OREGON
Smart Mobility
NETWORK

VOLUME I
TECHNICAL APPLICATION

Keeping **People**, **Goods**, and **Ideas** Moving in a Growing Region

June 18, 2018
Advanced Transportation and Congestion
Management Technologies Deployment Initiative
Notice of Funding Opportunity No. 693JJ318NF00010

In Partnership With...

Oregon Department of Transportation

TRIMET

Metro

PBOT
PORTLAND BUREAU OF TRANSPORTATION

OREGON STATE POLICE

WASHINGTON COUNTY OREGON

Oregon Department of Transportation

I. COVER PAGE

Project Name:	Oregon Smart Mobility Network
Eligible Entity Applying to Receive Federal Funding:	Oregon Department of Transportation
Total Project Cost (from all sources):	$31 million
ATCMTD Request:	$12 million
Are matching funds restricted to a specific project component? If so, which one?	No.
State(s) in which the project is located:	Oregon
Is the project currently programmed in the: » Transportation Improvement Program (TIP) » Statewide Transportation Improvement Program (STIP) » MPO Long Range Transportation Plan » State Long Range Transportation Plan	Yes, programmed in the: » ODOT STIP » ODOT TSMO Performance Measurement Plan » Portland Metro Regional TSMO Plan » Portland Metro Multimodal ICM Plan » Washington County ITS Plan » Clackamas County Freight ITS Plan
Technologies Proposed to Be Deployed (briefly list)	**Prepare:** Automated traffic signal performance measures (ATSPMs), automatic traffic recorders, bicycle and pedestrian counters, Bluetooth travel time systems, road weather decision support, CCTV monitoring cameras, and multimodal integrated corridor management architecture **Manage:** Adaptive ramp metering, dynamic speed limits, freight signal priority, queue warning systems, road weather information dissemination, adaptive pedestrian safety systems, Signal Phase and Timing (SPaT), dynamic routing, next-generation transit signal priority, V2X pedestrian/bicycle, automated speed enforcement, red-light-running crash mitigation systems **Recover:** Unmanned aerial systems (UAS) crash reconstruction, battery back-up systems

Oregon Department of Transportation

June 18, 2018

The Honorable Elaine Chao, Secretary of Transportation
United States Department of Transportation
1200 New Jersey Ave, SE, Washington, DC 20590

RE: Advanced Transportation and Congestion Management Technologies Deployment Initiative (ATCMTD) 2018 Grant Application (Funding Opportunity 693JJ318NF00010)

Dear Madam Secretary:

As technology continues to revolutionize the transportation environment in the United States, the Oregon Department of Transportation (ODOT) and its partners recognize the importance of staying on the leading edge, rapidly deploying and piloting scalable, portable solutions that add to the base of knowledge shared by agencies nationwide. ODOT is preparing to deploy a suite of advanced technologies that will allow us to **prepare** for congestion, **manage** it in real time, and **recover** quickly from unexpected events, improving reliability statewide. These three actions, **prepare**, **manage**, and **recover**, form the structure of the overall program we call the **Oregon Smart Mobility Network**.

Oregon is experiencing unprecedented growth. For the past four years, our state has been one of the top two US destinations for inbound moves, and we expect 2.2 million more people by 2065. Oregon tourism has increased 74% since 2003 and is now an $11.7 billion industry. And since 2015, Port of Portland's marine terminal is no longer served by major global cargo container shippers, meaning that interstate freight mobility will rely heavily on trucks traveling between Portland and Tacoma/Seattle for years to come.

All these factors have combined to make Portland area traffic the 12th most congested in the nation, with delays collectively costing $3.9 billion in fuel, lost time. As congestion in the Portland region affects travel time and the distribution of trips, so too does the growing congestion in Central Oregon. Bend, the region's largest city, is the fourth fastest-growing metro area in the country. Freight volumes on the area's major corridor, US 97, where bicycle tourism has an increasing presence, are expected to increase 45% by 2045.

The **Oregon Smart Mobility Network**, strategically applies smart technology statewide in both urban and rural contexts to ease the impacts of rapid growth, guide infrastructure investments, and promote optimal mobility for all modes. The entire program will be overseen by a single entity, ensuring uniform quality and integration. We have purposely chosen to focus on using technology to maximize our system's efficiency for existing modes. By doing this, we hope to strengthen Oregon's ability to absorb the impact of the coming transportation revolution as it takes shape.

The program prioritizes projects that promote **safety** on Oregon roads; foster **innovation** that can be applied elsewhere to strengthen and enrich the program and improve interstate travel; and take advantage of **opportunities** to build upon previous innovations, make use of available resources, and capture valuable data that will help us improve our system.

The nine projects selected for the program deploy 30 smart technologies to form an integrated and cohesive congestion planning, management, and recovery program serving all modes. For example, Next-Gen transit signal priority replaces less flexible on-board sensors with a centralized system that can be inexpensively deployed across the fleet through software. Smarter than the old technology, Next-Gen can consider how full the bus is in addition to whether or not it's on schedule

Oregon Department of Transportation

to determine signal priority. Adaptive pedestrian signal timing goes beyond blind response to a pedestrian call button to detect the presence or absence of people needing to cross and adapt for slower and quicker walkers. Unmanned aerial systems (UAS) will take to the skies to provide State police with accurate scene data after unexpected incidents, so roads can be cleared more quickly.

ODOT's partner agencies for the Oregon Smart Mobility Network program include the Portland Bureau of Transportation (PBOT), TriMet, Metro, the Oregon State Police, Portland State University, Washington and Multnomah Counties, and the Cities of Bend and Gresham. These are joined by private sector partners including Daimler Trucks of North America, Intelight, TransCore, Wavetronix, FLIR, Eco-Counter, and Traffic Technology Services. Our program builds on a shared body of work that has already yielded positive results. We have identified clear and measurable performance metrics, developed a package of projects designed to work in concert to maximize multimodal mobility per dollar spent, and established a common set of goals, objectives and success criteria.

Since Central Oregon and the Portland Metro area are experiencing the state's most rapid growth, and the need for interstate freight access through these areas will only become more pressing, our area of focus for this program will be the I-5 and US 97 and the connecting highways and arterials running between them. The urban area mobility enhancement projects we will develop in these corridors are designed to be scalable and portable to the other seven MPOs in the state and other urban areas along the critical I-5 and US97 north-south corridors serving the West Coast.

The rural area mobility enhancement projects are equally scalable and portable, and ODOT has plans to replicate these projects in other parts of the state where distances are great and the number and location of first responders is constrained.

ODOT has already begun building the Oregon Smart Mobility Network through advanced transportation management deployments on several key corridors with agency and private sector partners. We have ample evidence this program will work, and now we need USDOT's support to help us roll it out on a broader scale. Thanks to our ongoing efforts, ODOT and our partners are able to balance our $12 million request to the ATCMTD grant program with a $19 million match. USDOT's support for our program will also be preserved into the future by our continuing investments in operations and maintenance. ODOT has spent over $8 million on Transportation Operations Center (TOC) activities and over $6 million on maintenance over the past two years. We plan to increase operations and maintenance by 20% in the next biennium to ensure long-term program success beyond the period of performance.

The Oregon Smart Mobility Network program advances USDOT's vision for advanced transportation technologies. The proposed deployments will improve safety, efficiency, system performance, and infrastructure return on investment in Oregon, with scalability and portability to locations throughout the nation. We are proud of the progress ODOT has already made toward these important goals and grateful for this opportunity to partner with USDOT to carry them further.

Sincerely,

Galen McGill, PE
Systems Operator & ITS Manager

Andrew Dick
Connected, Automated, and Electric Vehicle Advisor

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SUMMARY TABLE

	SELECTION CRITERIA	RELEVANCE	REFERENCE
Technical Merit			
1	Degree that the proposed technology deployment aligns with program requirements and DOT goals, including safety, innovation, and opportunity.	**HIGH** – The ready-to-deploy solutions are cross-cutting in their ability to address challenges to safety, mobility, sustainability, economic vitality, and air quality. Through integration into routine functions, they will address existing challenges in the management and recovery of the transportation system and will help the region prepare for the future through performance-based smart technology applications.	2.1, 2.9, 2.12, 2.13
2	Readiness of proposed technology(ies) to be deployed, and likelihood of success of the applicant to deploy and sustain the proposed technology(ies), including the proposed approaches to addressing any regulatory environment and other obstacles to deployment.	**HIGH** – Not only are all proposed solutions deployment-ready, but most have been previously tested by the partner agencies or deployed on existing systems. ODOT has already committed funding for the largest deployment on I-205, so ATCMTD grant funding will be used for deployment at other locations. Operations and maintenance funding is committed by ODOT and its MPO, city, and county partner agencies.	2.5, 2.6, 2.10
3	Scalability or portability of the proposed technology deployment to other jurisdictions.	**HIGH** – Utilizing interagency knowledge, technologies were selected for scalability at the project level and portability throughout the Oregon Smart Mobility Network. ODOT and our partner agencies plan to expand the deployment of these innovative technologies.	2.1, 2.3, 2.4, 2.13
4	Commitment to evaluate the effectiveness (i.e., cost-benefit) of activities proposed.	**HIGH** – ODOT and its partner agencies are committed to evaluating the proposed solutions and have established performance metrics for this purpose. Some proposed technologies focus on performance measurement while others will provide data as part of other applications. Several existing data collection and dissemination systems will be used, including the ODOT TripCheck Traveler Information Portal (TTIP), ODOT RealTime™, and Portland State University (PSU) PORTAL.	2.7, 2.8
Staffing			
1	Degree that the Application includes a program/project management structure or organization that will successfully oversee the proposed technology deployment.	**HIGH** – ODOT's Program Managers, Galen McGill and Andrew Dick, and partner agency liaisons make up a steering committee that will ensure deployment of the proposed solutions. This team is made up of highly-qualified staff who have worked together for many years, and will be led by Galen and Andrew, who will serve as liaisons between the steering committee and FHWA.	3.4, 4.1
2	Expertise and qualifications of key personnel for managing or conducting appropriate aspects of the proposed technology deployment through the period of performance.	**HIGH** – Key personnel have been selected for their technical knowledge with advanced transportation and congestion management technologies. They are local experts but are also involved in national conferences, research partnerships with universities, and development of innovative vendor solutions.	3.4, 4.1, Resumes
Cost			
1	Cost will be considered in the award decision. The cost information will be analyzed to assess cost reasonableness and conformance to applicable cost principles. Applicants must provide the required matching funds, and supporting detail for these funds, including the applicant's activities to maximize the non-Federal share of the project funding.	**HIGH** – The project requests $12M in federal funding, which will be matched with $19M committed in non-federal matching funds. The requested funds do not exceed the maximum, and the match from ODOT and the partner agencies exceeds the requirement. Cost estimates were provided by each agency and reviewed by members of the steering committee. Through our commitment to long-term operations & maintenance funding, ODOT will sustain the value of USDOT's investment.	Volume 2
2	Funding availability will also be considered in the award decision. This evaluation factor will not be rated, but will be considered in selection.	**HIGH** – The project requests $12M in federal funding and will match the awarded funds with $19M committed in non-federal funds. This represents a strong return on investment for FHWA with respect to this portable and scalable set of projects, even before the significant benefits to the region and West Coast are quantified. ODOT and several of its partners have experience administering federal grants.	Cover Page
Project Prioritization			
1	The Department will prioritize projects that also enhance personal mobility and accessibility.	**HIGH** – Solutions were selected to enhance the movement of people and goods within the Oregon Smart Mobility Network, ultimately benefiting the entire West Coast. Each technology deployment will improve personal as well as freight mobility and accessibility through preparation, management, and recovery techniques.	2.1, 2.7, 2.8, 2.9, 2.13
2	The Department may consider whether a project's design is likely to generate benefits for all users of the proposed project, including non-driving members of a community adjacent to or affected by the project.	**HIGH** – While the overarching goal for the program is to move everyone efficiently and safely through the Oregon Smart Mobility Network, there are a number of technologies that will specifically benefit multimodal travel and enhance accessibility for users with disabilities, including next-generation transit signal priority (benefiting transit riders), adaptive pedestrian signal timing at traffic signals, and performance measurement specific to bicycles and pedestrians.	2.1, 2.3, 2.7, 2.8, 2.9, 2.13

II. PROJECT NARRATIVE

2.1 PROPOSED PROGRAMS

Oregon is at a crossroads. Over 2 million more people are expected by 2065; Central Oregon is urbanizing at an unprecedented rate and Bend, Central Oregon's largest city, is the fourth fastest-growing metro area in the US; Oregon tourism has increased by 74% since 2003; and reliance on surface roads for freight movement has increased significantly. Portland area traffic now ranks as the 12th worst in the nation. It is vital that we apply technology to optimize our existing transportation system so we can invest limited capital project funds as wisely as possible, fostering safety, efficiency, and economic development.

