
# BIENNIAL REPORT

# On the Condition of and Investment Needed to Maintain and Operate the Existing Surface Transportation Infrastructure for FY 2011 and FY 2012

**Chapters 335 and 355 of the**
**2007 Acts of Assembly of the Virginia General Assembly**

Virginia Department of Transportation
1401 East Broad Street
Richmond, Virginia 23219
September 15, 2009

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COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219-2000

September 15, 2009

The Honorable Timothy M. Kaine
Members of the Commonwealth Transportation Board
Joint Legislative Audit and Review Commission

Dear Ladies and Gentlemen:

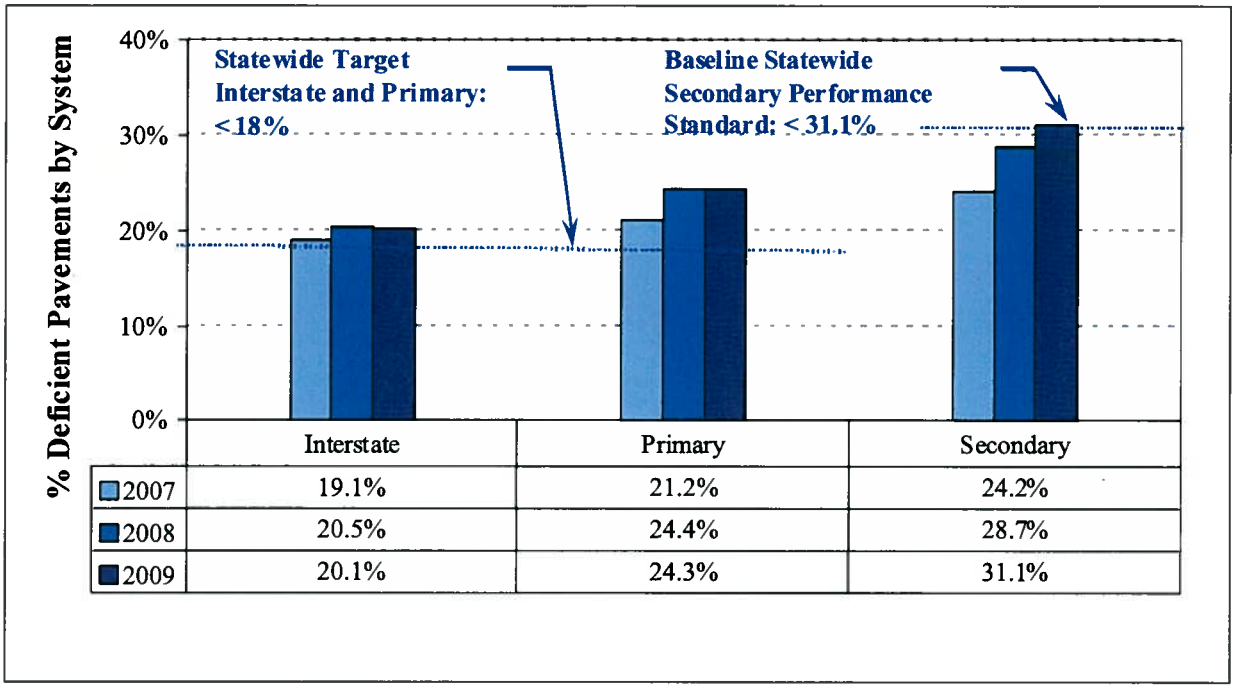
Enclosed is the 2009 Biennial Report on the Condition of and Investment Needed to Maintain and Operate the Existing Surface Transportation Infrastructure for FY 2011 and FY 2012 as required by § 33.1-13.02 of the *Code of Virginia*. This report is based on an asset management methodology as required by the *Code* and identifies the investment needed to maintain and operate the network for which the Virginia Department of Transportation (VDOT) is responsible.

The report estimates the annual investment needed to maintain and operate the VDOT maintained network for FY 2011 and FY 2012 is $1.885 billion and $1.899 billion, respectively, or a total biennial investment of $3.784 billion. With the current FY 2010 budget at $1.360 billion and proposed FY 2011 and FY 2012 budgets of $1.410 billion and $1.451 billion, respectively, the gap between needs and available funds is approximately $923 million over the FY 2011-2012 biennium.

The estimated investment needed for major assets (pavements, bridges, tunnels, guardrail, pavement marking, signs, signals, and technology assets) is estimated to be $1.103 billion in FY 2011 and $1.086 billion in FY 2012. This represents approximately 59 percent in FY 2011 and 57 percent in FY 2012 of the total amount needed to maintain and operate the existing infrastructure. The remainder of investment needed is for services such as snow and ice control, emergency and safety response, maintenance services for non-major assets, fleet equipment management, and management and direction.

Interstate and Primary system pavements will require an investment of $734 million over the FY 2011-2012 biennium to meet pavement performance targets. With this level of funding, the performance target for Interstate pavements would be met in 2011 and the performance target for Primary pavements would be met in 2013. This is a 44 percent increase over investment needs estimated in 2007 to meet the targets in the FY 2009-2010 biennium. Secondary system pavements require an estimated $687 million investment over the FY 2011-2012 biennium to maintain current conditions over the biennium, an increase of 27 percent over the $542 million estimated in 2007 to maintain current conditions over the FY 2009-2010 biennium. As shown in

the figure below, the most recent pavement ratings show only slight improvements in Interstate and Primary pavement conditions and a decline in Secondary pavement conditions.




| | Interstate | Primary | Secondary |
|---|---|---|---|
| 2007 | 19.1% | 21.2% | 24.2% |
| 2008 | 20.5% | 24.4% | 28.7% |
| 2009 | 20.1% | 24.3% | 31.1% |

The conditions of bridges statewide are just slightly below the performance target of 92 percent of bridges in sufficient condition. Bridges are estimated to need $113 million in FY 2011 and $114 million in FY 2012 to achieve and maintain their targeted performance. One significant factor in maintaining bridge performance has been the amount of federal bridge funds for bridge projects in the Six-Year Improvement Program.

The 2009 biennial assessment is approximately 27 percent higher than the 2007 assessment due to several factors:

- The cost of asphalt and other petroleum-based products increased significantly. Five years ago, $10 million would have provided funds for 282 miles of pavement overlays. Today, that same $10 million purchases only 177 miles of pavement overlays.
- The investment needed to bring pavements back to the performance target of no more than 18 percent of deficient lane miles on the Interstate and Primary systems and maintain that level of performance is $370.7 million in FY 2011 and $363.3 million in FY 2012.
- The investment needed to maintain the Secondary system in its current condition at no more than 31 percent of lane miles in deficient condition is $338.3 million in FY 2011 and $348.4 million in FY 2012.

- Updates and additions to the inventory of assets and updated condition information on assets have increased the needs. Included in the assessment for the first time is the complete inventory of all roadway lighting, signals, curb and gutter, sidewalks, technology assets (cameras, electronic message boards, etc.), and sound walls.

The August revenue estimate for transportation funds will require VDOT to reduce its FY 2010 budget approximately $135 million. Unless economic conditions improve by the next revenue estimate in November, further reductions may be necessary. In keeping with VDOT's Blueprint for the Future, services will continue at reduced levels through this fiscal year and into the next biennium in the areas of contracted Interstate maintenance, safety service patrols, safety rest areas, ferry service, and mowing. Restoring these services to their previous levels would add approximately $45 million to estimated needs in each of the next two years.

