anchorage Department of Public Works
- Capitol Transit: City and Borough of Juneau*
- Department of Environmental Conservation
- Department of Health & Social Services
- Department of Public Safety
- Division of Emergency Services
- Division of Tourism
- Federal Aviation Administration
- Federal Highway Administration
- Municipality of Anchorage
- National Park Service
- State of Alaska - Department of Administration (DOA)
- United States Coast Guard
- United States Forest Service
- University of Alaska – Fairbanks

Agencies marked with an asterisk (*) were interviewed for a second time in July 2005 as part of the update to the original Alaska Iways Architecture. Additionally, the following list of stakeholders were not interviewed during the original creation of the Alaska Iways Architecture but were identified as having existing or planned Intelligent Transportation Systems that should be included in the update to the Iways Architecture. The following agencies were interviewed for the first time in July 2005:

- City of Fairbanks
- City of North Pole
- Fairbanks North Star Borough
- Measurement Standards & Commercial Vehicle Enforcement
- People Mover (Anchorage Transit)

1.1.3 Conformity with the National ITS Architecture

On May 25, 2000, the United States Department of Transportation (USDOT) published a Notice of Proposed Rule Making (NPRM) that specifically addressed the conformity requirements of the National ITS Architecture and Standards in the planning, development and implementation of ITS projects. Subsequently, in early 2001, the USDOT released FHWA's Final Rule and FTA's Policy (referred hereafter as the Final Rule) for applying the National ITS Architecture at the regional level.

The focal point of the Final Rule is to ensure that current and future opportunities to integrate ITS across modes and multiple jurisdictions for the purpose of improving transportation operations are not overlooked in project development. Specifically, the Final Rule requires states and regions that are funding ITS projects through the National Highway Trust Fund to develop a state/regional ITS architecture that conforms with the National ITS Architecture. It is important to note that conformity with the National ITS Architecture does not require that the ADOT&PF link each of their internal functions, link to other operating agencies, nor share data. The Final Rule encourages operating agencies, like ADOT&PF, to consider the possibilities and make decisions that provide the best opportunity to ensure safe and efficient transportation services to travelers.

The process used by the project team to develop the Statewide ITS Architecture follows the required procedures and provides the required documentation to meet the intent of the Final Rule. Section 940.9D of the Rule/Policy states that a "regional ITS architecture shall include, at a minimum, the following:

1. A description of the region.
2. Identification of participating agencies and other stakeholders.
3. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture.
4. Any agreements (existing or new) required for operations including, at a minimum, those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture.
5. System functional requirements.
6. Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture).
7. Identification of ITS standards supporting regional and national interoperability.
8. The sequence of projects required for implementation."

In addition to the above requirements, the Rule/Policy also requires regions to develop ITS projects using a systems engineering approach. This will ensure that various aspects of the project (e.g., system planning, design, procurement, deployment, operations, maintenance, expansion and retirement) are considered prior to deployment.

1.1.4 Chapter Organization

Section 2 of this chapter identifies and describes Alaska's transportation user needs, and provides information on factors that make travel in the State of Alaska unique. Interview and workshop

results were completed and the transportation user needs were grouped into the following categories:

- Internal ADOT&PF Operations and Management
- Transit Operations
- Incident Management/Emergency Response
- Traveler Information
- Traveler Security/Safety
- Data Collection and Archiving
- Statewide Traffic Operations Center (TOC) and Interaction with Other Agencies
- Network Services and Communication
- Traffic Operations
- Institutional Coordination
- Airside Operations

Section 3 describes how the information contained in the User Needs Chapter was used in subsequent project tasks.

Section 4 lists the materials referenced in this chapter.

The Appendix at the end of this chapter lists the attendees at stakeholder workshops conducted in Juneau and Anchorage as well as a list of individuals that participated in the update to Alaska's Iways Architecture.

1.2 Geographic Scope and Understanding

The Alaska Iways Architecture applies to the entire State of Alaska, but is focused on the various aspects of Alaska's surface transportation system, and its applicable interfaces with other modes where advanced, integrated transportation systems can be used to address transportation-related needs and desires. Since the surface transportation system does not simply stop at the State's border, the Plan attempts to consider aspects of bordering regions so that ITS development and integration can occur efficiently, and as seamlessly as possible. To this extent, the pertinent ITS related activities of other regions; mostly the Canadian Providences that border Alaska, as well as the State of Washington, which is connected to Alaska via the Alaska Marine Highway System (an extension of the surface transportation system), were taken into account when developing this Plan.

Traveling in Alaska is very unique compared to most U.S. locations. Reasons for this include:

Population Density

Alaska's population estimated in 2006 was slightly over 670,000. This is only about 0.2% of the U.S. total, but its land mass makes up about 20% of the U.S. As a result, most travel in Alaska occurs in rural areas.

Weather Conditions

Adverse weather affects surface, air and marine travel and can have a more severe impact on travel than anywhere else in the U.S.

Dependence on Inter-modal Travel

Although Alaska's population comprises only 0.2% of the total U.S. population, Alaskans utilize 13% of all U.S. commuter airline and air taxi trips. Alaskans use commuter airlines 65 times more frequently than other Americans and also rely heavily on marine travel in their everyday lives.

Lack of Connectivity

Nearly 30% of Alaska's population has no connection by either road or ferry to the continental road network.

When considering these factors, ITS shows potential for enhancing travel safety and efficiency in Alaska. Traveler needs, as well as the needs of those responsible for operating and maintaining transportation systems, reflect the need for ITS in Alaska. The ADOT&PF ITS Policy Committee recognizes the potential benefits of ITS and has stated this in their mission statement:

> *The ITS program will apply advanced technology tailored to Alaska's needs in supporting ADOT&PF's mission through improvement in:*
>
> - *Transportation efficiency and reliability (internal and external)*
> - *Traveler safety and security (internal and external)*
> - *Quality of life*
> - *Multi-modal mobility*
>
> *ITS improvements will be integrated with other programs and partners on a statewide basis and insure cost-effective solutions affordable on a sustainable basis.*

1.3 Transportation User Needs

This section describes the transportation user needs expressed by stakeholders through interviews and participation at workshops. Stakeholders were interviewed initially when Alaska's Iways Architecture was created in December 2003, and again in 2006 when the Architecture was updated.

1.3.1 ADOT&PF Operations and Management

ITS can address several of ADOT&PF's needs as they relate to the operation and management of the statewide transportation system. In general, statewide operations and management needs pertain to ADOT&PF, however, in some cases needs that fall under this category overlap with the operations and management needs of statewide management agencies, including, emergency and transit management agencies. Needs that pertain to ADOT&PF operations and management fall into one of the following categories:

- Communications and networking
- Decision support
- Equipment enhancements

The specific needs that fall under each of these categories are described in the following sections.

