



**Virginia's Long-Range Multimodal
Transportation Plan
2007-2035**

**SYSTEM PRESERVATION AND
MAINTENANCE**

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ISSUE DEFINITION

A critical issue in developing Virginia's statewide multimodal transportation plan, known as VTrans2035, is accounting for needs related to preserving Virginia's existing transportation assets and maintaining a state of good repair for transit facilities, including its roads, bridges, ports, airports, rail lines, equipment, facilities and other elements of its transportation infrastructure. As Virginia's transportation network ages and the costs of materials increases, it becomes increasingly important to consider how best to manage the system to preserve its condition and functionality, and to factor this consideration into the planning process.

Transportation asset management is a developing field that provides a set of tools and techniques for managing transportation assets. In this paper the terms "asset management" and "system preservation and maintenance" are used interchangeably. The *Code of Virginia* (§ 33.1-23.02) defines highway asset management as "a systematic process of operating and maintaining the state system of highways by combining engineering practices and analysis with sound business practices and economic theory to achieve cost-effective outcomes."¹ The American Association of State Highway and Transportation Officials (AASHTO) offers an alternative definition of asset management, which extends the Code of Virginia definition to apply to other transportation assets besides highways, though it omits the direct reference to achieving cost-effective outcomes from the Virginia definition. AASHTO defines transportation asset management as follows:

*Transportation Asset Management is 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.*²

By any definition, transportation asset management is fundamentally concerned with using quality data, improved technology, and best practices to manage physical assets efficiently and effectively. This white paper outlines the importance of transportation asset management/system preservation and maintenance in VTrans2035, summarizes asset conditions and trends in Virginia, discusses Virginia's leadership roles in this area, and describes aspects of asset management that are practiced in other states and/or likely to emerge as issues in Virginia.

WHY IS THIS ISSUE IMPORTANT?

System preservation is an increasingly important issue for every U.S. transportation agency. Regarding the highway system, following a period of extensive construction in the post-war era, and particularly with completion of the Interstate Highway System, emphasis of transportation departments has shifted over time from building a transportation network to delivering transportation as a service. This has translated into an increased need for addressing questions central to an asset management approach, such as how an organization measures the

¹ *Code of Virginia*, 2007

² AASHTO Standing Committee on Highways, *Motion to Amend the Definition to Advocate the Principles of Transportation Asset Management*, May 6, 2006.

performance of its assets, what resources are needed to preserve transportation assets over time, and what system or business process improvements can help to increase efficiency, allowing for increasing resources for other activities. Further, improvements in technology have enabled the collection of more complete and timely data on asset conditions, in turn enabling improved approaches to condition assessment, predictive modeling, and monitoring.

At the national level, AASHTO has recognized the importance of this issue through actions such as adopting transportation asset management as a priority initiative, forming the AASHTO Subcommittee on Asset Management and publishing the *Transportation Asset Management Guide* in 2002.³ Likewise, the Federal Highway Administration (FHWA) has formed its Office of Asset Management with the mission of providing leadership and expertise in the systematic management of highway infrastructure assets.

Regarding other asset types besides highways, the challenges are similar. For example, transit agencies must contend with maintaining their buses, trains, track, rights of way, facilities and other assets in operation in a state of good repair. The United States is experiencing a surge in the use of public transportation. At the same time, the nation's public transit rolling stock and infrastructure is deteriorating and current funding levels are unlikely to halt a decline in the condition of transit assets. U.S. transit agencies face a significant challenge in defining what constitutes a state of good repair for their assets, and in achieving such a state. In recognition of this issue in 2008 the Federal Transit Agency (FTA) initiated the State of Good Repair Workgroup and is conducting a series of activities related to this topic, including performing a review of best practices and planning supplemental workshops. The challenges transit agencies face are similar in nature to those of highway agencies, but until FTA's recent initiative, there was less of a focus on system preservation issues in transit at a national level than in highways.

In addition to contending with the same issues transportation organizations are experiencing nationwide, Virginia faces a set of state-specific challenges with respect to asset management. Relative to other states, Virginia has a particularly large state-maintained highway system – the third-largest in the country. This is in part a result of the fact that Virginia is one of the most populous states (it is the twelfth most populous), with a dense transportation network, but largely can be attributed to VDOT's ownership of most of the local, or secondary, road system (in contrast to other states that have a large percentage of city or county owned-roads). Of the over 58,500 miles of local roads, all but the approximately 1,600 miles in Henrico County and Arlington County and 10,500 miles of city-owned roads are state-owned. Further, some cities and towns maintain their own roads. Nonetheless, as a result of the size and extent of the system, decisions about how to manage highway assets made at the state level in Virginia have a particularly extensive impact.