Section 33.1-13.02 of the *Code of Virginia* also requires VDOT to report on future employment level goals and the percent of asset management under private contract. Chapter 781 of the 2009 Acts of Assembly (Appropriation Act) sets VDOT's employment level for June 30, 2010 at 7,500 positions. Employment is proposed to remain at that level depending on the level of funding available to meet these needs. The percent of asset management under private contract will be reported on November 30th annually as required by § 33.1-13.01 of the *Code of Virginia.*

Finally, this report also provides information regarding the condition of locally maintained roads as specified under § 33.1-41.1 of the *Code of Virginia.* However, this report does not estimate needs for maintenance of local roads. Bridge inspection data for local systems indicate that 91.7 percent of locally maintained bridges are in sufficient condition. Currently, no statewide performance measure or assessment criteria have been adopted for measuring the structural condition of locally maintained pavements. Based on the International Roughness Index, a federal rating criterion for pavement smoothness, 83 percent of locally maintained pavements have fair or better ride quality.

If you have questions or need additional information, please let me know.

Sincerely,

David S. Ekern, P.E.
Commissioner

Attachment

cc: The Honorable Pierce R. Homer

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# Biennial Report

# On the Condition of and Investment Needed to Maintain and Operate the Existing Surface Transportation Infrastructure for FY 2011 and FY 2012

## Executive Summary

Section 33.1-13.02 of the *Code of Virginia* requires the Virginia Department of Transportation (VDOT) to report by September 15th of each odd-numbered year on the condition of and needs for maintaining and operating the existing surface transportation infrastructure based on an asset management methodology. This is the second Biennial Report from VDOT. It provides updates on the condition and performance of the VDOT maintained portion of Commonwealth's transportation infrastructure, as well as new information on the condition of locally maintained roads and bridges. The report provides detailed information on estimated investment needs to maintain and operate the existing VDOT maintained network, the standards on which those needs are based, and methods used to conduct the needs assessment. This report includes information on the condition of locally maintained roads, but does not estimate needs to maintain those roads.

This report presents needs for both investments in major assets and the delivery of services over the next biennium. This Biennial 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

Based on updated data and expanded use of the modeling approach, the investment needs for the biennium are approximately $3.784 billion, or $1.885 billion and $1.899 billion for FY 2011 and FY 2012 respectively, shown in Table ES-1 in comparison to the FY 2010-2015 Six Year Maintenance and Operations Program budget amounts for these years. The gap between the program budget and the FY 2011 and FY 2012 needs is approximately $923 million, or approximately $461.5 million annually. Detailed biennial needs are shown in Table ES-2.

**Table ES-1 Comparison of Six Year Maintenance and Operations Program Budget and Biennial Needs**

| Fiscal Year | Six Year M&O Program Budget (Million) | Assessed Needs (Million) | Difference (Million) |
|---|---|---|---|
| 2010 | $1,359.8 | | |
| 2011 | $1,409.5 | $1,884.5 | $475.0 |
| 2012 | $1,450.7 | $1,899.2 | $448.5 |

**Table ES-2 Detailed Investment Needs for FY 2011 and 2012 by Category and Service Area**

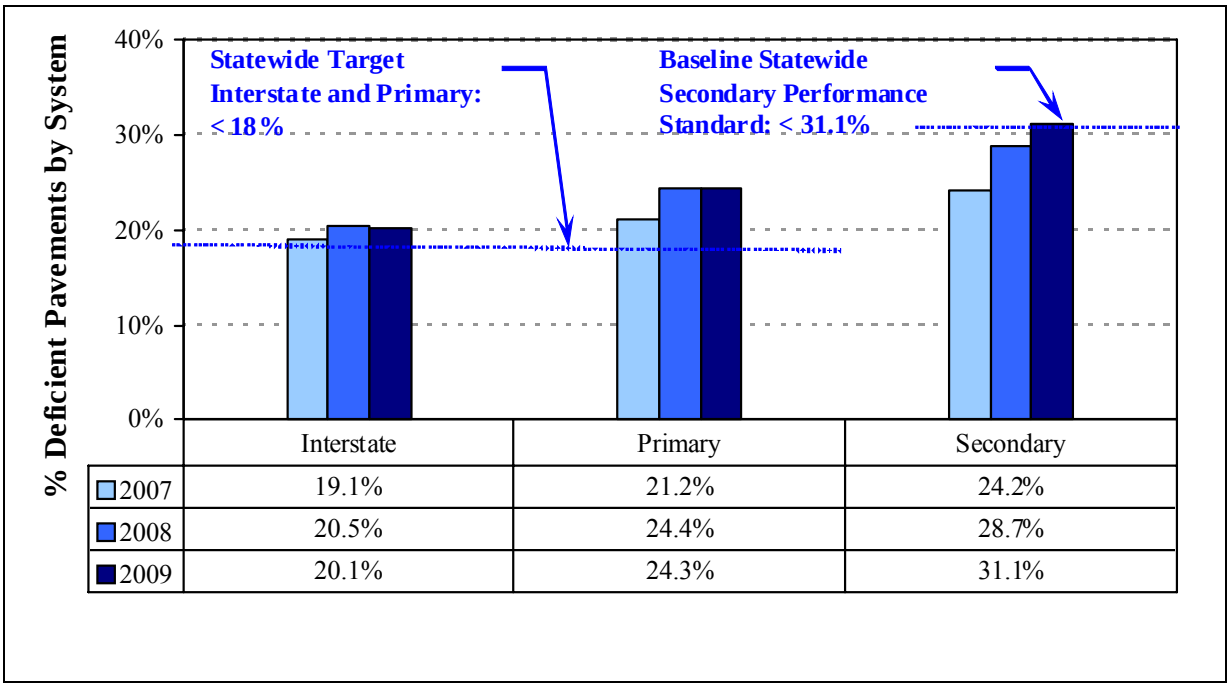
| Asset Investment | | FY 2011 $Million | FY 2012 $Million |
|---|---|---|---|
| Pavement | Interstate | $119.1 | $113.6 |
| | Primary | 251.6 | 249.7 |
| | Secondary | 338.3 | 348.4 |
| | **Sub-Total** | 708.9 | 711.7 |
| Bridges | Interstate | 69.0 | 36.0 |
| | Primary | 24.1 | 55.1 |
| | Secondary | 19.6 | 22.9 |
| | **Sub-Total** | 112.7 | 114.0 |
| Tunnels | | 32.0 | 34.7 |
| Traffic and Safety | | 158.3 | 161.8 |
| Signal and Technology Assets | | 90.6 | 64.0 |
| | **Investment Total** | $1,102.6 | $1,086.2 |
| **Services** | | | |
| Emergency and Safety Response Services | | $177.1 | $182.7 |
| Traffic and Safety Services | | 62.5 | 65.6 |
| Roadway Service | | 185.4 | 196.2 |
| Roadside Services | | 149.4 | 153.2 |
| Facility, Equipment and Management Services | | 207.6 | 215.4 |
| | **Services Total** | $782.0 | $813.1 |
| | **Grand Total** | **$1,884.5** | **$1,899.2** |

Totals may not match sum of parts due to rounding.
Note: This investment scenario presumes the Blueprint services reductions will continue into the next biennium. This means no change in contracted Interstate maintenance, safety service patrol, mowing, ferry operations, or rest areas. To return these services back to their previous levels would add approximately $45 million to the needs each year.

