

**ADDRESSING AMERICA'S SURFACE
TRANSPORTATION INFRASTRUCTURE NEEDS**

HEARING
BEFORE THE
**COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS**
UNITED STATES SENATE
ONE HUNDRED FIFTEENTH CONGRESS
SECOND SESSION

NOVEMBER 28, 2018

Printed for the use of the Committee on Environment and Public Works



Available via the World Wide Web: <http://www.govinfo.gov>

U.S. GOVERNMENT PUBLISHING OFFICE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED FIFTEENTH CONGRESS
SECOND SESSION

JOHN BARRASSO, Wyoming, *Chairman*

JAMES M. INHOFE, Oklahoma	THOMAS R. CARPER, Delaware,
SHELLEY MOORE CAPITO, West Virginia	<i>Ranking Member</i>
JOHN BOOZMAN, Arkansas	BENJAMIN L. CARDIN, Maryland
ROGER WICKER, Mississippi	BERNARD SANDERS, Vermont
DEB FISCHER, Nebraska	SHELDON WHITEHOUSE, Rhode Island
JERRY MORAN, Kansas	JEFF MERKLEY, Oregon
MIKE ROUNDS, South Dakota	KIRSTEN GILLIBRAND, New York
JONI ERNST, Iowa	CORY A. BOOKER, New Jersey
DAN SULLIVAN, Alaska	EDWARD J. MARKEY, Massachusetts
RICHARD SHELBY, Alabama	TAMMY DUCKWORTH, Illinois
	CHRIS VAN HOLLEN, Maryland

RICHARD M. RUSSELL, *Majority Staff Director*
MARY FRANCES REPKO, *Minority Staff Director*

C O N T E N T S

	Page
NOVEMBER 28, 2018	
OPENING STATEMENTS	
Barrasso, Hon. John, U.S. Senator from the State of Wyoming	1
Carper, Hon. Thomas R., U.S. Senator from the State of Delaware	3
WITNESSES	
Braceras, Carlos M., P.E., President at American Association of State High- way and Transportation Officials, and Executive Director, Utah Depart- ment of Transportation	5
Prepared statement	7
Responses to additional questions from:	
Senator Barrasso	19
Senator Carper	22
Senator Boozman	26
Senator Duckworth	28
Response to an additional question from Senator Fischer	30
Lanham, Robert, Vice President, Associated General Contractors of America ..	31
Prepared statement	33
Responses to additional questions from:	
Senator Barrasso	43
Senator Carper	45
Senator Boozman	46
Corless, James, Executive Director, Sacramento Area Council of Govern- ments	48
Prepared statement	50
Responses to additional questions from:	
Senator Barrasso	60
Senator Carper	61
Response to an additional question from Senator Duckworth	66
ADDITIONAL MATERIAL	
Testimony by American Association of Port Authorities	86
Statement for the Record of The American Society of Civil Engineers	88
Letter to Senators Barrasso and Carper from the Intelligent Transportation Society of America (ITS America), November 28, 2018	92

ADDRESSING AMERICA'S SURFACE TRANSPORTATION INFRASTRUCTURE NEEDS

WEDNESDAY, NOVEMBER 28, 2018

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The Committee met, pursuant to notice, at 9:35 a.m. in room 406, Dirksen Senate Office Building, Hon. John Barrasso (Chairman of the Committee) presiding.

Present: Senators Barrasso, Carper, Inhofe, Capito, Boozman, Wicker, Fischer, Moran, Rounds, Ernst, Sullivan, Cardin, Gillibrand, Markey, and Van Hollen.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM THE STATE OF WYOMING

Senator BARRASSO. Good morning.

Today we will discuss the need to address and modernize our Nation's surface transportation infrastructure.

This Committee has historically taken the bipartisan lead on infrastructure issues in the Senate; 2018 is a good example. It has been a banner year for moving infrastructure legislation forward. In March of this year President Trump signed into law legislation from this Committee to reauthorize and enhance the EPA's Brownfields Program. This legislation is going to help clean up contaminated sites for reuse. It will spur much needed infrastructure development on abandoned industrial sites.

In October President Trump signed America's Water Infrastructure Act. As the most significant water infrastructure bill passed in decades, the America's Water Infrastructure Act is going to grow the economy, cut Washington red tape, and keep communities safe.

America's Water Infrastructure Act will upgrade and maintain aging dams and irrigation systems, increase water storage, and deepen nationally significant ports. It authorizes funds to repair aging drinking water systems so that communities across America have access to clean drinking water. It authorizes important projects. It will create jobs and grow our economy. It will benefit Americans for years to come.

I believe the bipartisan successes on water infrastructure and brownfields cleanup can be replicated for America's surface transportation infrastructure as well.

Our surface transportation infrastructure drives the health, the well being, and the prosperity of the Nation. We depend on highways, roads, and bridges to move people and goods, to get to our

jobs, and to visit our loved ones. Simply put, surface transportation infrastructure connects all of us.

But for far too long we have not prioritized the needs of these vital infrastructure systems. New funding is needed to keep pace with the demands, and burdensome Federal regulations have slowed efforts to spend money efficiently. The time has come to cut red tape and make significant investments in our roads and bridges, investment necessary to keep the Highway Trust Fund solvent.

In a hearing last year in this Committee, Wyoming Department of Transportation Director Bill Panos stated in written testimony that "Using the current predominantly formula based FAST Act approach to distribution would ensure both rural and urban States participate in the initiative." He said, "It will also help push the benefits of any new infrastructure initiative out to the public promptly."

Now, I agree. Using the formula based approach will expedite the delivery of future infrastructure spending. Existing formula funding systems allow flexibility for both rural and urban States to use Federal money to its best advantage. What works in Los Angeles or Chicago may not work for smaller communities like Cody or Riverton, Wyoming.

We also need to update the law to allow our States to build faster, better, cheaper, and smarter. When we make significant investments in our Nation's infrastructure, we need to be sure that money is being used as effectively and efficiently as possible.

By cutting Washington's red tape, we can ensure that better roads and bridges can be delivered faster. As States, counties, and towns wait to obtain permits from Washington, costs for projects rise, and time is wasted. It shouldn't take a decade to permit a project that only takes months to build. We need to speed up project delivery, and I believe it can be done without sacrificing environmental safeguards.

We also should explore new technology both in how we build and how we drive can reduce costs, can improve safety, and can increase the longevity of our roads and bridges. Better roads and bridges across America help all of us. Everyone benefits from safer highways, well maintained roads, and resilient bridges.

America prides itself on its ingenuity and commitment to provide infrastructure that meets the needs of its people, and I know that my good friend, Senator Carper, agrees that it is up to our Committee, working together as we did on water infrastructure, working with the Administration to move forward with legislation to improve our highways, our roads, and bridges well into the future.

We are a Committee that gets things done. We want to continue on that road and get a highway infrastructure bill passed next year.

I would now like to recognize Ranking Member Carper for his remarks.

**OPENING STATEMENT OF HON. THOMAS R. CARPER,
U.S. SENATOR FROM THE STATE OF DELAWARE**

Senator CARPER. Thanks, Mr. Chairman.

Welcome to our witnesses, our guests, colleagues. I want to thank our Chairman for pulling us together this morning for signaling a clear interest in working seriously toward long term surface transportation reauthorization not at the middle of next year, not at the end of next year, starting right from the get-go.

I have long believed that transportation infrastructure is an area where our Committee can again lead in a bipartisan fashion. The Chairman has mentioned the Water Resources Development Act.

Ben Cardin has slipped off to another hearing in Foreign Relations, and Jim Inhofe has done the same thing in the Armed Services, but I just want to say to them and their staffs, everybody on the Committee and our staffs, Democrat and Republican, how proud I am of all of our collective efforts and grateful for our Chairman's leadership.

I believe that next year we are going to have another opportunity to work on legislation that improves the state of our Nation's infrastructure. I focus hugely on what is a major role of Government. Lincoln used to say the role of Government is to do for the people what they cannot do for themselves. I would put a finer point on that and say a major role of Government is to help create a nurturing environment for job creation and job preservation.

That is a big part of what we are responsible for, and roads, highways, bridges, rail, airports, ports, you name it, a big part of that nurturing environment. It is hugely important, and fortunately, this Committee has a lot of jurisdiction over, so we are going have fun working on this.

Our Committee's minority members, our staffs are ready to go to work with our Republican colleagues when the new Congress convenes in a little more than a month. I say that knowing we face significant challenges in reauthorizing our surface transportation programs, the most important of which is the need to identify sustainable sources of funding to address the growing deficit in the Highway Trust Fund. This, my friends, is always the 800 pound gorilla in the room, as we know.

In the last decade Congress had to transfer more than \$140 billion into the Highway Trust Fund because the Trust Fund revenues were insufficient to meet our investment needs. Additionally, Congress resorted to passing more than a dozen short term extensions of the transportation program the past decade, which created significant uncertainty for State and local agencies, and not uncommonly, added cost, significant cost because of that uncertainty to these projects.

Funding uncertainty leads States to stop or slow down many projects. If highway authorization expires or funding runs out, the Federal Highway Administration is unable to reimburse States for Federal aid projects already underway and make it impossible to approve new projects.

As we begin work on a new authorization of the Federal programs, one of our primary goals should be to avoid another series of short term extensions going forward, and that means having a bill passed before our current authorization expires in 2020.

Albert Einstein once said, "In adversity lies opportunity." That has been one of my guiding principles for as long as I can remember. I think it probably is for a lot of us. I believe that the opportunities to improve our transportation programs in the next few years are great, despite the challenges, the adversity that we are going to face along the way.

New technology, new data are going to enable us to modernize how we plan, how we build, how we operate and use our infrastructure. We ought to look for ways to ensure that Federal programs support innovations that improve mobility, improve safety, air quality, and other goals as well.

We can't have a conversation about surface transportation, though, without talking about climate change and the increasingly extreme weather that accompanies it. Our transportation sector is a major contributor to climate change, and our roads, bridges, rail-ways are also extremely vulnerable to the effects of extreme weather fueled by climate change.

According to the National Climate Assessment Report released last week by 13 Federal agencies, "Expected increases in the severity and frequency of heavy precipitation events will affect inland infrastructure in every region, including access to roads, the viability of bridges, and the safety of pipelines." Our next infrastructure bill must respond to this threat by focusing on a more resilient and sustainable transportation sector to protect communities nationwide.

Safety is another area which demands our close attention. Motor vehicle crashes have consistently been the leading cause of preventable deaths in our country, overtaken only recently by the opioid epidemic. More than 37,000 people are killed on our roadways each year. We can't continue to just accept this level of loss. Safety must be a top priority, and our investment decisions must reflect that prioritization.

In closing, let me reiterate that I am encouraged by the bipartisan consensus on the need to invest in our infrastructure, particularly transportation. I truly hope that this will be the first of many opportunities to engage in a bipartisan discussion, in this room and outside of this room, to identify areas of agreement where we can work together, which, as we all know, is a primary reason our constituents sent us here in the first place, to work together and get some things done, like we did last year. Actually, like we did in the last week with the Coast Guard reauthorization bill. I thank those on this Committee who played a role in developing compromise there on ballast water and VIDA Blue.

I want to welcome each of our witnesses, and thank you all again for joining us today, for our conversation. We look forward to learning and to hearing from you in just a minute.

Thank you so much.

Senator BARRASSO. Well, thank you very much, Senator Carper.

We are now going to hear from our three witnesses today. First, we are going to hear from Carlos Braceras, who is President of the American Association of State Highway and Transportation Officials, AASHTO, and Executive Director of the Utah Department of Transportation. We will also hear from Robert Lanham, who is the Vice President at the Associated General Contractors of America;

and James Corless, Executive Director for the Sacramento Area Council of Governments.

I would like to remind the witnesses that your full written testimony will be included as part of the official hearing record, so please try to keep your statements to 5 minutes so we will have time for questions. I look forward to hearing the testimony from each of you.

Let us begin with Mr. Braceras.

STATEMENT OF CARLOS M. BRACERAS, P.E., PRESIDENT AT AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, AND EXECUTIVE DIRECTOR, UTAH DEPARTMENT OF TRANSPORTATION

Mr. BRACERAS. Thank you, Chairman Barrasso, Ranking Member Carper, and members of the Committee. Thank you for the opportunity to appear today and address the surface transportation investment needs faced by our country.

My name is Carlos Braceras, and I serve as the Executive Director of the Utah Department of Transportation and as the President of the American Association of State Highway and Transportation Officials, AASHTO. It is my honor today to represent both the great State of Utah and AASHTO, which represents all 50 States plus the District of Columbia and Puerto Rico.

State DOTs have the utmost appreciation for your Committee's leadership to shepherd the FAST Act in December 2015. This legislation has ensured stability in the federally supported passenger rail, freight, safety, highway, and transit programs through 2020.

To further build on the Federal surface transportation solid foundation, we believe that it is now time for all transportation stakeholders, led by Congress and the President, to begin work on reauthorizing the FAST Act and to ensure a smooth transition to the next long term bill without the need for disrupted extensions.

AASHTO has already initiated, earlier this year, an extensive 18 month effort to develop and present our reauthorization policy recommendations this next October. As the FAST Act reauthorization gets underway, we recommend that Federal funds continue being provided through the existing formula based structure directly to States, rather than looking at untested approaches that will require more time and oversight.

Building on the federally funded State administered highway program established over a century ago, Federal investment in all modes of transportation have allowed States and their local partners to fund a wide range of projects that serve the interest of the Nation as a whole. Formula funds work because they serve all corners of our country, improving mobility and the quality of life in urban, suburban, and rural areas.

Even with the FAST Act, however, the investment backlog for transportation infrastructure continues to increase, reaching \$836 billion for highways and bridges, \$122 billion for transit. The percentage of Federal investment in transportation and water infrastructure has declined substantially from almost 6 percent of total Federal spending in the 1960s to only 2.5 percent by 2017.

While Federal investment has lagged, States have stepped up in the meantime to fill the gap, with 31 States successfully enacting

State level transportation packages since 2012. In Utah, our legislature recently adopted a State fuel tax and indexed both the fuel tax and registration fee to keep pace with inflation. Also, we are going to be the second State in the Nation to implement a road usage charge program.

But efforts by Utah and other States to fund the system ourselves are not enough. The Federal Government must step up its share of investment, and it will not be easy. Just to keep our current FAST Act funding levels, Congress has to find \$90 billion in additional revenue for a 5 year bill or \$114 billion for a 6 year bill.

At the same time, the purchasing power of the Trust Fund revenues has declined substantially due to the flat per gallon motor fuel taxes that have not been adjusted since 1993, losing half of their value over the last quarter-century. That means the Federal highway programs are expected to experience a 51 percent drop after the FAST Act in 2021, and the Federal transit programs would have to be zeroed out in 2021 and 2022.

In the past, similar shortfall situations have led to cuts in Federal reimbursements to States on existing obligations, leading to serious cash flow problems for States and resulting in project delays. Simply put, this is a devastating scenario that we must do all we can to avoid.

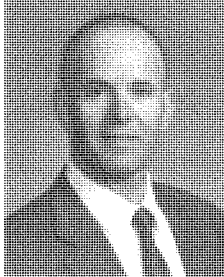
In addition, the FAST Act included a \$7.6 billion rescission of unobligated highway contract authority to take place in 2020. This is a budget artifice that disrupts transportation planning and timely delivery of projects. The cumulative effect of rescissions with over \$22 billion enacted since 2002 can wipe out the entire balance of contract authority held by States, which will lead to hard funding cuts to dollars promised under the FAST Act.

We must take advantage of the short window that we have right now to head off the dual threat of a funding cliff and a rescission in 2020. If we miss this opportunity for action, the extremely costly and disruptive scenario for transportation programs around the country will become all but inevitable.

State DOTs remain committed to assisting Congress in the development of policies that will ensure long term economic growth and enhance quality of life. You can be fully assured that AASHTO and the State DOTs will continue advocating for the reaffirmation of a strong Federal-State partnership to address our surface transportation investment needs.

I want to thank you for the opportunity to testify today, and I am happy to answer any questions you may have.

[The prepared statement of Mr. Bracerac follows:]



Carlos M. Braceras, P.E.
President
American Association of State Highway and
Transportation Officials
Executive Director
Utah Department of Transportation

Carlos M. Braceras was appointed acting director of the Utah Department of Transportation (UDOT) in May 2013. In this capacity, he is responsible for UDOT's more than 1,600 employees and the design, construction and maintenance of Utah's 6,000-mile system of roads and highways. UDOT recently celebrated the completion of two of the largest highway projects in Utah history with the Utah County I-15 Corridor Expansion (I-15 CORE) and the first phase of the Mountain View Corridor in west Salt Lake County.

Braceras joined UDOT in 1986. Prior to his appointment to acting director, he served as deputy director for 12 years. Braceras has also served as the director of UDOT's Region Three Office, chief geotechnical engineer, chief value engineer, a member of the Legacy Parkway/I-15 North Project team and as a roadway design engineer. He was named the "1998 State of Utah Governor's Manager of the Year" and was the 1998 recipient of the "UDOT Leader of the Year" Award. Prior to joining UDOT, Braceras worked as a well-site geologist doing oil and gas exploration and development. He is on the board of directors for the American Association of Highway and Transportation Officials (AASHTO), where he serves as the secretary/treasurer and as the chair of the Subcommittee on Maintenance.

Braceras received an undergraduate degree in Geology from the University of Vermont and an undergraduate degree in Civil Engineering from the University of Utah. He is a registered professional engineer.

AMERICAN ASSOCIATION
OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO

TESTIMONY OF

The Honorable Carlos M. Braceras, P.E.
President, American Association of State Highway and
Transportation Officials;
Executive Director, Utah Department of Transportation

REGARDING

**Surface Transportation Investment Needs
of the United States**

BEFORE THE

**Committee on Environment and Public Works
of the United States Senate**

ON

November 28, 2018

American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W., Suite 249
Washington, D.C., 20001
202-624-5800
www.transportation.org
info@aashto.org

INTRODUCTION

Chairman Barrasso, Ranking Member Carper, and Members of the Committee, thank you for the opportunity to appear today and address the surface transportation investment needs faced by our country.

My name is Carlos Braceras, and I serve as the Executive Director of the Utah Department of Transportation (UDOT) and as President of the American Association of State Highway and Transportation Officials (AASHTO). Today, it is my honor to testify on behalf of the great State of Utah and AASHTO, which represents the State departments of transportation (State DOTs) of all 50 States, Washington, DC, and Puerto Rico.

I first joined UDOT as a registered professional engineer and a geologist. Prior to my appointment as the Executive Director in May 2013, I served as the Deputy Director for twelve years with previous experience as Region Director, Major Project Manager, Chief Geotechnical Engineer and Chief Value Engineer. In addition to serving as AASHTO's President for 2018-2019, I am also the Chairman of the AASHTO Committee on Design and the Chair of the Technical Working Group of the AASHTO Center for Environmental Excellence. I am also the current Chair of the Board of Directors of the Intelligent Transportation Society of America.

My testimony today will emphasize four main points:

- Ensuring a strong federal role and investment in surface transportation by preparing for the next long-term surface transportation bill;
- Examination of surface transportation investment needs;
- Maintaining a strong federal investment in surface transportation by stabilizing the Highway Trust Fund; and
- Preparing for and harnessing significant technological advancements.

ENSURING A STRONG FEDERAL ROLE AND INVESTMENT IN SURFACE TRANSPORTATION BY PREPARING FOR THE NEXT LONG-TERM SURFACE TRANSPORTATION BILL

Throughout the history of our country, transportation has played an integral role in the success of our economy. Transportation is the foundation of the economy and quality life for every state in the nation. A well-functioning safe transportation system will help ensure the United States maintains its leadership position in the world. States have done an admirable job of addressing transportation within their boundaries, but there is clearly a need for a cohesive national transportation system. Take for instance, AdvancePierre Food Services, whose plant in Oklahoma ships throughout the country to other plants and retailers. Their success would not be possible without an effective interstate transportation system. While AdvancePierre's plants may

Testimony of Carlos M. Braceras, P.E.
 President, American Association of State Highway and Transportation Officials (AASHTO);
 Executive Director, Utah Department of Transportation

be in Oklahoma and other states throughout the country, Utah's transportation system needs to be able to support businesses such as this; nearly a quarter of the traffic on Utah's interstate system is commercial freight vehicles, carrying goods like AdvancePierre's food products to Utah and through it. Just as AdvancePierre depends on a reliable, effective, well-maintained, and safe transportation system in Utah, the businesses located in Utah also rely on effective national transportation system to move its products across this country and around the world.

This is just one example of how our entire nation—including residents and businesses of major metropolitan areas and rural areas alike—is well-served by a strong federal investment that improves surface transportation infrastructure. It drives home the point that our nation's transportation system is one of the key foundational elements necessary to ensure the economic vitality of our country.

The state departments of transportations (DOTs) have the utmost appreciation for your Committee's leadership, along with your Senate and House peers in partner committees to shepherd the Fixing America's Surface Transportation (FAST) Act in December 2015. This legislation has ensured stability in the federally-supported passenger rail, freight, safety, highway, and transit programs through 2020. While the five years authorized under the FAST Act has given us a temporary reprieve—thanks to over \$140 billion of General Fund transfers since 2008—from recurring deep cuts in obligations due to the annual gap between Highway Trust Fund receipts and outlays expected to grow to \$26 billion ten years from now, the case for maintaining a strong federal role and investment in transportation remains as important as ever.

To further build on the federal surface transportation's solid foundation, we believe that it is now time for all transportation stakeholders—led by Congress and the President—to begin work on reauthorizing the FAST Act, and to ensure a smooth transition upon the FAST Act's expiration on September 30, 2020, without the need for disruptive extensions of the program. Under the direction of AASHTO's Transportation Policy Forum, the state DOTs earlier this year initiated an extensive 18-month effort to develop and adopt reauthorization policy recommendations by October of next year. It is a bottom-up process, where we are currently in the process of gathering expert input from our wide range of technical committees comprising leaders from all state DOTs. We're also seeking our industry partners' input during this process prior to our formal adoption later next year, in order to maximize the inclusivity of perspectives in our policy recommendations to come.

As FAST Act reauthorization gets under way, we strongly recommend that federal funds to continue to be provided through the existing formula-based program structure directly to states rather than looking at untested new approaches that will require more time and oversight. For over one hundred years, we as a nation have enjoyed the fruits of the federal government's highly successful partnership with state DOTs to build and maintain our surface transportation system. Beginning from the Federal-aid Road Act of 1916 establishing the foundation of a *federally-funded, state-administered* highway program that has been well-suited to a growing and geographically diverse nation like ours, federal investment in all modes of transportation have allowed states and their local partners to fund a wide range of projects that serve the interest of the nation as a whole. The federal surface transportation program's inherent flexibility defers

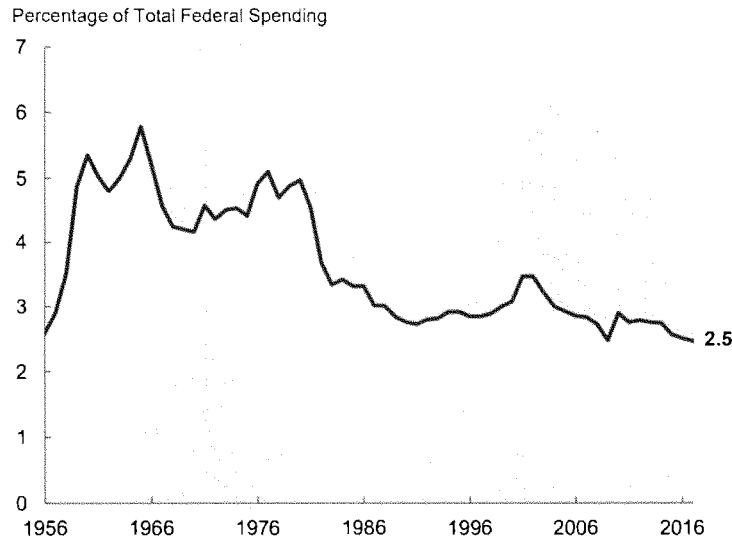
Testimony of Carlos M. Braceras, P.E.
President, American Association of State Highway and Transportation Officials (AASHTO);
Executive Director, Utah Department of Transportation

project selection and investment decision-making to state and local governments based on extensive public input from local communities and businesses to address their needs and ensure goods get access to a larger market than ever before. Putting the formula program framework that built the Interstate Highway System and the National Highway System—the backbone of our national network of roads and bridges that drive our national economy—into work again to underpin the next surface transportation legislation represents the optimal approach to serve all corners of our country, improving mobility and quality of life in urban, suburban, and rural areas.

EXAMINATION OF SURFACE TRANSPORTATION CAPITAL INVESTMENT NEEDS

Despite substantial funding challenges for transportation, the investment backlog for transportation infrastructure continues to increase—reaching \$836 billion for highways and bridges and \$122 billion for transit according to the US Department of Transportation’s (USDOT) *2015 Conditions and Performance Report*. Similarly, the American Society of Civil Engineers has identified a \$1.1 trillion funding gap for surface transportation between 2016 and 2025. Despite these growing needs, federal investment in transportation and water infrastructure has declined substantially from almost six percent of total federal spending in the 1960s to only 2.5 percent by 2017.

EXHIBIT 1. FEDERAL SPENDING ON TRANSPORTATION AND WATER INFRASTRUCTURE, 1956 TO 2017



Sources: Congressional Budget Office

Testimony of Carlos M. Braceras, P.E.
 President, American Association of State Highway and Transportation Officials (AASHTO);
 Executive Director, Utah Department of Transportation

It is also telling to look where our nation stands relative to global peers in infrastructure quality and economic competitiveness. The *2018 Global Competitiveness Report* rankings from the World Economic Forum on infrastructure quality has listed the United States at just ninth place overall.

EXHIBIT 2. US INFRASTRUCTURE QUALITY RANKINGS

Index Component	Value	Score *	Rank/140
Pillar 2: Infrastructure 0-100 (best)	-	89.5 ↓	9
2.01 Road connectivity index 0-100 (best)	100.0	100.0 =	1
2.02 Quality of roads 1-7 (best)	5.9	81.1 ↑	11
2.03 Railroad density km of roads/square km	23.2	58.0 =	33
2.04 Efficiency of train services 1-7 (best)	5.7	78.5 ↑	6
2.05 Airport connectivity score	7,293,521.7	100.0 =	1
2.06 Efficiency of air transport services 1-7 (best)	5.9	81.5 ↑	8
2.07 Liner Shipping Connectivity Index 0-157.1 (best)	86.3	86.3 ↓	7
2.08 Efficiency of seaport services 1-7 (best)	5.8	80.6 ↑	5
2.09 Electrification rate % pop.	100.0	100.0 =	1
2.10 Electric power transmission and distribution losses % output	5.8	93.1 ↓	26
2.11 Exposure to unsafe drinking water % pop.	0.5	100.0 =	1
2.12 Reliability of water supply 1-7 (best)	6.1	84.6 ↓	27

Sources: *The Global Competitiveness Report 2016-2017*

Given that much of the Interstate system has now reached the end of its design life and must be reconstructed or replaced—and there is considerable need for additional capital improvements to the broader federal-aid highway network and the country’s transit system—the federal government should strive to return to this prior level of investment relative to the national economy. States have stepped up in the meantime to fill the funding gap, with 31 states successfully enacting state-level transportation packages since 2012.

In Utah, the legislature recently adopted an increase to the state fuel tax and indexed both the fuel tax and registration fees to the Consumer Price Index to help transportation funding keep pace with inflation. Additionally, for many years Utah’s legislature has dedicated a portion of state sales tax—represented as the percentage of sales tax generated from the sale of automobiles and automobile parts—to help fund the state’s growing transportation needs. The state has also authorized local governments to adopt various local-option sales taxes to help fund local and regional transportation needs across modes. Finally, this year the Utah legislature directed UDOT to develop and implement a Road Usage Charge (RUC) program for certain alternative fuel and hybrid vehicles. Under this program, which begins on January 1, 2020, Utah will join Oregon as one of two states with an operational RUC program. As directed by the state legislature, UDOT will continue to study further expansion of a RUC program beyond the alternative fuel program as a potential future replacement of the fuel tax.

However, efforts by Utah and other states to fund our transportation alone is not enough to meet the large backlog of needs—the federal government must look to step up its share of investment.

Testimony of Carlos M. Braceras, P.E.
 President, American Association of State Highway and Transportation Officials (AASHTO);
 Executive Director, Utah Department of Transportation

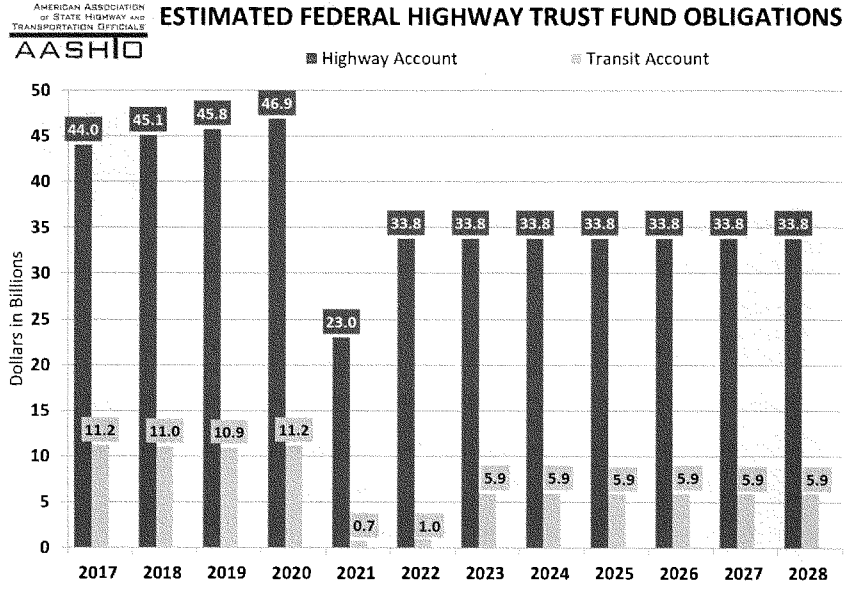
**MAINTAINING A STRONG FEDERAL INVESTMENT IN SURFACE
TRANSPORTATION BY STABILIZING THE HIGHWAY TRUST FUND**

According to the Congressional Budget Office, in order to simply maintain the current Highway Trust Fund (HTF) spending levels adjusted for inflation after the FAST Act, Congress will need to identify \$89.9 billion in additional revenues for a five-year bill through 2025; \$114 billion would be needed to support a six-year bill through 2026. At the same time, the purchasing power of HTF revenues has declined substantially mainly due to the flat, per-gallon motor fuel taxes that have not been adjusted since 1993, losing over half of its value in the last quarter century.

These dire trends mean that absent a revenue fix by 2020, the HTF is expected to experience a significant cash shortfall leading to an estimated 51 percent drop in highway obligations from the year before, or from \$46.9 billion to \$23 billion, and a zeroing out of obligations from the Mass Transit Account in 2021 and 2022 (excluding dollars flexed from the Highway Account). In the past, such similar shortfall situations have led to the possibility of a reduction in federal reimbursements to states on existing obligations, leading to serious cash flow problems for states and resulting project delays. Simply put, this is a devastating scenario that we must do all we can to avoid.

EXHIBIT 3. ESTIMATED FEDERAL HIGHWAY TRUST FUND OBLIGATIONS THROUGH 2028

Testimony of Carlos M. Braceras, P.E.
President, American Association of State Highway and Transportation Officials (AASHTO);
Executive Director, Utah Department of Transportation



For illustrative purposes, this scenario assumes maintenance of a "minimum prudence balance" of \$4 billion in the Highway Account and \$1 billion in the Mass Transit Account. Highway Account obligations exclude amounts owed to Mass Transit Account; Mass Transit Account obligations include amounts owed from Highway Account. © 2018 American Association of State Highway and Transportation Officials

In addition to the massive cash shortfall issue facing the HTF, the FAST Act included a \$7.6 billion rescission of unobligated highway contract authority to take effect on July 1, 2020, as a means to bring the spending baseline back to the 2015 level on paper. Unfortunately, the contract authority rescission is a budgetary artifice that at best impedes the flexibility of state DOTs to meet their individual infrastructure needs by disrupting transportation planning and timely delivery of projects; and at worst, the cumulative effect of rescissions—with over \$22 billion enacted since 2002—can wipe out the entire balance of contract authority held by states which will lead to hard funding cuts to federal dollars authorized under the FAST Act.

We in the transportation industry do everything in our power to build important projects as fast as possible, but due to the nature of large capital programs, including an extensive regulatory process, many of them take several years to complete. The lack of stable, predictable funding from the HTF makes it nearly impossible for state DOTs to plan for large projects that need a reliable flow of funding over multiple years. Major transportation projects around the country will be put to risk near the expiration of the FAST Act if Congress fails to address both the

Testimony of Carlos M. Bracerias, P.E.
 President, American Association of State Highway and Transportation Officials (AASHTO);
 Executive Director, Utah Department of Transportation

impending HTF shortfall and repeal of the FAST Act rescission. Such delays have serious economic consequences both in the short- and long-term, as these projects employ thousands of companies and hundreds of thousands of workers every year. More importantly, these projects are what connect the traveling public to the many facets of their lives. Once completed, they help stimulate economic growth and improve quality of life in every community where they are built.

In Utah, uncertainty surrounding the rescission and difficulty to determine the amount of contract authority that will be available in the different funding categories is hampering our ability to plan and program projects for the remainder of the FAST Act authorization. This could negatively impact UDOT's asset management program since a key component of the program is having the right funding available to do the right treatment at the right time. By applying surface treatments before major damage occurs we can maintain roads at comparatively low cost. Studies have shown that every dollar spent on preservation can save up to \$10 in rehabilitation and up to \$25 in reconstruction costs. Utah's federal highway funds are a critical component of our asset management program. Cuts to federal funding or even delays to the flow of federal funds to Utah's asset management program could delay preservation treatments, driving up asset management costs and impose long-lasting impacts to the health of the system.

We must take advantage of the short window of time we have right now to head off the dual threat of a funding cliff and a rescission in 2020. If we miss this opportunity for action, the extremely costly and disruptive scenario for transportation programs all around the country will become all but inevitable.

PREPARING FOR AND HARNESSING SIGNIFICANT TECHNOLOGICAL ADVANCEMENTS

I believe that we are at an inflection point in the transportation arena that is as significant as when the engine replaced the horse and buggy. Today, the dramatic change underway is the merger of technology between the car, truck and other vehicles with the roadway. This will change the way we move goods, services and people on our roads and highways. In the future, I view data as the new asset that will dramatically enhance public safety, save lives on our roadways, improve mobility, enhance program and operational efficiency, and create jobs. It is important now, more than ever, that we maintain relationships at local, state and federal levels to ensure our transportation system is not a bottleneck of continued innovation.

At UDOT, innovation is part of our culture and we've witnessed the success that innovation can bring. We were the first state to implement a large-scale design build project with the completion of a major reconstruction of Interstate 15 in record time ahead of the 2002 Winter Olympics. We were the first state to implement Construction Manager/General Contractor (CMGC) as a project delivery method that has helped us speed completion of projects and lower costs. We've implemented innovative interchange and intersection designs that save lives and provide more cost-effective solutions. The federal government can be a critical component to innovation, partnering with states to enable and facilitate creative solutions. In Utah, our partners at the Federal Highway Administration's Division Office continue to be an important ally as we

Testimony of Carlos M. Braceras, P.E.
President, American Association of State Highway and Transportation Officials (AASHTO);
Executive Director, Utah Department of Transportation

explore and implement innovative solutions to our transportation challenges. As the owners of a significant amount of the highway transportation infrastructure, state DOTs are at the forefront of preparing for deployment of connected and automated vehicles (CAVs), including ensuring that the current infrastructure is in a state of good repair such that any vehicle can operate on it in a safe and effective manner. In addition, many state DOTs are starting to plan, design, deploy, operate, and maintain the technology needed for CAVs, including vehicles equipped with ADS and vehicles connected to each other and the infrastructure.

Traditional investments include providing better lighting, consistent roadway design and better signage—investments that are especially needed on rural roads. A crucial component to improve roadway safety is spectrum for vehicle-to-infrastructure, V2V or as commonly known V2X, which needs to be preserved, and rural broadband expanded. Currently, UDOT is implementing Dedicated Short Range Communication within this spectrum to create a safer and more efficient transportation system. The National Highway Traffic Safety Administration also must move forward with industry on the proposal to establish a Federal Motor Vehicle Safety Standard for vehicle-to-vehicle communications (V2V). Cooperative V2V and vehicle-to-infrastructure (V2I) safety systems are needed to support fully automated vehicles, supported by robust research and deployment. Institutional capacity and workforce skills will need to be upgraded to operate, maintain and secure new smart roads and intelligent vehicles.

State DOTs strongly believe that the overall benefits will be seen with autonomous vehicles that are also connected with other vehicles and the infrastructure on which they operate. AASHTO is a founding member of the V2I Deployment Coalition, on which I also serve, along with the Institute of Transportation Engineers and the Intelligent Transportation Society of America, and various transportation industry representatives. This began as a concept to create a single point of reference for stakeholders to meet, discuss and collaborate on V2I deployment related matters. In addition, AASHTO recently established the Cooperative Automated Transportation (CAT) Coalition, with the aim of creating a clearinghouse of connected and automated vehicle policy frameworks, identifying funding opportunities and financing models to enable near-term investments, and to identify model regulations that enable near-term pilots and deployments.

States are continuing the initiative to develop policies to accelerate convergence of connected and autonomous vehicles and define industry interactions for full deployment.

For example, in Utah, the state legislature adopted HB 373 allowing UDOT to conduct a connected vehicle technology testing program on its roadways. We partnered with Peloton Technology to test a system which facilitates platooning of two-tractor-trailer rigs on a stretch of I-80. Both drivers continue to steer the trucks but an automated system controls acceleration, responds instantly to changes in speed of the front truck located 50 feet ahead, and respond to road hazards up to 800 feet away. The efficiency of air flow results in a savings of about five percent for the front truck and ten percent for the rear truck. This year, the Utah legislature adopted SB 56 fully authorizing use of this technology on Utah roads. States such as Florida, Michigan and Nevada have taken the initiative of policy changes and the state level, coupled with new guidance and standards at the national level, to effectively prepare for technological advancements that will provide a greater overall public value in the future.

Testimony of Carlos M. Braceras, P.E.
President, American Association of State Highway and Transportation Officials (AASHTO);
Executive Director, Utah Department of Transportation

Promising potential abounds when it comes to the use of drones, or Unmanned Aerial Vehicles (UAVs). As of May this year, AASHTO identified 20 state DOTs conducting research regarding the use of UAVs, and another 15 state DOTs are in the research phase—testing drones to determine how they can be utilized. The aircraft have assisted state DOTs with bridge inspections, accident clearance, surveying and identifying, monitoring and mitigating risks posed by landslides, rockslides and flooding.