Another important factor in Virginia is that there have been significant, recent increases in the cost of performing preservation work. Due to worldwide increases in demand for oil and raw materials such as steel, the increase in the cost of construction has significantly outpaced general inflation in recent years. This increase has been particularly unfortunate, given that it

³ Cambridge Systematics, Inc., Parsons Brinckerhoff Quade & Douglas, Inc., Roy Jorgensen Associates, Inc., and P.T. Thompson. *Transportation Asset Management Guide*, AASHTO publication RP-TAMG-1, Contractor's Final Report prepared for National Cooperative Highway Research Program (NCHRP) Project 20-24(11), 2002.

has come at a time when an increasing share of Virginia’s resources have been needed for asset preservation due to aging infrastructure. Although oil and other materials now cost less than they did at their mid-2008 peak, the drop in prices is likely temporary and has occurred along with worsening economic conditions which have strained state resources. Thus, there is an urgent need in Virginia to use the best possible data and approaches to make decisions about asset preservation that make the best use of ever more tightly constrained resources.

VTrans has long recognized the importance of system preservation and maintenance. Asset management strategies recommended in VTrans 2025 included:

- Continue implementation of a “maintenance first” policy.
- Increased use of new materials, technologies, and strategies that reduce long-term maintenance costs.
- Support continued development of Asset Management Systems, including inventories, performance criteria, and condition evaluation for all modes.
- Reduce disruption to travelers due to maintenance.

The increase in maintenance costs that has occurred since VTrans 2025, overall increase in needs and preservation expenditures for highway preservation, and concerns about increases in deferred maintenance occurring as a result of these trends, only serve to further increase the importance of careful consideration of system preservation and maintenance in VTrans 2035.

WHAT ARE CURRENT ASSET CONDITIONS AND PERFORMANCE MEASURES IN VIRGINIA?

A valuable source of information on the performance of the transportation system is the statewide Virginia Performs initiative. As part of this program all of the agencies in the Transportation Secretariat report on their objectives and key performance measures, including VDOT, DRPT, the Department of Aviation, and the Virginia Port Authority. Of these, VDOT has established measures that relate directly to asset conditions and performance. Also related to this effort VDOT and DRPT have developed online performance dashboards. VDOT’s dashboard provides detailed data, including details on trends and measures tabulated by road system and district.⁴ Asset condition-related measures on the dashboard and included in Virginia Performs are as follows:

- Percent of “non-deficient” interstate and primary roadway pavement lane miles (pavement in fair or better condition);
- Percent of lane miles with fair or better ride quality; and
- Percent of bridges not classified as Structurally Deficient.

DRPT’s dashboard is similar in functionality to the VDOT dashboard, but its measures are related to ridership rather than asset conditions.

⁴ <http://dashboard.virginiadot.org/>

Besides the reporting performed through Virginia Performs, Virginia has additional reporting on asset conditions and performance. VTrans publishes *Virginia's Transportation Performance Report*. This report was first published in 2006; a 2008 version was recently completed. Further, Chapters 335, 355 and 847 of the 2007 Acts of Assembly (§ 33.1-23.02 of the *Code of Virginia*) established a requirement for VDOT to report biennially on the condition performance of the surface infrastructure of Virginia (referred to as the Biennial Report in this white paper). The report was first prepared in September 2007. In addition, VDOT recently produced a *State of the Pavement Report* providing detailed information on pavement conditions, and *State of the Structures and Bridges Report* providing detailed information on bridge conditions.

The 2009 Biennial Report presents needs for both investments in major assets and the delivery of services over the next biennium. The Report differs in structure from the previous 2007 Biennial Report in that it sets out two major categories that comprise the total needs. First, the investments required to meet performance targets and service standards for major assets including pavements, bridges, tunnels, guardrail, signs, pavement marking, signals and technology assets are shown as a group. Second, funds needed to meet service standards for the delivery of all other maintenance and operations services are shown as a second category

Eighty percent of the needs reported in the assessment are based on some form of performance or service level model, compared to 75 percent in the 2007 assessment. Service levels are described in the appendix of the Biennial Report.

Investment needs for Interstate and Primary system pavements were generated using the Pavement Management System. Investment needs for Secondary pavements are based on inventory and life-cycle maintenance cost models. Bridge investment needs are generated from the Bridge Management System. Tunnel investment needs are based on known repairs as well as improvements needed to comply with Fire, Life, and Safety requirements.

Traffic and safety asset investment needs for signs, guardrail, pavement marking, markers and messages are based on inventory and life-cycle maintenance cost models. Investment needs for signals and technology assets including CCTV, dynamic message signs, hazard advisory radio, and traffic sensors are also based on inventory and life-cycle maintenance cost models. Service needs for pipes, ditches, turf, trees, brush, sound walls, unpaved roads and shoulders are based on inventory and service level models. Facility service needs are based on current costs and planned service levels. Lastly, needs for snow and ice removal, incident and emergency response services, land use permits, and other services are based on either costs from current contracts for those services, or FY 2009 expenditure data and service levels.

Table 1 summarizes the performance measures, targets and current values reported by VDOT. The table shows that the most significant deviations from the target are in pavement conditions. In this area VDOT is not achieving its target based on the most recent data available. Interstate and Primary system pavements will require an investment of \$734 million over the FY 2011-2012 biennium to meet currently established performance targets. With this level of funding, the performance target for Interstate pavements would be met in 2011 and the performance target for Primary system pavements would be met in 2013.