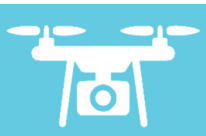
The **Oregon Smart Mobility Network** program builds on and strengthens a proven body of advanced technology deployments by ODOT and our partner agencies. Through rapid and strategic placement of key technologies in our state's most congested areas, we are creating an integrated network that will keep all modes moving not just today but well into the future.

We already have evidence that transformational technologies optimize travel on Oregon roads. Variable messaging signs activated on OR 217 in 2014 through ODOT's RealTime™ program helped produce an 11% reduction in crashes in their first year despite increased traffic volumes on the corridor. Many assets that will be deployed as part of the Network are being successfully piloted as part of the ongoing I-84 Integrated Corridor Management project. In addition, our partner agency PBOT has launched the Enhanced Transit Corridor Plan and is preparing to roll out Next-Gen transit signal priority and access treatments beneficial to the planned TriMet Frequent Service network.

In this next and most ambitious phase—the Oregon Smart Mobility Network—we will roll out these tested technologies along with several new additions across two of the most important travel corridors in our state: I-5 and US 97 and their connecting roadways. By doing this, we will achieve a ripple effect that will holistically improve the function of our entire transportation system as well as these key West Coast freight connections. Our team has identified clear and measurable performance metrics, developed a package of projects designed to work in concert to maximize mobility improvements per dollar spent, and established public- and private-sector partnerships, working with other agencies to assure a common set of goals, objectives, and success criteria.

OREGON SMART MOBILITY NETWORK

Through the Oregon Smart Mobility Network program, ODOT proposes to employ advanced technologies in three program areas to promote optimal multimodal mobility:

 PREPARE	 MANAGE	 RECOVER
Planning for the system through performance measurement and decision support	Managing the system in real time through active traffic management and road weather management	Keeping the system running when the unexpected happens through active demand management and traffic incident management

The program prioritizes projects that promote **safety** on Oregon roads; foster **innovation** that can be applied elsewhere to strengthen and enrich the program and improve interstate travel; and take advantage of **opportunities** to build upon previous innovations, make use of available resources, and capture valuable data that will help improve the system. Section 2.4 has additional details.

PREPARE

The vital first step toward alleviating congestion is ensuring the necessary tools and strategies have been developed and the needed assets are in place. Near-term operational decisions and long-term funding availability can influence the level of congestion experienced throughout the Oregon Smart Mobility Network. The 'Prepare' program area involves planning for the transportation system through deploying appropriate tools and technologies; identifying appropriate performance metrics; and placing needed decision support. The following table highlights some of the elements included in the program to promote performance-based decision-making and efficient monitoring.

Problems & Solutions

Problem #1:	Limited information to guide operational, maintenance, and funding decisions.
Solution:	Performance measurement technologies will be deployed through ATSPMs, automatic traffic recorders, bicycle and pedestrian counters, and Bluetooth travel time systems to inform funding, operations, and maintenance decisions.
Problem #2:	Especially in rural areas, limited data is available for issuing weather warnings to ease congestion and safety issues.
Solution:	Bluetooth travel time systems and weather sensors will be deployed as part of Road Weather Information Systems to help agencies make decisions during weather events.
Problem #3:	Monitoring traffic requires significant staff time. The existing system provides limited coverage and does not fulfill the need for advanced analytics.
Solution:	ATSPM units will provide actionable information and CCTV monitoring cameras will be deployed to provide staff with the option of surveying traffic and impacts of management and recovery strategies remotely. ATSPM units and CCTV cameras will also gather valuable data over time.
Problem #4:	Data to support future active demand management and traffic incident management on multimodal integrated corridors is in different formats.
Solution:	Data system architecture will be designed to seamlessly interface with multiple data formats, allowing support for such things as dynamic transit capacity assignment, predictive traveler information, and traffic incident decision support.

ATCMTD goals directly addressed by this program area

Economic Vitality: ATSPMs, Bluetooth travel time systems, NPMRDS/HERE datasets, and CCTV monitoring cameras are cost-efficient ways to collect data and monitor traffic. Road weather decision support improve safety and reduce costs related to crashes during weather events for travelers, goods movement, and transportation agencies.

Infrastructure: ATSPMs will be used to monitor infrastructure at signalized intersections.

Mobility: ATSPMs and Bluetooth travel time systems will be used to make operational adjustments that reduce congestion and emissions. Improved maintenance can proactively address mobility issues in the field.

Multimodal: ATSPMs will be used for multimodal applications including bicycles, pedestrians, freight, and transit. Bicycle and pedestrian counters will be deployed on multimodal facilities.

Safety: ATSPMs and adaptive pedestrian signal timing will be used to track red-light-running vehicles and reduce overall congestion, which has an impact on queuing and driver behavior.

Performance Measures: ATSPMs, automatic traffic recorders, bicycle and pedestrian counters, and Bluetooth travel time systems will be deployed to track system performance. The data will be shared publicly through existing interfaces such as Portland State University's PORTAL and ODOT's TripCheck Traveler Information Portal.

Traveler Information: Bluetooth travel time systems and road weather decision support will be used to inform traveler choices.

MANAGE

Managing existing and near-term congestion requires real-time support to help roadway users travel through the transportation system safely and efficiently. This program area includes active traffic management and road weather management solutions to provide system users with information they can use to make decisions. Following are examples of some of the solutions that will reduce traffic incidents, reduce congestion and emissions, improve the performance characteristics of multimodal systems, and provide access to real-time information.

Problems & Solutions

Problem #1:	Downstream congestion is causing bottlenecks and crashes.
Solution:	Active traffic management solutions, e.g. adaptive ramp metering, dynamic speed limits, and queue warning systems, and active demand management solutions, e.g. dynamic routing, will work in concert to reduce bottlenecks, improve traffic flow, and slow drivers before they reach stopped traffic.
Problem #2:	Weather events cause congestion and safety issues.
Solution:	Bluetooth travel time systems and weather sensors will be deployed to provide data for variable message signs and variable advisory speeds; trigger dynamic curve warning systems; and provide information in real time through websites such as ODOT's TripCheck.
Problem #3:	Congestion at traffic signals is impacting multimodal users.
Solution:	Transit signal priority and freight signal priority solutions will reduce delay for buses and trucks at traffic signals, positively impacting the movement of people and goods within the Oregon Smart Mobility Network. Deployment of adaptive pedestrian safety systems that detect pedestrians in real time will improve safety and communicating SPaT information will improve traffic flow.
Problem #4:	Red-light-running vehicles cause crashes that result in increased congestion and significant personal/economic loss.

Solution: Red-light-running crash mitigation systems detect vehicles that have entered the intersection in real time and extend the red interval until the vehicle has reached a safe location. These systems will be deployed to reduce the likelihood of a collision in the intersection, which can result in long delays.

ATCMTD goals directly addressed by this program area

Advanced Technologies: Freight signal priority, transit signal priority, and broadcast of SPaT data via both DSRC and the internet will promote development of connected vehicle applications.

Economic Vitality: Adaptive ramp metering, dynamic speed limits, queue warning systems, road weather information dissemination, and adaptive pedestrian safety systems are safety solutions that reduce the likelihood of crashes and associated economic damage. Freight signal priority, adaptive pedestrian safety systems, dynamic routing, and transit signal priority can also save valuable time for both industry and the traveling public. Red-light-running crash mitigation systems reduce the likelihood of costly crashes.

Mobility: Adaptive ramp metering, freight signal priority, adaptive pedestrian safety systems, SPaT, dynamic routing, and transit signal priority can improve traffic flow and reduce delay.

Multimodal: Freight signal priority and transit signal priority reduce delay for trucks and buses, while adaptive pedestrian safety systems serve pedestrians.

Safety: Adaptive ramp metering, dynamic speed limits, and queue warning systems inform drivers of congested conditions before they reach stopped traffic; road weather information dissemination inform drivers of weather events; and adaptive pedestrian safety systems monitor pedestrian movements at signalized intersections. Red-light-running crash mitigation systems will reduce the likelihood of crashes caused by vehicles running the red light

Traveler Information: Dynamic speed limits, queue warning systems, road weather information dissemination, SPaT, and dynamic routing provide travelers with information about congestion, weather, and real-time traffic signal timing.

RECOVER

When unexpected events occur, such as crashes or adverse weather, recovery of normal operations must happen as quickly and efficiently as possible. While the strategies in our Manage program area attempt to mitigate congestion and collision danger before **unexpected events occur, our Recover program area addresses conditions** after **an incident, speeding recovery and getting traffic flowing again. Following are some of the applications we will deploy to address congestion resulting from crashes, weather, transit delay, and power outages.**

Problems & Solutions

Problem #1:	Traffic continues to travel towards congested routes (caused by crashes or weather), further worsening congestion.
Solution:	Active demand management solutions such as dynamic routing will inform drivers of real-time traffic conditions, but will also be deployed to allow traffic to be directed to alternate routes.
Problem #2:	Late buses are unable to catch up to the schedule.

Solution:	Transit signal priority will give increased priority to buses that are running behind schedule, reducing overall delay for the transit line and improving connections for transit riders.
Problem #3:	Crash reconstruction is time consuming and worsens congested conditions after a traffic incident.
Solution:	UAS technology will be deployed to produce police-quality images of crashes with damage to vehicles or infrastructure. This technology allows a reconstructionist to quickly collect scene data, significantly reducing overall time required to clear incidents and resultant congestion in both urban and rural environments.
Problem #4:	Congestion worsens when there is a power outage and signals go dark.
Solution:	Battery backup systems will be installed to provide power to traffic signals when there is a power outage. These can power traffic signals for a few hours, reducing delay for all system users while power is being restored.

ATCMTD goals directly addressed by this program area

Advanced Technologies: Transit signal priority will deploy connected-vehicle technology, while the red-light-running vehicle application will employ advanced detection. The latest UAS technology will significantly reduce crash recovery times.

Economic Vitality: Dynamic routing, transit signal priority, UAS crash reconstruction, and battery backup systems will reduce delay and associated costs for the traveling public, particularly when there is an unexpected event.

Infrastructure: UAS crash reconstruction will provide information about infrastructure damage. ATSPM systems will provide real-time information on the state of repair at signalized intersections.

Mobility: Dynamic routing will reduce congestion and associated emissions, particularly if there is an unexpected event and traffic is directed to an alternate route.

Multimodal: Transit signal priority will help buses stay on schedule, improving transit reliability for all community members.

Safety: UAS crash reconstruction will help law enforcement clear traffic incidents more quickly.

Traveler Information: Dynamic routing will provide traveler information for unexpected events.

2.2 GEOGRAPHIC DESCRIPTION AND MAP

The rapid new growth of Bend and the Central Oregon region and the ongoing growth of the Portland Metro area coupled with the need for interstate freight access indicates that our area of focus should be both the north-south interstate corridors of I-5 and US 97 and the connecting highways running between them. The map in Exhibit 1 shows geographic distribution of the projects that will make up the Oregon Smart Mobility Network, showing where they fall within the continuum of our Prepare, Manage, and Recover program areas. Projects are listed below, along with their corresponding project numbers from Exhibit 1. Exhibit 1 also shows active transportation management deployments that are complete or underway, showing how the proposed Network connects.

