

2040

# Vermont Long-Range Transportation Plan

PREPARED BY VERMONT AGENCY OF TRANSPORTATION - 2018





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## Executive Summary

The 2040 Vermont Long-Range Transportation Plan (LRTP) is the state’s long-range, transportation plan for all modes of travel. The LRTP serves as a framework, guiding transportation decision-making and investments looking out over the horizon of the next 20 years.

The LRTP is not a project-oriented plan, rather, it is a policy document, establishing broad goals, objectives, and strategies to work toward the vision for Vermont’s future transportation system. It’s vision, goals and objectives are guided by Governor Scott’s priorities to grow the economy, protect the vulnerable and make Vermont more affordable as well as significant input from stakeholders and the public.

The LRTP is broad and sets general policy direction; modal plans such as the rail, intercity bus, and aviation system plans establish goals and objectives with more specificity and often identify project priorities.



### TRANSPORTATION SYSTEM OVERVIEW

Vermont’s transportation system is extensive and complex. There are 14,174<sup>1</sup> miles of maintained public roadways, including 2,331 miles of state highways, 378 miles of interstate and 139 Class-1 town highways. State highway and interstate maintenance is managed by the Vermont Agency of Transportation (AOT). The substantial remaining mileage is owned and managed by Vermont’s local municipalities<sup>2</sup>.

Vermont has 520 interstate bridges, 1,835 bridges on state highways, and 1,642 town highway long (over 20’) structures. AOT also maintains 1,265 short structures, which include bridges and culverts with spans from six to twenty feet, as well as over 50,000 smaller culverts. The state operates 30 Park and Ride lots and has assisted in the development of 66 municipal lots.

Non-highway infrastructure includes seven regional public transit operators providing nearly 5-million rides annually, 578 miles of active rail lines, 305 miles of which are owned by the state, and 16 public airports, 10 of which are owned by the state<sup>3</sup>. The Agency of Transportation (AOT) oversees 140 miles of rail-banked rail-trails either currently in use or under construction for use as four-season trails.

Many of Vermont’s highways, rail lines, and intercity bus routes extend far beyond the state borders. Planning, project development, construction, and maintenance must be coordinated at borders for the system to operate seamlessly for the user. Vermont’s geographic context influences state transportation policy and investments. Coordination with neighboring states and Canada is crucial to the function of Vermont’s transportation system.

<sup>1</sup> State and Municipal Highways, excluding Class 4 municipal (not subject to maintenance).

<sup>2</sup> Class 1 maintenance is shared by the state and municipality.

<sup>3</sup> 5 of the 16 public-use airports are privately owned and operated; Burlington International is owned by the City of Burlington.

## THE FUTURE

### CHALLENGES

Vermont's transportation system will face many challenges in the next two decades. Adequate and sustainable funding levels to maintain the existing transportation system in an acceptable condition, the interaction between land development and the transportation system, and highway safety are all perennial issues requiring diligent action to address successfully. Other challenges are just beginning to evolve such as Vermont's aging population and flat population growth. Highway-related water quality issues and the increasing frequency and severity of extreme weather events are significant concerns.

### OPPORTUNITIES

Some of our best opportunities to improve the transportation system in the future center on technological advances. Vehicle automation promises to increase highway safety and may increase mobility for vulnerable transportation system users, including older adults. Intelligent transportation systems already enable us to fine-tune our traffic signals, optimize plow routes, and efficiently manage incidents. In the future, cars will communicate with each other and the environment around them to provide safer, more efficient travel. The buildout of the electric vehicle charging network ensures that Vermont remains a relevant, friendly destination to visit and do business. Extension of existing passenger rail services hold great promise for tourism and economic opportunity. Our response to each of these challenges and opportunities will shape the transportation system of the future.

### DEVELOPING THE LRTP

The development of the 2040 Vermont Long-Range Transportation Plan began in 2016 with the implementation of a [statewide transportation public opinion survey](#). The results of this survey were folded into a report of Existing Conditions and Future Trends, which formed the basis for initial outreach and discussion. AOT planning staff convened a diverse set of stakeholders over a period of 12-months to guide the development of the LRTP. These included state agencies and departments, regional planning agencies, advocacy groups, trade associations, and our federal partners. These groups each offered unique perspectives on transportation issues and are AOT's partners in implementing the strategies identified in the LRTP.

### THE VISION

The vision for Vermont's transportation system is:

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*“A safe, reliable and multimodal transportation system that grows the economy, is affordable to use and operate, and serves vulnerable populations”.*

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This vision shares aspects of the previous (2009) version of the LRTP, with modifications to reflect new state policy priorities. The goals, objectives and strategies supporting the vision reflect a better understanding about the importance of equitable access and the relationship between transportation systems, community, and public health.

### ACHIEVING THE VISION

The Goals, Objectives and Strategies outlined in the 2040 LRTP were crafted to move us toward the vision for the transportation system. Each goal has a set of objectives to work toward and a set of strategies to

support the objectives. Though many of the strategies will be led by AOT as the state's primary transportation agency, a significant portion of the work to make the vision a reality will depend on partnerships with other agencies and organizations.

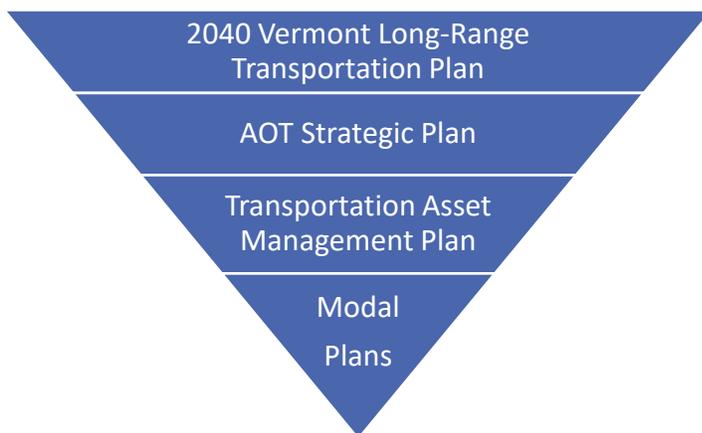
The six Goals and associated Objectives are presented in the following table. Each objective is supported by one to eight strategies, outlined at the end of Chapter 10.

Goal 1: Improve safety and security across all transportation modes.	Goal 2: Preserve and improve the condition and performance of the multimodal transportation system.	Goal 3: Provide mobility options and accessibility for all users of the transportation system.	Goal 4: Leverage transportation investments to increase Vermont's economic vitality.	Goal 5: Practice environmental stewardship.	Goal 6: Support livable, healthy communities.
1.1 Reduce the number of crashes on Vermont highways, with a focus on those resulting in a fatality or incapacitating injury.	2.1 Make strategic investments to preserve and improve conditions of highways, railroads, airports, bike-paths, trails, sidewalks, and public transit infrastructure.	3.1 Improve connections between modes for passenger and freight transportation.	4.1 Strategically invest in highways and bridges, railroads, airports, and public transit and bicycle and pedestrian facilities to support economic access and growth.	5.1 Reduce negative water quality impacts associated with transportation facilities.	6.1 Maintain and strengthen the vitality of Vermont's villages and downtowns.
1.2 Reduce incidents at work zone sites.	2.2 Provide a transportation system that adequately serves current and future demand.	3.2 Increase the viability of active forms of transportation through improved infrastructure and connectivity.	4.2 Grow tourism-oriented transportation services.	5.2 Reduce air pollution associated with fossil fuels used in transportation.	6.2 Make transportation investments that promote active transportation and reduce social isolation.
1.3 Reduce railroads derailments and highway-rail grade crossing incidents.	2.3 Maximize operational efficiency of all existing transportation modes.	3.3 Expand public transit, intercity bus, and passenger rail services.	4.3 Support transportation initiatives which enhance recreation opportunities.	5.3 Reduce the overall level of energy use by the transportation system users.	
1.4 Enhance airport safety and security at all publicly-owned commercial and general aviation airports.	2.4 Identify new, sustainable funding sources to maintain and improve the transportation system.	3.4 Increase awareness of transportation options for residents and visitors.		5.4 Reduce wildlife and habitat impacts associated with the transportation system.	
1.5 Improve the resilience of the transportation system.	2.5 Improve project development efficiency.				
1.6 Participate in the planning and delivery of coordinated disaster response services.					
1.7 Enhance traffic incident management.					

## Chapter 1: Introduction and Purpose

The 2040 Vermont Long-Range Transportation Plan (LRTP) is the state’s long-range transportation plan for all modes of travel. The LRTP serves as a framework, guiding transportation decision-making and investments looking out over the horizon of the next 20 years. While transportation in its most fundamental form is simply the movement of people and goods, today’s transportation system and that of 2040 must address many more considerations. Decisions on transportation priorities and investments must consider a range of issues such as population trends and changes in demographics and preferences, community context, energy, climate and weather, land-use and environment, and economic objectives.

Figure 1 - LRTP Context



Whereas the LRTP sets general direction, the Agency of Transportation (AOT) Strategic Plan, the Transportation Asset Management Plan, and Modal plans such as the rail plan, public transit policy plan, aviation system plan and bicycle & pedestrian plan establish goals and objectives with more specificity and often identify project priorities. These plans are all related and intended to be consistent with each other. Figure 1 represents the relative level of detail and specificity among and between these integral plans;

the LRTP is broad and high-level; the modal plans are focused and tactical. The Strategic Plan and TAMP focus on shorter time-frames and share aspects of the LRTP and Modal plans.

### The LRTP Development Process

#### 2016 Statewide Transportation Public Opinion Survey

The development of the 2040 Vermont Long-Range Transportation Plan began in 2016 with the implementation of a statewide survey. AOT sent 12,000 post-card invitations to participate statewide, resulting in a response rate of almost 20%. The resulting 2016 Statewide Transportation Public Opinion Survey Report provides insight into travel behaviors and public opinion of Vermont’s transportation infrastructure and services.

The survey findings were folded into an Existing Conditions and Future Trends report. This report describes Vermont’s existing transportation system and explores a range of topics including a state and national transportation policy, energy and climate change, population and demographics, funding and finance, land-use and transportation, and technological change. This report served as the basis for the kickoff of the plan update process and informed the Stakeholder and Regional Planning Commission (RPC) Transportation Advisory Committee (TAC) meetings.

#### Outreach and Stakeholder Participation

AOT relied on its strong relationship with the Regional Planning Commissions (RPCs) to achieve broad outreach throughout the state, consulting the RPC Transportation Advisory Committees (TAC) in all regions of the state twice during the development of the Plan. The first set of TAC visits took place over

the summer of 2017 to present the Statewide Survey findings and the Existing Conditions & Future Trends report. Discussion at each of the 11 RPC TAC meetings confirmed many of the issues identified in the Existing Condition and Future Trends report, added a few to the list, and provided insight into regional priorities. The second round of TAC visits took place early in 2018 to review the draft plan, including Goals, Objectives, and Strategies to support the Vision.

AOT also convened and hosted two Stakeholder groups, three times each, at key points throughout the plan development process. The External Stakeholder group included state agencies and departments, regional planning agencies, advocacy groups, trade associations, and our federal partners. *These groups each offer unique perspectives on transportation issues and are AOT’s partners in implementing the strategies identified in the LRTP.*

*AOT Staff Stakeholder Group*

The AOT Staff Stakeholder group met in parallel to the External Stakeholder group. The Staff Stakeholder group was comprised of representatives of all four major AOT branches including the Highway, Policy Planning and Intermodal Development, and Finance & Administration Divisions, as well as the Department of Motor Vehicles, covering the full range of expertise and responsibility. Through this group we were able to present information to subject matter experts, ensuring the plan is accurate and complete and acknowledges the daily realities of operating and maintaining the state’s transportation system. These meetings also served to spread awareness and understanding of the LRTP’s purpose and context throughout the Agency.

Table 1 - LRTP External Stakeholder Committee

2040 Long-Range Transportation Plan External Stakeholders
VT Agency of Natural Resources (ANR)
VT Agency of Human Services – Department of Health (AHS/VDH)
VT Agency of Commerce and Community Development (ACCD)
VT Department of Public Safety (DPS)
VT Public Service Department (PSD)
Premier Coach / Vermont Translines
Local Motion
VT League of Cities and Towns (VLCT)
VT Association of General Contractors (VT AGC)
VT Truck & Bus Association (VTBA)
VT Association of Planning & Development Agencies (VAPDA)
American Association of Retired Persons (AARP)
VT Association of the Blind and Visually Impaired (VABVI)
VT Center for Independent Living (VCIL)
VT Chamber of Commerce
Chittenden County Regional Planning Commission (CCRPC/MPO)
VT Public Transit Association (VPTA)
Green Mountain Transit (GMT)
Federal Highway Administration (FHWA)
Federal Transit Administration (FTA)

## Chapter 2: Executive and Legislative Policy Context

Many state policies addressing non-transportation issues relate closely to the transportation system. Conversely, transportation investments have impacts beyond their primary purpose of moving people and goods. In this way, the transportation system is an integral component of a greater system contributing to the overall desired state outcomes.

One of Governor Phil Scott’s first actions after taking office in January 2017 was to issue Executive Order No. 01-17. This directs all State Agencies to utilize their powers, duties and programs to establish the following cornerstones as strategic and operational goals:

1. Grow the Vermont economy
2. Make Vermont an affordable place to live, work and conduct business
3. Protect vulnerable Vermonters

These goals were continually revisited during the development of the 2040 Long-Range Transportation Plan. As a result, each LRTP Strategy presented in Chapter 10 serves at least one of the three overarching goals, and many strategies serve more than one.

In 2014, the Vermont Legislature created the Government Accountability Committee which is authorized to recommend mechanisms for State government to be more forward-thinking, strategic, and responsive to the long term needs of Vermonters ([2 VSA § 970](#)). To track progress, the following Vermont population level quality of life outcomes were established as part of Act 186 ([3 V.S.A. § 2311](#)):

Figure 2 - Scott Administration's Primary Goals



Table 2 - State Population Outcomes

State Population Outcomes Established by the General Assembly
1. Vermont has a prosperous economy.
2. Vermonters are healthy.
3. Vermont’s environment is clean and sustainable.
4. Vermont’s communities are safe and supportive Vermont is a safe place to live.
5. Vermont’s families are safe, nurturing, stable, and supported.
6. Vermont’s children and young people achieve their potential.
7. Vermont’s elders live with dignity and in settings they prefer.
8. Vermonters with disabilities live with dignity and in settings they prefer.
9. Vermont has open, effective, and inclusive government.
10. Vermont’s State infrastructure meets the needs of Vermonters, the economy, and the environment.

Vermont’s Chief Performance Officer (CPO) must submit a report to the General Assembly by September 30 each year to track progress toward these population outcomes. AOT is required by statute to provide bridge condition performance measures related to population outcome. AOT has chosen to provide additional measures for outcome #10 on pavement condition, transit ridership and rail line condition and ridership. AOT also provides safety

measures for outcome four and customer wait times at DMV offices and number of LEAN<sup>4</sup> events held for

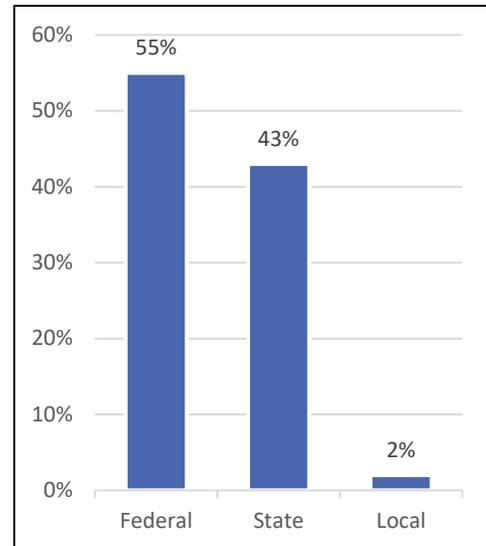
<sup>4</sup> LEAN is a method used to improve processes by identifying and removing waste.

outcome nine. AOT tracks many other measures to assess effectiveness in meeting a range of goals. See the *Performance Measures & Report* section of this plan to learn more.

### Federal Goals & Requirements

Vermont typically derives over half of its annual transportation budget from federal funding sources<sup>5</sup> and must follow specific requirements when expending these funds. AOT employs asset management and performance measurement techniques to ensure transportation investments produce the best return. While this has long been a best management practice employed by AOT, federal transportation law now *requires* states to manage investments and maintain infrastructure based upon performance goals.

Figure 3 - Vermont's Transportation Funding Sources



### National Performance Goals

The national transportation performance goals in the two most recent federal transportation acts, Moving Ahead for Progress in the 21<sup>st</sup> Century (MAP-21) of 2013 and the Fixing America's Surface Transportation (FAST) Act of 2015 are as follows:

- **Safety:** To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
- **Infrastructure condition:** To maintain the highway infrastructure asset system in a state of good repair
- **Congestion reduction:** To achieve a significant reduction in congestion on the National Highway System
- **System reliability:** To improve the efficiency of the surface transportation system
- **Freight movement and economic vitality:** To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
- **Environmental sustainability:** To enhance the performance of the transportation system while protecting and enhancing the natural environment
- **Reduced project delivery delays:** To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

MAP-21 & the FAST Act require reporting of specific measures related to the national goals. The FAST Act requires state long-range transportation plans to include a description of performance measures and targets as well as a system performance report. See the Performance Measures and Report section of the L RTP for more on this subject.

<sup>5</sup> Percentages derived from FY2016 Transportation Budget information provided by AOT Budget & Fiscal Management Section.

## Chapter 3: Planning Framework

Vermont has a rich history and culture of planning. Recognizing the impacts of a growing population and increased development pressure on Vermont’s trademark pastoral landscape, the Vermont Legislature passed Act 250 (10 V.S.A. § 151) in 1970, “to protect the environment in balance with sustainable development. The law sets goals and priorities for environmental and scenic protections and is responsible for helping Vermont retain its rural character, preserve the natural environment and support the state’s environmental diversity - which foster distinctive, attractive communities with a strong sense of place.”<sup>6</sup>

AOT often plays a part in the Act 250 project review process most frequently through Criterion #5 – “Transportation”<sup>7</sup>. Criterion #5 of Act 250 requires a proposed project, “not cause unreasonable congestion or unsafe conditions with respect to the use of highways, waterways, railways, airports and airways, and other means of transportation existing or proposed.” Criterion #5 was modified in recent years to also require that proposed projects consider, as appropriate, incorporation of transportation demand management strategies, and access and connections to existing and planned pedestrian, bicycle, and transit services. Through this mechanism, and other permitting processes such as the State Highway Access and Work Permit (19 V.S.A. § 1111), AOT is an active participant in managing development along state highways.

