

Asset Management

at the

Vermont Agency of Transportation



Asset Management at the Vermont Agency of Transportation (VTrans)

Introduction:

Transportation departments nationwide are struggling to meet increasing demand in an era of declining revenue. There are simply too many needs. Revenues into both the federal and state Transportation Funds are sluggish at best, and the future is uncertain. Departments must do more with less by carefully managing transportation assets to make every dollar count. This is why transportation departments have adopted an Asset Management approach.

What is Transportation Asset Management? The FHWA and the state transportation organization AASHTO define Asset Management as *“a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objectives.”* Simply put, Asset Management is putting limited transportation dollars to work where they do the most good. That means maintaining an aging transportation infrastructure before it becomes unusable. This is common sense, but it is easier said than done, and it requires balancing many competing interests. Departments must consider tradeoffs between paving, bridge, new highways, rail, airports, park & ride lots, and more.

This document will describe the background and status of Transportation Asset Management in Vermont. All of these activities and expenditures support the four key VTrans goals of:

- **Safety:** Ensure that safety is a critical component in the development, implementation and maintenance of the transportation system.
- **Preservation:** Protect the state’s investment in its transportation system.
- **Excellence:** Cultivate and continually pursue excellence in financial stewardship, performance accountability, and customer service.
- **Planning:** Optimize the future movement of people and goods with corridor and natural resource management, balanced modal alternatives, and sustainable financing.

Vermont Environment:

Vermont is a small state in both geography, and population. The Vermont Agency of Transportation (VTrans) consists of 1,300 employees and is centrally managed by a Secretary, a Deputy Secretary, five Directors, and a Commissioner of Motor Vehicles. Top management, engineering, information technology, finance, contracting, and legal are all located in one building in Montpelier, Vermont. Because of the small size and central location, VTrans staff is accessible at all levels to employees, the public, and the Vermont Legislature.

Unlike larger states, VTrans does not have autonomous regions that develop their own programs. The state, however, is divided into nine maintenance districts responsible for normal maintenance activities such as snow removal, guardrail repairs, sign replacement, litter, potholes, etc.

Eleven Regional Planning Commissions (RPCs) and one Metropolitan Planning Organization (MPO) assist VTrans planning efforts. Although final project decisions are made by VTrans management, the RPCs' priorities are factored into the process.

The state has an aging infrastructure that must be preserved. VTrans views asset management, quantitative project prioritization criteria, and associated performance measures as a means to get the most out of limited transportation dollars.

The total transportation budget of only \$430 million including DMV is highly dependent on federal funding (about 51%).

That budget supports a transportation infrastructure of:

- 2708 miles of paved state and Interstate highways
- 2675 bridges greater than 20 feet in length
- Ten state owned airports
- 305 miles of state owned rail line with 265 bridges
- 411 buildings (122 heated and 289 unheated)
- Other assets including a fleet of vehicles, park & ride lots, rest areas, and ancillary highway assets

Vermont does not have a sophisticated ITS systems for managing urban rush-hour traffic. The population of the largest city is only 40,000 people in a metropolitan area of about 150,000.



US Route 2, Danville, Vermont

Background of Asset Management in Vermont:

Strictly defined, transportation asset management is a tool for making transportation investments in a way that maximizes the value of existing transportation infrastructure, including the ability to predict asset conditions under different funding levels. Electronic databases and computer models are usual features of an asset management system. A broader definition includes all transportation investment, and the ability to do comparative scenarios with different levels of funding for all aspects of the transportation system. VTrans has been working with the broader definition (as has the FHWA).