Communications and Networking Capabilities

Communications and networking are critical for providing safe and efficient transportation operations and management. The identified transportation user needs related to communications and networking are summarized as follows:

Data and Application Sharing

Operational efficiencies may result if internal ADOT&PF systems are developed to share data and applications more easily. Such a system would allow staff to share and modify documents in real-time. Similarly, methods to exchange information between stakeholders are not as current as they could be. For instance, operational data are not uniformly updated on weekends. This is perceived as a significant obstacle to providing information on travel conditions and available services to travelers.

Communications Reliability and Security

To effectively coordinate and respond to incidents, agencies across the state must be able to communicate freely without delay. One obstacle that may prevent or delay communication between agencies is when communication systems go off-line. Communications systems may go off-line for a number of reasons, including loss of power, physical damage to components of the communications network, human errors, or computer viruses. Another obstacle is the lack of reliable, continuous cellular phone service. Cellular phone services with high speed data transfer capabilities (i.e., EVDO) are needed for field personnel to communicate with field personnel or operators at a center. The lack of reliable cellular communications is due in part to the rugged terrain inherent to many rural locations within the state.

The Alaska Land Mobile Radio (ALMR) program is a coordinated effort across federal, state and local jurisdictions. Its purpose is to build and operate an interoperable trunked radio system that will help enhance personnel safety and operational capabilities. In doing so, the ALMR will increase the reliability of communications throughout the state. The ADOT&PF has initiated its own land mobile radio system to improve communications among maintenance personnel statewide. This also has the potential to include data transfer. Cost of individual radios and data interfacing equipment is still very expensive.

Decision Support

To improve transportation system operations, system operators need to be able to access accurate, real-time information, which can be used to make better operational decisions. ADOT&PF has not yet completed deploying the infrastructure that can collect and transmit information to support transportation system operations and management to the level desired. Transportation user needs that enhance decision support functions are described in the following paragraphs.

Weather Information

Weather can significantly effect transportation operations and traveler safety in Alaska. Maintenance supervisors need accurate, real-time weather and road condition data. This data will enable ADOT&PF operations staff to proactively develop and implement appropriate strategies for prevailing weather conditions. This is particularly important for mountain passes. For instance, if archived and analyzed, historical temperature profiles may be used to support commercial vehicle enforcement by establishing dates in which to set seasonal weight restrictions. Weather and road condition information also allows maintenance staff to better schedule and coordinate routine maintenance operations, such as roadway striping.

Although ADOT&PF regularly uses weather information provided by the National Weather Service (NWS), they also need to determine micro-climate conditions, which require a level of detail not currently provided. While data provided by the NWS are useful in developing long-term strategies, it is not sufficiently detailed for developing and implementing real-time strategies. If ADOT&PF were provided with more detailed weather data, it would be possible to proactively initiate strategies appropriate to prevailing conditions, such as spreading chemicals on roadways before ice forms.

Subsurface Temperature Data

In addition to weather and pavement data, ADOT&PF personnel also need additional subsurface temperature data. By integrating subsurface temperature data with accurate weather information and surface data, ADOT&PF will be able to proactively initiate strategies for prevailing conditions, such as spreading anti-icing chemicals before ice forms. Similarly, ADOT&PF can use integrated weather data to select the times and dates that truck weight and load restrictions will be in effect. Weather data can also be further processed, formatted and disseminated to travelers via Highway Advisory Radio, Dynamic Message Signs, and through the State's 5-1-1 system.

On-Board Pavement Temperature Detection

On-board pavement temperature sensors installed on a variety of fleet vehicles could be used to develop a pavement temperature profile. This would automate the process of determining whether roadways need to be treated with chemicals, the type of chemical to use, and the quantity to apply. Over time, these profiles may provide the basis for thermal mapping of the roadway system, which would provide the additional data needed to make decisions on snow and ice control. Temperature sensing equipment needs to be associated with a Mobile Data Terminal to dump data via wireless technology to a base unit.

Avalanche Prediction and Detection

Avalanches pose a significant hazard to travelers in Alaska, including ADOT&PF and partner agency maintenance crews. ADOT&PF needs an accurate and reliable means of predicting when an area is particularly susceptible to avalanches. Such a system would be useful in determining when to warn travelers and when to implement avalanche strategies.

Bridge Scour Inspection and Detection

Several bridge scour detection systems were deployed throughout the state to date and there are plans to expand the remote electronic monitoring program. An expanded bridge scour system will help bridge engineers more easily determine when scour becomes a problem, helping to address the problem in a more timely fashion. By linking scour detection sites to a central location through telecommunications, bridge engineers will have on-demand monitoring capabilities and avoid inefficient travel to field locations.

Transportation Asset Management

An inventory of signs and other assets is necessary. This identification of available resources would provide a baseline for developing operational strategies. The inventory should include signs, communications infrastructure, and other transportation infrastructure that could potentially support operational strategies. A transportation asset management system could possibly tie into the ADOT&PF's maintenance management system to enable maintenance staff to more quickly identify the location, condition or other relevant characteristic of assets in need of repair.

Automatic Vehicle Location and Computer Aided Dispatch

Automatic Vehicle Location (AVL) and Computer Aided Dispatch (CAD) systems can be integrated to enhance the efficiency of maintenance and emergency response operations. This efficiency could be achieved by sending messages via the CAD system to only those vehicles known to be in the area where action is required.

Infrastructure Monitoring

Transportation infrastructure in Alaska, including but not limited to: roadways, bridges, tunnels, and pipelines, is subject to the effects of, and may be damaged by, natural occurring events like earthquakes, floods, tsunamis, and volcanic eruptions. Similarly, infrastructure may be damaged as

a result of vehicular accidents and acts of terror. When events like these occur, damage can go undetected for long periods of time, especially in rural locations of the state. To ensure traveler safety in lightly traveled areas of the state, critical infrastructure needs to be monitored routinely. Sensors and surveillance systems may be used to complete this task remotely from an operations center, therefore reducing the cost and labor associated with traveling to remote sites.

Integrated Geographic Information System Data Archive

As agencies in Alaska grow their Geographic Information Systems (GIS), it is becoming more clear that a widely accessible and integrated GIS database is needed. This will reduce redundancies in data and make information available to a wider audience. An integrated GIS data archive will allow agencies using the same GIS software to easily exchange data and will in turn reduce staff workloads, by eliminating the need to replicate files.

Remote Video Monitoring

Due to the large size and rural nature of Alaska, it's often difficult to monitor conditions in the field, or to verify that systems are working properly. Currently, there are several Closed Circuit Television (CCTV) cameras located throughout the state at Road Weather Information System (RWIS) stations to remotely monitor weather conditions. However, in the state of Alaska the need for remote monitoring extends beyond weather conditions. A need exists to quickly identify the operational status of systems (e.g., dynamic message signs and traffic signals) deployed in the field. CCTV cameras mounted on or nearby a traffic signal may also be used to monitor nearby traffic conditions, and based on these conditions, changes to signal timing patterns can be made.

Equipment Enhancements

Equipment improvements could be the best way to enhance operations and maintenance in several important areas. The transportation user needs that could be addressed through equipment enhancements are summarized below.

In order to meet increasing service delivery demands and expectations while facing continued reductions in maintenance funding, ADOT&PF maintenance managers continue to look for technologies to improve efficiency. Several technologies are available to enhance the efficiency of maintenance operations in Alaska.