While Act 250 is designed to address project impacts on a case-by-case basis, the Growth Management Act, often referred to as Act 200, was enacted in 1988 to provide a framework of land use goals and sought to encourage coordination between the local, regional and state levels. Vermont’s planning goals, (24 V.S.A. § 4302) require that all state agencies are responsible for supporting and reinforcing Vermont’s historic settlement pattern of compact village and urban centers separated by rural countryside. The statute further clarifies that all public investments, including the construction or expansion of infrastructure, should reinforce the general character and planned growth patterns of an area. Specific to transportation, the statute includes a goal “...(t)o provide for safe, convenient, economic and energy efficient transportation systems that respect the integrity of the natural environment, including public transit options and paths for pedestrians and bicyclists” and that “...highways, air, rail, and other means of transportation should be mutually supportive, balanced, and integrated.”

### Vermont Planning Law

AOT often plays a part in the Act 250 project review process. This most frequently occurs through Criterion #5. Criterion #5 of Act 250 requires a proposed project, “not cause unreasonable congestion or unsafe conditions with respect to the use of highways, waterways, railways, airports and airways, and other means of transportation existing or proposed.”

Vermont statutes require that all state agencies, regional planning commissions, and municipalities, are responsible for supporting and reinforcing Vermont’s historic settlement pattern of compact village and urban centers separated by rural countryside.

<sup>6</sup> State of Vermont, Natural Resources Board Website, <http://nrb.vermont.gov/>, 2017

<sup>7</sup> Criterion 9k - “Development affecting public investments” is also relevant, when the development is of such a magnitude as to impact public facilities, services, or lands, including highways.

## Vermont Transportation Planning Initiative

The Transportation Planning Initiative (TPI) program began in the early 1990's and grew out of a desire for a more balanced transportation planning process including increased local input. Previously, decisions about transportation projects and design were made with limited input from the public and in strict adherence to national design standards. This often resulted in projects that were out of character for smaller, more rural states such as Vermont. In 1990, the Vermont Legislature commissioned an analysis of the Agency of Transportation's management structure and effectiveness. The findings were for the Agency to develop a formal planning department responsible for all planning and relationship building with other levels of government and the public. In 1993, the TPI was created as a response to those findings. Since then, the program has gone through continual reevaluation and modernization, but the most essential element of the program remains to support public involvement and participation in state transportation and regional planning. More than 25 years after its inception, the TPI program serves as a model for other states.

## Chittenden County Regional Planning Commission

Chittenden County Regional Planning Commission (CCRPC) plays an especially important role in Vermont transportation planning as the state's only Metropolitan Planning Organization (MPO)<sup>8</sup>. Federal planning rules require special coordination between MPOs and State Transportation Agencies. AOT and CCRPC enjoy a longstanding positive working relationship and ongoing communication regarding shared goals and implementation of programs and projects. The LRTP was developed in coordination with CCRPC and in consideration of the Metropolitan Transportation Plan for the MPO region which is all of Chittenden County. Most recently, the two organizations have coordinated on national performance measure target setting and will continue to meet regularly in the future to continue this work.

## Federal Planning Goals

At the federal level, the passage of the FAST Act resulted in the addition of two Federal Highway planning goals to the previous eight guiding the statewide and non-metropolitan transportation planning process. Specifically, Title 23, Part §450.206, Subpart B – Statewide and Nonmetropolitan Planning and Programming states that:

*“(a) Each State shall carry out a continuing, cooperative, and comprehensive statewide transportation planning process that provides for consideration and implementation of projects, strategies, and services that will address the following factors:*

- (1) Support the economic vitality of the United States, the States, metropolitan areas, and nonmetropolitan areas, especially by enabling global competitiveness, productivity, and efficiency;
- (2) Increase the safety of the transportation system for motorized and non-motorized users;
- (3) Increase the security of the transportation system for motorized and non-motorized users;
- (4) Increase accessibility and mobility of people and freight;

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<sup>8</sup> A Metropolitan Planning Organization (MPO) is an agency created by federal law to provide local elected officials input into the planning and implementation of federal transportation funds to metropolitan areas with populations of greater than 50,000.

- (5) Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
- (6) Enhance the integration and connectivity of the transportation system, across and between modes throughout the State, for people and freight;
- (7) Promote efficient system management and operation;
- (8) Emphasize the preservation of the existing transportation system;
- (9) **\*\*NEW\*\*** Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation; and
- (10) **\*\*NEW\*\*** Enhance travel and tourism.

These two new planning factors addressing transportation system resiliency and reliability and enhancement of travel and tourism are consistent with goals identified independently in Vermont through the development of the 2040 LRTP. All ten factors were considered in the development of the 2040 LRTP and the Goals, Objectives, and Strategies contained within.

### Transportation Plan Coordination

AOT maintains subject and transportation mode-specific plans, often referred to as “modal” plans. The relationship of these “modal” plans and the LRTP is two-way. The LRTP establishes the long-range vision for Vermont’s transportation system; the modal plans are more focused and address the implementation of programs and projects that serve that vision. Conversely, as the modal plans are updated on their individual cycles, they inform the LRTP of existing conditions, future trends, and “state of the art” for each subject area. The following is a list of AOT plans considered in the development of the 2040 LRTP. A more detailed description of each is available in the 2040 LRTP appendices.

- Vermont Transportation Asset Management Plan (2018)
- AOT On-Road Bicycle Plan, (under development, 2018)
- Strategic Highway Safety Plan, 2017
- Vermont Intelligent Transportation Systems (ITS) Architecture, 2017
- Vermont State Rail Plan, 2016
- Vermont Freight Plan, 2015
- Vermont Statewide Intercity Bus Study Update, 2013
- Public Transit Policy Plan, 2012 (update underway)
- Pedestrian and Bicycle Policy Plan, 2008
- Vermont Airport System and Policy Plan, 2007 (update underway)
- Vermont Highway System Policy Plan, 2004

### State Policy Coordination

Transportation system investments can help achieve many desired statewide goals and outcomes. It is the intent of the 2040 Vermont Long-Range Transportation Plan to serve as many of these shared goals as possible by guiding informed, coordinated decisions about transportation investments. The Goals, Objectives, and Strategies found in the 2040 LRTP form the framework to support that decision-making process. The following state legislation and administrative directives were considered in the creation of the LRTP. While this list is not exhaustive, it highlights some of the most significant policies related to the transportation system. A more detailed description of each is included in the LRTP appendices.

- Vermont Comprehensive Energy Plan, 2016
- 2020 Comprehensive Economic Development Strategy, 2016
- Executive Order No. 07-15 Health in All Policies Task Force, 2015
- Act 64 Vermont Clean Water Act, 2015
- Act 34 Complete Streets, 2011

## Chapter 4: Transportation in Vermont

### Background

The latter half of the twentieth century was spent building the transportation system we rely on to this day. Preserving and maintaining our multimodal system of highways and bridges, pedestrian and bicycle facilities, railways, airports, and public transit services has been a priority since and will continue to be moving forward. The future of transportation centers around optimizing the performance of the existing infrastructure.

Vermont has thousands of miles of highway, hundreds of miles of active rail lines, sixteen public use airports, regional public transit operators covering the entire state, and intercity bus services connecting to the national intercity bus network. Managing and maintaining these systems requires a significant work force with great depth of experience and range of expertise, including many partners in the public and private sectors.



Vermont's interstate has been in place for many decades and its bridges are requiring major rehabilitation or reconstruction.

AOT is the primary agency responsible for the maintenance, operation, planning and capital investment in the state's transportation system. There are four major branches within AOT.



The AOT Highway Division includes the Maintenance & Operations Bureau – some of the Agency's most visible employees.

*Highway Division:* The Highway Division handles year-round maintenance of the state highway system; provides oversight for construction projects; ensures the quality of materials; provides grants and technical support for municipal projects; procures and maintains the fleet of trucks; provides information to the traveling public on road conditions; and inspects and maintains bridges, culverts, signs, and signals.

*Policy, Planning, and Intermodal Development Division:* The Division of Policy, Planning, and Intermodal Development (PPID) manages public transit, aviation, and rail programs, in addition to providing statewide planning, policy, research, mapping, development review, and public outreach. The division works with Vermont's eleven Regional Planning Commissions and, in the Burlington region, the Metropolitan Planning Organization, to develop regional transportation plans and generate input on prioritizing transportation projects in the regions. The division's work is supported by public input from the Rail Advisory Council, Aviation Advisory Council, and the Public Transit Advisory Council.

*Finance & Administration Division:* The Division of Finance and Administration provides services across the Agency, including contract administration, information technology, performance, accounting, budgeting, audit, civil rights, labor compliance, training, and recruitment.

*Department of Motor Vehicles:* The Department of Motor Vehicles oversees vehicle licensing, registration, tax, and titling; provides commercial licensing, permitting, and enforcement/inspection services; investigates fraud/violations; provides driver training programs; and collects motor fuel revenue.

### Regional Context

Vermont’s relatively small geographic scale requires consideration of its place within the larger regional context. This is especially true for transportation issues. Vermont’s highways, rail lines, and intercity bus routes often extend far beyond the state borders. Planning, project development, construction, and maintenance must be coordinated at borders for the system to operate seamlessly for the user.

Map 1 - Regional Context



Vermont’s geographic context influences state transportation policy and investments. Coordination with neighboring states and Canada is crucial to the function of Vermont’s transportation system. To this end, Vermont is an active participant in a range of regional transportation, environment, and economic policy bodies and is party to various cooperative agreements such as with the Province of Quebec, to cooperatively forward mutually beneficial transportation programs and projects. Maintaining these relationships is critical to making informed transportation policy and project development decisions into the future. Many of the most important partnerships are described in the following table.

Table 3 - Regional & International Partnerships

Partnership	Purpose and Relevance to Vermont
Tri-State Operations Initiative (Maine, New Hampshire, Vermont)	The Tri-State initiative supports coordinated operations management, system performance measurement, and Intelligent Transportation Systems (ITS) deployment. They have made cooperative investments in ITS applications and share information and performance contextualization between states.
Conference of New England Governors and Eastern Canadian Premiers (CONEG/ECP)	CONEG/ECP fosters intergovernmental cooperation on issues affecting the economic, social and environmental well-being of the Northeast United States and Eastern Canada. Actions include adoption of resolutions on shared concerns including benefits of cross-border trade, a regional climate change action plan, and <a href="#">transportation strategies</a> , with a special focus on expanding alternative fuel vehicle infrastructure.

I-95 Corridor Coalition (I95CC)	I-95CC is an alliance of transportation agencies, toll authorities, and related organizations, including public safety, from the State of Maine to the State of Florida, with affiliate members in Canada that provides a forum for key decision and policy makers to address transportation management and operations issues of common interest.
Transportation & Climate Initiative (TCI) of the Northeast and Mid-Atlantic States	TCI is a regional collaboration of 12 Northeast and Mid-Atlantic jurisdictions that seeks to develop the clean energy economy, improve transportation, and reduce carbon emissions in the transportation sector. Vermont worked with TCI to secure FHWA Alternative Fuel Corridor designation for the I-91 and I-89 corridors and continues to participate as part of the collective effort to build a coordinated, comprehensive EV charging network throughout the northeast and mid-Atlantic states.
Eastern Border Transportation Coalition (EBTC)	The EBTC is non-profit membership organization dedicated to improving the movement of people and goods between the United States and Canada. EBTC members are the transportation agencies of the U.S. States of Michigan, New York, Vermont and Maine and the Canadian Provinces of Ontario, Quebec, New Brunswick, and Nova Scotia.
Northeast Association of State Transportation Officials (AASHTO regional group)	NASTO is a collective group of representatives from the state transportation departments of the Northeastern United States and the Canadian provinces of Ontario and Quebec. NASTO serves as a focal point for discussion and research on transportation issues of interest to its members, with an emphasis on promoting cooperation and partnership among its members.
Transportation Border Working Group (TBWG)	TBWG facilitates the safe, secure, efficient, and environmentally responsible movement of people and goods across the Canada-U.S. border. The TBWG brings together multiple transportation and border agencies, and other organizations, to coordinate transportation planning, policy implementation, and the deployment of technology to enhance border infrastructure and operations.
Lake Champlain Basin Program (LCBP)	The LCBP works in partnership with government agencies from New York, Vermont, and Québec, private organizations, local communities, and individuals to coordinate and fund efforts that benefit the Lake Champlain Basin’s water quality, fisheries, wetlands, wildlife, recreation, and cultural resources.
States for Passenger Rail Coalition (SPRC)	SPRC is an alliance of 21 state departments of transportation and 4 passenger rail authorities from across the United States who work together to support the development and growth of intercity passenger rail service for America.
New England Transportation Consortium	The six New England DOTs pool funds to conduct and support implementation of research that addresses challenges unique to the region.

## Highways

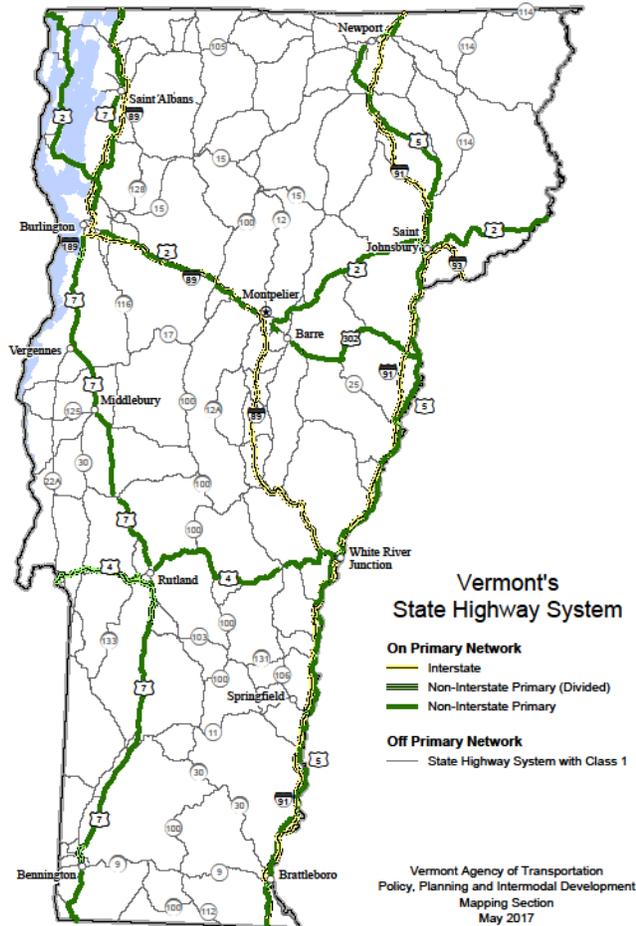
Vermont’s highway system is the backbone of the State’s transportation system, accounting for the highest use among all transportation modes in the movement of people and goods.

Over 80% of respondents to the 2016 Statewide Transportation Public Opinion Survey Report indicated the automobile and therefore the highway system, is their primary mode of transport and 88% of workers reported driving alone or carpooling as their primary mode to work.

Vermont’s highways also supports most of Vermont’s freight activity. According to the [Vermont Freight Plan](#)<sup>9</sup>, 83% of the total volume of freight traveling through or within Vermont travels by truck; this represents 88% of the total value of freight.

There are 14,174<sup>10</sup> miles of maintained public roadways, including 2,331 of state highways and 378 miles of interstate and 139 Class-1 town highways in Vermont. The remaining mileage is municipally-owned and managed. Of the state-owned highway system, 806 miles are federally designated National Highway System (NHS).

Map 2 - State Highway System



According to the Federal Highway Administration (FHWA), “the NHS includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The U.S. Department of Transportation (DOT) developed the NHS in cooperation with the states, local officials, and metropolitan planning organizations (MPOs).”<sup>11</sup> The NHS system in Vermont includes all Interstate Highways and major regional highways, such as US 7, US 4, VT 9, and VT 103. Map 2 illustrates the State Highway System, including Class 1 Town Highways.

<sup>9</sup> Vermont Freight Plan, Revised June 2017.

<sup>10</sup> State and Municipal Highways, excluding Class 4 municipal (not subject to maintenance).

<sup>11</sup> [www.fhwa.dot.gov/Planning/national\\_highway\\_system/](http://www.fhwa.dot.gov/Planning/national_highway_system/)

Vermont classifies state and town highways as follows:

<p><b>State Highways</b> are highways maintained exclusively by the Agency of Transportation. There are 2,331 miles of state highways.</p>	<p><b>Class 1 Town Highways</b> are town-maintained highways forming the extension of a state highway route and carrying a state-highway route-number. There are 139 Class 1 miles in VT.</p>
<p><b>Class 2 Town Highways</b> are town-maintained highways selected as the most important highways in each town (in addition to Class 1 highways). There are 2,790 Class 2 miles in VT, 600 of which are unpaved.</p>	<p><b>Class 3 Town Highways</b> are other town-maintained highways negotiable under normal conditions all seasons of the year by a standard manufactured passenger car. There are 8,535 Class 3 miles in VT; 6,423 miles of these roads have an unpaved gravel surface and are colloquially referred to as “dirt roads”.</p>

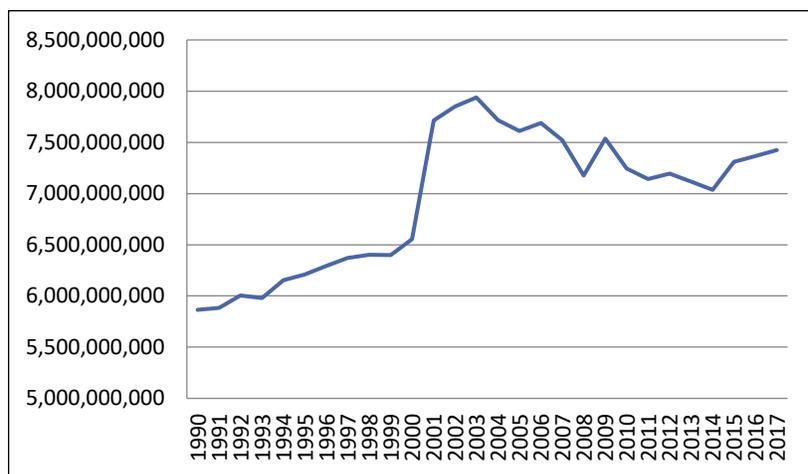
### Highway Bridges and Structures

Bridges are a significant component of Vermont’s highway system and a major infrastructure investment requiring strategic, ongoing maintenance. AOT must inspect all bridges with a span greater than 20 feet (considered “long structures”) on all interstate, state and town highways. There are currently 4,004 bridges in the inventory<sup>12</sup>. That includes 520 interstate bridges, 1,835 bridges on state highways, and 1,642 town highway long structures. These bridges are all eligible for federal funding of some type. AOT also maintains approximately 1,200 short structures, which include bridges and culverts with spans or widths between six and twenty feet, and approximately 50,000 smaller culverts. Retaining walls and rock cuts are also important structural assets that AOT manages.

### Highway System Use

Highway use is commonly measured in Vehicle Miles Traveled (VMT). VMT is a measurement of total miles traveled by vehicles within a defined time-period and geography. Throughout the 1990s and early 2000s, VMT in Vermont increased an average of 2% annually, peaking in 2003 at 7.9 billion<sup>13</sup>. Since then, VMT experienced a period of decline, reaching a low of 7 billion in 2014. The decline has stabilized in recent

Figure 4 - Vehicle Miles Traveled, Vermont 1990-2017



<sup>12</sup> 2018 AOT Factbook and Annual Report.