Table 1 Summary of Virginia Highway Asset Condition

Asset	Measure	System	Target Value	Current Value
Pavement	% of non-deficient pavement lane miles	Interstate	≥ 82%	79.9%
		Primary	≥ 82%	75.7%
		Secondary	≥ 69%	68.9%
	% of lane miles with fair or better ride quality	Interstate	≥ 82%	93.3%
		Primary	≥ 82%	87.1%
		Secondary	N/A	69.3%
Bridges and Structures	% not classified as structurally deficient	Interstate	≥ 97%	97.7%
		Primary	≥ 94%	94.1%
		Secondary	≥ 89%	89%

Regarding transit, individual transit agencies report data on transit assets to the FTA through the National Transit Database. This database includes general inventory information on fixed guideways, stations, facilities and other fixed assets. It contains detailed inventory data on bus fleets, as well as annual and cumulative mileage at the fleet level. Also, DRPT collects data on transit agency vehicle fleets, and uses this information to analyze average bus age, a proxy for remaining bus service life. Recently DRPT has implemented the Program Guidance and Grant Evaluation System for predicting capital needs of Virginia transit agencies requesting grants from DRPT. A major capital need for many transit agencies is the rehabilitation or replacement of existing rolling stock. This activity is comparable to the preservation activities performed by a highway agency, in that it is needed to maintain a state of good repair for a transit system in contrast to system expansion activities that increase the size of the system. The DRPT system, described further below, provides a capability for more comprehensive analysis of transit assets. Table 2 below summarizes data on average fleet age for Virginia transit agencies reporting to DRPT. This has been computed based on reported model years for individual vehicles using data extracted by DRPT in March 2009. The table shows the FTA vehicle classification, number of vehicles in the database, and average age. Note the table does not describe conditions for the Washington Metropolitan Area Transportation Authority, which has performed its own engineering analysis of investment needs required to achieve a state of good repair, including work required on buses, rail vehicles, rail, stations, and other facilities.⁵

Table 2. Summary of Virginia Transit Fleet Conditions

Vehicle Type	Count	Average Age (years)
Bus – less than 30 feet long	<u>165</u>	3.9
Bus – 30 feet long	<u>212</u>	7.2
Bus – 35 feet long	<u>389</u>	7.5
Bus – 40 feet long	<u>600</u>	8.5
Van	<u>1938</u>	6.5
Sedan/station wagon	<u>366</u>	7.1

⁵ Washington Metropolitan Area Transportation Authority Customer Services, Operations, and Safety Committee, *Briefing on Metro Matters Projects*, March 2008.

Vehicle Type	Count	Average Age (years)
Ferry	<u>3</u>	23.0

For aviation assets, the Virginia Department of Aviation (DOAV) focuses on helping maintain pavement conditions for airside pavement at the 63 public use airports in Virginia. DOAV characterizes pavement in terms of Pavement Condition Index (PCI). This is a 0 to 100 scale, with a value of 86-100 defined as “excellent,” 71-85 “very good,” 56-70 “good,” and less than 56 defined as fair, poor, very poor or failing. DOAV has recently implemented a pavement management system to track conditions, and has populated the system with data from 56 airports thus far. Table 3 summarizes airside pavement conditions using data from the DOAV pavement management system. For table shows, for different airside uses and ranks, the average PCI and area of pavement. As indicated in the table in all categories shown, with the exception of secondary runways, airside pavements are on average in good or better condition.

Table 3. Summary of Virginia Airside Pavement Conditions

Use	Rank	PCI	Area (square feet)
Runway	<u>Primary</u>	<u>74</u>	32,317,239
	<u>Secondary</u>	<u>54</u>	1,538,867
	<u>Tertiary</u>	<u>N/A</u>	N/A
	<u>All</u>	<u>73</u>	33,856,105
Taxiway	<u>Primary</u>	<u>81</u>	22,374,873
	<u>Secondary</u>	<u>67</u>	1,443,392
	<u>Tertiary</u>	<u>89</u>	543,540
	<u>All</u>	<u>80</u>	24,361,805
Apron, Helipad, Overrun	<u>Primary</u>	<u>73</u>	23,665,466
	<u>Secondary</u>	<u>74</u>	1,396,544
	<u>Tertiary</u>	<u>89</u>	1,247,071
	<u>All</u>	<u>74</u>	26,309,081
All	<u>Primary</u>	<u>76</u>	78,357,579
	<u>Secondary</u>	<u>65</u>	4,378,803
	<u>Tertiary</u>	<u>89</u>	1,790,611
	<u>All</u>	<u>75</u>	84,526,993

Regarding port assets, the Virginia Port Authority (VPA) owns and operates three marine terminals: Norfolk International Terminals, Portsmouth Marine Terminal, and Newport News Marine Terminal. Also VPA owns and operates the Virginia Inland Port inland intermodal facility, located in Front Royal, Virginia. VPA’s *Annual Report* summarizes the value of VPA’s assets. This calculation is made in accordance with General Accounting Standards Board (GASB) Statement 34 using a straight-line depreciation approach for depreciating capital assets. VPA assumes a useful life of 3-41 years for buildings, 5-50 years for improvements, 4-41 years for infrastructure, and 3-36 years for equipment. Based on VPA’s calculations, asset value for VPA’s capital assets increased from approximately \$691 million in 2007 to \$770 million in 2008.