Snow Plow In-Vehicle Guidance

During and after heavy snowfall it may be difficult for snow removal operators to precisely locate the roadway surface. To avoid the risk of running off the road, operators generally hug the guardrail. This practice slows snow removal and often damages guardrails. Because of this, there is a need to implement a system to help operators locate the roadway surface when visibility is poor. This would speed snow removal and reduce guardrail damage.

Smart snowplow technology can provide this capability. On-board systems that sense the location of devices (usually magnets) deployed along the roadway plot the geometry of the roadway on a monitor within the vehicle to provide guidance to the driver. The ADOT&PF previously tested snowplow technology at a test site along Thompson Pass. The smart snow plow project combines recent advancements in, Differential Global Positioning System (DGPS), called Real Time Kinematics (RTK), and collision avoidance technology to avoid vehicles and obstacles such as guardrail during low visibility caused from blowing snow, fog and darkness. The proposed test site extends from milepost 12 to milepost 45 on the Richardson Highway in south central Alaska near the city of Valdez.

Avalanche Control and Removal

Avalanches causing road closures on Alaska's major highways can isolate remote communities from essential services. Because alternate surface transportation routes are frequently not available, there is pressure to clear the avalanches as quickly as possible, rescue stranded motorists, and restore essential services to isolated communities. Avalanche removal sometimes occurs as conditions change and avalanche chutes become unstable. It is often difficult to detect these conditions quickly enough to avoid death or injury. The result is that personnel removing avalanche debris are sometimes at risk from subsequent avalanches. There is a need to implement systems that can minimize this risk to the greatest extent possible. In the past, ADOT&PF had TAMER (Teleoperated and Automated Maintenance Equipment Robotics), a system that allowed operators to control road equipment remotely, which improved the safety of individuals responsible for avalanche clean-up. Over time operation and maintenance of TAMER proved to be too costly. Therefore, expressed needs for avalanche control and removal extend to include adequate funding for operations and maintenance activities.

Mobile Data Terminals

Communications to and from personnel in the field, is needed to speed response to incidents and emergencies, and to improve ADOT&PF's day-to-day operations. To communicate more effectively, mobile data terminals, similar to laptop computers, may be installed on vehicles to access and report information remotely from the field. For instance, snow plows and other maintenance vehicles may be equipped with mobile data terminals to access information stored in the maintenance management system or to report activities so other resources can be used more effectively. For instance, maintenance personnel may potentially use mobile data terminals to report pavement conditions which can then be entered into the state's 5-1-1 system for use by motorists.

Automated Bridge Deicing

Because air temperatures change faster than ground temperatures, ice often forms on bridge decks (surrounded by colder air) before it forms on roadways. It is often necessary to treat icy bridges when adjacent roadways do not require treatment. As a result, maintenance equipment is often dispatched to treat bridges only to return later to treat the roadway. There is a need for more efficient anti-icing systems for bridges that have the greatest tendency to require treatment when surrounding roadways and structures do not.

An automated de-icing system was implemented at the Knik River Bridge just northeast of Anchorage. Additional bridges throughout the State may also benefit from automated de-icing. This type of system may be a cost effective solution to bridge maintenance, especially if bridges are heavily traveled and located in remote locations of the State. These systems sense when ice is about to form on the bridge deck and automatically dispense chemicals onto the surface to prevent ice from forming and bonding to the pavement.

Work Zone Safety Monitoring and Alerting

Interviewees identified safety in construction or maintenance work zones as an important issue. Intrusion alarms and other smart work zone technologies are possible approaches to increasing construction and maintenance worker safety. These devices provide an audible alarm when a vehicle is detected entering a work zone.

AMHS Automated Reservation System

AMHS managers identified a need to fully automate the reservation system, which currently requires human intervention by someone who is knowledgeable of the system. Visitors to Alaska often plan their trips several years in advance, so they need reliable vessel schedules at least two years in advance in order to arrange for all of their logistics. The AMHS would like to have an

automated reservation and scheduling system that provides a way to schedule transportation assets at the same time that visitors need to arrange accommodations and tours.

AMHS Automated Vessel Location and Tracking

Enhancements to traveler information and automated scheduling (see directly above) may be more easily accomplished as AMHS enhances their program to automatically locate and track their vessels. Such enhancements could help AMHS operators report to the public the status of vessels (i.e., are vessels running on schedule) and alert the public of any events that may delay their trip. Currently, vessel location data is plotted on the 511.alaska.gov website; however, in the future users may benefit more directly if the website contained operational information about each vessel that users can receive through a single click of a mouse. This will allow travelers the ability to make better travel-related decisions, which may ultimately improve travelers' perception of AHMS and other public modes of transportation.

In addition to its trip planning benefits, a vessel location and tracking system will also improve safety operations when vessels are involved in, or affected by, incidents or emergencies. When these events occur, operators may use real-time vessel location information to identify the location of vessels more quickly, which reduces the time needed to assist vessels in distress.

Additional transportation user needs related to AMHS operations include the following:

- Automating administrative processes (e.g., timesheet reporting and safety regulation documentation).
- Providing limited networking capabilities between vessels and operating centers.
- Collecting and disseminating shipboard weather data to the National Weather Service.

Fog Detection and Alerting

Dense fog along a roadway impairs visibility, and reduces roadway safety. It is especially dangerous in low lying areas and mountain passes, where lower temperatures contribute to the formation of ice on roadways. Because of these effects, it is critical that drivers slow down when approaching and passing through areas where fog has formed.

Fog sensors are identified as a potential solution to fog related crashes that occur in the State. Fog sensors may be deployed at strategic locations along a roadway to detect the presence of fog. Sensors can be integrated with Dynamic Message Signs (DMS) to alert motorists of specific actions they need to take when approaching an area where fog has formed.

Snow Plow and Snow Blower Tracking and Monitoring

Due to the extended winter season in cities and villages throughout Alaska, significant effort and resources are often applied and used to treat snow and ice covered roadways. These resources include; maintenance staff (time and wages), snowplows, and chemicals or other materials (sand and salt) used to treat roadways. In many cases, these resources can be used more effectively. For instance, staff that operate snowplows tend to treat roadways based on visual observations in the field, and correspondence with other drivers. This method lends itself to over-treating some segments of roadway and under treating others. Because of this there is a need to equip snow plows with Automatic Vehicle Location (AVL) sensors to better track the movement of snow plows, and in doing so the use of chemicals and materials. By equipping snow plows with AVL sensors, operators can position resources (i.e., snow plows) where they are most needed (e.g., areas that have not been previously treated). As a result, only the roadways that need treatment most will be targeted for snow and ice removal operations and less chemicals and materials will be used. Using less chemical and materials will also reduce the amount of particulate matter released into the environment.