The current performance targets for the Interstate and Primary system pavements were used to calculate a proposed level of performance for the upcoming biennium. Interstate and Primary system pavements will require an investment of $734 million over the FY 2011-2012 biennium to meet currently established pavement performance targets so that no more than 18 percent of pavements are deficient. With this level of funding, the performance target for Interstate pavements would be met in 2011 and the performance target for Primary pavements would be met in 2013. However, current FY 2010 funding for the two systems combined is approximately $350 million. An additional amount of more than $33 million would be needed for the biennium to meet this level of performance.

This report establishes a performance standard for the Secondary system to maintain the system at its current level, that no more than 31 percent of the Secondary system pavements would be deficient. If this performance level were to be funded, the Secondary system pavements would require an estimated $687 million investment over the FY 2011-2012 biennium. At the current level of funding, Secondary system pavements are estimated to continue to deteriorate at a minimum of three percent annually.

As shown in Figure ES-1, 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.




| | Interstate | Primary | Secondary |
|---|---|---|---|
| 2007 | 19.1% | 21.2% | 24.2% |
| 2008 | 20.5% | 24.4% | 28.7% |
| 2009 | 20.1% | 24.3% | 31.1% |

**Figure ES-1 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 this 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, as shown in Table ES-2 above, 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, shown in Figure ES-2, 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.


**Figure ES-2 Maintenance and Operations Program Service Areas and Service Groups**

Table ES-2 above provides the biennial funding needs for maintenance and operations services for each of the five service areas based on service levels described in Appendix B.

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.

# Biennial Report

# On the Condition of and Investment Needed to Maintain and Operate the Existing Surface Transportation Infrastructure for FY 2011 and FY 2012

This report provides both a high level statewide view and a more detailed district view of the condition of and investment needed to maintain and operate the existing transportation infrastructure for which the Virginia Department of Transportation (VDOT) is responsible over the FY 2011-2012 biennium. It aligns maintenance and operations activities with the agency's strategic mission and goals.

## Statutory Requirements

The following is a short summary of the statutory requirements for the Maintenance and Operations Program. The full texts of referenced sections of the *Code of Virginia* are shown in Appendix A.

Section 33.1-13.02 of the *Code of Virginia* requires VDOT to report by September 15th of each odd-numbered year on the condition of and needs for maintaining and operating the existing surface transportation infrastructure based on an asset management methodology.

Section 33.1-41.1 of the *Code of Virginia* and Item 458 of Chapter 781 of the 2009 Acts of Assembly pertain to payments to localities, and include requirements for reporting expenditures of funds received as well as performance on local roads.

Section 33.1-23.02 of the *Code of Virginia* addresses the definition of maintenance, operations, and asset management; as well as requirements to develop asset management practices in the operation and maintenance of the state system of highways. In addition, this section of the *Code* defines requirements for VDOT to report its performance measures and targets for the upcoming biennium by June 30th of even numbered years, and to report on the Department's actual performance for the preceding biennium no later than September 30th of even numbered years. The legislation also requires VDOT to advise the Commonwealth Transportation Board (CTB) as to the methodology used to determine its maintenance needs.

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# Introduction

This report first summarizes the statutory requirements for the report and its contents, then presents a short review of the factors and trends affecting current and future maintenance and operations investments needs in Chapter II. Biennial needs are presented in Chapter III beginning with investment needs for major assets such as pavements and bridges, followed by needs for services. Chapter IV presents performance information for local roads and bridges provided by Virginia cities. Specific language from the *Code of Virginia* pertaining to the statutory requirements for this report is provided in Appendix A, while Appendix B shows the Maintenance and Operations Service Levels framework.

## *Trends and Key Factors Affecting Maintenance and Operations Work Activities*

This section discusses the trends and key factors affecting maintenance and operations work activities, including growth of the VDOT maintained network; growth in highway system usage; economic issues; and emerging issues in technology, policy, and VDOT's customer profile.

### System Growth

As of 2008, the most recent year for which data is available, the VDOT maintained network contained 58,218 centerline miles or 125,756 lane miles of Interstate, Primary, Secondary, and Frontage roads, making it the third largest state maintained highway system in the country. Figure 1 and Table 1 show annual growth and rates of growth of the VDOT maintained network over the last 30 years. The size of the network has grown each year over this period, although areas of greatest growth have shifted from the Interstate system, which saw tremendous growth in the 1970s and 1980s as the system was developed, to the Primary and Secondary systems which continue to increase in size. Overall, the network has grown more than 13 percent in the last 30 years.