WHAT ARE THE RECENT TRENDS AND AVAILABLE FORECASTS OF FUTURE ASSET CONDITIONS AND PERFORMANCE?

Information on trends is available through a variety of sources including the Biennial Report, VDOT Performance Dashboard and Virginia Performs. In particular, information on recent trends in VDOT performance measures is available through the Virginia Performs initiative, the 2007 Transportation Performance Report, and on the VDOT Performance Dashboard, and the State of Pavements and Bridges reports. However, the amount of detail and time period varies by performance measure. For instance, the dashboard shows trends in pavement condition by system, district and county for the past four years. For bridges the dashboard shows detailed information on current conditions, but limited data on trends. For performance data, the dashboard shows detailed data for the last 13 months.

The Biennial Report provides additional detail on historic trends in condition for highway assets and projects funding required to achieve performance targets and service levels. Achieving performance targets depends on the availability of funds which has become a greater challenge with the current economic conditions. Based on the information from these sources, the trends in asset conditions and performance for VDOT-owned assets can be summarized as follows:

As shown in Figure 3, Interstate and Primary system pavement conditions improved slightly from 20.5 percent of Interstate and 24.4 percent of Primary system pavements in deficient condition in 2008 to 20.1 percent of Interstate and 24.3 percent of Primary system pavements in deficient condition in 2009. Secondary system pavement conditions deteriorated from 28.7 percent in deficient condition in 2008 to 31.1 percent in 2009. Pavement conditions overall have deteriorated since 2007 and investment needs have increased 41 percent for Interstate, 45 percent for the Primary system, and 27 percent for the Secondary system.

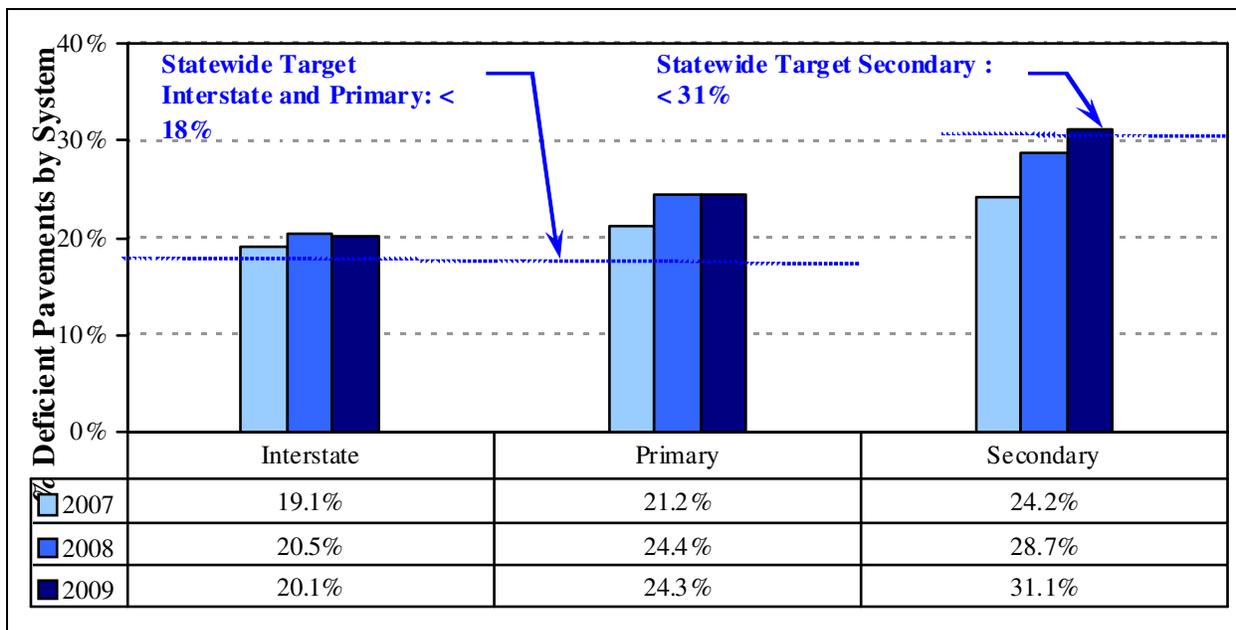


Figure 3 Statewide Percent Deficient Pavements by System

The percentage of bridges rated structurally deficient has remained essentially unchanged at 91.5 percent in fair or better condition, down slightly from the 91.6 percent shown in the 2007 Biennial Report. In contrast to pavement needs, bridge needs have not changed significantly since the 2007 report. This is largely because prices for steel and concrete, which are the primary components of bridges, have not increased as much as asphalt, and also because the amount of federal funds available for bridge projects in the Six-Year Improvement Program is much greater than the amount of federal funds for pavement maintenance projects.

The 2007 needs assessment for FY 2009 and FY 2010 reported \$1.493 billion and \$1.487 billion in needs for each year respectively. The figures in the Biennial Report and those in the 2007 Report are all reported in “current year” values, meaning the needs for each year are adjusted for inflation based on the official inflation forecast provided by the Virginia Department of Taxation. Based on the Department of Taxation’s figures, FY 2010 was not inflated, FY 2011 was inflated by 4.3 percent, and FY 2012 was inflated by an additional 3.0 percent.