1.3.2 Transit Management and Operations

Public transportation stakeholders in Alaska identified several transit related needs that can be addressed through ITS. These needs include:

- Transit and Traffic Management Operations and Coordination
- Transit Vehicle Tracking
- Real-time Arrival Information and Notification
- Transit Vehicle On-board Video Monitoring and Control
- Transit Vehicle Diagnostic Performance Monitoring and Reporting
- Transit Traffic Signal Priority

Each of these needs are discussed below:

Transit and Traffic Management Operations and Coordination

Existing transit agency operations may be improved if they are more closely coordinated with the operations of traffic management agencies. In general, transit management agencies would like real- or near real-time traffic information including; incidents, construction, and maintenance to reroute transit vehicles around impacted areas. This reduces the time it takes transit vehicles to navigate around these areas, which reduces transit schedule variability, and promotes greater public acceptance of transit in general. One possible method that may be used to disseminate traffic related information to transit agencies, and perhaps to the larger public as a whole, may be to expand the content of the state's 511 system to include additional traffic related information as it becomes available.

Ridership Statistics Collection and Reporting

On-board passenger counting systems are needed to gain a better understanding of transit ridership so better investment and operational decisions can be made. With accurate ridership information, transit agencies can allocate funding or other assets to routes that have the greatest need for improvement and the highest levels of ridership. For day-to-day operations, ridership information may be used to coordinate activities and assets with partner transit agencies, in an effort to deliver timely services to the public when vehicles unexpectedly break down or are being repaired. Accurate passenger counts also serves as means to demonstrate to decision makers that more funding is needed for transit projects and that projects completed thus far have successfully increased ridership.

Transit Vehicle Tracking

Automated vehicle location (AVL) equipment need to be installed on transit vehicles to track and locate transit vehicles in real-time. Data received from AVL equipment can improve existing transit operations in several ways. First, data received from global positioning equipment may be used to determine deviations in transit schedules and routes. Second, collected data will make it possible to locate damaged or severely delayed vehicles and replace them with other available vehicles that are located nearby. Third, vehicle location data collected over a period of time may be stored and analyzed to determine average transit vehicle running times. In each of these cases, real-time vehicle location information improves the reliability of transit schedules, which helps to improve the overall perception of transit.

Transit Vehicle Estimated Arrival

GPS units installed on transit vehicles also make it possible to estimate transit vehicle arrival times. Real-time vehicle location information collected by AVL systems installed on fixed route transit vehicles may be provided to transit riders so they can make better decisions before they leave their points of origin or while waiting at transit stops. For instance, if a bus is delayed, riders may elect to

wait for their transit vehicle inside nearby buildings when weather conditions are unfavorable. Information from the AVL system can also be used to notify riders of the next stop through an on-board annunciation system.

Similarly, real-time vehicle location information collected by AVL systems installed on para-transit vehicles may be used to inform transit riders that a para-transit vehicle will be arriving soon to pick them up. Such a system could work by paging patrons when vehicles are on-their way to pick them up. Currently, para-transit riders are not given advance notice of when vehicles will pick them up, but rather are given a window when vehicles will likely come. Because of this patrons are often not ready when transit vehicles arrive at their destination, and therefore, transit operations are delayed.

Transit Vehicle Video Monitoring

Security cameras installed inside a transit vehicle can be used for other purposes besides security. Stakeholders would like to use cameras installed on transit vehicles as a means to make more informed decisions regarding operations when incidents occur. These cameras may be used to monitor environmental and roadway conditions and incidents (e.g., crashes) immediately outside the transit vehicle. For instance, cameras may be controlled by an operator at a transit management center to determine the extent and nature of incidents and based on these visual observations make more informed decisions regarding whether or not to implement temporary changes to fixed routes, or to cease operation (in case of severe weather). The additional information of conditions outside the transit vehicle can be used to make more informed decisions regarding operations when unique situations occur.

Use of cameras for purposes other than security will require updates to be made to allow for additional features. For instance, most, if not all, cameras installed inside transit vehicles are stand alone systems that simply record activities inside the vehicle when it is in operation. In order for cameras to be used to monitor conditions outside the vehicle, cameras with Pan/Tilt/Zoom capabilities will have to be installed. Similarly, additional communications equipment is needed to enable operators to control cameras from a remote location.

Transit Vehicle Diagnostic Monitoring and Reporting

Smart Tires

Stakeholders identified a need to deploy smart tires on transit vehicles. Smart tires contain a sensor in the tire that monitors and measures tire pressure in real-time. If a loss in tire pressure is observed, the driver of the transit vehicle will be notified by an indication displayed on the driver's instrument panel. Based on the readings of the tire sensor, the driver can take immediate action before the tire becomes completely flat, or delay action until all riders have exited. Similarly, the information from the tire sensor can be automatically passed along to the transit agency's maintenance department before the vehicle arrives, providing staff with additional time to make necessary arrangements.

Brake Heat

Stakeholders also identified the need to measure heat from brakes of transit vehicles. Increases in heat from brakes may indicate a potential problem with a vehicle's brakes and that repairs may be needed.

1.3.3 Rail Operations

Technologies located at highway-rail intersections, as well as sensors deployed along the railway may be used to improve the operation and safety of railways in Alaska. However, deploying any strategy other than static signs would be difficult along much of the rail system, due to the lack of power supply. If power sources can be found or made available, technologies including sensors

may be used to identify rockslides and avalanches, and determine track conditions automatically. This function may be improved through visual verification of the railroad through enhanced surveillance.

1.3.4 Incident Management and Emergency Response

An accurate and efficient means of detecting incidents is a critical need, and the initial step in activating appropriate responses to incidents to ensure that sick, injured or stranded travelers quickly receive the appropriate medical attention. For several reasons, this can be a significant challenge in Alaska. First, given the remote nature of travel in the State, the probability that an incident will occur and not be seen by other travelers is much greater than in other states. Second, although cellular phones are an effective means of detecting and reporting incidents, Alaska's rural nature makes this method less reliable than in other areas due to gaps in coverage area. Stakeholders identified the following systems and needs to improve incident management and emergency response:

- Roadside systems to provide notification of emergencies – Such systems may include roadside call boxes to offer travelers in rural parts of the state a means to request assistance when needed.
- In-vehicle systems to provide notification of emergencies - Mayday systems similar to those offered by General Motor's OnStar service fit this category and may be used to assist in detecting and pinpointing incidents that occur throughout the State, especially in rural remote locations.
- Systems that reduce the time needed to conduct collision investigations. These systems reduce the effects incidents have on traffic and the time that lapses between when the incident occurs and medical treatment is given.
- Systems that reduce the time needed to respond to incidents (oil spills, disruptions to ferry services, acts of terror, natural disasters) on Alaska's waterways, including ports.

Emergency Response Preparedness

Effective emergency response requires agency coordination, communication and cooperation. To improve emergency response in Alaska, stakeholders identified the need to link operations and response plans so agency responsibilities are clearly identified. One example is to include transit in emergency planning so transit coaches and transit ITS systems can be used for evacuation purposes.