<sup>13</sup> The significant increase in VMT reflected in year 2000 is due to a change in calculation methodology implemented at the time.

years, posting slight increases in 2015 and 2016. This change in VMT growth trends has positive and negative implications discussed in the Challenges and Opportunities sections of the LRTP.

### Maintenance & Operations

Maintaining and operating Vermont's highway system requires a vast array of equipment, technology, and expertise throughout the state to address daily needs, short-term repairs, and long-term improvements. Within the Agency of Transportation Highway Division, the Maintenance and Operations Bureau (MOB) contains numerous sections working on traffic operations. Specialties including logistics & facilities, signage, signal operations, Intelligent Transportation Systems (ITS), and environmental concerns such as hazardous materials & waste management and stormwater management. Other sections are focused on bridge maintenance and pavement management.



AOT District maintenance crew replacing a large culvert on a state highway.

Vermont is divided into eight regional maintenance districts with a total of 64 garages, each with a dedicated staff. These teams are most visible during Vermont's short fair-weather construction season, conducting a wide range of maintenance activities on bridges, pavement, guard-rail, culverts, and a host of other tasks. In winter, they plow the state highway system with a fleet of 275 dump-trucks with plows and wings, 72 pickups with plows, and 68 loaders and graders.

### Intelligent Transportation Systems (ITS)

The majority of Vermont's existing Intelligent Transportation Systems (ITS) components are part of the highway system and managed from within the Maintenance & Operations Bureau. These include variable message signs, Road Weather Information Stations (RWIS), advanced traffic signal technologies, and advanced traffic management systems (ATMS). Current advances in ITS technologies are fast-paced and many of the opportunities for improving the transportation system lie in this area.

While nothing will ever replace the hard work of Vermont's transportation maintenance crews, many future advancements in highway operations will be realized through the rapidly evolving arena of intelligent transportation systems. Vermont stands to make significant gains in traffic safety, congestion mitigation and related reductions in environmental impacts through these advancements. Traffic signal coordination, signal priority, and variable message signs providing traveler information are already enabling smoother highway operations and improved traveler experience. Future opportunities include vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. Investments in transportation infrastructure technology will be crucial to successfully incorporating these quickly evolving technologies. Telecommunication infrastructure such as fiber optic lines and transmission equipment are critical foundational components of these systems.

## Water Transportation

In addition to two major bridges crossing Lake Champlain, one between Alburg, VT and Rouses Point, NY, and the other between Shoreham, VT and Crown Point, NY, Vermont's highway system is connected to New York's by privately operated water transportation services crossing Lake Champlain in four locations.



Lake Champlain Transportation, Inc's ferries carrying passengers and freight between VT and NY. Photo: tripadvisor.co.nz

Lake Champlain Ferries operated by Lake Champlain Transportation Company (LCT) provides regular ferry service between Grand Isle, VT and Plattsburg, NY; Burlington, VT to Port Kent, NY; and Charlotte, VT to Essex, NY. The Grand Isle – Plattsburg crossing operates 24-hours per day year-round. Burlington – Port Kent operates from May to October. Charlotte – Essex runs year-round during the daytime.

Farther to the south and under different ownership, the Fort Ticonderoga Ferry provides service between Ticonderoga, NY and Shoreham, VT in Addison County. The "Fort Ti Ferry" provides service from early-May to late-October. Each of these services provides an important connection for

passenger and truck freight traffic across Lake Champlain.

The lake itself also serves as a link in a continuous navigable water route connecting the Hudson River at Albany with the St. Lawrence River in Sorel Quebec. The Champlain Canal connects the southern end of Lake Champlain at Whitehall, New York with the Hudson River north of Albany. To the north, the Richelieu River, through the Canal-de-Chambly and the Canal-de-Saint-Ours, provides the connection to the St. Lawrence River. Once a major freight artery, the route is now largely used for recreational purposes, with freight being virtually non-existent. Operational constraints such as lengthy seasonal closures, daytime operations, limited barge capacity because of physical constraints, and deferred maintenance have greatly diminished the attractiveness of the route for commercial haulage.<sup>14</sup>

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<sup>14</sup> Vermont Freight Plan, 2015

## Park and Rides

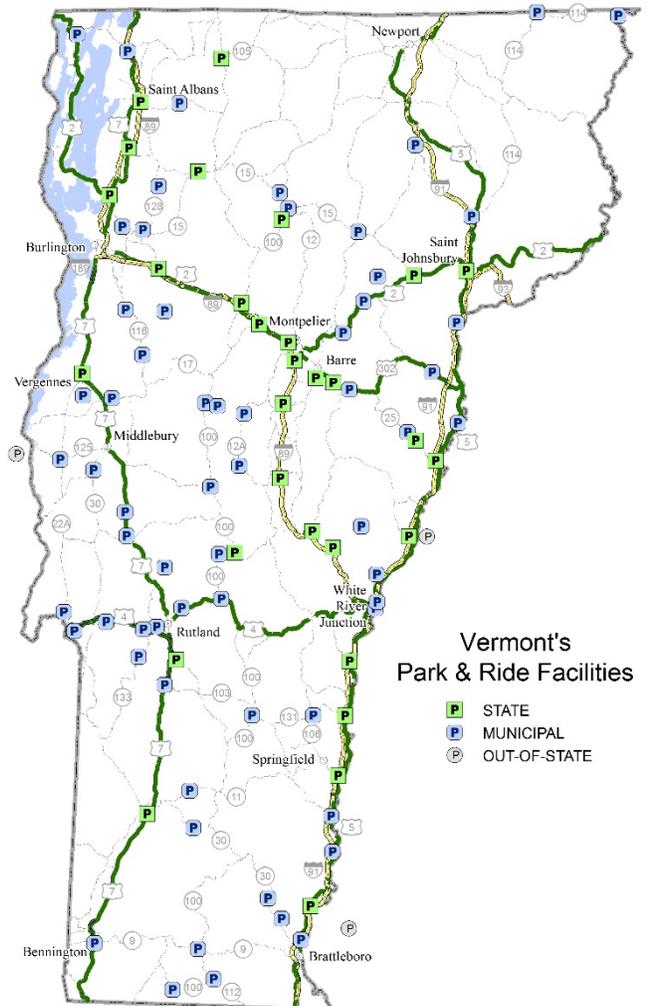
AOT's Park and Ride Program has evolved organically over the years, from what can be characterized as a demand-and-response effort to a more sophisticated program involving numerous Agency sections and external Agency partners. AOT operates 30 state-owned lots and has assisted in the development of 66 municipal lots.

Most of the state-owned lots are along the I-89, I-91, and US 7 corridors. Municipal lots serve local needs, often filling in the gaps off the main interstate and state route corridors<sup>15</sup>

The 30 state-owned lots provide 1,525 parking spaces at which commuters and other travelers can park a car and either share a ride with a carpool or vanpool, or, in many cases, board one of the numerous public transit system bus routes. AOT maintains an interactive web page of [Park & Ride facilities](#) for commuters to reference when making travel plans. Map 3 illustrates the state and municipal park and ride lots throughout Vermont.

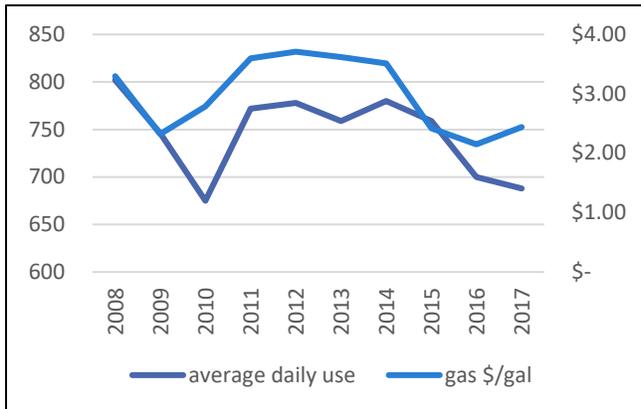
Approximately half of the 1,525 park and ride spaces owned and maintained are occupied on average each day. The trend of park and ride use follows gas prices closely as shown in Figure 5.

Map 3 - Park and Ride Facilities



<sup>15</sup> Statewide Park and Ride Facilities Plan, December 2015

Figure 5 - State Park and Ride Use & Gasoline Prices, 2008-2017<sup>16</sup>



The [2015 Statewide Park and Ride Facilities Plan](#) asserts that park and ride facilities serve a key function within the statewide transportation system and in promoting the Agency’s vision. These facilities promote multimodal transportation, and reduce energy consumption, and the number of vehicles present on state highways. Park-and-ride facilities will continue to serve a vital role as a part of the overall transportation system. The Agency identified a need to formalize the program to maximize the use of current facilities, standardize and

streamline the process for expanding existing and developing new facilities, and sustainably manage, maintain, and operate Agency assets<sup>17</sup>.

### Bicycle & Pedestrian

Bicycling and walking in Vermont are not only popular recreational activities but are a means of transportation for many. The 2016 Statewide Transportation Public Opinion Survey found that walking is the next most frequently used mode of transportation<sup>18</sup> after the automobile, with 45% reporting they walk multiple times per week or month. In the same survey, 42% of respondents indicated dissatisfaction with the current level of bicycling facilities, including on-road shoulders and separated paths, and 37% of respondents saw room to improve sidewalks and pedestrian infrastructure.

Perhaps the most significant recent development in bicycling is the advent of broadly available electric-assist technology. Bicycles with electric-assist provide the ability to ride longer distances, and in varying terrain with less effort, increasing the viability of the bicycle as a means of transportation. The technology is advancing rapidly, becoming lighter and more compact, and far less expensive than it once was. It is left to be seen how much of an influence electric-assist technology will have on the bicycling behavior of Vermonters and visitors to the state.

### Healthy Transportation

Investments in bicycle and pedestrian infrastructure support active transportation through the built environment. Physical environment (including natural and built features) is one of six key determinant factors affecting health outcomes. A 2015 “Total Health Expenditure Analysis” (THEA) conducted in partnership with Vermont Department of Health found AOT makes considerable investments in infrastructure supporting positive health outcomes, including bicycling and pedestrian facilities, public transit, park and rides, and highway safety projects and programs.

AOT’s Bicycle and Pedestrian Program seeks to provide safe and convenient facilities for those Vermonters who desire alternative transportation. To this end, the Agency provides a wide range of technical assistance regarding best practices in bicycle and pedestrian friendly facility design, including in-

<sup>16</sup> Source: AOT TPI RPC annual park and ride counts and AOT Contract Administration (gas prices)

<sup>17</sup> Vermont Statewide Park and Ride Facilities Plan, 2015

<sup>18</sup> All transportation trips included – not exclusively work commute.

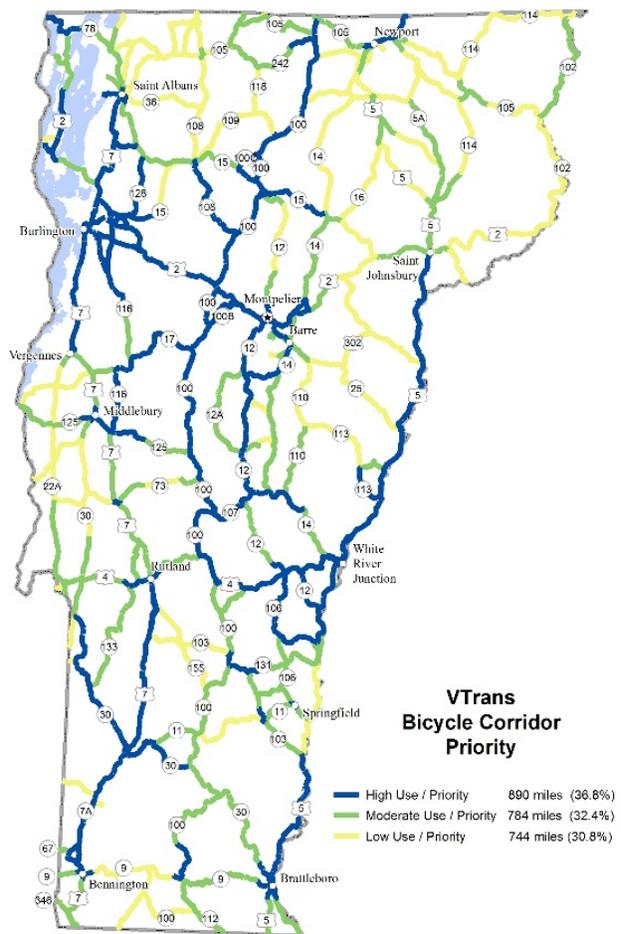
house consultation on AOT highway and bridge projects as well as a range of other program-level coordination and safety education initiatives.

AOT also administers a bicycle and pedestrian grant program and provides Federal Transportation Alternatives<sup>19</sup> grant funding to municipalities and other qualified not-for-profits for the establishment of bicycling and pedestrian infrastructure. All of these efforts serve the [AOT Strategic Plan](#) goals of making Vermont more affordable and serving the vulnerable by providing accessible, convenient and affordable travel choices, as well as Act 32 “Complete Streets” law of 2011. The latter requires “that the needs of all users of Vermont’s transportation system - including motorists, bicyclists, public transportation users, and pedestrians of all ages and abilities - are considered in all state and municipally managed transportation projects and project phases.”

AOT is currently developing an On-Road Bicycle Plan in support of enhancing on-road bicycle improvements on State roadways. The AOT On-Road Bicycle Plan is a planning effort to categorize the state roads into high, moderate, and low-use corridors based on current and potential bicycle use. The Plan will assist AOT in understanding where to focus limited resources toward bicycle improvements and will allow better integration into Agency projects and activities such as paving and road sweeping. Map 4 is a corridor priority map developed as part of this process.

Biking and walking are not only affordable, healthy means of transportation; they are a significant contributor to Vermont’s tourism economy. A 2012 report on the economic impact of bicycling and walking in Vermont was extremely positive. Bicycle-pedestrian infrastructure and program expenditures, bicycle-pedestrian event tourism, and bicycle-pedestrian-oriented businesses resulted in a total 2009 economic contribution of \$82.7 million in output, and over 1,400 jobs with \$40.9 million in labor earnings.<sup>20</sup> According to one of the study authors, “Not only is bike and pedestrian activity consistent with our healthy lifestyle, our outdoor recreation orientation and the Vermont brand, it makes a positive contribution to the economy as well.” - Jeff Carr, Economist Economic and Policy Resources, Inc. (EPR)

Map 4 - Bicycle Corridor Planning



<sup>19</sup> The FFY18 and FFY19 cycles of this grant program are devoted to stormwater projects to address Lake Champlain Phosphorous Total Maximum Daily Load (TMDL) thresholds set by the Federal EPA. See the Water Quality section of this document for more information.

<sup>20</sup> Economic Impact of Walking and Biking in Vermont, 2012

## Rail-Trails

AOT owns approximately 140 miles of rail-banked rail-trails statewide. These trails serve as separated bicycle travel corridors during the warmer months, serve as snowmobile and skiing trails in the winter and are a great recreational resource generating economic return and physical activity in village centers.

The 93-mile [Lamoille Valley Rail Trail \(LVRT\)](#) will be the longest in New England when it is complete, representing an epic transportation and recreation resource crossing northern Vermont from St. Johnsbury to Swanton through numerous town and village centers.

The Missisquoi Valley Rail Trail

(MVRT) in the northwest of Vermont has been complete for many years and has proven a popular destination. The MVRT extends 26.4 miles between St. Albans city and Richford. Other state-managed rail-trails include the Delaware & Hudson line in the southwest, extending for approximately 20 miles in two segments – one between Castleton and Poultney, the other between West Pawlet and Rupert with a section in between that travels through New York. Finally, the Beebe Spur trail is 4 miles extending from Newport along Lake Memphremagog towards the Canadian border. Other popular rail-trails in Vermont include the Island Line Trail extending from the Burlington waterfront into the Champlain Islands, and the Wells River Trail passing through Groton State Forest.



The Lamoille Valley Rail Trail (LVRT) will be over 90 miles long, crossing the state from St. Johnsbury to Swanton when it is finished. Villages with completed sections such as Morrisville are already seeing significant activity.

### Public Transit

Vermont has seven, regional [public transit providers](#) serving community needs such as individual mobility including Medicaid transportation, access to employment, and economic development - including tourism. Map 5 illustrates Vermont’s regional public transit provider regions and routes.

Due to the predominantly rural nature and low-density development of Vermont, most regional providers offer a mixture of fixed and flexible routes and demand responsive services covering the range of mobility needs. Some providers, often located near ski resorts, also operate seasonal services that support the state’s tourism industry. Commuter services have proven particularly popular in recent years, with the Montpelier LINK operating between Burlington and Montpelier accounting for over 130,000 boardings in 2016.

Vermont’s public transit ridership reached an all-time high in 2015 at just over 5 million trips statewide. Roughly half of the trips took place in the greater Chittenden County region and the other half occurred throughout the rest of the state. Ridership dipped slightly in 2016 to 4.7 million trips statewide. This trend is consistent throughout the United States and is associated with relatively low fuel prices.

Map 5 - Public Transportation Services

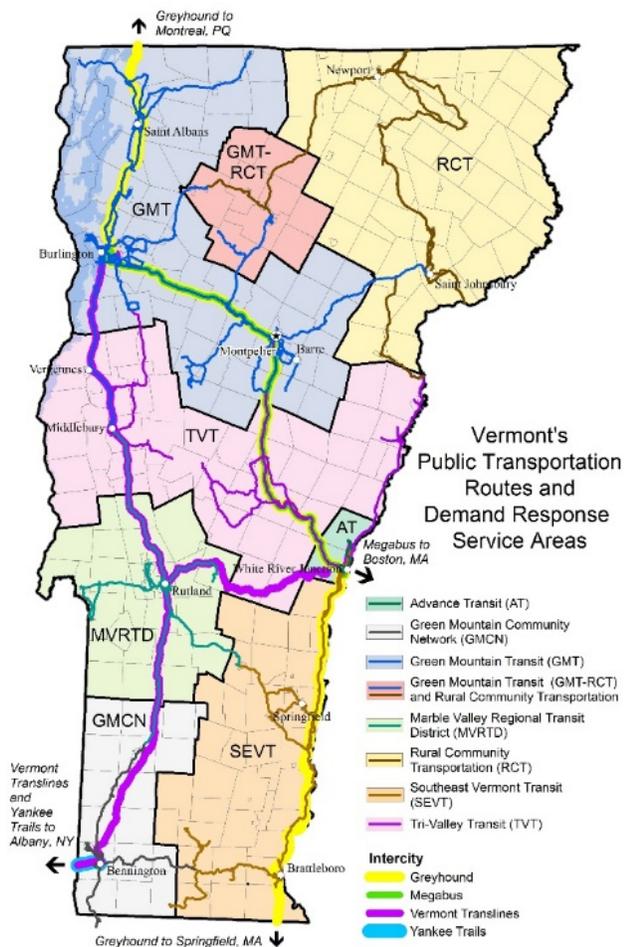
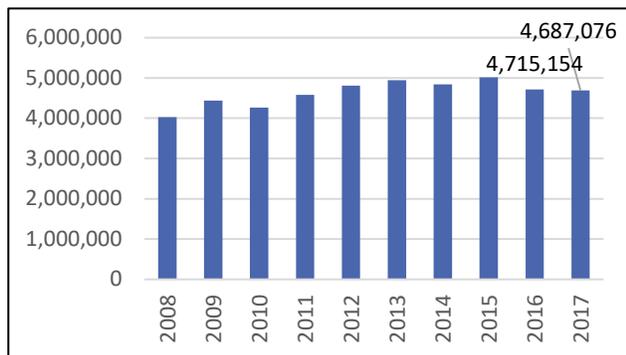


Figure 6 - Statewide Public Transit Trips, 2008-2017<sup>21</sup>



### Intercity Bus Service

Vermont has experienced growth in intercity bus service connections in recent years. In addition to ongoing services provided by Greyhound, Megabus, and Yankee Trails, AOT implemented two new intercity routes with Vermont Translines in 2014, establishing connections between Burlington and Albany, NY and/or Rutland and White River Junction. Greyhound Lines provide international service, connecting Montreal, PQ, with Springfield, MA along the I-89 and I-91 corridors. Megabus provides service between Burlington, VT and Boston, MA, via I-89 and I-93, and Yankee Trails provides service between Bennington, VT and Albany, NY, primarily along US 7. These services are all part of the national intercity bus network.