Estimates of maintenance and operations investments needed have increased 27 percent since the 2007 assessment, largely due to the continued deterioration of pavement conditions and significant increases in the cost of asphalt. Other drivers include more complete inventory data on many assets, in some cases collected for the first time, and updated unit costs for all major maintenance and operations activities. For example, inventory data is now available for the first time for, highway lighting, sound walls, sidewalks, curb and gutter, road edge and object delineators, cameras, dynamic message signs, high occupancy vehicle (HOV) gates, hurricane gates, and traffic sensors. Updated and more complete data was also collected on guardrail, signs, and ditches.

In the two years since the 2007 assessment was completed, two pavement condition assessments have been conducted and inventory data is now available for 23 types of drainage, roadside, traffic, and intelligent transportation system (ITS) assets, in addition to complete inventories of pavements and bridges that VDOT has had for many years. For pavements, which are the largest single contributor to cost, 100 percent of the Interstate and Primary systems were assessed this past year. Over the last three years, approximately 70 percent of Secondary system pavements have been assessed. The most recent year’s sample of the Secondary system pavements was used to estimate needs for the Secondary system. VDOT has implemented several new computer systems that contribute to improved analysis of needs, through better data and improved system functionality.

These needs were calculated using an asset management approach as directed by § 33.1-23.02 of the *Code of Virginia*. Since 2004, the quantity and quality of data available to assess the inventory and condition of assets, estimate deterioration, track and quantify work, and develop performance based needs models has improved annually. Sixty-three percent of the needs identified in the 2005 assessment were based on complete or sampled asset inventories, unit costs of work, and models that generate work recommendations based on performance criteria. For this 2009 assessment, seventy-nine percent of the needs reported are based on this approach. The remainder of investment needs is based on actual expenditure information, contract costs, and in some cases, approved FY 2010 budget amounts.

Significant changes are occurring within the agency that impact estimates of maintenance and operations needs. In response to current economic conditions, VDOT has developed a Blueprint for the Future that includes changes to the way maintenance and operations services are defined, assessed, and reported. The new framework establishes priorities and identifies levels of service for the delivery of maintenance and operations. The framework allows VDOT to more clearly show the relationship between investment needs and service activities, providing greater accountability.

Specifically, pavements, bridges and tunnels, signals, pavement markings, signs, stripes, guardrail, and ITS assets are considered to be of such critical safety and operational importance that rehabilitation, major repair, and preventive maintenance activities impacting their condition are classified as “asset investments” and shown as one category. Investment activities performed on these assets are designed to change the physical condition of the assets and to preserve and extend their useful life. Asset investment includes those activities required to meet performance targets and services levels for these assets. The biennial assessment identifies \$1.103 billion and \$1.086 billion in investment related needs for FY 2011 and FY 2012 respectively.

The remaining maintenance and operations “services,” comprising ordinary and preventive maintenance work, such as cleaning ditches, washing bridge decks, patching pot-holes, debris removal, snow and ice removal, emergency response, incident management, mowing, and equipment management, is the second category of needs. Services also include maintaining rest areas, operating ferries, tunnels and moveable bridges, managing traffic, traffic signal optimization, providing traveler information, and safety service patrols. Each maintenance and operations activity tracked by the agency has been classified as a component of one of five major Service Areas, and further classified as either “asset investment” or “service”. The five Service Areas are:

- Emergency and Safety Response Services;
- Roadway Services;
- Traffic Control Services;
- Roadside Services; and
- Facility, Equipment, and Other Services.

Needs for drainage, vegetation, signs, pavement markings, guardrail, signals, and ITS assets have changed based on priorities and service levels recently developed as part of VDOT’s approach to maintenance and operations. These needs also changed due to better inventory information and updated unit costs. For example, new data indicate inventories of signs and guardrails are considerably higher than previously estimated. Priorities are focused first on safety and then “from the centerline out.” As a result, some services such as vegetation management or drainage management are considered less important than investment related activities on pavements and bridges.

Needs for operations have increased in some areas and decreased in other areas to reflect changes in priorities. For example, safety service patrol and safety rest area needs decreased reflecting reduced levels of service in those programs, while tunnel needs increased significantly,

reflecting the focus on preserving major infrastructure assets. Needs for traffic signals and dynamic message signs increased due to the number of signals and signs needing replacement and the quantity of work needed to ensure these assets continue to function properly.

The availability of more complete inventory information on major assets is a contributing factor to the increase in estimated needs over those reported in the 2007 assessment. Only slight increases in the unit cost of street and highway construction are expected over the next two years due to the economic recession and slow recovery forecast by many economists. Also, with more complete information now available on the inventory of most major assets, future changes in estimated investment needs are more likely to be a result of changes to unit costs of maintenance or service levels or unforeseen changes that may occur to the condition of the assets, from a major storm for example. The continued investment VDOT has made in data used in this assessment not only supports biennial reporting, but is being used to improve business processes and the cost effectiveness of VDOT's maintenance and operations program.