Vermont is one of the few states that has Asset Management and Performance Measures written into statute. VTrans was involved on a cooperative basis with the General Assembly, the Joint Fiscal Office, and the Legislative Council in developing the wording of the legislation. Statute requires VTrans to:

- Develop an asset management plan which is a systematic goal and performance-driven management and decision-making process of operating, maintaining, and upgrading transportation assets cost-effectively
- Include deterioration rates for infrastructure assets
- Determine, long-term, the annual funds necessary to fund infrastructure maintenance at the recommended performance level
- Assets mentioned in the legislation are pavements, structures, facilities, construction and maintenance equipment, vehicles, real estate, materials, corporate data and information, and ground and water transportation facilities & equipment.
- In 2005 and 2006, the Legislature required a quantifiable project prioritization method that assigns a numeric score to projects listed in the annual budget. Those scores must include the project priorities from the eleven Regional Planning Commissions and Vermont's one MPO.

Asset Management Systems:

Like many other states, Vermont has “stovepipe” systems that analyze investments within a single type of asset. The status of Vermont’s asset management systems are:

- Pavement – Computer software for pavement management is widely available. Vermont’s Paving Section does an excellent job running Deighton’s dTIMS pavement management software to develop the VTrans paving program.
- Bridges – Vermont uses AASHTO’s Pontis bridge management software. VTrans’ Structures Section measures structurally deficient bridges, but is working to make more use of the Pontis deterioration models and a bridge health index to plan effective preventative maintenance.
- Safety – This is not an “asset.” However, safety and crash statistics are important drivers in project prioritization and selection. Within the last two years, Vermont has doubled the number of crash incidents being collected due to a new DMV crash form, education, and a web-based crash reporting form for law enforcement. As part of the Highway Safety Improvement Program, VTrans analyzes the crash statistics and identifies the top 50 high-crash locations in the state. VTrans calculates the benefit/cost ratios of possible fixes, makes appropriate repairs, and monitors the results. Even though Vermont’s highway fatality rate is well below the national average, VTrans continues to work with other agencies to keep that rate low in spite of rising traffic volume.
- Maintenance Management – VTrans’ Operations Division uses MATS (Maintenance Activity Tracking System) to record most highway maintenance work by location. MATS is being expanded to track inventory and condition of ancillary assets.



Missisquoi Bay Bridge Rt. VT 78 over Lake Champlain

- Central Garage Fleet and Equipment – The Central Garage must have the right equipment available at the right time especially for snow removal and emergencies. VTrans uses software from Maximus to track equipment usage and to optimize maintenance and replacement cycles at the least cost.



Bridge inspection equipment

- Buildings – The Operations Division uses facility inventory and condition reporting software to calculate a building health index and to recommend repairs in a priority sequence.
- Signs – Traffic Operations maintains a database of 81,000 signs. Over 5,000 signs are replaced annually due to knock-downs, obsolescence, loss of reflectivity, changing federal standards, or as part of paving or construction projects.

- Aviation – The Aviation Section uses the Airport Information Management System (AIMS) to identify, prioritize and track progress on aviation related projects. Aviation safety is the primary project driver at both the federal and state level. A consultant is assisting VTrans in developing an Aviation Policy Plan that will address managing these assets, prioritizing projects, and measuring the results.



Mount Snow Airport, West Dover

- Congestion Management – Many states have highly sophisticated congestion systems to manage rush-hour urban traffic. As a rural state, VTrans does not need a congestion management system at this time. Although congestion is increasing, Vermont is the envy of our urbanized neighbors.

Individual asset areas where VTrans is improving its management approach:

- Roadway construction – Some construction projects are straightforward; however, projects that realign a highway, build a new highway, or add lanes can be complex and expensive. These multi-year projects typically involve many hearings, right-of-way purchases, and state and federal permits. The Program Development Division is developing an approach to prioritize roadway projects; however, VTrans has a several years’ backlog of projects already underway or promised. Some of these projects are being delayed so that VTrans can put more emphasis on preserving the existing infrastructure.