<sup>21</sup> Source: AOT Public Transit Program. Reporting year is State Fiscal Year (July 1 – June 30).

Most recently, in the fall of 2017, the AOT Public Transit Program, with strong support from local stakeholders in Bennington and Manchester, established a new intercity bus service (Vermont Shires Connector) connecting with Albany, NY and the Rensselaer Train Station. Map 5 shows current intercity bus routes serving Vermont.

Results of the 2016 Statewide Transportation Public Opinion Survey indicated that 30% of Vermonters use public transit with some frequency. Also, of note from the survey, 28% of respondents reported that improvements to transit or other alternate modes could get them to drive their personal automobiles less. This is an important consideration in the context of the statewide goal in the [2016 Comprehensive Energy Plan](#) of holding Vehicle Miles Traveled at 2011 levels.



Governor Phil Scott poses with Secretary of Transportation Joe Flynn and Department of Tourism and Marketing Commissioner Wendy Knight at the grand opening ceremony for the Vermont Shires Connector Amtrak Thruway service between Albany, NY and Bennington County.

## Railroads

Vermont's rail system encompasses approximately 578 miles of active rail lines. These lines are all used for freight service with two routes also being used for intercity passenger service. The State of Vermont owns 305 miles of the active rail lines. Map 6 illustrates the Vermont's rail system.

### Freight Rail

Freight rail service in Vermont is provided by short line and regional railroads. In other parts of the nation, Class I railroads (carriers with revenues exceeding \$467 million) serve as the railroad equivalent of the Interstate highway system, carrying freight between regional markets. By contrast, short line and regional railroads serve a gathering role, providing a "last mile" connection to shippers on relatively light density rail lines. In Vermont, like most other New England states, short line and regional railroads make up the rail system. As such, most freight is handled by multiple railroads between origin and destination. Genesee & Wyoming, Inc. and the Vermont Rail System each provide freight rail service throughout the state.

Genesee & Wyoming, Inc. owns two railroads passing through Vermont. These are the New England Central Railroad and the St. Lawrence & Atlantic Railroad.

The Vermont Rail System provides freight service on each of the State-owned rail lines under the subsidiary railroads Vermont Railway, Green Mountain Railroad, and Washington County Railroad.

These rail lines are leased to the Vermont Rail System, such that the State is responsible for capital improvements on the lines, as well as maintaining some of the rail bridges, while the operator is responsible for ongoing maintenance and freight operations.

Fundamental goals for rail transportation adopted within the [Vermont State Rail Plan](#) include expansion of the system's capacity and efficiency through upgrading of all bridges to 286,000 lbs carload standard, upgrade to 115 lbs rail, and elimination of vertical clearance obstacles.<sup>22</sup>

Map 6 - Rail System



<sup>22</sup> Vermont State Rail Plan, October 2015

**Passenger Rail**

Passenger rail service in Vermont is provided by the National Passenger Railroad Corporation (Amtrak) through the *Vermont* and *Ethan Allen Express* services. Map 7 shows Vermont’s passenger rail routes.<sup>23</sup>

The Ethan Allen Express provides daily service between New York City, Albany, Schenectady, Saratoga Springs and Rutland, serving stations in Castleton and Rutland.

The *Vermont* operates daily service between Washington, D.C., New York, New Haven, Springfield and St. Albans on a daytime schedule totaling 13 hours and 45 minutes between endpoints, serving nine passenger stations in the state.

The Ethan Allen Express and *Vermont* services are both subsidized through cooperative agreements between Vermont and other states. The *Vermont* is supported by Vermont, Massachusetts, and Connecticut, while the Ethan Allen Express is supported by Vermont and New York State. The Vermont portion of the subsidies for the two services is about \$8.1 million per year, which Vermont pays to Amtrak for providing the services.

Map 7 - Passenger Rail Routes

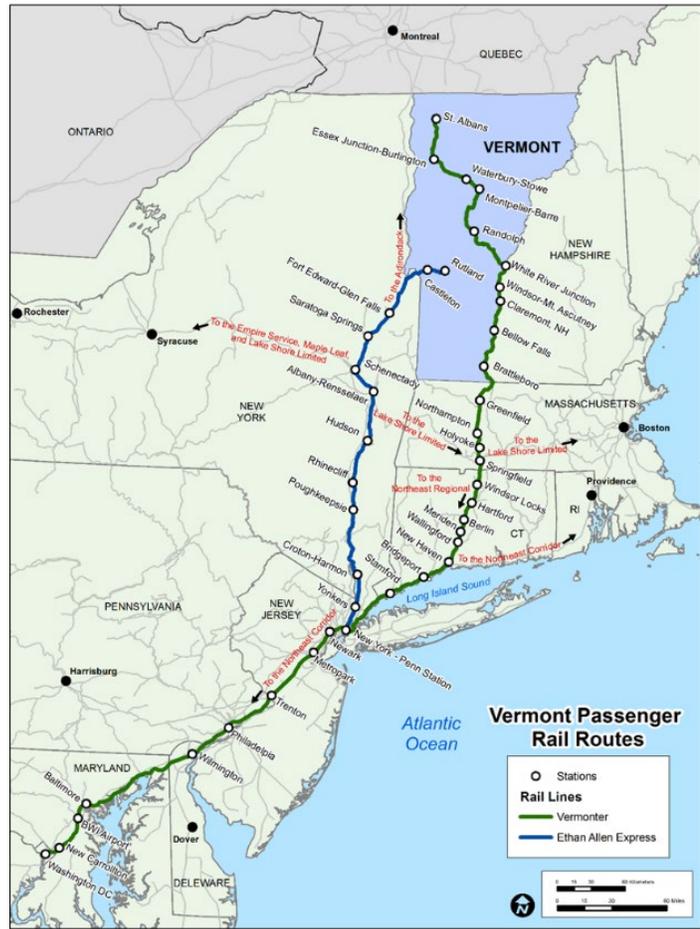
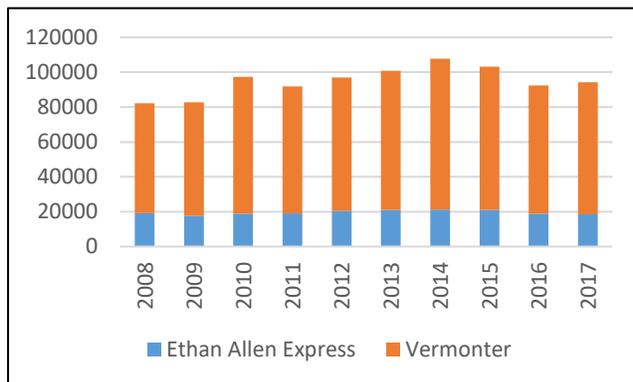


Figure 7 - Amtrak Passenger Rail Ridership at Vermont Stations, 2008-2017<sup>24</sup>



Vermont ridership for the Ethan Allen Express and the *Vermont* totals around 100,000 annually. The restoration of passenger rail service to Montreal and expansion of the Ethan Allen Express to Burlington are among the top rail priorities for the State.

Recent passenger rail developments in Massachusetts include additional service beginning in 2019 along the “Knowledge Corridor”. This service expansion will result in two morning trains and two evening trains operating between Greenfield, MA, and New Haven,

<sup>23</sup> Map from [Vermont State Rail Plan](#), October 2015

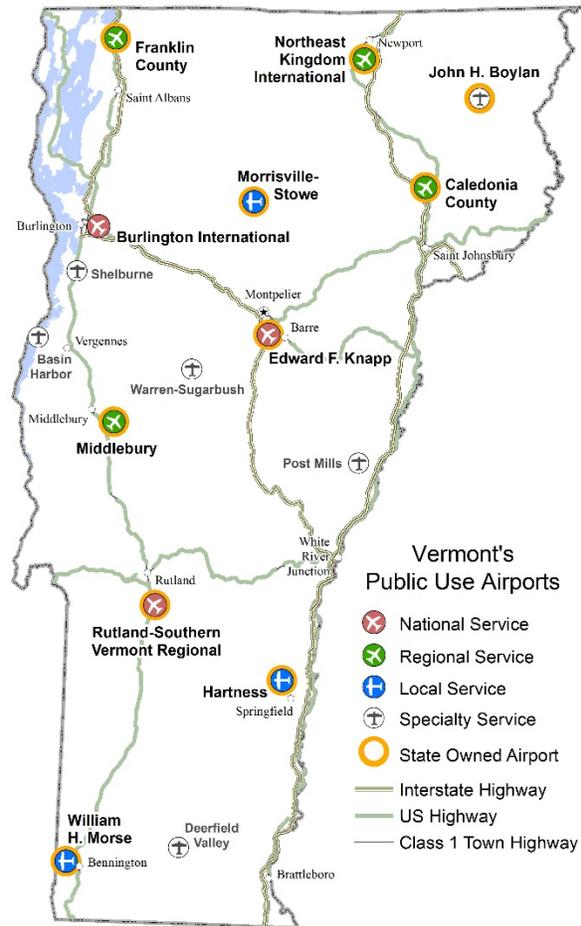
<sup>24</sup> Data provided by Amtrak Sr. Manager, M. William Hollister. Reporting year is Federal Fiscal Year (October 1 – September 30)

Connecticut, and points beyond including New York City. This service will enable same-day, round-trip capability. As Greenfield is less than half an hour from Brattleboro, VT, this service represents an opportunity for Vermonters living in greater Brattleboro area.

### Aviation

Vermont’s public use airport system consists of 16 airports of varying sizes and attributes. There are 10 airports owned by the state, five owned privately, and one municipally owned (Burlington International). Map 8 shows Vermont’s system of public use airports.

Map 8 - Public Use Airports



Thirteen of the 16 airports are part of the FAA’s National Plan of Integrated Airport Systems (NPIAS), which identifies airports that are significant to the national air transportation system.

Burlington International and Rutland-Southern Vermont Regional State airports host commercial services. The others are general aviation airports.

Edward E. Knapp airport in Berlin, and Rutland-Southern Vermont contribute significantly to Vermont’s freight movement system, with 1.5 million pounds of freight moving through Rutland in 2016 and 545,000 pounds passing through Knapp<sup>25</sup>.

Burlington International Airport is the state’s most active airport with respect to passenger service; there were 593,311 enplanements in 2016<sup>26</sup> up slightly from 2015. Rutland-Southern Vermont Regional airport saw 5,146 enplanements in 2016, just slightly lower than the previous year.

AOT has just begun an update of the Vermont Airport System Plan, including an extensive public outreach process. Results of the updated plan will be incorporated into the next update of the LRTP.

<sup>25</sup> 2017 AOT Fact Book and Annual Report

<sup>26</sup> Federal Aviation Administration (FAA) Final Calendar Year 2016 Passenger Boarding Data [www.faa.gov/airports/planning\\_capacity/passenger\\_allcargo\\_stats/passenger/](http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/)

## Chapter 5: Performance Measures

The passage of MAP-21 and the FAST Act resulted in the requirement that states apply a performance-based approach to manage transportation system investments. Performance assessment based on target-setting and performance measurement on National Highway System (NHS) infrastructure is intended to move states toward a collective set of national transportation system performance goals.

AOT's target-setting process was conducted in coordination with the Chittenden County Regional Planning Commission (CCRPC), staff to Vermont's sole Metropolitan Planning Organization (MPO). The following is an overview of current federal performance measures and targets. AOT is required to report to the FHWA and FTA on various timetables for the measures. Failure to show progress toward targets may result in restrictions on how federal funds may be expended.

### National Performance Management Measures

#### Safety

As the predominant mode of transportation, highway safety is a top priority. According to the FHWA, "the Safety Performance Management Final Rule supports the Highway Safety Improvement Program (HSIP), as it establishes safety performance measure requirements for the purpose of carrying out the HSIP and to assess fatalities and serious injuries on all public roads. The Safety Performance Management Final Rule establishes five performance measures as the five-year rolling averages to include:

1. Number of Fatalities
2. Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)
3. Number of Serious Injuries
4. Rate of Serious Injuries per 100 million VMT
5. Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries"<sup>27</sup>

Vermont has experienced a general improvement in highway safety over the past decade. While individual years have varied by each of the following measures, the trend over time has been a decrease in fatalities and injuries. Targets and performance measures are expressed as a rolling 5-year average to mitigate for anomalous years. AOT established the following five-year rolling average targets for calendar year 2018:

Figure 8 - Highway Safety Performance Measures (Five-Year Rolling Average)

Measure	Target	2017 Value
Number of Fatalities	≤ 58	70
Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)	≤ 0.83	TBD <sup>28</sup>
Number of Serious Injuries	≤ 290	254
Rate of Serious Injuries per 100 million VMT	≤ 4.3	TBD

<sup>27</sup> <https://safety.fhwa.dot.gov/hsip/spm/>

<sup>28</sup> Pending 2017 VMT calculations.

Number of Nonmotorized Fatalities and Nonmotorized Serious Injuries	≤ 40	37
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## Pavement

Vermont's pavement management system overseen by AOT is the most advanced of the Agency's transportation asset management tools. It has been in place since the mid-1990s and its operators are well-versed in the science of pavement deterioration and investment optimization. AOT developed and has used two statewide performance measures to manage its pavement investments for more than 15 years. While the new measures required by MAP-21 are slightly different than the legacy measures used by AOT, both sets will inform Vermont when optimizing pavement investment decisions. The following are the MAP-21 pavement condition targets and current values for CY2018:

Figure 9 - Pavement Condition Performance Measures

### Pavement Condition

Measure	Target	2017 Value
Interstate pavements in good condition	≥ 35%	38.9%
Interstate pavements in poor condition*	≤ 4.9%	2.4%
Non-interstate NHS pavements in good condition	≥ 30%	34.7%
Non-interstate NHS pavements in poor condition	≤ 9.9%	10.3%

\*The federal performance measures allow no more than 5% of poor condition pavements on the Interstate and 10% poor on the non-Interstate NHS pavements.

## Bridges

Bridge investments, like pavement, have also been managed by AOT for many years through an evolving system of field inspection, scoring and quantitative analysis to set investment priorities. Bridges are inherently more complex, having more components, each with their own unique set of issues and metrics for measurement, making them more complicated to measure and rate than pavement. The complexities also make it challenging to predict future performance deterioration. Much like pavement, Vermont has used its own self-imposed performance measures and targets to ensure successful maintenance and preservation of this major infrastructure investment. The following MAP-21 bridge condition targets will be added to the performance framework for Vermont's bridges:

Figure 10 - Bridge Condition Performance Measures

### Bridge Condition

Measure	Target	2017 Value
Percentage of NHS bridges classified as in Good condition (% deck area)	≥ 35%	47.1%
Percentage of NHS bridges classified as in Poor condition* (% deck area)	≤ 6%	2.5%

\*FHWA minimum federal bridge performance target is that no more than 10%, of its NHS bridge deck area, will be structurally deficient.

### Travel Time Reliability

Along with the physical conditions of the highway system, states are required to assess and set performance targets related to travel time. This concept is referred to as Level of Travel Time Reliability (LOTTR). Travel Time Reliability measures how often actual travel time varies from expected travel time. Travel time variation is different from daily, recurring congestion. Reliability is affected by events that are not expected by a traveler such as a crash, bad weather or special events. Much of the major interstate and state highway system comprising the National Highway System (NHS) in Vermont currently provide a high level of reliability.

### Travel Time

Along with the physical conditions of the highway system, states are required to assess and set performance targets related to travel time. Level of travel time reliability (LOTTR) is calculated as the ratio of the longer travel times to a “normal” travel time, using data from FHWA’s National Performance Management Research Data Set (NPMRDS) or equivalent. The measures are the percent of person-miles traveled on the relevant portion of the National Highway System (NHS) that are reliable. These calculations are made for the interstate system and non-interstate system NHS routes. A separate measurement is calculated for truck travel time to measure the effectiveness of the interstate highway system’s ability to distribute freight.

The following targets are established for the statewide system for the 2018 calendar year.

Figure 11 - Travel Time Reliability Measures

### Travel Time Reliability

Measure	Target	2017 Value
Interstate travel time reliability	≥ 90% of miles with LOTTR ≤ 1.50	99.6%
Non-interstate NHS travel time reliability	≥ 80% of miles with LOTTR ≤ 1.50	88.2%
Truck travel time reliability	Interstate Truck Travel Time Reliability (TTTR) Index ≤ 1.75	1.69

Two additional areas of national performance measurement related to the highway system are traffic congestion and on-road mobile source emissions. Neither measure apply to Vermont as the state is currently in compliance with national ambient air quality standards. The latter, on-road mobile source emissions, is currently being considered for repeal by FHWA.

### Public Transportation

In addition to Federal Highway Administration performance measures, the Federal Transit Administration (FTA) has similar requirements of its grantees. Vermont is a direct recipient of FTA funding though it doesn’t operate transit services; grants are made to subrecipients to operate public transportation services throughout the state. In this role, AOT must sponsor a group Transit Asset Management (TAM) plan on behalf of any subrecipients that are not themselves direct recipients of FTA Section 5307 funding. Green Mountain Transit (GMT) is the only direct 5307 recipient in Vermont. The remaining transit

providers operating under grants with AOT will be accommodated into a group TAM in accordance with applicable content and timeline requirements.