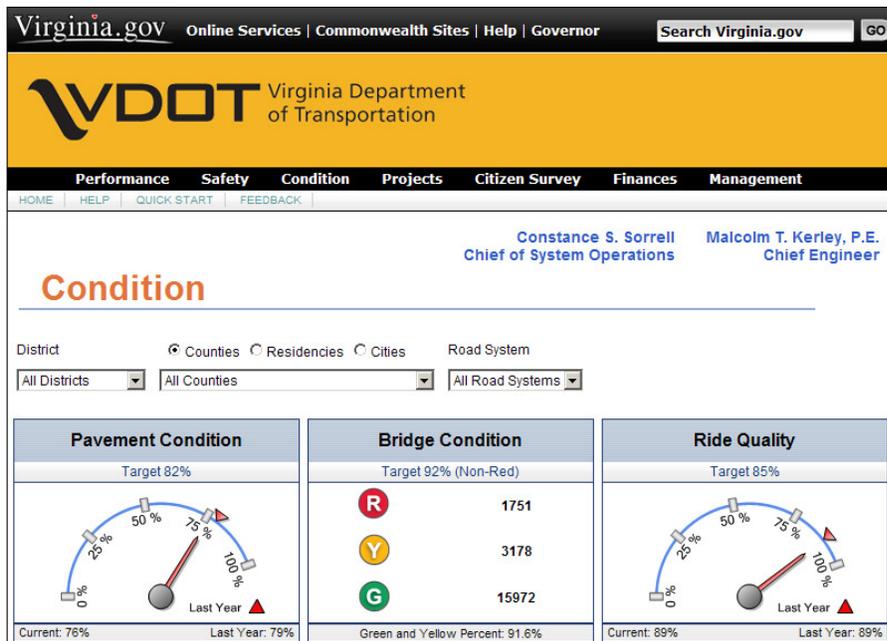
Regarding transit assets, with implementation of Program Guidance and Grant Evaluation System, DRPT now has an enhanced capability for monitoring changes in asset conditions over time. Detailed information has not been published regarding trends in transit fleet conditions. However, DRPT reports in *Virginia's Transportation Performance Report* that the trend in average fleet age has been downwards, consistent with agency goals.

WHAT ARE VIRGINIA'S CURRENT LEADERSHIP ROLES AND UNIQUENESS?

There are several key areas related to asset management where Virginia is unique and/or plays a leadership role. With regard to the highway system, as noted previously, Virginia has an extensive state-owned system. Due to the size of the state and large percentage of the highway system that is state-owned compared to other states, Virginia has the third-largest state-owned network in the U.S. The extent of Virginia's highway system places the state in a somewhat unique position.

One area where Virginia is leader in the U.S. is in statewide performance reporting. The Transportation Performance Report provides summary condition information across asset types, and VDOT's Performance Dashboard provides an extremely effective visual representation of conditions and performance for VDOT-owned highway assets. Figure 1 shows an example screen from the dashboard, depicting several of the condition-related measures. For each measure one can see further details on the measure, such as data reported by county or district and/or trend data. Other states besides Virginia have initiated efforts to report performance, but the Virginia Performs effort is notable for its comprehensive nature, and for the integrated, highly-accessible scorecard approach it uses for web-based reporting. VDOT's Performance Dashboard supplements the Governor's Scorecard produced as part of Virginia Performs.

Figure 1. VDOT Performance Dashboard – Condition Summary



Virginia has established itself as a leader in asset management in a number of additional respects. In response to requirements established by the Virginia Legislature, VDOT produces annual reports on asset conditions, and more detailed biennial reports with prediction of needs and detailed condition data. To support its reporting requirements VDOT has developed a detailed asset management methodology to measure performance, manage assets using a life-cycle approach, and allocate maintenance funding using a Needs Based Budget approach.⁶ As detailed in the methodology report, VDOT's approach incorporate the following primary components:

- Asset Management System
- Pavement Management System
- Bridge Management
- Condition Assessment
- Other Infrastructure Assets
- Equipment Management
- Snow Removal

Data from the biennial needs assessment are used to develop the budget for the statewide maintenance and operations program, and to distribute those funds to the nine districts and central office divisions responsible for delivering the program. VDOT uses commercially available systems for pavement management and bridge management, and internally developed systems and databases to calculate and compile needs from other assets and services within the maintenance and operations program. As VDOT moves forward it plans to further strengthen its asset management methodology through steps such as a fully quantifying its asset inventory and

⁶ VDOT, *Asset Management Methodology*, Report to the General Assembly of Virginia, 2006.

developing a performance-based budget that correlates a given level of spending to a particular level of performance or service.

Another area where VDOT has taken a leadership role is in the use of outsourcing to improve program delivery and reduce costs. The *Code of Virginia* (§33.1-49.1) requires that VDOT outsource all of its Interstate Highway System maintenance by July 2009. In response, VDOT has established a series of Turnkey Asset Management Services (TAMS) contracts that privatize routine maintenance of Interstate Highway System corridors, including activities such as mowing, drainage maintenance, patching, snow removal and incident response. The TAMS contracts include performance standards that specify the desired outcomes and timeliness requirements for maintenance work. VDOT met the July deadline for privatizing all of its Interstate Highway System maintenance. Beyond the TAMS contracts, VDOT has explored use of outsourcing and public private partnerships in a number of areas. VDOT has used outsourcing where it has the potential to reduce cost and improve performance, such as in pavement resurfacing, bridge maintenance and inspection, guardrail maintenance, and operations.