Another area that has seen rapid gains is the use of “big data,” which refer to volume (large amounts of data), variety (different data being combined), and velocity (the speed at which new data is being produced and added to the analysis), used to analyzed computationally to reveal patterns, trends, and associations, especially relating to traffic patterns, human behavior, and interactions. A great example can be seen in 16 states DOTs—including Utah—partnering with the Waze, a popular driving app. Under its Connected Citizens Program, there has been increased and ongoing partnership between Waze and various governmental agencies to share publicly-available incident and road closure data to facilitate smoother movement of vehicles and people. Recognizing the public value of partnering with the private sector, Utah began partnering with Waze in 2013 and was one of the first states to do so.

An important component to advance roadway technology is the ability to create a digital highway with fiber optics to make our roads smarter and safer, benefiting surrounding communities, including underserved rural areas. In Utah, we believe this is best accomplished through P3s and streamlining federal regulations that provide maximum flexibility to states, which have enabled Utah to successfully support expansion of service provider networks. The property value of linear highway corridors is a major incentive enabling P3s. These partnerships began in the late 1990s when a change in federal law allowed the states to accommodate longitudinal access of telecommunications facilities within interstate rights-of-way under certain conditions. Utah changed our state law to allow companies to lease or barter in-kind for this access. These successful P3s have enabled us to significantly expand highway operations over large, remote expanses of the state as well as enabling private providers to expand their service in both urban and rural areas. The Utah DOT deploys conduit and fiber with every road project that makes sense and coordinates road projects with any telecommunication company that wants to partner. Through these partnerships Utah has realized over 2,600 combined private and public miles of fiber, conduit and circuit, with a total value of almost \$90 million to the public. Utah’s P3 approach to fiber has allowed us to not only expand our traffic management system, but has facilitated the expansion of broadband into rural areas of the state. That fiber system will provide the backbone for the future connected transportation system.

Federal policies need to support P3s such as these by carefully considering the uniqueness of each partnership. The ability to be flexible is what makes these partnerships possible. Rigid regulations or mandates can remove the very flexibility that is needed, complicating implementation and adding unnecessary additional system costs.

CONCLUSION

State DOTs remain committed to assisting Congress in the development of policies that will ensure long-term economic growth and enhanced quality of life through federal investments provided to all states under the long-term surface transportation legislation. You can be fully assured that AASHTO and the state DOTs will continue advocating for the reaffirmation of a strong federal-state partnership to address our surface transportation investment needs.

I want to thank you again for the opportunity to testify today, and I am happy to answer any questions that you may have.

Senate Committee on Environment and Public Works
Hearing entitled, "Addressing America's Surface Transportation Infrastructure Needs"
November 28, 2018
Questions for the Record for Carlos Braceras

Chairman Barrasso:

1. We heard from a number of State DOTs earlier in this Congress that the Department of Transportation's non-environmental regulatory processes and requirements could be reduced to give states more flexibility to focus on priority tasks and accelerate the delivery of infrastructure projects. My understanding is that AASHTO has ideas on how to reduce regulatory burdens that would not be considered environmental requirements. Can you provide this committee some examples?

AASHTO has developed a comprehensive inventory of legislative proposals for Congress to consider during the reauthorization process. Included in this inventory are several items that would reduce regulatory burdens that would not be considered environmental in nature.

Examples include providing additional authority for state DOTs to assume federal responsibilities related to federal funds obligation management, project agreements, right of way acquisition, preliminary engineering costs and preventive maintenance projects. In addition, the TIFIA federal program can be more effectively harnessed by allowing for 49 percent of project cost to covered under a loan, and improving its accessibility for rural projects by streamlining the application process.

The full inventory can be found here: <https://tpf.transportation.org/wp-content/uploads/sites/35/2017/06/AASHTO-Inventory-of-Admin-and-Leg-Recommendations-2017-07-17.pdf>

2. As you know, Congress has had difficulty reauthorizing federal transportation legislation on time, often requiring repeated short-term extensions of the program.

- a. How important is it that Congress reauthorize the FAST Act on time?

It is very important that Congress reauthorize the FAST Act on time. As state DOTs, we rely upon a level of certainty and stability in order to appropriately plan and program projects. This is especially important as it relates to large, complex, multi-year projects.

- b. Would another series of short-term extensions impact your ability to deliver much-needed transportation improvements in Utah?

Short-term extensions are very disruptive to state DOTs, our local transportation partners and the overall transportation construction and engineering industries because they impose unnecessary costs by preventing

dollars to be committed to key projects. In addition, such extensions force transportation investment programs to be ramped up and down to meet varying short-term deadlines.

In Utah, these extensions adversely impact our ability to deliver planned transportation projects on time. For example, in Utah where we have four distinct seasons, construction season only lasts around 7 months. We work hard to advertise our projects in the fall and early winter to both allow our contractors to be able to begin construction activities when the warm weather arrives, and to get more competition amongst our contractors to get better bids. If we don't have program certainty, due short-term extensions, many times it forces us to delay advertising projects which then results in having to advertise too many construction projects later in the year when there is less contractor competition. This then results in higher prices, less value for the taxpayers investment, and in many time pushing much needed safety projects into another construction season.

3. From its beginning, the Federal-Aid Highway program has been viewed as a federal-state partnership.
 - a. What is your view on the current state of this partnership?

As I mentioned in my testimony, for over one hundred years, we as a nation have enjoyed the fruits of the federal government's highly successful partnership with state DOTs to build and maintain our surface transportation system. And this partnership continues to work today and serves the American people very well.

Beginning from the Federal-aid Road Act of 1916 establishing the foundation of a *federally-funded, state-administered* highway program that has been well-suited to a growing and geographically diverse nation like ours, federal investment in all modes of transportation have allowed states and their local partners to fund a wide range of projects that serve the interest of the nation as a whole. The federal surface transportation program's inherent flexibility defers project selection and investment decision-making to state and local governments based on extensive public input from local communities and businesses to address their needs and ensure goods get access to a larger market than ever before.

- b. How important is a robust federal role to the states?

The federal government is an important partner to both state DOTs and local governments. Transportation is the foundation of the economy and quality life for every state in the nation – and thus is important to the country as a whole. A well-functioning and safe transportation system will help ensure the United States maintains its leadership position in the world. While States

have done and continue to do an admirable job of addressing transportation within their boundaries, there is clearly a need for the federal government to support, foster and invest in a cohesive national transportation system.

4. Can you provide a few of AASHTO's ideas on how we can build on provisions included in the FAST Act and prior acts to further streamline project delivery?

The members of AASHTO believe that where possible, feasible and prudent, additional refinements to project delivery processes should be considered. It is possible to improve the project delivery process without damaging the environment; after all, we at state DOTs are even more committed—because we live there—to protecting the environment just as policymakers are at the federal level.

Under the direction of AASHTO's Transportation Policy Forum, the state DOTs earlier this year initiated an extensive 18-month effort to develop and adopt reauthorization policy recommendations by October of 2019. It is a bottom-up process, where we are currently in the process of gathering expert input from our wide range of technical committees comprising leaders from all state DOTs. We're also seeking our industry partners' input during this process prior to our formal adoption later next year, in order to maximize the inclusivity of perspectives in our policy recommendations to come.

Through this process that reflects state DOTs' ground-level experience of delivery projects every day, we expect to provide Congress with legislative proposals related to program and project delivery.

5. Are there any further ways that the U.S. Department of Transportation could use their programs to encourage innovation, or remove regulatory or policy barriers to innovation?

A key concept that AASHTO has been working with Congress and the Administration over the last few years is the idea of assigning more of the traditional federal authorities to states. State DOTs have a tremendous amount of experience in carrying out the federal program. This means for states interested, if there are opportunities to reduce "check-in" points with the federal agency during project development and delivery, they would be happy to take on the federal responsibility and be held accountable for outcomes. A great example is reexamining the Stewardship and Oversight agreements that each state has with their local FHWA Division Office.

6. Not all users of the road pay into the Highway Trust Fund. Given the projected funding shortfall in that fund, do you believe other users of our roads, such as drivers of electric cars, should pay into the trust fund?

The Highway Trust Fund was founded upon the premise of "user pays" which means that through the collection of motor fuel taxes and heavy truck fees, the beneficiaries of the national highway system are the ones that pay into it. This model successfully completed the Interstate Highway System and serves as the foundation

of the current federal surface transportation program framework. That being said, due to gradual increases in number of vehicles that either consume lesser amount of motor fuels or no motor fuels at all, the traditional fuel-tax based model is, over time, becoming less equitable than originally intended.

As Congress considers solutions to bring back solvency of the Highway Trust Fund, it should consider a number of critical factors which include long-term sustainability, robust dollar yield, administrative efficiency, and equity, among others.

7. The FAST Act established the National Highway Freight Program to improve the efficient movement of freight. What changes, if any, can be made to improve this important program?

The National Highway Freight Program (NHFP) has been a very important component of the federal transportation program. The fact that a portion of the funds are provided to the states by formula is also helpful – this provides the stability and certainty needed to plan and develop freight projects. With this funding from the FAST Act, state DOTs have been able to address freight bottlenecks that exist today, while also planning for the freight system of the future. We can see the changes that the growth in e-commerce has made to the transportation system – that is only going to increase.

There is no doubt that freight will continue to be a priority of the states and we ask that Congress continues to make it a national priority as well. As noted earlier, a key element of AASHTO's Transportation Policy Forum is engaging in a bottoms-up approach to developing reauthorization proposals, including those proposals related to the NHFP. We expect to have these ready to submit these policy recommendations to Congress in October of 2019.

Ranking Member Carper:

8. Utah has recently adopted both an increase to the state fuel tax as well as a program to implement a Road Usage Charge. What lessons learned can you share from your efforts to raise revenues for transportation, and what can Congress do to support more widespread implementation of Road Usage Charges?

I would summarize our lessons learned as Trust, Data, and Financial Responsibility.

For over the last 20 years the Utah Department of Transportation has developed a high level of trust between the state legislature and the public by being transparent and by delivering high profile and innovative projects within budget and ahead of schedule. We “walk our talk”.

In Utah the importance of the transportation system is understood, it is a key foundational element that supports our economy and quality of life. So, transportation matters, it has to work today and for future generations.

And, because over many years we have consistently provided system performance data, both existing and predictive based on different funding scenarios to our legislature, they were able to develop an understanding and a trust for what the data was telling them. So, providing adequate funding to preserve our system assets and mobility needs is a responsibility. In Utah we believe that good roads and bridges cost less, and we didn't want to pass unfunded liabilities on to our future generations. As fiscal conservatives it is our responsibility to invest the taxpayers resources to achieve the lowest cost of ownership, we do that by adequately funding transportation.

In Utah we believe that the gas tax has served us and this nation well for over a 100 years, it will so for the next ten plus years. But, with the changing vehicle fleet and greater fuel efficiencies, the ability for the gas tax to continue to support our transportation system is dwindling. In Utah we believe strongly in the concept of "user pay", we believe that maintaining the connection between use and what one pays is critical. And, as we know that connection between what is being paid with the gas tax and the amount of system use is beginning to disappear.

As we move forward with implementing our voluntary road usage charge program we are learning questions that we didn't even know we would have to answer. There are some key issues that we need to begin to learn together. Items such as privacy, data security, interoperability, overhead collection costs, and many more. We need the leadership of Congress and the Administration to work in partnership with the States to continue to fund and support pilot programs to allow us all to learn together so that we can be ready to support the transportation system of the future.

9. As you know, Congress has had a difficult time reauthorizing federal transportation legislation on time – requiring repeated extensions of the program. What would be the impact on your agency if Congress failed to reauthorize the transportation programs on time and instead passed a series of short-term extensions?

Unfortunately, state DOTs have had to deal with extensions each time Congress is unable to reauthorize the federal transportation program on time. While AASHTO recognizes it can be difficult to reach agreements on policy and funding issues – it is important for Congress to understand there are real impacts from extensions.

In the past, states have reduced their planned transportation investments if there's any uncertainty that the federal government will reimburse expenditures. And short-term extensions are particularly damaging – as such piecemeal funding introduces a lot of instability and unpredictability that keeps states from undertaking complex, multi-year projects. By forcing transportation investment

programs to be ramped up and down to meet varying short-term deadlines, these kinds of delays increase the costs of projects and also delays the delivery of much-needed transportation projects.

AASHTO members stand ready to do whatever we can to help Congress reauthorize the FAST Act on time.

10. We are now in the beginning stages of our work to reauthorize the Federal surface transportation programs. As part of these reauthorization discussions, what topics do you believe particularly merit in-depth discussions for future hearings?

There is no shortage of important topics to consider for FAST Act reauthorization. That being said, we have identified these topics as the top legislative issues to address:

- Repeal the \$7.6 billion contract authority rescission in the FAST Act.
- Ensure timely reauthorization of a long-term federal surface transportation bill that increases and prioritizes formula-based federal funding provided to states.
- Ensure strong investment in multimodal transportation by enacting a sustainable revenue solution for the Highway Trust Fund.
- Ensure that a sound national framework to deploy Connected and Automated Vehicles (CAV) is developed by building on traditional federal-state-local roles.
- Foster the development and testing of new, innovative project delivery practices by assigning traditionally federal authorities and associated accountability to interested states.
- Allow flexibility to efficiently implement the most effective safety countermeasures.

11. Technology will continue to drive the future of transportation and infrastructure in this country. What can Congress do to foster these kinds of innovations?

You're absolutely right. Technology is changing everything—from the vehicles we use to get around to the way goods are manufactured and shipped. We can no longer expect to build our way out of congestion and instead state DOTs increasingly focus on optimizing the transportation system as a whole, getting more capacity and value from what we already have.

These changes require proactive adaptability as state DOTs consider our role as owners and operators of critical infrastructure. State DOTs seek innovative approaches to improve our transportation system. Evolving and accelerating challenges require us to consider new ways to address all our customers' needs—some of which are familiar and longstanding and some we undoubtedly are not even aware of yet.

Congress is and should continue to be a partner in the research, development and deployment of technology in the transportation sector. But it is important that Congress recognize the fast changing nature of technology and not create an

atmosphere that discourages innovation. Continued federal financial support for research, development and deployment programs is critical.

It is also important that Congress understand the role that state DOTs play when it comes to deploying new technologies. AASHTO members are leading the way in areas such as connected and autonomous vehicle development and deployment. States have to be a full partner in any discussions at the federal level.

12. The transportation sector is now the largest contributor of greenhouse gas emissions in our economy. At the same time transportation infrastructure is highly vulnerable to the impacts of extreme weather. How should the next reauthorization enhance the environment and improve sustainability, while also ensuring that communities build infrastructure to withstand extreme weather? In your view, what steps should we take to ensure that all investments are climate-resilient? How can we incorporate wetlands and other natural infrastructure to enhance overall climate resilience where feasible?

We very much appreciate Congress's interest in ensuring we develop as resilient of transportation system as possible to make sure our physical stock is able to adapt and respond to changing conditions. To that end, AASHTO runs the Resilient and Sustainable Transportation Systems Technical Assistance Program. This is a voluntary pooled-fund program that provides timely information, tools, and technical assistance to AASHTO members in meeting the difficult challenges that arise related to climate change, energy efficiency, energy security, infrastructure adaptation, alternative vehicles and fuels, and other relevant topics. This program is a critical resource for state DOTs to address climate change and energy issues, while also providing the information needed to engage in and influence policy dialogue on resiliency at the federal level.

13. As trustee for American Indians and Alaska Natives, the federal government has a responsibility to fulfill its treaty obligations to tribal communities. As we continue our work to reauthorize Federal surface transportation programs, we will continue our efforts to uphold those trust responsibilities. Can you share any experiences working on infrastructure development projects with tribal communities? Can you share challenges or barriers, if any, that were encountered during these projects? Are there solutions that you would recommend?

A great example of how AASHTO enhances collaboration between state DOTs and tribal governments can be found on our recent "Innovation in Practice" webinar recording:

http://www.financingtransportation.org/capacity_building/event_details/webinar_dots_tribal_collaboration_1018.aspx

This discussion provided an accessible introduction to transportation funding opportunities available to tribal governments by highlighting successful examples of collaboration, leadership, and education from states working to build internal capacity to foster

successful partnerships between DOTs and tribal governments. Speakers included representatives from state departments of transportation and tribal governments.

Some of the challenges identified include:

- Politics of tribal-state relationships sometimes interfere with finding effective solutions benefitting tribes, states, counties, other governments and the traveling public
- Waiver of Sovereign Immunity
- States and local governments (including Tribes) are not familiar with mechanisms like 23 USC 202(a)(9) transfer agreements

That being said, a great example of a tribal transportation project is the road to Tanana, Alaska. Opened in 2016, it is the first road to connect a community to the state system in more than 20 years. Key elements of success include:

- Community partnership:
 - City and tribe passed resolutions in support of the road after two years of community discussion
 - Alaska DOT&PF designers came to the village several times to meet the community
 - Community picked the route
- Benefits to community
 - Improved personal mobility
 - Lowers cost of freight/ cost of living
 - Opportunities for economic growth

Senator Boozman:

14. In the 2011, the Arkansas General Assembly passed a Constitutional Amendment that levied a temporary, 10-year, one-half percent general sales tax increase to fund highway improvements.

- This program is known as the Connecting Arkansas Program, or CAP.
- This half cent sales tax is expected to generate approximately \$170 million in highway revenue annually.
- Up to \$1.2 billion in short-term bonds will be issued to help fund construction of, or improvements to, major four-lane highways.

a. Mr. Braceras, in your testimony you mentioned different ways your state of Utah has used proceeds from a sales tax and a gas tax to fund surface transportation infrastructure projects.

b. What have been the benefits you have seen from Utah taking matters into their own hands?

With the federal share of our Utah transportation budget being only 22 percent, it has allowed us increased flexibility to apply our federal funds on projects that we can deliver with greater efficiency. This minimizes the impact that the federal regulations have on our project

delivery and allows us to maximize the investment. The value of this can be seen when local governments come to us and exchange their federal money for state money at 85 cents on the dollar.

- c. And more importantly, what can the federal government do to incentivize states like Arkansas and Utah who are willing to put more skin in the game?

First of all, it is important to note that state and local governments provide the bulk of funding for our nation's transportation and water infrastructure. In 2017, state and local governments provided 59 percent of \$174 billion in capital outlays as opposed to 41 percent from the federal government. Furthermore, state and local governments provided 90 percent of \$266 billion in operations and maintenance outlays that year as opposed to only 10 percent from the federal government.

That being said, in the context of the federal surface transportation program, there is no better incentive to states than increased federal funding as proven by the construction of the Interstate Highway System. The current highway and transit program where the federal share ranges from 50 to 90 percent is an important lever to induce greater state and local investment in our transportation system.

- 15. It has become apparent that modernization and expansion of America's infrastructure system is not an option, but a necessity. If we do not act, the United States will no longer remain a global economic leader, and will be unable to retain our current standard of living.
 - a. How can the federal government give states and the private sector, the tools necessary to get these important infrastructure projects funded?

Many of AASHTO's member DOTs appreciate the ability to access capital markets to help speed up the delivery of much-needed transportation improvements, and many states already rely on various forms of financing and procurement ranging from bonding, TIFIA credit assistance, state infrastructure banks, and public-private partnerships.

Additional tools that Congress can provide to induce greater private sector investment include amending 23 USC 111 to pilot the commercialization of rest areas on the Interstate Highway System and by eliminating the general tolling prohibition in 23 USC 301 in order to maximize user fee-based revenue options for states, to be used towards surface transportation infrastructure investments.

That being said, states fully recognize the inherent limitations of financing for the vast spectrum of publicly-valuable transportation projects. The reality is that most transportation projects simply cannot generate a sufficient revenue stream through tolls, fares, or other user fees to service debt or provide return on investment to private-sector equity holders.

The state DOTs continue to support a role for financing and procurement tools such as public-private partnerships given their ability to not only leverage scarce dollars, but to also better optimize project risks between public and private sector partners best suited to handle them. But we also maintain that financing instruments in the form of subsidized loans like TIFIA, tax-exempt municipal and private activity bonds, infrastructure banks, and tax code incentives are insufficient in and of themselves to meet most transportation infrastructure investment needs we face.

16. Aside from providing grants and funding, what can the federal government do to ensure that infrastructure is delivered in a timelier and more cost-effective manner?

A key concept that AASHTO has been working with Congress and the Administration over the last few years is the idea of assigning more of the traditional federal authorities to states. State DOTs have a tremendous amount of experience in carrying out the federal program. This means for states interested, if there are opportunities to reduce “check-in” points with the federal agency during project development and delivery, they would be happy to take on the federal responsibility and be held accountable for outcomes. A great example is reexamining the Stewardship and Oversight agreements that each state has with their local FHWA Division Office.

Senator Duckworth:

17. The Tennessee Department of Transportation (TDOT) recently decided to increase the number of full-time equivalents (FTEs) undertaking construction inspections on the State’s transportation projects. At recent congressional hearing, TDOT’s commissioner reported that despite increasing TDOT’s FTE by 500, the agency achieved a net savings of \$43 million annually, which was reinvested into projects across the State.

Recognizing that every state is unique and manages its Federal aid highway program differently, at a time when Congress is considering solutions to address the projected shortfall in the Highway Trust Fund and increase infrastructure investment, TDOT’s decision seems to be an effective way of stretching available funds and prioritizing infrastructure investments.

- a. From a human capital planning perspective, to what extent do state DOTs consider the short- and long-term costs to taxpayers associated with the hiring of FTEs versus external consultants?

Each state has unique considerations when it comes to human capital planning and implementation. That being said, the California Department of Transportation's report entitled *Comparing In-House Staff and Consultant Costs for Highway Design and Construction* provides important considerations that can be relevant for any state DOT around the country.

(http://www.dot.ca.gov/research/researchreports/preliminary_investigations/docs/consultant_vs_staff_cost_preliminary_investigation_7-15-11.pdf)

The Caltrans' study's findings—which doesn't necessary represent the AASHTO position—are as follows:

“We looked for more recent publications to identify the cost implications of outsourcing in the current environment. Virtually all of the publications we located emphasize the challenges associated with making accurate and comprehensive cost comparisons.

While we found reports that support both cases—state DOT-sponsored projects that conclude consultants cost more than in-house staff contrast with reports commissioned by trade associations that indicate the use of consultants is the more cost-effective option—a greater number of reports support the assertion that generally, in-house services cost less than contracting out.

While many reports address the cost question, we found that costs are not the overriding factor in deciding to outsource. Other reasons, such as expediting project delivery and managing workload, take precedence over cost.”

- b. Are you aware of any independent analysis that suggests an increased reliance on outside consultants is more cost effective than the use of FTEs? If so, please reference that analysis in your response.

Transportation Research Board's National Cooperative Highway Research Program synthesis report entitled “State DOT Outsourcing and Private-Sector Utilization”

(http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_313.pdf) notes the following:

“Determining if the outsourcing is effective or successful depends on the goals and objectives of the effort. If the schedule is of paramount

importance, then a contractor that delivers on that schedule has been successful. In some cases, legal issues arise and a contractor that complies with such requirements is successful. If a project is complex and requires special skills or equipment, then a contractor that offers these and completes the project has been successful. Ultimately, effectiveness or success is defined by the agency outsourcing the activity in question.”

- c. Does UDOT have a process in place to evaluate the costs and benefits of outsourcing design, engineering or construction inspection activities?

In Utah we work to maintain what we call our core competencies. Our fundamental responsibility is to assure that we are getting a fair return on the taxpayers investment. We outsource over 90 percent of our design activities and over 60 percent of our construction engineering. This allows us to utilize the private sector as our program varies over time. We provide a level playing field for the private sector to compete, this results in innovative design and construction.

Senator Fischer:

- 18. The Federal Highway Administration currently issues eligibility letters for roadside safety hardware, such as highway barriers, which states use to confirm that the hardware had been tested. However, FHWA has stated that it will stop issuing eligibility letters for roadside safety hardware in December 2019. This is a concern for states that rely on these letters to certify compliance with crash-test standards. If FHWA does stop issuing eligibility letters, what effect would that have on state acquisition of roadside safety hardware?

Without FHWA’s federal-aid eligibility letters, potential concerns include whether states and other transportation agencies have the necessary in-house technical expertise to conduct reviews of roadside safety hardware crash test results, and from a manufacturer’s perspective, whether each state’s review process and determination of compliance with crash test guidelines will be consistent with all of the others. AASHTO and FHWA continue to work together to identify a national solution that ensures consistent evaluation and deployment of these devices to ultimately improve highway safety.

Senator BARRASSO. Well, thank you very much for sharing your best thoughts. We appreciate your comments.

Now, Mr. Lanham.

**STATEMENT OF ROBERT LANHAM, VICE PRESIDENT,
ASSOCIATED GENERAL CONTRACTORS OF AMERICA**

Mr. LANHAM. Chairman Barrasso, Ranking Member Carper, and distinguished Committee members, thank you for convening today's hearing.

My name is Bob Lanham. I am a highway and bridge builder from Houston, Texas. I have the pleasure this year of serving as vice president of AGC. AGC is a national organization of 26,500 businesses that are involved in every aspect of the construction business in all 50 States, Puerto Rico, and Washington, DC. AGC members build the Nation's infrastructure; its highways, bridges, airports, transit systems, rail facilities, and other transportation projects that keep America moving.

Mr. Chairman, in my written testimony I stress several themes. The main overarching theme is that the time for infrastructure investment is now.

As the Committee knows, there has been much talk at the White House and on Capitol Hill over the last 2 years about investing in and upgrading the Nation's infrastructure. While the Congress has moved infrastructure authorizations and provided new investment for current Federal infrastructure programs, more needs to be done.

The American people, President Trump, bipartisan Members of Congress, and those of us in the stakeholder community have all expressed support and the need for a bold and robust infrastructure vision. There is no reason not to invest in our infrastructure now.

AGC has long recognized and advocated for the need to invest in more types of infrastructure, from highways, roads, and bridges, to runways and water systems. As such, we have recommended to the Congress and the Administration that any new infrastructure plan should be broad based. However, we should caution that any new proposal must not ignore one of the gravest threats to the transportation investment in this Nation: the long term solvency of the Highway Trust Fund.

Shortly after the FAST Act expires in September 2020, additional revenue of some \$20 billion per year will be needed just to maintain current funding levels. Failing to address the Fund's solvency ongoing revenue shortfall leaves open the possibility of disruption and uncertainty for States, as well as the construction industry. AGC urges the Congress and the Administration to act sooner, rather than later.

In the past funding uncertainties and short term extensions have led to project delays, cancellations, higher costs, delays of improvements that affect safety, efficiency, and economic development. If in fact the Congress acts on a broad based infrastructure bill, and we hope you do, failure to address the structural flaws in the Highway Trust Fund will undermine any potential benefits from such bill.

Increasing the motor fuels tax is the simplest and most effective way to achieve this goal, but several other viable revenue alternatives exist. We believe the Highway Trust Fund revenue construct must include three things: one, a reliable, dedicated, and sustainable revenue source derived from the users and the beneficiaries of our surface transportation system; two, resources sufficient to end the chronic shortfalls and support increased investment; and three, be dedicated solely to surface transportation improvements.

Adhering to these principles would assure the States and the Federal Government that we will continue to be a reliable partner with the States and local governments in the funding and delivering of a safe transportation network that meets our Nation's needs, both economic and growth.

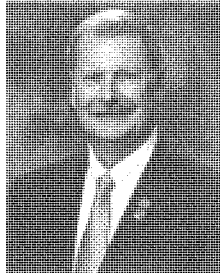
Further, as the Congress potentially considers a comprehensive infrastructure proposal, it is important to recognize that two previous authorizations, the FAST Act and its predecessor, MAP-21, both reformed the Federal surface transportation programs in a manner that emphasized meeting national goals, while providing States flexibility. Given this admirable policy achievement, we do not need to create new programs or add additional procedures to deliver additional surface transportation investments as a part of any infrastructure initiative.

To quite simply put it, our recommendation is for the Congress and the Administration to take this generational opportunity that presents itself in a broad, robust infrastructure bill to once and for all end the cycle of short term extensions and provide growing revenue to address our needs. This newfound certainty and the additional investments should allow for the reauthorization of the FAST Act prior to its expiration in 2020.

Unfortunately, none of the themes in my testimony are new. I imagine that you have heard them before, time and time again. But what is different today is leaders on both ends of the spectrum are supportive of such a proposal, and this Committee and its leaders are an essential component in making this happen.

I am thankful for the opportunity to testify today and look forward to any questions you might have.

[The prepared statement of Mr. Lanham follows:]



Robert "Bob" Lanham
Vice President
Associated General Contractors of America

Bob is a native Texan and a US Army veteran. He is a 1981 honors graduate of Texas A&M University with a Bachelor of Science Degree in Civil Engineering. Bob was a member of the Corps of Cadets and is an alumnus of Chi Epsilon and Tau Beta Pi. He is a registered professional engineer. In 2015, Texas A&M recognized Bob as a Distinguished Graduate of the

Department of Civil Engineering.

Bob started out as Project Engineer with Williams Brothers in 1985 upon separation from the US Army. Over the next 30 years, he worked in virtually every aspect of the business ranging from project management, estimating and contract administration. In January 2013, Bob was named President.

Bob is a life member of the AGC of America's Board of Governors. Over his AGC career through various positions has been privileged to serve 8 years on the AGC of America's Board of Directors (formerly Executive Board). In 2006, he served as Chairman of AGC of America's Highway and Transportation Division. Bob has served two terms as the President of the AGC of Texas (2000 and 2011). He has chaired and served on dozens of AGC committees and taskforces over his career at the state and national levels. Bob served as the chairman of The Road Information Program (TRIP) in 2006 and continues to serve on its Executive Committee.

34

Statement of

Robert Lanham
President
Williams Brothers Construction Co., Inc.

For

The Associated General Contractors of America

to the

United States Senate

Committee on Environment and Public Works

For a hearing on

**“Addressing America’s Surface Transportation Infrastructure
Needs”**

November 28, 2018

AGC of America
THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

Quality People. Quality Projects.



The Associated General Contractors of America (AGC) is the largest and oldest national construction trade association in the United States. AGC represents more than 26,500 firms, including America's leading general contractors and specialty-contracting firms. Many of the nation's service providers and suppliers are associated with AGC through a nationwide network of chapters. AGC contractors are engaged in the construction of the nation's commercial buildings, shopping centers, factories, warehouses, highways, bridges, tunnels, airports, waterworks facilities, waste treatment facilities, levees, locks, dams, water conservation projects, defense facilities, multi-family housing projects, and more.

2300 Wilson Boulevard, Suite 300 • Arlington, VA 22201 • Phone: (703) 548-3118

Statement of AGC Vice President Robert Lanham

President

Williams Brothers Construction Co., Inc.

Houston, Texas

Senate Committee on the Environment & Public Works

On the topic of

Addressing America's Surface Transportation Infrastructure Needs

November 28, 2018

Chairman Barrasso, Ranking Member Carper and members of the Senate Environment and Public Works Committee, thank you for inviting me here today. My name is Bob Lanham. I am a highway and bridge builder from Houston, Texas and currently serve as the Vice President of the Associated General Contractors of America (AGC). AGC is a national organization representing 26,500 businesses involved in every aspect of construction activity in all 50 states, Puerto Rico and Washington, D.C. AGC members build highways, bridges, airports, transit systems, rail facilities and other transportation projects that keep America running.

In my testimony, I will stress the following themes:

- The time for infrastructure investment is now;
- The U.S. transportation infrastructure system's needs cannot sustain a status quo approach to investment;
- The economic benefits of transportation infrastructure investment are well-documented;
- Continued federal, state and local partnership is critical to the success of our national transportation system;
- A broad infrastructure package must include a sustainable, long-term solution to funding the Highway Trust Fund; and
- Further improving the environmental review and permitting process is necessary.

None of these themes are new. In fact, I imagine that you have heard them before, time and time again. What's different today, however, is that leaders on both ends of Pennsylvania Avenue and on all ends of the political spectrum agree that the addressing our nation's transportation infrastructure is the top priority for the new Congress. And, this committee and its leaders are an essential component to making this priority a reality. That is why I not only feel grateful to be here, but hopeful that my words will ring true and help lay the foundation for your successfully passing a broad infrastructure package.

The Time for Infrastructure Investment is NOW

Addressing our nation's infrastructure needs, and transportation infrastructure in particular, has no partisan bounds. America's transportation system impacts our daily lives whether we live in rural communities or in great urban meccas. It effects everything from our ability to get to work to the cost and availability of the products we rely on both in our personal lives and in our businesses. Further, to the global competitiveness of our nation's economy. Investing in our nation's transportation infrastructure has traditionally enjoyed bipartisan support. President Trump and leaders in the 115th Congress—including members of this committee—made investing in infrastructure a top priority. Although, a robust and broad infrastructure bill remained elusive for now, AGC applauds the efforts of the Senate and your colleagues in the House of Representatives in passing a host of legislation that will help maintain our infrastructure, including America's Water Infrastructure Act, the Federal Aviation Administration Reauthorization, Federal Emergency Management Agency Reauthorization and disaster relief legislation. In addition, Congress recognized the need to shore up federal infrastructure investment by providing an additional \$10 billion in FY 2018 for transportation infrastructure programs above the levels contained in the Fixing America's Surface Transportation Act (FAST Act).

Now is the time to build on these legislative successes and quickly address our transportation needs when the 116th Congress convenes. Even as this committee prepares to reauthorize the FAST Act, a broad infrastructure package could provide an important earlier opportunity to address many issues impacting our nation's surface transportation network. Among the issues, priority should be given to providing the revenue or funding necessary to achieve the long-term solvency and stability of the Highway Trust Fund. Any new surface transportation investments made as part of a robust infrastructure bill should be distributed among existing FAST Act programs. Allocating resources in this manner would ensure that they have the greatest impact on our transportation infrastructure network and our economy as a whole.

Public opinion clearly suggests that infrastructure spending is broadly popular. Recent Gallup polling shows that Americans support substantial infrastructure spending: more than six in ten Americans (64 percent) in March 2017 agreed with the President's proposal to enact a \$1 trillion program to improve U.S. infrastructure, including roads, bridges and tunnels. A year earlier, in March 2016, an even larger majority of Americans (75 percent) said they support spending more federal money to improve infrastructure. In addition to winning broad national support, transportation infrastructure renewal sparked majority support from both major parties last year.

The U.S. Transportation Infrastructure System's Needs Cannot Sustain a Status Quo Approach to Investment

Despite the importance of transportation investment to the U.S. economy there is much need for improvement and growth. For example, the 2015 American Association of State Highway and Transportation Officials (AASHTO) Transportation Bottom Line Report found that annual investment in the nation's roads, highways and bridges needs to increase from \$88 billion to \$120 billion and from \$17 billion to \$43 billion for the nation's public transit systems to improve conditions and meet the nation's mobility needs. The investment backlog for transportation infrastructure continues to increase, reaching

\$836 billion for highways and bridges and \$122 billion for transit according to the U.S. Department of Transportation. The American Society of Civil Engineers (ASCE) has identified a \$1.1 trillion funding gap for surface transportation between 2016 and 2025.

Americans' use of our transportation systems underscores the necessity to close these funding gaps. The Road Information Program (TRIP) reports, for instance, that increases in vehicle travel since 2000 have resulted in a significant increase in wear and tear on the nation's roads. Vehicle travel growth, which slowed significantly because of the Great Recession and subsequent slow economic recovery, has since returned to pre-recession growth rates. From 2000 to 2016, vehicle travel in the U.S. increased by 16 percent. The rate of growth in vehicle miles traveled has accelerated since 2013, increasing by six percent between 2013 and 2016. Travel by large commercial trucks, which place significant stress on paved road and highway surfaces, continues to increase at a rate approximately double the rate for all vehicles, and is anticipated to continue to grow at a significant rate through 2030. Travel by large commercial trucks in the U.S. increased by 29 percent from 2000 to 2016. The level of heavy truck travel nationally is anticipated to increase by approximately 56 percent from 2018 to 2045, putting greater stress on the nation's roadways.

From coast to coast, major streets and freeways are showing significant signs of distress. Reports provided by the Federal Highway Administration (FHWA) based on data submitted annually by state departments of transportation on the condition of major state and locally maintained roads and highways uncover a litany of troublesome facts, including:

- Forty-four percent of America's major roads are in poor or mediocre condition.
- One-third of the nation's major urban roadways—highways and major streets that are the main routes for commuters and commerce—are in poor condition. These critical links in the nation's transportation system carry 70 percent of the approximately 3.2 trillion miles driven annually in America.
- Forty-five percent of America's major urban interstates experience congestion during peak hours. Traffic congestion costs American motorists \$170 billion a year in wasted time and fuel costs. The nation's population grew by 15 percent from 2000 to 2017 while new road mileage increased by only five percent.
- Driving on roads in need of repair costs U.S. motorists \$130 billion a year in extra vehicle repairs and operating costs – \$599 per motorist.

With these worrisome facts in mind, we must remember that our transportation infrastructure needs do not discriminate between rural and urban America. Many of the transportation challenges facing rural America are like those in urbanized areas. However, rural residents tend to be more heavily reliant on their limited transportation network—primarily rural roads and highways—than their counterparts in more urban areas. Residents of rural areas often must travel longer distances to access education, employment, retail locations, social opportunities and health services. As the Department of Transportation (USDOT) reported:

- In 2015, 15 percent of the nation's major rural roads (arterials and collectors) were rated in poor condition 21 percent were rated in mediocre condition, 16 percent were rated in fair condition and 48 percent were rated in good condition.

- In 2016, 10 percent of the nation’s rural bridges were rated as structurally deficient.

Furthermore, a concern in the rural areas of our country is motorist safety. As TRIP points out, “[t]he higher traffic fatality rate found on rural, non-Interstate routes is a result of multiple factors, including a lack of desirable roadway safety features, longer emergency vehicle response times, and the higher speeds traveled on rural roads compared to urban roads.” Many of the safety deficiencies on rural roads can be fixed. These include narrow lanes, limited shoulders, sharp curves, exposed hazards, pavement drop-offs, steep slopes and limited clear zones along roadsides.

As articulated above, the needs of our nation’s transportation infrastructure system are great and extensively catalogued. Nonetheless, so too are the tremendous benefits of sufficiently investing in this system.