PORTLAND METRO AREA

In the Portland Metro area, increasing congestion has made it more difficult to move people and goods around and through the region. There are four projects planned for Portland that will address arterial corridor management, active traffic management, and/or Next-Gen transit signal priority (TSP) on the following corridors:

- **ODOT (1):** I-205
- **ODOT (2):** OR 212/224
- **City of Portland (3):** NE Airport Way
- **TriMet (2, 3, 4, 5):** NE Sandy Boulevard, NE 82nd Avenue, W/E Burnside Street, SE Hawthorne Street, SE Foster Road, NE Airport Way, OR 212/224, NW/NE/SE Cornelius Pass Road

SUBURBAN WASHINGTON COUNTY

Located west of Portland, Cornelius Pass Road connects rural areas and serves as an alternate freight route for technology companies in Oregon's "Silicon Forest." An arterial corridor management project is planned to address long delays during peak traffic conditions as well as difficult access during winter conditions.

- **Washington County (5):** NW/NE/SE Cornelius Pass Road

CENTRAL OREGON

US 97 provides a parallel north-south freight relief route to I-5. It is also a critical West Coast freight corridor and prone to dangerous weather conditions in winter. A road weather management project is planned for US 97 with ATSPM planned for a corridor within the Bend city limits to help move people and goods from US 97.

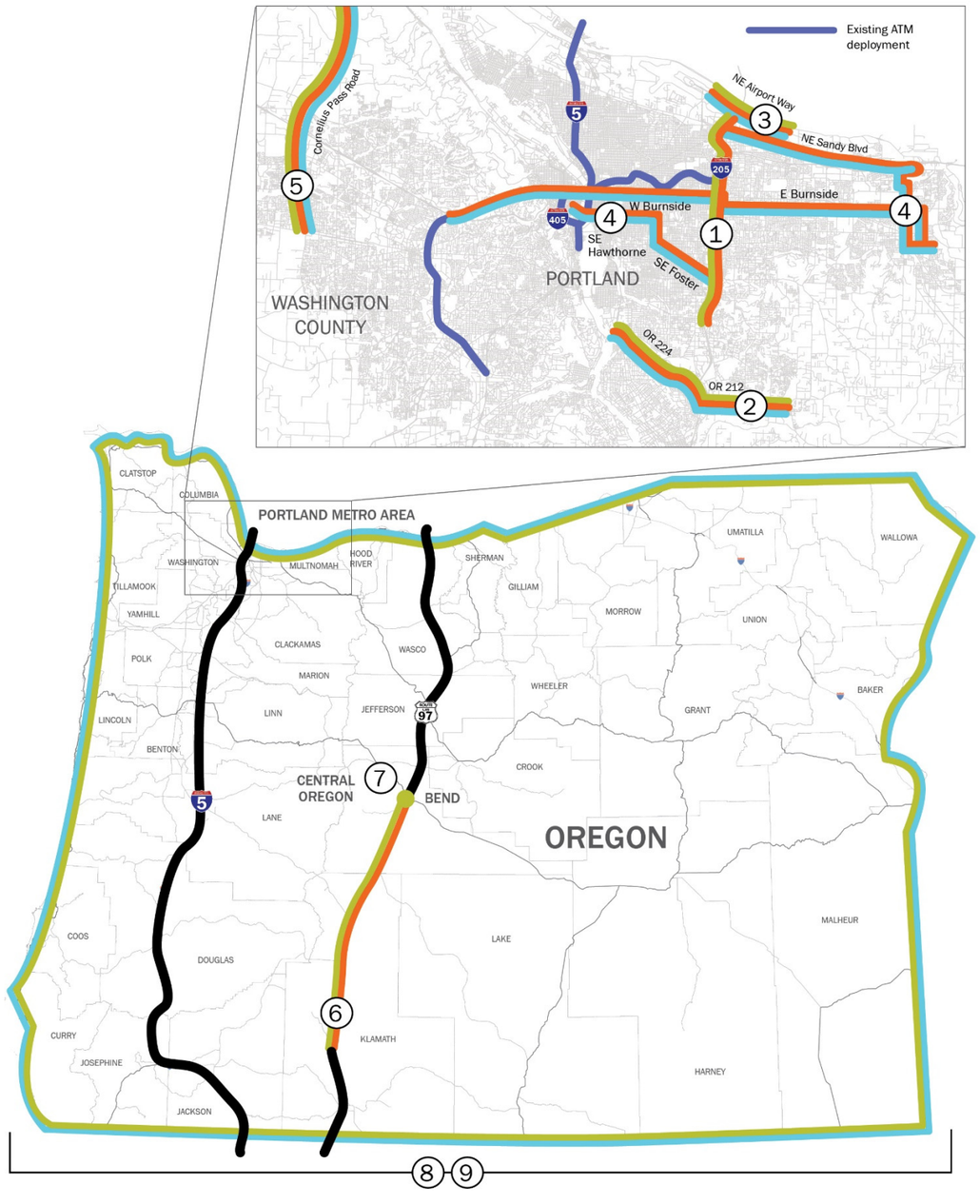
- **ODOT (6):** US 97
- **City of Bend (7):** NW Colorado Avenue/NW Arizona Avenue Couplet

STATEWIDE

Two projects will influence operations statewide and are not tied to a specific geographic area.

- **ODOT (8):** Multimodal integrated corridor management architecture
- **Oregon State Police (OSP) (9):** UAS crash reconstruction

Exhibit 1: Program Geographic Area



NO.	PROJECT DESCRIPTION	RESPONSIBLE AGENCY	PREPARE	MANAGE	RECOVER	SOLUTIONS
1	I-205 Active Traffic Management	ODOT	X			Automatic Traffic Recorders
				X		Adaptive Ramp Metering
				X		Dynamic Speed Limits
				X		Queue Warning System
2	OR 212/224 Arterial Corridor Management	ODOT	X			ATSPMs
			X			Bluetooth Travel Time System
			X			CCTV Monitoring Cameras
				X		Freight Signal Priority
				X	X	Next-Gen TSP
3	NE Airport Way Arterial Corridor Management	Portland	X			ATSPMs
			X			Bluetooth Travel Time System
			X			CCTV Monitoring Cameras
				X		Freight Signal Priority
				X	X	Dynamic Routing
				X	X	Next-Gen TSP
4	Next-Generation Transit Signal Priority	TriMet		X	X	Next-Gen TSP
5	Cornelius Pass Road Arterial Corridor Management	Washington County	X			ATSPMs
			X			Bicycle and Pedestrian Counters
			X			Bluetooth Travel Time System
			X			Road Weather Decision Support
				X		Adaptive Pedestrian Safety System
				X		Freight Signal Priority
				X		Next-Gen TSP
				X		Road Weather Information Dissemination
				X		SPaT
				X	X	Dynamic Routing
					X	Battery Back-Up Systems
					X	Red-Light-Running Crash Mitigation System
6	US 97 Road Weather Management	ODOT	X			Road Weather Decision Support
				X		Dynamic Speed Limits
				X		Road Weather Information Dissemination
7	City of Bend Colorado/Arizona Couplet ATSPMs	ODOT	X			ATSPMs
8	UAS Crash Reconstruction	ODOT			X	UAS Crash Reconstruction System
9	Multimodal Integrated Corridor Management Architecture	ODOT	X			Multimodal ICM Architecture

2.3 REAL WORLD ISSUES AND CHALLENGES

Following is a discussion of the real-world issues and challenges addressed by the proposed technology deployments. Table 1 describes how the Oregon Smart Mobility Network program aligns with the ATCMTD focus areas.

POPULATION GROWTH

Oregon is going through a period of unprecedented change and growth. The state's population has doubled since 1970 to reach an all-time high of 4.1 million, and 2.2 million more people are expected by 2065.[1] For the past four years, Oregon has been one of the top two destination states for inbound moves.[2]

Portland traffic is now the 12th worst in the nation, with delays collectively costing $3.9 billion in fuel, lost time, and freight delays—that averages to $1,648 a year per Metro resident.[3] Portland traffic congestion is no longer limited to typical rush hours. The evening rush now lasts 6 hours or more on several major Metro highways. As Bend's population grows, so too does traffic in the area. Solutions planned in each of the three program areas—Prepare, Manage, and Recover—were chosen to reduce congestion and improve reliability throughout the Oregon Smart Mobility Network.

GROWTH IN TOURISM

At the same time, Oregon's unique combination of outdoor recreation, good food, and culture has created an international tourism industry that barely existed a decade ago. In just the past two years, tourism revenue has grown by $1 billion to reach a high of $11.7 billion. 30 million visitors came to Oregon in 2017.[4] Traveler information solutions for dynamic routing and road weather information dissemination will benefit travelers unfamiliar with Oregon roadways, particularly during severe weather events or wildfires.

FREIGHT CHALLENGES

After the departure of major global shippers Hanjin and Hapag-Lloyd in 2015, Port of Portland's Terminal 6 is back in business with weekly container service, but with the growing use of megaships it's unlikely major global carriers will return to our inland port. For the foreseeable future, interstate mobility for freight will rely heavily on trucks traveling between Portland and Seattle. As hours of 'rush hour' congestion spread into midday, congestion-free midday windows used by freight haulers to deliver goods and services are shrinking. As mid-day becomes more unreliable, freight has more problems meeting delivery schedules, forcing up the cost of shipping.

Freight signal priority will reduce delay for trucks traveling within the Portland Metro area and active traffic management solutions will generally reduce congestion, making it easier to travel throughout the Oregon Smart Mobility Network.

TRANSIT DELAYS

While the City of Portland has adopted a 25% transit mode share goal and Metro calls for tripling 2005 transit mode share by 2035, actual mode share has stayed stubbornly at 12% since 2000.[5]

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[1] PSU Population Research Center population forecast
[2] United Van Lines National Movers Studies, 2013-2017
[3] Inrix 2017 Global Traffic Scorecard
[4] Travel Oregon
[5] Enhanced Transit Corridors Plan, City of Portland

Buses are increasingly stuck in traffic, and with the City projected to gain approximately 140,000 new jobs and 260,000 new residents by 2035, the problem will only escalate. As of the writing of this plan, TriMet spends roughly $1-2 million per year to add buses to routes just to keep up with published route schedules and account for greater variability and longer travel times to complete a route. Through the Enhanced Transit Corridors Plan, the City and TriMet have prioritized reliability and speed treatments for transit on key corridors throughout the City. The Oregon Smart Mobility Network includes several projects that will help the City, Metro, and TriMet implement this plan.

CENTRAL OREGON BECOMING AN ECONOMIC HUB

It's no longer just the Portland Metro area driving Oregon's growth: Central Oregon is Oregon's fastest growing region[6] and Bend, its largest city, is the fourth fastest-growing metro area in the country.[7] Freight volumes on the area's major corridor, US 97, are expected to increase 45% by 2045.[8] Road Weather Management solutions planned for the US 97 corridor will increase available information for both the traveling public and freight providers.

SAFETY CONCERNS

As congestion grows, freeway crashes and delays contribute to worsening reliability.[9] Active traffic management solutions including dynamic speed limits and queue warning systems aim to reduce crashes on freeways and arterials, while red-light-running crash mitigation systems and adaptive pedestrian safety systems are poised to reduce crashes at signalized intersections. When crashes do occur, traffic incident management solutions such as UAS crash reconstruction can help clear them quickly.

TABLE 1: ALIGNMENT TO ATCMTD FOCUS AREAS

ATCMTD FOCUS AREA	PREPARE	MANAGE	RECOVER
Multimodal Integrated Corridor Management	X	X	X
Installation of connected vehicle technologies at intersections and pedestrian crossing locations	X	X	X
Unified fare collection and payment systems across transportation modes and jurisdictions		(1)	
Freight Community System			
Technologies to support connected communities	X		
Infrastructure Maintenance, Monitoring, and Condition Assessment	X		X
Rural technology deployments	X	X	X

(1) A multimodal unified fare collection and payment system has already been implemented in the Portland Metro area. It will complement and add value to the projects planned as part of the Oregon Smart Mobility Network program even though it is not necessary to include any cost in this project for its deployment.