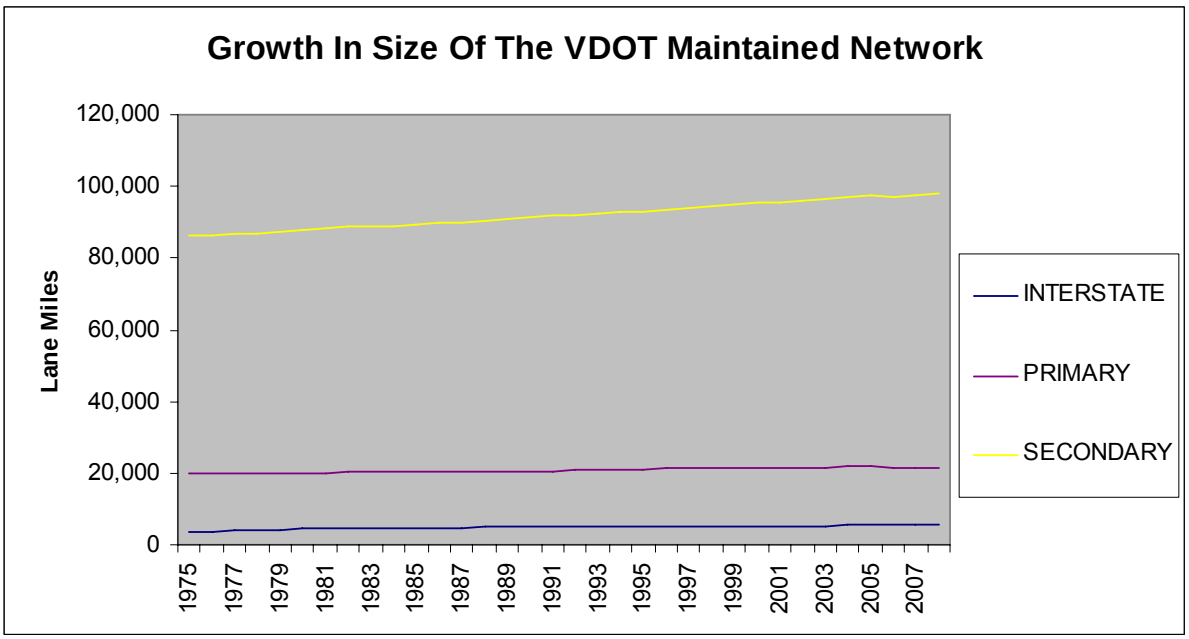


**Figure 1 VDOT Maintained Lane Miles from 1975 to 2008**

**Table 1 VDOT Maintained Network Lane Mileage from 1975 to 2008**

| | Interstate | % | Primary | % | Secondary & Frontage | % | Total | % |
|---|---|---|---|---|---|---|---|---|
| Lane Miles 1975 | 3,763 | | 19,726 | | 86,688 | | 110,177 | |
| Lane Miles Added and Percent Change | | | | | | | | |
| 1976-1985 | 923 | 24.5% | 567 | 2.9% | 3,361 | 3.9% | 4,850 | 4.4% |
| 1986-1995 | 500 | 13.3% | 848 | 4.3% | 3,818 | 4.4% | 5,166 | 4.7% |
| 1996-2005 | 189 | 5.0% | 814 | 4.1% | 4,378 | 5.1% | 5,381 | 4.9% |
| 2006-2008 | 20 | 0.5% | -313 | -1.6% | 474 | 0.5% | 182 | 0.2% |
| 1975-2008 | 1,632 | 43.4% | 1,916 | 9.7% | 12,031 | 13.9% | 15,579 | 14.1% |
| 2008 | 5,395 | | 21,642 | | 98,719 | | 125,756 | |

While the overall rate of growth of the VDOT maintained network has decreased in recent years, the network continues to grow by approximately 400 lane miles per year, even after accounting for the transfer of responsibility for maintenance to localities as part of the Suffolk City devolution, the effects of which can be seen in 2006 in Figure 2. The network's growth is largely due to Secondary subdivision lane miles built by developers being added to the system.

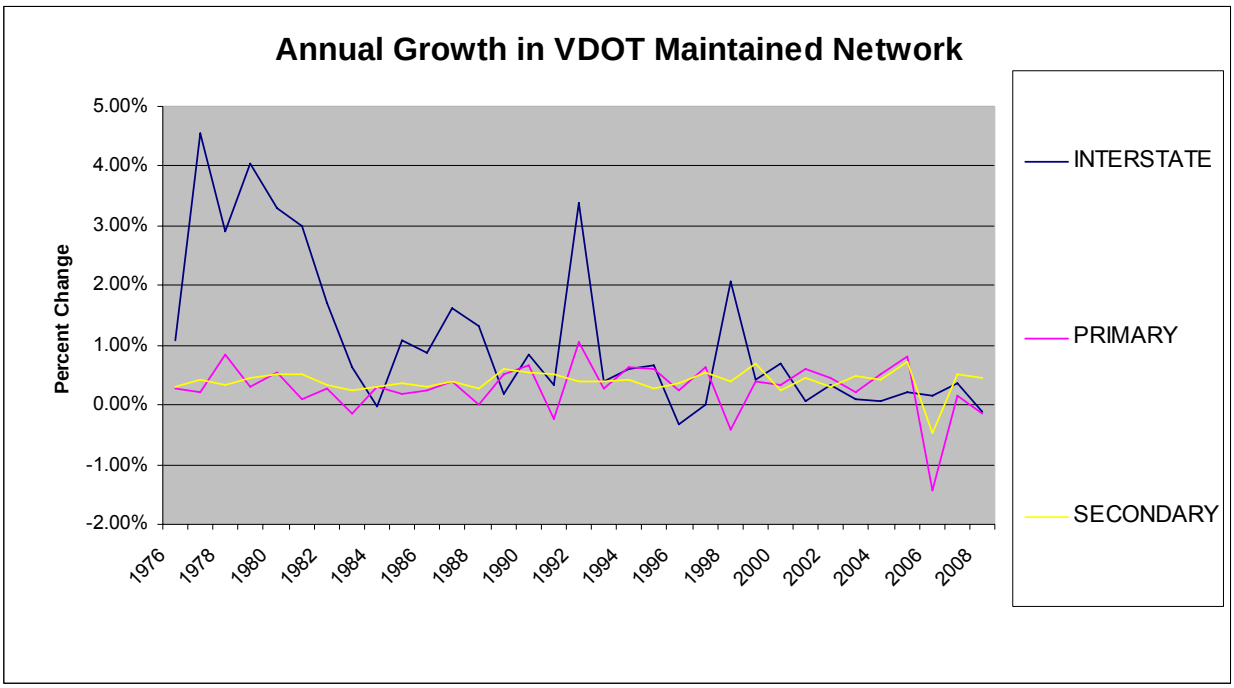


**Figure 2 Annual Percent Change in Size of VDOT Maintained Network by System**

**Growth in System Usage**

Usage of the state highway system has increased more rapidly than the size of the system. Figure 3 shows statewide annual vehicle miles traveled (VMT) by system from 1960 to 2008. The data clearly show the most significant increase in VMT on the Interstate system, corresponding to the initial construction and subsequent expansion of the Interstate system. The Primary system experienced the second greatest increase in VMT, followed by the Secondary system, and lastly, the non-VDOT maintained system. The non-VDOT maintained system consists primarily of Urban streets.

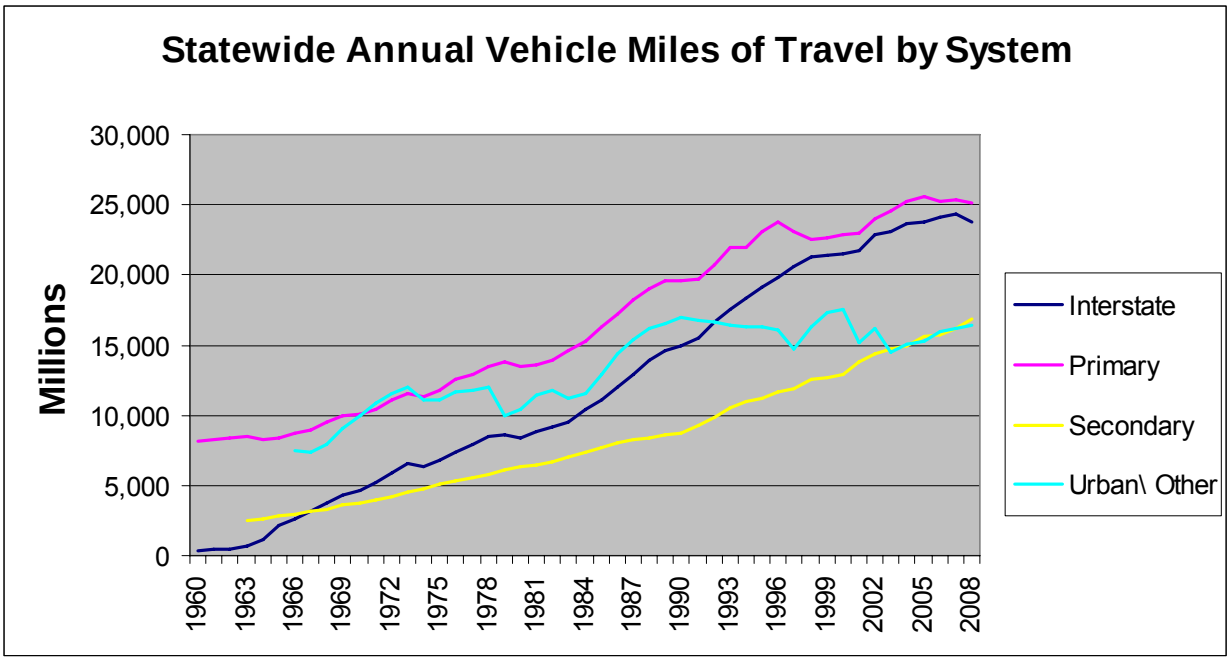


**Figure 3 Annual Vehicle Miles of Travel by System**

The data also show that in the last five to 10 years, increase in VMT has slowed dramatically on Interstate and Primary systems. In fact, VMT on the Interstate and Primary systems decreased between 2007 and 2008 by 2.2 percent and 0.9 percent respectively. The rate of growth in VMT on the Secondary system is unchanged over the same 10 year period. Table 2 below shows growth in vehicle miles of travel statewide by system.