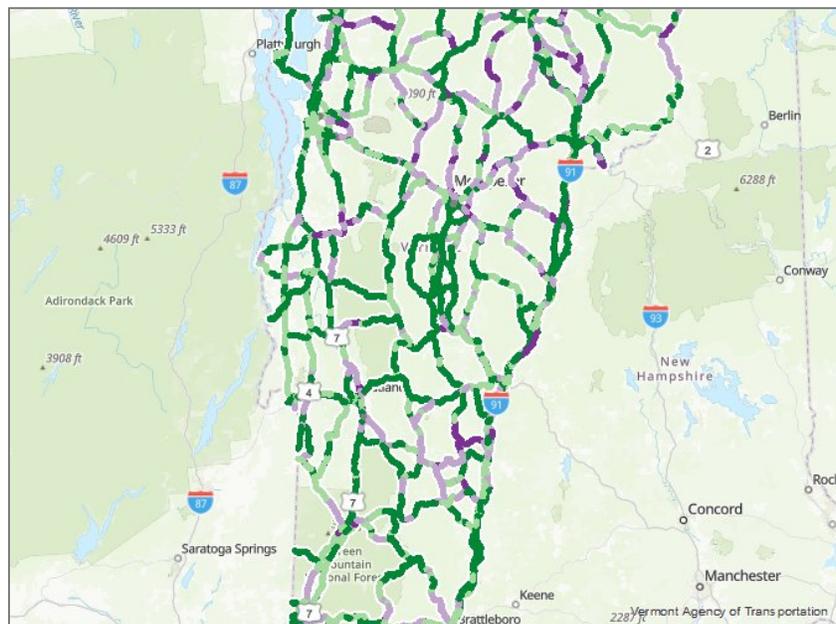
The major components of the TAM include:

- An asset inventory (facilities, equipment, rolling stock, infrastructure)
- A condition assessment of inventoried assets
- Description of the analytical tool used to prioritize investments
- A prioritized list of investments

AOT will establish the group TAM in cooperation with the subrecipient agencies and will coordinate with GMT and the CCRPC in the setting of performance targets. The initial TAM Plan is due October 1, 2018.

### Other State Performance Measures

While Vermont like all states must comply with the National Performance Management Measures described above, AOT has long understood the value of data-driven, performance-based management. The Agency keeps track of numerous measures to gauge performance over a range of programs. Many of these measures are available in the online “[VTransparency](#)” portal. This central repository for data and performance reporting houses information on statewide pavement conditions, highway safety data, bridge inspection information and much more. Citizens may view real-time information about snow plow operations during a winter storm, current travel conditions including weather related issues, incidents, and traffic congestion. The portal also provides extensive information about planned transportation projects throughout the state. Tech-savvy customers can access data sets through the open-data portal to create their own maps or analyses of various transportation data.



VTransparency screen depicting pavement conditions

bridge inspection information and much more. Citizens may view real-time information about snow plow operations during a winter storm, current travel conditions including weather related issues, incidents, and traffic congestion. The portal also provides extensive information about planned transportation projects throughout the state. Tech-savvy customers can access data sets through the open-data portal to create their own maps or analyses of various transportation data.

### Relationship of Statewide Transportation Improvement Program (STIP) projects to Performance Targets

Along with the implementation of the National Performance Measures described above, states must show they are investing in a manner that will result in progress toward reaching the targets set for each measure. Specifically, states must, “describe, to the maximum extent practicable, the anticipated effect

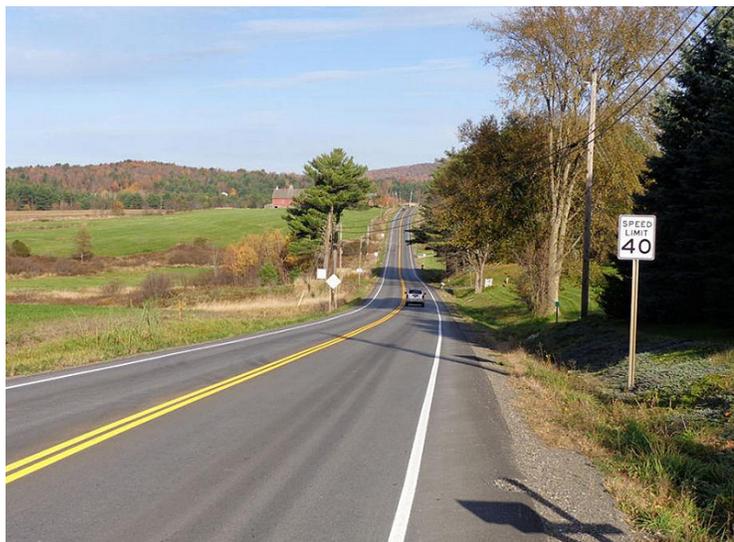
of the investment priorities (or their program of transportation improvement projects) toward achieving the performance targets.<sup>29</sup>

The State Transportation Improvement Program (STIP) provides the best reflection of how Vermont is spending federal transportation funding to reach those targets. The STIP is a staged, multi-year, statewide, intermodal program of transportation projects funded by the Federal Highway Administration or Federal Transit Administration.<sup>30</sup>

Projects listed on the STIP are consistent with the Statewide Long-Range Transportation Plan produced by the Vermont Agency of Transportation as part of a planning process that involves the Chittenden County Metropolitan Planning Organization. The STIP also includes a section specific to the CCRPC/MPO region referred to as the TIP.

### Pavements & Bridges

Vermont's pavement conditions have improved dramatically over the past decade thanks to sustained investment levels and a focus on preventive maintenance. In 2008, the Agency of Transportation's statewide paving budget was just over \$56 million. At that point, 36% of pavements were in poor condition. Over the next ten years, paving expenditures were increased to closer to \$90 million annually, resulting in a reduction in poor pavement conditions to just 14% of the system. Budgeted figures for the 2018 and proposed 2019 fiscal years maintain this course of sustained investment.



Pavement conditions have improved significantly over the past decade thanks to sustained investment and preventive maintenance strategies.

Vermont's bridges have a similar story to pavement. A decade ago, 20.5% of Vermont's 1,835 state highway bridges<sup>31</sup> were categorized as "structurally deficient". As of 2017, that percentage was down to 5.1%. Interstate bridges and town highways have experienced similar improvement. This again is thanks to an acknowledgement of the critical importance of these structures to travel throughout that state, and the will to make significant, sustained reconstruction and maintenance investments. Vermont intends to maintain this state of good repair and is budgeting accordingly. The proposed FY2019 state highway bridge budget is approximately \$57.6 million with increases projected out through 2021.

### Highway Safety

As one of the top priorities in the state, highway safety receives significant attention and investment. The Vermont Highway Safety Alliance (VHSA) reflects this commitment to increasing safety on our highways.

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<sup>29</sup> Final Rule – Statewide and Non-Metropolitan Transportation Planning; Metropolitan Transportation Planning, US Federal Register, 5/26/2016

<sup>30</sup> <http://vtrans.vermont.gov/about/stip>

<sup>31</sup> 781 long (greater than 20') and 1,054 short (6' to 20')

The VHSA was formed in 2012, “to formalize an integrated statewide highway safety program focused on the best utilization and sharing of resources to accelerate the advancement of highway safety in the State. The mission is to work together to collect, share, and use data in a unified effort to develop and implement strategies that improve highway safety.”<sup>32</sup>

Within AOT, the Highway Safety Data Unit collects and manages data related to highway system conditions, collects highway video, reports highway sufficiency rating data, and manages the Crash, Fatality Analysis Reporting System (FARS), among other crucial data management work. Highway Safety staff are also directly involved with the Vermont Highway Safety Alliance and work closely with statewide law enforcement on crash reporting and analysis. This analysis generated valuable information about the causes of crashes, informing the strategies employed by AOT and the other Vermont Highway Safety Alliance partners.

The 2017-2021 Strategic Highway Safety Plan (SHSP) focuses on seven critical emphasis areas (CEAs) of work to reduce major crashes. These are:

1. Improve infrastructure to minimize lane departure and intersection incidents
2. Reduce speeding and aggressive driving
3. Increase use of occupant protection (such as seat belts)
4. Increase safety of vulnerable users (pedestrians, bicyclists, and motorcyclists)
5. Improve younger (under age 25) and older (65 and over) driver safety
6. Reduce impaired driving
7. Curb distracted and inattentive driving



Seatbelt checks increase awareness of the importance of occupant protection.

Vermont has made significant progress in highway safety in the past decade and through aggressive goal setting, and infrastructure investments, outreach, education, and enforcement, will continue to work toward safer roads. Vermont’s proposed FY2019 traffic and safety budget is approximately \$17.3 million with a slight increase projected for FY2020. It is expected this continued investment will move Vermont toward its highway safety targets described above.

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<sup>32</sup> 2017-2021 Vermont Strategic Highway Safety Plan.

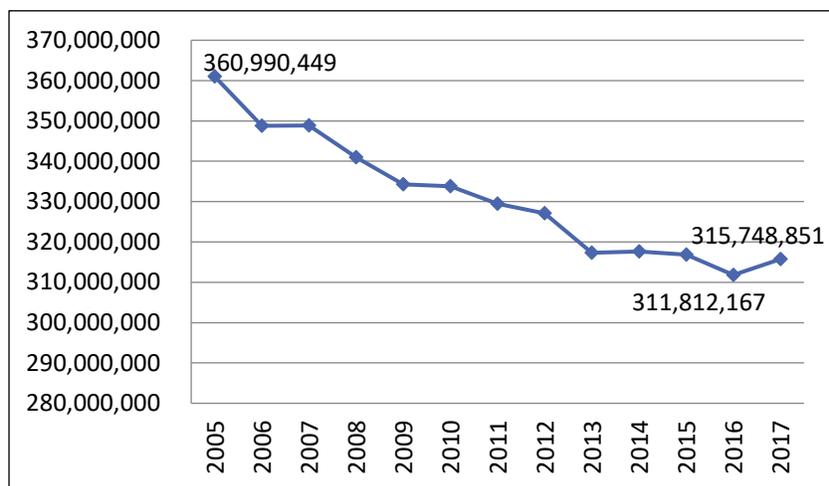
## Chapter 6: Challenges

Vermont’s transportation system will face many challenges in the next two decades. Some of these challenges are ongoing and the state has already grappled with them for many years. Adequate and sustainable funding levels, the interaction between development and the transportation system, and highway safety are all perennial issues requiring continued diligence to address them. Other challenges are just beginning to evolve such as changing demographics and relatively flat population growth. A number of these issues also present our best opportunities to improve the transportation system of the future such as technological advances that may reduce the cost to travel while increasing safety, energy efficiency and mobility for transportation system users. Our response to each of these challenges will shape the transportation system of the future. The following are the most significant challenges to address moving forward.

### Funding & Finance

Over half of Vermont’s \$614 million<sup>33</sup> annual transportation budget is derived from federal funding sources, primarily from the Highway Trust Fund (HTF). The HTF – which collects taxes on gasoline and diesel sales - is the primary federal mechanism to fund highway and transit programs. The HTF’s long-term solvency continues to be threatened by lower than anticipated revenues (due in large part to higher vehicle fleet mileage and slow growth rates in Vehicle Miles Traveled (VMT)) and the impact of inflation (the gas tax has not been raised since 1993).

Figure 12 - Gasoline Consumption by State Fiscal Year (gallons)



State revenues account for the second largest share of Vermont’s annual transportation budget. The current budget includes approximately \$249 million state funds, in addition to \$12 million in Transportation Infrastructure Bonds (TIB) funds. State revenues encompass a diverse combination of gas and diesel taxes, purchase and use taxes, motor vehicle fees, and TIB funding. The gasoline tax risks associated with federal funding are also applicable to state funding. Mirroring national trends, Vermont has witnessed a decline in gasoline consumption as residents drive less and shift to more fuel-efficient vehicles. The outlook for transportation funding under the current revenue mechanisms is not particularly positive for the reasons presented above. If trends continue, the gap between system needs and funding generated by the primary revenue sources will widen.

<sup>33</sup> State Fiscal Year 2018 Budget - <http://vtrans.vermont.gov/about/capital-programs>

## Asset Conditions

Vermont invested significantly over the past decade in some of its most fundamental transportation assets and infrastructure. Pavement and bridge conditions have improved considerably as a result<sup>34</sup>. For instance, 20.5% of Vermont's state highway bridges were rated as structurally deficient in 2007. By 2017, this had fallen to 5.1%. Notable improvements in bridge conditions on the interstate and town highways also occurred over the same period. Pavement conditions statewide have seen similar improvement. In the late



An AOT bridge inspection crew checks the condition of a large bridge.

2000's, as much as 34% of the state highway system was in "very poor" condition, and 23% rated as "good". By 2017, 43% of pavements were in "good" condition, and just 11% were "very poor". The state has also been able to make incremental improvements in the condition of its active rail lines through a series of successful federal discretionary grants. Significant aviation investments in runway extensions and safety improvements have been made in recent years at Vermont's public use airports in Newport, Rutland, Middlebury and Morrisville.

The State's asset sustainability index (ASI), the amount of available funds divided by the amount of infrastructure needs, is 0.67. An ASI ratio of 0.67 means that the State has approximately 2/3 of the funding it needs to maintain its assets in a state of good repair. Funding uncertainties create challenges to maintaining the state's transportation infrastructure in a state of good repair.

A revamped project selection and prioritization system based on the principles of performance and risk management coupled with the wise use of asset management best practices will be vital to stretching precious transportation funding. According to a financial analysis included in the 2018 Transportation Asset Management Plan (TAMP), the annual infrastructure gap between total transportation system need and revenue ranged between \$230 and \$250 million during the five-year period between 2014 and 2018. This is the funding for basic needs – essentially maintaining the existing system. The following table excerpted from the TAMP highlights the most significant risks to successful maintenance of our transportation infrastructure in a state of good repair. Through the focus areas are not presented in ranked order of importance, safety of the system and funding to maintain it in a state of good repair are crucially important.

<sup>34</sup> Statistics from 2018 AOT Factbook

Table 4 - Risk Focus Areas for Transportation Assets<sup>35</sup>

Focus Area	Risk Event	Primary Consequence
Safety	If asset condition declines below certain levels...	then deficiencies could lead to increased crashes, decreasing safety and service
Funding	If funding declines below minimum acceptable levels...	then asset conditions will deteriorate prematurely, leading to increased total lifespan costs and decreased cost effectiveness
Workforce	If we continue to lose knowledge within AOT and industry...	then lower quality products will result from inception through construction and maintenance resulting in the reduction of useful life, service, and safety
Tools and Resources	If data is unavailable or incomplete or models are not reliable...	then asset management strategies may be flawed, and treatments performed on the wrong pavements or bridges at the wrong time or place
Sustainability	If best practices* are not steadily used to make the cost-effective asset management decisions for the short- and long-term...	then program and maintenance costs will rise while corresponding quality, service, and expected life span will decrease
Environmental Conditions	If Vermont continues to experience extreme weather events due to climate change...	then local instabilities to assets will lead to a greater need for maintenance activities and/or reduced asset lifespans

\*Asset, risk, data, and performance management

### Population & Demographic Change

Vermont’s population grew steadily during the period between 1960 and the early 2000’s. However, growth has been flat for the past decade. According to the U.S. Census Bureau, Vermont had 626,042 residents in 2015 and is the second smallest state by population, behind only Wyoming.

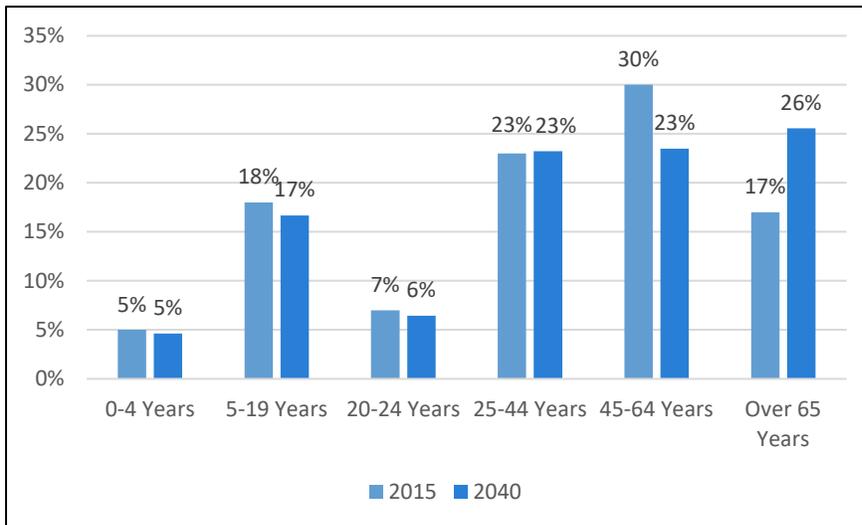
In addition to slow growth, Vermont is experiencing the same trend of an aging population as many northeast states, and much of the rest of the country. It has the second oldest population, with a median age of 42.8; only Maine is older with a median age of 44.1. Under current conditions, by 2040, half of Vermont’s population will be 45 years or older; 26% of the population will be over 65 years of age<sup>36</sup>.

This trend of aging population presents multiple challenges. Vermont, as a predominantly rural state, is especially subject to issues of social isolation and difficulty in accessing basic services, including shopping and healthcare. As the population ages, it is likely more elders living in rural areas will face increasing challenges in access to basic services as well as social interaction.

<sup>35</sup> Vermont Transportation Asset Management Plan (TAMP), 2018

<sup>36</sup> Demographic & Economic Trends & Forecasts Report, RSG & EPR, 2016.

Figure 13 - Vermont's Aging Population<sup>37</sup>



These population trends are also challenging to Vermont in terms of overall affordability, workforce and labor supply, and economic opportunity. A stagnant or slow growing population, with an increasing percentage of retirees leads to a decreasing tax-base from which to fund services and infrastructure investments. Existing businesses have difficulty finding employees and new businesses are

challenged to make the decision to start up or relocate to Vermont. This cycle leads to slow job growth. It is difficult to break this cycle. Vermont will continue to grapple with these issues in the coming years.

### Economic Changes

Vermont's economy has evolved over time to be primarily service-based. Nearly 70% of Vermont's 2014 gross-state-product was derived through service-providing industries<sup>38</sup>. Top contributors include real estate (14.8%), health-care and social assistance (10.3%), retail (7.7%) and accommodation and food services (4.7%). According to a 2016 employment projection report developed by the Vermont Department of Labor, Economic and Labor Market Information, job growth in the next decade is expected to be strongest in service-industries such as personal care, construction and extraction, healthcare, business and financial operations, and food service. The importance of Vermont's tourism and recreation industry cannot be underestimated. According to the Vermont Tourism 2015 Benchmark Report, "3.5 billion dollars of economic activity each year supported by the employment of more than 31,000 Vermont workers provided hundreds of millions of tax-dollars to support state and local government programs."<sup>39</sup> Furthermore, travel and tourism has served an important long-term economic development process for the state by introducing visitors that may become second-home owners and eventual residents of the state. It is by this process many of Vermont's most well-known and successful brands took root, including IBM, Ben & Jerry's, and Burton Snowboards. The changing economy from a primarily production-based to service-based will require thinking differently about how transportation investments are made, and the balance between sustaining both production and service economies.

### Land Use

Vermont has avoided much of the vast sprawling form of development so common to more populous states. However, inefficient, low-density, rural-residential and strip commercial development exists at the periphery of many of Vermont's urban areas. This land use pattern is difficult to avoid due to the relatively inexpensive and easily built-upon suburban and rural open lands surrounding developed

<sup>37</sup> Ibid.