1.3.5 Traveler Information

ITS-related equipment and technologies have significant potential to enhance travel safety and efficiency in Alaska. For instance, ITS devices like dynamic message signs and highway advisory radio may be used to disseminate pertinent information to travelers while they are en-route, helping them make better travel decisions in real-time. To the extent possible, it is important that the information disseminated to travelers is as consistent and accurate as possible, both in content and in the manner in which it is disseminated. This will heighten the traveler's confidence in the information provided.

It is also important to have broad, preferably complete, geographic coverage throughout the State. Disseminating traveler information statewide along major corridors, villages and in urban areas will provide a more complete traveler information system that both rural and non-rural communities can benefit from.

In order to disseminate traveler information successfully in Alaska travelers primarily require the following four criteria:

- Accurate and reliable information. Alaska needs to provide driving conditions every day with continuous updates as conditions change.
- Real-time information. Travelers need information that is current. Information that is not updated can have significant effects on the safety and effectiveness of travel.
- Easy to understand information. Travelers need information that is straightforward and easy to comprehend.
- Trouble free information access. Travelers need to access the information with little effort such as a number that is easy to remember (i.e., 511) with a straightforward delivery of information.

Traveler Information for the General Public

Residents of Alaska will benefit from access to real-time, accurate traveler information before and after they embark on a trip. Travelers need the following types of information:

- Traffic conditions
  - Congestion
  - Incidents
  - Road closures
- Weather conditions
  - Rain/Sleet/Snow
  - Ice
  - Fog
  - Dust storms
  - Avalanches
- Construction and maintenance activities

These types of information need to be provided to travelers before they depart on trips to limit motorist exposure to events and conditions that may delay their trip, or put their safety in jeopardy. Interviewees also felt that the amount of information provided to travelers while en-route needs to be increased. Real-time traveler information can help guide travelers away from incidents such as congestion during rush hour, accidents causing congestion or urgent incidents such as avalanche warnings or earthquake damage. Desired means to provide en-route travel information include, systems installed in the field, in-vehicle systems (e.g., radio, highway advisory radio, and in-vehicles navigation systems) and the State's 511 travel information number. The State's 511 system may be particularly useful for providing pre-trip/en-route traveler information.

The media can provide another means to disseminate travel condition information quickly and effectively. Therefore, ADOT&PF must generate an efficient means to provide real-time information to radio and television outlets. Currently, ADOT&PF faxes information to the media. This method is considered inefficient, and could be made more effective if processes were set into place to automate this process.

Traveler Information for Tourism

Tourism is an essential element of Alaska's economic structure. Tourists need timely and accurate information to plan their trips and successfully navigate Alaska's roadways. Therefore, tourists should have access to the types of traveler information discussed above, as well as yellow pages type of information such as:

- Real-time ferry arrivals/departures
- Rest stop locations and services
- Restaurants
- Gas stations
- Lodging
- Educational and cultural activities
- Fishing area closures
- Wildlife viewing
- Community festivals and lodging

To support tourism, it is critical that tourists have easy access to traveler information. Expanded use of the Internet is seen as a tool that has significant potential benefits in providing accessible traveler information. ADOT&PF provides 511.alaska.gov which provides links to various travel information websites to help with traveler destinations. In the future, various types of traveler information can be added to this site, making it a more attractive source of information.

Not all visitors will have ready access to the Internet. Therefore, Alaska must provide other means to access travel information. One idea identified includes a system of kiosks to provide this information.

Traveler Information for Public Transportation

To encourage the use of transit and improve the public's perception of it, riders need access to timely and accurate information so they can plan their trips more efficiently. Transit traveler information needs to be provided to riders before and during their transit trip. The following types of information are needed:

- Schedules and routes
- Fares
- Rider alerts
- Bus arrival information based on real-time bus tracking

CVO Traveler Information

Due to the long distances and adverse weather and pavement conditions that carriers may encounter, there is a need to provide Commercial Vehicle Operators (CVO) with accurate and timely information related to both pavement and weather conditions. In addition, operators need information on closures and alternate routes.

1.3.6 Traveler Safety & Infrastructure Security

Given Alaska's remote nature and its harsh winter weather conditions, collisions, or other natural or man-made events that strand travelers are potentially very dangerous. Natural events such as avalanches or freezing rain, or man-made events such as terrorist attacks or hazardous material spills may severely disrupt transportation, reduce traveler safety, and may require the use of valuable resources to clean up or repair damaged infrastructure. Due to the geographic size of Alaska, natural events that threaten the structural integrity of infrastructure need to be reported quickly to limit the impacts of such events on the traveling public and to implement an appropriate response to them so that normal transportation operations can be restored.

Incident Identification and Response

In-Vehicle Emergency Alerting and Mayday Support

A primary need for travelers is to have a way to detect incidents more quickly and accurately. Due to the geographic size and the rural characteristics of Alaska, quickly identifying and responding to incidents is difficult and requires significant financial investment. Therefore, emergency and incident management agencies in the State have to use systems currently in place or systems that can be deployed quickly without significant public investment. In-vehicle emergency alerting and mayday systems have the potential to report incidents quickly without significant public investment. In-vehicle mayday systems like OnStar allow travelers to request assistance from their vehicles using GIS.

Computer Aided Dispatch Systems

Computer Aided Dispatch (CAD) systems can enhance emergency response operations. This provides the state police and ADOT&PF with a platform to exchange information and coordinate operations.

International Border Security

As a result of the September 11th attacks, significant emphasis has been placed on preserving homeland security, ensuring that potential terrorists and illegal weapons do not enter the United States. Therefore, security at international borders and ports of entry (aviation and marine) need to be enhanced to prevent terrorist-related activities from occurring within the State.

Transportation Infrastructure Monitoring

Alaska's critical infrastructure, including but not limited to the Alaska Pipeline, the Valdez Port, and transportation command centers need to be routinely monitored to increase security and improve safety. Information regarding threats to infrastructure (i.e., natural or man-made) should be communicated to response agencies quicker to prevent or limit the amount of damage to infrastructure. To begin the process of securing critical infrastructure in Alaska, stakeholders identified critical assets located within the State that need to be monitored. This acts as a baseline for enhancing security and will help identify locations where infrastructure can be monitored through either existing or planned systems. A discussion of the monitoring needs related to Alaska's critical infrastructure is provided in the Alaska Homeland Security Technical Appendix, which was developed at time of the initial Alaska Iways Architecture.

1.3.7 Data Collection and Archiving

Transportation agencies throughout Alaska need to enhance methods currently used to collect, process, archive, and share data. Currently, there isn't a commonly accepted approach or method to collect and share data among the different transportation agencies in the state. Instead, agencies must relay on inefficient methods for sharing data, like manual requests issued and received via, phone, fax and e-mail. These approaches often require long lead times to receive needed data. Additionally, there is no guarantee that agencies will be able to use another agency's data due to conflicts between computing and software platforms. To reduce inefficiencies associated with the collection, processing, archiving, and sharing of data, stakeholders are interested in establishing a centralized database where data from various regional data sources can be easily uploaded and downloaded, without delay.