- Large culverts greater than six-foot in diameter/width – VTrans regularly inspects large culverts and uses preventive maintenance and replacement techniques to manage these critical assets. Failed culverts, especially if they are deeply buried, can be expensive, dangerous, and disruptive to repair. An asset management plan that addresses problems before failure can add decades to culvert life



Thawing a frozen culvert

and save millions of dollars. Although VTrans prioritizes culvert projects for emergency repairs, an automated management system is not yet in place.

- Small culverts less than six-foot in diameter – The state needs an accurate inventory and condition rating of the 40,000 culverts on state roads. Highway Operations districts are inspecting and collecting information on culverts and drainage components to better manage this critical asset.
- Rail – VTrans owns 305 miles of rail lines with 265 bridges that are leased to rail operators. The rail operators are responsible for the track and bed per terms of the lease. VTrans is responsible for rail bridges. Bridge inspections and condition ratings are underway so that VTrans can determine needs and prioritize activities on this valuable asset.
A consultant is working with VTrans to develop a Rail Policy Plan that will address asset management, performance measures, and project prioritization.



Clearing the rail to Rutland
Photo by Shaun McGinnis

- VTrans is also improving the inventory, condition assessment and management of other assets including:
 - Bike friendly highways and bike paths.
 - Sidewalks
 - Ledges & slopes
 - Retaining walls
 - Public transit buses
 - Rest Areas

Asset Management and Performance Measures:

VTrans is responsible for measuring and reporting on our performance, and has developed 33 strategic performance measures that are related to the condition of the underlying asset, or measure a service provided to our customers.

Performance measures need targets that are achievable, affordable, and balanced with competing transportation demands. Achieving that balance is a challenge. It implies making value judgments as to the relative importance of paving, bridge, bike paths, roadway capacity, public transit, and more.

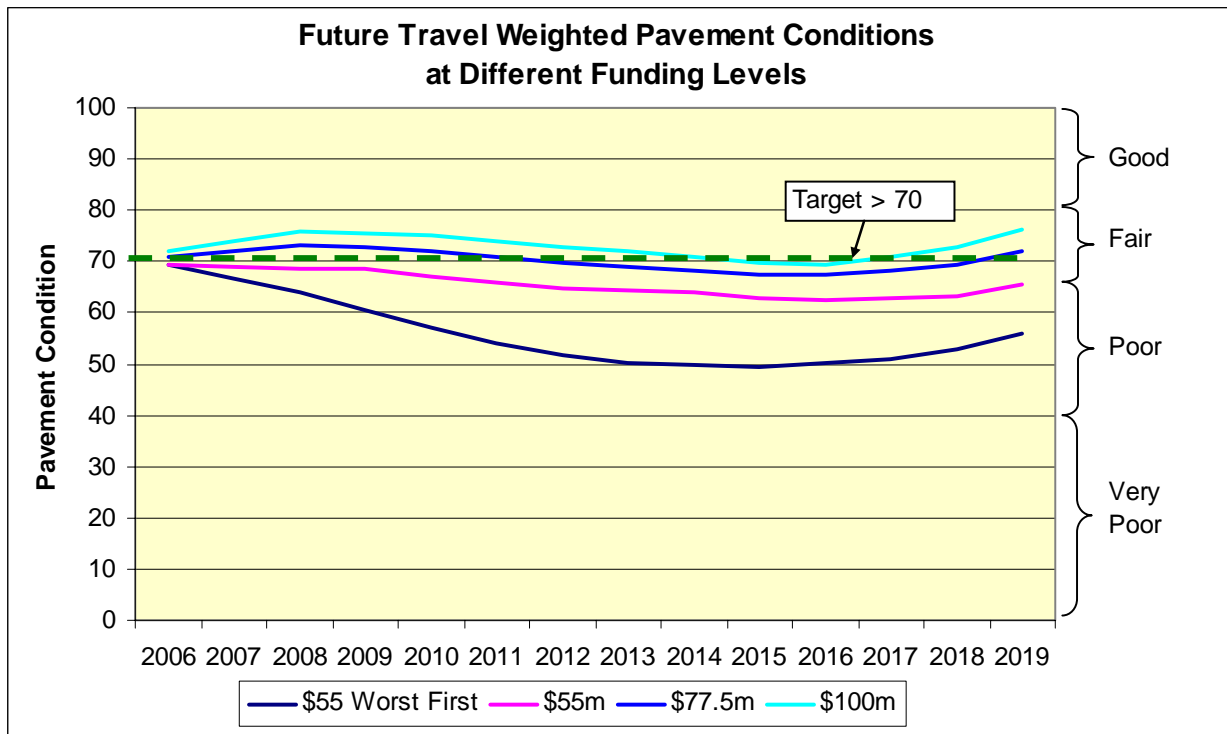
It is relatively easy to compare similar assets and make rational decisions if the asset has a good inventory, condition rating, and deterioration model. Comparison between asset classes is far more difficult. To help with that comparison, VTrans asked Program Managers to describe the asset condition in terms of “good/fair/poor” and to define what those terms mean. Those definitions help evaluate between asset classes. The primary determinants, however, are still