[6] PSU Population Research Center, 2017 population estimates
[7] US Census Bureau, 2018
[8] ODOT, US 97 Four-Phase Strategy
[9] ODOT Portland Region 2016 Traffic Performance Report

2.4 SERVICES AND SYSTEMS

Following are descriptions of the technologies proposed in each Oregon Smart Mobility Network program area. Exhibit 2 demonstrates conceptually how these technologies will be deployed in urban and rural areas throughout the program corridors.

PREPARE

Specific systems and technology that will be used to support performance measurement, road weather management, surveillance and monitoring, and multimodal integrated corridor management architecture planned as part of the Prepare program area include:

- ATC traffic signal controllers
- ATSPM applications
- Automatic traffic recorders
- Bicycle and pedestrian counters
- Bluetooth device readers
- CCTV cameras
- Communications (i.e., fiber)
- Detection (i.e., radar, loops)
- Road weather information system (RWIS) applications
- Weather sensors

MANAGE

Specific systems and technology that will be used to support the active traffic management, active demand management, road weather management, and traffic signal management planned as part of the Manage program area include:

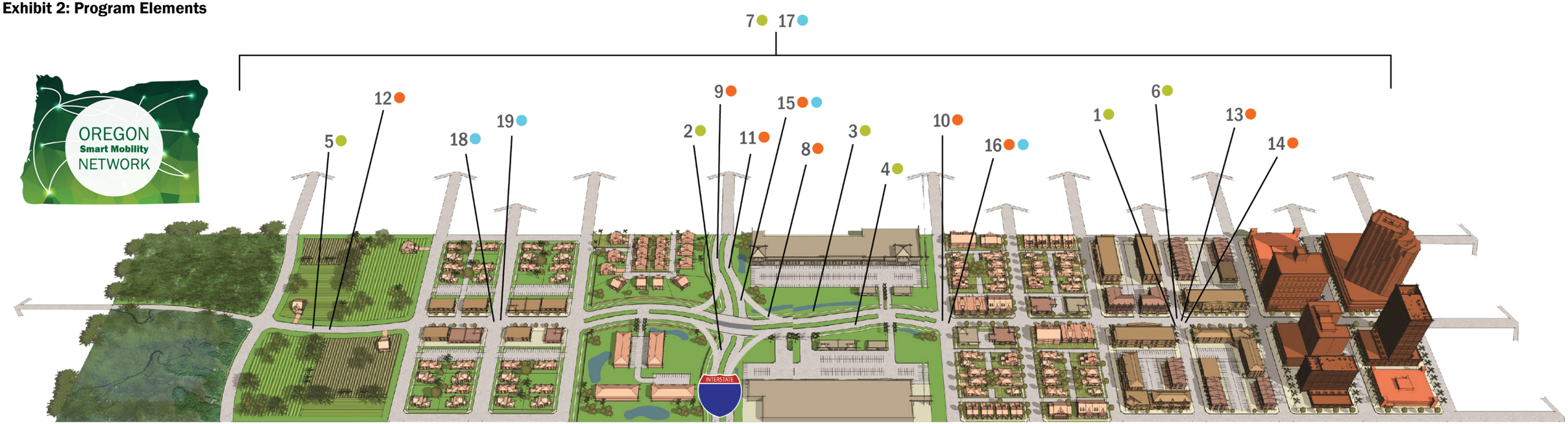
- Adaptive pedestrian signal timing
- Adaptive pedestrian safety system applications
- ATC traffic signal controllers
- Bluetooth device readers
- Communications (i.e., fiber, cellular)
- Detection (i.e., radar, loops, infrared)
- DSRC onboard units (OBU)
- DSRC roadside units (RSU)
- Dynamic curve warning systems
- Freight signal priority applications
- MAP data
- Next-Gen TSP central system applications
- Next-Gen TSP onboard software
- Ramp meter signals
- SPaT central system applications
- Transit signal priority applications
- Variable message signs (VMS) and supports
- Variable speed limit (VSL) signs and supports
- Weather sensors
- Red-light-running crash mitigation system applications

RECOVER

Specific systems and technology that will be used to support the active traffic management, active demand management, traffic incident management, and traffic signal management planned as part of the Recover program area include:

- ATC traffic signal controllers
- Battery backup systems
- Bluetooth device readers
- Communications (i.e., fiber, cellular)
- Crash reconstruction software
- Detection (i.e., radar)
- Next-Gen TSP central system applications
- Next-Gen TSP onboard software
- Tablets for crash reconstruction
- Transit signal priority applications
- UAS
- Variable message signs and supports

Exhibit 2: Program Elements



Base graphic source: FDOT Complete Streets Handbook

LEGEND/EXAMPLES

PREPARE

1 ATSPMs
2 Automatic Traffic Recorders
3 Bicycle & Pedestrian Counters
4 Bluetooth Travel Time System
5 Road Weather Management Decision Support
6 CCTV Monitoring Cameras
7 ICM Architecture

MANAGE

8 Adaptive Ramp Metering
9 Dynamic Speed Limits
10 Freight Signal Priority
11 Queue Warning Systems
12 Road Weather Information Dissemination
13 Adaptive Pedestrian Safety Systems
14 SPaT
15 Dynamic Routing
16 Transit Signal Priority

RECOVER

15 Dynamic Routing
16 Transit Signal Priority
17 UAS Crash Reconstruction
18 Battery Backup Systems
19 Red-Light-Running Crash Mitigation

2.5 OPERATIONS & MAINTENANCE

The proposed Oregon Smart Mobility Network will build on existing transportation systems management and operations (TSMO) already deployed in Oregon. ODOT has a long history of successful ITS and TSMO deployments and has created a **robust staffing and organizational structure** to ensure effective operations and maintenance of its investments. The program will be operated and maintained by ODOT and partner agency staff in the following categories:

- **ITS System Operators** develop the framework that governs ITS applications (e.g., times of day, correlating sensors to different features), adjust the underlying software, and make changes in real time in response to roadway conditions.
- **Ramp Meter Operators** make adjustments to ramp meter rates as part of active traffic management, adjusting influx of vehicles in order to avoid downstream bottlenecks.
- **Transportation Operations Center (TOC) Operators** coordinate responses to congestion detected by ATSPMs, dispatch incident response when there are collisions, and notify maintenance teams of malfunctioning infrastructure in need of repair.
- **ITS Maintenance Teams** are made up of specialists that deploy and maintain ITS equipment (e.g., dynamic message signs, weather sensors, CCTV cameras).
- **ITS Central Systems Teams** are responsible for 24/7 support of all ITS software, servers, and network infrastructure.
- **Traffic Signal Operators and Maintenance Teams** are responsible for adjusting traffic signal timing, maintaining signal infrastructure, and managing applications that influence signal operations such as freight and transit signal priority. Freight, transit, and other priority treatments will improve performance for all users accessing the freeway system.
- **Transit Operators** manage bus schedules and computer-aided dispatch systems.
- **Collision Reconstruction Unit** collects data at crash sites where there are injuries and/or damage to infrastructure before the site is cleared.

The ODOT team has the proven expertise and qualifications to successfully manage and sustain the deployed solutions through their full life cycle, well beyond the period of performance.

ODOT demonstrates its commitment to long-term operations and maintenance through **committed funding**. ODOT has spent over $8 million on TMOC operations and over $6 million on maintenance over the past two years. A 20% increase in operations and maintenance funding is anticipated in the next biennium to ensure long-term program success beyond the period of performance.

2.6 BARRIERS TO DEPLOYMENT

No significant barriers to the deployment of the proposed projects has been identified.

No major regulatory or legislative challenges are expected for this deployment. The legislative environment in Oregon is supportive of new technology, particularly with House Bill 4063, signed by Governor Kate Brown on April 10, 2018, naming ODOT the state's lead agency on automated vehicle (AV) policy (as recommended by NHTSA). The solutions proposed for the Oregon Smart Mobility Network will improve mobility for all roadway users, not precluding AV advancements.

The Oregon Smart Mobility Network program has no outstanding barriers to deployment impacting its readiness or challenging its long-term success. With any cutting-edge technology, some institutional and technological challenges are expected (all of which can be addressed):

- Compatibility with a variety of legacy systems.
- Rapid technological advancements resulting in evolving specifications during the project life.
- Maintaining a schedule that is both ambitious and attainable, particularly for development and integration of new applications.
- Development of long-term TSMO and data privacy plans that are acceptable to all partners.

ODOT's successful regional partnerships in transportation technology will be a critical part of overcoming coordination challenges and keeping all the partner agencies informed about the projects from planning to system integration. Institutionally, ODOT and the partner agencies already share technological systems, including a traffic signal central system, access to video, a regional communications network, a regional data warehouse, and travel time and traveler information systems. Interagency coordination among the partner agencies has been embedded in ODOT's business process and its regional partners for decades.

2.7 QUANTIFIABLE SYSTEM PERFORMANCE IMPROVEMENT

The program will produce quantifiable improvements to a number of system performance measures. Table 2 aligns metrics with the program goals. Pre-implementation travel times and vehicle hours will be calculated from existing traffic counts and speed monitoring studies. Pre-implementation reliability will be calculated using the tools already deployed and refined by SHRP 2 L03. Several of the program areas include improved monitoring through Bluetooth device readers and CCTV cameras, which will improve monitoring of travel times, delays, and reliability.

Dollar amounts of benefits will be calculated using ODOT values for passenger and commercial vehicle travel times, crash costs by type using ODOT values, and reliability costs using the guidelines for reliability cost factors developed in SHRP 2 L17; for this last metric, a factor of 0.85 to 1.2 times the standard deviation of travel time will be used; freight reliability is given a higher valuation due to the need for reliability for perishables and just-in-time inventory freight movement.

TABLE 2: PERFORMANCE MEASURES

GOALS	PERFORMANCE MEASURES
Safety	• Number of crashes with fatalities and serious injuries. • Crash clearance time. • Number of facilities connected for remote monitoring.
Infrastructure Condition	• Percentage of facilities with required maintenance performed. • Percentage of intersections providing ATSPM.
Congestion Reduction	• Vehicle hours of delay at signalized intersections. • Freeway travel time.
System Reliability	• Travel time and reliability. • Number of facilities connected for remote monitoring.
Freight Movement and Economic Vitality	• Truck hours of delay at signalized intersections. • Number of on-time buses.

TABLE 2: PERFORMANCE MEASURES (CONT'D)	
GOALS	**PERFORMANCE MEASURES**
Environmental Sustainability	• Vehicle hours of delay. • Pedestrian hours of delay at signalized intersections. • Number of facilities with available bicycle and pedestrian volumes.

2.8 QUANTIFIABLE SAFETY, MOBILITY, AND ENVIRONMENTAL BENEFIT PROJECTIONS

The Oregon Smart Mobility Network program will produce quantifiable benefits as follows:

- **Safety:** Active traffic management and road weather management improvements including dynamic speed limits, queue warning systems, and road weather information dissemination have been shown to reduce the likelihood of crashes. Traffic signal management applications including adaptive pedestrian safety systems and red-light-running crash mitigation systems detect high-risk road users and reinforce safety through traffic signal timing. The UAS crash reconstruction program will reduce crash clearance times, making secondary crashes less likely. Adding systems that allow staff to monitor events from a central location, including ATSPMs, CCTV monitoring cameras, and road weather decision support will reduce time spent exposed in the field.
- **Infrastructure Condition**: Systems such as ATSPMs and UAS crash reconstruction systems automate infrastructure monitoring, resulting in more efficient maintenance efforts. In the event of a power failure, battery backup systems keep infrastructure operating during repair.
- **Congestion Reduction**: A variety of performance measures can be used to adjust traffic signal timing, reducing delay. Battery backup systems reduce delay during power outages, and providing SPaT messages to drivers can help reduce lost time and keep traffic moving.
- **System Reliability**: A variety of performance measures can be used to adjust traffic signal timing to improve travel time and reliability. Real-time adjustments can be made through active traffic management and active demand management strategies including adaptive ramp metering and dynamic routing. During severe weather events, road weather information dissemination can direct drivers to more reliable routes with lower travel times.
- **Freight Movement and Economic Vitality**: We anticipate reduced freight delay and improved on-time bus performance with the addition of freight and transit signal priority. This will aid in freight movement throughout the region and allow transit to serve a wider population.
- **Environmental Sustainability**: Reduced congestion and lower travel times will result in reduced emissions of criteria pollutants and greenhouse gases. In particular, freight signal priority will reduce pollution from idling high-emission freight vehicles. Other systems such as adaptive pedestrian safety systems will promote active transportation by reducing delay for non-motorized roadway users.