**Table 2 Growth in Vehicle Miles of Travel Statewide by System**

| | All Systems Statewide | | Total VDOT System | | Interstate System | | Primary System | | Secondary System | | Non-VDOT System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Change | % Change | Change | % Change | Change | % Change | Change | % Change | Change | % Change | Change | % Change |
| 1961-1970 | 6,665 | 30.64% | 9,992 | 118.07% | 4,351 | 1310.54% | 1,930 | 23.74% | 1,242 | 48.08% | 2,471 | 32.98% |
| 1971-1980 | 10,113 | 35.59% | 9,688 | 52.50% | 3,695 | 78.90% | 3,392 | 33.71% | 2,601 | 70.09% | 425 | 4.27% |
| 1981-1990 | 21,646 | 56.18% | 15,054 | 53.49% | 6,568 | 78.40% | 6,088 | 45.25% | 2,398 | 37.99% | 6,592 | 63.45% |
| 1991-2000 | 14,623 | 24.30% | 14,077 | 32.59% | 6,598 | 44.15% | 3,272 | 16.74% | 4,207 | 48.30% | 546 | 3.22% |
| 2001-2008 | 7,480 | 10.00% | 8,555 | 14.94% | 2,270 | 10.54% | 2,287 | 10.02% | 3,999 | 30.96% | -1,075 | -6.13% |

## Economic Trends

Patterns of change in highway utilization are highly correlated with changes in economic activity, as can be seen from Figure 4. Periods of economic growth tend to correspond to periods with increased VMT. Likewise, periods of decreased economic activity correspond with slower growth in VMT. The severity of current economic conditions suggest it is very likely VMT growth will be negative for 2009 and continue to be flat or decrease further until economic conditions improve. A reduction in VMT means pavements and bridges will not deteriorate quite as rapidly as they would under higher traffic volume, which could impact future needs for those assets.

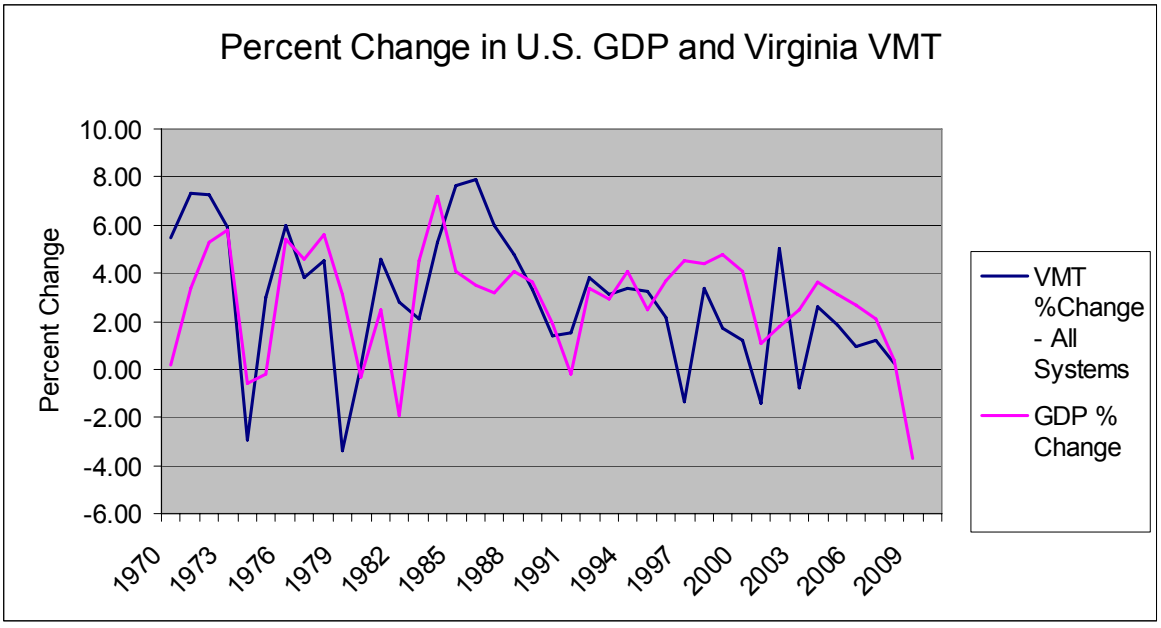


**Figure 4 Relationship Between GDP and Vehicle Miles of Travel**

**Trends in the Cost of Street and Highway Construction and Maintenance**

One factor contributing to VDOT's ability to maintain the highway system is the reduction in the department's buying power as measured by changes in the Producer Price Index (PPI) for Street and Highway Construction over the last several years. Five years ago, $10 million would have purchased 282 lane miles of pavement overlays; today, $10 million dollars purchases 177 lane miles of pavement overlays.

The rising cost of construction is also a contributing factor to the slowing rate of growth in the size of the state system of highways. The PPI for Street and Highway Construction shows that street and highway construction costs increased an average of two percent per year from 1986 to 2003, but increased to 10.3 percent per year from 2004 to 2008. The impact of such dramatic increases in costs in the last five years is that each year the same amount of funding purchases about 10 percent less maintenance and construction than it did the year before.

The PPI for Street and Highway Construction is weighted heavily by asphalt, which is influenced by crude oil prices. The PPI peaked in July 2008, around the same time crude oil prices peaked just under $150 per barrel. From July 2008 through April 2009, the PPI dropped more than 18 percent as crude oil prices plummeted to under $40 per barrel. Crude oil prices have rebounded to the $70 per barrel range since April 2009, and the PPI for Street and Highway Construction has also moved up slightly.

The Energy Information Administration forecasts oil prices to remain in the $70 to $75 per barrel range through 2010, after which prices will edge slightly higher as global economic activity and oil production slowly increase. Likewise, the PPI for Street and Highway Construction should also remain steady through most of 2010 and increase slightly toward the second half of 2010 and into 2011 and 2012.