The benefits of a centralized data archive are two-fold. First, numerous agencies can access a common set of collected data, which reduces the cost associated with collecting a similar set of data. Second, agencies will have the opportunity to make better, more unified decisions. Without a centralized data archive, individual agencies must make decisions with the data they've previously

collected. These sets of data can range in age, and when analyzed may produce varying results. In some cases, two similar sets of data collected at different times may produce results that conflict with each other. This can lead to differences in thinking between agencies, which can strain previously established working relationships.

In its initial phases of implementation, a centralized database may include the following types of data:

- GIS Files and Metadata – to develop consistent and updated maps.
- Crash Records – to pinpoint high accident locations so agencies resources can be allocated to locations the need them most.
- Origin and Destination Information – to input into transportation models.
- Weather and Climate Information.
- Traffic Information (speeds, volumes, turning movements, and classifications).

In the long term, the desired near-term data archive solution may evolve into a fully integrated source of information where various types of data will be collected and stored on a real-time basis. For instance an automated crash notification and reporting system where police use a common electronic crash form can help foster efficient archiving of crash data where all stakeholders can assess the information efficiently. Similarly, there is a need to collect and archive air quality data to locate and define non-attainment areas.

Weather Information

The ability to disseminate accurate weather-related information in Alaska is critical to ensure traveler safety. Frigid wintertime temperatures often exacerbate safety concerns during adverse weather conditions. An efficient and reliable means to detect safety concerns, and to disseminate this information, needs to be developed. Weather conditions that pose the greatest threat to travelers include roadway icing, avalanche conditions, fog, and occasionally dust storms. Tsunamis can also cause significant danger to travelers, residents, and infrastructure in Alaska's coastal areas.

The Alaska Marine Highway System is an important component of the transportation network in Alaska. As with every other mode of transportation, weather conditions can significantly affect the operations of marine vessels. Weather problems that most often affect the operations of vessels are icing and currents. To avoid unnecessary delay and compromising the safety of travelers, it is important to provide travelers with real-time vessel arrival/departure information.

It is also critical that ADOT&PF provide information on road closures or changes in winter operations that affect accessibility. It can be extremely hazardous to travelers if current and accurate information is not provided. To effectively achieve this, ADOT&PF must have current and accurate information on closures and a means to disseminate this information to travelers.

Interviewees identified several strategies to address weather-related challenges. Some of these include:

- Portable remote weather information stations for construction zones.
- Real-time connections to the media, highway or airport to disseminate information quickly.
- Mechanisms to deliver real-time information to vehicles.
- Provide more accurate information, especially on remote stretches of highways to travelers.
- Integrate weather information from various sources (i.e., RWIS, NWS forecasts) to better predict future weather conditions and to disseminate accurate weather information in real-time to motorists.

1.3.8 Statewide Traffic Operations Center and Multi-Agency Coordination

A traffic operations center (TOC) provides the opportunity to coordinate and integrate transportation operations on both regional and statewide levels. Generally, a TOC provides the following functions:

- control of field devices (e.g., cameras, traffic signals, message signs),
- point of data collection and processing,
- information dissemination to other stakeholders and the general public, and
- mechanism to coordinate operations involving multiple stakeholders.

The transportation user needs as they relate to a statewide TOC and interagency coordination are:

Integration and Coordination of Transportation Systems Operations

Interviewees noted a need to integrate communications among the ADOT&PF and other regional stakeholders. A statewide TOC provides a platform accessible by multiple agencies.

Traffic Signal Operations

Interviewees identified a need to be notified of traffic signal malfunctions and make traffic signal adjustments remotely from a TOC or similar activity. This could be partly addressed by better communications between local law enforcement and ADOT&PF. In addition, stakeholders identified the need to make traffic signal adjustments remotely from a TMC or similar facility.

1.3.9 Network Services and Communication

Latency (slow data movement) in communication is a problem. There is sometimes a three-second delay between transmission and reception of data on the communications network. This delay may cause problems when using certain software packages. The AHMS system has experienced a communication latency problem in the past.

Many of the systems that address the transportation user needs identified in this chapter require communication from a remote location to a central site. In some of Alaska's more remote areas, there simply is not enough communications infrastructure in place to support these systems. The combination of sparse population density and unique and challenging topology and geography exacerbates the telecommunication challenge. The Department of Administration is leading an effort to improve the telecommunication system throughout the State. Improved reliability and wireline and wireless telecommunication coverage is critical to the success of the ITS program in Alaska.

Radio communication between maintenance and operations staff is also critical to the success of the ITS program. The ITS equipment installed in the field (even with sufficient telecommunications to transmit data to a central site) is of limited benefit if operators and decision-makers can't communicate with field personnel to respond to the conditions that this equipment detects. The multi-agency Land Mobile Radio System (LRMS) effort is helping to address the radio communication needs.

Not only is communication a limited resource in Alaska, but so is power. Direct power is often not available in remote areas resulting in procuring expensive self contained power systems. In addition, power outages are a significant problem, usually a result of mechanical failures or severe weather conditions, making it even more challenging.

Many of the remote maintenance stations do not have internet access or access to the State's Wide Area Network (WAN) causing them to be disconnected from the rest of the ADOT&PF and other agencies. This reduces sharing of real-time information such as road conditions via the internet. Currently, many of these remote stations call or fax in the road condition reports.

1.3.10 Traffic Management and Operations

To address air quality improvement, stakeholders identified the need to reduce the time that traffic spends idling without increasing traffic capacity. Effectively, any activity that enhances traffic flow and reduces vehicle emissions is considered beneficial to air quality. For instance, improved incident response can be considered as an activity that improves air quality because it reduces the time vehicles must wait in congestion. In doing so, fuel efficiency increases and fewer emissions are released into the environment. Similarly, initiatives that promote the use of transit help reduce the total number of vehicles on the roadway, which lessens congestion and consequently improves fuel consumption and air quality.

There is a related need to implement traffic and transportation operational strategies that are based on air quality. This would be a system to divert or guide traffic away from the most congested areas when air quality is low.

Stakeholders also identified a need for an adaptive signal control system based on weather and pavement conditions. This enables signal timing to be adjusted when arterials are covered with snow or ice. Signal timings would account for the increased time it takes for vehicles to stop in snow and ice and help make the process of plowing and spreading chemicals more efficient.

Traffic Signals

Remote Traffic Signal System Control

To improve inter-agency operations and the safety of maintenance staff, stakeholders indicated a need for central traffic signal control. Stand alone traffic signals (i.e., traffic signals that are not integrated with other systems) are often more difficult and costly to maintain than systems that are remotely controlled. Stand alone traffic signals require that maintenance personnel travel to and from a traffic signal to perform maintenance or to adjust signal timing patterns. Due to the geographic size and climate of Alaska, traveling to and from a traffic signal may take several hours. The time it takes to perform maintenance activities, and the costs associated with this task, can be significantly decreased by integrating traffic signals. Additionally, establishing communications with traffic signals throughout the State reduces the frequency of field visits, and in turn improves the day-to-day safety of maintenance personnel.