These projects include increased monitoring sensors that will be used to measure changes in travel times and reliability. Emissions estimates will be calculated using factors developed from the MOVES model. Improvements will be quantified and monetized using appropriate values: ODOT values for travel times and crashes, SHRP 2—recommended reliability time factors for reliability, and federal dollar values for criteria pollutants and greenhouse gas emissions.

2.9 VISION, GOALS, AND OBJECTIVES

VISION

Through the **Oregon Smart Mobility Network**, ODOT envisions a safer, more reliable statewide transportation system for all modes, enabled by strategic application of smart technology. By **preparing** for congestion, **managing** it in real time, and having tools in place to expedite **recovery** from unexpected events, we will maximize the efficiency of the transportation system we have today so infrastructure investments can be made wisely, deliberately, and in ways that will keep all modes moving not just today but well into the future. This Network will be scalable and portable to other Oregon regions and to other states facing similar growth challenges.

By keeping people, goods, and ideas moving, the Oregon Smart Mobility Network promotes economic vitality, supporting our burgeoning tourism industry, our growing population, and Oregon businesses. By reducing congestion, it will enhance one of our state's most important assets—its air quality—and help make our rapid growth truly sustainable economically, environmentally, and socially.

GOALS	OBJECTIVES	PREPARE	MANAGE	RECOVER
Safety	Reduce the number of traffic fatalities and serious injuries.		X	X
	Reduce time spent clearing crashes.			X
	Monitor unexpected events from a central location allowing for regional decision-making.	X		
Infrastructure Condition	Maintain infrastructure in a state of good repair.	X		X
Congestion Reduction	Reduce vehicle delay.		X	X
	Monitor traffic operations from a central location allowing for regional decision-making.	X		
System Reliability	Improve travel time and reliability.		X	X
	Monitor traffic operations from a central location allowing for regional decision-making.	X		
Freight Movement and Economic Vitality	Reduce freight delay.		X	
	Improve access to on-time transit.		X	X
Environmental Sustainability	Reduce emissions resulting from congestion.		X	X
	Reduce pedestrian delay.		X	
	Monitor bicycle and pedestrian activity in real time.	X		

2.10 LEVERAGE EXISTING TECHNOLOGY INVESTMENTS

ODOT and its partner agencies' ability to leverage existing technology investments is founded on over 50 years of productive, ongoing collaboration. Current collaborative initiatives include:

- **RealTime™:** ODOT's advanced transportation management software, utilized for active traffic, active demand, and road weather management systems.
- **TripCheck:** ODOT's shared traveler information platform for dynamic routing and road weather information dissemination.
- **TripCheck Traveler Information Portal:** ODOT's shared portal for distributing active traffic, active demand, and road weather management data to private industry and media.
- **Hop Fastpass™:** TriMet, C-TRAN, and Portland Streetcar have launched a unified fare collection and payment system with plans to expand to bikeshare options.
- **Traffic Signal Central Management Software:** Shared central management software capable of connecting to legacy equipment. New ATC controllers will be connected to this system.
- **ATC Controllers:** Single statewide ATC controller (capable of integrating DSRC and collecting data for ATSPMs) allows for consistency between agencies.
- **Bluetooth Readers:** ODOT and several partner agencies have existing Bluetooth readers installed and reporting to PORTAL. Installation of additional readers will expand the system.
- **Video Distribution System:** ODOT operates a video distribution system that allows shared video images and video control. New CCTV monitoring cameras will be added to this system.
- **Communications:** The region has an existing communications backbone as well as a shared Regional Communications Master Plan.

The project will also build on a number of agency-specific technology investments, including:

ODOT

- **Active Traffic Management:** Adaptive ramp metering, dynamic speed limits, and queue warning systems are installed on several key corridors in Oregon.
- **SPaT:** ODOT is testing connected vehicle applications for SPaT using a corridor in Salem.

CITY OF PORTLAND

- **PORTAL:** Portland's shared regional data archive for travel times, speeds, and counts.
- **Portland Urban Data Lake (PUDL):** City of Portland's data tool that supports collecting, storing, integrating, and analyzing data from different sources.

TRIMET

- **Next-Generation Transit Signal Priority:** The vehicle-to-center solution will utilize existing hardware installed on the buses. New software will send the bus location, schedule, passenger count, and heading information to the central office for processing and action.

WASHINGTON COUNTY

- **Freight Signal Priority and Transit Signal Priority:** These deployments will install new equipment (radar detection and ATC controllers) but utilize existing priority technology.
- **Adaptive Pedestrian Safety Systems and Red-Light-Running Crash Mitigation Systems:** These deployments will build new functions into existing technology (i.e., detection, ATC controllers).

2.11 SCHEDULE

	PROJECT	2019				2020				2021				2022	
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
1	ODOT I-205 Active Traffic Management	Build/Deploy	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M	O&M	O&M	O&M	O&M
2	ODOT OR 212/224 Arterial Corridor Management	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M
3	City of Portland NE Airport Way Arterial Corridor Management	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M
4	TriMet Next-Generation Transit Signal Priority	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M
5	Washington County Cornelius Pass Road Arterial Corridor Management	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M
6	ODOT US 97 Road Weather Management	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M
7	ODOT City of Bend Colorado/Arizona Couplet ATSPMs	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M
8	ODOT Oregon State Police UAS Crash Reconstruction	Build/Deploy	Build/Deploy	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	Testing & Reporting	O&M	O&M	O&M	O&M	O&M	O&M
9	ODOT Multimodal Integrated Corridor Management Architecture	Planning	Planning	Design	Design	Build/Deploy	Build/Deploy	Build/Deploy	Build/Deploy						

Planning | Design | Build/Deploy | Testing & Reporting | O&M

2.12 USDOT ITS PROGRAM LEVERAGE

Proposed deployments align with the programs identified in the USDOT ITS Strategic Plan (see Table 3). All proposed projects include **enterprise data** and **interoperability** capabilities, and several will also **accelerate deployment** of **emerging capabilities** and **connected vehicle** technologies:

- **Automated Traffic Signal Performance Measures**: Identified in the FHWA Every Day Counts program, promote rapid deployment.
- **Adaptive Pedestrian Safety Systems and Red-Light-Running Crash Mitigation Systems:** Development of new traffic signal controller functions to detect real-time pedestrian movements in crosswalks and vehicles running red lights.
- **Freight Signal Priority:** Implement DSRC and a partnership with Daimler to enhance the connected vehicle environment using USDOT pilot projects as examples.
- **SPaT:** Deployed through a partnership with Intelight.
- **Next-Gen TSP:** Connected-vehicle-to-center solution. Buses will communicate their location to a central location where priority decisions will be made and sent to the signals.
- **UAS Crash Reconstruction**: UAS technology to record crash scenes, which is later overlaid on previously-imaged LIDAR roadway scans, significantly reducing time spent on scene.

TABLE 3: ALIGNMENT TO USDOT ITS PROGRAMS

PREPARE	MANAGE	RECOVER	PROJECT	Accelerating Deployment	Automation	Connected Vehicles	Emerging Capabilities	Enterprise Data	Interoperability
X			ATSPMs	X			X	X	X
X			Automatic Traffic Recorders					X	X
X			Bicycle and Pedestrian Counters					X	X
X			Bluetooth Travel Time Systems				X	X	X
X			CCTV Monitoring Cameras					X	X
X			Road Weather Decision Support					X	X
	X		Adaptive Pedestrian Safety Systems	X			X	X	X
	X		Adaptive Ramp Metering					X	X
	X		Dynamic Speed Limits					X	X
	X		Freight Signal Priority	X		X	X	X	X
	X		Queue Warning Systems					X	X
	X		Road Weather Information Dissemination					X	X
	X		SPaT	X		X	X	X	X
	X	X	Dynamic Routing					X	X
	X	X	Next-Gen Transit Signal Priority	X		X	X	X	X
		X	Battery Back-Up					X	X
		X	UAS Crash Reconstruction	X			X	X	X

2.13 TECHNOLOGIES, GOALS, FOCUS AREAS, AND OBJECTIVES

Table 4: Technologies, Goals, Focus Areas, and Objectives

	ATSPMs	Automatic Traffic Recorders	Bicycle and Pedestrian Counters	Bluetooth Travel Time Systems	CCTV Monitoring Cameras	Road Weather Decision Support	Multimodal ICM Architecture	Adaptive Pedestrian Safety Systems	Adaptive Ramp Metering	Dynamic Speed Limits	Freight Signal Priority	Queue Warning Systems	Road Weather Information Dissemination	SPaT	Dynamic Routing	Next-Gen Transit Signal Priority	Battery Backup Systems	Red-Light-Running Crash Mitigation Systems	UAS Crash Reconstruction Systems
PREPARE																			
MANAGE																			
RECOVER																			
PURPOSE (NOFO SECTION A.1, P.6)																			
Reduced traffic-related fatalities and injuries								X		X		X	X					X	
Reduced traffic congestion and improved travel time reliability									X		X		X	X	X	X	X		
Reduced transportation-related emissions									X		X		X	X	X	X	X		
Optimized multimodal system performance			X					X			X					X			
Improved access to transportation alternatives			X					X								X			
Public access to real-time integrated information		X	X	X						X		X	X	X	X				
Cost savings to agencies, businesses, and the public	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Other benefits to transportation users and the general public							X												
TECHNOLOGIES (NOFO SECTION A.3, P.7-9)																			
Advanced traveler information systems										X		X	X	X	X				
Advanced transportation management technologies	X	X	X	X	X	X	X		X	X	X	X	X		X	X			
Infrastructure maintenance, monitoring, and assessment	X																X		X
Advanced public transportation systems																X			
Performance data collection, analysis, and dissemination	X	X	X	X		X	X												
Advanced safety systems including V2V, V2I, and AV								X		X		X	X					X	
Integration of ITS with the Smart Grid and other charging systems																			
Electronic pricing and payment systems																			
Advanced mobility and access (i.e. dynamic ridesharing)																X			
VISION (NOFO SECTION A.4, P.9)																			
Address safety, mobility, sustainability, economic vitality, air quality	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Integration into routine functions	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Management and information sharing across sectors	X	X	X	X	X	X	X			X		X	X	X	X				
Scalability and portability	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
GOALS (NOFO SECTION A.4, P.10)																			
Reduced costs and improved return on investments	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Environmental benefits that alleviate congestion									X		X		X	X	X	X	X		
Measurement and improvement of operations	X	X	X	X		X	X												
Reduction in traffic crashes and an increase in safety								X		X		X	X					X	
Collection, dissemination, and use of real-time information	X	X	X	X	X	X	X			X		X	X	X	X				
Monitoring transportation assets to ensure a state of good repair	X																X		X
Economic benefits by movement of people, goods, and services									X		X		X	X	X	X	X		
Accelerated deployment of V2V, V2I, and AV											X			X		X			
Integration of advanced technologies into TSMO	X	X	X	X	X	X	X												
Evaluation of advanced technologies	X	X	X	X		X	X												
Reproducibility and knowledge transfer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FOCUS AREAS (NOFO SECTION A.4, P.11-13)																			
Multimodal integrated corridor management	X	X	X	X	X	X	X		X		X		X		X	X			
Installation of connected vehicle technologies											X			X		X			
Unified fare collection and payment system																			
Freight community system																			
Technologies to support connected communities			X				X												
Infrastructure maintenance, monitoring, and assessment	X																X		X
Rural technology deployments	X		X	X		X		X		X	X		X	X	X	X	X	X	X
KEY DEPARTMENTAL OBJECTIVES (NOFO SECTION A.4, P.13)																			
Supporting economic vitality at the national and regional level									X		X		X	X	X	X	X		
Leveraging federal funding to attract investment		X							X	X		X				X			
Innovative approaches to improve safety and expedite delivery								X		X		X	X					X	
Achieving specific, measurable outcomes	X	X	X	X		X	X												

III. MANAGEMENT STRUCTURE

Following is a description of the proposed management structure that will oversee the implementation of the project and provide administration of the agreement.