The Economic Benefits of Transportation Infrastructure Investment are Well-Documented

The positive relationship between transportation capital investment, economic output and private sector productivity has been well documented for decades by business analysts, economists and the research community. A safe, reliable and efficient transportation network helps businesses increase access to labor and materials, increase market share, expand customer base, reduce production costs, access global markets and foster innovation. A 2017 study performed for NAIOP—the Commercial Real Estate Development Association—by Professor Stephen Fuller of George Mason University found the \$1.16 trillion in construction spending in 2016:

- Contributed \$3.4 trillion to U.S. GDP.
- Generated \$1.1 trillion in new personal earnings.
- Supported a total of 23.8 million jobs throughout the U.S. economy

Transportation investment also drives technology advances. Advances made in autonomous vehicle technology is driven by transportation needs and, once available commercially, will rely on a good transportation network to operate safely and efficiently. There has been a technology boom in transportation construction that is increasing productivity and enhancing quality.

Contractors are making widespread use of drones, estimating and project management software, automated machine guidance systems on equipment, 3D modeling, paperless projects, E-construction, precast-slide in bridges and the list goes on. Most of this technology is developed and manufactured in the United States. New materials and treatments are being developed to lengthen the life of the infrastructure once put in place. Enhancing critical transportation assets will boost the economy in the short-term by creating jobs in construction and related fields.

In the longer-term these improvements will enhance economic competitiveness and improve quality of life by reducing travel delays and transportation costs, improving access and mobility, improving safety, and stimulating sustained job growth.

Continued Federal, State and Local Partnership is Critical to the Success of our National Transportation System

The partnership between federal, state and local governments is essential to our transportation infrastructure. This partnership is as important as ever and must be continued for our country to meet the transportation needs of our growing economy. As such, state and local governments have taken it upon themselves to raise revenue to supplement their respective programs in the absence of new federal investment.

According to the USDOT's *2015 Conditions and Performance* report, state and local governments provided 80 percent of \$217 billion invested in state and local road-related programs and 74 percent of \$43 billion invested in transit-related programs compared to 20 percent and 26 percent, respectively, contributed by the federal government. States continue to make significant commitments to invest in transportation infrastructure as evidenced by successful enactment of transportation revenue packages in 33 states since 2012. Unfortunately, the federal government has not kept up its end of the bargain by failing to adjust the user fees that provide funding for much of our federal surface transportation investments.

Federal leadership and commitment is crucial to ensuring the continued success of this long-standing partnership. The certainty of federal investments allows state departments of transportation (DOTs) to make needed investments in the major freight corridors that drive national and regional economic growth. The one million miles of roadways eligible for the federal aid highway program account for 25 percent of total miles but carry 84 percent of all traffic. The 48,000 miles of the Interstate Highway System, which is the backbone of the U.S. economy, carries 25 percent of all traffic, including over half of the miles driven by freight trucks delivering goods across the country. Federal investment also accounts for 82 percent of rural and 64 percent of urban transit agency capital outlays, in infrastructure and rolling stock. Federal-aid funding remains critical to state-level capital investment in highways and bridges, averaging 52 percent of that state investment in recent years.

Highway accessibility was ranked the number one site selection factor in a 2017 survey of corporate executives by Area Development Magazine. Labor costs and the availability of skilled labor, which are both impacted by a site's level of accessibility, were rated second and third, respectively. Seventy-three percent of the \$27.7 trillion worth of commodities shipped to and from sites in the U.S. is transported by trucks on the nation's highways. An additional 14 percent is delivered by rail, water, parcel, U.S. Postal Service or courier, which use multiple modes, including highways.

A Broad Infrastructure Package Must include a Sustainable, Long-term Solution to Funding the Highway Trust Fund

The FAST Act expires on September 30, 2020. AGC urges Congress to use the opportunity provided by a broad infrastructure package to fix the Highway Trust Fund (HTF) and look at ways to enhance the existing federal transportation infrastructure programs. While the FAST Act was a welcome reprieve from the uncertainty created by the many delays and short-term reauthorization extensions that led up to its passage, it still left a great deal of uncertainty about future surface transportation investments. The FAST Act temporarily stabilized federal highway and public transportation investment by transferring \$70 billion from the General Fund of the U.S. Treasury to supplement an estimated \$208 billion in HTF revenue from existing sources over the five-year duration of the bill.

Soon after the FAST Act expires, additional revenue of some \$20 billion per year will be needed just to maintain current funding levels. Failing to address the HTF's ongoing revenue shortfall leaves open the possibility of disruptive uncertainty for states and the construction industry leading up to and after the expiration of the FAST Act. Without an extension and new revenue, AASHTO estimates that states will see about a 50 percent reduction in highway funding from FY 2020 to the following year and \$47 billion to \$23 billion in FY 2021. We urge you to act sooner rather than later. In the past, failure to meet the deadline resulted in numerous short-term extensions that caused project delays and cancellations, higher costs and delay of improvements affecting safety, efficiency and economic development

Federal Motor Fuels and Diesel User Fees

With the hope that the legislation will not just keep the country treading water but will instead provide the kind of investment needed to propel our economy into the future, AGC urges you to provide real, reliable, dedicated and sustainable revenue sources derived from the users and beneficiaries of the system for the Highway Trust Fund that supports increased federal surface transportation investments. Additionally, any new revenue should be dedicated solely to surface transportation improvements and preferably distributed through the current federal highway and transit programs. AGC's preferred method to address the solvency of the HTF is an increase in the federal motor fuels tax—something that has not been done since 1993—of 25 cents for both gasoline and diesel. Recognizing the growing number of electric and hybrid vehicles, we also recommend Congress consider fees or charges that would ensure these vehicles pay into the system they use. For example, consideration should be given to imposing an annual registration fee for electric and hybrid vehicles.

Vehicle Miles Traveled or Mileage Based User Fees

In 2009, the National Surface Transportation Infrastructure Commission concluded that the U.S. needs a new approach to transportation infrastructure financing. The commission specifically notes that "[d]irect user charges are the most viable and sustainable long term- user pay option for the Federal government." There, the commission recommended moving to a vehicle miles traveled (VMT) fee or mileage-based user fee (MBUF). The VMT is a user charge based on miles driven in a specific vehicle as opposed to the current excise tax on fuel consumed. At its simplest, the fee would be cents per mile. A VMT would ensure that all users are paying their "fair share" to keep roads and bridges in a state of good repair regardless of the type of vehicle they drive.

To make it work on a national scale, a VMT system needs to be tested, piloted and refined at the state and local level. In the FAST Act, Congress provided some \$95 million to states to undertake pilot programs to look at implementation of a VMT fee. Numerous states are currently undertaking these studies and they are showing positive results. The VMT seems to make sense as a future replacement for the motor fuels tax but is not ready for implementation just yet. We urge you to continue to provide assistance to states to continue these pilots. The next step should be to build on the results of these state pilots and institute a national pilot program.

Public Private Partnerships

Public Private Partnerships (P3s) have been given much emphasis in the past few years. Clearly, there is a place for P3s in addressing current and future transportation needs. P3s bring additional financing to the table to address transportation needs that would not be there without federal encouragement. In addition, P3s shift risk away from state DOTs and bring new players into the operations and maintenance mix. However, P3s are not the one and only answer to the funding shortfall. Only certain types of projects may attract P3 development. These are primarily revenue generating projects based in largely in dense urban areas. While encouragement for P3s should continue, it must be understood that they are an enhancement and not the solution to the funding shortfall.

Further Improving the Environmental Review and Permitting Process

AGC is very appreciative for the work this committee has undertaken in helping enact bipartisan environmental reforms in MAP-21 and the FAST Act. But more work can be done and improvements upon those enacted reforms can be made.

AGC members have pointed to a host of technical and procedural problems that government agencies face, in general, during document preparation and interagency reviews: they inevitably lead to inconsistencies in the environmental approval process, schedule delays and costs overruns. Such uncertainty spurs legal challenges, which can ultimately threaten the viability of the project. AGC has worked closely with the current Administration and supports their efforts to further improve the environmental review and permitting process. Additionally, we have shared our extensive environmental recommendations to the House and Senate in testimony or statements for the record¹. Three of these reforms that would have substantial positive impacts are:

¹ [The Associated General Contractors of America](#) to the U.S. House of Representatives Committee on Small Business for a hearing on "Evaluating the Paperwork Reduction Act: Are Burdens Being Reduced?", March 29, 2017; (2) [The Associated General Contractors of America](#) to the U.S. Senate Committee on Environment and Public Works for a hearing on "Infrastructure Project Streamlining and Efficiency: Achieving Faster, Better, and Cheaper Results", May 3, 2017; (3) [The Associated General Contractors of America](#) to the U.S. House of Representatives' Committee on Small Business for a hearing on "Expediting Economic Growth: How Streamlining Federal Permitting Can Cut Red Tape for Small Businesses", September 6, 2017; (4) [The Associated General Contractors of America](#) to the U.S. Senate Committee on Homeland Security & Governmental Affairs' Permanent Subcommittee on Investigations for a hearing on "Cutting Through the Red Tape: Oversight of Federal Infrastructure Permitting and the Federal Permitting Improvement Steering Council", September 7, 2017; and (5) [The Associated General Contractors of America](#) to the U.S. House of Representatives Committee on Transportation and Infrastructure Subcommittee on Water Resources and Environment for a hearing on "America's Water Resources Infrastructure: Approaches to Enhanced Project Delivery", January 18, 2018.

- First, require a merger of the National Environmental Policy Act and Clean Water Act 404 permitting processes with the U.S. Army Corps of Engineers issuing permits at the end of the process, using the NEPA-generated information;
- Second, allow the monitoring, mitigation and other environmental planning work performed during the NEPA process, and included the final Environmental Impact Statement / Record of Decision, to satisfy federal environmental permitting requirements, unless there is a material change in the project; and
- Third, develop a reasonable and measured approach to citizen suit reform to prevent misuse of environmental laws.

Conclusion

Mr. Chairman, thank you again for convening today's hearing, your leadership and for allowing AGC to participate. The role of our national transportation system in supporting U.S. competitiveness and our quality of life cannot be understated. Transportation impacts the daily lives of citizens and businesses in every state in the Union. The American public recognizes the need to improve our system and bring it back to world class status.

A golden opportunity is before the Congress. At a time when it seems there is little we all agree on, infrastructure may prove to be the missing link. I urge this committee to take advantage of this opportunity. An important step Congress can take is to fix the Highway Trust Fund. Providing a reliable, dedicated and sustainable revenue source derived from the users and beneficiaries of the transportation system to not only address the annual shortage but allow for robust future investments is key. Please don't put off this debate until later. The longer we wait the more difficult the solution becomes. You have shown great leadership in not waiting until the new Congress convenes before holding this hearing. Please continue that leadership and work with your colleagues here in the Senate and over in the House to allow such legislation to move forward. Again, thank you for your time and consideration.

Response of Robert Lanham on behalf of the Associated General Contractors of America (AGC) to questions for the record posed by Members of the Senate Environment and Public Works Committee following the November 28, 2018 hearing entitled, "Addressing America's Surface Transportation Infrastructure Needs."

Chairman Barrasso:

1. We heard from a number of State DOTs earlier in this Congress that the Department of Transportation's non-environmental regulatory processes and requirements could be reduced to give states more flexibility to focus on priority tasks and accelerate the delivery of infrastructure projects. Can you provide your thoughts on reducing regulatory burdens for non-environmental regulatory processes and requirements?

The Disadvantaged Business Enterprise (DBE) Program began in 1985 and has been reauthorized in each transportation authorization with little Congressional scrutiny. Over the past several years US DOT has issued new DBE program regulations that have increased the compliance burden for both prime contractors and DBEs which are costly to meet and can cause project delays. Efforts to improve program administration should be implemented including:

Recommendations for DBE Program Reforms:

- Clarify requirements for compliance with complicated, confusing and often contradictory requirements. Specific areas of concern are best faith effort requirements, commercially useful function determinations and DBE certification procedures.
- Provide more transparency in goal setting and disparity study requirements.
- Put more emphasis on business development aspects of the program, including enhancing supportive services funding to assist DBE business strength.
- Establish one DOT wide definition of "small business concern" based on existing Small Business Administration (SBA) size standard criteria that applies to all categories of work undertaken by DBEs. All DOT modes, including the Federal Highway Administration, Federal Transit Administration and Federal Aviation Administration would use the same size criteria.

2. Are there any further ways that the U.S. Department of Transportation could use their programs to encourage innovation, or remove regulatory or policy barriers to innovation?

Congress created the Technology and Innovation Deployment Program to fund efforts to accelerate the implementation and delivery of new innovations and technologies that result from highway research and development to benefit all aspects of highway transportation. This program has promise and could be used to incentivize contractors to bring new technologies, innovative construction means, methods and materials into the market place. On design-build and CMGC procurements contractors theoretically have an incentive to bring these alternative technical concepts and technologies to the table. This same incentive could be offered to encourage contractors in the competitive bid arena to offer these new ideas. Attempts to earmark this funding for specific proprietary technologies or materials should be avoided to allow the competitive market to work.

3. Press reports indicate that state DOTs and contractors are having trouble attracting qualified workers. Is this a workforce development problem or is there a shortage of workers generally?

The workforce issue is both a development and shortage problem. The 2008-2010 recession led to a collapse of the construction market. As the market declined workers left the industry and moved on to other industries. Attracting those workers back and finding new workers with the necessary skills and the

interest in construction careers are the challenges facing the industry. For the past five years AGC has undertaken an annual workforce availability survey. This year's survey found that 93% of the 2552 respondents said they would like to hire new hourly craft personnel to meet their backlog of project needs or to replace retirees. However, eighty percent said they were having difficulty finding craft workers and 56 percent are having difficulty filling salaried positions. The current booming economy and low unemployment rate has made the problem far worse.

AGC responded to this concern with a Workforce Development Plan in 2016 advocating a skills agenda targeted at bringing new entrants into the industry and has had success in getting many of the recommendations implemented, including:

Getting Congress to enact a new federal career and technical education bill that boosts funding and increases flexibility to make it easier for education officials to set up construction focused high school programs. AGC has also been successful in getting reforms in the 2016 Workforce Innovation & Opportunities Act and in getting the Trump Administration to focus on the need to enhance apprenticeship training opportunities.

Many of our AGC chapters have recruiting and training programs either independently or in conjunction with technical schools. In addition, AGC is working with FHWA and AASHTO on recruitment/training pilot programs.

Most companies in our survey report they are investing in their work force by paying higher wages and benefits to retain and attract workers in both categories, including paying incentives and bonuses to attract and retain their workers. Nearly half of the respondents said they have initiated in-house training programs and as many are involved with high school and college career building programs.

4. If Congress is able to fund a substantial increase in highway funding, does the highway construction industry have the capacity to expand production without unduly raising costs?

History shows that the industry is capable of growing to meet market demands. Since the start of the interstate highway program the market has gone through up and down gyrations but the industry has always grown to meet the needs. Competition leads to increased productivity gains as firms look for advantages to make them more successful in procuring contracts. A growing transportation construction market allows contractors to make investments in equipment, technology and worker training which helps them to be more productive thus reducing construction costs. Taxpayer benefit by receiving improved infrastructure delivered in a cost-efficient manner.

A steady and increasing highway construction market is a key factor in growing and maintaining a well-trained workforce. Workers are attracted when they know there are steady, reliable jobs available and that there are opportunities for growth both in wages and career opportunities. Contractors are willing to make the investment needed in training, including training in new technologies, when they feel confident that the market will support that investment. Contractors will continue to do what is necessary to retain and grow their workforce to meet market demands. A new generation of worker career opportunities with long term benefits.

Ranking Member Carper:

5. As you mentioned in your testimony, contractors are using a wide range of new technologies in transportation construction, such as drones, 3D modeling, project management software, and precast bridges. Have these innovations led to reductions in construction costs for transportation projects?

There has been an explosion in technology applications for the construction industry and contractors are adopting them as part of their operations. Contractors are always looking for ways to be more productive and lower their costs. The competition in the industry requires each company to look for ways to lower their costs. Project owners benefit from this competition through lower costs and faster project delivery.

6. As you know, Congress has had a difficult time reauthorizing federal transportation legislation on time – requiring repeated extensions of the program. What would be the impact on your businesses if Congress failed to reauthorize the transportation programs on time and instead passed a series of short-term extensions?

Nothing is more detrimental to the industry than the on-again, off-again market gyrations that occur when the Federal transportation authorization legislation is not in place. Without certainty in the Federal program, states cut back on project lettings and tend to favor short term maintenance projects rather than major improvement projects. This flows down to the construction industry and creates resource and cash management problems for contractors. Contractors are unwilling and unable to make investments in equipment, new technology and worker training when there is so much market uncertainty. Retaining a workforce under these circumstances is a problem. It is important that Congress act swiftly to reauthorize the FAST Act before it expires and finds the revenue necessary to stabilize the Highway Trust Fund and provide steady and significant growth in annual funding moving forward.

As an example my company, Williams Brothers Construction was forced to lay off one third of our work force in 2010 due to the significant decline in the construction market resulting from the recession. Congress enacted the American Recovery and Reinvestment Act (ARRA) in 2008 which double funding in the Federal-aid Highway program for one year. While this funding helped the industry on a short-time basis by extending the need for layoffs, the short-term nature of the funding did not allow firms to make long term commitments. A steady growing market is far preferable to the peaks and valleys of funding.

7. Technology will continue to drive the future of transportation and infrastructure in this country. What can Congress do to foster these kinds of innovations?

The construction industry has a huge incentive to adopt new technologies to remain competitive. Contractors are always striving to be more efficient by doing more with less while improving quality and ensuring worker safety. Congress should not attempt to decide or be influenced to select what technologies are the best or which ones should be used. Incentives that allow the industry to try new applications should be used to encourage experimentation.

8. As trustee for American Indians and Alaska Natives, the federal government has a responsibility to fulfill its treaty obligations to tribal communities. As we continue our work to reauthorize Federal surface transportation programs, we will continue our efforts to uphold those trust responsibilities. Can you share any experiences working on infrastructure development projects with tribal communities? Can you share challenges or barriers, if any, that were encountered during these projects? Are there solutions that you would recommend?

AGC has not received any feedback on this issue from our chapters or individual members.

Senator Boozman:

9. The Congressional Budget Office (CBO) projects that revenues for the Highway Trust Fund (HWT) will be insufficient to meet obligations by 2021.
 - a. What would the impact be to the over 26,000 businesses you represent if the HWT becomes insolvent?

If the Highway Trust Fund becomes insolvent sometime after the expiration of the FAST Act road construction and maintenance projects throughout the country could grind to a halt. Insolvency of the trust fund would have a rippling across AGC members engaged in the transportation construction business as companies will have to lay-off employees and hold off on the purchase of new equipment and other capital investments. Construction companies operate on small margins and cash management is a significant factor in a firm's longevity. A significant disruption in highway projects going out for bid will no doubt result in business failures and bankruptcies for construction businesses.

It is important to note, even the threat of insolvency would have a significant impact on our industry and the nation's transportation network. The result of failing to address the HWT's ongoing revenue shortfall leaves open the possibility of disruptive uncertainty for states and the construction industry once the FAST Act expires. Without an extension and new revenue, AASHTO estimates that states will see about a 50 percent reduction in highway funding from FY 2020 to the following year and \$47 billion to \$23 billion in FY 2021. The bottom line is that failing to address the pending insolvency of the HWT will result in the further deterioration of our nation's transportation network, impacting mobility, safety and economic well-being.

10. Taxpayers across the country, including in Arkansas, point to government inefficiency in the delivery of infrastructure.
 - a. Projects that should reasonably be completed in a few years typically last decades, delaying public benefits and exponentially increasing costs.
 - b. Do you believe the Administration's push to eliminate regulatory barriers and streamline permitting will help important infrastructure projects to get completed on time and on budget?

AGC believes that the effort of the Administration to streamline the environmental review process will help more infrastructure projects be completed on time and on budget from inception to the ribbon cutting. Most of the delay in project delivery comes during the planning, permitting and development stage of the project, not during actual construction. The April 9, 2018 "One Federal Decision" memorandum of understanding that was signed by more than a dozen federal agencies establishes a coordinated and timely process for environmental reviews of major infrastructure projects and should make significant improvements to the project delivery process. Additionally, the Administration's performance and accountability system for major infrastructure projects and the Federal Highway Administration's final rule to improve and streamline environmental review processes should help projects get out to bid faster and completed on time and on budget.

11. We frequently hear that there is an abundance of private sector capital (both equity and debt) on the sidelines, waiting to invest in infrastructure projects.

- a. There is no doubt P3s offer a valuable tool for infrastructure investment, but do you see private investment making up the difference needed to simply maintain spending for transportation programs?

P3s have been given much emphasis in the past few years. Clearly, there is a place for P3s in addressing current and future transportation needs. P3s bring additional financing to the table to address transportation needs that would not be there without federal encouragement. However, it is important to understand that financing and funding are not the same thing and do not provide the same benefit in addressing transportation infrastructure needs. In addition, P3s shift risk away from state DOTs and bring new players into the operations and maintenance mix. This risk shifting, however, comes at a cost that increases the price of project delivery. In addition, only certain types of projects may attract P3 development. These are primarily revenue generating projects based largely in dense urban areas. While encouragement for P3s should continue, it must be understood that they are supplemental to the formula based funding program and are not the solution to the funding shortfall.

Senator BARRASSO. Well, thank you so very much for your thoughts and your testimony. I appreciate it.
Mr. Corless.

**STATEMENT OF JAMES CORLESS, EXECUTIVE DIRECTOR,
SACRAMENTO AREA COUNCIL OF GOVERNMENTS**

Mr. CORLESS. Chairman Barrasso, Ranking Member Carper, and members of the Committee, I am James Corless, Executive Director of the Sacramento Area Council of Governments, and I am honored to be here today representing our Council, which represents 22 cities and 6 counties in the greater Sacramento region.

As you know, I am from California, but I am also from the heartland of California. Our region is not coastal in California; we are central and inland. We are not deep blue; we are a patchwork of reds, blues, and purples; and 85 percent of our land in our region is rural. We are truly a microcosm of America.

Senator Carper, you like to quote Einstein. I like to quote my 13-year-old daughter, who says, “Daddy, Sacramento, we’ve got some problems and challenges, but we’re real, we’re genuine, and we’ve tackled them head on.” In that spirit, I am here this morning to talk about four major points that we really think you need to address in the next authorization bill: funding, innovation, long term planning, and bridging the urban-rural divide.

On funding, my two colleagues here have said much that I would agree with, and I am not going to repeat that, but I will say one thing. We are going to have to come up with a successor to the gas tax sooner or later, whether it is sooner or later.

I think there were comments in the media this morning that seemed to suggest, perhaps, that I was against a miles-traveled fee, and I want to just correct that for the record. I am not against a miles-traveled fee in terms of something that will replace the gas tax, but hear me out on this. This is very important that we address it.

Twenty miles traveled on a two-lane rural road is not the same as 20 miles traveled on an urban interstate at 9 a.m. at peak hour, rush hour traffic congestion. They exact different costs. The urban interstate is going to require us to build billions of new infrastructure, so we want to manage that demand. We can manage that demand through effective pricing. It is not just about the miles you travel; it is about when you travel; it is about how you travel.

So, in the next authorization bill we want more pilot programs. We want to be able to be more creative. We want to test pricing schemes much like the utility sector now prices utilities. Most things in the private sector are priced by time of day, by peak travel. We do not do this in the transportation sector, and we need to correct that.

Second point on innovation. New technology innovation—you all know this—is coming faster than we know it. Now, we made advances in MAP-21 and the FAST Act, but we are falling further behind in terms of the speed of technology and things that are transforming our sector. From the local level, as important as the Federal program is, it seems out of touch, given where technology is.

In the Sacramento region, we have started a program called Civic Lab. This was a really interesting idea. We took 20 teams, cities, counties, and transit agencies, and we challenged them to come up and solve their transportation challenges with a couple of rules: you can't spend a lot of money, you have to use technology, you have to use creative problem solving, and must partner with the private sector. We did an umbrella procurement. We allowed them to pull off our umbrella procurements so they didn't have to go through their own procurements to partner with private sector companies.

The projects that came out were truly inspirational. A low income project to move youth to summer construction jobs so low income youth could actually show up on time, at 7 a.m. every day, through a shuttle service; on-demand transit for a rural community where you couldn't make fixed route public transit work to get folks to work and to jobs on time; a new traffic management program that can help one of our more popular rural farm areas deal with peak hour congestion during harvest season.

But here is the rub: we can't take our Federal funds and actually use them to fund these projects. We don't have that eligibility and that flexibility, and we need that. If you want to embrace innovation, we have to do that.

USDOT made a huge stride with its Smart Cities Challenge, and I say recreate that, but do it for communities of all sizes, urban, rural, and suburban, and even State level programs that would be State versions of a challenge for communities to use technology and innovation to come up with quick and effective low cost solutions.

In terms of the planning process, it is too slow, it is too cumbersome. We have too much to do. It is too much of a check-box exercise. The future is changing rapidly, and we need our planning process to be quicker, easier, more meaningful, and more data driven. USDOT can do a lot in this regard. We actually are using one of its datasets that it procured for the entire Nation. It is a great use of its economy of scale. We also need USDOT to help build the capacity of our agencies.

Finally, bridging the urban-rural divide, we have had a program now for 10 years that we call the Rural-Urban Connection Strategy, and we learned, first and foremost in that program, that broadband and high speed communications are seen as a form of transportation for our rural communities. We need eligibility in our Federal funds to allow those kinds of communication networks and broadband to be funded right along transportation; it is equal to or greater than in terms of the need of rural communities, as it is as mobility and roads and highways.

With that, I would be happy to answer any questions, and thank you again for the invitation.

[The prepared statement of Mr. Corless follows:]



James Corless
Executive Director
Sacramento Area Council of Governments

In April 2017, James Corless began his appointment as Executive Director for the Sacramento Area Council of Governments (SACOG), which provides transportation planning and funding for the six-county Sacramento region, and serves as a forum for the study and resolution of regional issues.

Prior to his appointment to lead SACOG, Mr. Corless was the founding director of Transportation for America, where he built an impressive national network of civic, elected, and business leaders who understand that strategic investments in infrastructure are crucial for attracting economic development. Under his leadership, Transportation for America advocated for state and federal transportation funding and policies that focus on local knowledge to drive investments and maximize local economic development. Corless also led advocacy efforts and developed place-based programs and policies.

Mr. Corless has also served in senior positions for the Metropolitan Transportation Commission in the San Francisco Bay Area, where he managed the agency's efforts to partner with the private sector and local governments to promote jobs, retail, and residential construction along public transportation corridors. Mr. Corless helped author several pieces of groundbreaking state legislation in California that have helped encourage coordination of transportation, growth and economic development and has served as a visiting lecturer at the University of California at Berkeley in the Department of City and Regional Planning.

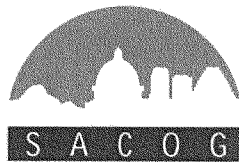
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

**ADDRESSING AMERICA'S SURFACE
TRANSPORTATION INFRASTRUCTURE NEEDS**

TESTIMONY OF JAMES CORLESS
EXECUTIVE DIRECTOR,
SACRAMENTO AREA COUNCIL OF GOVERNMENTS

SUBMITTED FOR THE RECORD

NOVEMBER 28, 2018
WASHINGTON, DC



Sacramento Area Council of Governments
www.sacog.org
@sacog

Introduction

Chairman Barrasso, Ranking Member Carper, and members of the Committee, on behalf of the Sacramento Area Council of Governments (SACOG) I welcome the opportunity to submit comments for the record as part of today's hearing. SACOG is a council of governments that represents the 22 cities and six counties of the Greater Sacramento Region in California. My agency, and my peer regional planning agencies, truly appreciate being included in your thinking as the Committee on Environment and Public Works starts developing a successor to the FAST Act.

A Perspective from the Heartland of California

I'm honored to be here in front of this distinguished committee today and I'm proud to represent the Greater Sacramento region. When you hear Sacramento, you might make a lot of assumptions that go with the stereotype of "California": that we're a coastal state, that we're an urban state, that we're a blue state. I want to dispel those myths when it comes to central and inland California. The Sacramento region is one of the nation's most diverse. We're diverse in terms of our people, our politics and our places. Indeed, our region covers the booming urban core of Sacramento, vibrant suburbs, historic towns and main streets, newly developing exurbs, rural farmland and thousands of acres of forests. We are truly a microcosm of America, which is the reason we are often used as a test market for advertisers. It's with that perspective, and in the spirit of that diversity, that I offer my testimony and our regional insights for the Committee today.

(1) Meeting the Funding Challenge: From the Bottom Up

It is impossible to address the future of the nation's surface transportation program without first getting to the heart of our biggest challenge: the transportation 'fiscal cliff' that's staring at us when the current FAST Act authorization expires in 2020. By many accounts, we will have a financial hole to fill in the tens of billions. In filling this hole, we have two enormous challenges to confront. First, we need a short-term fix that either means raising the federal gasoline tax or continuing stopgap funding solutions of the recent past. Second,

we need to accelerate our efforts to deploy the successor to the gas tax. It's my belief that whatever successor emerges as the favorite will need to be tested and deployed in a majority of the states before it's adopted at a national level. It's also my belief that we should not simply replace the current tax on gasoline with a tax on the number of miles you drive. A rural resident who drives 20 miles on a lightly travelled two-lane road doesn't impose anywhere near the cost of an urban resident who travels 20 miles on a congested interstate highway in the middle of rush hour. We need creative approaches to generating revenue for transportation that can both reduce traffic congestion and apply some sense of fairness between rural and urban areas. Among other things, we should test creative time-of-day pricing much like energy rates currently used by the utility sector.

So let's get to work. Let's build on the existing pilot projects across the country and move into more widespread deployment. The next authorization should encourage both pilot tests and larger scale deployment at both the state level and within metropolitan regions. It should lift the current prohibition on tolling the interstates and allow for the testing of a variety of creative approaches to 21st century transportation user-fees.

(2) Embracing Innovation: Is the Transportation Sector Prepared?

As someone who's been in the transportation planning profession for nearly three decades, I believe this is one of the most exciting and disruptive times that our profession has ever seen. The introduction of new automated vehicle technology, the growth of big data, and the proliferation of new private-sector companies providing new on-demand mobility solutions have started to transform transportation planning and how we think about moving people and goods. Automated vehicles have the ability to not just revolutionize our transportation system, but to provide new freedom and independence for seniors and people with disabilities.

Yet support for these new innovations are still the exception rather than the rule in our current federal transportation programs and policy. The U.S. Department of Transportation took two critical steps forward when it issued the Smart Cities Challenge in 2015 and began developing its automated vehicle policy. While

these are positive steps, they are nowhere near enough to help states, regional planning agencies and local governments plan for and embrace a future of autonomous, shared, connected and electric vehicles that's coming faster than we ever thought.

In the Sacramento region, our agency has started preparing for this disruption by developing a new program we call "Civic Lab." Civic Lab is a nine-month initiative that, in its first year, involved eight teams representing over 20 different local jurisdictions from a range of urban, suburban and rural areas. We challenged them to bring their most pressing transportation and mobility problems to us. Our ground rules were that they couldn't spend a lot of money on the solution, they had to use creative problem-solving techniques popular among start-up companies, they had to use some form of technology or data, and they needed to consider partnering with a private sector company. Our agency issued an umbrella procurement for private sector vendors so that our teams didn't have to go through their own local government procurement process. We now have six of our eight teams who are advancing pilot projects to test their ideas, many of whom are pulling from that regional umbrella procurement in order to quickly partner with private companies. We have helped our teams develop innovative transportation projects including a program that will move low-income youth to summer construction jobs so they can reliably get to work on time, an on-demand shuttle service for a rural community on the edge of our region that isn't well served by fixed-route public transit, an automated bus that will connect a train station with our local campus at Sacramento State University, and a new traffic management program that can help one of our most popular rural farm areas deal with peak congestion during harvest season. Since these are pilot tests, we're also working with another local university, U.C. Davis, to provide a data-driven evaluation of our projects.

While all of this is tremendously exciting and inspiring, we've also learned that there are some significant federal roadblocks that we have to overcome. For starters, most of our transportation pilot projects simply aren't eligible for our standard federal formula funds. We need to remove the current restrictions on our federal transit funds to allow our projects – most of which are promoting shared rides and multiple passengers in vehicles – to be eligible for funding. And we need to broaden the flexibility of our federal highway funding to allow

these types of innovative approaches to compete. Currently, we are only finding that kind of flexibility through our federal Congestion Mitigation and Air Quality (CMAQ) funds. We even have some of our rural innovation projects that may not be eligible for any federal transportation funding whatsoever. The next authorization bill should change these restrictions so that these types of innovation projects can thrive.

But there's much more that the next transportation authorization bill must do to embrace innovation. While states and metropolitan planning organizations rely on and appreciate the certainty that formula funds provide, there should be a greater emphasis on national and even state-level competitive grant programs that explicitly encourage innovation, technology, pilot projects and partnerships with the private sector. For example, USDOT's Smart Cities Challenge should be replicated but allow for communities to compete within different categories according to whether they are urban, suburban or rural. State-level challenge grant programs should be funded so that each state can design its own innovation grant program tailored to the needs and geography of each particular state.

But we need to go even further in infusing innovation and technology into our federal transportation programs. We need to partner with technology companies and designers to develop smart, quick, low-cost solutions to reduce fatalities on rural, two lane roadways. We will never have enough money to turn every two-lane road with a safety problem into a four- or six-lane facility. I give my colleagues at the state departments of transportation in Missouri, Texas, Oregon, and Washington a lot of credit for attempting to tackle this critical safety issue. Yet the lessons need to be better understood and more widely shared. We are still approaching these rural safety issues with too much reliance on older, more expensive solutions, and too little understanding of how smart, lower-cost designs can save more lives, faster.

And while we need to invest more in mass transit, we also need to invest in the capacity of our transit agencies in order to allow them to transform from agencies that simply move buses and trains into agencies that move people. There are critical experiments already underway in Houston, Indianapolis and in my hometown of Sacramento where transit agencies are redesigning bus routes for the first time in 50 years. They are experimenting with new forms of

microtransit that can provide flexible, door-to-door transit through on-demand apps. These innovations in public transit have just as much relevance – if not more – in our nation's rural areas and small towns.

(3) Simplifying but Strengthening the Planning Process

As an agency that sees itself as a regional planning body, and as someone who has been involved with the transportation planning profession for several decades, I can tell you that we are entering a similar period of disruption in the field of planning that we're seeing with automated vehicle technology. As Yogi Berra famously said, "the future ain't what it used to be." We can no longer plan for the next 20 years as if it will look just like the last 20.

The next federal surface transportation authorization bill should advance our approach to transportation planning by encouraging our planning process to be quicker, easier, more meaningful and data-driven. The truth is that our current planning process is too cumbersome and too slow. It's weighed down by a complicated set of requirements, many of which tie the hands of planning agencies, make us plan for the sake of planning, or are simply out of date. Just as MAP-21 and the FAST Act simplified and streamlined the number of distinct federal funding programs, so too should the next authorization simplify the planning process without eliminating the overall goals and outcomes that the federal government understandably wants us to achieve. I would start by eliminating the multitude of planning factors that we have to consider and reduce them to just four: economic prosperity, access to opportunity for disadvantaged populations, traffic safety, and environmental sustainability including resilience to extreme weather events.

While we simplify and streamline the planning process, we can strengthen it at the same time. We need the federal government to be a strong partner and invest in new data and analysis tools in order to build the capacity of regional planning agencies and state departments of transportation. For instance, the U.S. Department of Transportation invested in the procurement of a national 50-state dataset on traffic flows and traffic congestion. Our agency is currently using this dataset as part of our long-range modeling in our latest 20-year transportation

plan. This is a perfect role for USDOT and a remarkably cost-effective use of public resources.

USDOT should also help build the capacity of transportation agencies by working with us to develop new tools that can evaluate the effectiveness of major new transportation investments. While we took some important first steps towards more performance-based planning in MAP-21 and the FAST Act, we stopped short of carrying those performance measures all the way into the evaluation of specific transportation projects. It's one thing to track the year to year changes in our federal performance measures, but it's far more meaningful if we can understand how our specific transportation investments and individual projects move the needle and make progress on things like reducing traffic fatalities. This is admittedly a technical challenge, but it is also the next frontier in performance-based planning. And it is far more achievable today than it was just a few years ago due to the prevalence of big data.

In summary, we need to overhaul our transportation planning process to be less about checkboxes and more about data-driven decisionmaking. We need it to have fewer regulatory requirements that take staff time and resources, and include more meaningful evaluations of how cost-effective our transportation investments will be.

(4) Bridging the Rural-Urban Divide

As I describe above, I represent a mid-size region in the heartland of California that brings together just about every type of geography possible: rural, urban, and suburban. Exactly a decade ago, our board of directors recognized that we needed to be more intentional about bridging our rural-urban divide, and so we launched our Rural-Urban Connection Strategy (RUCS) program. After the adoption of our award-winning Blueprint plan, an agreement that represents a voluntary commitment to quality growth in urban and suburban areas throughout our six-county region, our local elected officials realized that our rural areas were notably missing.

So we launched an effort designed to help our rural communities better capitalize on their existing assets. We've developed economic assessment tools that help local farmers understand how to maximize their profitability, and help

our local governments understand how to maximize their local tax revenues from productive agricultural land over the long term. We've identified that, in some cases, we've taken too much of a short-term view on air pollution. This has led to the closure of some of our local agricultural processing plants, only to find that we have increased long-haul truck traffic that now has to haul many of our products hundreds of miles in order to get them processed. We've discovered that our urban areas are economically dependent on our rural agricultural lands and vice-versa. Indeed, for every job on a farm within our region, we have two jobs in urban areas that are dependent on that farm and its economic output. We've come to understand that we'd be better off with a broader and more flexible toolbox of infrastructure investments. For example, many of our rural communities see broadband and high-speed communications as a transportation investment, on par with roads, bridges and freight rail. We've learned that not every rural, two-lane road is a farm-to-market road. Indeed, some rural transportation investments have far more economic bang for the buck than others. We believe it's our job as a regional planning agency to understand these issues and be aware of those differences, particularly in a region where 85 percent of our land is rural.

We don't do ourselves any favors by segregating rural areas from urban ones. Yes, they have undeniably different issues they're grappling with. But they are almost always inextricably linked. A vast number of rural areas across the U.S. are usually part of a larger regional economy that typically contains one or more smaller cities at its core. And once again, it's typically regional planning agencies – sometimes designated as Rural Transportation Planning Agencies (RTPOs) – and councils of governments that unite these urban-rural regions.

MAP-21 and the FAST Act gave rural officials a stronger voice in the planning process. The next transportation authorization bill should do even more to invest in regional planning capacity at all levels. It should increase the authority and direct funding for smaller, non-metropolitan planning organizations and strongly encourage local urban-rural coordination initiatives.