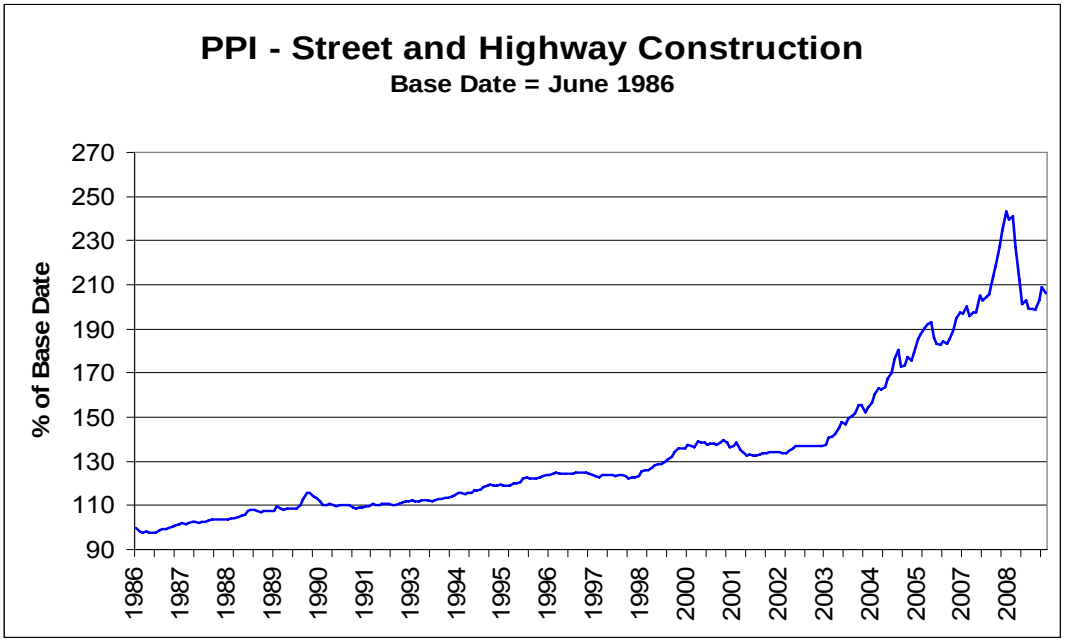


**Figure 5 Producer Price Index - Street and Highway Construction**

**Previous Allocations to Maintenance and Operations**

Allocations to the Maintenance and Operations Program rose steadily over the period from 1978 to 2002, even when adjusted for inflation as shown in Figure 6. However, while the nominal value of allocations to the Maintenance and Operations Program has continued to increase sharply since 2002, the real dollar value actually fell between 2002 and 2008, and only rose again in 2009. The real value of the Maintenance and Operations Program allocation grew 4.3 percent per year from 1986 to 2002, but grew only 0.8 percent per year between 2002 and 2009. The net effect is that since 2002, funding to the Maintenance and Operations Program has not been sufficient to keep pace with the rising cost of maintenance and operations work.

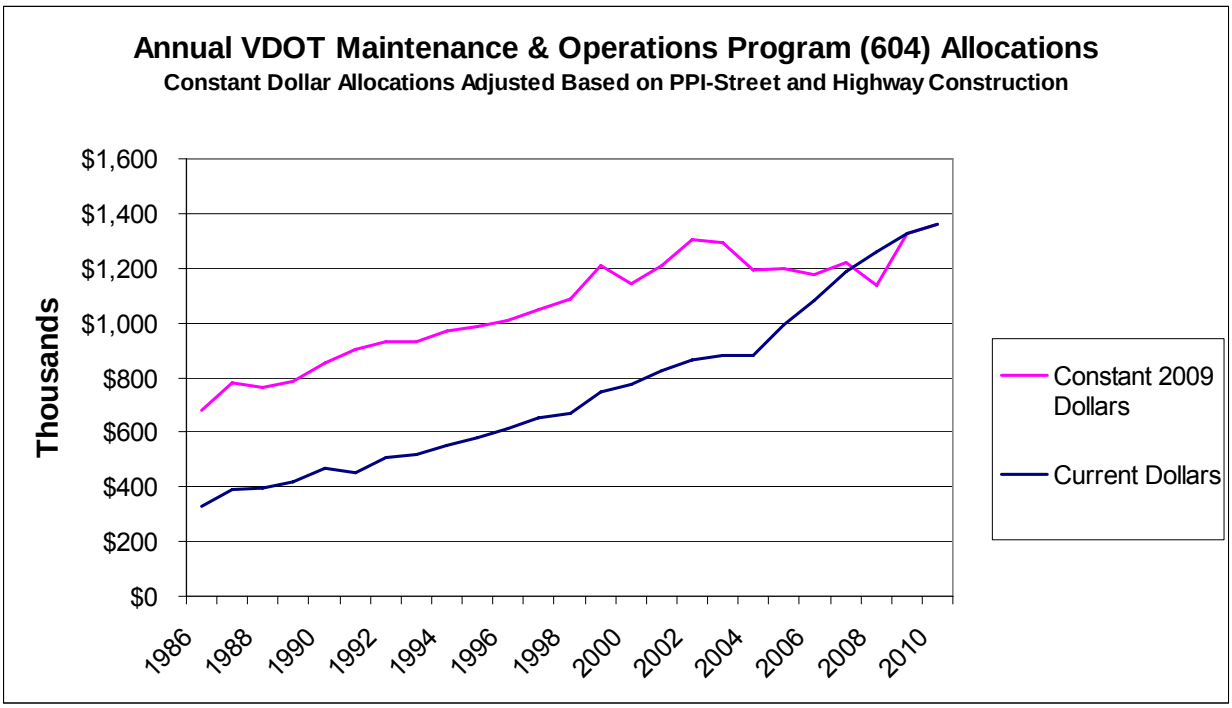


**Figure 6 Annual Program Allocation Shown in Current and Constant (2009) Dollars**

## *Emerging Issues*

**Age of the System**

- 11,465 (55 percent) of all bridge structures in Virginia are 40 years old or older.
- Most of Virginia's Interstate and Primary system lane miles were constructed over 30 years ago.
- Three of VDOT's eight tunnel tubes are 40 years old or older. Three others are over 30 years old.

**Technology**

- New vehicle technologies such as hybrids and electric cars and trucks are changing the composition of the vehicle fleet. As the proportion of vehicles with these technologies

grows, fuel tax revenues per vehicle mile of travel will decrease, impacting the availability of funds to address maintenance and operations needs.

- In-vehicle communications technologies will help improve safety and provide new traveler accessories and features. Future vehicle and roadside technologies will make it possible in the foreseeable future to measure VMT, regardless of the energy source of the vehicles.
- New technologies and changes in tax policy may affect driving behavior or demand for travel which could influence funds available for maintenance and operations.

**Energy and Environmental Policy**

- Global oil production is likely to peak in the next ten years. Consequently, gasoline and diesel prices will trend upward and volatility will likely get worse as supplies begin to diminish and disruptions become more common. Impacts to highway maintenance and operations include shifts in mode preferences affecting system utilization and volatility in fuel tax revenues to fund maintenance and operations.
- The U.S. is considering legislation to help reduce greenhouse gas emissions and other contributors to global warming. Federal legislation may include some form of mobile source carbon reduction policy (for example, a cap and trade program or carbon tax) similar to policies enacted in other countries. This could have an impact on the price of fuel and new vehicles, which may lead to changes in utilization of the state highways and investment needs for maintenance and operations.
- Current investments in rail and transit will impact future needs for additional roadway capacity improvements helping to reduce VMT, and hence the rate of deterioration on roads and bridges.
- Future air and fuel quality regulations will affect vehicle and fuel prices, and may result in greater operations investment needs to address congestion and mobile source contributors to air quality non-attainment.