3.1 ENTITIES ENTERING AGREEMENT

ODOT will be responsible for the agreement with FHWA and the overall project delivery. In addition, ODOT will lead active traffic management, arterial corridor management, automated traffic signal performance measures, road weather management, and multimodal integrated corridor management architecture.

ODOT is accustomed to delivering transportation infrastructure and ITS projects and will use its established and proven process for design, procurement, and delivery phases of program projects. The Oregon Smart Mobility Network program will also involve the deployment of new software applications, which will involve the Transportation Application Development (TAD) section within ODOT's information services department.

ODOT oversees millions of dollars in federal funding and regularly hires a third-party certified public accountant to audit spending of federal money. In addition to traditional federal funding sources, ODOT has secured and successfully overseen the use of previous TIGER grants and federal American Recovery and Reinvestment Act (ARRA) funding.

KEY PARTNERS

The following organizations will play active roles throughout the life of the project:

Portland Bureau of Transportation (PBOT): The City of Portland's transportation bureau, PBOT, is a central hub for the Oregon Smart Mobility Network. The City plays a regional leadership role in ITS and currently maintains the shared traffic signal central management software. PBOT will lead an Arterial Corridor Management project involving ATSPMs, Bluetooth travel time systems, CCTV monitoring cameras, freight signal priority, dynamic routing, and Next-Gen TSP. These solutions will build on other arterial corridor management efforts throughout Portland as well as integration with TriMet's Next-Gen TSP.

TriMet: TriMet provides transit service in the Portland region, including bus, light rail, and commuter rail. TriMet will lead deployment of Next-Gen TSP. While there will be collaboration with other agencies to update intersection equipment, TriMet will coordinate the implementation of the central server system and necessary software upgrades on vehicles.

Washington County: Washington County is active in developing and testing new ITS solutions. Located west of Portland, it is home to Intel and Nike world headquarters. Washington County will lead an arterial corridor management project that includes ATSPMs, bicycle and pedestrian counters, Bluetooth travel time systems, road weather decision support and information dissemination, freight signal priority, Next-Gen TSP, adaptive pedestrian safety systems, SPaT, dynamic routing, battery backup systems, and red-light-running crash mitigation systems.

3.2 PUBLIC AND PRIVATE PARTNERSHIP OPPORTUNITIES

ODOT and the partner agencies will work with several other public- and private-sector partners to deploy the proposed projects. Public sector partners include:

- **City of Bend** for collaboration on the Colorado Ave/Arizona Ave Couplet automated traffic signal performance measures.
- **Metro** for providing oversight on multimodal integrated corridor management architecture.
- **Oregon State Police (OSP)** for deploying the UAS crash reconstruction program through the Collision Reconstruction Unit.
- **Portland State University (PSU)** for integrating travel time and count data on PORTAL.
- **Multnomah County:** Providing data for PUDL integration.
- **City of Gresham:** Providing data for PUDL integration.

Private sector partners include:

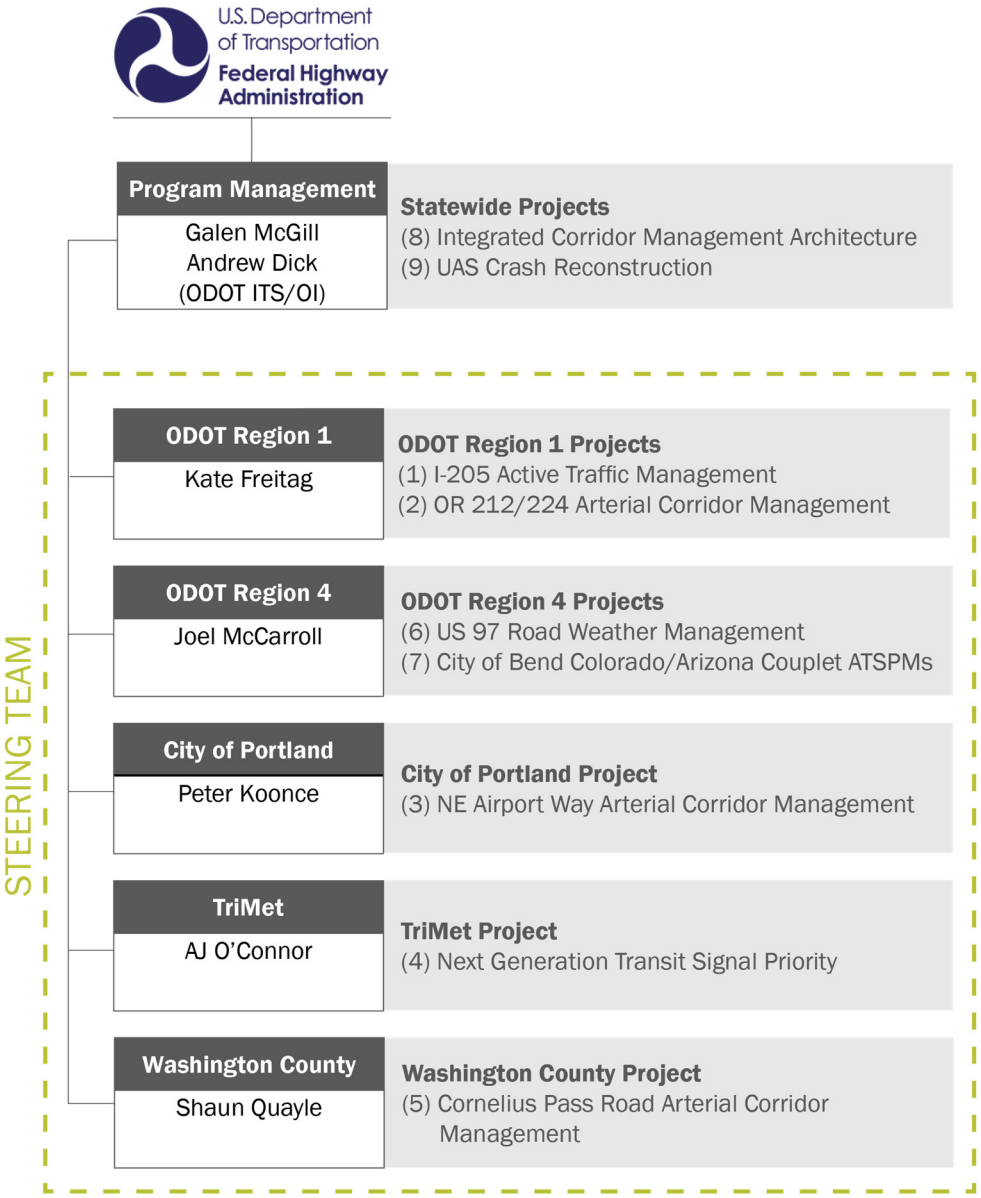
- **Daimler Trucks North America** for integrating onboard DSRC units for freight signal priority.
- **Intelight** for traffic signal controller integration with freight and transit signal priority, adaptive pedestrian safety systems, SPaT, and red-light-running crash mitigation systems.
- **TransCore** for integration with transit signal priority.
- **Wavetronix** for radar detection integration with freight signal priority, transit signal priority, and red-light-running crash mitigation systems.
- **FLIR** for infrared detection integration with adaptive pedestrian safety systems.
- **Eco-Counter** for bicycle and pedestrian counters on separated facilities.
- **Traffic Technology Services (TTS)** for connected vehicle applications.

3.3 PROPOSED SUB-RECIPIENTS

Proposed sub-recipients will be responsible for managing the following projects:

- **City of Portland:** Airport Way Arterial Corridor Management
- **TriMet:** Next-Gen Transit Signal Priority
- **Washington County:** Cornelius Pass Road Advanced Transportation Management System

3.4 PROJECT TEAM



3.5 COOPERATIVE AGREEMENT

As described in Section 3.4 Project Team, each of the nine projects will be managed independently by ODOT or a sub-recipient agency. Steering committee members will provide oversight to ensure consistency between deployments in the three program areas—Prepare, Manage, and Recover. While ODOT and the partner agencies currently collaborate regularly through regional planning efforts, cooperative agreements will be established as needed between ODOT and the sub-recipient agencies (City of Portland, TriMet, and Washington County) within a reasonable time after selection.

IV. STAFFING DESCRIPTION

The following sections identify the key personnel who will be involved in implementation and deployment of the proposed projects, including their respective roles and responsibilities.

ODOT will work with a consultant to design each project it oversees. Once the design is complete, ODOT will conduct a bidding process for the construction work. This is consistent with the usual process ODOT uses for ITS and advanced transportation management deployments.

ODOT will design requirements for new software systems associated with the ATCMTD program either in house or by working with a consultant, then conduct a procurement process to acquire and implement the new system. ODOT's Transportation Application Development (TAD) section will be responsible for implementing the new software system following procurement.

Sub-recipients will follow a deployment process similar to the ODOT procedure described above, although there will be some procedural variances in order to maintain consistency with each agency's particular rules and regulations.

4.1 KEY PERSONNEL

The organization chart in Section 3.4 illustrates the key project team members responsible for project delivery. The program will be led by ODOT staff members Galen McGill* and Andrew Dick.* They will act as liaisons between FHWA and the partner agencies and ensure delivery of all infrastructure and ITS applications deployed in conjunction with the program.

Galen and Andrew will be supported in all executive decisions by a Steering Team consisting of staff from ODOT and each partner agency. The following staff will be responsible for assuring the successful deployment of their respective agency projects:

- **ODOT:** Kate Freitag, PE and Joel McCarroll, PE
- **PBOT:** Peter Koonce, PE*
- **TriMet:** AJ O'Connor, MPA*
- **Washington County:** Shaun Quayle, PE*

Several other sections of ODOT will be involved with project delivery, including construction management and the signal systems divisions. Resumes for Key Personnel appear on the following 5 pages.

*Designated Key Personnel

4.2 PRIMARY POINT OF CONTACT

The primary point of contact for the Oregon Smart Mobility Network program will be Galen McGill, ODOT's ITS Team Manager, reachable at (503) 986-4486 or galen.e.mcgill@odot.state.or.us.

Oregon Department of Transportation

GALEN MCGILL, PE

System Operations and ITS Manager

> "As the System Operations & ITS Manager, my goal is to move people and goods safely and efficiently through effective operations strategies and innovative use of technology. The Oregon Smart Mobility Network program builds on our past successes in implementing operations solutions and prepares Oregon for the future."