<sup>38</sup> Vermont Economic and Demographic Profile Series, 2015.

<sup>39</sup> Vermont Tourism 2015 Benchmark Report, 2017.

centers. The upfront savings of developing these lands are simply passed on, through increased vehicle miles traveled and traffic congestion and demand for sidewalks, bicycle facilities and transit service in in areas that are costly and difficult to serve. The fundamental economics of this cycle will continue to present a challenge to more efficient, compact development.

### Water Quality

Impervious roadway surfaces can quickly convey polluted stormwater runoff to nearby waterways. AOT and municipalities are responsible for stormwater collection, conveyance and treatment along highways and other transportation related facilities. Act 64 of 2015, referred to as Vermont's Clean Water Act, set the stage for a coordinated statewide initiative to address water quality issues from a wide range of pollutant sources including stormwater runoff from roads. A separate Federal Environmental Protection Agency (EPA) action in 2016 requires Vermont to address unacceptably high phosphorous levels in Lake



Federal and state mandates require that Vermont address highway stormwater issues.

Champlain. AOT has multiple roles and responsibilities in the water quality arena. AOT is responsible for the management of thousands of highway miles and other highway facilities subject to new requirements including the new Statewide Transportation Separate Storm Sewer System (TS4) permit administered by the Vermont Agency of Natural Resources (ANR). Vermont Department of Environmental Conservation (DEC) estimates the cost to address Lake Champlain TMDL requirements on municipal roads at approximately \$10 million per year and they estimate cost of compliance on the state highway system managed by AOT at a total of \$50 to 91 million over 20 years. These costs are in addition to costs currently in place to comply with various other water quality regulations.

### Freight & Trade

Proportionally, highways carry most of Vermont's freight - approximately 83% by weight and 88% by value<sup>40</sup>. Interstate highways I 89 and I 91 span the state and provide high-speed, high-capacity routes for trucks and automobile traffic. They are also the main gateways to Vermont's external markets in New Hampshire, Massachusetts and Quebec. Trucks travelling to and from New York and for most east-west travel in Vermont rely on principal and minor arterials including VT 9, US 4, V 103, US 7, VT 22A, US 2 and VT 15 that pass directly through cities and village centers. Rail accounts for 16% by weight and 11% by value, and air-cargo accounts for less than 1% by both measures. Burlington International Airport, E.F. Knapp Airport (Barre-Montpelier) and Rutland - Southern Vermont Regional Airport provide regularly scheduled cargo service. Much of the rail infrastructure in Vermont is weight restricted and limited to carrying loads that are significantly less than the present national standard rail carload weight of 286,000

<sup>40</sup> Vermont Freight Plan, 2015.

pounds. Many state highways passing through towns were not designed to handle significant truck volumes, and present safety and quality of life challenges. The Vermont Freight Plan projected an annual freight growth rate of 1.28 percent for the period 2007 through 2035, resulting in 43% growth over the same period. While most of Vermont's interstate and NHS highway system routes have the capacity to handle this growth, given the fixed physical limitations within city and village centers means the quality of life impacts associated with truck traffic such as noise, vibration, traffic operations and bicycle/pedestrian concerns are likely to become more intense over time.

### Highway Safety

Vermont has made significant progress over the last few decades in reducing the numbers of highway crashes and fatalities, though improvements are becoming increasingly difficult to achieve. Vermont continues to struggle with the same issues and experiences the same trends as other states across the nation. The four most prevalent causes of crashes all related to driver behavior: are speed, impaired driving, distracted driving and occupant protection. In 2016 fatal highway crashes where a seat belt was available, 48% of drivers or passengers were not wearing a seat belt. Increased highway safety is one of the National



There are over 400 tractor-trailers per day that pass through downtown Vergennes on VT 22A.

Performance goals established by federal transportation law (MAP-21 and FAST Act). The objective is to significantly reduce traffic fatalities and serious injuries on all public roads through a range of strategies including infrastructure investments. Vermont, along with all the other states, must track progress toward established targets. Failure to show progress toward the targets carries potential federal financial penalty in the form of reduced flexibility in how Vermont may use federal transportation funds. Highway safety will continue to be a major priority for Vermont.

### Security

Vermont's transportation infrastructure is critical to state security. That infrastructure is also vulnerable to a broad range of hazards. The [State of Vermont Hazard Mitigation Plan](#) (SHMP), recently updated in 2018, identifies and ranks hazards faced in the state, vulnerabilities to these hazards at the state and local level, and mitigation strategies that will harden the state against disaster<sup>41</sup>. Vermont's transportation system is included in the SMHP as part of the critical infrastructure necessary to maintain statewide security. Hazards identified in the plan are organized under broad categories of **Natural Hazards** (including atmospheric hazards such as flooding and fluvial erosion, severe winter storms, tropical storms, infectious disease outbreaks) and **Technological Hazards** (including dam failure, terrorism, invasive species, rock cuts, and nuclear power plant failure). These hazards all have the potential to impact transportation system security negatively. The most impactful incidents in the past decade have been the result of weather events resulting in rivers becoming overwhelmed by rising water levels, and subsequent

<sup>41</sup> State of Vermont Hazard Mitigation Plan, 2018

damage. Tropical Storm Irene, described below in “Extreme Weather Events”, is an extreme example of such a threat to transportation system security, though smaller more isolated events such as rockfall on rail corridors, and fluvial erosion events washing away highway infrastructure have been realities in just the past two years. Vermont will undoubtedly continue to face these challenges in the coming years.

### Extreme Weather Events

Climate change has manifested itself in Vermont most obviously in the form of extreme weather events. The Northeast has experienced a greater recent increase in extreme precipitation than any other region in the U.S.; between 1958 and 2012, the Northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events). The 2018 SHMP identifies flooding and fluvial erosion as the highest-ranking hazard in the state.

The impacts of these events on the transportation system are clear. Tropical Storm Irene destroyed miles of roadway at extreme expense to the state and its residents, not to mention the human and emotional toll it exacted on Vermont. The impact of Irene and other such storms has been strong enough that AOT has made resilience to future disasters a goal in its [Strategic Plan](#).

At the federal level, the Transportation Research Board has made climate adaptation & system resilience a priority and is supporting extensive research. The US DOT and FHWA have been supporting state DOT research and planning activities including development of a vulnerability assessment framework and support for numerous state DOT climate resilience pilot projects. Additionally, recently updated federal transportation planning rules require that states consider and implement planning processes that, “improve resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation.”<sup>42</sup>



Scenes like this are becoming more common in Vermont and in the Northeast U.S. in general.

<sup>42</sup> Title 23, Part §450.206, Subpart B – Statewide and Nonmetropolitan Planning and Programming



particularly true during peak periods and in some cases, special events. It is unlikely Vermont will very often take the traditional highway approach of “building” its way out these situations. While traffic congestion that recurs daily is somewhat limited to certain areas of the state, unexpected delays caused by crashes, special events, bad weather or other disruptions occur everywhere. As noted in Chapter 5, recently implemented National Highway Performance Measures require the monitoring and measurement of travel time reliability throughout the National Highway System by both the State and the Chittenden County MPO region (staffed by CCRPC). This monitoring will allow AOT in coordination with CCRPC to identify, measure, and track the frequency and extent of unexpected delays in the system, and coordinate on responses to manage and alleviate the congestion.

### Technological Change

Our transportation system is expected to undergo significant changes in the coming decades due to the adoption and utilization of a variety of transformational technologies<sup>44</sup>. A few of the most significant and high-profile technology changes as of late include connected and automated vehicles (CAV), the electrification of our transportation system through the increased adoption of electric vehicles (EVs), and new business models for providing mobility as a service such as Uber. As a small, rural state, Vermont will not likely be on the cutting edge of these innovations, but it is important that Vermont be aware of the benefits, needs and constraints of these technologies, and cognizant of how they should be adapted to our rural environment. Maintaining pace with these advancements, making smart investments that will provide a good return, and coordinating with our neighboring states and Canada are challenges we face in maintaining and improving Vermont’s transportation system over the next twenty years.

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<sup>44</sup> Technology and Vermont’s Transportation System, Dubois & King, VEIC, and Smart Mobility, 2017

## Chapter 7: Opportunities

Many of the challenges Vermont's transportation system faces in the coming decades also provide the best opportunities to achieve the vision for the system. Technological advancements that may be challenging for a small state such as Vermont to stay abreast of will still provide the opportunity to reach our goals. Vermont can leverage Intelligent Transportation Systems (ITS) research and development to take advantage of opportunities to improve the function of intersections, alleviating congestion and vehicle emissions, and cutting down on travel delay. In time, connected and automated vehicle technologies could significantly improve highway safety, cutting down on crashes through incident avoidance systems. These changes are already taking place with lane-correction and assistive-braking systems becoming common in moderately priced passenger vehicles. Vermont's public transit systems will continue to be a wise investment as they provide healthy, affordable mobility for transit-dependent individuals, as well as commuter services and downtown routes that attract workers and businesses alike. Coordinated investments in Vermont's historic villages and downtowns, providing walkable communities that encourage vibrant local economies and attract new residents and business, are a great opportunity to preserve the unique character of our state and while increasing economic vitality. As a small state, partnerships at all levels, including with our northeast state neighbors and Canada to our north, will remain vital to our success. The following are more specifics on how Vermont can leverage multiple opportunities to enhance the transportation system to reach our goals and ultimate vision for the system.

### Leveraging Transportation Infrastructure to Grow Vermont's Economy

Vermont's transportation system is integral to efforts to grow the state economy. The transportation system enables shippers to export their products, employees to get to work, and visitors to access tourist destinations. Vermont's three major interstate highways facilitate product movement, distribution access, and workforce commuting. Rail lines crisscross the state and there are 16 public-use airports, including Burlington



AMTRAK's "Vermonter" route operates daily between St. Albans, Vermont and Washington, D.C. via New York City.

International (BTV) serving over half a million passengers annually<sup>45</sup>. Highways are the state's most critical transportation asset, providing access and mobility to Vermonters, businesses, and tourists travelling by motor vehicle, transit, bikes or foot<sup>46</sup>. Regional public transportation commuter services operate along many of the major highway corridors serving employment centers, and resorts areas. Vermont's Agency of Commerce and Community Development's Tourism and Marketing Department recently updated the

<sup>45</sup> Federal Aviation Administration (FAA) Final Calendar Year 2016 Passenger Boarding Data [www.faa.gov/airports/planning\\_capacity/passenger\\_allcargo\\_stats/passenger/](http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/)

<sup>46</sup> Vermont 2020 Comprehensive Economic Development Strategy (CEDs), February 2016

[Think Vermont](#) portal to promote tourism encourage business investments in Vermont by touting its many transportation assets including international air service, regional public transportation routes, intercity bus and passenger rail, and a bicycle-friendly culture. Keeping the transportation system in a state of good repair is vital to Vermont’s economy. Investments in additional highway capacity projects may also be justified when there is a clear connection to growing the economy. In some instances, improvements, such as the upgrade of the state’s rail infrastructure to national freight standards of 286,000-pound gross carload capacity, and airport enhancements to support freight for commercial and personal deliveries will be crucial to growing Vermont’s economy. The buildout of electric vehicle charging infrastructure in coordination with partners in the United States and Canada ensures a positive experience for the growing market of EV owners as they traverse Vermont. Finally, the extension of Amtrak Vermonter passenger rail service to Montreal and the Ethan Allen Express to Burlington will provide unprecedented opportunities for Vermont’s economy. Vermont must think creatively about how to capitalize upon its transportation infrastructure, continue to invest wisely in the existing system, and strategically develop new services and initiatives.

### Public Transit

Public transit holds great potential to achieve progress on multiple state goals. Vermont’s public transit services provide affordable, environmentally sound transportation options for people of all means and needs. These services transport employees to jobs and visitors to tourist destinations generating economic benefit to the state. Specialized services ensure Vermont’s most vulnerable populations of elders and persons with disabilities can access medical appointments and meet basic shopping needs. Each Green Mountain Transit LINK commuter bus removes dozens of single occupancy vehicles from roads each trip, decreasing traffic congestion and delay, and reducing greenhouse gas emissions. Vermont’s longstanding commitment to public transportation will continue to be a wise investment and strategy toward achieving its transportation vision for the future.



Services like Southeast Vermont Transit’s “Moover” provide non-automobile access to medical appointments for some of Vermont’s most vulnerable citizens, as well as transport employees and visitors to tourism destinations like Mount Snow.

### Integrating Land Use and Transportation

The coordination of existing and future land use with the transportation system is crucial to maintaining highway system performance, and the preservation of the traditional historic settlement patterns in Vermont. The aesthetics of traditional village settlements separated by undeveloped rural stretches of land are fundamental to the Vermont “brand” but also lead to more efficient use of public resources. The first transportation-related strategy in the [2016 Comprehensive Energy Plan](#), is efficient land use “maintain(ing) historical settlement patterns of compact centers surrounded by rural countryside to provide walkable, transit friendly environments that require less automobile use.”

Within AOT, land use & transportation coordination tools range from the very broad, such as the Corridor Management Planning Process, which seeks to balance ideas for transportation improvements with anticipated land use and development challenges by engaging a wide range of interested parties, to the very specific, such as the application of the Vermont State Design Standards, the Title 19 § 1111 Highway Access Permit Process, and the more recent Act 145 Transportation Impact Fee. These processes and programs seek to balance between mobility and access.

AOT also coordinates with state agency partners and supports various state level initiatives aimed toward maintaining historic settlement patterns. The Vermont Department of Housing and Community Development (DHCD) manages designation programs for downtowns, village centers, new town centers, growth centers, and neighborhood development areas. AOT has a partnership with DHCD in the [Better Connections](#) program. This program supports comprehensive planning and analysis leading to coordinated investments across multiple funding sources. This type of coordinated investment has led to successes like St. Albans downtown and Barre Main Street, where transformative projects have resulted in reinvigorated downtowns.



Coordinated investment in Vermont's downtowns supports our historic settlement patterns and generates economic momentum in our developed centers. Pictured here is St. Albans.

### Energy Use and Air Quality

Transportation is the largest end use of energy (37%) and the largest generator (45%) of greenhouse gases in Vermont<sup>47</sup>. Unsurprisingly, Vermont's Comprehensive Energy Plan (CEP) leans on transportation-related strategies to achieve reductions in statewide energy consumption as well as obtaining most of its energy from renewable sources. The CEP sets a target for state to obtain 90% of its total energy from renewable sources by 2050. The CEP also includes interim transportation goals to reduce transportation energy consumption by 20% and power 10% of transportation energy from renewable sources by 2025. Vermont's transportation sector is currently fueled 94% by petroleum. Vermont has a significant opportunity to achieve increased energy efficiency and maintaining its clean air quality through the migration of the vehicle fleet to alternative fuels. Facilitating the expansion of EV charging infrastructure throughout the state is critical to these goals.

### Regional and International Relationships

As discussed earlier in the Transportation System Background section, Vermont's relatively small geographic scale requires consideration of its place within the larger regional context. Coordination with neighboring states and Canada will continue to be crucial to the function of Vermont's transportation

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<sup>47</sup> 2016 Vermont Comprehensive Energy Plan (CEP)

system and progress toward many LRTP goals, as well as the Administration’s overall state goals of Economic Growth and Affordability. Successful implementation of key projects including passenger rail extensions to Montreal and Burlington, the buildout of statewide EV charging infrastructure, and modernized, well-functioning international ports of entry rely on these relationships. Ongoing participation in organizations including the Conference of New England Governors and Eastern Canadian Premiers (CONEG/ECP), the Eastern Border Transportation Coalition (EBTC), and the States for Passenger Rail Coalition (SPRC) ensure we are soundly progressing toward shared goals.

### A Multimodal Transportation System

Vermont’s multi-modal transportation system reflects a general understanding and belief that a well-rounded transportation system includes multiple modes and options for travelers and freight transport. Though highways carry most of Vermont’s freight and personal transportation demand, rail service, public transportation services, public airports, and safe bicycle and walking facilities are all integral to a complete, optimized transportation system. Vermont has consciously invested in all modes of transportation including preservation of rail corridors vital to transport of heavy



Vibrant villages and multimodal transportation options go hand in hand. Photo: Caleb Kenna

commodities throughout the state, airports that provide economic development opportunity and public safety services, and public transit services that provide affordable commute options, as well as basic access to services for our most vulnerable Vermonters. Bicycle and pedestrian investments contribute to Vermont’s progress on goals related to livable, healthy communities. The ability to walk and bicycle safety is an integral aspect to community life, contributing to overall health and mobility, as well as presenting economic development opportunities. These options are all integral parts of a comprehensive transportation system.

### Transportation Demand Management

Information about how to access the range of services are just as essential as having a multi-modal transportation system. The [Go! Vermont](#) program, operated by AOT, serves as a one-click/one-call source for information on efficient transportation modes, such as regional public transportation, intercity bus service, park and ride locations, and offers carpool matching and vanpool services. Go! Vermont works in partnership with the Chittenden Area Transportation Management Association (CATMA), as well as the Upper Valley Transportation Management Association (UVTMA) to inform and promote the use of alternative forms of transportation. Initiatives such as the annual Way-to-Go challenge, Employer Outreach services, and program support for efficient transportation organizations all work together to provide incentives for commuters to leave their car at home. Maintaining a well-rounded transportation information system will serve Vermont well in the future as all modes provide unique benefits and serve to move the state toward multiple goals.



Vermont has been very successful in obtaining federal discretionary grants to fund rail improvements that will support improved passenger services and increased freight capacity.

### Discretionary Funding

Vermont has experienced significant success in securing competitive discretionary grants awards over the past decade. Many rail infrastructure improvements over this period have been funded through federal awards from the Transportation Investments Generating Economic Recovery (TIGER) program, and in earlier years, the Highspeed & Intercity Passenger Rail Program, both administered by the US Department of Transportation. These grants funded major portions of track upgrades along the Amtrak Vermonter corridor, reducing trip times and increasing reliability of service. In 2015, Vermont was awarded a TIGER grant to replace 11 miles of old jointed rail with new continuously welded

rail on the western corridor, as well as to fund station and platform in anticipation of passenger service extension from Rutland to Burlington. Vermont's public transit program has seen similar success in securing tens of millions of federal dollars through the competitive State of Good Repair and Bus & Bus Facilities grant programs administered by the Federal Transit Administration. These grants have enabled timely replacement of dozens of public transit vehicles that had met their limits of useful life, paid for significant facility improvements such as the Burlington Downtown Transit Center completed in 2017, funded operations and maintenance facilities in Addison County and in Southeast Vermont, as well as funded statewide technology improvements. Vermont will be wise to continue to monitor funding availability in these and other discretionary grant programs and submit applications when appropriate opportunities present themselves.