**Customer Profile**

- Below are listed just a few of the demographic and customer profile factors that will impact travel demand and the need for funds to maintain and operate the existing surface transportation network:
    - Population growth – more people of driving age means more drivers on the road;
    - Economic prosperity – as the economy recovers, VMT will likely increase because increases in per capita disposable income tend to result in increased per capita travel demand;
    - As oil prices increase, customers will be likely to purchase more fuel efficient vehicles, further eroding revenues;
    - As the cost of transportation increases, more multi-modal trips will be made;
    - An aging population requiring improvements in signage, pavement marking and other assets for safety reasons;
    - Increased use of technology providing alternatives to business travel may decrease some travel demand; and
    - As changes in land use development encourage more compact development, travel demands and travel patterns will change.

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# Maintenance and Operations Needs Assessment

Virginia is experiencing the effects of a growing population and an aging transportation infrastructure. The challenge of preserving and operating the state's transportation system is exacerbated by decreasing tax revenues associated with current economic conditions. In response to these and other factors, VDOT has developed a Blueprint for the Future, which includes changes to the way maintenance and operations services are defined, assessed, and reported. The new operating framework establishes priorities and identifies performance standards for the delivery of maintenance and operations services within five major service areas, as shown in Figure 7. The framework also allows VDOT to more clearly show the relationship between investment needs and planned activities, thus providing greater accountability.

All maintenance and operations activities tracked by the agency have been classified as one of five Service Areas, and further classified as either "asset investments" or "services".


**Figure 7 VDOT Framework for Maintenance and Operations**

The framework is based on the following priorities:

- The safety of the traveling public is VDOT's first priority. All maintenance and operations activities shall focus first on the immediate safety of the traveling public
- The second priority in all maintenance and operations work is on those activities that contribute to the preservation of the roadway. The focus here is from the centerline out.

- Aesthetics, upgrades (construction), and other activities not directly contributing to the preservation of the roadway or to specific safety hazards will be addressed only after the first two priorities have been addressed.

## *Asset Investments*

Pavements, bridges and tunnels, signals, pavement markings, signs, guardrail, and technology assets are considered to be of such critical safety and operational importance that activities such as replacement, rehabilitation, major repairs, and preventive maintenance impacting their physical condition and consistent, reliable operation are classified as "asset investments". For example, sealing cracks in pavement, performance patching and pavement overlays, repairing bridge decks, replacing damaged guardrail, and replacing traffic signals are considered asset investments.

Investment activities performed on these assets are required to change the physical condition of the asset, to keep them in good operating condition, to preserve and extend useful life, and not simply to clean or repair a broken part.

Estimated investment needs for the FY 2011-2012 biennium shown in Table 3 are based on performance targets and service standards, as defined in Appendix B.

**Table 3 Estimated Asset Investment Needs for the Biennium FY 2011 - 2012**

| Asset Investment | | | FY 2011 $Million | FY 2012 $Million |
|---|---|---|---|---|
| Pavement | Interstate | | $119.1 | $113.6 |
| | Primary | | 251.6 | 249.7 |
| | Secondary | | 338.3 | 348.4 |
| | | **Sub-Total** | 708.9 | 711.7 |
| Bridges | Interstate | | 69.0 | 36.0 |
| | Primary | | 24.1 | 55.1 |
| | Secondary | | 19.6 | 22.9 |
| | | **Sub-Total** | 112.7 | 114.0 |
| Tunnels | Interstate | | 27.6 | 32.9 |
| | Primary | | 4.3 | 1.8 |
| | | **Sub-Total** | 32.0 | 34.7 |
| Traffic and Safety | Interstate | | 50.4 | 43.8 |
| | Primary | | 75.8 | 84.9 |
| | Secondary | | 32.1 | 33.1 |
| | | **Sub-Total** | 158.3 | 161.8 |
| Signal and Technology Assets | Interstate | | 40.0 | 14.4 |
| | Primary | | 35.9 | 31.0 |
| | Secondary | | 14.8 | 18.5 |
| | | **Sub-Total** | 90.6 | 64.0 |
| | | **Asset Investment Total** | $1,102.6 | $1,086.2 |

**Pavement**

Pavement Inventory

VDOT maintains more than 125,000 lane miles of Interstate, Primary, and Secondary system roadways. Table 4 shows the distribution of roads by system and by construction district.

**Table 4 VDOT Maintained Lane Miles of Roadway by District (2008)**

| District | Interstate | Primary | Paved Secondary | Unpaved Secondary | Frontage | Total |
|---|---|---|---|---|---|---|
| Bristol | 533 | 2,953 | 8,465 | 3,831 | 112 | 15,894 |
| Salem | 490 | 2,666 | 11,235 | 3,430 | 107 | 17,929 |
| Lynchburg | 0 | 2,798 | 9,684 | 2,678 | 35 | 15,195 |
| Richmond | 1,315 | 3,418 | 11,968 | 1,703 | 79 | 18,483 |
| Hampton Roads | 872 | 1,766 | 6,494 | 582 | 92 | 9,807 |
| Fredericksburg | 281 | 2,170 | 8,262 | 878 | 24 | 11,615 |
| Culpeper | 279 | 1,851 | 5,960 | 2,203 | 52 | 10,345 |
| Staunton | 942 | 2,472 | 7,542 | 2,940 | 74 | 13,969 |
| Northern Virginia | 684 | 1,548 | 9,426 | 781 | 81 | 12,520 |
| **Total** | 5,395 | 21,642 | 79,036 | 19,025 | 658 | 125,756 |

Pavement Performance Measures and Targets

Investment needs for pavements are based on two performance measures and targets shown in Table 5, percent of Interstate and Primary system pavements in fair or better condition, and percent of Interstate and Primary system pavements with fair or better ride quality. The target is to have at least 82 percent of Interstate and Primary system pavements in fair or better condition, and at least 85 percent of Interstate and Primary system pavements with fair or better ride quality. These targets were set in 2004 and reflected current conditions at that time. The investment needs presented here are based on each district achieving the performance target on Interstate and Primary system pavements. The assessment also assumes that all pavement work ongoing in the summer of 2009 is completed as planned. This includes projects funded through the Maintenance and Operations Program as well as projects funded through the American Recovery and Reinvestment Act (ARRA), which will improve more than 435 lane miles of pavement.

A digital pavement condition assessment is conducted each year on 100 percent of Interstate and Primary pavements and on a statistically representative sample of 20 percent to 25 percent of Secondary system pavements in every county in the state (except Arlington and Henrico). After three years using this technology, nearly 70 percent of Secondary system pavements have now been assessed. Assessment of the remainder of Secondary system pavements should be completed by 2011. Pavement condition data are collected using vehicles outfitted with state of the practice equipment to measure roughness, rutting, cracking, and other physical distresses. The data are summarized into a numerical index called Critical Condition Index (CCI) that ranges from 0 to 100, where 100 represents the best condition (i.e., no distresses at all on pavement surface). Pavements with a CCI below 60 are considered to be in deficient condition, which means that they are candidates for some type of maintenance activity.