Traffic Signal Priority for Transit

There is interest in deploying transit priority systems as a means to improve current transit operations and promote transit use in cities throughout the State. When implemented, systems deployed on traffic signals and transit vehicles, will allow transit vehicles to proceed through signalized intersections with little or no delay. Signal emitters installed on the transit vehicle communicate with receivers tied into the traffic signal to give transit vehicles priority over other vehicles stopped at a traffic signal. This reduces the time the transit vehicle must wait before receiving a green signal indication.

Traffic Signal Pre-emption for Emergency Response

Similar to traffic signal priority systems for transit, traffic signal pre-emption systems are needed to improve emergency response. Traffic signal pre-emption systems deployed on traffic signals and emergency vehicles allow emergency vehicles to proceed through signalized intersections without having to stop. Unlike traffic signal priority systems, which reduce the time vehicles must wait at traffic signals, pre-emption systems pre-empt exiting traffic signal timing patterns to give a green signal indication to emergency vehicles as they approach the intersection. This allows the emergency vehicle to proceed through the intersection without stopping.

Inventory of Signals

Stakeholders desire a system to inventory transportation assets located in the field, including traffic signals. An inventory of assets help city staff determine where assets are located as well as characteristics pertaining to each. For instance, an inventory of traffic signals deployed in the State, may allow agencies to determine how long each signal has been in place, dates the signal was maintained, and the type of maintenance activities performed. This information is useful for day-to-day maintenance, and budgeting for new systems and equipment. Such an inventory can be recorded and stored in the integrated GIS discussed earlier in this chapter.

Automated Traffic Data Collection and Archival

Real-time traffic data is needed for real-time control of highways and for incident detection. Traffic data including: speeds, classifications, turning movements and volumes need to be automatically collected and downloaded to a centralized point, upon which the accuracy of the data can be verified and/or used in real-time traffic operations. To date, over 100 automated traffic counting recorder stations are deployed in the State, however, additional traffic recorders are desired at strategic locations to enhance the set of traffic data currently being collected.

In addition to expanding and enhancing the network of automated traffic data recorders, stakeholders also indicated that they would like to collect origin and destination data to support air quality initiatives. One strategy identified for automatically collecting origin-destination information would involve the use of video cameras placed at strategic locations to identify the license plates of passing vehicles.

Currently, traffic data is manually pulled into ADOT&PF's Highway Analysis System (HAS), where registered users are able to download batch information and customized reports. HAS can be difficult to use and is viewed to be non-user friendly. There is a need to develop a new system or modify the HAS to make it easier and more efficient to access information and to obtain a more comprehensive set of traffic data.

1.3.11 Commercial Vehicle Operations

The efficient operation and regulation of commercial vehicles is vitally important to Alaska. The ADOT&PF is continuing to develop and expand a Commercial Vehicle Information System & Network program (CVISN). Air, rail, road, and marine travel modes each play an integral role in Alaska's transportation system. Commercial vehicles are significant users of the transportation system. The following sections summarize the identified transportation user needs as they relate to commercial vehicle operations.

Credentials Administration

Currently, two separate agencies are responsible for maintaining data related to commercial vehicles. The Department of Administration, Division of Motor Vehicles maintains vehicle registration records and driver credentials. The Department of Transportation collects and manages safety inspection data and issues oversize/overweight permits. Enforcement officers need a

centralized data repository that contains or allows access to all State maintained information on commercial vehicles, including vehicle credentials, permits, driver credentials, and information on carrier safety. In other words, a single point of information is necessary, to reduce confusion and streamline existing operations. The centralized data repository should allow authorized users to access this information from either a fixed or remote location.

Electronic Screening

There is a need to increase the effectiveness of size/weight and safety enforcement by focusing enforcement resources on high-risk carriers, vehicles and drivers. This can be accomplished in part by providing a means for safe and legal vehicles to legally bypass open weigh stations.

On-line Permitting

A website that allows commercial vehicle operators to electronically submit and receive oversize and overweight permits is desired.

Enhanced CVO Enforcement

The ADOT&PF Division of Measurement Standards and Commercial Vehicle Enforcement is responsible for the enforcement of size, weight and safety laws relating to commercial vehicles covered under the Alaska Administrative Code and the Federal Motor Carriers Safety Regulations. To enhance enforcement activities and make them safer, the Division desires to use wireless devices to enhance the ability of an enforcement officer to enforce CVO laws. Currently, two officers are needed to complete a single stop; one officer (stationed in the weigh station or weigh in motion site) is needed to monitor commercial vehicles as they approach these facilities and notify the second officer if a violation has occurred, while the second officer (stationed in a patrol car upstream of the weigh station/weigh in motion site) is needed to pull over the commercial vehicle and issue a citation. With new wireless devices, the officer located upstream of the weigh in motion site, can monitor the same information that the officer in the weigh station or weigh in motion site receives. This reduces the need for two officers to enforce CVO regulations.

Freight Tracking

To enhance security and safety and improve commercial vehicle operations there is a need to track commercial vehicles and the hazardous materials they haul. Commercial vehicles may be equipped with electronic tags that store specific information regarding the type of cargo a commercial vehicle is hauling. These electronic tags may also serve as means to prevent access to cargo that is considered hazardous or sensitive. Additionally, vehicles may be equipped with GIS based tracking devices that automatically track the location of a commercial vehicle. Together, technologies like these are used to automatically alert commercial vehicle carriers and enforcement agencies when a commercial vehicle deviates from its planned route, or when there is a breach in the vehicle's cargo (i.e., there is unauthorized access to the cargo). Carriers and enforcement agencies may use this information to respond more quickly when incidents occur, or preempt such incidents from occurring.

Enhanced Roadside Safety Inspection

Roadside safety inspections need to be made more effective and efficient to reduce the time needed to complete the inspections. Inspections also need to be made more thorough.

Mobile computing platforms are desired to give enforcement officers the ability to enter and access information while conducting safety inspections. Laptops or other similar mobile devices are needed to digitally enter and store the results of safety inspections. Similarly, enforcement officers need to have access to commercial vehicle safety information as well as State maintained

credentials and permit information. Laptops equipped with cellular modems or EVDO technology are necessary to upload and download information remotely from the field.

1.3.12 Institutional Coordination

The potential benefits of deploying operational strategies and technologies to enhance the safety and efficiency of Alaska's transportation systems cannot be fully realized unless they are coordinated from an institutional perspective. Some of the specific challenges associated with institutional coordination are described in this section.

Traffic operations centers provide the opportunity to integrate the operations of several transportation systems. The TOC also provides a platform that enables integration of communication among ADOT&PF and their regional stakeholders. Stakeholders identified the ability for multiple agencies to communicate with one another as a primary need for implementing a TOC.

Another challenge associated with the interaction of multiple agencies relates to traffic signal operation. When a traffic signal is in flash mode, it can significantly disrupt traffic operations. However, if local police agencies were able to communicate with a signal operator when signals go into flash mode, the time needed to correct the problem would be reduced, minimizing traffic disruptions and helping make travel safer and less congested.

Coordination and communication between ADOT&PF and visitor associations and tourism groups could be improved to foster safer, more efficient travel by means of information dissemination. Combined resources would provide a greater potential for reaching a large number of travelers in Alaska.