### Downtown Development

Investments in Vermont's historic villages and downtowns are a great opportunity to preserve the unique character of our state and increase economic vitality of the state. According to the 2013 report, Strengthening Vermont's Economy by Integrating Transportation and Smart Growth Policy, "smart growth principles and associated smart growth transportation policies (such as focusing investments in villages and downtown centers) offer tremendous opportunities to deliver direct transportation benefits such as travel time and travel cost savings as well as a host of economic, social, and environmental benefits." Consistent with the recommendations in the Smart Growth Policy Report, factors that support smart growth are being incorporated into the AOT project selection and prioritization process, the corridor management planning process is updated, and the Better Connections Grant program was created. Also, as recommended by the Smart Growth Report, an extensive outreach effort was undertaken with a broad stakeholder group that recommends a specific work program for an update to the Vermont State Design



The installation of this roundabout at the intersection of Route 100 & Route 2 in Waterbury is an example of a transportation project serving as a catalyst for change. The aesthetic and functional improvement of this intersection has been part of broader effort to revitalize this end of town which is now a vibrant multi-use village area with new shops, post-office, recreation facilities, and new housing.

Standards to keep pace with the state of practice and ensure that Vermont transportation facilities are designed to meet current state and community needs and accommodate a variety of users of the transportation system.<sup>48</sup> Planning programs such as [Better Connections](#) managed by AOT in partnership with Vermont Agency of

Commerce and Community Development (ACCD) can assist in developing strategies to leverage combined investments in our historic villages and downtowns. Coordinated investments such as those in St. Albans downtown and Barre Main Street are examples of the impact that can be achieved by combining resources on a focused area to achieve results where the whole is greater than the sum of its parts. These opportunities will continue to present themselves and should be leveraged when as much as possible.

### Technological Advancement

While keeping up with the rapid advancement of technology is a challenge, those advancements also represent some of the greatest opportunities to improve the safety, efficiency, and general effectiveness of our transportation system, while reducing the its environmental impacts. A few of the most significant and high-profile technology changes as of late include connected and automated vehicles (CAV), the electrification of our transportation system through the increased adoption of electric vehicles (EVs), and new business models for providing mobility as a service such as Uber. Vermont can benefit from these technologies with a safer, more efficient system that provides more mobility choices and higher level of energy efficiency. With specific regarding toward EVs, Vermont should continue to leverage its FHWA Alternative Fuel Corridor designations and relationships with adjacent states and the Province of Quebec to work toward the build-out of the EV charging network.



Burlington Electric Department is helping Vermont meet [Renewable Energy Standard](#) requirements by promoting the purchase or lease of electric vehicles through a rebate program.

Vehicles with some level of automated driving technology can be expected on Vermont highways in the not-too distant future. It is highly likely there will be a mix of conventional vehicles and vehicles with some level of automation on Vermont highways for several decades to come. The potential mobility, social and economic benefits of automated vehicles are significant, but the timing and magnitude of the benefits

<sup>48</sup> Smart Growth America, "Revising the Vermont State Standards, M2D2: Multimodal Development and Delivery, Work Program: March 2015.

and consequences are uncertain. In the short term, Vermont should focus on facilitating the transition by making automated vehicles available to Vermonters in a safe and efficient way by (1) providing the statutory authority for a permit processes that allows and regulates the testing of AVs in Vermont; and (2) providing the statutory authority to explicitly accommodate and specifically regulate automated driving on public roads in Vermont by the public.

## Chapter 8: Environmental Consultation and Mitigation

Along with all the benefits brought by Vermont's transportation system, there are also negative impacts. Transportation is the largest end use of energy (37%)<sup>49</sup> and the largest generator (45%)<sup>50</sup> of greenhouse gases in Vermont. If not treated properly, highway stormwater runoff can contribute to water quality degradation as it transports sediments, nutrients and other pollutants into our waterways, lakes and ponds. Wildlife mortality occurs where highways and wildlife corridors intersect. Infrastructure projects such as a new highway interchange or a project within a historic downtown have the potential to impact historic or archaeological resources. The vision of the 2040 Long-Range Transportation Plan (LRTP) includes consideration of these issues at the broadest level, as well as compliance with required federal and state permitting processes during project development.

Environmental mitigation activities means strategies, policies, programs, and actions that, over time, will serve to avoid, minimize, rectify, reduce or eliminate impacts to environmental resources associated with the implementation of a long-range statewide transportation plan or metropolitan transportation plan - [23 CFR § 450.104](#)

This section describes broad areas of impact of the transportation system on the environment, principles of the LRTP that support the mitigation of those impacts and describes policies, programs, and partnerships that support shared statewide goals of environmental stewardship.

### General Areas of Impact

#### Energy & Air Quality

Transportation contributes significantly to energy consumption and greenhouse gas emissions. Due to the state's rural nature, and to relatively small industrial and manufacturing sectors as a proportion of the overall state economy, and its movement to more sustainable sources of power, air pollution from transportation in the form of tailpipe emissions – is the largest emitter of greenhouse gases. Shifts in vehicle technology and Vermont's relatively clean energy profile bode well for the state's ability to manage the amount of energy consumed through transportation and to maintain Vermont's air quality.

#### Water Resources

Stormwater runoff is generated when precipitation from rain and snowmelt flows over land or impervious surfaces and does not infiltrate into the ground. Impervious surfaces such as highways, parking lots, or airport runways, along with concentrated drainage conveyances from this infrastructure, increase the volume and flow rate of stormwater. This runoff can cause cumulative impacts throughout a watershed. Stormwater can also pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, or wetland. Significant legislative, regulatory, and program initiatives have been established in recent years to address these issues.

<sup>49</sup> Vermont Transportation Energy Profile, 2017.

<sup>50</sup> Vermont Greenhouse Gas Emissions Inventory Update, June 2015.

## Wildlife

Hundreds of vehicle-to-animal collisions on Vermont's highways are reported to the State Police every year. Approximately 300 collisions with deer alone are reported annually.<sup>51</sup> These reported incidents are only a portion of the actual number of collisions. Reducing the frequency of these collisions is a matter of good environmental stewardship as well as highway safety; both are primary goals of the LRTP. AOT and numerous partners are working to better incorporate consideration of natural ecosystems, including habitat connectivity, in the operation of the transportation system. Bridge and culvert design, fencing, and habitat conservation can help make transportation infrastructure more permeable to wildlife.



Vermont is rich with wildlife that must navigate highway crossings.

## AOT Culture of Environmental Stewardship

Vermont's commitment to minimizing transportation impacts is reflected in the staff employed at the Agency of Transportation to address such issues. AOT employs numerous environmental resource experts in its Highway Division, including an Environmental Program within the Maintenance and Operations Bureau, as well as Environmental Engineers within the Construction Management Bureau. Specialists in these sections include experts on:

- Historic and Archaeological Resources
- Wetlands & Waterways
- Farmland Soils and Agriculture
- Fish, Wildlife, Plants, and Rare Species
- Parks and Recreation Areas
- Stormwater and Water Quality
- Hazardous Materials and Waste Management
- Vegetation Management.

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<sup>51</sup> Source: AOT Crash Data Repository

AOT also employs an Environmental Policy Manager tasked with participating in the development and implementation of many of the initiatives described in this section. The AOT Environmental Policy Manager facilitates regular coordination meetings with the VT Agency of Natural Resources (ANR). These meetings serve as a forum to discuss resource issues and cooperatively develop coordinated responses.

“AOT recognizes that environmental quality - clean water and air, scenic beauty, ecological diversity and protection of the state’s historic character - are what Vermonters desire and are considered integral parts of the state’s economic well-being. AOT will fulfill its environmental responsibility through an Agency-wide *environmental stewardship ethic*. This ethic will be guided by *principles* and *practices* that will apply to all of the agency’s business activities.” - AOT Policy Manual, Policy #8021, 2004

The Environmental Policy Manager’s work is guided by the AOT Environmental Stewardship Ethic Policy. AOT adopted this policy in 2004 to establish fundamental environmental principles and practices that would apply to AOT as an organization. These principles range from statements of support for the protection, preservation and/or improvement of our natural resources, wildlife habitat, and cultural and scenic resources, to actions such as minimizing agency-generated waste by reducing, reusing, or recycling materials, and reducing the use of non-renewable energy resources through promoting building and vehicle energy efficiency. Other practices include broad considerations such as encouraging the development of all transportation modes as an integrated, seamless transportation system, to the very specific, such as including life-cycle costs in the initial cost analysis of a transportation investment. This culture of environmental stewardship is woven throughout the Agency’s daily work.

### L RTP Principles to Reduce Transportation System Impacts on the Environment

The following general principles will support the reduction of transportation on the environment. These are also the basis for many of the Goals, Objectives, and Strategies included in the L RTP.

- ✓ **Emphasize maintenance and preservation of the existing system** - There is general acknowledgement in the transportation industry that we have exited the era of vast transportation system expansion. The interstate highway system has been established and we are entering a period of technological advancement that will enable us to maximize its efficiency and effectiveness mostly within its existing footprint. By limiting the physical expansion of the transportation system, we will avoid many of the types of resource impacts that have resulted in the past as a part of major infrastructure projects.

- ✓ Provide a multimodal system - Providing convenient alternatives to the single occupancy vehicle helps in many ways. More fuel efficient and less polluting options include carpools, vanpools, public transit, and of course, walking and bicycling when possible. Not only are these modes more energy efficient and less polluting than the average single occupancy vehicle, fewer vehicles on our highways results in less traffic congestion, further mitigating negative air quality impacts.



Vibrant villages and multimodal transportation options go hand in hand. (Caleb Kenna photo)

- ✓ Focus on downtown & village investments - Vermont has for many years supported planning, regulatory and funding programs, and policies aimed at downtown and village development and redevelopment. Focused growth centers place housing, shopping and services, and employment closely together. Mixed use development such as this can reduce the transportation demand placed on our highways, along with the associated energy consumption and tailpipe emissions. Compact development also supports the viability of public transit services and walking and bicycling as a means of transport.

## Partnerships, Agreements, and Initiatives

Many of Vermont's best opportunities to act as good stewards of the environment in the operation of the transportation system are through partnerships, some of which extend beyond state boundaries. The following sections touch upon those partnerships, as well as legislative initiatives, regulations, and best practices for the operation and maintenance of the transportation system with an eye toward the LRTP goal of environmental stewardship.

### Energy & Air Quality

Transportation is undergoing a tremendous shift in vehicle technology toward electrification. Electric motors and drivetrains are far more energy efficient than internal combustion engines and have no tailpipe emissions. Vermont has made a firm commitment to this shift in technology, with consistent goals across the State Strategic Plan, the LRTP, and the AOT Strategic Plan all moving Vermont toward the build-out of the statewide electric vehicle charging network in coordination with our regional and international neighbors.

Vermont set bold targets in its [Comprehensive Energy Plan \(CEP\)](#) to achieve reductions in statewide energy consumption as well as obtaining most of its energy from renewable sources. The CEP sets the state on a path to obtain 90% of its total energy from renewable sources by 2050. Many of the strategies are transportation-related, including the electrification of the passenger fleet. The CEP also includes interim goals to reduce transportation energy consumption by 20% and power 10% of transportation energy from renewable sources by 2025.

AOT is a partner and regular participant in [Drive Electric Vermont \(DEV\)](#). DEV is a statewide coalition of policy makers, industry leaders, and citizens dedicated to promoting the spread of electric transportation throughout Vermont. DEV holds events around the state to educate Vermonters about electric vehicle technology and its benefits to our transportation sector and participates in the development of policy supporting the growth of the EV market and infrastructure.

On a broader level, Vermont is one of eight signatory states on the [Zero Emission Vehicle Memorandum of Understanding \(ZEV-MOU\)](#). This MOU is a statement of Vermont's commitment along with seven other partner states to coordinated action to ensure the successful implementation of their state zero-emission vehicle (ZEV) programs. The MOU identifies joint cooperative actions the signatory states will undertake, and additional actions that individual jurisdictions are considering, to build a robust market for ZEVs.

The state is also working beyond its borders on coordinated development of EV charging infrastructure. Vermont received [FHWA Alternative Fuel Corridor](#) designations for the entirety of I-89 and the majority of I-91 by showing sufficient availability and accessibility of public charging facilities along those major routes. This was achieved by working in partnership with the northeast and mid-Atlantic states as members of the [Transportation and Climate Initiative](#) supported by the Georgetown Climate Center.



FHWA Alternative Fuels Corridor  
Logo

Vermont's effort to coordinate the buildout of the EV charging network has extended north into the Province of Quebec as well, through active participation in the Conference of New England Governors and Eastern Canadian Premiers (CONEG/ECP). Actions taken by this group include adoption of resolutions on shared concerns including a regional climate change action plan, and [transportation strategies](#), with a special focus on expanding alternative fuel vehicle infrastructure.

### Water Resources

Vermont is taking significant steps to reduce transportation system impacts on water resources. Act 64 of 2015 laid the foundation for the protection and restoration of Vermont's waters by adopting a comprehensive cross-sector approach, with a broad suite of programs and regulations including stormwater runoff from highways.

In addition to Vermont's response to protect waters statewide in Act 64, the U.S. Environmental Protection Agency (US EPA), in June 2016, established Total Maximum Daily Loads (TMDLs) for phosphorus in the 12 lake segments of Vermont's Lake Champlain Basin and reduction targets for each broad category of phosphorus source. The [Vermont Clean Water Initiative](#) was established to support implementation of the policies and actions necessary to satisfy the Lake Champlain TMDLs.



Retro-fitting stormwater management features into a highway interchange.

Phosphorus loading to Lake Champlain is dominated by “nonpoint sources,” which are generated by runoff and erosion across the landscape, as opposed to “point sources” such as wastewater and certain stormwater discharges. Because stormwater runoff from state and local roadways and non-road developed lands contributes to the non-point sources of phosphorus, AOT has a role and responsibility to address water quality at multiple levels. AOT clearly has responsibility to address issues on the state highway system but Act 64 also requires municipalities to acquire and comply with a Municipal Roads General Permit by 2018.

To assist municipalities with the planning and capital investments required for compliance,

AOT is providing state and federal transportation funds through the Better Roads Grant Program, Municipal Highway and Stormwater Mitigation Program as well as the Transportation Alternatives Program. AOT is also providing technical assistance to municipalities to help them devise the best solution to individual issues.

Vermont’s clean water investments for the state highway system and non-road transportation infrastructure such as airports, maintenance facilities, park & rides, and welcome centers, are addressed primarily through the statewide Transportation Separate Storm Sewer System (TS4) Permit. This permit regulates stormwater discharges from these state facilities while reflecting the unique linear nature of highway infrastructure. It also allows several stormwater programs<sup>52</sup> to be rolled into one comprehensive regulatory program including:

- Municipal Separate Storm Sewer System (MS4) Program
- Total Maximum Daily Loads (TMDL) for multiple impaired watersheds and waterways that do not meet Vermont Water Quality Standards
- Multi-Sector Permit Program (MSGP) regulating stormwater discharges and source control from industrial facilities
- Operational Stormwater Discharge (OSD) Program

In addition to the statutory and regulatory mechanisms described above, AOT is also a partner in the Lake Champlain Basin Program (LCBP). The LCBP works in partnership with government agencies from New York, Vermont, and Québec, private organizations, local communities, and individuals to coordinate and fund efforts that benefit the Lake Champlain Basin’s water quality, fisheries, wetlands, wildlife, recreation, and cultural resources.

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<sup>52</sup> The Construction Stormwater Discharge Program remains separate from the TS4.

## Wildlife

AOT is active in numerous initiatives intended to increase understanding of the relationship of the transportation system and wildlife habitat, with the objective of reducing transportation system impacts on wildlife.

The Agency is an active participant in the [Staying Connected Initiative \(SCI\)](#), a multi-state, multi-partner initiative working to protect species and biodiversity in the face of climate change. As the climate changes and development occurs, species will have to move to higher elevations and latitudes. SCI is conducting research, supporting regional and cross border habitat conservation and working with transportation agencies so landscape connectivity in key habitat corridors and species movement is possible now and in the future. AOT developed a [Transportation & Habitat Connectivity Guidance Document](#) through the SCI in 2012. This document outlines best practices for planning, design and construction, and operations and maintenance of transportation infrastructure.

AOT and the ANR Fish and Wildlife Department (FWD) signed a [Memorandum of Agreement \(MOA\)](#) in 2005 (updated in 2015) to promote the accommodation of wildlife and aquatic organisms along transportation systems and minimized wildlife-vehicle collisions. The MOA states that AOT and FWD will establish a committee, identify fish and wildlife impacts from transportation, and take various actions to minimize impacts to fish and wildlife. Measures include facilitating wildlife movement across highways using underpasses, culverts, or other means, GIS modeling to predict wildlife movement, and improved planning and inter-agency coordination.

In 2015, staff from AOT and FWD took part in a facilitated workshop to identify specific actions each agency could take to address the shared concerns. These included:

- Encouraging AOT design and operations staff to be creative in developing new approaches to enhancing wildlife connectivity and not dictating specific practices per se. Specific standards and practices will eventually emerge from dialogue and experimentation.
- Expanding the Road Ecology Program for AOT staff to support the development of innovative wildlife solutions. This would include ongoing training or workshops aimed at improving the understanding of BMPs in place in other jurisdictions, what's worked in Vermont, and dialogue and information sharing on possible innovations.
- Incorporating wildlife connectivity considerations into the [Vermont Corridor Management Planning Program](#).
- Enhancing access to wildlife connectivity data across AOT.



Field review of a state highway intersection with a wildlife corridor.

Each of these actions is evolving as knowledge is gained through experience and the collective knowledge grows throughout the Agency.

Efforts to address transportation system impacts on wildlife also extend beyond state borders. In addition to the Conference of New England Governors and Eastern Canadian Premiers (CONEG/ECP) resolution on transportation described above, the CONEG/ECP, including Vermont, adopted Resolution 40-3 on Ecological Connectivity, Adaptation to Climate Change, and Biodiversity Conservation in 2016. This resolution acknowledges the importance of ecological connectivity and is a commitment by the members to incorporate consideration of terrestrial and aquatic habitat connectivity in the design and construction of transportation infrastructure.

### Summary

The initiatives described above are a representation of the significant range of efforts AOT and the State of Vermont have undertaken to minimize and mitigate the impacts of the transportation system on the environment. In addition to these initiatives, AOT adheres strictly to a project development process with numerous checkpoints throughout to ensure impacts are avoided, minimized, and mitigated when necessary.

### Project Development Process

The 2040 LRTP intentionally sets a course for transportation investments while remaining mindful of environmental stewardship as one of the main goals. Depending on the type of funding used for a transportation project and the potential for impacts, there are also numerous permitting processes that may apply. These include the National Environmental Policy Act (NEPA) of 1969, Section 106 of the National Historic Preservation Act, Section 4(f) of the U.S. Department of Transportation Act of 1966, Federal Water Pollution Control Act more commonly known as the “Clean Water Act”, and Vermont’s own Act 250.

AOT has developed an [Environmental Procedures Manual](#) and made it available online in an effort to educate and inform citizens, municipalities and partner agencies, as well as private developers of the project development process and associated permitting requirements intended to address natural and cultural resource impacts. The outcomes of these processes include mitigation strategies, if deemed necessary. The general flow of resource consideration in the project development process is to 1) avoid impacts if possible, 2) minimize those impacts deemed unavoidable, and 3) mitigate for those impacts incurred.