Congress should also consider broadening the eligibility of certain federal transportation funding programs – such as the Surface Transportation Block Grant Program (STBGP) – in order to allow eligibility to fund broadband projects and high-speed communications networks in rural communities. Here's the

rationale for this: transporting information and data is now as valuable as transporting people and goods, sometimes even more so, in rural communities who are increasingly relying on high speed communications for economic development, tourism, access to education, telemedicine and agricultural sales and marketing.

Conclusion

In the greater Sacramento region, we've learned a lot about using our regional planning role in general, and our transportation investments in particular, as way to bridge our divides and better connect our communities. I'm here today to tell you just how vital federal transportation funding is in supporting our work and strengthening our economy. But I'm also here to tell you that while we are underinvesting in transportation, simply spending more money on our current programs and traditional approaches won't work. We need to be smarter about how we invest our limited funds. The next transportation authorization bill must change the way we plan for and invest in transportation projects, doing more to embrace and encourage technology, innovation, data-driven planning and true regional collaboration that can bridge our urban-rural divides.

**Answers to Questions for the Record Following a Hearing on “Addressing
America’s Surface Transportation Needs” Conducted by the Senate
Environment and Public Works Committee**

On November 28, 2018, the Senate Environment and Public Works Committee convened a hearing at which James Corless, executive director of the Sacramento Area Council of Governments (SACOG), testified about the future of the federal transportation program and how to address the nation’s mobility needs. After the hearing, Chairman Barrasso, Ranking Member Carper, and Senator Duckworth submitted questions for the record. This document provides SACOG’s answers.

Chairman Barrasso

Question: How well is the current partnership between the federal government, state government and the metropolitan planning organization meeting the needs of the Sacramento region?

Answer: In part because of California state law and bills signed by then-Governor Wilson in the 1990s, California has developed a productive and effective framework for partnership between all levels of government including the MPOs and councils of governments within our state. MPOs and councils of governments are the only place where local elected officials get involved in the state and federal transportation planning process, and where this happens well all parties stand to benefit and transportation projects typically enjoy stronger local support. The involvement of MPOs in the process in other states is uneven, and the next federal surface transportation bill should invest more in building the capacity of these regional planning organizations in both metropolitan regions as well as rural regions across the country.

Question: What changes do you think need to be made in order to improve transportation in regions such as yours and across the nation.

From a policy perspective, we need to stabilize the federal highway trust fund and develop the next generation of user revenues that will replace the federal gasoline tax to continue federal investments in infrastructure. We need to allow more flexibility in federal funding programs that allow us to partner more readily with the private sector and encourage innovation and more technology-driven solutions. We need to break down the walls between different types of transportation – roadways, railways, water transportation and mass transit – and put a stronger focus on moving people and goods regardless of mode. And we need the authority and flexibility to experiment with road user pricing, particularly on the Interstate highway system.

Ranking Member Carper

Question: We are now in the beginning stages of our work to reauthorize the Federal surface transportation programs. As part of these reauthorization discussions, what topics do you believe particularly merit in-depth discussions for future hearings?

Answer: This next surface transportation authorization bill needs to acknowledge how much the world has changed in the last ten years and take a fresh look at a number of key issues that are worthy of future hearings. Among the topics we would suggest:

- Technological disruption and innovation: how can federal transportation investments spark new innovation, new technology-driven approaches to traffic management and new services that can provide affordable mobility solutions to all Americans while partnering with the private sector? There is tremendous promise in funding challenge grants and pilot programs to encourage innovation at the state and local level.
- Innovative solutions to rural accessibility including broadband: per my testimony, rural transportation issues are critical but we must begin to redefine “access” to economic opportunity, education and health care to allow broadband and high speed communications to be eligible for transportation funds.
- Workforce development and job training in an era of unprecedented retirements and automation: we have never experienced a bigger turnover in our transportation-related workforce but we also must reorient our workforce development and driver training programs to account for automated vehicles and prepare for a new generation of technology and data-driven mobility and logistics services.
- Mobility for disadvantaged populations: accessibility for seniors, people with disabilities and low-income workers is still far too challenging. Federal policy and investments should target removal of these barriers and coordination of various programs intended to address these populations.

Question: Technology will continue to drive the future of transportation and infrastructure in this country. What can Congress do to foster these kinds of innovations?

Answer: We are in a rapidly changing world in terms of technology, data and automation. These changes are starting to have profound effects on our transportation networks and federal policy and the next surface transportation authorization bill could consider the following:

- **Build on the success of USDOT’s Smart Cities Challenge Grant program.** While only one winner was selected in the USDOT Smart Cities program, it had a tremendously positive effect on getting local communities to think creatively about advancing innovation. That program should be restructured, updated and recreated, with

federal funding allocated for similar state level innovation challenge grants. This is a relatively small federal investment that can yield benefits many times over.

- **Address the data governance gap from significant amounts of data being generated from new technologies, including CAVs.** The federal government should help develop and implement robust data-sharing requirements for new vehicle technology to improve the quantity and quality of data collected, and to reduce the millions of dollars spent annually on technologically primitive data collection, both from regular traffic operation and from traffic crashes. In California's Capital Region, cities, counties, SACOG, Caltrans and transit operators all collect data, but there is often limited data sharing between the public and private sectors.

Because the industry is in the preliminary testing phase of CAVs operating on public roadways, there should be broad sharing of information generated by commercial technology developers so that collective learning can happen while still protecting proprietary information of the technology developers. Private CAV operators testing on public roads should be required to make data available to help manage traffic operations. Congress should set an open data standard so that vehicles and infrastructure all operate on common standards.

- **Data privacy security standards should be more comprehensive for transportation technologies.** In the era of big data that is increasingly commercially collected, limited standards and weak enforcement creates risks for the public and limits innovation.
- **Require USDOT to establish a structured advisory and deployment coordination program between industry (including OEMs) and the public sector to support the development and deployment of vehicle and infrastructure technologies.** Utilize the groups formed to design future competitive funding programs and proposed federal policy changes within Congress. For example, local governments and MPOs should be as fully engaged as state DOTs in CAV deployment efforts. Local agencies manage at least half of the surface transportation in the US and have a different perspective from states, who manage relatively uniform facilities. Many of the biggest planning and operational challenges for CAVs are in cities, where design is not consistent and operating conditions are very dynamic.
- **Provide more funding and flexibility to deploy CAV technologies** through annual appropriations and federal reauthorization of the FAST Act.
 - Make programs that deploy the use of CAVs eligible for funding beyond the historical practice of funding only capital expenses to include maintenance activities helpful to the operation of CAVs.
 - Federal aid procurement rules should become more flexible to reflect that CAV equipment is not the same as procurement for a more traditional construction projects.

- Additional federal funding should be available for building new CAV testbeds and maintaining existing ones. This could enable public agencies owning the infrastructure to collaborate with private technology developers to better understand each other's needs. That would lead to better standards and better infrastructure.
- Appropriate higher levels of funding to the FAST Act authorization levels for FHWA's Advanced Transportation & Congestion Management Technologies Deployment (ATCMTD) program and FTA's Mobility on Demand (MOD)-Sandbox program and the Lo-No Carbon bus capital program.
- Provide technical assistance and grant selection criteria benefits to support innovative cities and counties pilot testing CAVs that are electrically powered and shared, and that are targeted at improving equity and accessibility for underserved communities.

Question: In 2012, the Moving Ahead for Progress in the 21st Century Act consolidated dozens of programs, providing state and local transportation agencies with greater flexibility, while requiring performance measures to ensure accountability. Do you believe that the performance management regulations that have been promulgated by the Federal Highway Administration are achieving the goals of accountability and transparency, and are influencing investment decisions by States and MPOs?

Answer: As with other large MPOs in California, SACOG has been strongly supportive of integrating performance assessment into transportation planning and programming decisions. We have been an early adopter of performance measurement methodologies into competitive funding programs and ongoing data monitoring activities. Because we only recently adopted targets for some federal performance rules, or are in the process of doing so for others, it is too early to assess the impacts from the new federal rules in California.

A key challenge for the implementation of federal performance targets are resource needs for implementation. It's essentially an unfunded mandate for state DOTs and MPOs. It takes significant time and money to establish performance measures and monitor over time and California is similar to other states in that planning resources are inadequate at current levels. In order to support success, the federal government should match the increased responsibilities for performance management through increased funding (along with additional flexibility with existing fund sources) to support data collection, data analysis, target-setting activities, target-setting community engagement, and reporting processes as required under the new rules.

MPOs are likely to continue to be catalysts for innovation in performance-based planning and programming, but need resources to do so. Congress should incorporate into any new transportation reauthorization bill additional funding, technical assistance, and incentives for innovative practices. For example, Congress could establish a High-Performing MPO program similar to what was proposed in the GROW Act (a precursor to the FAST-Act).

Question: As you know, Congress has had a difficult time reauthorizing federal transportation legislation on time - requiring repeated extensions of the program. What would be the impact on your agency if Congress failed to reauthorize the transportation programs on time and instead passed a series of short-term extensions?

Answer: The greater certainty of funding that comes from a multi-year authorization bill supports the planning and coordination efforts that are at the core of an MPO's mission. A series of CRs versus a new authorization would be harmful to project delivery in our region and limit the economic benefit multipliers from transportation project investments.

Volatility in annual appropriation levels will likely increase without a multi-year authorization because the Highway Trust Fund is becoming insolvent. A higher reliance on general fund transfers raises the chances that Congress won't keep funding steady year-to-year through the appropriations process. The risk for lower appropriation levels will be greatest in the years when the economy is worse – these are the very years that infrastructure investments are most needed for economic growth.

It's hard to plan the implementation of large projects that will require multiple years of funding. If funding levels are not steady, the implementation timeline for a project will be stretched out and the ultimate cost of the project will increase as a result. Borrowing costs for public agencies will likely also be higher without the greater assurance of funding levels from a multi-year authorization bill. Larger projects often require complex funding packages to complete that include financing in addition to capital grants.

Question: The transportation sector is now the largest contributor of greenhouse gas emissions in our economy. At the same time transportation infrastructure is highly vulnerable to the impacts of extreme weather. How should the next reauthorization enhance the environment and improve sustainability, while also ensuring that communities build infrastructure to withstand extreme weather? In your view, what steps should we take to ensure that all investments are climate-resilient? How can we incorporate wetlands and other natural infrastructure to enhance overall climate resilience where feasible?

Answer: The federal government should consider funding for adaptation research beyond sea level rise, looking at other impacts such as extreme heat, wildfire, and secondary effects like landslides. The next federal transportation bill should provide funding for critical and vulnerable regions and locations to make infrastructure more resilient, and require the inclusion of adaptation measures when funding projects in vulnerable areas. SACOG is finalizing a transportation adaptation plan that will measure impacts on infrastructure and provide policies on how best to plan, design, fund, build, and maintain critical transportation assets in vulnerable areas. Our sister agency to the southwest of us in the

San Francisco Bay Area, the Metropolitan Transportation Commission, recently ran a high profile resiliency challenge grant program and learned some vital lessons. The federal government should provide resources to regions to help implement such programs and policies.

Question: What role do you suggest the federal government can take in enhancing public adoption of electric vehicles as passenger vehicles and in public transportation, and what are the greatest barriers to the electrification of transportation in America?

Answer: First and foremost, the federal government should maintain all financial incentives for the purchase or lease of electric vehicles. Second, the federal government should make a concerted effort to support more domestic manufacturing of electric vehicles, trucks and buses. This is the type of job training and workforce development challenge that should be met through more robust domestic manufacturing of zero-emission vehicles and can be done so in partnership with community colleges and vocational schools. Third, the federal government should provide additional resources to write down the capital cost of zero emission transit vehicles.

Question: As trustee for American Indians and Alaska Natives, the federal government has a responsibility to fulfill its treaty obligations to tribal communities. As we continue our work to reauthorize Federal surface transportation programs, we will continue our efforts to uphold those trust responsibilities. Can you share any experiences working on infrastructure development projects with tribal communities? Can you share challenges or barriers, if any, that were encountered during these projects? Are there solutions that you would recommend?

Answer: In our larger metropolitan region, our local cities and counties and our state department of transportation – Caltrans – develop infrastructure projects working in close consultation with our tribal communities. This work is typically carried out through transportation project development processes and other planning frameworks. SACOG and other MPO's work diligently to develop trusting relationships and provide ongoing opportunities for tribal engagement both in long range transportation plans and more specific project development processes. One short-term improvement that could be addressed through federal policy is the treatment of burial sites and Native American human remains during the planning and construction of infrastructure projects. There are improving technologies including LIDAR that can provide a quicker and more robust virtual scan to determine the presence of human remains and burial sites. This is far less disruptive and costly compared to physical excavation. Second, when remains and burial sites are found that are thought to be Native American, tribes need to be included in the archaeological process including decisions about whether any human remains will be transported offsite. There are many organizations and tribes here in California that are at the forefront of these issues and have a wealth of real-world experiences and

recommendations for what already works well locally, in addition to how the consultation and coordination processes could be strengthened and improved.

Senator Duckworth

Question: Given your experience with the national Smart Cities Collaborative to encourage cities to leverage technology to enhance municipal services, to what extent does expanding app based on-demand access to paratransit services improve mobility options for disabled individuals? What other changes to federal policy may be most effective to expand access to paratransit services?

Answer: The rise of app-based ridehailing providers has revolutionized transportation in general and disrupted the taxi industry in particular. Yet there is still too much of a gap between the private sector ridehailing companies and the services they offer, and the public sector paratransit services which provide essential mobility but are often far too costly. There are emerging experiments with a fair amount of promise in Boston and elsewhere, and the federal government should be investing more in testing new public-private partnerships to determine how we can provide better service that doesn't require long response times at lower costs. In addition, Congress should consider the following:

- Ensure that ADA considerations are integrated into the testing and deployment of Connected and Automated Vehicle (CAV) technologies. This will ensure that paratransit services are a part of CAV transit pooling services.
- Promote the use of paratransit by Medicaid providers. As part of the policy reforms, provide reimbursement for transportation costs at an equivalent rate for both public and private providers of paratransit trips.
- Expand the current employer-provided transit pass tax benefits to include paratransit services for training and education of travelers.
- The US Department of Justice (DOJ) should adopt the Public Rights-of-Way Accessibility Guidelines (PROWAG). Paratransit services are often challenged by streetside accessibility conditions. PROWAG would provide transportation agencies with solid, researched solutions for accessibility within their transportation corridors. Once these guidelines are adopted by the US DOJ they should become enforceable standards under Title II of the ADA.

Senator BARRASSO. Well, we appreciate the testimony of all of you. We are going to start with some questions.

I want to start, Mr. Braceras, if I could, with you. Utah, Wyoming, Senator Fischer, who is on this Committee from Nebraska, when she was in the State senate she chaired the transportation committee in the State for Nebraska; I chaired the transportation committee in the State of Wyoming.

We have a poster board here we are going to pull up that just kind of shows the bottom part, the orange I-80 heading to Utah, Wyoming, and then to Nebraska. The orange is where we are today. The green is where we are going to be in the next decade or so, with expanded amounts of traffic going back and forth. Clearly, that is where all the action is traffic-wise in Wyoming. Lots of the State doesn't have that kind of traffic, but we see it there, and then going down to Denver, Colorado.

The Congressional Research Service has come up with this map about freight traffic specifically. As you know, for every one of the big trucks, that is like 4,000 cars in terms of the impact on the roads, so we are going to see that.

What can be done, do you think, to help ensure that interstates in rural States like ours in many ways, as well as Nebraska, can keep pace with the increasing interstate commerce, as well as the commuting that goes along?

Mr. BRACERAS. Thank you for the question, Mr. Chairman. It is interesting how connected we are as a Nation and how our transportation system is really providing that connection.

When there is a big snowstorm in Wyoming and I-80 shuts down—

Senator BARRASSO. Like it did on Sunday.

Mr. BRACERAS [continuing]. The trucks back up into Utah, and we, on our variable message signs, are indicating the conditions of what I-80 is looking like in Wyoming, and truckers are making a decision of where they are going to spend their time because their hours of service are limited.

I think the point that our Nation depends on a connected transportation system, and it needs to function, and it needs to be reliable and dependable for this to work. When you think about the purpose of a transportation system, every single transportation system in the world was created around the fundamental purpose of growing an economy and improving quality of life. It is as simple as that. And if our system is not functioning well, it impacts our entire country.

So, I tell people in the State of Utah that I need a Federal transportation program, I need a Federal transportation vision because I need the roads to function in Nebraska, in Wyoming, in California in order for my Utah companies to be successful.

So, Mr. Chairman, I think it is important that for us to recognize that even though we are connected with the transportation system, that every State is unique, and regions within States are unique, and it is important for us at the Federal level to recognize that they are different. Most solutions are best done when they are done with locals and being done together, so if the Federal Government could work with States and with regions to be able to provide the flexibility to find the solutions that work for that region, then we

can start to address the transportation system for the entire country.

Senator BARRASSO. You still believe—I think it was in testimony that was given by your organization in the House—that using the highway formula funding, as opposed to trying to recreate something, is the way to go?

Mr. BRACERAS. Mr. Chairman, absolutely. As I stated in my oral testimony as well, it is a tried and proven method of delivering the highway program. We have been doing this now for about 100 years. We can make sure that we deliver the appropriate program, essentially the right project at the right time for the right region in the most efficient and effective way with the existing Federal funding formula program that is in place today.

Senator BARRASSO. This is for you, Mr. Lanham. We had a hearing earlier about ocean plastic and the oceans that are affecting plastics and what could be used, how plastics could better be used. This was a hearing that we had on plastics, and it was interesting, the Washington Post had an article last month headlined Plastic Bottles May Become Part of Roads Surface, trying to find what we could do with all of the plastics that are out there.

The article explains that using recycled plastics in road and highway construction can make our roads and highways actually more resilient, that is what they are claiming there. In other words, using plastic waste can make our roads last longer, save taxpayer money.

What do you think about the idea of actually using innovative materials, or others, about recycled tires and things to use in road building, and is there a future in that?

Mr. LANHAM. Mr. Chairman, we are big supporters of it and have been doing it for a very, very long time as a company. Williams Brothers Construction Company, we constructed 24 miles of Interstate 10 west of downtown Houston. The existing roadway, every piece of that was recycled and reintegrated back into the construction of the new freeway; nothing was thrown away. So, though that is not new materials, we didn't have to go to the quarries to obtain aggregates recently mined; we were able to reuse the materials and integrate.

I think other products are out there. We have used ground tires in asphalt pavements. There are opportunities, I think, out there to continue that innovation. What needs to understand is how the business works in construction with regards to economic drivers and costs, and how it ends up affecting the State in the price of their projects.

We look at things in mass and volume. If I have a project, and I need 100,000 tons of aggregate to produce the pavements for this job, somebody asked me can I use some crushed porcelain in there, I say, what is the volume available? A thousand tons. OK, it has become a nuisance for business, as opposed to being an actual commodity throughput.

So, those are the kinds of things that need to be weighed in the discussion, but it has been proven, we can effectively recycle and maintain quality product for the taxpayer.

Senator BARRASSO. Thank you.

Senator Carper.

Senator CARPER. I was looking forward to this hearing when I saw who was going to testify, and you have exceeded my expectations. This like a smorgasbord of good ideas and good advice, so thank you for all of it.

I had a visit a month or so ago in my office from folks from Hyundai who have a couple of plants in this country, a Korean company, and we were talking about fuel efficiency for the vehicles that they are going to be building in the future. I remember being at the Detroit Auto Show about 10 years ago. The car of the year that year was the Chevrolet Volt. It was a hybrid combination battery and regular gasoline driven engine. It got about 38 miles on a charge. This last year the car of the year at the Detroit Auto Show was the Chevrolet Bolt. It is just a straight electric vehicle, battery, and it gets about 140 miles to the charge.

Folks from Hyundai came by and they told me that about in a year or so they are going to be launching some new model vehicles that will be all electric and that will get, I think they said, about 250 miles to the charge. They are not going to buy any gasoline; they are not going to buy any diesel.

We have some States that are showing us the way of how to make sure that the folks that are not contributing through traditional user fees to the building and maintenance of our roads, while actually contributing to reducing the threat of climate change and extreme weather that we are seeing everywhere almost every week.

A couple of us on this Committee, including our Chair and Senator Inhofe and I, I think Senator Cardin as well, met with the President several months ago. He brought us in to talk about transportation infrastructure. I was surprised; I expected him to basically talk for an hour and then say we were finished, but he talked for a few minutes and then said what do you all think. I shared with him an idea that George Voinovich and I suggested to Bo Simpson almost 10 years ago, and the idea was to restore the purchasing power of the traditional user fees, gas and diesel, 4 cents a year for 4 years, and then to index going forward.

I suggested to the President that that might be a good idea, and he cut me off. He cut me off, and he said, that's not enough. He said it ought to be 25 cents a gallon, and it should be now. He said, I know there will be a lot of political pushback on that, but he said, I will take the heat for that.

Later in the day I talked to Elaine Chao, our Secretary of Transportation, and I said, was he serious, did he really mean that? She said, he has been talking about it every week for weeks.

So I think, as a former Governor, the key in getting stuff done on the financing side is leadership, whether you are the Governor for your State or you happen to be President of the United States. If the President will show that kind of leadership, we can make a whole lot of progress.

We have provided under previous legislation, as you know, a national pilot for about a dozen States for road user fees. How is that going? Any ideas? Any thoughts?

Go ahead.

Mr. BRACERAS. Yes. Thank you, Senator, for that question. There are a couple activities taking place. There is a coalition of 14 west-

ern States that are involved in what we call RUC West, Road Usage Charge West, and we have been working together for—

Senator CARPER. I call that rock and roll.

[Laughter.]

Mr. BRACERAS. It is almost that cool. My wife rolls her eyes.

But we got together, and what we are doing is, we are trying to learn even the questions to ask on what it takes to implement a road usage charge. So the State of Utah has been participating in this for the last 6 years, and what we do is we provide funding and we do little projects, all working together to be able to start to move this idea forward.

This last legislative session we brought this to our legislature, and we had this discussion about it, and we thought they would maybe sponsor a small pilot program on their own. Instead, they passed legislation instructing us to actually implement a voluntary program for road usage charge for alternative fuel vehicles, essentially the electric vehicles, because they see very much this transition that is happening. It is clearly an inflexion point in the technology for automobiles where it is going to be electric vehicles, and it is going to happen faster than most people think.

So, by January 2020 we have to have a program turned on to actually have an implemented program. So, we are going to learn from this, and expectations are that we are going to expand this as we become more comfortable with how to do this.

The importance in transportation—and Bob mentioned this in his testimony—the connection between the use and how much you pay for that usage or how much impact you make on that system, that connection is an important one, and a road usage charge, I believe, provides the ability to make that connection, and it also provides the opportunity to price appropriately. As Mr. Corless said in his testimony, it is important to recognize that 5 miles in rural Utah is quite different than 5 miles in urban Utah, and one of the points that we have been selling to our—not selling—excuse me. One of the points, as we have been working with the Farm Bureau in Utah and the rural members of our State, is that it will give us the ability to not charge on non-public roads. So, if you are running on a private road, you won't be charged for that usage, and that is something that is becoming attractive.

So I think there are ways to be able to implement a program that will help us carry the transportation forward. But I don't think this is something that happens in the next 5 years; I think it is important to look at the gas tax. That is going to be the way we fund transportation, I believe, for the next 20 or so years, but we need to recognize a transition is taking place.

Senator CARPER. All right.

My time has expired. Let me just ask Mr. Lanham and Mr. Corless, do you approve this message?

Mr. LANHAM. Yes, sir.

Senator CARPER. Mr. Corless.

Mr. CORLESS. Senator Carper, I think the Federal Government will only follow the States on the next system of pricing. I think we have 5 to 10 years to get more than 25 States to really implement what Utah is doing and other States, so we have to get on with it. We have a short term problem and a long term problem,

but that long term problem is going to come at us very quickly, and I think we need a majority of the States to be out there deploying so the Feds can pick up the best ideas coming from the States and localities.

Senator CARPER. Good.

All right, thank you very, very much. Thanks for your example in Utah, especially.

Senator BARRASSO. Thank you, Senator Carper.

Senator Inhofe.

Senator INHOFE. Thank you, Mr. Chairman.

Let me, real quickly, try to get three things in, crowded, just so I can get your comments, and if there isn't time to do it, we can do this for the record. This will be for all three of you. Those three things would be work force development, our freight program, which we have included in the past, and then also the project delivery problem.

Starting off with the work force development, I am very proud, and I think you know this, Mr. Lanham, because you have a lot of good members in Oklahoma. You have probably heard me say this before, but we had a Governor once named Bartlett. He and I, when I was in the State senate—and we are talking about way back, before most of you guys up here were even born. Back in the 1960s we started that program. We started that for Oklahoma. It has been a leader for a long period of time. In fact, we have recently extended that.

One of the problems we have in work force development—and I want to get comments from each one of you on that issue—is one that is across the board. When we did the FAA reauthorization bill, I put an amendment on there that you had experimental pilot programs to develop work force development program in the FAA reauthorization bill.

Anyone want to comment on that issue, work force development? Now, you are doing a good job. I know that you guys put forth programs where you can hire people right out of these technical programs, and that has been very, very effective in Oklahoma.

Mr. LANHAM. Part of what we call our OJT, on the job training, program where we liaison with the technical schools or can work with the vocational training out of the high schools, but yes, sir, works well. It is a major emphasis and focus for AGC of America. We are partnering with AASHTO, Federal highways. We have a pilot program trying to go. We have five States that have signed on that are working with a test project on how to integrate work force development.

We are battling a lot of cultural stigma with regards to most of our challenges. It is not with professional trades, engineers; it is with the construction trades, the carpenters. And that is not a college bound career. We are offering alternatives to young people and well paying careers, and how do we reach through that bias that seems to be out there.

Senator INHOFE. Well, thank you. Is it fair to say that you have had comparable success in other States that you have had in Oklahoma? Because you have had success in Oklahoma.

Mr. LANHAM. We have, yes, sir.

Senator INHOFE. That is good.

On the issue of the freight program that we had, Mr. Braceras, I notice you made a comment in your written testimony on an Oklahoma company, an Enid, Oklahoma, company, so you are familiar with the problem.

I was chair of this Committee when we did the FAST Act, and we developed a program for the first time, a freight program. Any comments to how that seems to be working right now or areas for improvement on that?

Mr. BRACERAS. Thank you, Senator. That program is working very well for the State of Utah. To me, the freight program was a clear recognition by this Committee and Congress of the importance that the transportation system serves for freight. When you think about it, the freight is that connection for people. Even if you are not out there using the roadways, you depend on the freight that is being moved by the highway system and the rail system. So I consider the freight program one of the really good additions that came about. And we are doing projects right now that we could not have gotten to and would not have been able to prioritize but for the freight program, so thank you.

Senator INHOFE. Well, good.

Mr. Lanham, it was an off the record comment that you made in response to something Senator Barrasso stated. The Federal formula program has worked. That is one of the few things in government that seems to be working. It does take into consideration the needs of various States; they have a lot of input. When you come up with a formula, and you introduce a comprehensive bill, and everyone is mad about it at this table over here, you have done a good job.

Any other comments on the two subjects that I brought up on this?

All right, thank you very much, Mr. Chairman.

Senator BARRASSO. Thank you, Senator Inhofe.

Senator Cardin.

Senator CARDIN. Thank you, Mr. Chairman. I thank all three of our witnesses.

I live in Baltimore and commute to Washington, so I have a vested interest in us getting this right. Tomorrow, Senator Van Hollen and I have a breakfast meeting in Montgomery County. It is about 40 miles from my house, and where the meeting is is about 10 miles from the Capitol, and I will be commuting about 3 hours tomorrow morning. We have a challenge in this region, and we have a challenge in this country, so this issue is critically important to all of us.

The FAST Act passed in 2015. We hailed it as a major accomplishment, and it did give us predictability through September 30th, 2020. This Congress should have dealt with infrastructure. We were not able to deal with the transportation infrastructure; we did do it with water, and I agree with the assessment of that being a great accomplishment. But we are going to have to deal with it in the next Congress. It has to be done.

What I would like to just get your views on is that legislation we passed in 2015, it had acceptable balance between highways and transit; it dealt with major projects of national significance; it continued creative financing through the TIFIA program, provided

local flexibilities. We have already talked about that, including the transportation alternative programs. Dealt with the regulatory system; tried to streamline that process. Senator Inhofe mentioned some of the other areas in dealing with freight.

Now, I would like to just get your view as to what area of change would you like to see most as Congress looks at a multiyear reauthorization of our transportation infrastructure. I would illuminate that I hope we would all agree is our No. 1 priority, that is, the size of the program, making it as large as possible, obviously requiring revenues; and then, second, making it as long multiyear as we possibly can because of the predictability of these projects having a longer lead time, the more aggressive we can be on infrastructure in this country.

So, recognizing we want a robust program, we want it adequately funded. Some of us do serve on the Finance Committee, so we are going to have to deal with that issue. But the EPW Committee is the principal committee on this issue, and I would just welcome your thoughts as to where you would like to see improvement on the FAST Act as it relates to the issues that are under our Committee's jurisdiction.

Mr. BRACERAS. Thank you, Senator, for that question. We have made significant progress over the last, I would say, 15 to 20 years in how the program is being delivered right now. There has been a lot of work done in streamlining the project delivery.

And when I use that word streamlining, I hope it is not looked at in an offensive way. The flexibility that Congress has given to State DOTs, we have assumed NEPA, the environmental process. The State of Utah has taken over that responsibility, and it clearly has allowed us to do the right thing at the right time for our citizens. We are the biggest champions of the environment in Utah; that is where we live, that is what we love, and our citizens hold us accountable for that, so I thank you for that flexibility in that area.

I would ask that we continue to look at options for providing additional flexibility for how we use the funding that we have available to us. One of the things that we do aggressively is we exchange Federal money for State money for our locals. Our locals don't do as many Federal projects as we do, and they struggle with the process. So, they line up, and we exchange at 85 cents on the dollar, and we give them State money that gives them the flexibility to deliver the projects that they need for their citizens, and they can deliver it more effectively and efficiently, and we then manage the Federal program because we do it every day.

So, I think that is an example of how the Federal money brings some restrictions with how we deliver these projects, and it doesn't have to be as complicated as it is. If Congress and the Administration can focus and be partners on the outcomes of what we are trying to achieve. We are trying to save lives, we are trying to lower the total cost of ownership of our infrastructure by doing the right project at the right time. And we are trying to improve mobility so you don't have to spend 3 hours commuting to a meeting that probably shouldn't take that long. This is all about quality of life and our economies, so if we could focus on those outcomes more, provide

flexibility for States and locals to be able to deliver the program, I believe we can make another step forward.

Mr. CORLESS. Senator Cardin, three things quickly. First is innovation and technology. I think we do have some programs in the current FAST Act, but we have to make it real. We have to go beyond just sort of eligibility. We have to really push a whole different thought process around ITS, innovation technology, and really imbedding those in how we operate the transportation system, No. 1.

Two, I think we have to strengthen regional planning, rural planning, build capacity among organizations like mine.

Then finally, I think—I credit Utah for this but also the State of Virginia—doing a lot of very quantitative data driven project selection using data. We have to basically re-instill trust among the public that those investments, limited dollars, are getting the biggest bang for the buck. I think Virginia has gone from zero to 60 with its SMART SCALE process. It did that after it passed a major revenue increase at the State level. It is transparent. People understand what benefits they get from those projects.

We have to get into that across all the States and all the regions in the country, and I think the USDOT can have a strong role in helping build that capacity for us on the data side.

Mr. LANHAM. Senator, I would just add two more things that have been discussed. One is backup on work force development. I think there is an opportunity to provide for work force development encouragement in the next reauthorization. The second is, continue to look for opportunities to add what I would call contemporaneous reviews in the NEPA process and the permitting process. There are still some opportunities where those things can run concurrently instead of consecutively and save some time, because we end up with a duplicate process, and I think we have a hard time explaining that to the public, what we do.

Senator CARDIN. Thank you.

Senator BARRASSO. Thank you, Senator Cardin.

Senator WICKER.

Senator WICKER. Mr. Chairman and Mr. Ranking Member, I have to say that this has been a very disappointing hearing. I was hoping you would choose some magicians to come in here, perhaps some alchemist to tell us how to stir a pot of lead, get it to the right temperature, and turn it into silver and gold, and we wouldn't actually have to pay for infrastructure.

But here we have learned, and we are hearing it from both sides of the aisle, presumably even from the President of the United States, that if we want to build roads and bridges and infrastructure, we have to come up with some revenue solutions to actually pay for this. So, I am just heartsick and disappointed that we are having to go down this path.

But since we are, Mr. Braceras, you are saying that the Highway Trust Fund is a solid mechanism for delivering the funds in the right way, is that correct?

Mr. BRACERAS. Yes, sir.

Senator WICKER. And you think for the next 10 to 20 years the gasoline tax is going to be the way to put money into that Trust Fund?

Mr. BRACERAS. I believe so, yes, sir.

Senator WICKER. OK. Do you advocate or have you given any thought to going from the per gallon to a percentage of the price, as some States have done?

Mr. BRACERAS. Yes. In the State of Utah we haven't made that jump, but we have indexed the gas tax, and the gas tax rises based on CPI.

Senator WICKER. So it is the same result.

Mr. BRACERAS. It is close to the same result. The legislature has put a cap, but it is a pretty high cap, on how high that will continue to go, and every year our tax commission makes that adjustment based on the cost.

Senator WICKER. When was the last per gallon enacted?

Mr. BRACERAS. In 2015.

Senator WICKER. OK. And what is it?

Mr. BRACERAS. Today, it is sitting at 29—

Senator WICKER. I am asking the Federal.

Mr. BRACERAS. The Federal rate is 18.4 on gas.

Senator WICKER. And when was that implemented?

Mr. BRACERAS. In 1993.

Senator WICKER. OK. What if we had indexed that back at that point? Where would we be?

Mr. BRACERAS. We have lost about 50 percent of our purchasing power, Senator, since that point. Now, based on what you set as an index, I don't know if you would completely make that up, but we would not be fighting. In my opinion, we are fighting two battles: we are fighting the inflation battle that is a pretty powerful one, and we are also fighting the fact that we haven't made a change in so long.

Senator WICKER. So, if we had just kept it even with inflation, we would be 50 percent better?

Mr. BRACERAS. Yes, sir.

Senator WICKER. Or words to that effect. Now, your organization also has published a matrix of illustrative surface transportation revenue options which would be ways, in decades to come, to move to other forms. And then we have been talking about this user fee or whatever the terms are, vehicles per mile and things like that.

Let me ask you, Mr. Braceras, which of those options do you think are the most viable going forward?

And then if Mr. Corless and Mr. Lanham could follow up and explain exactly mechanically how this works and we differentiate between rural roads and private roads and interstate highways in our ability to collect the revenues, and are there privacy concerns that you think are real in terms of vehicle owners having to give out that information.

Mr. BRACERAS. Senator, I will speak for Carlos Braceras as Executive Director of the Utah DOT in this response. Yes, I think the gas tax is the way to go in the future. As an association, we provided a menu of options, and over the next 18 months we want to home in on a better way of providing advice to Congress on what options are available.

But as you have the challenge of getting all your members on the same page, we have the same challenges, 52 members to get on the same page as well. But I believe the gas tax is the way to go in

the near future, and I also believe that road usage charge, which is the term we are using instead of VMT, but road usage charge is the path forward for a longer term fix to this, and we need to start transitioning in.

Senator WICKER. OK, so how hard is it to differentiate? How do we do that, between the rural roads and the interstates and private roads?

Mr. LANHAM. Senator, you can differentiate, but it will require technology that we have seen some pushback with GPS tracking. Obviously, where you have driven has been an issue for many groups with regards to privacy; on what road was I driving at what time. But that is exactly the information we need because engineers, the smart ones, that is exactly how they design these roads, is what kind of traffic is going to be on and when. So, I think it feeds to the managers of the system how to better take care of the roads and design them better in the future when we actually have better data in the entire network.

Senator WICKER. How do we do it, Mr. Corless?

Mr. CORLESS. Well, Senator, either you do odometer readings, which is very imprecise and every road is the same, every mile is the same, or you do it with what is already the technologies installed in most vehicles; you have a device using GPS, it knows where you are going. There are definite privacy concerns.

The good news about us having 5 to 7 years is I believe we can work those out. But I think we have to be precise; we have to use GPS, because there is a fairness issue that I brought up, and I don't think every mile is the same if you travel rural versus urban.

Senator BARRASSO. Thank you, Senator Wicker. Staff has been instructed, based on your admonition, to make sure that for the next Committee hearing we will have an authoritative, credible, and accurate alchemist to make a presentation.

Senator WICKER. Thank you very much. I appreciate your attending to that.

[Laughter.]

Senator BARRASSO. Senator Van Hollen.

Senator VAN HOLLEN. Thank you, Mr. Chairman.

Thank you all for your testimony. I really want to pick up on Senator Wicker's questions because I think we all recognize, on a bipartisan basis, we have huge infrastructure needs in many areas and obviously in surface transportation, and a big gap between those needs and the resources available, and I think the political stumbling block really has been identifying a way that we can bring in those revenues.

As I understand the testimony of all of you, in the short term, you believe some kind of increase in the Federal motor fuels tax is the way to go. Is that correct for all three of you?

Mr. BRACERAS. Yes.

Mr. LANHAM. Yes.

Mr. CORLESS. Yes.

Senator VAN HOLLEN. And just in terms of the politics of this, as you look around the country now, that is still the primary funding mechanism for States, is it not?

Mr. BRACERAS. Yes.

Mr. LANHAM. Yes.

Mr. CORLESS. Yes.

Senator VAN HOLLEN. All right. And that is true in States that are dominated by more Republican Governors and legislatures, as well as Democratic Governors, right? And you increased it in Utah in 2015 and a lot of other States in the last 5 years increased their gas taxes?

Mr. BRACERAS. Thirty-one other States.

Senator VAN HOLLEN. In the last?

Mr. BRACERAS. Thirty-one other States since 2012.

Senator VAN HOLLEN. Since 2012. So I just think, as we look at both the short term and then the longer term, it is important to look at some of the State activity. And I agree, as we look to the long term, the States are also sort of examples of innovations that we should see how they test out and whether we can adopt them.

In the absence of additional Federal funding, States, or certainly localities that are able to do it based on the concentration of populations, are moving forward more in the area of public-private partnerships, is that right?

Mr. BRACERAS. Yes.