Coordination of WAN usage also needs to be improved. With the current WAN system, an agency with smaller or less critical communication needs can use a majority of the system capacity with little regard for other agencies that have more extensive operations.

In addition to deploying technologies that enhance incident and emergency management operations, stakeholders identified the need to bring together designated liaisons from each involved agency as an important step in improving operations. This provides a platform for the agencies to work together on institutional, technical and operational issues.

Throughout the process of identifying transportation user needs, stakeholders identified several solutions as having significant potential to accommodate these needs. It is very apparent that many of the identified solutions require institutional coordination and cooperation. Some of these solutions include:

- Real-time data sharing and document modification
- Inter-agency mobile communications
- Linking of multiple websites
- Emergency vehicle signal preemption
- Data collection and archiving
- Improved communications

Communications between construction and emergency management occur via similar communications bands (flaggers in the field and operators at an emergency operations center or emergency response dispatch center).

1.3.13 Airside Operations

As mentioned in Section 1.2 travelers in Alaska depend more on air service than any other U.S. state. Air travel schedules should be linked with other visitor-related services so travelers can

efficiently arrange for all of their travel. Increased links from a central travel or transportation website to air schedules and travel destination information would be beneficial.

Only 25% of the airfields at regional airports are paved, and others have unlit runways. The Federal Aviation Administration (FAA) requires that "certified" weather stations be implemented to support flight operations; however some stakeholders feel that some of these systems are not as accurate or reliable as they need to be to ensure flight operations.

Another problem that faces airport operations is the presence of wildlife. Wildlife that wanders onto runways can damage aircrafts and cause catastrophic accidents. Systems are needed to monitor runway conditions so that aircrafts can land safely.

1.3.14 Port Operations and Security

Stakeholders identified the need to improve operations and security at Alaska's ports especially at the Port of Valdez. Alaska's ports are vital for the movement of goods including food, oil, and materials to and from Alaska. Improving port operations and ensuring port security helps ensure that goods are delivered without delay. Additionally, enhanced security at ports prevent the illegal entry of individuals and weapons into Alaska and as a result overall safety and security of travelers and residents in Alaska will be improved.

To improve operations and security at Alaska's ports, stakeholders identified the need to identify and track the movement of vessels in and around ports and within shipping lanes. By identifying and tracking vessels, port operators can adequately expedite the arrival of vessels by identifying their cargo and expected arrival time, pre-processing paperwork, and taking the necessary actions needed to efficiently load/unload cargo. Identifying and tracking vessels also gives operators the opportunity to verify vessel compliance with voyage plans and, if necessary, limit access to ports for those vessels that do not fully comply. This will expedite operations and enhance security.

1.4 Next Steps

User needs identified and summarized in this document serve as input to the next stages of defining Alaska's Iways Architecture. These stages are described below, with a description of how the transportation user needs data was used. In some cases, systems or technologies may not currently exist to satisfy user needs identified throughout this document. In cases like these, user needs cannot be mapped to the National ITS Architecture and must be carried over to subsequent revisions of Alaska's Iways Architecture. When Alaska's Iways Architecture is updated in the future, needs not previously mapped to the National ITS Architecture can be reassessed to determine if new systems and technologies have been developed to satisfy these needs. If so, user needs that were left out of the Alaska Iways Architecture may be included. If not, identified user needs must be carried over until technologies and systems evolve to satisfy them.

1.4.1 User Services

The National ITS Architecture identifies user services as groups of ITS functions that meet various transportation user needs. Identifying user services is part of creating a vision for ITS in Alaska. The transportation user needs identified in this chapter and the knowledge of existing ITS in Alaska were used to create a User Services Report for the state. The User Services Report identifies functions that the regional transportation agencies provide directly and those that they should support other agencies in providing (e.g., enforcement activities).

1.4.2 ITS Long-Range Vision

The development of the ITS Long-Range Vision relied on the identification of transportation user needs and the associated user services selected to address those needs. The ITS Long-Range Vision identifies and documents the full set of desired and needed ITS elements while emphasizing that the complete set of ITS elements will not be in place for many years. The report includes functional strategies that ADOT&PF should implement to meet the State's transportation needs.

1.4.3 Operational Concept

The Operational Concept articulates how identified systems will interact and operate to deliver National ITS Architecture User Services and satisfy the State's ITS Long Range Vision. The Operational Concept also describes how ITS data can be used to meet operational needs in Alaska. It provides an analysis of the current operations for collecting and disseminating transportation data, and describes the deployed and planned ITS systems in the state. It describes the communications infrastructure that may be necessary to deliver transportation information in a timely manner.

1.4.4 Physical ITS Architecture

An initial step in planning and managing ITS deployments is defining an ITS architecture. An ITS architecture defines the institutional and technical linkages necessary to plan, design, implement, operate, and maintain ITS. The National ITS Architecture, initially adopted in 1996, provides a technical and institutional framework to guide the coordinated deployment of ITS by public agencies and private organizations. It defines the functions performed by ITS components and the various ways in which components can be interconnected. The National ITS Architecture can be localized for regions, corridors, and transportation authorities. It can benefit state and local transportation agencies, like ADOT&PF, by helping them implement and integrate ITS in a manner that maximizes benefits and return on investment.

ADOT&PF's Iways Architecture will foster the interoperability of ITS systems across jurisdictions and with other ITS services that are implemented in the future or may already exist. By identifying the interrelationships of existing, planned and future ITS projects, ADOT&PF's Iways Architecture will foster ITS deployment and integration without losing the initial investment used to deploy existing systems. In addition, using the National ITS Architecture can save ADOT&PF time and money because it contains much of the up-front analysis and planning information needed to deploy ITS.

The transportation user needs assessment provided the opportunity to identify and document the desired interfaces and data exchange requirements required for developing an ITS architecture.

1.4.5 Implementation Plan

The Implementation Plan will define a set of projects proposed for implementation in Alaska in the next ten years (2008-2018). Each project satisfies one or more transportation user needs. Projects are prioritized for deployment in the short- (0-3 years), mid- (3-5 years) or long-term (5-10 years) based on a set of criteria defined in this chapter. In addition to project identification and prioritization, the Implementation Plan also provides discussion on the activities closely surrounding project implementation that may affect it, including; project funding, institutional and system integration, standards, and specific policies that will lead to more effective project implementation in Alaska.

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APPENDIX A: STAKEHOLDER WORKSHOP ATTENDEES

Table 1-1:
Attendees of the Alaska Iways Architecture & RWIS Kickoff Meeting in Anchorage (February 7, 2000)

Name, Agency	Phone	Email
Jennifer Wilson, ADOT&PF	269-0512	Jennifer_wilson@dot.state.ak.us
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Eileen Reilly, Alaska Railroad	265-2655	Reillye@akrr.com

Table 1-2:
Attendees of the Alaska Iways Architecture & RWIS Kickoff Meeting in Juneau (February 8, 2000)

Name/Affiliation	Phone	Email
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Table 1-3:
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