Native American long house found along the Missisquoi River during excavation of Route 78 upgrade in Swanton. (Photo & text: DHCD website)

### Conclusion

AOT is engaged in a broad range of activities, initiatives, and partnerships intended to avoid, minimize, and mitigate the impacts of the transportation system on the environment and the full range of its natural,

cultural and historic resources. From the Agency's environmental stewardship ethic policy, to partnerships encouraging the spread of electric vehicle charging infrastructure, to specific design considerations such as incorporating wildlife pathways into culvert designs, the Agency is committed to reducing its "footprint" as it carries out its mission to provide for the safe, efficient movement of people and goods.

This discussion of environmental mitigation strategies has been reviewed by a diverse set of state and federal resource professionals at multiple agencies. This was done to comply with federal planning requirements as well as to ensure broad understanding among AOT's partners of the Agency's awareness of the issues and its work to address the impacts of the transportation system on the environment. A list of reviewers is available in the LRTP appendices.

## Chapter 9: Achieving the Vision

Achieving the vision for Vermont’s transportation system will require a thoughtful, balanced, systematic approach to making investments. The future of transportation funding is uncertain, and Vermont, like every other state must balance competing needs throughout the system. Wise investments will achieve progress toward more than one LRTP goal as well as support desired statewide outcomes.

AOT has developed and updated many internal systems to support success. Two of the most significant are the development of the Transportation Asset Management Plan, and the recent update of the Project Selection and Prioritization Processes.

- Transportation Asset Management Plan (TAMP) – by implementing projects consistent with the TAMP and general asset management principles, Vermont makes data-driven decisions about the right investment in the right place, and the right time. The completion of its first comprehensive, system-wide transportation asset management plan moves AOT closer to the ability to optimize investments within and across transportation assets.

- AOT Project Selection & Prioritization Processes (VPSP2) – prior to this update, AOT had not updated its project selection process for a decade. The timing of this update allows the Agency to align with the Governor’s vision to focus on the economy, affordability, and serving our most

Figure 15 - Project Selection & Prioritization Criteria



vulnerable citizens while also meeting new national performance requirements. By factoring in a project’s impact on issues such as the state’s economy, transportation system resilience, and public health, we can develop a prioritized project list that support multiple goals. These criteria are consistent with the general goals of the 2040 LRTP and will serve to produce an annual project list reflective of the desired statewide outcomes.

But, AOT is not the only player in achieving Vermont’s vision for the transportation system; this will depend on many partnerships and other organizations fulfilling their own missions. Responsibility for preserving and maintaining the existing transportation system and optimizing its performance rests primarily with AOT. However, the other primary goals of the 2040 LRTP will require a much broader set of stakeholders to contribute time, energy and resources. A few examples of this are:

- Improving transportation safety and security relies on relationships between AOT, VT Department of Public Safety, Vermont State Police, local law enforcement agencies, and a host of other partners.

- Providing mobility options and accessibility for all users of the transportation system, including the most vulnerable Vermonters, will be achieved through partnerships with regional public transit providers, intercity bus carriers, Amtrak, VT Tourism & Marketing Department, and collaboration with advocacy groups such as Local Motion and AARP, as well as municipalities. Similarly, opportunities to grow tourism-oriented transportation services which increase Vermont's economic vitality are best achieved through partnerships with many of the same organizations.
- Environmental stewardship relies on strategies developed and implemented through ongoing partnerships with the VT Agency of Natural Resources, VT Public Service Department and organizations such as Drive Electric Vermont and private corporations.
- Coordinated investments in Vermont's developed centers may be implemented through any number of organizations in partnership such as VT Department of Housing & Community Development, VT Buildings & General Services, private developers, and local and regional development corporations to name a few.

Finally, it is important to mention Vermont's regional planning commissions as partners in implementing the 2040 Long-Range Transportation Plan. Through their assistance, AOT and many of its sister state-agencies can effectively expand our reach into communities throughout Vermont. This relationship often facilitates the development of projects and programs that serve many of the goals in the LRTP. The ongoing cooperative Transportation Planning Initiative (TPI) is an important component to public outreach and implementation of the LRTP strategies.

## Chapter 10: Goals, Objectives, & Strategies

The following tables provide a framework of objectives and strategies to work toward the 6 primary goals of the Long-Range Transportation Plan. Achievement of these goals will carry Vermont toward the vision of the future transportation system.

**Goal 1: Improve safety and security across all transportation modes.**

Objectives	Strategies
1.1 Reduce the number of crashes on Vermont highways, with a focus on those resulting in a fatality or incapacitating injury.	<ul style="list-style-type: none"> <li>• Implement infrastructure projects in accordance with the Vermont Strategic Highway Safety Plan.</li> <li>• Implement outreach, education and public awareness programs on highway safety issues in partnership with the Vermont Highway Safety Alliance.</li> <li>• Address safety issues as a component of each modal plan (public transit, bike-ped, rail, aviation).</li> <li>• Conduct winter maintenance activities in accordance with Vermont's Safe Roads at Safe Speeds policy.</li> <li>• Investigate the feasibility of real-time speed-limit changes to respond to weather conditions and special events; develop and implement technology solutions to employ the strategy if found feasible.</li> <li>• Maximize the use of Intelligent Transportation Systems (ITS) strategies to address highway safety issues.</li> <li>• Review the needs of all modes as part of the project development process, employing Complete Streets principles in accordance with state policy.</li> </ul>
1.2 Reduce incidents at work zone sites.	<ul style="list-style-type: none"> <li>• Implement Vermont Strategic Highway Safety Plan measures addressing work zone safety; emphasize the use of radar speed-feedback signs.</li> <li>• Maximize the use of ITS and technology for advance-warning systems and alternate route selection.</li> </ul>
1.3 Reduce railroads derailments and highway-rail grade crossing incidents.	<ul style="list-style-type: none"> <li>• Improve the condition of state-owned railroad tracks, bridges, and highway-rail grade crossings.</li> </ul>
1.4 Enhance airport safety and security at all publicly-owned commercial and general aviation airports.	<ul style="list-style-type: none"> <li>• Improve runway, lighting, and associated aviation infrastructure in accordance with FAA design requirements and the adopted Airport Layout Plan (ALP) for each airport.</li> </ul>
1.5 Improve the resilience of the transportation system.	<ul style="list-style-type: none"> <li>• Design infrastructure to withstand severe weather events.</li> <li>• Advance AOT's understanding of transportation system vulnerabilities to severe weather events through ongoing research and development of analytical tools.</li> <li>• Incorporate resilience as a factor in project identification, prioritization, and planning and design.</li> <li>• Provide technical assistance and support to municipalities to prepare for, withstand, and recover from severe weather events.</li> <li>• Update AOT's Continuity of Operations Plan (COOP) to address flooding, cybersecurity and other emerging threats.</li> </ul>
1.6 Participate in the planning and delivery of coordinated disaster response services.	<ul style="list-style-type: none"> <li>• Coordinate with the Department of Public Safety, other state, regional, and federal agencies, RPCs, municipalities, first responders, and private partners such as intercity bus providers, railroad operators, airport fixed base operators, on disaster response planning and training.</li> <li>• Develop and/or ensure security plans exist as required and/or needed for all transportation modes and facilities.</li> </ul>
1.7 Enhance traffic incident management.	<ul style="list-style-type: none"> <li>• Use ITS and technology to better manage the response and recovery related to traffic incidents.</li> <li>• Improve communications of real-time road hazards and disaster impacts.</li> </ul>

**Goal 2: Preserve and improve the condition and performance of multimodal transportation system.**

Objectives	Strategies
<p>2.1 Make strategic investments to preserve and improve conditions of highways, railroads, airports, bike-paths, trails, sidewalks, and public transit infrastructure.</p>	<ul style="list-style-type: none"> <li>• Maintain adequate funding levels to ensure a state of good repair for all modes at state and local levels.</li> <li>• Apply for competitive discretionary federal funding to rehabilitate and upgrade transportation infrastructure.</li> <li>• Continue to develop asset management processes and systems to inform transportation infrastructure investment priorities and to maximize value.</li> <li>• Develop long-range multimodal corridor management plans in coordination with local governments and regional planning agencies.</li> <li>• Monitor research and track trends at the national and state levels on strategic disinvestment strategies.</li> </ul>
<p>2.2 Provide a transportation system that adequately serves current and future demand.</p>	<ul style="list-style-type: none"> <li>• Review agency policies to ensure that capacity decisions are balanced with other community needs and objectives.</li> <li>• Implement capacity projects necessary to maintain a level of service (LOS) consistent with the state’s policy.</li> <li>• Ensure broad public access to electric vehicle charging infrastructure.</li> <li>• Support testing and deployment of connected and automated vehicles (CAVs).</li> <li>• Maintain and apply state-of-the-art planning tools and data to support the evaluation of existing and future demand.</li> <li>• Periodically review and update the project prioritization process.</li> </ul>
<p>2.3 Maximize operational efficiency of all existing transportation modes.</p>	<ul style="list-style-type: none"> <li>• Make data-driven decisions to relieve recurring traffic congestion through operational improvements.</li> <li>• Strategically deploy ITS infrastructure and advanced traffic control systems to monitor and manage traffic conditions.</li> <li>• Review and modify design standards and maintenance practices where appropriate to facilitate cost-effective improvements.</li> <li>• Plan for and accommodate the ongoing integration of connected and autonomous vehicles, including considerations of Vehicle to Vehicle (V2V), and Vehicle to Infrastructure (V2I) technologies.</li> <li>• Support Travel Demand Management (TDM) initiatives, including telework, alternative work schedules, transit pass programs, and other similar strategies to relieve congestion.</li> <li>• Apply access management practices throughout the state highway system.</li> <li>• Upgrade and modernize sub-standard traffic signal infrastructure for all users.</li> <li>• Conduct annual public transit route performance reviews and implement the recommendations of the report.</li> </ul>
<p>2.4 Identify new, sustainable funding sources to maintain and improve the transportation system.</p>	<ul style="list-style-type: none"> <li>• Explore federal loan programs such as the USDOT Transportation Infrastructure Finance &amp; Innovation Act (TIFIA) for project financing.</li> <li>• Apply for competitive discretionary federal funding as opportunities arise.</li> <li>• Explore leasing of highway right-of-way to telecommunications companies, or other industries, to generate revenues.</li> <li>• Monitor research and track trends at the national and state levels on alternative financing mechanisms.</li> </ul>

<p>2.5 Improve project development efficiency.</p>	<ul style="list-style-type: none"> <li>• Conduct early consultation with resource agencies and employ project delivery techniques such as design-build and design-build-maintain when appropriate.</li> <li>• Periodically review grant and contract processes to identify potential gains in efficiency or time-saving modifications.</li> <li>• Periodically review the project development process to identify any potential gains in efficiency or time-saving modifications.</li> <li>• Apply "Continuous Improvement" techniques to the project development process to minimize/optimize the amount of time and resources spent on pre-construction activities and grant administration and management.</li> </ul>
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**Goal 3: Provide mobility options and accessibility for all users of the transportation system.**

Objectives	Strategies
<p>3.1 Improve connections between modes for passenger and freight transportation.</p>	<ul style="list-style-type: none"> <li>• Consider the needs of all modes as part of the project development process and incorporate improvements to facilitate multi-modal connectivity</li> <li>• Use highway funding flexing authority to finance multimodal projects.</li> </ul>
<p>3.2 Increase the viability of active forms of transportation through improved infrastructure and connectivity.</p>	<ul style="list-style-type: none"> <li>• Continue to support the AOT Bicycle and Pedestrian Grant Program</li> <li>• Develop and implement projects and schedule maintenance activities in support of priority corridors identified in the Vermont On-Road Bicycle Plan.</li> <li>• Lead and/or support public outreach and education on non-motorized transportation options.</li> <li>• Review the needs of all modes as part of the project development process, employing Complete Streets principles in accordance with state policy.</li> </ul>
<p>3.3 Expand public transit, intercity bus, and passenger rail services.</p>	<ul style="list-style-type: none"> <li>• Encourage and support public transit provider route planning to identify priority routes.</li> <li>• Implement priority routes identified in the Statewide Intercity Bus Study.</li> <li>• Strengthen the coordinated provision of public transit services with Medicaid transportation services and other social service program transportation needs.</li> <li>• Support connections to regional intercity bus and passenger rail services.</li> <li>• Encourage coordination between public transit systems and school systems to meet transportation needs.</li> </ul>
<p>3.4 Increase awareness of transportation options for residents and visitors.</p>	<ul style="list-style-type: none"> <li>• Lead and/or support public outreach and education on transportation options through programs such as Go VT, 511, and social media.</li> <li>• Develop new strategic education campaigns promoting the various modes of transportation.</li> </ul>

Goal 4: Leverage transportation investments to increase Vermont’s economic vitality.

Objectives	Strategies
<p>4.1 Strategically invest in highways and bridges, railroads, airports, and public transit and bicycle and pedestrian facilities to support economic access and growth.</p>	<ul style="list-style-type: none"> <li>• Align transportation planning and investments with economic development strategies and plans.</li> <li>• Undertake needed highway and bridge rehabilitation along the National Highway System.</li> <li>• Implement highway capacity projects identified in state and regional plans.</li> <li>• Rehabilitate and upgrade tracks, bridges, and grade crossings identified in the State Rail Plan.</li> <li>• Implement projects that increase the capacity of rail to accommodate modern industry load ratings, vertical clearances, and operating speed for the movement of freight and passengers.</li> <li>• Upgrade aviation infrastructure consistent with the State Airport System and Policy Plan.</li> <li>• Upgrade and expand public transit maintenance and operations facilities.</li> <li>• Maintain state-owned rail-trails in a state of good repair and make improvements as necessary</li> </ul>
<p>4.2 Grow tourism-oriented transportation services.</p>	<ul style="list-style-type: none"> <li>• Promote public transit, rail, and aviation services as a tool to support tourism and economic development; coordinate and partner with the Department of Tourism &amp; Marketing.</li> <li>• Implement priority routes identified in the Statewide Intercity Bus Study.</li> <li>• Develop projects and schedule maintenance in support of priority corridors identified in the Vermont On-Road Bicycle Plan.</li> <li>• Lead and/or support public outreach and education on non-motorized transportation options.</li> <li>• Review the needs of all modes as part of the project development process, employing Complete Streets principles in accordance with state policy.</li> </ul>
<p>4.3 Support transportation initiatives which enhance recreation opportunities.</p>	<ul style="list-style-type: none"> <li>• Develop projects in support of priority corridors identified in the Vermont On-Road Bicycle Plan.</li> <li>• Develop projects in support of state-designated Vermont Byways.</li> <li>• Develop and implement a statewide strategy for maximizing the appeal and the economic benefit of Vermont’s highways for bicycle tourism.</li> <li>• Participate in the Vermont Outdoor Recreation Economic Collaborate (VOREC) and consider the recommendations of VOREC in transportation planning and project development.</li> <li>• Support recreation trails systems by improving on-road connections to nearby villages and urban centers.</li> </ul>

Goal 5: Practice environmental stewardship.	
Objectives	Strategies
5.1 Reduce negative water quality impacts associated with transportation facilities.	<ul style="list-style-type: none"> <li>• Work with the Agency of Natural Resources (ANR) on the development of water quality management practices as they relate to Vermont’s highways.</li> <li>• Implement highway stormwater management initiatives, including permitting processes, grant programs, and technical assistance, in partnership with ANR, Regional Planning Commissions, and municipalities.</li> </ul>
5.2 Reduce air pollution associated with fossil fuels used in transportation.	<ul style="list-style-type: none"> <li>• Increase the use of, and support additional access to and development of, alternative fuels that could reduce Vermont's reliance on fossil fuels.</li> <li>• Encourage the development and use of transportation construction and operations technologies that reduce emission of greenhouse gases.</li> <li>• Actively participate and support the build-out of Vermont's electric vehicle charging network and the overall transition to fleet electrification.</li> </ul>
5.3 Reduce the overall level of energy use by the transportation system users.	<ul style="list-style-type: none"> <li>• Implement the transportation recommendations included in the 2016 Comprehensive Energy Plan, including supporting efficient land-use, reduction in single occupancy vehicles, and electrification of the light duty vehicle fleet, as well as alternative fuels for the heavy / commercial fleet.</li> <li>• Work in partnership with the Agency of Natural Resources and the Public Service Department to take an active role in rate cases at the Public Utilities Commission and advocate for competitive electric rates to support electrification of the transportation sector.</li> <li>• Work in partnership with the Regional Planning Commissions in the implementation of the regional energy plans that have received determinations of energy compliance from the Public Service Department.</li> <li>• Increase use of walking, biking, transit, rail, and Travel Demand Management (TDM) options by developing infrastructure and educational campaigns.</li> </ul>
5.4 Reduce wildlife and habitat impacts associated with the transportation system.	<ul style="list-style-type: none"> <li>• Include wildlife habitat and crossings in the context of the AOT Highway Corridor Planning Process.</li> <li>• Coordinate with ANR Fish &amp; Wildlife Department, Regional Planning Commissions, and municipalities to identify and address wildlife crossing issues when planning, designing, and constructing highway projects.</li> <li>• Incorporate the Best Management Practices identified in the 2012 Vermont Transportation &amp; Habitat Connectivity Guidance Document.</li> <li>• Coordinate with the Regional Planning Commissions as they implement the requirements of Act 171 (year) to identify forest blocks and habitat connectors.</li> </ul>

Goal 6: Support livable, healthy communities.

Objectives	Strategies
<p>6.1 Maintain and strengthen the vitality of Vermont’s villages and downtowns.</p>	<ul style="list-style-type: none"> <li>• Update the Vermont State Standards to incorporate state of practice in highway design and to ensure Vermont transportation infrastructure is designed to meet current state and community needs and accommodate a variety of users.</li> <li>• Support transportation improvements and services assessed as critical to enhancing, stimulating and connecting villages and downtowns.</li> <li>• Coordinate transportation investments in villages downtowns with other public and private investments.</li> <li>• Make focused public transit service investments in and around densely developed villages and downtowns.</li> <li>• Coordinate planning, project development, and implementation with ACCD in support of “State Designated” areas such as downtowns and village centers.</li> <li>• Develop standards for traffic calming on state highways in villages and downtowns.</li> </ul>
<p>6.2 Make transportation investments that promote active transportation and reduce social isolation.</p>	<ul style="list-style-type: none"> <li>• Support investments in and around villages and downtowns that accommodate and improve the viability and safety of active transportation, such as walking and bicycling.</li> <li>• Participate in the Health in All Policies Task Force.</li> <li>• Strengthen the coordinated provision of public transit services with Medicaid transportation services and other social service program transportation needs.</li> <li>• Update the Vermont State Standards, incorporating state of the practice in highway design to ensure Vermont transportation facilities are designed to meet current state and community needs and accommodate a variety of users.</li> <li>• Conduct health impact assessments for selected transportation projects, programs, and policies and apply what is learned to future investments.</li> </ul>