Virginia has taken a leadership role in management of transit assets with the recent development of Program Guidance and Grant Evaluation System by DRPT. This system is designed to assist DRPT in evaluating grant applications from Virginia transit agencies. It has functionality for:

- Predicting capital needs for DRPT grantees based on inventory information and asset management principles;
- Evaluating grant applications for consistency with the capital needs analysis;
- Collating and organizing quantitative evaluations using public benefit models (developed separately) and qualitative evaluations from DRPT grant program managers;
- Presenting summary scores and rankings for individual capital grant line items; and
- Evaluating the impact of different options associated with the DRPT capital grant funding policies.

DRPT's initial focus in deploying Program Guidance and Grant Evaluation System was the prediction of bus rolling stock needs and the evaluation of capital grant applications in the context of those needs. The initial release of Program Guidance and Grant Evaluation System thus focuses on buses. Nonetheless, the system supports analysis of other public transportation asset types, including:

- Passenger rail rolling stock;
- Facilities;
- Infrastructure items (e.g., track, signage, bus shelters);
- Communications, security and computer equipment; and
- Miscellaneous parts, tools and items.

In addition to educating grantees regarding the impact that Program Guidance and Grant Evaluation System may have on the grant evaluation process, DRPT will use the capital needs predictions from Program Guidance and Grant Evaluation System to provide grantees with

guidance on future grant applications. Program Guidance and Grant Evaluation System became operational in January 2009 and is currently being used by DRPT to help evaluate Fiscal Year 2010 grant applications.

ARE THERE RELEVANT LESSONS FROM OTHER STATES OR OTHERS?

Asset management is an area of great interest in the transportation community, and there are a number of areas where others have advanced the state of the practice that may be of relevance to Virginia. Regarding asset management for highway assets, one valuable resource for information on practices in other states is the report on the recent asset management domestic scan.⁷ This document details asset management practices in the states of Florida, Michigan, Minnesota, Ohio, Oregon, and Utah. Further, the upcoming report on NCHRP Project 20-74, Developing an Asset Management Framework for the Interstate Highway System, reviews asset management data, systems, measures and approaches for use in managing IHS assets.⁸ Comparison of the current status of Virginia's asset management efforts with that of other states indicates that in many respects Virginia is practicing state-of-the-art asset management. Nonetheless, experiences in other states may be quite relevant to Virginia, particularly in areas not addressed in the current methodology, or where VDOT is evaluating possible improvements to its methodology. Relevant lessons described in these resources include:

- Approaches to better integrating decisions on increasing capacity with decisions on maintaining existing assets: some states, most notably Oregon, have developed approaches that integrate consideration of preservation and capacity improvements that may be relevant to Virginia. Adopting such an approach would require reporting systemwide measures of congestion, and developing funding scenarios that show the impact of shifting funds between capacity and preservation projects.
- Level of detail in asset inventories: one issue VDOT faces is shifting from a sample of maintenance conditions to a more complete inventory. VDOT now has a video log of its highways, and has begun using this log to collect asset inventory data. This should, in theory, enable more detailed quantification of roadside assets and maintenance needs, based on a complete inventory rather than use of sample data. However, further work remains to transition to use of this new data for predicting maintenance needs. A number of states have contended with the issue of developing an inventory of roadside assets, typically resulting in some combination of detailed inventory and sampling. The domestic scan describes approaches adopted in each of the states in the scan.
- Asset management approaches at the local level and at Metropolitan Planning Organizations (MPO): the Domestic Scan describes local and MPO examples of asset management in Florida, Michigan and Oregon that may be relevant to Virginia metropolitan areas. MPOs in these states have implemented many of the same concepts that VDOT and DRPT have implemented at the state level, such as

⁷ Cambridge Systematics, Inc. and Michael D. Meyer. *U.S. Domestic Scan Program: Best Practices in Transportation Asset Management*, Scan Tour Report, NCHRP Project 20-68, 2007.

⁸ Cambridge Systematics, Inc., et. al., *An Asset-Management Framework for the Interstate Highway System*, NCHRP Report 632, 2009.

developing asset inventories, specifying performance measures, and systematically analyzing system preservation and maintenance needs.

An additional area where Virginia may benefit from others' experience is in the implementation of maintenance management systems. A maintenance management system is used for managing state and TAMS maintenance activities, issuing work orders, linking maintenance work to assets, and supporting other day-to-day maintenance management activities. Such a system does have the potential to help Virginia perform its asset maintenance more efficiently and effectively. States such as the Utah, South Carolina, and the New England states of Maine, Vermont and New Hampshire (which share a single system) have implemented standalone maintenance management systems. Other states such as Pennsylvania, North Carolina and Colorado have implemented or are currently implementing maintenance management systems integrated with their Enterprise Resource Planning systems. Implementing a maintenance management system, either as a standalone system or an integrated part of agency's Enterprise Resource Planning system, offers the potential for increasing maintenance efficiency, strengthening management oversight, and improving accountability.