federal funding restrictions, project momentum, and expert judgment on how to preserve the asset.

A sample of performance measures and targets are:

VTrans Strategic Performance Measures (partial list as an example)		
Asset/Investment Categories	Strategic Performance Measures	Target
Highways	Pavement condition index based on vehicle miles traveled Percent of miles of pavements rated in "very poor" condition	70 on a scale of 0 - 100 < 25%
	Number of structurally deficient bridges (bridges longer than 20 feet)	Fewer than: <ul style="list-style-type: none"> • 21 Interstate SD bridges • 122 state SD bridges • 255 town SD bridges
	Park & Ride facility condition	Improve Facility Condition Index each year
Rail	Ton-miles of freight	3% increase per year
	Number of Vermont origin or destination carloads	3% increase per year
Bike / Pedestrian	Mileage of bicycle and pedestrian facilities developed	Develop 4 miles per year
Maintenance	Percent of State highway centerlines renewed annually	100%
	Complete spring litter clean up on 100% of state roads by the end of May	100%
	Paint structural steel each calendar year to preserve bridges	780 tons of structural steel
Transportation Buildings	Improve average building condition as measured by the building condition index.	TBD
Central Garage	Percentage of vehicles within their cost-effective service lives	85% or more
Public Transportation	Percent of routes at or below the acceptable level for cost per passenger	TBD
DMV	Service walk-in customers at DMV offices with within 30 minutes	90% or better

It is easy to choose projects and measure asset performance with a sophisticated computer management system that models deterioration and predicts financial needs. That capability enables VTrans to say, "With X dollars, we will deliver Y asset condition in the long term." VTrans, like other DOTs, does that well for pavement and bridges but not as well for the other asset classes. An example for paving for 2006 is in Figure 1 below:



Source: VTrans Pavement Management Section

Figure 1: Pavement condition at different funding levels

The above chart relates asset condition in terms of good/fair/poor to different funding levels over a period of time. Funding levels have little impact in a single year, but have a huge impact in the long term. Note that the chart shows two \$55 million scenarios. One is labeled “Worst First.” Good asset management principles apply the right treatment at the right time to prevent deterioration. That often means paving a highway while it can still be salvaged even though another nearby highway might be in rougher condition but is beyond simple repairs. That is difficult to explain to the public, but it does provide the best value for limited dollars.



US 302, Groton, Vermont

Project Prioritization

VTrans must be able to explain why one project is chosen over another. Good asset management practices require that VTrans uses a rational approach based on facts. Project expenditures must meet our customers’ needs for the lowest possible cost over the longest possible time.

In 2005 the Legislature required VTrans to develop a quantifiable project prioritization method that assigns a numeric score to projects listed in the annual budget. Those scores must factor in project priorities from the eleven Regional Planning Commissions and Vermont’s one MPO.

Assets included are pavement, bridge, roadway, traffic & safety, bike/ped, park & ride, buildings, aviation, and rail.