Senator VAN HOLLEN. And can you talk about how that has sort of picked up around the country? I know in Maryland, for one of our major transit projects, the Purple Line, it is a public-private partnership. So, can you talk about the examples of where that has worked well, but also some of the potential horror stories that people encounter with public-private partnerships and where you see that fitting in to this equation?

Mr. BRACERAS. I am not sure if I can come up with a horror story, but I think the important thing on a public-private partnership is, again, one size does not fit all in these because we are not all the same. A public-private partnership, I have characterized to our legislature before, is really everything on the spectrum.

If you look at when we went into design build to deliver projects, that is an increase in the public-private partnership when you are working with the contractors and the consultants. Or construction manager-general contractor, that is another movement on the scale of a public-private partnership.

Maybe this is the horror story. We have evaluated doing full tolling on a brand new freeway facility as a public-private partnership, and the public pushback was tremendous against that because there was a fear that they were going to lose their ability to control; they were going to be one level away from being able to control.

But we also do public-private partnerships right now in our rest areas, where we work with private companies to provide facilities and features in our rest areas that we couldn't have done before. We do public-private partnerships with our Web based applications, where we will provide advertising opportunities. Our legislature is going to move a bill this session.

We have talked about doing it with our IMTs, Incident Management Teams, but our public safety officers did not want to have commercialization of those Incident Management Teams, but we are going to do courtesy patrols that will be public-private partnerships.

So the idea is, I think, a very important one that we need to continue, and it is going to continue to evolve in the country, and I believe there are opportunities for public-private partnerships whether you are in a rural State or in an urban area as well, so it is not one size fits all.

Senator VAN HOLLEN. Got it.

Mr. CORLESS. Senator Van Hollen, I am a big fan of public-private partnerships. In a small scale, with a Civil Lab program, that is what we have been experimenting with in Sacramento, California.

But I do want to say something that I think is very important. I don't believe that a public-private partnership is the way to generate revenue that is just sort of sitting out there mythically waiting on the sidelines; it is a way to manage risk. That is really the benefit of P3s, is that it manages risk; it puts it in the private sector. In order to do that well, we in the public sector have to be good dealmakers; we have to understand actually how to make a deal and what the private sector brings and what we need in terms of the public interest.

But with a few exceptions, toll roads perhaps being one of them, we are not making a profit in the transportation sector. That is not what we are doing. We are moving people and goods and bits of information. We decided long ago that movement was a public good, so there is not, generally speaking, a profit there. So we have to be careful that this is not some sort of a recipe for them coming to save the Federal transportation program. It is a tool which we should be using far more often.

Senator VAN HOLLEN. And let me be clear. I think private-public partnerships are an innovative way to try to leverage some additional resources. As you say, the goal is not to make a profit, and that is where public oversight is absolutely essential, kind of a utility type model. There have been some examples, like parking garages, where all of a sudden people were paying a much bigger fee, and it was going into bank accounts of some Wall Street banks.

So I am just suggesting that if we don't get our act together at the Federal level and increase the Federal funding component of what we do here, you are going to see more pressure for leveraging additional funds through public-private partnerships. And while they may be available in both rural and urban areas, they are going to be more available in urban areas, so I am just encouraging everybody to come to the table to come up with a solution for Federal revenue.

Senator BARRASSO. Thank you, Senator Van Hollen.

We have a briefing with the Secretary of State and Secretary of Defense coming up within about 25 minutes, so if we could try to keep it to 5 minutes each.

Senator Rounds.

Senator ROUNDS. Thank you, Mr. Chairman.

Mr. Corless, you indicated earlier that you really like the idea of the options that are made available so that we can address local needs based upon what the demands are in an urban versus a rural area, and I got to thinking it sounds good because in South Dakota we are rural, and to be able to do this is helpful for us. Yet at the same time, one of the benefits of having a Highway Trust

Fund, and one that has stood the test of time over literally decades, has been that this has been a Trust Fund for infrastructure development, and we restrict it to that.

The more lenient we are in terms of what is included in that means, then, that we risk the chance that the public will see this as one more opportunity to tax them for those areas that may be somewhat related to transportation, but not necessarily for brick and steel and so forth, and asphalt.

Talk to me about how you view this in terms of the urban challenges you face and how we still keep that sense of confidence in the public that gas tax money is going to go to roads and bridges, and not to other types of designs and attempted changes of, as you say, moving people at the right time of the day as opposed to actually building concrete roads.

Mr. CORLESS. It is a great question, Senator. Let me be clear. I think to keep the trust in the Trust Fund we have to keep it focused on transportation, on moving people, goods, and information. I don't advocate for any more mission creep than that.

However, I do think that we are at a point now in our transportation system where we need to actually begin to transition from constructing to operating. We have high poverty in our rural areas. Moving people from point A to point B sometimes takes operations funding.

To be clear, the Trust Fund was set up to build the interstate system. It was set up as a construction program, so it is a question in front of you in terms of how much you want to allow some operations. There is some flexibility already. We have the congestion mitigation air quality funds, CMAQ, the STP block grant funds. We are able to use some eligibility in some of those.

I don't think we should transition to an entirely operational program, but I do think it is in the Federal interest to basically be a seed investor to get some of the best ideas out there going, but to limit it, say, for a 3 year window on some of these more operational improvements. That is how we use our CMAQ funds. I think we could actually extend that into other sources of funds so that we can get the most innovative projects possible.

Senator ROUNDS. Thank you.

Mr. Braceras, your thoughts. Once again, I think this is the biggest threat we have to being able to pass a long term project, is making sure that we can find the appropriate split between, as Mr. Corless has suggested, operational needs versus construction and reconstruction needs.

Your comments?

Mr. BRACERAS. Yes. Thank you, Senator. I believe focus is very important in what we do. That is how we are going to develop the trust that we need from our citizens to be able to deliver this program. In the State of Utah, maybe we are lucky in this way. Our Federal money makes up about 20 percent of our total program, so we have the gas tax that I talked about earlier, but we also have just over 21 percent of the State-wide sales tax that goes for capacity projects. So, we focus our entire Federal program on the simplest maintenance projects that we have on the State, so we are doing pavements and bridge projects, and we can very clearly show

what that program is delivering for our citizens, and it really is that focus, I think, is important.

So, as you consider where you want to go with the next reauthorization, I believe being very clear on what you are trying to achieve with the Federal program is going to be important. We are going to put a man on the moon type of thing. But that is a very important part, I believe. We have to provide that vision.

Senator ROUNDS. Mr. Lanham, we are going to run out of money, according to the forecast right now; the Trust Fund is there. What should be the focus of the Trust Fund resources we have?

Mr. LANHAM. Senator, I think we need to take a hard look at what our mission is on the Federal level and what it is that we need to be able to spend money on, and what should be the local responsibility. I think we are at a point where I think do we have the money? Can we afford it? If we can't, then what do we need to be doing with it on a priority, and that is what we need to focus on. I think we stretch too far with too little, and we are not completing things.

Senator ROUNDS. Thank you.

Thank you, Mr. Chairman. I yield back.

Senator BARRASSO. Thank you, Senator Rounds.

For the Senators just arriving, we have a briefing with the Secretary of State and the Secretary of Defense in about 15 minutes, so I am going to ask that people try to stay within the 5 minutes.

Senator Gillibrand.

Senator GILLIBRAND. Thank you, Chairman Barrasso and Ranking Member Carper, for holding this hearing today to examine our Nation's transportation infrastructure needs.

In the Northeast, and in New York in particular, we are faced with the challenge of aging infrastructure that has outlived its useful life and needs repair or replacement. On top of that, climate change fueled sea level rise and extreme weather threaten to put our infrastructure at risk if we do not rebuild it in a more resilient way.

Our rail infrastructure is literally crumbling. Our century old Hudson Tunnel, used by Amtrak's Northeast Corridor and hundreds of thousands of New Jersey transit commuters each day are at serious risk of failure. This already aging tunnel has been made worse by flooding and corrosion during Super Storm Sandy. Closure of that tunnel would shut down Amtrak service for people trying to get from New York, Boston, and Providence on one side of the Hudson River to cities like Newark, Philadelphia, Wilmington, and Washington, DC, on the other side. It would be nothing short of a disaster, and an avoidable one at that.

That is why I cannot talk about our infrastructure needs without mentioning this fact: every day the current Administration delays moving forward with the Gateway Program, they are gambling not just with New York's economy, but the economy of the entire Northeast region. The Administration should stop stalling and work with New York and New Jersey in a constructive way. They should begin by releasing the environmental impact statement for the Hudson Tunnel so that we can move this critical project forward.

We also need to ensure that we are fully investing in our subways, commuter railroads, bus services. At a minimum, we need to protect the 20 percent set-aside for mass transit in the Highway Trust Fund.

But we can be doing even more to deliver additional dollars for transit capital and maintenance projects. Funding is necessary to fix safety problems and expand capacity to keep up with the demands of riders who will rely on public transportation to get around. We shouldn't be waiting for trains to break down or crash into platforms, or multi-hour delays that are basically leaving our commuters stranded, unable to get to work on time. There is such a sense of urgency in our city right now that we have to do something to improve our subways and commuter railroads, so we have to get serious about the problem.

New York's infrastructure challenges are not limited to just rail and transit. According to our most recent data, there are more than 18,000 structurally deficient bridges in our State, including the Brooklyn Bridge. We also need to think about our roads and highways, and how to integrate technologies like autonomous vehicles that have very different operational requirements than existing vehicles, and that includes everything from roadway signage to lane markings to pedestrian safety. There are also many rural highways in upstate New York, as there are across the country, that will prove challenging for these vehicles to operate safely on.

I hope that Congress looks forward to the next surface transportation reauthorization in 2020, as well as other legislative priorities for infrastructure. We have to take a comprehensive approach that provides funding necessities for highways, bridges, railroads, safe and resilient investments that meet our transportation and mobility needs.

Two questions with my minute and 40 remaining.

Mr. Corless, what more should Congress be doing to invest in public transit and ensure that transit agencies have the ability to maintain their existing infrastructure and meet the current and future capacity needs of riders?

Mr. CORLESS. Senator Gillibrand, thank you for that question. Even in Sacramento we are now having over 40 days a year above 100 degrees. Our light rail system is breaking down due to the heat, and we are stranding people, and they are walking along the train tracks.

So whether it is the New York Metro region or a city like Sacramento, here is the fact: we have aging mass transit infrastructure that was funded federally in the last five decades that is now actually about to fall apart, and you cannot do that with just simple FTA formula funds, so we need some sort of infusion, a pilot program, if you will, to rebuild the transit systems big and small across the country, because the formula funds are not going to do that, and it is getting past the point of being unsafe.

Senator GILLIBRAND. And what would be the consequences for transit riders if funding of the mass transit account of the Highway Trust Fund was reduced or eliminated?

Mr. CORLESS. It would be pretty catastrophic, because I think, again, you are already seeing—I don't have to tell you about the New York subway and Amazon moving over to Long Island City.

You are having a hard enough problem as it is. So I think the connection between transportation in general, transit in our major metro areas and economic prosperity is strong, and we can't lose it.

Senator GILLIBRAND. Thank you.

Thank you, all of you, for participating.

Thank you, Mr. Chairman.

Senator BARRASSO. Thank you, Senator Gillibrand.

As I turn to Senator Capito, we are going to conclude the hearing a few minutes before 11, so that gives time for 5 minutes for you and 5 minutes for Senator Whitehouse.

Senator CAPITO. Thank you, Mr. Chairman.

Thank all of you for being here today. It has been an interesting conversation. I am from a rural State, West Virginia, and we would benefit immensely from future investments in surface transportation. Some people think Senator Byrd has paved the entire State of West Virginia, but we still have things like the King Coal Highway and Coalfields Expressway and Corridor H that we are looking on, and they are different highways to build because of our terrain. I am sure Mr. Braceras can identify with that, being from a mountainous State as well.

But just last year West Virginians voted via referendum to approve a \$1.6 billion in road bonds to fund projects across the State. I talk about it quite a bit because our State is known to not be one of the wealthier States, wealthier citizens, but our citizens really sort of rose up and said this is important to us. We use our roads frequently, we are rural, we use them for everything, and crumbling bridges and potholes and other things that are difficult for us are very important to everyday lives of everybody citizens. So \$1.6 billion is quite a big stretch.

And you noted in your testimony, Mr. Braceras, that 33 other States have made other improvements, 31 States have raised their gas tax, which we did that as well.

So, what I would like to see in a future infrastructure package is a reward to the States that are really stepping up and putting their bang for the buck by their States, and I would like to know, if anybody would like to respond to that in terms of how you think that the State really taking that initiative.

You mentioned the Federal input into Idaho was only, what, 22 percent. That is pretty impressive. What would your comment be on that?

Mr. BRACERAS. I think, recognizing that States are stepping up and filling the needs, the citizens clearly need and want transportation systems to work; they depend on it every single day.

Senator CAPITO. And it is a political winner, too.

Mr. BRACERAS. I had a phone call from the Wall Street Journal right after the legislature raised the gas tax in 2015, and they said, well, isn't Utah a pretty red State? This is unusual for a conservative State.

And I said, you know what, it is a conservative principle to take care of what you have and have a lower cost of ownership, and that is what our legislature saw, is that by investing in infrastructure, they were actually saving the taxpayers money in the long run; and that is difficult because you are looking at a longer I call it political

timeframe is not really the same as an engineering timeframe sometimes, or economic timeframe, so it becomes difficult to do, but you have to develop that trust.

So it is very critical, I believe, for this Nation to be able to step up and develop what I call a world class transportation system. If we are going to continue to be leaders in this world, we need a world class transportation system.

Senator CAPITO. Let me ask you, Mr. Lanham, a question. I am a big proponent of expanding our broadband infrastructure, which I think goes hand in hand with our surface transportation. In your experience of building, what are you seeing advances around the country in terms of dig once kind of propositions where you are putting the infrastructure in for fiber and other things at the same time you are doing improvements to the road transportation or building a new road?

Mr. LANHAM. Yes, ma'am, Senator. We see a lot happening in that area. It is complicated, too, because there are so many different entities that own these facilities to get them to come to the table, because they are providing service for the public, they are occupying the public right of way free of charge, and yet they provide nothing but headaches to my friends for trying to execute projects. But we are seeing come and trench, where in one spot everybody goes in at the same time; better engineering, better documentation about where they are at.

So, what we see is then building a library of information that we will be able to protect that asset in the future because we know where it is at and what is actually there with an accommodation for expansion.

Senator CAPITO. Well, thank you for that.

The other thing I would comment, one of the comments you made about constructing a toll road in Idaho, we had a very similar experience in West Virginia where it was simply a 30 mile four lane to make four lane, and the local folks just really got very, very upset. I mean, it was going to be \$4 both ways. That is a lot of money.

So they were going to opt to go back down on that dangerous two-lane, which defeats the purpose of building a safer highway. So sometimes toll roads may be an answer in a lot of cases, but in rural areas it is really, really tough to have localities buy into that.

Thank you all very much.

Senator BARRASSO. Thank you, Senator Capito.

Senator Whitehouse.

Senator WHITEHOUSE. Thank you, Chairman.

I just want to say a word about smaller coastal communities and the infrastructure needs that they have. I know Utah is not very coastal, and even Sacramento isn't very coastal.

Mr. CORLESS. Not yet.

Senator WHITEHOUSE. Yes, exactly.

[Laughter.]

Senator WHITEHOUSE. We are working on it. Our problem in Rhode Island is that by the time Sacramento gets coastal, there is a hell of a lot less of Rhode Island, and we don't want that to happen.

But we have, in my State, about 10 to 11 inches of sea level rise since the hurricane of 1938, the really monster storm that hit us

back then. So not only do you stack up that extra sea level for the next big one, but it is not that way just along the shore, it is also that way all the way out to sea. So, when you are dealing with storm surge, you have that whole higher heap of ocean out there that is now surging ashore.

People aren't very expert yet on how you correlate additional sea level rise to storm surge. You know it is at least about 10 to 11 inches. It could be a lot more. So we have communities who are facing this problem. We have communities where, in a storm, you have to figure out where you pre-deploy a fire truck.

Senator Gillibrand was here. One of her neighborhoods burned in New York because the fire and the fire trucks were separated by a flooded area. If that happens, it is a terrible thing for folks.

So there is this whole new planning for increased sea level risks, storm risks that coastal communities are facing, and people are starting to get on their case. Moody's is starting to judge their municipal bonds based on sea level rise storm surge kind of risks and how ready they are for that. Freddie Mac is warning of a property values collapse in coastal areas, which would have a terrible effect, obviously, on the tax base of those smaller communities, so there is a warning coming from Freddie Mac along with the warning from Moody's.

And if they turn for help to FEMA and try to figure out from FEMA maps what this risk looks like, they are being misled, because our experience has been that FEMA maps are spectacularly wrong. We have had to do State level and local work in Rhode Island to do the coastal mapping, Mr. Chairman, because FEMA is unreliable as a partner in terms of the accuracy of its mapping.

And it is not just Rhode Island. When the big hurricane hit Houston, there was a 50 percent error between what FEMA predicted in terms of flooding and what flooding actually took place.

So, if you are in a coastal community, you have your municipal bond people looking at you with a glinty eye saying, what is up, are you ready for this? You have Freddie Mac saying, by the way, these property values you depend on to pay for your municipality might collapse, so there is not just a lot of money pouring in. The mapping that you have to rely on to make these plans is not reliable. And there you are as a town manager trying to figure out how the hell do I handle this.

So I love the conversation that we are having about infrastructure. I am all for very big investments in infrastructure. But before you do the infrastructure, you have to have the plan so that the community can get it right. And I think we have a big gap right now in helping particularly coastal communities plan for this. It may be that the weird temperature considerations that you described in Sacramento, Mr. Corless, are a similar kind of analogy, something new that small communities have to deal with.

I know that Phoenix, Arizona, for instance, is having to entirely figure out how it redoes its emergency response staffing because it gets so hot for so long there that people can't work out of doors in that heat; and if you are a firefighter, you can't decide to work indoors that day, you have to go where the fire is.

So they have to wholly redo how they staff, and they have to have a whole extra team for cooling people down. It changes the

way they work. The airport had to be closed because the tarmac was melting and the air was too thin for jets. So there are all these problems that emerge, and it is really hard for local communities faced with these problems to think their way through them with no support in a very constrained municipal budgetary environment.

So, any way in which you all working on this can help keep your focus on this and your attention on this, I think it is really, really important. Just going back and rebuilding in place what we already built is probably not going to work. We have to understand how dramatically the climate is changing. And if we are going to build 30, 40, 50 year projects, we have to be planning for the full lifecycle of those projects.

So my time is out, and I just urge you to think about that as we work forward. Infrastructure is great, but these peculiar and changing conditions that are driven by climate change and carbon emissions absolutely need to be taken into account, and we are leaving small communities stranded without the support to help them work through a lot of new science and a lot of new engineering.

Senator BARRASSO. Well, thank you very much, Senator Whitehouse.

Thank you to each of our witnesses who are here. We are very grateful. We are going to leave the hearing record open for 2 weeks in case others have questions. They may provide written questions. We would appreciate your written responses.

I want to thank all of the members for attending, as well. I especially want to thank our esteemed guests for their time.

Yes.

Senator CARPER. All I want to say is we have a lot of hearings in this Committee and other committees that we serve on. Some of them are really good; some of them maybe less. This was terrific. You all did a great job, and I just want to applaud you and thank you for being here. It may serve as a catalyst and give us some good ideas to work with. Thank you.

Senator BARRASSO. Thank you again.

The hearing is adjourned.

[Whereupon, at 11:01 a.m. the Committee was adjourned.]

[Additional material submitted for the record follows:]

**Testimony by
American Association of Port Authorities (AAPA)
Before the
Senate Environment and Public Works Committee
Hearing on
“Addressing America’s Surface Transportation Infrastructure
Needs”
Wednesday, November 28, 2018
9:30 AM**

Thank you Chairman Barrasso and Ranking Member Carper for convening this important hearing. The American Association of Port Authorities (AAPA) appreciates the opportunity to submit testimony for this hearing. AAPA will be releasing a comprehensive FAST Act reauthorization platform in the coming months. This testimony focuses on the surface transportation needs of the freight network.

AAPA is the unified voice of the seaport industry in the Americas, representing more than 130 public port authorities in the U.S., Canada, the Caribbean and Latin America. This testimony is on behalf of our U.S. members. Seaports deliver vital goods and services to consumers, ship U.S. exports, create jobs and support local and national economic growth. Seaports are vital economic engines whose cargo activity supports over 23 million American jobs and accounts for over a quarter of the U.S. economy. In 2014, U.S. seaports generated nearly \$4.6 trillion in total economic activity.

Freight and specifically ports took a big step forward with the passage of the of the FAST Act. With the creation of two funding programs; *Projects of Highway and Freight Significance* (discretionary) and *National Highway Freight Program (formula)* the FAST Act provided a total of \$11 billion in dedicated freight funding over five years.

However, of the \$11 billion only \$1.13 billion is multimodal eligible, far below what is needed to build out a 21st century multimodal freight network. Currently, only \$200 million of multimodal eligibility remain in the INFRA account. Earlier this year, the American Association of Port Authorities (AAPA) identified more than \$20 billion in multimodal needs for public port authorities alone over the next decade. A top priority for the port industry continues to be multimodal funding.

The challenges confronting the freight programs are funding levels and project eligibility. The current freight programs are funded out of the highway trust fund, which means that eligible projects are primarily highway focused. Highways are important to our freight network, but ports are multimodal facilitators, meaning rail, trucks and ships all need access to ports. One could argue that as our supply chain becomes more sophisticated and there are more inland distribution centers with the advent of e-commerce, multimodal funding will become even more in demand.

To build off the work in the FAST Act, AAPA believes that all freight program funding should be 100 percent multimodal. A first step in accomplishing this would be to lift the multimodal cap on the INFRA program. AAPA strongly supports Ranking Member Carper's legislation (S.3587) that repeals the multimodal cap on the discretionary grant program created in the FAST Act.

The FAST Act has provided the programmatic framework for a 21st century multimodal freight network. However, to fully leverage the success of the FAST Act freight provisions, the next reauthorization bill will need to address increasing funding as well as identifying a multimodal funding source or sources.

To address the funding shortfall, AAPA supports raising the gas tax as well as a waybill fee concept and we encourage the Committee to carefully consider these options. AAPA recommends that funding be dedicated to the freight programs.

Equally important, from a supply chain perspective, the FAST Act requires that states complete state freight plans to continue receiving their freight formula funding. The results have been telling. To date, 95 percent of the states have submitted multimodal state freight plans to the U.S. Department of Transportation. This is important because it signals that states recognize the value and have the demand for multimodal projects.

AAPA looks forward to working with the EPW Committee and Congress as we move forward on an infrastructure package and the FAST Act reauthorization bill next Congress.



Washington Office
101 Constitution Ave., N.W.
Suite 375 East
Washington, D.C. 20001
(202) 789-7850
Fax: (202) 789-7859

Statement for the Record of
The American Society of Civil Engineers
on
“Addressing America’s Surface Transportation Infrastructure Needs”
United States Senate
Committee on Environment and Public Works
November 28, 2018

Introduction

The American Society of Civil Engineers (ASCE)¹ appreciates the opportunity to submit a statement on the importance of long-term, strategic investment in our nation's surface transportation infrastructure systems. ASCE is eager to work with the Committee in 2019 and beyond to find ways to further improve our nation's vital surface transportation infrastructure systems.

Our nation's surface transportation infrastructures systems are critical to our nation's public safety, national security, and economic competitiveness. In the 20th Century, the federal government led the way in transportation infrastructure by building our nation's greatest infrastructure systems. Leading back to the Works Progress Administration projects completed during the Great Depression to the creation of the Interstate Highway System in the 1950s and 1960s, the 20th Century will be remembered as a time when Americans took pride in building a strong and lasting infrastructure foundation. However, since that pivotal time, federal leadership and investment have decreased, and the condition of the nation's infrastructure suffered. Nevertheless, infrastructure's relationship to public safety, national security, and economic competitiveness demonstrate the need for a strong infrastructure system because of the critical role the interests of federal government has played. After all, Article 1, Section 8 of the US Constitution includes infrastructure and commerce as a federal responsibility. Therefore, a strong federal role in policy and funding is necessary to assure a national surface transportation system that meets the national needs.

Presently, many of our surface transportation system assets have reached the end of their design life. Coupled with long underinvestment and inadequate support for the Highway Trust Fund (HTF), a large and growing investment gap of \$1.1 trillion over the next ten years has emerged. This gap must be closed if we hope to both repair and modernize our surface transportation infrastructure systems to be competitive in the 21st century.

ASCE's 2017 Infrastructure Report Card

Infrastructure is the foundation that connects the nation's businesses, communities, and people, serves as the backbone to the U.S. economy, and is vital to the nation's public health and welfare. Every four years, ASCE publishes the *Infrastructure Report Card*, which grades 16 major infrastructure categories using a simple "A" to "F" school report card format. ASCE released its *2017 Infrastructure Report Card*², giving the nation's

¹ ASCE was founded in 1852 and is the country's oldest national civil engineering organization. It represents more than 150,000 civil engineers individually in private practice, government, industry, and academia who are dedicated to the advancement of the science and profession of civil engineering. ASCE is a non-profit educational and professional society organized under Part 1.501(c) (3) of the Internal Revenue Code. www.asce.org.

² <https://www.infrastructurereportcard.org/>

overall infrastructure a grade of “D+,” with an investment gap of \$2 trillion over the next 10 years – and the total investment needed is nearly \$4.6 trillion. Our surface transportation infrastructure categories earned subpar grades, with bridges at “C+,” roads “D,” and transit “D-,” and have a \$1.1 trillion 10-year investment gap.

Our nation’s surface transportation investment gap and subpar grades are a result of our dated federal motor fuels tax and inability to properly fund the HTF and our current transportation infrastructure needs. Continued underinvestment of the HTF will cause our surface transportation infrastructure to further degrade. Implicitly, failing to sufficiently invest in America’s deteriorating infrastructure will have a cascading impact on the nation’s economy—impacting business productivity, gross domestic product (GDP), employment, personal income, international competitiveness, and public safety.

As Congress starts debate on the next reauthorization of our surface transportation network, ASCE urges Congress to find a long-term, sustainable solution to fixing the HTF. Finding a long-term revenue solution will provide for a stronger, safer national network for the 21st century.

Surface Transportation Infrastructure Systems

Bridges

The nation has 614,387 bridges, almost four in ten of which are 50 years or older. In 2016, 56,007 - 9.1% - of the nation’s bridges were structurally deficient, meaning that they require significant maintenance, rehabilitation, or replacement. In that same year, on average there were 188 million trips across a structurally deficient bridge each day. While the number of bridges that are in such poor condition and considered structurally deficient is increasing, the average age of America’s bridges keeps increasing and many of the nation’s bridges are approaching the end of their design life. The most recent estimate puts the nation’s backlog of bridge rehabilitation needs at \$123 billion.

Roads

With over four million miles of roads across the US— 15 lane interstates to residential streets—roads are among the most visible and familiar forms of infrastructure. In 2016, U.S. roads carried people and goods over 3.2 trillion miles – or more than 300 round trips between Earth and Pluto. After a slight dip during the 2008 recession, Americans are driving more, and vehicles miles traveled hit a record high in 2016.

Despite the high use and demand, the nation’s roads are often crowded, frequently in poor condition, chronically underfunded, and are becoming more dangerous. More than two out of every five miles of the nation’s urban interstates are congested, and traffic delays cost the country \$160 billion in wasted time and fuel in 2014. One out of every five miles of highway pavement is in poor condition and our roads have a significant and increasing backlog of rehabilitation needs. After years of decline, driving on unsafe roads has led to

37,133 people dying in 2017 on our nation's roads.

Solutions

Our nation's elected leaders need to act quickly to address the widening investment gap for surface transportation infrastructure systems. The federal government has historically been the leader in strengthening our surface transportation network. Because of this federal leadership role, we urge Congress to:

- Fix the HTF by adding 25 cents to the federal motor fuels tax. The current user fee must be raised and tied to inflation to restore its purchasing power. This idea has been led by the U.S. Chamber of Commerce and would provide a much-needed infusion of \$394 billion over ten years and combat the \$1.1 trillion investment gap of surface transportation capital needs.
- Looking to the future, Congress should establish a broad pilot program to better understand how a Mileage-Based User Fee (MBUF) could be implemented.
- Include a tax on electric vehicles that would account for their presence on our nation's roads.
- Authorize surface transportation programs to improve our system. Congress must support that commitment by focusing on expanding infrastructure investment; maximizing effectiveness; building for the future; and enhancing project delivery. This includes fully implementing the meaningful reforms included in the FAST Act in order to streamline project development.
- Adopt key recommendations from the recently released congressionally mandated report from the National Academies of Sciences, Engineering and Engineering, Committee for a Study of the Future Interstate Highway System, and the Transportation Research Board (TRB) entitled, "Renewing the National Commitment to the Interstate Highway System: A Foundation for the Future." Specifically, Congress should work to adopt a comprehensive interstate renewal and modernization program, identify and make repairs based on life-cycle cost principals, and consider resilience in long-term planning.

Ultimately, ASCE asserts that our nation must prioritize the investment needs of our surface transportation infrastructure system which is critical to our nation's public safety, national security, and economic competitiveness. Fixing the HTF as well as other strategic, robust, and sustained investments, must be made quickly if we hope to close the growing funding gap and restore America's world-class infrastructure. ASCE thanks you for holding this hearing and looks forward to working with the Committee to find solutions to fixing our nation's surface transportation infrastructure system.



November 28, 2018

The Honorable John Barrasso
 Chairman
 Committee on Environment and Public Works
 United States Senate
 Washington, DC 20510

The Honorable Tom Carper
 Ranking Member
 Committee on Environment and Public Works
 United States Senate
 Washington, DC 20510

Dear Chairman Barrasso and Ranking Member Carper:

In anticipation of the Senate Committee on Environment and Public Works upcoming hearing on “Addressing America’s Surface Transportation Infrastructure Needs,” the Intelligent Transportation Society of America (“ITS America”)—the nation’s leading association of cities, states, Metropolitan Planning Organizations, established and emerging private sector companies in the automotive and technology industries, and academic institutions focused on a better future transformed by intelligent mobility that is safer, greener, and smarter—offers the Committee on Environment and Public Works a preview of ITS America’s “Intelligent Transportation Technologies Best Practice Report: A Better Future Transformed by Intelligent Mobility” that the association is preparing for the reauthorization of the FAST Act.

Today’s hearing takes place at an important time. Just as infrastructure was critical to the development of our economy in the 20th century, maintenance of existing infrastructure and deployment of smart infrastructure will be critical for our global competitiveness in this century. Advances in robotics, artificial intelligence, and wireless communications have inspired a race to make the next generation of mobility a reality. We are on the cusp of that future transformed by intelligent transportation technologies. The modern world literally turns on the boundary of where the tire rubber meets the paved road. For over a century, this was the most important interface between the car and the infrastructure. For automakers, the objective was always to design vehicles that were “road friendly” to the greatest extent practical. However, with new information and wireless technologies, there is a new interface -- a digital interface between the car and driver and the road infrastructure. This has presented an opportunity for infrastructure operators to improve safety, manage traffic, and introduce new models and modes of transportation in ways that were previously unknown. By applying intelligent transportation technologies to our existing infrastructure, we can maximize the efficiency of our system and make it more sustainable, accessible, and equitable.

New transportation technologies are game changers. We now have the technical capability to connect vehicles to other vehicles, to the infrastructure, and to pedestrians—collectively referred to as Vehicle-to-Everything (V2X) communications or Connected Vehicle—via the 5.9 GHz spectrum band. Advanced traffic management infrastructure, Vehicle-to-Infrastructure (V2I) communications, and Vehicle-to-Pedestrian (V2P) communications can reduce crashes, smooth traffic flow, reduce pollution, and most importantly, save lives. The National Highway Traffic Safety Administration estimates that safety applications enabled by V2V and V2I could eliminate or mitigate the severity of up to 80 percent of non-impaired crashes, including crashes at intersections or while changing lanes. More than 30 states and 45 cities are deploying V2I communications that use the Dedicated Short-Range Communications safety spectrum band to enhance safety, reduce crashes, and decrease fatalities. V2I deployments include expansions of the Safety Pilot Model Deployment in Ann Arbor (MI), large Pilot Deployments in New York City (NY), Tampa (FL), and Wyoming, and the Smart City Challenge in Columbus (OH).

In addition to other technologies, electric vehicle infrastructure will be key to the deployment of the next generation of mobility. An increasing number of vehicle manufacturers are committing to deploy electric



vehicles. ITS America believes that electric vehicles represent one of the best ways to reduce carbon dioxide pollution and our nation's dependence on oil from volatile and unpredictable regions of the world.

Before I provide a preview of ITS America's intelligent transportation technology best practices report, I would be remiss if I did not strongly urge Congress and the Administration to identify long-term and sustainable funding for the Highway Trust Fund to ensure the FAST Act is reauthorized before the law expires in 2020. Maintaining our infrastructure is vital. Funding for ongoing intelligent transportation research also is important. This kind of research requires funding.

Changes are happening today that will fundamentally affect how people interact with transportation in the months and years ahead. The nation is entering a technology revolution that will define the way people, goods, and services move for decades to come. It is a new transportation era as dramatic as the period where the car supplanted the horse and buggy.

The nation must deploy intelligent transportation technologies on a large scale to remain competitive in an increasingly global economy. ITS America believes the reauthorization of the FAST Act is the vehicle to increase the nation's investment in the transportation technologies that will shape mobility. This investment can positively affect both the safety and operations of our transportation infrastructure system.

ITS America thanks the Committee on Environment and Public Works for its leadership on the FAST Act, which made technology investments eligible across highway programs. We stand ready to work with the Committee on the reauthorization of the FAST Act that builds on those investments. We ask that this letter and preview of ITS America's intelligent transportation best practice report be entered into the hearing record.

Sincerely,

A handwritten signature in blue ink, appearing to read "Shailen Bhatt".

Shailen Bhatt
President and CEO
Intelligent Transportation Society of America

Cc: U.S. Senate Committee on Environment and Public Works
Ron Thaniel, Vice President of Legislative Affairs, ITS America, rthaniel@itsa.org

A Better Future Transformed by Intelligent Transportation Technologies: Best Practices

ITS America is pleased to provide the Senate Committee on Environment and Public Works with a preview of ITS America's "Intelligent Transportation Technologies Best Practice Report: A Better Future Transformed by Intelligent Mobility" that the association is preparing for the reauthorization of the FAST Act.

This report will provide best practices on current intelligent transportation technology deployment in the United States including: project sponsor; location; description of technology and why technology was selected; transportation safety, mobility or infrastructure challenge the project is addressing; project cost information, including federal match, state and local match, and private funding; how the project contributes to the overall state of good repair of the system; how the project helps freight and goods movement; how the project improves the environment; how the project will support the deployment of connected and automated vehicle technologies and smart infrastructure; how the project supports larger smart communities objectives; the project's economic benefits; and level of support from federal, state, and local elected officials.

The report will provide a detailed body of data on intelligent transportation technology deployment. We will use the data to inform Congress and the Administration on the need to prioritize intelligent transportation technologies in the reauthorization of the FAST Act. We will also use the best practices to inform the owners and operators of most of nation's transportation infrastructure—state, city, and county elected officials and policymakers.

Best practices focus on deployment of congestion-reduction technologies available today such as current generation active traffic management, managed lanes, incident response management and smart signal operations. Current travel demand management strategies include systems that provide availability and pricing of capacity on roads, highways, parking, and curb space.

The current generation of intelligent transportation systems don't simply report congestion to infrastructure operators or road users, but also actively manage transportation assets (e.g., highway/intersection/bridge lanes, ramps, parking stalls, etc.) to leverage their maximum capacity, capabilities, and lifespan for all. The next generation systems will tightly integrate data from automated and connected vehicles, which further improve the productivity of our transportation infrastructure by orders of magnitude over current systems.

ITS America will be compiling intelligent transportation best practices through January 2019. We look forward to an opportunity to share with this Committee our complete report on intelligent transportation technologies best practices.

Summary of Intelligent Transportation Technology Best Practices

Arizona Department of Transportation Interstate 10 Dust Detection and Warning System

The Arizona Department of Transportation is in the process of creating a first-of-its-kind dust detection and warning zone on a busy rural stretch of Interstate 10 between Phoenix and Tucson that has frequently

seen hazardous blowing dust. The dust storm early warning system uses both spot detection technology and remote sensing technology to measure both the visibility along the roadway and to detect the development of dust events at a distance from the highway to allow for advance warning time. The visibility alerting capability will be integrated with automated response using Variable Speed Limit (VSL), Dynamic Message Sign (DMS), and in-pavement detection (speed loops) to warn travelers of actual or potential dust events prior to encountering them within the corridor, and closed-circuit cameras will be installed that allow staff at ADOT's Traffic Operations Center in Phoenix to see the real-time conditions on the roadway. This entire system will be connected via fiber optic cable, which results in faster information dissemination for motorists and for ADOT when blowing dust develops suddenly in this 10-mile stretch.

California Department of Transportation Interstate 80 Safety, Mobility, and Automated Real-time Traffic (SMART) Corridor

The Interstate 80 Safety, Mobility, and Automated Real-time Traffic (SMART) Corridor project combines traditional traffic operations management strategies and technologies, with new approaches, such as active traffic management and the use of overhead lane control signs to alert travelers and harmonize traffic speeds to conditions. These measures are being combined with adaptive ramp metering, the use of arterials, and information display boards to give travelers the information needed to make wise travel route and mode choices. The integrated corridor management approach relies on interconnecting Transportation Management Centers (TMCs) operated by local jurisdictions with Caltrans' regional TMC, video monitoring, and playbooks for planned events and incidents.

Colorado Department of Transportation SMART 25 Managed Motorways Pilot Demonstration

The managed motorways concept first developed and implemented by the Victoria State Department of Transportation (VicRoads) in Melbourne, Australia, is a complex coordinated ramp metering and freeway management system which adjusts to real-time traffic conditions to prevent the breakdown of corridor traffic-flow. The complexity of the system requires a robust deployment of traffic detection on ramps and the freeway mainline to fully understand and control for real-time congestion conditions.

Colorado Department of Transportation RoadX's Smart Pavement Project

RoadX Smart Pavement is a precast concrete panel embedded with digital technology and fiber optic connectivity that acts like a laptop tracking pad.

Colorado Department of Transportation RoadX's Smart Cone Pins Project

RoadX in partnership with iCone developed a low cost (\$600/unit to buy) GPS pin that fits into a standard roadway cone. When that "smart cone pin" is activated, it sends its true location and status to a cloud environment that anyone one can ingest and display on a map.