YEARS WITH ODOT

- 30 years

EDUCATION

- BS, Electrical Engineering, Oregon State University
- MBA, Willamette University Atkinson Graduate School of Management
- Operations Academy Senior Management Program

PROFESSIONAL LICENSES

- Professional Engineer: OR

ACTIVITIES & AWARDS

- 2017: ODOT Lifetime Career Achievement Award
- 2016-19: US Representative, PIARC/World Road Association TC B.1 Road Network Operations & ITS Technical Committee
- 2015: Oregon DOT Mary Olson Leadership Award

RELEVANT ACCOMPLISHMENTS

- Proficiency managing all aspects of a DOT Operations Program
- 20+ years of experience successfully delivering technology projects
- Strong leadership skills developed through extensive involvement in state, national, and international initiatives

PROFESSIONAL EXPERIENCE

Oregon Department of Transportation, System Operations & ITS Manager, Salem, Oregon, 1998-Present

- Statewide responsibility for delivery of the agency's Transportation System Management and Operations (TSMO) program including:
  - TSMO planning
  - Project delivery
  - Software systems
  - Maintenance and life cycle management of intelligent transportation systems (ITS) assets
  - Transportation Operation Centers
  - Traffic Incident Management Program
- Participate as a member of various agency leadership teams including Maintenance and Operations Leadership Team, Traffic Operations Leadership Team, Technical Leadership Team, Connected and Automated Vehicle Steering Team, Data Warehouse Steering Team
- Contributor to multiple FHWA, TRB, and AASHTO project teams

Oregon Department of Transportation, Research Manager, Salem, Oregon, 1997-1998

- Responsible for managing the agency research and technology transfer programs
- Served as member of the AASHTO and WASHTO Research Advisory Committee

Oregon Department of Transportation

ANDREW DICK

Connected, Automated and Electric Vehicles Advisor

> "As CAEV Advisor, I help the Oregon Department of Transportation prepare for the range of innovative vehicles that will transform the transportation system in the coming years."

YEARS WITH ODOT

〉 2 years

EDUCATION

〉 BA, International Political Economy, Colorado College

ACTIVITIES & AWARDS

〉 AASHTO Standard Committee on Planning, CAV Planning Task Force, Member

〉 CAT Coalition, Technical Resources Working Group, Member

〉 NCHRP 20-102(01), Panel Member

RELEVANT ACCOMPLISHMENTS

› Policy expert on connected vehicle technologies
› Facilitates Connected Vehicle/Automated Vehicle Steering Team
› Serves as liaison to project partners and coordinates proposal development

PROFESSIONAL EXPERIENCE

Oregon Department of Transportation, Connected, Automated and Electric Vehicles Advisor, Salem, Oregon, 2016-Present

› Connects and coordinates agency divisions and external partners to deploy projects related to new transportation technology
› Represents agency in CAT Coalition, V2I DC initiative, and other technical/policy efforts related to CV
› Developed agency comment on V2V communications NPRM
› Participated in development of a number of regional plans and proposals, including:
  - Portland Regional Smart Cities Action Plan
  - Metro Emerging Technology Strategy
  - ODOT Emerging Technologies Impacts Assessment

Northeast States for Coordinated Air Use Management (NESCAUM) Transportation Analyst, Boston, Massachusetts, 2010-2016

› Conducted transportation sector energy and emissions modeling analyses for states including Massachusetts, New York, Connecticut, and Rhode Island
› Provided transportation sector analysis for Connecticut Comprehensive Energy Strategy (CES) and Massachusetts Clean Energy and Climate Plan (CECP)
› Served as MOVES modeling expert for organization

Northeast States for Coordinated Air Use Management (NESCAUM) Special Assistant to Low Carbon Fuel Standard Program Boston, Massachusetts, 2009-2010

› Developed modeling tools to analyze a low carbon fuel standard for 11 Northeast/Mid-Atlantic states

PBOT
PORTLAND BUREAU OF TRANSPORTATION

PETER KOONCE, PE

Division Manager, Signals, Streetlighting, & ITS

> "I actively manage the design, operations, and maintenance of traffic signal, streetlighting, and the ITS network for the City of Portland."

YEARS WITH CITY OF PORTLAND

〉 10 years

EDUCATION

〉 BS, Civil Engineering, Oregon State Univerity

〉 MS, Civil Engineering, Texas A&M University

PROFESSIONAL LICENSES

〉 Professional Civil Engineer: OR

ACTIVITIES & AWARDS

〉 Transportation Research Board (TRB) Traffic Signals Committee Chair

〉 National Bus Rapid Transit Institute, University of South Florida, Review Panel

〉 National Institute for Advanced Transportation Technology, University of Idaho, Advisory Board

RELEVANT ACCOMPLISHMENTS

› Experience and expertise in signal systems and ITS applications
› In-depth knowledge of Portland signal infrastructure
› Strong connections to project staff and participating agencies

PROFESSIONAL EXPERIENCE

Portland Bureau of Transportation, Division Manager, Signals, Streetlighting, & ITS, Portland, OR, 2009-Present

› Manage design, operations and maintenance of Portland signal infrastructure
› Oversee 45 professionals and budget of $13 million annually
› Upgraded Electrical Maintenance Shop to deliver projects and increase productivity
› Handled budget cuts without decrease in output from engineering services
› Deployed retrofit of all streetlights with LED technology

Kittelson & Associates, Inc., Principal Engineer, Portland, OR, 1998-2009

› Conducted traffic operations, transportation planning, and transit operations projects across the US and Canada
› Served as one of company's 13 owners, assisting with strategic direction of company and 120 employees
› Acted as recognized leader in transit and signal specific issues, helping agencies plan traffic signal and ITS improvements
› Managed over $2 million annually of consultant work activity and as many as 10 staff in Kittelson offices around the country

Portland State University, Adjunct Professor, Portland, OR, 2002-Present

› Teach a course in traffic signal timing and engineering applications during the summer term
› Developed summer exchange program, PSU's first civil engineering Study Abroad program, in partnership with Northeastern University program at Technical University Delft, The Netherlands
› Bulleted list of relevant responsibilities and experience

TRIMET

A.J. O'CONNOR, MPA

Manager, Intelligent Transportation Systems

> "My role at TriMet is to ensure that technology enables TriMet's mission to provide safe, and reliable transportation for all. The Oregon Smart Mobility Network will provide TriMet with an innovative technology that will allow TriMet and the regions to meet our transportation goals."

YEARS WITH TRIMET

〉 31 years

EDUCATION

〉 Bachelor of Arts History, Lewis & Clark College
〉 BA, Political Science, Lewis & Clark College
〉 Master's in Public Administration, Lewis & Clark College

RELEVANT ACCOMPLISHMENTS

› Project manager for P25 700 MhZ digital Radio procurement and implementation
› Project manager for computer aided dispatch and automatic vehicle location replacement project

PROFESSIONAL EXPERIENCE

TriMet, Manager, Intelligent Transportation Systems, Portland, OR, 2001-Current

› Responsible for daily operations and maintenance of electronic and manual fare collection systems
› Responsible for daily operations and maintenance of CCTV systems and passenger information displays
› Responsible for daily operation of rail control and bus dispatch control centers

SHAUN QUAYLE, PE

Rural & Suburban Arterial Technology Project Engineer

> "I am passionate about maximizing mobility and safety on multimodal arterials. The Oregon Smart Mobility Network project will demonstrate numerous innovative solutions to address universal arterial mobility and safety issues, such as red light running and jaywalking."

YEARS WITH WASHINGTON COUNTY

- 1.5 years

EDUCATION

- BS, Civil Engineering, Oregon State University
- MS, Transportation Engineering, University of Tennessee

PROFESSIONAL LICENSES

- Professional Engineer: OR, WA, FL
- ODOT Certified Signal Inspector

ACTIVITIES & AWARDS

- Institute of Transportation Engineers, Member
- International Signal Municipal Association (IMSA), Member & Level 1 Signal Technician Certified.
- Vehicle to Infrastructure Deployment Coalition TWG #4, Participant.
- Transportation Research Board Signal Systems Committee (Friend)

RELEVANT ACCOMPLISHMENTS

- **Thought leader in optimized traffic signal operations**, as a co-author of the 1st & 2nd Editions of the FHWA *Traffic Signal Timing Manual*
- **Inventor of the Smart Red Light Running (RLR) Mitigation System** to predict and prevent crashes at high-speed signalized intersections
- **Co-developer of the "Adaptive Pedestrian Safety System"** to better inform pedestrians, and right-size pedestrian service to eliminate waste and strategically protect pedestrians
- **"Outstanding in the field."** ITS engineer who has 15+ years of design, implementation and operations experience of a multitude of arterial technologies, systems engineering, and tech verification/validation

PROFESSIONAL EXPERIENCE

Washington County Department of Land Use and Transportation, Transportation Engineer, Hillsboro, OR, 2017-current

- Oversee & optimize traffic signal timing for all 350 intersections
- System engineering, design, and implementation of three different adaptive traffic signal systems
- Co-engineer, rural flood warning system, curve warning system, speed management system, transit priority, truck priority, and smart red light running mitigation system
- Member of Portland-Metro ITS Technical Advisory Board (Transport)

Kittelson & Associates, Inc., Senior Engineer, Portland, OR, 2007-2016

- ITS practice leader for NW region
- Traffic signal & ITS design
- Technology-driven systems engineering
- Traffic impact studies / comprehensive safety evaluations

Guest Transportation Lecturer, Portland State University, University of Portland, Oregon State University, and University of Florida, 2004, 2008-2016

- Taught university undergraduate and graduate course lectures on traffic engineering, safety, ITS, and traffic signal operations

Kittelson & Associates, Inc., Traffic Analyst, Orlando, FL, 2002-2005

- Traffic impact studies / comprehensive safety evaluations
- Transportation research

Appendix

ADDITIONAL RESUMES

Oregon Department of Transportation

DAVID HIRSCH, PE, PTOE

ODOT Region 4—Interim Traffic Manager/Lead Traffic Operations Engineer

> "At ODOT, I strive to develop connected and maintainable transportation systems that are safe and efficient for all users."

YEARS WITH ODOT

〉 6 years

EDUCATION

〉 BS, Civil Engineering, University of Minnesota

PROFESSIONAL LICENSES

〉 Professional Engineerin: OR, MN

〉 Professional Traffic Operations Engineer

ACTIVITIES & AWARDS

〉 Chair, NCHRP 03-133

〉 NCITE, Young Transportation Engineer of the Year, 2012

RELEVANT ACCOMPLISHMENTS

› Proven history of implementing traffic operation technologies
› Well versed and practiced in implementing integrated corridor management (ICM) strategies throughout Central Oregon
› Respected traffic control operations practitioner
› Dedicated proponent of transportation system management & operations (TSMO) and automated traffic signal performance measurement (ATSPM) capabilities

PROFESSIONAL EXPERIENCE

ODOT, Interim Traffic Manager, Bend, OR, 2017-Present

› Managing a diverse team of transportation professionals
› Providing direct guidance to maintenance staff
› Providing Region 4 expertise and traffic related jurisdictional authority on varying ODOT business lines
› Participating as the lone Region 4-based member on the ODOT statewide Traffic/ITS/TSSU work planning and coordination team

ODOT, Lead Traffic Operations Engineer, Bend, OR, 2012-Present

› Managing the varying traffic signal operating systems for ODOT Region 4 and jurisdictions identified in signal maintenance agreements
› Developing system-wide projects to expand and/or enhance traffic operations related infrastructure
› Serving on numerous technical advisory committees to support internal Agency and external studies various traffic operations related devices
› Spearheaded the development of the ODOT statewide transition to migrate from the current traffic signal controller interface to the advanced traffic controller (ATC) platform

Stonebrooke Engineering, Traffic Project Mgr., Burnsville, MN, 2009-2012

› Managed several successful multi-agency and multi-faceted community safety and modal operational projects that required the buy-in of several agency and community group officials
› Led the successful development and integration of a multi-agency pilot street lighting study comparing energy efficient light sources, the largest of its kind in the state
› Developed large scale Transportation Management Plans (TMPs) for large freeway construction projects along heavily congested corridors

YEARS WITH WASHINGTON COUNTY, OREGON

〉 13 years

YEARS WITH ODOT

〉 7 years

EDUCATION

〉 BS, Civil Engineering, Oregon State University

PROFESSIONAL LICENSES

〉 Professional Engineer: OR

ACTIVITIES & AWARDS

〉 Institute of Transportation Engineers, Member

〉 Transportation Portland (TransPort), Member

〉 PORTAL (Portland-Vancouver Transportation Data Archive), Technical Advisory Chair

〉 Adjunct Transportation Professor, George Fox University 2018

STACY SHETLER, PE

Washington County Traffic Engineering Manager

> "In my role at Washington County, I get to be personally involved in the planning, design, construction, and operations & maintenance of technology systems to improve the safety and mobility for the people that work and live here. The Oregon Smart Mobility Network helps drive innovation and quicken the adoption of technologies that provide better transportation services for Oregonians."