The purpose of this process is to incorporate asset management principles into VTrans' programs. VTrans strives to minimize long-term costs by using engineering analysis to determine the optimum treatment at the right time. VTrans also factors in priorities assigned by the local RPCs and the MPO.

To get the regional and local input, VTrans asked the eleven RPCs and the MPO to establish a priority for each of their projects in the VTrans Capital Program. The RPCs consulted with their associated Transportation Advisory Committee (TAC) of local officials to determine relative project importance from a local perspective.

In parallel, VTrans Program Managers developed priorities using their engineering systems, asset condition, traffic volume, and other factors appropriate for the asset. VTrans priorities are blended with the RPC priorities to develop a project score. (RPC priorities closely mesh with VTrans priorities. It is not surprising that two groups of intelligent people trying to do the right thing come up with similar results.)

2006 is the second year of the prioritization process. One start-up issue is that some projects are so far along that they must be completed regardless of other factors. This concept is referred to as "Project Momentum." As old projects are completed, Project Momentum will be less important when assigning project priorities.

VTrans views prioritization as a crucial step in asset management. Assets such as paving and bridge use sophisticated systems to determine the most cost effective treatment. Other assets such as VTrans' 29 Park & Ride lots depend mostly on judgment. The key is to use a method that is appropriate for the size and complexity of the underlying asset.

Budget Development - Balancing Competing Interests:

The mission of state transportation agencies nationwide has changed away from building highways towards managing & maintaining an intermodal transportation system. The VTrans budget reflects that shift by emphasizing preservation of what we already have rather than the construction of new highways. This emerges from an asset management and performance management frame of mind that takes a system-wide view of transportation problems and needs. The rationale is to ensure the maximum benefit per dollar of investment while at the same time achieving system wide performance goals.



Covered Bridge Preservation, Tunbridge, VT

There is an explicit link to the annual budget development process as a means to accomplish these goals. A Budget Committee, made up of senior staff from all divisions and chaired by the Deputy Secretary, works with the various program managers to develop a proposed budget. Program Managers develop spending proposals at varying funding levels that reflect the quantitative project scores from VTrans and Regional Planning Commissions. Spending proposals are constrained by the preliminary budget estimates from the state.

The Program Managers meet with the Budget Committee to explain their program and how it affects the underlying asset and whether it will help achieve the target performance level (if a target has been established). Budget adjustments are made until December at which time the Governor's office gives final budget figures to state agencies and departments. (These figures use the latest revenue projections from the Transportation Fund and General Fund.) Of course, more adjustments are made during the legislative session starting in January.

One important step is determining the relative size of each transportation program across modes. For example, for FY 2008, money is shifting to Interstate bridge from several other programs. These decisions are based on the overall asset condition, performance measure, and institutional knowledge. As a small centralized DOT, VTrans is in a reasonable position to make qualitative judgments. However, a more mathematical engineering approach would make decisions easier to explain. The overall approach is still under development and will certainly improve over the next few years.

Figure 2 below illustrates the main steps in the budget development process. The most difficult step is #5 – *Balance cost to achieve target with other VTrans needs*. Ideally, this would be based on a quantitative scoring mechanism that could compare across asset classes and modes. In reality, decisions are heavily influenced by federal earmarks, “must do” emergency projects, prior commitments, legislative feedback, and federal modal funds such as rail, air, and public transit. Little discretionary money is left.

Another challenge is related to target performance levels in box #1 and #2. Targets must be achievable, affordable, and balanced across asset classes. That balance is difficult to achieve between competing interests.