Florida Department of Transportation Truck Parking Availability System (TPAS)

Truck parking shortages are a national safety concern. The current deployment of TPAS is 68 public sites located throughout Florida's state highway system along Interstate 10 (SR 8), Interstate 75 (SR 93), Interstate 95 (SR 9), and Interstate 4 (SR 400). TPAS uses a combination of in-pavement space occupancy detection for the location with mixed vehicle type usage (welcome centers and rest areas) and



microwave vehicle detection for monitoring of ingress/egress at the weigh stations. The data are aggregated at the District Regional Transportation Management Center (RTMC) and disseminated to the commercial vehicle operators through dynamic roadside signs as well as through Florida's 511 system and third-party data feeds.

Georgia Department of Transportation Statewide Traffic Signal Software Upgrades

By deploying an advanced and open traffic signal control platform, Georgia Department of Transportation (GDOT) seamlessly manages arterial operations with local agency partners across jurisdictional boundaries. With an additional suite of operational tools, as well as real-time monitoring using high-resolution data and automated traffic signal performance measures, GDOT leverages technology to extend engineering and maintenance resources across the entire state. Targeting issues proactively and responding to maintenance issues before they impact the traveling public improves the mobility of all users on the arterial network.

Maryland Department of Transportation: Coordinated Highways Action Response Team (CHART) Development

The CHART Advanced Traffic Management System (ATMS) is a set of software programs running on a combination of Windows 2008 Servers, connected to a statewide network of Closed Circuit Television (CCTV) cameras, overhead and portable Dynamic Message Signs (DMSs), Highway Advisory Radios (HARs), Traffic Sensor Systems (TSSs) (microwave traffic flow detectors), remote weather stations, and On/Off devices (electronic relay devices such as for horns and fog beacons). It is used to identify and track traffic flow disruptions, send responders to correct the disruption and notify the public using the DMS and HAR devices, as well as sending notifications to the media and feeding data to a live traffic web site (<http://www.traffic.maryland.gov>) and Maryland 511.

Maryland Department of Transportation: Freeway Traffic and Safety Patrol/Response (FTSP) Vehicle Acquisition

The FTSP vehicles include both heavy duty and light duty vehicles. To perform incident management and emergency response functions efficiently, these FTSP vehicles are equipped with state-of-the-art technologies such as Automated Vehicle Location (AVL), Permanently mounted Closed Circuit Television (CCTV) cameras, two-way radio communications and Capital Wireless Information Net (CapWIN) capabilities.

Michigan Department of Transportation: US-23 Flex Route

Completed in 2017, the US-23 Flex Route is nine miles in length from M-14 to M-36 north of Ann Arbor. The project included construction of road, bridge and interchange operational improvements and Active Traffic Management (ATM) strategies for the US-23 corridor to address daily recurring and non-recurring traffic, incident management and overall motorist safety. Using the Flex Route's lane control gantry system, MDOT can now dynamically manage recurrent and non-recurrent congestion through technology and operational ATM strategies including dynamic lane control and shoulder use, variable speed advisories and queue warning.

Metropolitan Transportation Commission of the San Francisco Bay Area: Bay Bridge Forward



Bay Bridge Forward is a suite of projects that moves more people in fewer vehicles to make the most efficient use of the bridge's capacity. It includes implementation of near-term, cost-effective operational improvements that offer travel time savings, reliability and increased capacity for carpooling and bus/ferry transit. These improvements will not only increase person throughput and improve access to jobs in San Francisco but also reduce congestion, incidents, and emissions in the bridge corridor.

Pennsylvania Department of Transportation: Interstate 76 Integrated Corridor Management

The project is located along the I-76 corridor in Montgomery and Philadelphia Counties. The mainline component of the program consists of junction control and flex lanes using a collection of ITS technologies such as dynamic lane assignment, variable speed limits and queue warning, also known as Active Traffic Management (ATM). Traffic signal equipment on arterial roadways will be upgraded and standardized, and control and maintenance responsibilities for these corridor signal systems will transfer from the municipalities to PennDOT. Both the mainline and arterial roadways will be outfitted with communications equipment that will allow for the bi-directional flow of information between roadway infrastructure, automobiles, transit vehicles, pedestrians, and bikers. These deployments will support the Commonwealth's commitment to furthering vehicle-to-infrastructure connected vehicle initiatives.

Regional Transportation Commission of Southern Nevada: Waycare

Located in southern Nevada, Waycare helps improve safety and efficiency on freeways, including key freight corridors and major arterials by compiling and analyzing data to report in real-time the location of accidents and predict where dangerous driving conditions or congestion may occur. This technology enables faster validation and response to roadway incidents as well as a more efficient use of resources to proactively deploy traffic patrols and abatement efforts with the goal of preventing incidents.

Regional Transportation Commission of Southern Nevada: INRIX

INRIX's state-of-the-art platform allows cities and road authorities to digitize their traffic rules and restrictions, such as speed limits, crosswalks, turn restrictions and bikes lanes, so they can communicate with highly automated vehicles (HAVs), allowing them to operate safely and effectively.

Regional Transportation Commission of Southern Nevada: Audi

Audi debuted the first-of-its-kind "Time to Green" feature that provides the driver with a countdown to when a red light will turn green. The Regional Transportation Commission of Southern Nevada's (RTC) advanced traffic management system provides specially-equipped Audi vehicles real-time traffic signal information through countdown in the instrument panel. The "Time to Green" feature helps reduce stress and keep drivers more informed when approaching intersections. Thanks to data provided from the connected vehicle, traffic signal timing sequences can be adjusted to keep traffic flowing and reduce idling time and congestion that leads to increased emissions and air pollution.

Regional Transportation Commission of Southern Nevada: AAA and Keolis

The Regional Transportation Commission of Southern Nevada (RTC), along with the city of Las Vegas, provides traffic signal data to a self-driving shuttle sponsored by AAA and Keolis that operates in mixed traffic along a half mile loop in downtown Las Vegas. The shuttle is the country's first autonomous bus to be fully integrated with "smart city" infrastructure. The shuttle is fully electric and does not produce



emissions that lead to air pollution. Lessons learned from a fully autonomous deployment in a complex urban setting will inform other use cases and lead to environmental benefits.

Regional Transportation Commission of Southern Nevada: Nexar

Nexar is an app that uses smartphone dash cams and wireless technology to provide drivers real-time alerts to prevent vehicle, cyclist and pedestrian collisions. The app records video outside of a vehicle and measures vehicle dynamics related to speed, braking and turns. Warnings from adjacent vehicles are communicated to drivers via the app, such as the need to brake for a hazard. The Nexar network is well established in New York City and San Francisco, where it reported a 24 percent reduction in collisions since its inception.

Tennessee Department of Transportation: I-24 SMART Corridor

Tennessee Department of Transportation is implementing an Integrated Corridor Management (ICM) system that will seamlessly manage the corridor as a multimodal system through institutional collaboration and integration of infrastructure. This ICM system will implement ramp metering, multijurisdictional traffic signal coordination, electronic signs for traveler information, incentivized removal of disabled vehicles, transit service enhancements, incident management strategies.

Utah Department of Transportation: Multiple Intelligent Transportation Technology Projects

The signal interconnected projects improved signal coordination through signal controller time clock syncing. Variable message sign project improved communication of road conditions and safety messaging to traveling public. The fiber optic communications projects improved communications with ITS devices (CCTV, VMS, Traffic Signals, RWIS, etc.) and improved communications/emergency services to remote areas.

Washington State Department of Transportation: US 395/ Hawthorne Road Channelization & Signal Modification

This project revised the lane configuration and upgraded the existing signal system at Hawthorne Road and US 395 in Spokane, Washington. US 395 (Division Street) is a major at-grade arterial route in/through Spokane and a major freight route. Channelization revisions created exclusive left turn lanes on Hawthorne going east and west, a combined through lane and right turn lane for eastbound traffic, and exclusive through lanes and right turn lanes for west bound traffic. These changes allowed the signal to run in a standard eight-phase operation under new signal controllers capable of expansion to automated vehicle technologies and increased operational efficiency of the intersection. The total reduction in vehicle delay is 22,637 minutes/day.

Washington State Department of Transportation: Centralized Signal System-Joint ATMA throughout Clark County

Clark County, Washington, is part of the Portland, Oregon metropolitan service area. As the second densest county in Washington, smart solutions are necessary to extend the service life of existing infrastructure to sustain the region's rapid growth. Clark County negotiated with their vendor to transform their local centralized traffic signal system into a regionally shared Advanced Traffic Management System (ATMS). This upgrade by Clark County enabled the remaining local jurisdictions to share traffic



data, and remotely operate traffic signals, within each other's systems. As part of the agreement, WSDOT-owned-and-operated signals from the seven-county region of Southwest Washington may utilize the regional signal system. These automated processes will maximize utilization of existing infrastructure, reduce delays and emissions, and increase mobility.

Wyoming Department of Transportation: Mobile App Enhancements

WYDOT developed a mobile application for smartphones to share pre-trip and en route traveler information. This application had three major components:

- A map for pre-trip planning that provides information including road conditions, traffic incidents, weather sensor data, web camera images, road construction notifications, and truck parking locations.
- A hands free/eyes free feature that speaks road condition, traffic incident, and road construction information as drivers travel down the road, alerting them in advance to adverse conditions ahead.
- A "Where am I?" feature that correlates the user's GPS location to the nearest route and mile marker. This can be used in an emergency when a driver needs to be able to share his or her location. The location can easily be sent via text or email.

Wyoming Department of Transportation: Revised Commercial Vehicle Operator Portal

The Commercial Vehicle Operator Portal (CVOP) is a web-based system focused on providing a one-stop shop for current road conditions and road weather forecast information on the most commonly traveled commercial routes in the state. This information is shared with the trucking community and was designed based on feedback provided directly from fleet managers.

Econolite: Lakeview Avenue Overcrossing Orange County Transportation Authority

On June 6, 2017, the Lakeview Ave. overcrossing in Orange County, California, officially opened to drivers. The overcrossing now routes vehicular traffic over Burlington Northern Santa Fe (BNSF) railroad line uninterrupted. Nearly 70 individual trains use the BNSF tracks daily, regularly blocking the way of drivers travelling north or south along the busy corridor. As part of the project, several intersections along Lakeview Ave. were upgraded with new NEMA traffic control cabinets and 2070 controllers. This provides the traffic management technology that enables programming of signals to help optimize traffic flow through the corridor. In addition, emergency vehicles and first responders, including ambulances, fire, and police are now able to respond more quickly and cross the rail line without interruption, which is critical for life-saving calls.

Southwest Research Institute: ActiveITS

ActiveITS is a proven and stable system, capable of obtaining 99.99%+ uptime, and can run in clustered virtualized and cloud-hosted configurations. Key features of the ActiveITS system include automated event management response plans for dynamic message sign (DMS) postings, email notification, traveler information alerts, highway advisory radio (HAR) messages; archiving and reporting to enable performance-based oversight of event management operations; interconnected operations for information sharing and control between traffic management centers; and management of field devices, events, and other functions by an operator in a single integrated browser/map-based/application-based interface in a Windows environment.



**Texas A&M Transportation Institute and Virginia Tech Transportation Institute:
Implications of Truck Platoons for Roadside and Vehicle Safety Hardware**

Researchers and students at the Texas A&M Transportation Institute (TTI) are examining how roadside safety devices, such as guard rail and median barriers, will react to an impact from a truck platoon.

Researchers and students at the Virginia Tech Transportation Institute (VTTI) are examining how crashes such as these would affect the occupants of the vehicle. The research will inform policy on truck platoon operating rules and roadside safety device standards.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Arizona Department of Transportation
 FASTLANE Grant: Interstate 10 Dust Detection and Warning System

Funded in part by a 2016 FASTLANE grant, the Arizona Department of Transportation is in the process of creating a first-of-its-kind dust detection and warning zone on a busy rural stretch of Interstate 10 between Phoenix and Tucson that has frequently seen hazardous blowing dust. The system, being installed now along 10 miles of I-10 along with a widening project in that area, is expected to be complete in fall 2019. The project is located on Interstate 10 between mileposts 209 and 219. This area, between Eloy and Picacho Peak, is about 40 miles northwest of Tucson and 50 miles southeast of Phoenix. I-10 between Phoenix and Tucson, Arizona's two largest metropolitan areas, is the busiest stretch of rural interstate in Arizona.

The dust storm early warning system uses both spot detection technology and remote sensing technology to measure both the visibility along the roadway and to detect the development of dust events at a distance from the highway to allow for advance warning time. The visibility alerting capability will be integrated with automated response using Variable Speed Limit (VSL), Dynamic Message Sign (DMS), and in-pavement detection (speed loops) to warn travelers of actual or potential dust events prior to encountering them within the corridor, and closed-circuit cameras will be installed that allow staff at ADOT's Traffic Operations Center in Phoenix to see the real-time conditions on the roadway. This entire system will be connected via fiber optic cable, which results in faster information dissemination for motorists and for ADOT when blowing dust develops suddenly in this 10-mile stretch.

The challenge of sudden blowing dust, a problem across much of Arizona, is especially acute on busy Interstate 10 between Phoenix and Tucson, which has significant freight traffic. In addition to injuries and fatalities, crashes caused by blowing dust can lead to extended closures of I-10 that affect great numbers of drivers of private and commercial vehicles. In addition to providing earlier warnings about blowing dust in this especially troublesome area, this innovative system will advance ADOT's understanding of whether similar systems can be effective in other locations around Arizona.

The dust detection project was imbedded in the cost of the larger I-10, SR87 to Town of Picacho widening and realignment project. The portion of the project funding relative to the dust detection and warning system, per the terms of the FASTLANE Grant, is an 80/20 (Federal/State) ratio and the total for the dust portion of the project is \$4,755,246 federal and \$1,188,812 state matching funds.

10 I-10 Dust Detection System
BETWEEN MILEPOST 309 AND MILEPOST 319

Cloud cover sensors

Digital message signs

Variable speed limit signs (variable speed limit 2 miles for 8 miles)

Variable speed limit signs (variable speed limit 2 miles for 8 miles)

Digital message signs

Digital message signs

Digital message signs

ADOT

FOR MORE INFORMATION
855.712.8530
projects@adot.gov
adot.gov

As of 2017, nearly 50,000 vehicles a day used this stretch of Interstate 10. Many of these are commercial vehicles carrying goods from Arizona businesses to markets in California, Texas and



Mexico, and vice-versa. In addition to the human toll, crashes that result from blowing dust hinder movement of commercial vehicles. They also hinder personal travelers who contribute to Arizona's robust tourism industry.

As Arizona Department of Transportation Director John Halikowski has noted, the efficient flow of commerce in Arizona drives our state's economic vitality. As part of this commitment, Arizona, California, New Mexico and Texas have established the I-10 Corridor Coalition to the support innovations that help create friction-free commercial travel. This project is aligned with that objective.

This project helps to reduce crashes which leads to fewer closures and reduces the emissions that otherwise would have resulted from long queues on this busy and highly freight traveled stretch of road. Additionally, fewer deadly crashes means less disturbance to environment especially with freight and hazardous materials transported through the corridor.

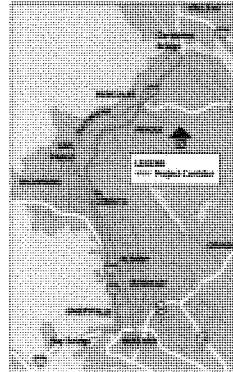
Collection of weather and visibility data and advanced detection of dust will play an important role in safety of connected and autonomous vehicles and supports the deployment of those technologies in this important stretch of the road. The segment of I 10 that would receive the ITS enhancements is identified as the center of dust storms along the entire length of I 10. The application of the technology as proposed could lead to a wealth of information to inform other regions in the United States on averting crashes that have significant societal costs in terms of loss of life, incapacitation and delay.

Support for this project is spread throughout the corridor. During the development of the FASTLANE Grant application, numerous entities offered formal support for the project, including Arizona Governor Douglas A. Ducey; Arizona's Congressional members (Ann Kirkpatrick, David Schweikert, Martha McSally, Matt Salmon, Paul Gosar, Krsyten Sinema, Ruben Gallego and Trent Franks); Pinal County; Pima County; Maricopa Association of Governments; Pima Association of Governments; SunCorridor Metropolitan Planning Organization; the City of Tucson's Mayor and City Manager; City of Phoenix's Mayor; City of Casa Grande; City of Coolidge; City of Eloy; and the Arizona Trucking Association.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
California Department of Transportation
 Interstate 80 Safety, Mobility, and Automated Real-time Traffic (SMART)
 Corridor

The Interstate 80 Safety, Mobility, and Automated Real-time Traffic (SMART) Corridor is a partnership between Caltrans, the Alameda County Transportation Commission (ACTC) and the Contra Costa Transportation Authority (CCTA), along with other local partner agencies and municipalities, which have taken a “SMART” approach to the management of one of the busiest corridors in the Bay Area. The project is located on a 20-mile segment of Interstate 80 in Alameda and Contra Costa Counties, from the Carquinez Bridge to the San Francisco/Oakland Bay Bridge. The freeway serves commuters, recreational traveler and freight.

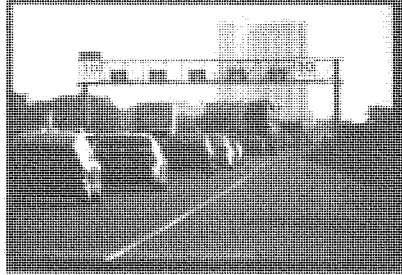


This highly congested corridor is physically constrained by adjacent urban development and the San Francisco Bay. Additional freeway widening is not possible. The SMART corridor project combines traditional traffic operations management strategies and technologies, with new approaches, such as active traffic management and the use of overhead lane control signs to alert travelers and harmonize traffic speeds to conditions. These measures are being combined with adaptive ramp metering, the use of arterials, and information display boards to give travelers the information needed to make wise travel route and mode choices. The integrated corridor management approach relies on interconnecting Transportation Management Centers (TMCs) operated by local jurisdictions with Caltrans’ regional TMC, video monitoring, and playbooks for planned events and incidents.

The following technologies have been implemented as part of the project:

- Adaptive Ramp Metering
- Automated Incident Detection
- Incident Response Plans
- Variable Advisory Speed Signs
- Lane Use Signs
- Information Display Boards
- Trailblazer Signs
- Coordinated Traffic Signal Operations
- Arterial and Freeway Detection
- Transit Signal Priority

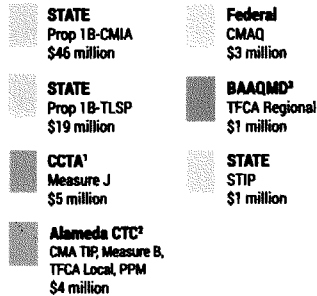
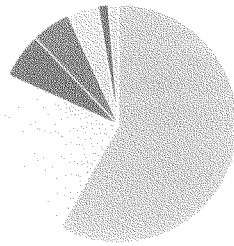
Safer, more efficient and reliable traffic flow along Interstate 80 is essential to the current and future vitality of the San Francisco Bay Area. As many as 270,000 vehicles use Interstate 80 every day and approximately 25 accidents occur on the route per week. On one portion of westbound Interstate 80, the accident rate is twice as high as the statewide average for similar highways. As a result, motorists experience as much as 25-35 minutes of delay during typical commute hours. Emergency vehicle access is impacted due to the congestion, resulting in slower incident response and recovery times. Some motorists may choose to exit onto San Pablo Avenue, a parallel local arterial, to avoid the traffic jam, but the traffic signals on San Pablo Avenue



and other arterials are not currently equipped to handle the resulting increase in traffic. Gridlock occurs, impacting bus operations and traffic flow on these streets. Without knowledge of the accident location, diverted motorists stay on city streets, and traffic jams persist. Even if motorists don't detour, they don't know how long it will take them to reach their destination due to inconsistent and unreliable travel times.

The I-80 Smart Corridor project was \$79 million. The funding breakdown is as follows:

Total Budget: \$79 million



Early indications show the Interstate 80 Smart Corridor likely helped reduce the rate of growth in congestion and improved travel times on the freeway during certain periods of the day. Although some have speculated travel times would be decreased because of the project, it's unrealistic to expect such impact when freeway demand has gone up significantly in the past decade. Further after-studies will have more definitive conclusions and analysis. Interstate 80 is a major freight route from the ports of Oakland and San Francisco as well as the San Francisco Airport, to the western United States. Reducing travel times and increasing reliability reduces transportation costs to business.



This project will reduce the rate of growth of congestion. It will reduce emissions and the need to widen freeway. The project also coordinates traffic signals between the State highway and local streets, which will reduce idling, thereby reducing GHG emissions. Message signs comparing transit travel times and freeway travel times can promote transit, hopefully reducing congestion and single vehicle ridership. Transit signal priority helps buses move through the corridor more quickly, adding to their appeal and shifting demand. The SMART corridor infrastructure has the capability to detect incidents and notify external systems.

This is the first effort to integrate freeway, arterial and transit operations and share data with cities and other partners. This project should be viewed as a building block to identify the many risk and challenges and future projects will take these lessons learned. There are many traffic flow and safety benefits to the project, including: enhanced safety and roadway operations throughout the corridor; travel-time savings and reliability by optimizing the use of existing lanes; congestion relief along the corridor during incidents; reduction of secondary accidents associated with congestion; improved emergency access and incident recovery time with less congested routes for emergency vehicles; and transit travel-time savings along San Pablo Avenue.

Beyond the \$10 million cost share from the local Commissions and Air Quality Management District, local agencies are working together for unified operations and maximize efficiency of the system.

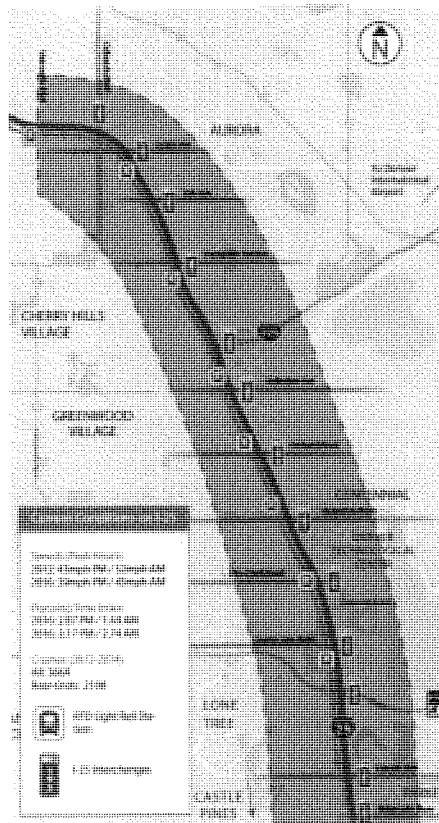
“By making I-80 smarter, we are making it work better for everyone — commuters, goods movement, transit, carpools, and local road users. The commitment of local voters who passed both the Alameda and Contra Costa County sales tax measures, as well as the state bonds in 2006, is what made this critical work possible. We are proud to work together to bring these solutions to our communities to make sure people can reliably get where they need to go — to work, to education or to families.” – Rebecca Kaplan, Oakland City Council member

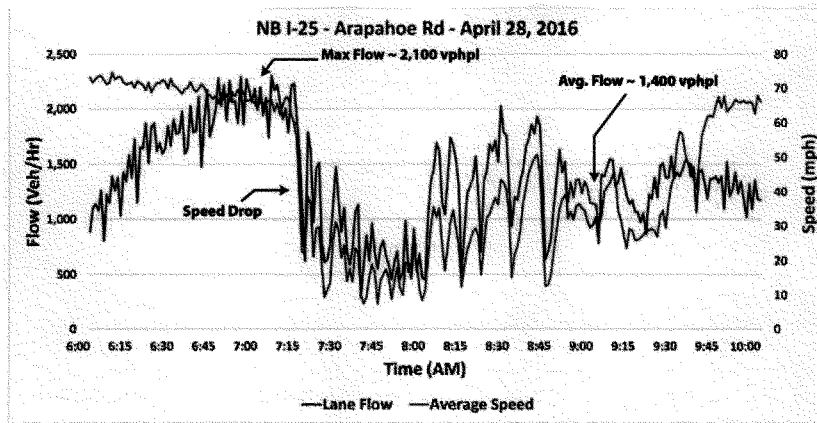
Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Colorado Department of Transportation
 SMART 25 Managed Motorways Pilot Demonstration

The SMART 25 Managed Motorways Pilot is located on I-25 northbound between Ridge Gate Parkway and University Boulevard, connecting Denver's central business district and the Southeast Denver business corridor.

The managed motorways concept first developed and implemented by the Victoria State Department of Transportation (VicRoads) in Melbourne, Australia, is a complex coordinated ramp metering and freeway management system, which adjusts to real-time traffic conditions to prevent the breakdown of corridor traffic-flow. The complexity of the system requires a robust deployment of traffic detection on ramps and the freeway mainline to fully understand and control for real-time congestion conditions. On the M1 Motorway in Melbourne, the managed motorways system was shown to increase traffic flow by 25%, improved average traffic speed between 35-60%, and improved overall travel time reliability between 150% (AM peak) and 500% (PM peak).

The primary goal of the SMART 25 Project is to address recurring peak-period congestion and severe unreliability on this vital I-25 corridor, by providing a more efficient, productive, and reliable freeway corridor using advanced transportation management technologies, without expanding interstate capacity. This approach will help to regain the productivity lost due to congestion. As shown in the graph below, once a bottleneck location breaks down, a max flow of 2,100 vphpl is reduced to 1,400 vphpl for the remainder of the period. SMART 25 will coordinate ramp signals to prevent this breakdown from happening in the first place.



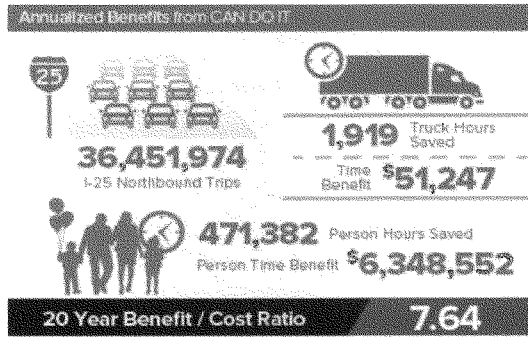


The total \$11,310,923 project cost will be funded through state sources, and a \$1 million FHWA AID grant.

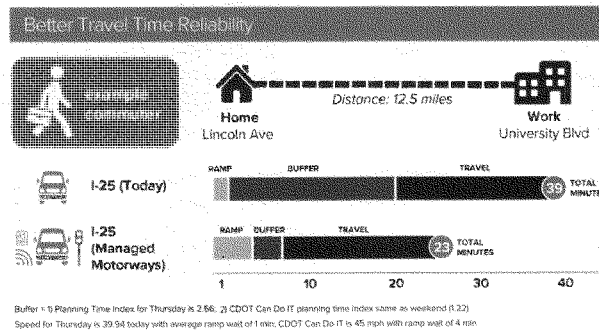
The deployment of advanced traffic detection on ramps and the freeway mainline will provide a real-time understanding of freeway conditions to aid in normal operations, incident management, and identify the location of bottlenecks for potential spot improvements. The elimination of freeway breakdown will improve throughput, travel time reliability, and average speed for all vehicles, including freight movement. By improving traffic flow and reducing recurring congestion and the associated start-stop conditions, vehicle emissions are also reduced.

The advanced traffic detection devices deployed throughout the SMART 25 corridor will provide real-time traffic conditions at a level of accuracy currently unavailable anywhere in North America. Once in place, this high-quality real-time data will be available to inform connected and automated vehicle (CAV) applications. In addition to providing high-quality real-time data to CAV applications, the same data can also be utilized by numerous Smart City programs.

The economic benefits of the SMART 25 project were calculated as part of a recent FHWA ATCMTD grant initiative. Through its predictive flow control of the freeway mainline, the managed motorways concept has been proven to add upwards of 500 vphpl in peak periods on the M1 in Melbourne. A similar benefit for SMART 25 would be equivalent of adding a new lane of travel without the expense, resulting in a 20-year Benefit / Cost Ratio of 7.64.



SMART 25 is a priority project for CDOT and a designated FHWA Project of Division Interest. CDOT is confident that the SMART 25 will demonstrate that a limited technological investment can generate the same benefits as hundreds of millions of dollars in freeway lane expansions. The pilot deployment will alleviate congestion, enhance access, improve safety, and reduce emissions, thereby delivering massive economic benefits to the Denver Metropolitan Area.





Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Colorado Department of Transportation
RoadX's Smart Pavement Project

RoadX Smart Pavement is a precast concrete panel embedded with digital technology and fiber optic connectivity that acts like a laptop tracking pad.

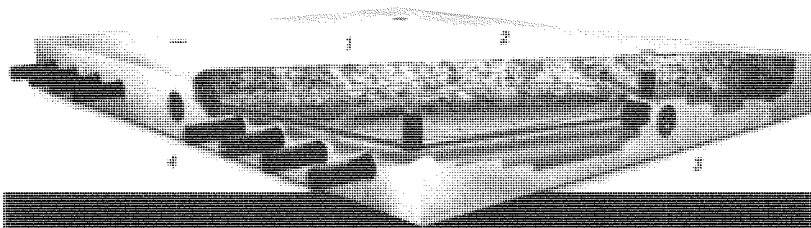
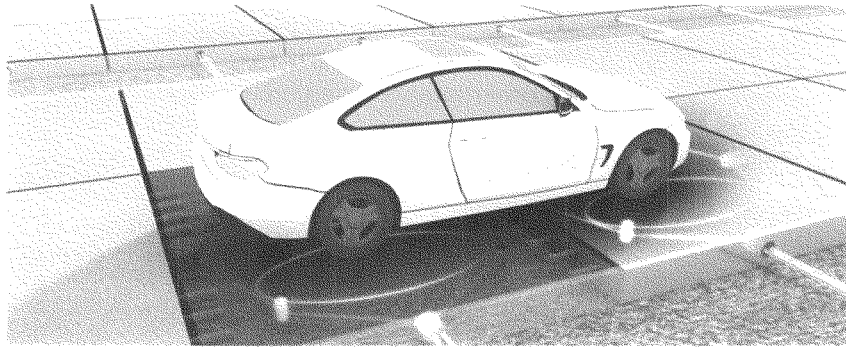
As proposed along US 285, a rural roadway with steep grades and reverse curves where a usually high number of incidents have occurred where vehicles depart the roadway and traverse down a steep embankment, the system has the capability to sense when vehicle leaves the roadway with automated notification to alert emergency responders to a possible incident. The emergency responders will be able address the incident immediately so that they do not go undetected for days.

The total cost of the Smart Pavement project is estimated at \$10M, with State and Federal funds providing a not to exceed amount of \$2.75M and private investment making up the remainder. The \$2.75M is 80/20 federal/state funds. Another example of a RoadX P3 extending dollars in the advanced mobility space.

This project will be able to monitor the pavement condition and communicate real-time maintenance needs when detected. This project will also be able to monitor the weather conditions at the site and provide real-time information to CDOT. CDOT maintenance staff can quickly address adverse weather conditions as they occur and enhance the safety for passenger and freight vehicles. This project will be constructed within the existing roadway envelope and will not negatively impact the rural characteristic of the area.

An understanding, in real-time, about the location and status of connected vehicles is a very important data set that could benefit the connected vehicle ecosystem being constructed in Colorado. This section of roadway is prone to adverse and extreme weather conditions. The economic benefits of can be recognized by ensuring safe and available passage of the roadway for freight traffic servicing the rural communities.

This project is a high priority for CDOT and FHWA as this pavement will enhance the safety and reliability of the roadway through vehicle to infrastructure technology.

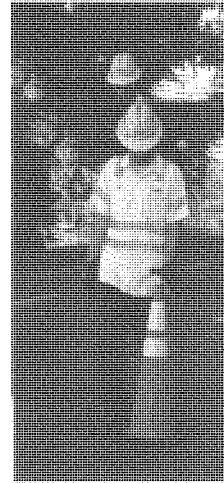


<p>1 PATENTED COMBINED ACCESS POINT (CAP) Patented combined access point (CAP) technology provides a single access point for both wireless and wired communication, reducing the number of access points required and simplifying installation and maintenance.</p>	<p>2 DIGITAL LAYER VEHICLE DETECTION LOGIC Digital layer vehicle detection logic provides a more accurate and reliable method for detecting vehicles on the road.</p>	<p>3 ROUTER High-speed, multi-protocol router provides a secure and reliable connection to the network.</p>	<p>4 CONDUIT AND CONDUIT SYSTEM Conduit and conduit system provides a secure and reliable method for protecting the network infrastructure.</p>
--	--	--	--



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Colorado Department of Transportation
 RoadX's Smart Cone Pins Project

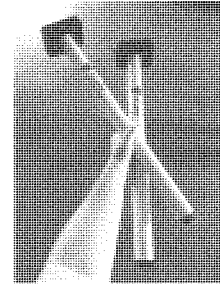
RoadX in partnership with iCone developed a low cost (\$600/unit to buy) GPS pin that fits into a standard roadway cone. When that "smart cone pin" is activated, it sends its true location and status to a cloud environment that anyone can ingest and display on a map. Work zones are a large frustration for the traveling public and a very dangerous location for workers and commuters. The location and status of work zones is often unknown. This is a problem today but will be a bigger problem when highly automated vehicles are involved, given the variability of work zones. "Smart Cone Pins" can be added to a work zone for under \$1,000 per lane closure to provide real-time location and status of work zones. This information can be used today by navigation apps but more so is preparing us for the future when vehicle will be needing to ingest information for the infrastructure to make better decision on how they travel – improving travel times and reducing delays. The cone pins are \$600/unit with first 100 units being deployed with 80/20 federal/state funds.



By the project contributes to overall state of good repair of the system by improving the understanding of the location and status of work zones, which can help expedite construction and improve the system.

The project helps freight and goods movement by reducing delays at construction zones, thereby improving freight movement. By reducing back-ups and congestion air quality can be improved.

Connected and ultimately automated vehicles desperately need the information smart cone pins can provide. Today, as the human drives, connected vehicles could share work zone activates with their network of other connected vehicles helping to distribute traffic around work zones. In the future, as automated vehicles operate on behalf of a human, they will look to avoid work zones at all costs given the complex nature of work zones (ever changing lane markings, humans giving hand signals, sudden speed changes, narrow lanes...). The real-time information smart cone pins will provide will allow automated vehicles to understand, via their connected aspect, where to avoid so they can operate as designed.



An understanding, in real-time, about the location and status of work zones is a very important data set that could benefit smart communities extensively.

Smart work zone is a high priority for the ITS JOP office within the FHWA. The standardization of data, about work zone, is currently underway – these smart cone pins can become the basis for this standardization.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Florida Department of Transportation
 Truck Parking Availability System (TPAS)

Truck parking shortages are a national safety concern. The results of insufficient or underutilized truck parking spaces can have negative social and economic impacts. Due to the lack of truck parking availability information and lack of safe and convenient truck parking spaces, tired commercial vehicle operators may continue to drive while searching for a place to park and rest, resulting in fatigue-associated crashes. Additionally, truck drivers may park at unsafe locations such as on the shoulders of roads or ramps or in vacant lots, causing safety related issues. Mobility is also impacted as the drivers utilize available time searching for parking instead of moving freight.

The current deployment of TPAS is 68 public sites located throughout Florida's state highway system along Interstate 10 (SR 8), Interstate 75 (SR 93), Interstate 95 (SR 9), and Interstate 4 (SR 400). The public sites include Welcome Centers, Rest Areas, and Weigh Stations where commercial vehicle parking is provided. TPAS uses a combination of in-pavement space occupancy detection for the location with mixed vehicle type usage (welcome centers and rest areas) and microwave vehicle detection for monitoring of ingress/egress at the weigh stations. The data are aggregated at the District Regional Transportation Management Center (RTMC) and disseminated to the commercial vehicle operators through dynamic roadside signs as well as through Florida's 511 system and third-party data feeds.

Based on early research by Florida International University (BDK80 977-14 (2012)), the proposed technology was selected as in-pavement sensors for the mixed-use facilities (rest areas and welcome centers) for spot detection while side-fired radar (microwave vehicle detection system (MVDS)) would be used for ingress/egress monitoring of the weigh stations. As limited in-situ data were available to document the performance of the in-pavement sensors, research projects (BDV31 977-56 (2016) and BDV31 977-85 (2018)) were conducted at the Columbia County, FDOT District 2 rest areas was used to validate the vendor data. Based on the research data, FDOT prepared a Developmental Specification governing the requirements of the detection sensors and associated hardware.

Total project deployment cost was \$24 million state contribution was 48% and federal contribution was 52%. There were no local or private funds for this project.

The project will reduce truck parking in locations such as shoulders or other non-designated locations, resulting in reduced maintenance activities. Additionally, trucks can maintain routes along the interstate system, reducing impacts to the arterial network. Also, trucks parked on freeway shoulders or on the ramps are detrimental to the mobility and safety of the motoring public and can potentially lead to incidents.

With the real-time truck parking availability information, truckers will be able to make informed decisions on truck parking during or prior to making trips that will save time and allow dispatchers to pre-plan the trips. Proper information dissemination on truck parking availability



will save an average of 30 minutes of driving time for most of truck drivers, i.e. less truck trips and more capacity available to the other motorists. Additionally, trucks searching for parking adds to congestion levels on the Interstate system.

Florida residents will benefit from reduced emissions and a reduction in overall truck trips and crashes impacting fellow motorists' safety and mobility. The manufacturers and shippers in the region will benefit from the more efficient movement of cargo and drayage, which enhances the global competitiveness of the Florida economy. The port authorities will benefit from the efficient freight parking management in their last mile drayage movement.

The project leverages the Intelligent Transportation System (ITS) infrastructure and deploys additional technology to provide real-time data for efficient decision making. Future upgrades, including the third-party data feeds, can provide for additional integration with connected and automated vehicle technologies. TPAS promotes advance route planning for freight movement and supports just in time goods delivery by helping truckers know about available parking as close to their destinations as possible.

The economic benefit of the system is divided into three categories, in addition to the intangible benefits of safety and convenience for the truck drivers as well as enhancing freight operations and Interstate commerce. The economic benefits are described in the table below, based on the benefit cost ratio.