RELEVANT ACCOMPLISHMENTS

› 16+ years of experience developing, designing, and delivering technology projects from large to small in scale
› Strong collaboration skills at a regional and local level with both private and public partners
› TIGER Grant 2014: Advanced Traffic Management System Project
› SCATS and InSync adaptive signal system deployments
› Traffic operations center expansion and systems integration
› Countywide travel time system deployment

PROFESSIONAL EXPERIENCE

Washington County Department of Land Use and Transportation, Traffic Engineering Manager / Principal Engineer, Hillsboro, OR, 2011-Present

› Manage and direct 25 professional/technical staff as well as multiple consultant contractors/consultants
› Fund and deploy urban/rural/suburban ITS
› Plan and implement TSMO Technologies

Washington County Department of Land Use and Transportation, Traffic Engineer, Hillsboro, OR, 2005-2011

› Planned, implemented and managed the Traffic Operations Center
› Implemented, integrated and managed ITS and adaptive signal systems
› Prepared signal, illumination, and ITS design plans
› Analyzed and reviewed traffic and safety systems and alternatives

Oregon Department of Transportation, Operations Management System Coordinator/ Traffic-ITS Designer, Salem, OR, 2002-2005

› Developed and implemented operations performance measures
› Evaluated operations program funding needs and priorities
› Developed designs including plans, specifications, and estimates
› Evaluated technology products and solutions

Oregon Department of Transportation

KATE FREITAG, PE

Region 1 Traffic Engineer for Operations and Safety

> "As the Region 1 Traffic Engineer, my focus is safe and efficient operations for all users of the transportation system. The Oregon Smart Mobility Network proposal improves safety, reliability, and efficiency for a variety of roadway users while preparing Oregon for increased growth as well as technological advances."

YEARS WITH ODOT

- 19 years

EDUCATION

- BS, Civil Engineering, University of Portland

PROFESSIONAL LICENSES

- Professional Engineer: OR

ACTIVITIES & AWARDS

- 2017: ODOT Professional Achievement Award
- 2018-2020: TransPort Committee Chair

RELEVANT ACCOMPLISHMENTS

- 13+ years of experience in traffic safety and operations
- Experience delivering traffic operations, safety, and technology projects
- Strong background in leading and collaborating in a regional, multi-agency technical environment

PROFESSIONAL EXPERIENCE

Oregon Department of Transportation, Region 1 Traffic Engineer, Portland, OR, 2017-Present

- Program management for the Region 1 Intelligent Transportation System (ITS) program, including development, evaluation, and deployment of new technology
- Provide technical expertise and leadership regarding traffic engineering issues
- Lead and direct technical aspects of traffic investigations, design, and operations
- Participate as member of agency's Traffic Operations Leadership Team

Oregon Department of Transportation, Region 1 Traffic Operations Engineer, Portland, Oregon, 2005-2017

- Lead worker for Region 1 Traffic Signal Operations and ITS team
- Evaluate complex traffic engineering issues and recommend solutions for implementation
- Manage Traffic Operations projects, including signal condition assessment and replacement program
- Develop action plans for motorist information regarding planned special events, construction activities, and pre-planned maintenance activities

Oregon Department of Transportation, Region 1 Development Review Analyst, Portland, Oregon, 2001-2005

- Performed and reviewed traffic analyses and safety evaluations
- Prepared briefing materials, engineering findings, and proposed mitigation for complex transportation issues
- Team lead worker from 2003-2005

Oregon Department of Transportation

JOEL MCCARROLL, PE, PTOE

District 10 Manager

> "In my role at ODOT, safely managing, maintaining and operating the transportation system is my top priority. The Oregon Smart Mobility Network will leverage technology to strengthen my department's ability meet its goals."

YEARS WITH ODOT

- 26 years

EDUCATION

- BSCE, Worcester Polytechnic Institute
- MBA, Portland State University

PROFESSIONAL LICENSES

- Professional Engineer: OR
- Professional Traffic Operations Engineer

ACTIVITIES & AWARDS

- 2016 Lifetime Career Achievement Award (ODOT)
- 2008/9 AASHTO Engineering Management Fellow

RELEVANT ACCOMPLISHMENTS

- Substantial experience identifying, scoping, leading TSMO projects
- Working with key stakeholder to build support for TSMO programs and projects
- Identifying maintenance and operations resources required for running TSMO programs

PROFESSIONAL EXPERIENCE

ODOT, District 10 Manager, Bend, OR, 2017-Present

- Manager of a maintenance district with 60 employees and a $10 million annual budget including budget development, work planning and personnel management
- Responsible for all aspects of maintenance and operations in a three county area in Central Oregon
- Responsible for winter maintenance activities and emergency management

ODOT, Region 4 Traffic Manager, Bend OR, 2002-2017

- Responsible for all aspects of traffic engineering, operations and maintenance in ODOT's Central Oregon Region
- Implement transportation system management and operations strategies in the region
- Responsible for the development and scoping of safety and operations projects
- Set regional priorities for ITS planning, implementation and maintenance

ODOT, Assistant District Manager, Portland, OR, 1999-2002

- Assistant manager for a maintenance district with 60 employees and a $7 million annual budget including budget development, work planning and personnel management
- Manage district permitting program for access, utilities and special events

ODOT, Traffic Analyst, Portland, OR, 1998-1999

- Led the implementation and evaluation team for ODOT's first high occupancy vehicle lane
- Project manager for ITS studies and ITS projects

Metro

CALEB P. WINTER

Transportation Planner and Project Manager

> "In my role at Metro, I will work with regional, state and third-party partners to share and integrate data for safer operations, advancing the Oregon Smart Mobility Network."

YEARS WITH METRO

〉 12 years

EDUCATION

〉 Technical classes in planning, Portland State University

〉 BA, Sociology and Anthropology, Lewis and Clark College

ACTIVITIES & AWARDS

〉 Research Chair, Transportation Research Board, Committee on Transportation Demand Management

〉 Former Board Member of Oregon Walks

PUBLICATIONS

〉 I-84 Multimodal ICM Deployment Plan (forthcoming)

RELEVANT ACCOMPLISHMENTS

› Led I-84 multimodal integrated corridor management (ICM) planning

› Convened operator agencies around regional transportation system management and operations, capability maturity framework, ITS network and other initiatives

› Assisted other regions by presenting at peer exchanges in New York State, Nashville, TN and Dallas, TX

› Participated in Mobility on Demand Sandbox work led by TriMet for their Open Trip Planner for Shared Use Mobility

› Participated on the advisory committee for a One-Call/One-Click solution for demand-responsive transit to extend innovations to serve seniors and people with disabilities in urban and rural communities

PROFESSIONAL EXPERIENCE

Oregon Metro, TSMO Program Manager, Portland, OR, 2006-present

› Project manager for $2M annually across two dozen projects with community-based organizations, cities, counties, transit agencies, Portland State University and Oregon Department of Transportation

› Leading TransPort, subcommittee of the region's transportation policy process, by developing long-term work plans and facilitating funding decisions in coordination with members, the chair and vice chair

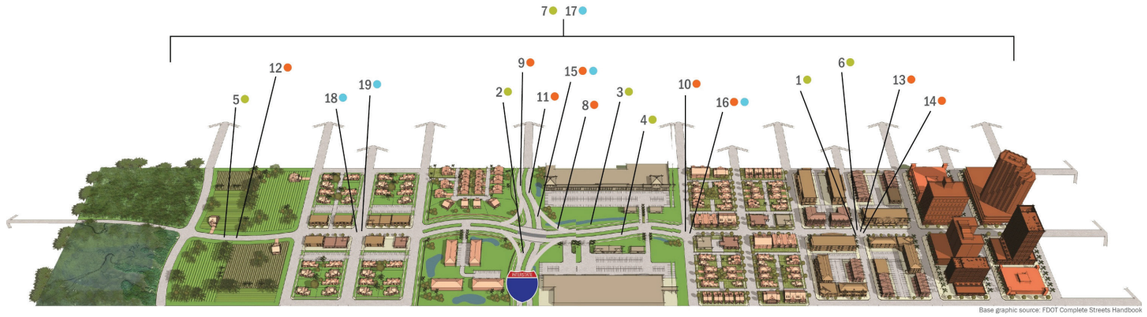
› Completed ITS architecture, updating the relationships between technologies used for traffic management, transit operations, incident management, traveler information and data systems

› Coordinating regional big data needs and investments through improved management of Portland State University for MAP-21 performance measures

TriMet, Senior Research Analyst, Portland, OR, 1996-2006

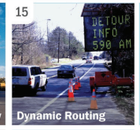
› Researched commute options, conducted regional studies, developed new measures for travel mode split over time, and measured cost effectiveness

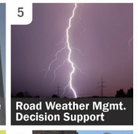
PROGRAM ELEMENTS

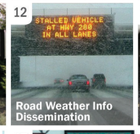


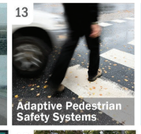
Base graphic source: FDOT Complete Streets Handbook

PREPARE









MANAGE

RECOVER

In Partnership With...

Oregon Department of Transportation

PBOT PORTLAND BUREAU OF TRANSPORTATION

TRIMET

Metro

WASHINGTON COUNTY OREGON

Multnomah County

tts TRAFFIC TECHNOLOGY SERVICES

DAIMLER

WAVETRONIX

INTELIGHT NEVER STAND STILL

FLIR

PROJECT DETAILS

NO.	PROJECT DESCRIPTION	RESPONSIBLE AGENCY	PREPARE	MANAGE	RECOVER	SOLUTIONS
1	I-205 Active Traffic Management	ODOT	X			Automatic Traffic Recorders
				X		Adaptive Ramp Metering
				X		Dynamic Speed Limits
				X		Queue Warning System
2	OR 212/224 Arterial Corridor Management	ODOT	X			ATSPMs
			X			Bluetooth Travel Time System
			X			CCTV Monitoring Cameras
				X		Freight Signal Priority
				X	X	Next-Gen TSP
3	NE Airport Way Arterial Corridor Management	Portland	X			ATSPMs
			X			Bluetooth Travel Time System
			X			CCTV Monitoring Cameras
				X		Freight Signal Priority
				X	X	Dynamic Routing
				X	X	Next-Gen TSP
4	Next-Generation Transit Signal Priority	TriMet		X	X	Next-Gen TSP
5	Cornelius Pass Road Arterial Corridor Management	Washington County	X			ATSPMs
			X			Bicycle and Pedestrian Counters
			X			Bluetooth Travel Time System
			X			Road Weather Decision Support
				X		Adaptive Pedestrian Safety System
				X		Freight Signal Priority
				X		Next-Gen TSP
				X		Road Weather Information Dissemination
				X		SPaT
				X	X	Dynamic Routing
					X	Battery Back-Up Systems
					X	Red-Light-Running Crash Mitigation System
6	US 97 Road Weather Management	ODOT	X			Road Weather Decision Support
				X		Dynamic Speed Limits
				X		Road Weather Information Dissemination
7	City of Bend Colorado/Arizona Couplet ATSPMs	ODOT	X			ATSPMs
8	UAS Crash Reconstruction	ODOT			X	UAS Crash Reconstruction System
9	Multimodal Integrated Corridor Management Architecture	ODOT	X			Multimodal ICM Architecture

Total Project Cost (from all sources): **$31 million**
ATCMTD Request: **$12 million**

PROGRAM GEOGRAPHIC AREA