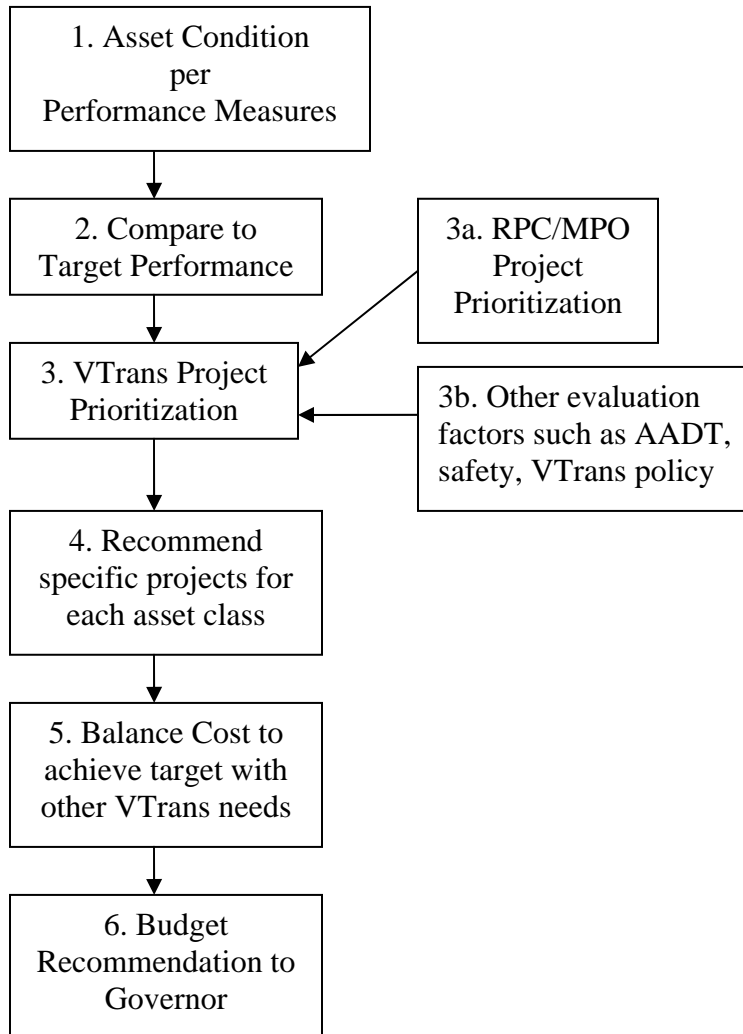


Figure 2: VTrans Budget Development Steps

The budget document submitted to the Legislature contains a list of projects by program along with the priority ranking. VTrans believes that stakeholders, including the Legislature, will support the process of prioritization, performance measures and targets. That should lend credibility to the transportation program and the project choices submitted to the Legislature.

Next Steps:

- Review or establish target performance levels for each asset class. Targets must be achievable, affordable and balanced across asset class. These are high-level decisions that must reflect VTrans and State policies and preferences. For example, what is the relative importance of paving, rail, bridges, Interstate bridges, etc?

- Analytical tools need a common repository that can link assets by location, condition, value, and usage. The VTrans Information Technology Section is working on an integrated data warehouse that will improve on those linkages. This will also drive on-time and on-budget performance reporting for projects. Nationwide, DOTs are developing “dashboards” to report their performance by state, county, town and project. A comprehensive database that is frequently updated is crucial to accurate reporting.
- Performance measures need to be brought down to operational levels. These measures must support VTrans’ mission, vision, and objectives. The Agency’s mission, vision, goals, and objective statements are being rewritten and will be published in early 2007.
- Policy Plans: VTrans is developing policy plans for rail, aviation and public transit. These plans will address the project selection process and performance measures. Rail is of particular importance because of the asset value and financial commitment to operate 305 miles of rail line with 265 bridges.

In conclusion, Transportation Asset Management is part of the VTrans culture. VTrans has made excellent progress in the last five years, however, asset management and performance measures are an ongoing effort. VTrans and other DOTs are faced with deteriorating infrastructure that must be maintained with fewer dollars. Good stewardship requires that VTrans maximize the use of limited funds through a Transportation Asset Management approach.