PARAMETER	2015-2020	2021-2030	2031-2040
BENEFIT			
Safety Benefits	\$10,362,888	\$10,362,888	\$10,362,888
Driver Travel Time	\$63,922,560	\$42,247,638	\$25,831,499
Environmental	\$34,385,855	\$22,563,639	\$13,677,718
Total Benefit	\$108,671,303	\$75,174,165	\$50,872,905
COST			
Equipment Cost	\$13,988,850	\$13,988,850	\$13,988,850
Operations and Maintenance Cost	\$21,585,465	\$14,653,914	\$9,252,638
Total Cost	\$45,569,315	\$35,652,924	\$26,901,297
Benefit to Cost Ratio	3.83	3.25	2.65

The project is fully supported by the Federal and State (FDOT) funds and is included as key areas of emphasis in multiple plans, including the Moving Ahead for Progress in the 21st Century Act (MAP-21), the National Strategic Freight Plan and Florida's Freight Mobility and Trade Plan and Motor Carrier System Plan. The project is also supported by other state agencies, including the Florida Department of Highway Safety and Motor Vehicles. Finally, the project is supported by the Florida Trucking Association.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Georgia Department of Transportation
 Statewide Traffic Signal Software Upgrades

The Georgia Department of Transportation (GDOT) has long enjoyed the benefits of a common traffic signal control platform. An identification of operational limitations led the department to update this environment to a modern platform built on open standards and the Advanced Traffic Controller (ATC) specifications through the systems engineering process. The outcomes identified for this effort were for improved operations, tracking of performance metrics, and maintenance practices through expanded operations and automated monitoring using high-resolution data. This project updated over 9,500 traffic signals across the state of Georgia to a modern platform.

Through open procurement, GDOT selected Intelight MaxTime and MaxView for its signal control software and central system, respectively. The platform and deployment included updating all of Georgia’s 2070 traffic signal controllers with ATC Linux based processor boards. The technology was based on open standards that would enable GDOT to innovate well into the product’s lifespan to best handle arterial management across jurisdictional boundaries. Other public agencies including Utah DOT, Minnesota DOT, Oregon DOT, and the city of Dallas, use this software.

By deploying an advanced and open traffic signal control platform, GDOT seamlessly manages arterial operations with local agency partners across jurisdictional boundaries. With an additional suite of operational tools,

as well as real-time monitoring using high resolution data and automated traffic signal performance measures, GDOT leverages technology to extend engineering and maintenance resources across the entire state. Targeting issues proactively and responding to maintenance issues before they impact the traveling public improves the mobility of all users on the arterial network.



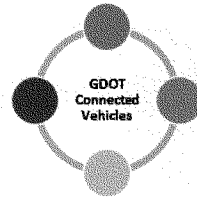
Total project cost is \$18,000,000 over 5 years – 80/20 Federal/State, the Federal share through FAST Act appropriations.

The system informs users on where and when operational and maintenance intervention is needed for targeted response and better allocation of resources. Automated alerts of system health provide GDOT and local agencies the opportunity to identify operational and maintenance

issues as quickly as possible and the ability to intervene as needed. The prioritized and proactive approach to arterial management provides the optimum approach to maintenance and operations. Data analytics provide additional intelligence for data driven decisions. The regional signal control architecture that this project provided was essential in managing traffic in the I-85 bridge collapse and reconstruction in 2017. The technology was paramount in providing unified control of detour routes and arterial management during reconstruction of a critical viaduct that carried 250,000 vehicles every day.

The system is deployed across the state at all 9,500 traffic signals. This broad deployment allows for innovative applications to accommodate freight through traffic responsive or adaptive approaches to arterial operations. The system has the flexibility to adjust operations and accommodate heavy freight movement as needed, while improving operations on arterials across the state. Improved mobility through enhanced arterial operations across jurisdictional boundaries reduces stops, travel times, and improves traffic flow. This in turn reduces vehicle emissions.

Because GDOT is deploying a common system on an advanced Linux based architecture, it can establish an ecosystem for the state that provides for broad deployment of connected vehicle technologies that support both autonomous and non-autonomous vehicles. GDOT has deployed 54 dedicated short-range communications (DSRC) devices already with this approach. Due to the scalable nature of the system, GDOT is in a position for a broad deployment of connected devices across the entire state. GDOT intends to deploy more than 1700 DSRC radios over the next two years to deliver vehicle to infrastructure-based applications, all built on this common signal control network.



Additionally, GDOT is leveraging this technology to provide an open data platform that supports third party applications by providing all connected vehicle data to users. This will ensure that GDOT supports not only low-latency DSRC V2I applications, but also the wide range of Vehicle-to-Everything (V2X) applications that will come in the future.



**Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Maryland Department of Transportation
Coordinated Highways Action Response Team (CHART) Systems Development**

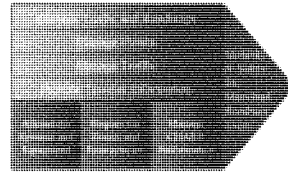
The Federal Highway Administration (FHWA) provides funding support for the development and maintenance of the CHART Systems project. The funding support is provided under the Fixing America's Surface Transportation (FAST) Act's Surface Transportation Block Grant (STBG) Program – Z240. The total approved funds for the five years beginning in fiscal year 2017 (FY 17) and ending in fiscal year 2021 (FY 21) is \$29.2 million, out of which \$13.04 million was activated for the three years beginning in fiscal year 2017 (FY 17) and ending in fiscal year 2019 (FY 19). This funding is provided by the FHWA at 80% with 20% Maryland State matching funds.

The three main components of the CHART Systems Development are:

- a) CHART Advanced Traffic Management System (ATMS),
- b) Emergency Operations Reporting System (EORS); and
- c) Lane Closure Permitting (LCP).

The goal of the CHART Systems Development is to fulfill the business process requirements defined in the Maryland Department of Transportation State Highway Administration's CHART Business Area Architecture (BAA).

CHART Business Area Architecture



The CHART Advanced Traffic Management System (ATMS) is a set of software programs running on a combination of Windows 2008 Servers, connected to a statewide network of Closed Circuit Television (CCTV) cameras, overhead and portable Dynamic Message Signs (DMSs), Highway Advisory Radios (HARs), Traffic Sensor Systems (TSSs) (microwave traffic flow detectors), remote weather stations, and On/Off devices (electronic relay devices such as for horns and fog beacons). It is used to identify and track traffic flow disruptions, send responders to correct the disruption and notify the public using the DMS and HAR devices, as well as sending notifications to the media and feeding data to a live traffic web site (<http://www.traffic.maryland.gov>) and Maryland 511.

The Emergency Operations Reporting System (EORS) application includes:

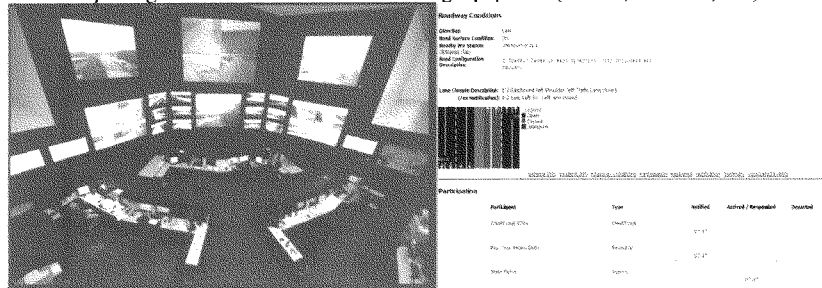
- Storm Event Reporting – Provides the ability to manage and report on the utilization of personnel, equipment, materials and conditions for an event.
- Snow Emergency Plans – Provides the method by which snow emergencies are managed for MD counties.
- Event Mapping – Provides the ability to specify conditions of predefined roadway segments.
- Route Restrictions – Provides the ability to manage vehicle restriction information.
- Post Storm Review & Archive – Provides the ability for a shop to add information about a previous storm event.

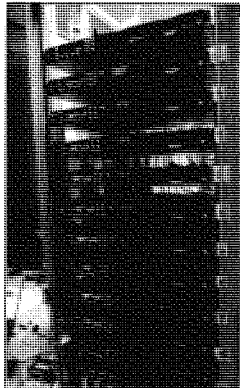


- Situational Awareness Reporting (SARS)/ Archive – Provides the ability to add event data at the district, EOC, CHART and PIO level. Also provides the ability to generate a summary report of the data entered.
- The Lane Closure Permitting (LCP) application includes:
 - Permit Mapping – Provides the ability to map the geolocation of a lane closure permit. This functionality is provided by the LCP through integration with external web services and a User Interface (UI) provided by the CHART Mapping application.
 - LCP Data Exporter services – Provides an interface for external applications to get LCP permit data. There are two basic interfaces: CHART Mapping and Public. The Public service resides in the demilitarized zone (DMZ) outside of the MDOT network. The Public interface contains a subset of the data available internally, although the data is much the same.

The current CHART System connects 909 CCTV cameras, 375 DMS, 68 HARs, 104 Weather Stations, 45 Warning Flashers, and 394 speed sensors to over 80 control centers statewide. This project will continue to better automate incident response, as well as build the CHART ATMS out to additional first responders and transportation agencies from across Maryland, Virginia, the District of Columbia, as well as Federal agencies in the National Capitol Region and beyond.

The following pictures are Statewide Operations Center (SOC) video wall, screen shots from the CHART reporting tool and other ATMS networking equipment (servers, decoders, etc.).





ID	Device Name	Device Subnet	Device IP	Device MAC	Device Vendor	Device Type	Device Status	Device Location	Device Description	Device Notes
4401	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED	10.100.100.100	10.100.100.100	08:00:20:08:00:20	HP	Server	Active	MD 295 AT MD 100	Request message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "4401"	
4403	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED	10.100.100.100	10.100.100.100	08:00:20:08:00:20	HP	Server	Active	MD 295 AT MD 100	Request message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "4403"	
4429	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED	10.100.100.100	10.100.100.100	08:00:20:08:00:20	HP	Server	Active	MD 295 AT MD 100	Request message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "4429"	
5534	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED	10.100.100.100	10.100.100.100	08:00:20:08:00:20	HP	Server	Active	MD 295 AT MD 100	Request message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "5534 FMS# 10"	
8816	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED	10.100.100.100	10.100.100.100	08:00:20:08:00:20	HP	Server	Active	MD 295 AT MD 100	Request message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "8816"	

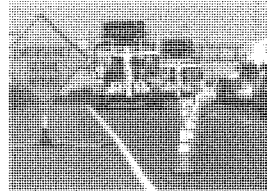
Support Message Edit DMS (Auto) Edit DMS (Manual) Execute Revoke Execution Remove

Previous on Map Refresh Close Event Filter Alarm



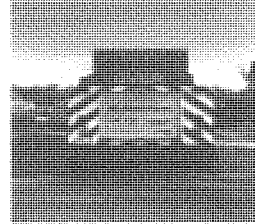
**Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Maryland Department of Transportation
Freeway Traffic and Safety Patrol/Response (FTSP) Vehicles Acquisition**

Federal Highway Administration (FHWA) also supports the acquisition of FTSP vehicles for the Office of CHART's Emergency Traffic Patrol (ETP) program. This acquisition of FTSP vehicles is also funded under the FAST Act's Surface Transportation Block Grant (STBG) Program – Z240. The total approved funds for two Fiscal Years; 2017 through 2018, is \$2.86M, funded by both FHWA and State funds at 80% and 20% match respectively.



The FTSP vehicles include both heavy duty and light duty vehicles. To perform incident management and emergency response functions efficiently, these FTSP vehicles are equipped with state-of-the-art technologies such as Automated Vehicle Location (AVL), permanently mounted Closed Circuit Television (CCTV) cameras, two-way radio communications and Capital Wireless Information Net (CapWIN) capabilities.

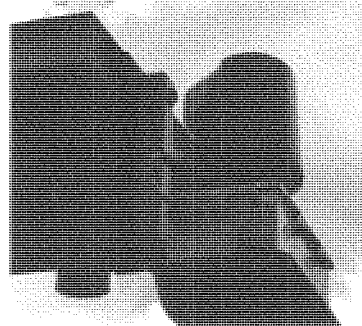
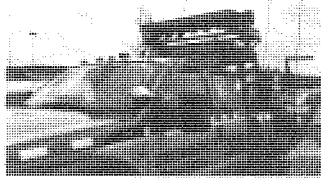
The AVL system allows CHART to record and analyze the performance of its vehicles in real time. This facilitates enhanced public services through better on-time performance and an improved response time to statewide emergencies. It also allows CHART to evaluate and pursue new ways of adjusting its services to meet the ever-changing needs of the Baltimore-Washington metropolitan area.



The CCTV cameras mounted on CHART FSP vehicles aid in the delivery of services by allowing remote operation of the camera from the operations center, thereby relieving responders of the need to set-up, manage and control the cameras before, during or after servicing an event or incident. Since a high definition camera is mounted on top of the vehicle, operators back at the operations center can control the pan, tilt, and zoom functions of the camera remotely, view a higher quality picture from a higher vantage point while allowing the responder to focus more on delivering services on site. The cameras provide CHART with valuable real-time information to be more efficient in incident management and incident clearance. It also allows CHART operators and managers to communicate information about the incident scene with their peers as well as field operators more effectively to speed recovery times and restore traffic to normal conditions.

The CapWIN is a program that was created by and continues to operate under the direction of a coalition of law enforcement, fire/Emergency Medical Services (EMS), and transportation agencies in Maryland, Virginia, and the District of Columbia to advance data communications across agency, jurisdiction, government, and discipline boundaries. The CapWIN program facilitates enhanced incident response communications by integrating transportation, public safety and voice communications systems data throughout the Baltimore-Washington region. CapWIN supports effective incident management coordination and information sharing capabilities among multiple responders which include: law enforcement, fire and rescue, EMS, transportation agencies, motorist assistance services, information service providers (ISPs), and the media.

The pictures show examples of FTSP vehicles and the permanent camera mounted on one of the vehicles.





**Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Michigan Department of Transportation
US-23 Flex Route**

The US-23 freeway between Brighton and Ann Arbor carries approximately 66,000 vehicles per day. Outside of the Detroit metropolitan area, it is the most congested corridor in Michigan. During light traffic and ideal conditions, the drive between Brighton and Ann Arbor only takes about 20 minutes, but during rush hour, it can take more than an hour. And without a good alternate route in the area, traffic can be at a near standstill whenever there is an incident.

The US-23 corridor north of Ann Arbor experiences heavy peak hour directional traffic southbound in the morning and northbound in the afternoon and has been the subject of study and improvements for 20 years. In 2009, the Michigan Department of Transportation (MDOT) completed the US-23 Corridor Feasibility Study that identified short-term and long-term corridor improvements. While MDOT was able to address the short-term recommendations and implement a corridor Intelligent Transportation System (ITS) and expand the regional Freeway Courtesy Patrol, a long-term solution to adequately address safety, recurring and non-recurring congestion and incident management was needed. Due to the State of Michigan's infrastructure funding challenges and an estimated construction cost of over \$185 million to widen this section of the US-23 corridor, MDOT investigated other innovative ways to solve the corridor's operational and safety problems.

In 2017, MDOT opened its first Flex Route along US-23 in Washtenaw and Livingston counties. For years, the problems of peak hour directional traffic, incident management and corridor operations and safety eluded the department. All short-term solutions for congestion, operations and incident management were exhausted through the implementation of Intelligent Transportation System and expansion of a Freeway Courtesy Patrol. However, a long-term solution to adequately address safety, recurring and non-recurring congestion and incident management was still needed. Due



to the State of Michigan's infrastructure funding challenges and an estimated construction cost of over \$185 million to widen the US-23 corridor, MDOT investigated other innovative ways to solve the corridor's operational and safety problems. The US-23 Flex Route was the solution. Completed in 2017, the US-23 Flex Route is nine miles in length from M-14 to M-36 north of Ann Arbor. The project included construction of road, bridge and interchange operational improvements and Active Traffic Management (ATM) strategies for the US-23 corridor to address daily recurring and non-recurring traffic, incident management and overall motorist safety. Using the Flex Route's lane control gantry system, MDOT can now dynamically manage



recurrent and non-recurrent congestion through technology and operational ATM strategies including dynamic lane control and shoulder use, variable speed advisories and queue warning.

Real-time data is being used to actively manage traffic to open the shoulder, harmonize speeds, warn drivers of conditions ahead and respond to incidents. Dynamic Message Signs (DMS), Microwave Vehicle Detection Systems (MVDS), Closed Circuit Television (CCTV) cameras and fiber optic cable are all being used in a new and innovative way. A new software module was developed for the project and integrated into MDOT's existing Advanced Traffic Management System (ATMS) software package. The software includes: response plans for the MDOT Statewide Operations Center (STOC) Flex Route Operators to open the shoulder during peak periods; an algorithm to analyze real-time data and propose advisory speeds to harmonize traffic flow; and logic for dynamic response plans to react to incidents that may require lane closures and/or shoulder openings.

Along with the Flex Route system and road, bridge and interchange improvements, MDOT also incorporated other safety innovations and multi-modal opportunities into the project. MDOT added truck parking ITS in advance of the rest area, seven emergency pull-off sites and a park and ride facility that is enabled with ITS for future transit service.

Benefit Cost Analysis using TDM-BIC, FHWA's Tool for Operations Benefits Cost Analysis

TDM-BIC	Costs	Benefits
FHWA's Tool for Operations Benefits Cost Analysis		
Model Inputs	capital costs - \$16,421,000 (2017 dollars) operations and maintenance costs - \$671,800 (annually)	change in capacity - 20% change in speed - 10% reduction in crash rate - 20% reduction in travel time - 20% time savings in communicating work zone information - 20% driver saving information - 20% time saved by drivers - 2 mins all other TDM-BIC inputs left at default
Average Annual Value	\$2,330,517	\$11,645,248
Annual Benefits to Cost		5.06

*Values were estimated from TDM-BIC modeling and MDOT IT-Related survey

Since deployment, the US-23 Flex Route has improved planning time by 57% and travel time by 32% during the morning peak hours, and corridor speeds have increased by approximately 20 mph. MDOT anticipates that over time, the incidents of primary and secondary crashes will be reduced. With a total project cost of \$119,000,000 and an ITS budget of \$16,421,000 this project showed an annual ITS Cost/Benefit Ratio of 5.06 as seen above. This project used a number of funding types, including, but not limited to; CMAQ, R&R, Bridge R&R all contributing towards an 80:20 federal match. Overall, the US-23 Flex Route has improved congestion and advanced transportation systems management and operations for the corridor. It has also had a significant impact on the reliability, safety and mobility for the motorists who travel US-23.

Below is a list of objectives met with the US-23 Flex Route:



1. Improved system reliability and planning time during the peak hour by 57% southbound in the morning and 22% northbound in the evening.
2. Improved system travel time during the peak hour by 32% southbound in the morning and 9% northbound in the evening.
3. Improved corridor speeds from 40 mph to 59 mph southbound in the morning and from 51 mph to 56 mph northbound in the evening.
4. Improved corridor incident management.
5. Added seven crash investigation sites and emergency pull offs.
6. Improved interchange operations by improving ramp terminals and adding ramp extensions at five interchanges.
7. Reconstructed three interchanges and three bridges and added non-motorized accommodations for future connection. Bridge improvements included raising the under clearance to address high load hits.
8. Reduced primary and secondary crashes in the first month of operation by over 50%
9. Improved work zone operations by providing for an additional flex lane to manage traffic during maintenance and construction activities
10. Improved corridor aesthetics through CSS coordination with the local communities

In 2018, the US-23 Flex Route project was awarded the Best of Intelligent Transportation Systems (ITS) Award for Transportation Systems Operations from ITS America and the Engineering Eminent Conceptor Award from the American Council of Engineering Companies (ACEC) of Michigan. The ACEC Michigan award is the highest honor awarded to the infrastructure project with the most impact on the citizens of the State of Michigan.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Metropolitan Transportation Commission of the San Francisco Bay Area
 Bay Bridge Forward

Funding: \$49.4M (\$16.5M Federal, \$32.9M Regional/Local). The Metropolitan Transportation Commission (MTC) approved funding for the program in 2016. The Commission is comprised of locally elected officials (mayors, city councilmembers, county supervisors) as well as non-voting state and federal officials from—the U.S. Department of Transportation, U.S. Department of Housing and Urban Development, and California State Transportation Agency.

The San Francisco-Oakland Bay Bridge Corridor is the single most congested travel corridor in the 9-county Bay Area region. This bridge corridor endures nearly 27,000 vehicle-hours of daily delay and carries over 270,000 vehicles across the bay. Not only does this corridor top the Bay Area in congestion, but rail, ferry and bus transit services also experience crowding.

Bay Bridge Forward is a suite of projects that moves more people in fewer vehicles to make the most efficient use of the bridge's capacity. It includes implementation of near-term, cost-effective operational improvements that offer travel time savings, reliability and increased capacity for carpooling and bus/ferry transit. These improvements will not only increase person throughput and improve access to jobs in San Francisco but also reduce congestion, incidents, and emissions in the bridge corridor. The Bay Bridge Forward Project began implementation in 2016, and most projects are underway and expected to be completed over the next two years. Below are descriptions of Bay Bridge Forward projects with ITS elements.

West Grand HOV/Bus Only Lane, West Grand Transit Signal Priority (TSP), Dynamic Transit Routing

West Grand High Occupancy Vehicle (HOV)/Bus Only Lane

During the morning commute periods, westbound approaches to the Bay Bridge experience significant delays, which include traffic from the I-80, I-580, I-880, and the West Grand Avenue on-ramp in Oakland. The West Grand Avenue on-ramp provides access to the northbound I-880 connector approaching the Bay Bridge, as well as access to eastbound I-580. Buses using the West Grand Avenue on-ramp can access the bridge via a bus-only ramp that is also open to other HOVs during carpool hours.

The project is intended to increase Transbay person throughput by providing access and operational improvements for transit buses and eligible carpools through the conversion of approximately 1,300 feet of the right shoulder on the West Grand Avenue on-ramp and northbound I-880 connector to a bus lane. This project allows buses and carpools to access the HOV/Bus Only lane earlier and bypass queues during congested conditions.

West Grand Transit Signal Priority (TSP)

MTC, in conjunction with the city of Oakland and Alameda-Contra Costa Transit District (AC Transit), is also implementing TSP along West Grand Avenue in the city of Oakland. Buses traveling on West Grand Avenue and continuing to the West Grand on-ramp across the Bay

Bridge will benefit from travel time savings and reliability with both TSP and the HOV/Bus Only Lane.



Caption: West Grand Ave. On-Ramp Bus/HOV Lane, Transit Signal Priority, and Dynamic Transit Routing

Dynamic Transit Routing

AC Transit currently has one bus route that uses the West Grand on-ramp. However, with the West Grand HOV/Bus Only Lane and West Grand TSP, AC Transit has identified several other routes that often get stuck in congested conditions on the I-580 bridge approach that would benefit from rerouting to West Grand. MTC is working with AC Transit to develop a decision support system for dispatchers to reroute buses to West Grand based on real-time traffic conditions.

Vehicle Occupancy Detection

In the Bay Area, 58% of HOV lanes are degraded, meaning that they fail the federal performance standard of maintaining an average speed of 45 mph at least 90 percent of the time during the peak hour over a consecutive 180-day period. Additionally, occupancy violations average 24% in the Bay Area and range as high as 39%, contributing to degradation.

To enforce such widespread violations, MTC is testing a pilot deployment of automated vehicle occupancy detection systems. The second phase of the pilot will include custom features such as an app to alert California Highway Patrol officers of frequent violators. This pilot is a step towards the wider deployment of vehicle occupancy detection technology to enforce managed lanes.

Integrated Bridge Corridor

The Bay Bridge is central to and an integral part of the Bay Area transportation system that connects between I-80, I-880, I-580 and US101. There are currently several Integrated Corridor Management (ICM) systems and Express Lanes being planned and implemented in the area on I-80 and I-880; the existing Bay Bridge metering lights are also being upgraded to an advanced system with an adaptive algorithm to account for bridge capacity and to increase throughput. The Integrated Bridge Corridor component of the Bay Bridge Forward will develop and implement a system to manage the collective system of traffic management strategies on these major freeway corridors feeding the Bay Bridge to optimize system performance based on real-time traffic information.

Commuter Parking Initiative

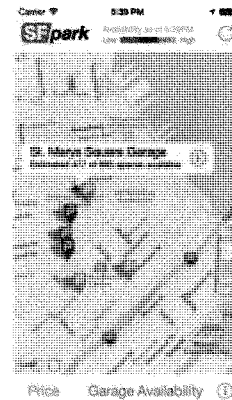
The Commuter Parking Initiative will construct three new commuter parking lots using underutilized airspaces under freeways. These parking lots will be actively managed and employ technologies such as real-time availability to allow commuters to know whether spaces are available, mobile payment, and license plate readers for efficient enforcement.

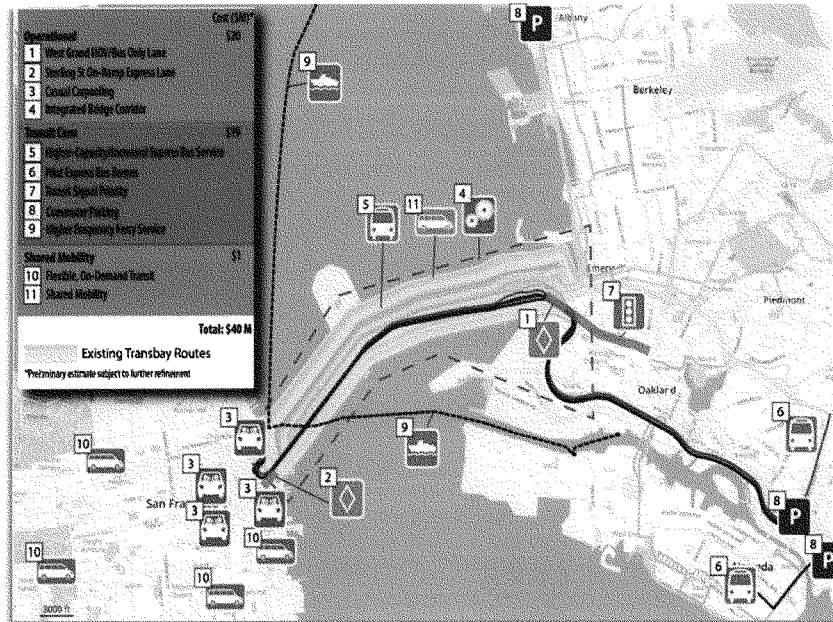
Flexible Transit

Hospitals are among the largest employers in San Francisco; most are located outside of downtown and not directly served by regional transit providers. After reaching out to some large employers, MTC decided to work with University of California, San Francisco (UCSF) and Kaiser Foundation Hospital (KFH). Both hospitals have a growing share of their employees living outside of the city due to housing affordability, which has challenged their ability to recruit and retain staff.

UCSF is piloting new flexible on-demand transit routes between the East Bay (Oakland, Berkeley, and Emeryville) and UCSF in San Francisco. The goal is to develop a transit service that can divert drive-alone East Bay drivers to transit. This service employs technology that allows users to reserve their pickup time and location; drivers can also skip stops if they know that riders are not alighting at particular stops.

KFH is implementing a commute management platform to help reduce employee drive-alone rates, offer ridesharing options, and manage parking. KFH is implementing a platform that integrates with parking systems, mobility providers, and HR systems; captures a baseline and measures employee commute activity across all modes, especially parking; applies more efficient management of employee transportation programs; helps employees find and share rides to and from work; and measures the effectiveness of different commuter incentives and commute mode options.





Caption: Near-Term, Low-Cost, and High-Impact Efficiency Strategies



Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Pennsylvania Department of Transportation
Interstate 76 Integrated Corridor Management

This is a PennDOT District 6-0 project, included on the Delaware Valley Regional Planning Commission (DVRPC) TIP. The project was identified and developed through a comprehensive analysis of Transportation Systems Management and Operations (TSMO) measures along the I-76 corridor, culminating in a Concept of Operations (ConOps) for Intelligent Transportation Systems Enhancements published in September 2016. Out of the initial ConOps effort, four separate consultant services projects have been advanced: one for the design of Active Traffic Management enhancements on the I-76 mainline; two for design of parallel arterial corridor traffic signal enhancements in Montgomery and Philadelphia counties; and one for the management and coordination of TSMO initiatives within the entire corridor.

The project is located along the I-76 corridor in Montgomery and Philadelphia Counties. The overall project location includes 13 miles of mainline I-76 between the Pennsylvania Turnpike (I-276/I-76) in King of Prussia and US Route 1 in Philadelphia. Also included are the parallel and intersecting arterial roadways, rail and bus transit facilities, and pedestrian and biking paths within roughly the same limits.

The mainline component of the program consists of junction control and flex lanes using a collection of ITS technologies such as dynamic lane assignment, variable speed limits and queue warning, also known as Active Traffic Management (ATM). These technologies were selected because I-76 in the project limits experiences recurring and non-recurring traffic congestion and has a history of congestion-related crashes.

Traffic signal equipment on arterial roadways will be upgraded and standardized, and control and maintenance responsibilities for these corridor signal systems will transfer from the municipalities to PennDOT in line with state legislation and resultant legal agreements. This will allow for a more seamless coordination and operation of signals during congested periods and incidents on the expressway and make these corridors a more reliable transportation alternative. Arterial ITS deployments will also be expanded to help facilitate the active monitoring of these corridors and the provision of traveler information to motorists.

Both the mainline and arterial roadways will be outfitted with communications equipment that will allow for the bi-directional flow of information between roadway infrastructure, automobiles, transit vehicles, pedestrians, and bikers. These deployments will support the Commonwealth's commitment to furthering vehicle-to-infrastructure connected vehicle initiatives.

ATM, flex lanes and junction control are proven technologies for dynamically managing all the pavement (including shoulders), allowing traffic to utilize lanes/shoulders at different times of the day for the movement(s) that require them the most. ATM technologies can also reduce rear-end crashes that result from motorists' inability to reduce speed quickly enough when congestion is initially observed, crashes related to adverse weather conditions, and secondary crashes.



Operating and maintaining traffic signals on corridors across jurisdictional boundaries will allow for them to operate more efficiently and reduce operations and maintenance costs through economies of scale. Standardization of signal and communications equipment will make the system more reliable and support preventative and response maintenance activities.

Enhancements to bicycle, pedestrian and transit facilities and the integration of PennDOT highway and SEPTA transit data and operations will allow for these modes to be more attractive as a transportation option within the corridor and provide travelers with more reliable information with which to make mode and route decisions.

Funding for all parts and phases of the I-76 ICM Program, as noted in the soon-to-be-adopted Delaware Valley Regional Planning Commission's FY 2019-22 Transportation Improvement Program (DVRPC TIP), are federal transportation dollars in the National Highway Performance Program (NHPP) category. PennDOT has chosen to allocate these funds to the program from statewide funding sources, rather than within the fiscally-constrained regional programming budgets.

As shown in the Regional Interstate Management Program summary, the I-76 ICM Program is funded in the following categories and amounts per fiscal year (previous TIP funding supports the ongoing Preliminary design phase):

	<i>FY 2019</i>	<i>FY 2020</i>	<i>FY 2021</i>	<i>FY 2022</i>	<i>FY 2023-26</i>
Final Design		\$1.0 M	\$3.5 M	\$3.485 M	\$0
Utility			\$4.24 M	\$1.75 M	\$0
Right-of-Way			\$6.24 M	\$4.0 M	\$0
Construction				\$12.0 M	\$107.025M
Total	\$0	\$1.0 M	\$13.98 M	\$21.235 M	\$107.025 M

When combined with the previously programmed Preliminary Design and Regional Traveler Information construction funding, the I-76 Integrated Corridor Management Program has been allocated nearly \$170 million, divided among its major program components.

Along mainline I-76, the ICM project will partially reconstruct the shoulder to provide sufficient width for a third travel lane. This is consistent with TSMO goals, in that shoulder expansion to provide a temporary third running lane is a fraction of the cost required to reconstruct and widen the entire highway and will buy time before a full reconstruction needs to be completed. However, this work will support future reconstruction when it is economically feasible by providing the width necessary to maintain traffic as the highway is expanded.

The mainline design team is looking at facilities within the I-76 corridor (bridges, culverts, storm water management facilities) that are deficient or in need of repair as site investigation progresses. Upgrades or repair of these facilities to address deficiencies and extend service life will be included in the overall project. Along arterial corridors, as previously noted, this project will be upgrading and standardizing traffic signal equipment for 160 traffic signals, reducing the burden of future maintenance.

This project will provide congestion relief during peak travel times and help facilitate goods movement to/from the city of Philadelphia and the Philadelphia Port Facilities. The reduction of stop and go traffic conditions during daytime hours will reduce tailpipe emissions. Additionally, a comprehensive analysis of stormwater management and permitting will address groundwater and infiltration requirements. As previously indicated, both the mainline and arterial corridors will be outfitted with connected/automated vehicle communications equipment. The systems integration portion of the project will include the transport, processing, and dissemination of CAV data at the District's Regional Transportation Management Center (RTMC). The project supports smart communities' objectives by providing a robust, redundant communications backbone that can be enhanced and extended through the region with existing data access points.

Per Regional Integrated Transportation Information System (RITIS) data, congestion along the referenced 13-mile section of I-76 costs Pennsylvania drivers over 3 million hours of delay annually, which equates to a user delay cost of \$73 million. In addition, the impact of higher-than-average accident rates along the corridor leads to additional economic costs. The implementation of ICM and ATM improvements along I-76 is focused on providing economic benefits for in both areas. It is not anticipated that the implementation of Flex Lanes along I-76 will provide much in the way of trip generation but it will instead better service existing regional trips.

This project is supported by three primary regional stakeholder groups. These groups have been meeting regularly during both the Concept of Operations development as well as through conceptual/preliminary engineering for the corridor project. Feedback has been constructive and substantive from all member agencies. Stakeholder groups are broken up as follows:

- Executive Stakeholder Group
 - PennDOT (District and Central Office)
 - SEPTA
 - PA State Police
 - FHWA
 - Delaware Valley Regional Planning Commission
 - City of Philadelphia
 - Montgomery County
- Emergency Responder Stakeholder Group
 - Local EMS, Fire, Police agencies.
 - Most Coordination has been facilitated through the DVRPC's I-76/I-476 Incident Management Task Force Group.
- Advisory Committee
 - All members of the Executive and Emergency Responder Groups plus:
 - Local Municipality Representatives
 - Additional County Government Agencies
 - Local Transportation Advocacy Groups

General public information sharing is accomplished via a project website and social media. The program is frequently discussed as one of the region's highest profile projects.



Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Regional Transportation Commission of Southern Nevada
Waycare

Waycare is a partnership between Regional Transportation Commission of Southern Nevada (RTC), Nevada Department of Transportation (NDOT), Nevada Highway Patrol, and Waycare. Located in southern Nevada, Waycare helps improve safety and efficiency on freeways, including key freight corridors and major arterials by compiling and analyzing data to report in real-time the location of accidents and predict where dangerous driving conditions or congestion may occur.

This technology enables faster validation and response to roadway incidents as well as a more efficient use of resources to proactively deploy traffic patrols and abatement efforts with the goal of preventing incidents. So far, early incident identification through Waycare has shown to be 11.9 minutes faster on average than prior modes of incident identification. Waycare is quantifying travel reliability and that information is used to make measurable impacts on safety and efficiency.

The project cost is \$779,000 and is funded with local dollars.

By enabling faster incident response times and proactively addressing problematic traffic areas, Waycare helps ensure a safer and more efficient movement of freight and goods on highways and arterials. The project reduces congestion, which, in turn, reduces emissions of greenhouse gases. The project demonstrates how multiple entities collaborate to successfully deploy vehicle-to-vehicle and vehicle-to-infrastructure technology. It proves that data from a multitude of providers can be successfully integrated to solve problems.

Waycare supports smart communities objectives in several ways, including the sharing of data and promoting the collaboration between multiple agencies to make roadways safer and travel more efficient. Traffic congestion can be reduced (thus allowing for more efficient travel for all) when roadway incidents are cleared more quickly, which Waycare has achieved in Southern Nevada.

RTC is working with state officials from the DOT and the Department of Public Safety as well as local traffic agencies and emergency responders. Key local, state, and Federal elected officials have been updated on the project.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Regional Transportation Commission of Southern Nevada
 INRIX

The Regional Transportation Commission of Southern Nevada (RTC) is partnering with INRIX on a new platform called AV Road Rules (AVRR), which provides the foundation for jurisdictions and road authorities to digitize and communicate traffic rules to connected and autonomous vehicles, allowing them to operate safely and effectively within roadway limitations such as speed limits, turn restrictions, bikes lanes and more.

INRIX's state-of-the-art platform allows cities and road authorities to digitize their traffic rules and restrictions, such as speed limits, crosswalks, turn restrictions and bikes lanes, so they can communicate with highly automated vehicles (HAVs), allowing them to operate safely and effectively.

The project includes no local or federal dollars. Minimal staff time is required for coordination and digitizing.

AVRR also enables HAVs to report infrastructure needs, such as potholes, inadequate lane striping and inadequate signage, to the appropriate road authorities. This is a valuable tool for cities to more quickly identify infrastructure needs and leverage HAV operation to improve the safety and comfort of streets for all users.

AVRR will be distributed to freight and goods movement providers, thereby improving their efficiencies. AVRR deployment to HAVs will improve traffic flow and reduce greenhouse gas emissions.

As connected and autonomous vehicles continue to develop, a central challenge to consumer acceptance is the question of how the vehicles will operate safely and understand local rules of the roads. The first-of-its-kind AV Road Rules (AVRR) platform will help ensure the safe and effective operation of highly automated vehicles (HAVs) on public roads. In addition to helping build public acceptance of autonomous vehicles, the platform will also help cities and authorities prepare now to test and deploy connected and automated vehicles.

Smart infrastructure and data sharing processes must be in place to enable vehicle-to-infrastructure and vehicle-to-vehicle communication, and the AVRR platform supports this objective. This partnership allows third-party providers, such as Inrix, and regional transportation agencies, such as RTC, to identify best practices and opportunities. These results can be shared with agencies throughout the country, resulting in decreased transportation costs and improved mobility.

RTC, one of a few state and local agencies participating in the program, is collaborating with state and local agencies.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Regional Transportation Commission of Southern Nevada
 Audi

Audi debuted the first-of-its-kind “Time to Green” feature that provides the driver with a countdown to when a red light will turn green. The Regional Transportation Commission of Southern Nevada’s (RTC) advanced traffic management system provides specially-equipped Audi vehicles real-time traffic signal information through countdown in the instrument panel. Traffic Tech Services runs the predictive analysis to determine whether a traffic light’s countdown is accurate. If the countdown meets certain confidence levels, it is released to Audi for display in the car. The RTC’s traffic management center, which operates across all jurisdictions in southern Nevada, provides the means (hardware and software) for data to be pushed to Traffic Tech in real time.

The “Time to Green” feature helps reduce stress and keep drivers more informed when approaching intersections. In addition, the RTC’s traffic management center receives real-time anonymous traffic signal timing data from the connected vehicle to help better manage congestion on crowded roadways.