Regarding management of transit assets, the FTA has recently prepared an introduction to the topic of state of good repair, including a discussion of tools and practices in this area, and an overview of the importance of this issue.⁹ FTA is planning workgroup activities and resources as part of its state of good repair initiative.

One state with experience in integrating consideration of transit assets with other transportation assets is Oregon. The domestic scan described previously includes discussion of transit asset management practices in use by the Oregon Department of Transportation (ODOT) that may be relevant to Virginia. ODOT incorporates consideration of bike lanes, sidewalks, and state-funded buses in its asset management approach. Note that the Commonwealth Transportation Board has adopted a Policy for Integrating Bicycle and Pedestrian Accommodations that describes how to address these assets as part of a construction project, but this policy is not intended to address preservation and maintenance needs for existing bike lanes and sidewalks.

WHAT ARE THE MAJOR OPPORTUNITIES FOR FUTURE INITIATIVES?

Major opportunities for Virginia to further improve upon its asset management approaches involve leveraging improvements in technology, particularly information technology, to improve system efficiency and effectiveness. These approaches include:

- Integrating consideration of risk with asset management: tragic events such as the collapse of the I-35 bridge in Minneapolis have served as a vivid reminder of the importance of minimizing the risks to the traveling public in operating and maintaining the transportation system. Despite the importance of this topic, traditional asset management systems fail to address most risks. VDOT is currently piloting an approach to incorporate risk in highway asset management that builds upon risk-based concepts common in other industries, and which are now being

⁹ Federal Transit Administration, *Transit State of Good Repair: Beginning the Dialogue*, 2008.

implemented in Europe. The software VDOT is testing categorizes assets based on vulnerability and potential consequences of risk, and supports the development of risk-based maintenance strategies. VDOT has applied the approach to testing lighting supports and lamps in Northern Virginia. These assets are more straightforward to model than bridges, but nonetheless are a safety concern in the event of structural failure, and thus represent an appropriate asset on which to pilot risk management concepts. Further, VDOT is evaluating use of the approach for analysis of Virginia structures.

- Implementation of a maintenance management process, policies, and system to monitor and report on the completion of work and the delivery of services. As mentioned before, VDOT has a bridge management system and pavement management system which it uses to model performance and assess needs. However, the current Work Accomplishments module of the Asset Management System only partially meets VDOT's need for a system that can create work orders, schedule work and assess resource availability, track the status and completion of work, and report work and resource productivity, with mapping capability.
- Completion of the Roadway Network System will enable VDOT to map and reference assets and activities to its network of roads which would enable more powerful visualization of information, and improve coordination and planning. This geographic mapping and visualization capability depends not only on development of the software, but on development of a reliable set roadway data to map and reference to and on a consistent process to manage and update data over time.
- Continuing implementation of Program Guidance and Grant Evaluation System for supporting transit asset management: the initial implementation of Program Guidance and Grant Evaluation System is targeted at helping manage bus rolling stock. As DRPT continues its implementation of the system, Program Guidance and Grant Evaluation System is expected to evolve into a tool for analysis of capital needs for the full range of transit assets which DRPT helps to support.
- Analyzing the current costs of various asset management activities to set benchmarks and against which to measure future efficiency measures.

WHAT MAY RISE TO TOP PRIORITY IN THE FUTURE?

At present there is great uncertainty concerning the economy, price trends, public sentiment, and a range of other issues that complicates any effort to anticipate future priorities. In the near term, with passage of the American Recovery and Reinvestment Act of 2009 and its emphasis on short-term spending, focus is likely to be on program delivery: initiating work that will provide a short-term economic stimulus while helping meet the need to preserve and improve Virginia's transportation infrastructure. The questions that lawmakers and the public are likely to emphasize in this context are essentially questions of "what" and "how," such as that of what projects Virginia can initiate given available funds and constraints, and how Virginia can best contract to perform the needed work quickly. Given Virginia transportation agencies have documented significant system preservation and maintenance needs, and given the available trends suggest these needs are, if anything, growing over time, a prudent strategy moving forward is to target infrastructure investments towards system preservation efforts, including investments in renewing existing roads, bridges, rolling stock and other transportation assets to address deferred preservation and maintenance needs and reduce future costs, and to reduce services where necessary to shift dwindling resources to higher priority areas.

Over the long term, there is likely to be an increased emphasis on a different set of questions more related to "why?" That is, as the Virginia transportation infrastructure continues to age, and the investment required to preserve the transportation system likely continues to grow, legislators and the public will increasingly ask hard questions concerning what Virginia taxpayers and transportation users should expect from their transportation system, and whether the targeted levels of condition – until now largely based on the goal of simply keeping things as they are – are representative of best practices. Virginia has to a great extent anticipated these kinds of questions through the efforts described above, such as moving towards a performance-based budget and developing new systems and tools that leverage improved technology. Provided these efforts move forward (and assuming they are, indeed, consistent with future priorities), Virginia seems well-positioned to continue to play a leadership role in the area of transportation asset management.