There is no cost to RTC. Hardware and software were already in place to support this effort. Minimal staffing hours are needed to implement and maintain the program. The project enables RTC to receive real-time feedback related to the performance of software and the communication network. RTC is working with Audi and its engineers to design analytics using the real-time feeds.

The RTC’s traffic management center receives real-time anonymous traffic signal timing data from the connected vehicle to help better manage traffic on crowded roadways, helping to keep freight and goods moving more smoothly. Thanks to data provided from the connected vehicle, traffic signal timing sequences can be adjusted to keep traffic flowing and reduce idling time and congestion that leads to increased emissions and air pollution. Eventually, the V2I information can be integrated into a vehicle’s start/stop behavior, navigation system to optimize routing, and predictive services (such as presenting the driver with a speed recommendation designed to maximize the number of green lights one can make in sequence). These services are designed to improve efficiency, drive time or traffic management.

This precedent-setting partnership will help establish the foundation for how local governments and auto manufacturers can develop meaningful policies, build infrastructure and connect systems to accommodate V2I technology to achieve smart community objectives, including improving mobility, increasing safety and reducing congestion. The economy can benefit from signal timing that reduces delays and improves reliability. Data from projects like Audi can support these analytics.

RTC works with state and local agencies to ensure that traffic signal hardware and software as well as communication networks can provide real-time signal data that Audi and its engineering team can use.

Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Regional Transportation Commission of Southern Nevada
 AAA and Keolis

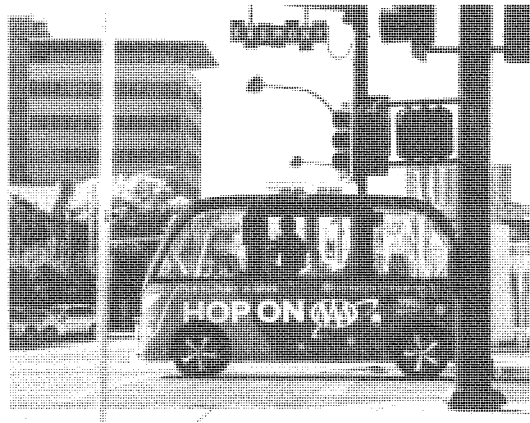
The Regional Transportation Commission of Southern Nevada (RTC), along with the city of Las Vegas, provides traffic signal data to a self-driving shuttle sponsored by AAA and Keolis that operates in mixed traffic along a half mile loop in downtown Las Vegas. The shuttle is the country's first autonomous bus to be fully integrated with "smart city" infrastructure. The project furthers the development and deployment of autonomous shuttle technology that can serve as a viable transportation option to improve safety and traffic flow. This project includes local and private sector funds.

RTC and its partners monitor the health of the infrastructure system using the data generated from the infrastructure and the shuttle. They are also developing best practices regarding cyber security, which will contribute to state-of-good-repair of technology deployments.

Lessons learned from autonomous vehicle performance are directly transferable from the shuttle use to freight and goods movement use. The shuttle is fully electric and does not produce emissions that lead to air pollution. Lessons learned from a fully autonomous deployment in a complex urban setting will inform other use cases and lead to environmental benefits.

This pilot will help the partners understand the customer experience on board an autonomous shuttle and learn more about how autonomous vehicles operate in mixed traffic. The project will help the entities begin to develop standards for sharing data with connected and autonomous vehicles as federal standards don't currently exist.

Currently, the shuttle is offering free rides and is attracting more than 150 passengers a day. However, in the future, an autonomous shuttle like this could be a viable transit option and part of a fare-based transit system.



Project is a collaboration of local and regional agencies, a private-sector transit provider and shuttle manufacturer, and AAA. State and federal partners are aware of the project successes.



The project concept was used in recent Federal grant applications to address first-mile last-mile challenges.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Regional Transportation Commission of Southern Nevada
 Nexar

Nexar is an app that uses smartphone dash cams and wireless technology to provide drivers real-time alerts to prevent vehicle, cyclist and pedestrian collisions. The app records video outside of a vehicle and measures vehicle dynamics related to speed, braking and turns. Warnings from adjacent vehicles are communicated to drivers via the app, such as the need to brake for a hazard. The Nexar network is well established in New York City and San Francisco, where it reported a 24 percent reduction in collisions since its inception.

The National Highway Traffic Safety Administration (NHTSA) believes implementing V2V networks can help reduce crashes, not including those involving drivers under the influence, by 79 percent. Thus, the Nexar network can help increase vehicular and pedestrian safety on Nevada roadways. Nexar's data also enables the RTC / local and state governments to leverage car-sourced information to improve infrastructure and traffic management, roadway maintenance, regional transportation planning and policy-making, and ridesharing/transit applications. There are currently no direct costs incurred by state or local agencies. Minimal staff time is being used to assist with deployment and analytics.

Nexar's street level car-sourced information, including congestion, traffic patterns, infrastructure defects, road hazards, and collision instances, is shared with the RTC/ local and state governments in real-time. The real-time traffic data Nexar provides can help the RTC better manage busy roadways, thus improving the movement of freight and goods. The data Nexar provides can help reduce CO2 emissions by identifying impediments to traffic flow.

V2V is a critical safety feature that extends the line-of-sight and allows for communication between human drivers and autonomous vehicles. As the network develops, Nexar will train Nevada traffic operations officials and help enable, monitor, manage and ultimately certify autonomous vehicles.

Nexar's platform allows state and local transportation officials access to previously unavailable real-time anonymous data related to roadway use, traffic patterns and transportation infrastructure. The data can help local governments achieve smart community objectives, including improving safety, efficiency and system performance; reducing CO2 emissions by identifying impediments to traffic flow; and enacting a more holistic road management policy by leveraging the data Nexar generates to understand road velocities, traffic blockers, and human braking effectiveness. To support the statewide V2V network, Nexar expects to add more than a dozen new full-time jobs in Nevada as the network grows. In addition, establishing the V2V network has the potential to support growth of the transportation ecosystem and foster hundreds of additional jobs in technology, insurance, data management, software development and autonomous vehicle training.

RTC, the State and various local transportation providers are the key project supporters in Nevada.



Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Tennessee Department of Transportation
I-24 SMART Corridor

The I-24 SMART Corridor runs from Nashville to Murfreesboro, Murfreesboro Pike (parallel arterial running the entire length of I-24), connecting arterials between I-24 and Murfreesboro Pike.

Transportation technology has long been proven as an effective tool for managing traffic congestion. Along I-24, traffic volumes have increased by more than 60%. Accident rates along this segment are the highest in the state. To respond to this increased traffic demand, the Tennessee Department of Transportation is implementing an Integrated Corridor Management (ICM) system that will seamlessly manage the corridor as a multimodal system through institutional collaboration and integration of infrastructure.

This ICM system will implement ramp metering, multijurisdictional traffic signal coordination, electronic signs for traveler information, incentivized removal of disabled vehicles, transit service enhancements, incident management strategies, and many other complementary elements to achieve the following objectives:

- Enhance safety along the corridor
- Inform travelers of freeway and arterial conditions
- Establish interagency coordination
- Promote the use of alternate travel modes
- Create reliable travel times along the corridor
- Prepare the corridor for future technology

This project is expected to directly contribute to these measures by creating the following corridor performance enhancements:

- Reliable and regular traffic flow along the freeway will reduce secondary, rear-end accidents that cause significant additional delay.
- Rapid removal of disabled vehicles from the freeway shoulder will improve safety by reducing or eliminating the possibility of vehicles side-swiping or rear-ending disabled vehicles, causing substantial congestion.
- Incident management strategies deployed along the arterials will improve the ability to increase throughput of freeway traffic that uses arterials to bypass a freeway incident. These strategies enable the arterial to return to normal traffic flow more quickly.
- New fiber communications will fill gaps in existing infrastructure to enable agencies to remotely monitor traffic conditions and optimize traffic operations in a proactive manner.
- Transit operations will be enhanced through improvements in infrastructure and deployment of field technology by facilitating transit reliability, which is expected to increase ridership.

The estimated cost for the I-24 ICM project is \$68M. This includes project development, design, construction, and system integration. The project will be delivered through 11 different



deployments in multiple project phases, including design/construction, equipment procurement, and service procurement. Project funding consists of the following:

80% federal – National Highway Performance Program – Surface Transportation Block Grant
20% state.

Development of this project includes an Operations and Maintenance strategy that outlines roles and responsibilities for routine, preventative, and replacement maintenance activities. By supplementing these responsibilities and activities with estimated annual costs to operate and maintain the equipment, TDOT will be able to sustain a Smart Corridor program that has reliable functional performance.

I-24 is a major freight corridor into and through the Nashville metropolitan area, with critical distribution centers located throughout the corridor. Advanced traveler information to freight traffic will be used to alert freight operators of current conditions before vehicles enter the corridor. This will inform drivers to avoid the corridor, delay entry to the corridor, or use alternate routes to bypass the corridor in the event of significant incidents causing congestion. Greenhouse gas (GHG) emissions are increased when vehicles spend more time in the corridor and on the road. The I-24 ICM will reduce travel time and reduce vehicle delay for all vehicles. This will reduce GHG on the freeway as well as arterials.

I-24 will be equipped with electronic changeable message signs between each interchange along the freeway in both directions. Each sign will be equipped with a Dedicated Short-Range Communication (DSRC) radio transmitter/receiver that will send traveler information messages to subscribed vehicles approaching each sign location. These devices also will collect valuable vehicle information to be stored in a central database for traffic flow analytics. DSRC also will be installed at signalized intersections along the parallel arterial and connector routes to assist with future CV/AV applications and help fulfill FHWA's Signal Timing and Phasing (SPaT) challenge issued to the state DOTs.

Regarding smart infrastructure, the communications network will be integrated such that field devices (e.g., video cameras, traffic signals, electronic signs) will remotely communicate with central management centers in each jurisdiction. The central management centers will be connected to each other to share of video and data from agency to agency and promote collaboration of traffic management strategies across agency boundaries.

Introducing connected vehicle technology to the region will promote smart communities by providing drivers and potential drivers with advanced corridor traffic information, enabling drivers to make informed decisions about specific routes and time of departure. This also positions the corridor to accommodate other smart community technology related to one-stop services for shopping, travel modes, and other services. This project will promote increased productivity through regular travel enhancements as well as freight and goods movement. Improved corridor performance will create a desirable community for future residential and commercial development, supporting a vital and vibrant economy.

This project has full support from federal, state, and local entities. The Federal Highway Administration (FHWA) is a valuable partner in defining and developing project concepts and overall project process. FHWA approved the project, which was developed according to its



Systems Engineering process. TDOT is the lead agency for the overall project and has provided full support for its development and delivery. All stakeholders along this corridor, which includes the cities of Nashville, LaVergne, Smyrna, and Murfreesboro, Rutherford County, MTA, and RTA, have been full and active partners in the development of project strategies. These stakeholders have contributed to project direction, concept definition and review, and overall project support for the establishment of a Smart Corridor within their jurisdictions. Each city's governing body has executed a Project Charter and a Resolution of Support memorializing their backing of the project.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Utah Department of Transportation
 Highlights of Technology Projects

Signal Interconnect Projects

Benefits Realized:

- Improved traffic signal coordination through signal controller time clock syncing
- Daily alerts when signal detection is down, leading to faster mitigation of detection issues
- Full situational awareness of signal operations quality for connected signals
- Ability to remotely manage signals for special events and incidents, which results in improved efficiency of operations and safety of personnel
- Remote operations capabilities reduce need for afterhours maintenance deployments, saving time and money, and improving worker safety
- Improved interagency coordination and operation of signals on state and local corridors

Other Statistics/Facts:

- 97% of UDOT owned traffic signals are connected
- 82% of non-UDOT owned traffic signals are connected
- All traffic signals statewide (UDOT and non-UDOT) are on the same system and can be controlled by UDOT and local agencies

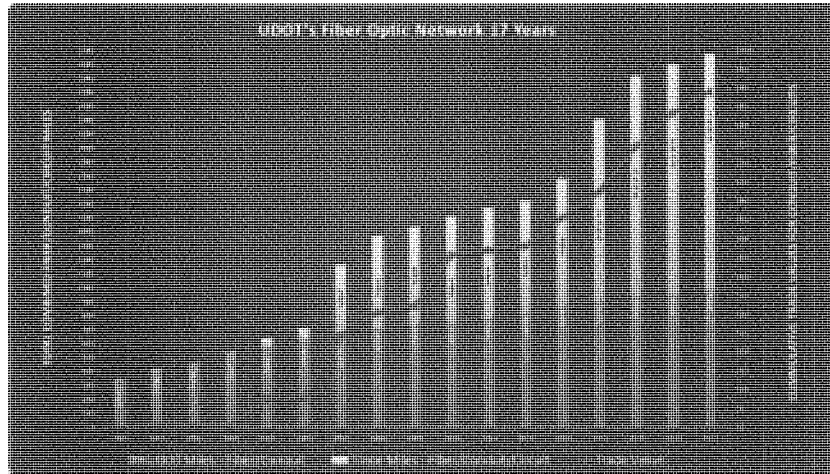
Variable Message Sign (VMS) Projects

Benefits Realized:

- Improved communication of road conditions and safety messaging to traveling public
- Route diversion for improved congestion/incident management
- Reduced primary and secondary crashes through improved communication with traveling public
- Realtime travel time communication to traveling public

Studies/Statistics Regarding VMS Effectiveness (not specific to Utah, but indicative of general benefits of VMSs):

- Study done by Wisconsin DOT published May 2002 indicated up to 72% of motorists surveyed adjusted their travel routes based on VMS messaging
- 94% of motorists surveyed traveling on rural roads took actions provided by VMSs in a Missouri study published December 2011
- In the San Francisco Bay Area, 8% of motorists switched to transit when VMSs communicated travel time savings of 20 minutes or greater (study published September 2009)
- University of Minnesota study from November 2002 showed VMSs reduced travel times by 12.1% during non-peak hour incidents
- Study done in 4 major metro areas published by FHWA in July 2014 indicated an average of 86% of drivers surveyed feel Public Service Announcements (PSAs) on VMSs are so metimes, often, or always more effective compared to other media





Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Washington State Department of Transportation
 US 395/ Hawthorne Road Channelization & Signal Modification

This project revised the lane configuration and upgraded the existing signal system at Hawthorne Road and US 395 in Spokane, Washington. US 395 (Division Street) is a major at-grade arterial route in/through Spokane and a major freight route. The existing traffic signal at Hawthorne Road did not permit the east and west lanes to move at the same time due to lane configuration restrictions. Channelization revisions created exclusive left turn lanes on Hawthorne going east and west, a combined through lane and right turn lane for eastbound traffic, and exclusive through lanes and right turn lanes for west bound traffic. These changes allowed the signal to run in a standard eight-phase operation under new signal controllers capable of expansion to automated vehicle technologies and increased operational efficiency of the intersection. The total reduction in vehicle delay is 22,637 minutes/day.

The total project cost approximately \$1 million – state contribution is \$100,000 and federal contribution is \$900,000 (CMAQ).

The Spokane metropolitan area and Spokane County qualify as a Transportation Management Areas (TMA) and a federally-designated maintenance area for air quality. Through the area Metropolitan Planning Organization, Spokane Regional Transportation Council, WSDOT applied for a Congestion Mitigation & Air Quality Improvement (CMAQ) program grant. The project was a joint venture with Spokane County Public Works.

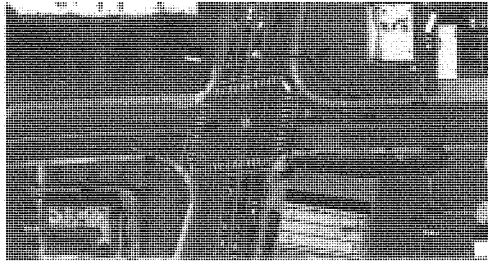


Figure 1 Before

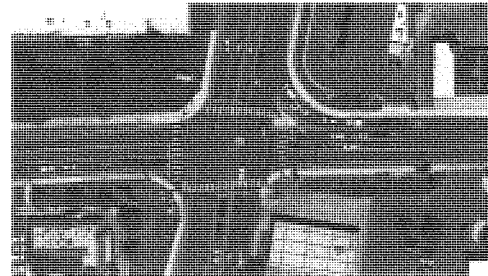


Figure 2 After



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
Washington State Department of Transportation
 Centralized Signal System-Joint ATMS throughout Clark County

Clark County, Washington, is part of the Portland, Oregon metropolitan service area. As the second densest county in Washington, smart solutions are necessary to extend the service life of existing infrastructure to sustain the region's rapid growth. As the region has grown, increasingly traffic signal systems operated by different jurisdictions interact. For example, a county highway that crosses I-5 will be operated by the county, however the interchange traffic signals are operated by WSDOT. This creates segmented systems that can cause breakdowns in the transportation system. Clark County and WSDOT, in coordination with the area Metropolitan Planning Organization (MPO), have a history of working collaboratively to share infrastructure such as fiber to lower the overall cost of infrastructure to residents of Clark County.

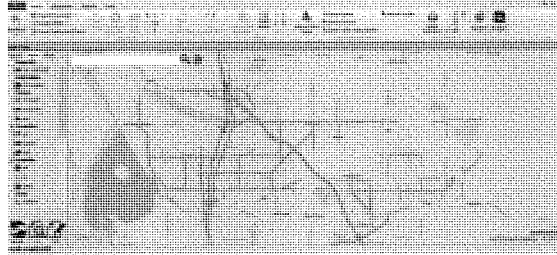
In this spirit, Clark County negotiated with their vendor to transform their local centralized traffic signal system into a regionally-shared Advanced Traffic Management System (ATMS). This upgrade by Clark County enabled the remaining local jurisdictions to share traffic data, and remotely operate traffic signals, within each other's systems. The shared centralized signal system is documented in an interagency agreement. As part of the agreement, WSDOT-owned-and-operated signals from the seven-county region of Southwest Washington may utilize the regional signal system. WSDOT successfully obtained a Congestion Mitigation & Air Quality Improvement (CMAQ) program grant through the Southwest Washington Regional Transportation Council for this work.

The CMAQ grant will fund WSDOT's needed system upgrades to effectively communicate with Clark County's systems. For the centralized signals systems to communicate thru ATMS, WSDOT must make signal controller upgrades to the controller's CPU's (central processing units) on existing signals on SR 500 and SR 503 to communicate and share data with our local partners. Additionally, to better define and track individual traffic movements within each intersection, additional detection loops and detectors will be installed.

ATMS is capable of adaptively managing and adjusting traffic signal timing to meet real time demand. These automated processes will maximize utilization of existing infrastructure, reduce delays and emissions, and increase mobility. Once the signal controller upgrades are completed in this project, high resolution signal data captured by the system will be used to create performance measures to evaluate efficiency of the traffic signal system. During traffic

incidents, engineers working in the WSDOT Traffic Management Center will remotely adjust county and WSDOT systems to assist in managing the associated congestion.

ATMS has an eye on the future, broadcasting signal phasing and timing (SPAT) data over the internet to third party vendors (Tidalwave) as well as from physical field devices via dedicated short-range communications (DSRC). This data will be crucial as the region transitions to connected and autonomous vehicles.



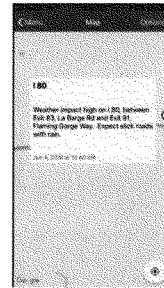
Screen Shot of ATMS 1

The total project cost approximately \$200,000 million, out of which, state contribution is \$51,000 and federal contribution is \$149,000 (CMAQ).

Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Wyoming Department of Transportation
Mobile App Enhancements

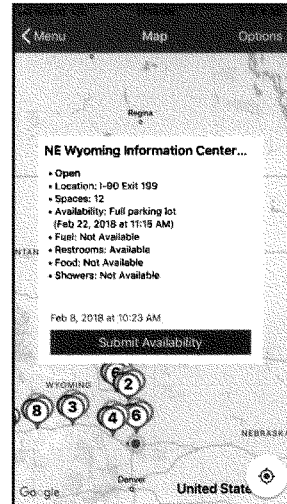
WYDOT developed a mobile application for smartphones to share pre-trip and en route traveler information. This application had three major components:

- A map for pre-trip planning that provides information including road conditions, traffic incidents, weather sensor data, web camera images, road construction notifications, and truck parking locations.
- A hands free/eyes free feature that speaks road condition, traffic incident, and road construction information as drivers travel down the road, alerting them in advance to adverse conditions ahead.
- A “Where am I?” feature that correlates the user’s GPS location to the nearest route and mile marker. This can be used in an emergency when a driver needs to be able to share his or her location. The location can easily be sent via text or email.



Based on feedback from the public, we realized we had a real opportunity to improve the application to provide better information for travelers in Wyoming. Funding from the FAST Act allowed us to improve the app to include improved features:

- Submit an Image, which allows users to “pass it to the passenger” and submit images of road conditions or traffic incidents directly to the state’s Transportation Management Center. Images and/or text submitted through the app can then be shared with the public, or information gleaned from the photos can be used to update information reporting systems.
- Report on truck parking availability. By sharing information about the number of spaces available in public parking areas, truck drivers can share with each other important information that can be used to make decisions about whether to park or to continue driving. During road closures due to adverse weather, this can also help truck drivers navigate to safe parking locations.



Transportation safety, mobility, or infrastructure challenge the project is helping address: This application helps the agency provide accurate, timely road condition information to the traveling public. Because of the long distances between towns, travelers often don’t have the option to take an alternate route or choose to stop a trip due to poor conditions once they’ve committed to driving. This application provides relevant information about truck parking availability to help



drivers with that decision-making process. It also allows the public to communicate with WYDOT if information systems are not accurately reporting conditions.

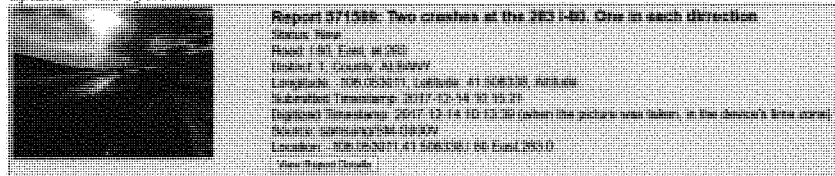
Project cost information, including federal match, state/local match, and private funding: About \$21,000

By allowing travelers a direct line to the Transportation Management Center allows WYDOT to respond to conditions as reported by travelers. Limited staff means that we rely on the public to help alert us to issues on the roadway. This application facilitates that.

This application provides vital road and traffic condition information to truck drivers while they are en route. By providing them timely, accurate condition information, truckers can make decisions about whether and when to travel. In addition, the app allows truck drivers to post information about parking availability. This provides near real-time updates to other drivers to help give them the information they need when making decisions about where to park. This becomes more important when limited visibility or high winds result in road closures. Providing road and traffic condition information can ease traffic congestion, which has a benefit to the environment.

Information received through the truck parking availability and submit a picture features will be broadcast via roadside units as part of WYDOT's Connected Vehicle Pilot. By providing accurate, timely road condition information, travelers can make informed decisions about whether and when to travel. This provides situational awareness for drivers who can choose to stay home, take an alternate route if one is available, or delay a trip. Safer drivers reduce the risk of crashes, which have a substantial economic impact.

Demonstrate the level of support from federal, state, and local elected officials and other key policymakers: The mobile app has been downloaded by the public more than 130,000 times. Given Wyoming's population of about 560,000 people, this level demonstrates a significant uptake of the system.





Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Wyoming Department of Transportation
Revised Commercial Vehicle Operator Portal

The Commercial Vehicle Operator Portal (CVOP) is a web-based system focused on providing a one-stop shop for current road conditions and road weather forecast information on the most commonly traveled commercial routes in the state. This information is shared with the trucking community and was designed based on feedback provided directly from fleet managers. Because of their feedback, WYDOT provides road weather forecasts for pavement condition, wind, and visibility in 12-hour increments for a total of 72 hours in advance. WYDOT's contract meteorologist also provides a more detailed wind grid in three-hour increments, so fleets can make important safety and delivery decisions. More than 800 firms from all but five states are using the system.

Pre-trip decision support information is vital to fleet operators, and WYDOT provides this road forecast information through a simple, web-based interface available to all commercial fleets and operators.

WYDOT estimates that the current system cost no more than \$25,000 to build and deploy. The system was funded using FY 2018 FAST Act funds with a 90/10 federal/state match.

Providing truck drivers and fleet operators with accurate road weather forecasts and current conditions in one place allows them to know what their drivers are facing and to advance shipments, delay shipments, or re-route their cargo if needed. The primary reason for the project is to provide the freight community with accurate road weather forecast information so they can make important delivery decisions. A recent survey of CVOP users revealed that most fleets are using the information WYDOT provides to their deliveries (advancing shipments, delaying shipments or re-routing) before and during forecasted storm events. The project reduces emissions by minimizing the time commercial vehicles spend idling behind a road closure gate.

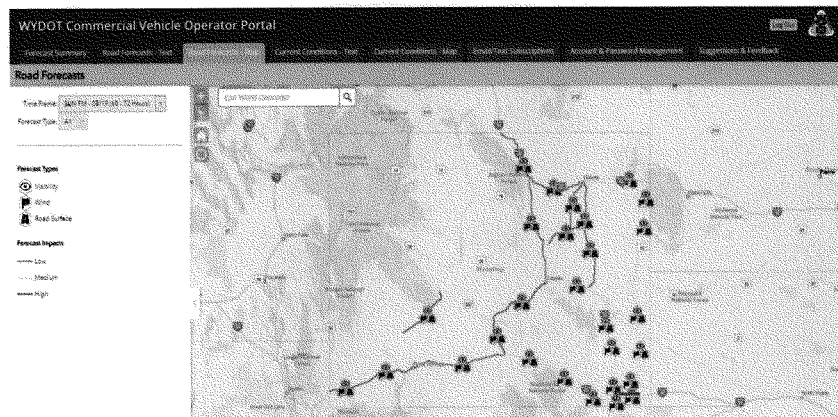
WYDOT was one of three entities selected for the first wave of Connected Vehicle Pilot Projects. Integral to the Wyoming Pilot is the enhancement of the CVOP system, which was recently completed to include both forecast and current conditions in map and text formats. The new CVOP will incorporate the Pikalert system originally developed by the National Center for Atmospheric Research. In time, it is expected that Pikalert will allow WYDOT to forecast all routes in the state.

WYDOT's mission is to provide a safe, high quality, and efficient transportation system. The CVOP provides information directly focused on keeping drivers safe and moving efficiently. During a recent survey, 96.12 percent of the respondents said they are either very satisfied (75.19 percent) or somewhat satisfied (20.93 percent).

Demonstrate the level of support from federal, state, and local elected officials and

other key policymakers: The key stakeholders for this project are commercial trucking companies, the Governor's Transportation Safety Coalition, and the Wyoming Trucking Association. All key stakeholders support this project.

Sample tabs from the WYDOT Commercial Vehicle Operator portal are below.



WYDOT Commercial Vehicle Operator Portal

Home | My Account | My Profile | My Alerts | My Reports | My Settings | My Notifications | My Account & Profile Management | Support & Feedback

Travel information for Interstate 25 is as follows:

Last update on: Aug 17, 2018 11:02 am

District Comments	
District 1	MS: Wagonwheel Rd: Area is closed between Elk Mountain and Arroyo at milepost 297. 80: Roadwork, right lane blocked (EASTBOUND) near Chagwater at milepost 367. 80: Roadwork, right lane blocked WESTBOUND near Chagwater from milepost 373 to 393 (WEST). Road damage. Travel lane blocked near Larimer at milepost 6. 5
District 2	875: Roadwork, NORTHBOUND, Right Lane Blocked near Cooper at milepost 165. Proceed with caution
District 4	

City	Location	Conditions				Last Report Time	Camera	Notes
		Condition	Severity	Restrictions	Notes			
Cheyenne NMS CORSDIST	Between the Colorado State Line and Cheyenne	Dry	None		Aug 17, 2018 11:02 am			
	Between Cheyenne and Exit 23, WY 146	Dry	None		Aug 17, 2018 11:02 am			
Chagwater NMS CORSDIST	Between Exit 29, Wagon Rd and Chagwater	Dry	None		Aug 17, 2018 11:02 am			
	Between Chagwater and Exit 73 WY 34	Dry	None		Aug 17, 2018 11:02 am			
Wheatland NMS CORSDIST	Between Exit 73, WY 34 and Wheatland	Dry	None		Aug 17, 2018 11:02 am			
	Between Wheatland and Exit 52, US 26	Dry	None		Aug 17, 2018 11:02 am			

Aug 17, 2018 11:02 am



Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice

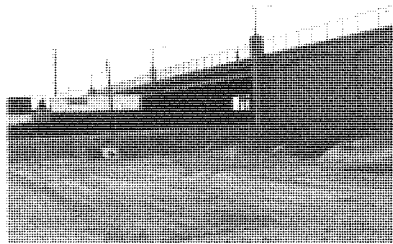
Econolite

Lakeview Avenue Overcrossing Orange County Transportation Authority

On June 6, 2017, the Lakeview Ave. overcrossing in Orange County, California, officially opened to drivers. The overcrossing now routes vehicular traffic over Burlington Northern Santa Fe (BNSF) railroad line uninterrupted. It is the fifth of seven over-crossings and under-crossings the Orange County Transportation Authority (OCTA) planned to improve the safety and travel time of thousands of residents along the corridor and rail line in the cities of Anaheim and Placentia, and to improve the freight operations that utilize the vital and heavily used rail line.

Nearly 70 individual trains use the BNSF tracks daily, regularly blocking the way of drivers travelling north or south along the busy corridor. By 2030, OCTA estimates that 130 trains per day will use the rail line, creating more traffic congestion, emissions, and safety concerns without an overcrossing solution.

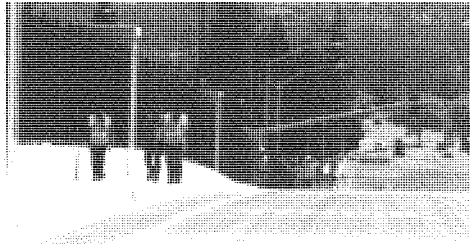
Beginning in mid-2014, construction began on Lakeview Ave. to elevate and realign the corridor to separate car traffic from train traffic. In addition to increasing safety and reducing travel times, the overcrossing is also helping to reduce vehicle and freight emissions and noise. The overpass is between Orchard Drive to the north and Eisenhower Circle to the south.



In conjunction with the overcrossing, a ramp was constructed connecting Lakeview Ave. to Orangethorpe Ave. As a result, North Bubach St. was rerouted to connect to the new Connector Road with a new signalized intersection. A new frontage road was built for local resident and business access, and another road also built at the southwest corner, which connects the new frontage road to Lakeview Ave.

As part of the project, several intersections along Lakeview Ave. were upgraded with new NEMA traffic control cabinets and 2070 controllers. This provides the traffic management technology that enables programming of signals to help optimize traffic flow through the corridor. In addition, emergency vehicles and first responders, including ambulances, fire, and police are now able to respond more quickly and cross the rail line without interruption, which is critical for life-saving calls.

The OCTA is spending an estimated \$635 million on the overcrossing and undercrossing projects that cross the BSNF rail line, and the Lakeview Overcrossing project is \$70 million. In addressing improved freight operations and emissions reduction, the Lakeview Overcrossing project received \$7.8 million in CMAQ funding.



The Lakeview Overcrossing project grand opening was supported by city officials of Anaheim, Placentia, including Placentia Mayor Craig Green, Yorba Linda Mayor Peggy Huang, and Anaheim Mayor Tom Tait – a few of the cities that are directly impacted by the Lakeview Ave. corridor and the BNSF rail overcrossing. The overcrossing project specifically targets and provides:

- Enhanced Safety for all roadway users (vehicle, pedestrians, bicyclists, transit, etc.)
- Quicker Emergency Response
- Elimination of Rail Crossing Delays
- Easier Commerce and Business Access
- Sustainable Economic Growth
- Reduced Vehicle and Freight Emissions
- Reduced Vehicle and Freight Travel Noise
- Improved Quality of Life



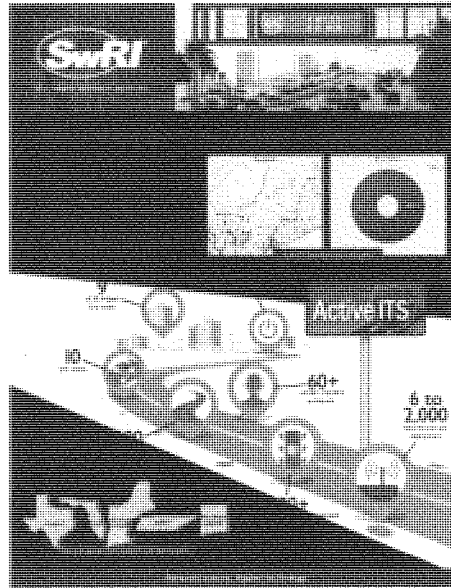
Intelligent Transportation Society of America
Innovation in Surface Transportation Best Practice
Southwest Research Institute
ActiveITS

A leader in intelligent transportation systems, Southwest Research Institute (SwRI) has over 20 years of experience developing, deploying, and maintaining small- and large-scale ITS systems. ActiveITS is a proven and stable system, capable of obtaining 99.99%+ uptime—and can run in clustered virtualized and cloud-hosted configurations.

System Functionality

Key features of the ActiveITS system include:

- Event Management
 - Automated event management response plans for dynamic message sign (DMS) postings, email notification, traveler information alerts, highway advisory radio (HAR) messages, and more
- Performance Measures
 - Archiving and reporting to enable performance-based oversight of event management operations, ITS field equipment maintenance, service patrol, and ATMS operations
- Center-to-Center Connectivity
 - Interconnected operations for information sharing and control between traffic management centers
- Integrated User Interface
 - Management of field devices, events, and other functions by an operator in a single integrated browser/map-based/application-based interface in a Windows environment

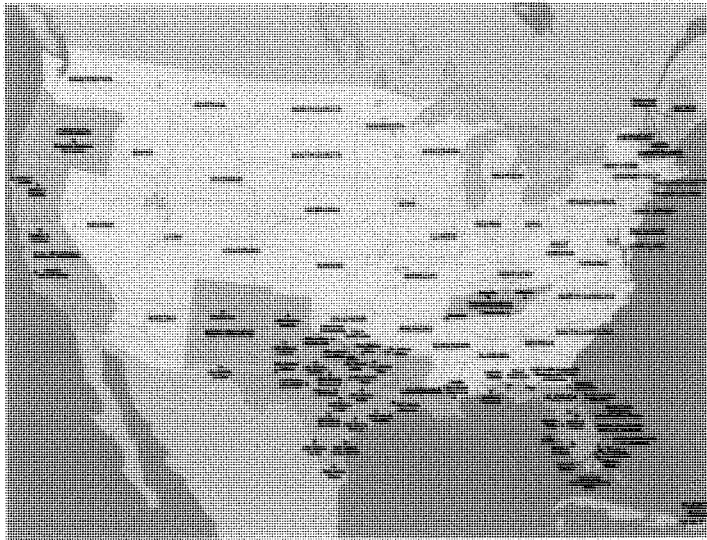


State-owned Software

By instilling a non-proprietary approach to ITS software solutions, SwRI leverages previous ActiveITS software deployments as the baseline ATMS solution and then customizes



and enhances the system based on client requirements. SwRI's approach to develop once and deploy repeatedly provides clients additional cost value through efficiency as well as freedom to openly integrate all utilized ITS systems. States have spent about \$95 million on ActiveITS software over a period of 20 years and approximately 50% of that has been federal money.



Intelligent Transportation Society of America
 Innovation in Surface Transportation Best Practice
**Texas A&M Transportation Institute and
 Virginia Tech Transportation Institute**
 Implications of Truck Platoons for Roadside and Vehicle Safety Hardware

Using automated and connected vehicle technology, truck platoons may operate in the future with spacing between vehicles as little as 50 feet. Researchers and students at the Texas A&M Transportation Institute (TTI) are examining how roadside safety devices, such as guard rail and median barriers, will react to an impact from a truck platoon. Researchers and students at the Virginia Tech Transportation Institute (VTTI) are examining how crashes such as these would affect the occupants of the vehicle. The research will inform policy on truck platoon operating rules and roadside safety device standards.

Finite Element Analysis is a computer modeling technique that uses mathematical computations of impact forces. Computer models of trucks are used that detail their weight and movement characteristics (See Figure 1). Computer models of roadside hardware such as concrete median barrier is also used in these computations to assess the potential damage to the barrier and the truck when a collision occurs. The use of computer modeling allows many variables to be evaluated without the expense and time involved in crash testing actual vehicles. Simulations were run for two different styles of concrete median barrier (see Figure 2).

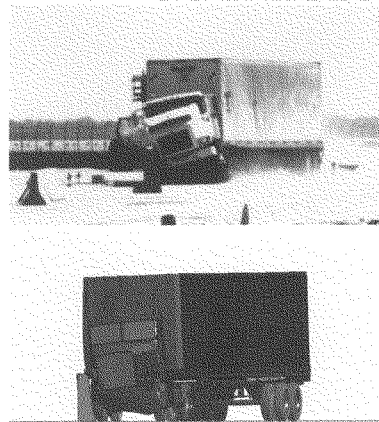


Figure 1

Truck platooning will improve freight movement in an era of driver shortages and to increase fuel efficiency up to 12%. These trucks, however, are still susceptible to loss of control crashes due to hydroplaning and emergency braking. Roadside hardware protects the occupants of the truck and vehicles in opposing lanes by redirecting errant vehicles back to the roadway. Federal and state highway safety improvement funds are used to install and maintain this roadside hardware. It is important to understand the effect that truck platoon crashes may have on this vital piece of infrastructure. This research project will identify which design of roadside hardware will best withstand multiple impacts and what damage will be caused to the hardware that will need repair.

This project will help prepare state and local agencies for the operation of truck platoons on their facilities. It will provide information for planning on future improvements and maintenance of roadside hardware.

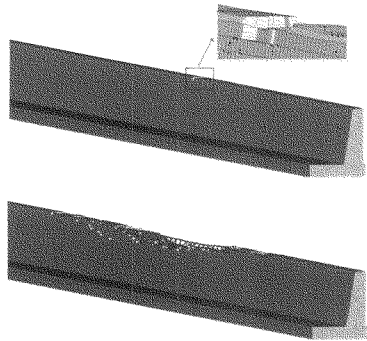


Figure 2



Shailen Bhatt
President and CEO
The Intelligent Transportation Society of America
1100 New Jersey Avenue, SE, Suite 850
Washington, DC 20003
www.itsa.org | [@ITS_America](https://twitter.com/ITS_America)