**Table 5 Pavement Performance Measures, Targets and Current Performance**

| Measure | Target | Current Performance |
|---|---|---|
| Percent of Interstate and Primary system pavements in fair or better condition (CCI ≥ 60) | ≥ 82 percent | 76 percent |
| Percent of Interstate and Primary system pavements with fair or better ride quality (IRI ≥ 140) | ≥ 85 percent | 89 percent |

Pavement ride quality is measured by the International Roughness Index (IRI), a dimensionless quantity used for measuring road roughness and proposed as an international standard by the World Bank. A pavement section with an IRI value less than 140 is termed to have a fair or better ride quality for Interstate and Primary pavements. The current performance target for pavement ride quality is that no less than 85 percent of the Interstate and Primary pavements will have fair or better ride quality. The target is based on benchmarking with other states.

Pavement Conditions

Figure 8 below shows statewide Interstate, Primary and Secondary system pavement conditions from 2007 to 2009. Secondary system pavement conditions are based on an annual assessment of 20 percent to 25 percent of roads in each county (except Henrico and Arlington). Note that after three years, data has been collected on approximately 70 percent of the Secondary system. VDOT plans to assess the entire Secondary system by 2011.

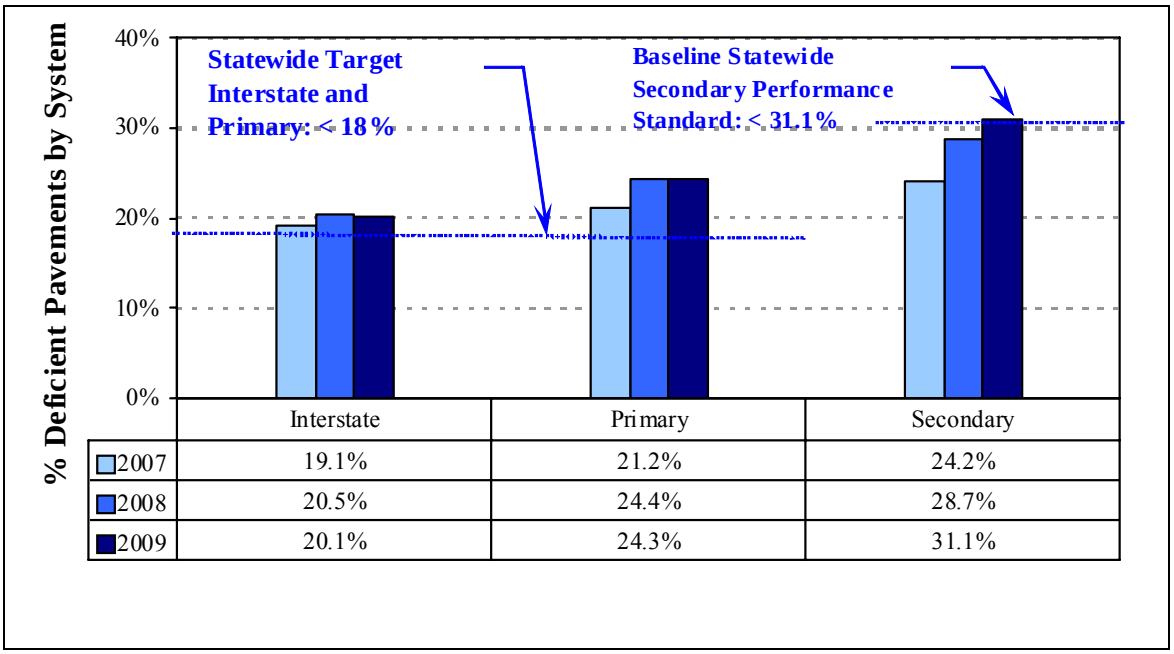


**Figure 8 Statewide Percent Deficient Pavements by System**

The 2009 pavement condition survey found that 20.1 percent of Interstate, 24.3 percent of Primary, and 31 percent of Secondary pavements are deficient statewide (meaning that the pavements are in poor or very poor condition, defined as having a CCI of < 60). This is greater than the established performance target of no more than 18 percent of Interstate and Primary system pavements in deficient condition statewide. The 2009 pavement condition survey was conducted in the spring of 2009; hence, the pavement maintenance and rehabilitation work completed during the summer of 2009 is not reflected in the condition ratings. Table 6 shows percent deficient pavements in each district by system.

**Table 6 Pavement Condition by District and System in 2009**

| | Interstate | | Primary | | Secondary | |
|---|---|---|---|---|---|---|
| **District** | **Deficient Lane Miles** | **Percent Deficient** | **Deficient Lane Miles** | **Percent Deficient** | **Deficient Lane Miles*** | **Percent Deficient*** |
| Bristol | 156.5 | 29.1% | 546.4 | 18.8% | 506.4 | 31.6% |
| Salem | 75.9 | 15.4% | 649.7 | 25.0% | 492.8 | 25.6% |
| Lynchburg | | | 359.5 | 13.1% | 610.2 | 25.0% |
| Richmond | 293.7 | 22.8% | 804.2 | 24.2% | 699.1 | 30.0% |
| Hampton Roads | 172.9 | 22.2% | 537.6 | 31.1% | 516.3 | 35.2% |
| Fredericksburg | 77.5 | 27.9% | 705.6 | 32.5% | 518.3 | 37.1% |
| Culpeper | 39.0 | 14.0% | 302.1 | 16.6% | 399.8 | 30.0% |
| Staunton | 104.0 | 11.0% | 549.0 | 22.2% | 390.3 | 26.5% |
| Northern Virginia | 133.8 | 21.2% | 741.6 | 44.8% | 657.4 | 46.1% |
| **Statewide** | 1,053.3 | 20.1% | 5,196.7 | 24.3% | 4,790.6 | 31.1% |

*Condition survey was performed on approximately 20 percent of the hard-surfaced Secondary pavement network with sample pavement sections from every county.

Statewide, 93.3 percent of Interstate and 87.0 percent of Primary pavements were rated to have a fair or better ride quality based on the last condition evaluation performed in 2009. Table 7 shows the percent of each district's network with fair or better ride quality by system.

**Table 7 Percent of District Network with Fair or Better Ride Quality in 2009**

| District | Interstate | Primary |
|---|---|---|
| Bristol | 99.3% | 79.3% |
| Salem | 98.3% | 90.9% |
| Lynchburg | | 95.3% |
| Richmond | 90.4% | 85.4% |
| Hampton Roads | 80.5% | 89.7% |
| Fredericksburg | 95.7% | 88.9% |
| Culpeper | 97.6% | 97.3% |
| Staunton | 99.4% | 88.4% |
| Northern Virginia | 93.0% | 64.4% |
| **Statewide** | **93.3%** | **87.0%** |

Pavement Investment Needs

Table 8 below presents the investment required to meet the pavement performance targets for the Interstate and Primary systems by June 2011 and 2013, respectively, and to maintain the current performance on the Secondary system. For Interstate and Primary system pavement, investment needs are determined based on the current condition of each section of pavement, cost of the treatment that provides the highest benefit/cost ratio for that section of pavement, and the least cost set of treatments across all pavement sections that will meet the following constraints set for each district:

- At least 82 percent of district Interstate and Primary system pavements have CCI ≥ 60 by end of FY 2011 and FY 2013, respectively
- Maintain current percent of sufficient pavements in districts where more than 82 percent of Interstate and Primary system pavements are in sufficient condition (CCI ≥ 60: based on the 2009 condition assessment)
- No more than 10 percent of district Interstate and Primary system pavements in a condition state that requires reconstruction
- Maintain the current average CCI for district Interstate and Primary system pavement

Interstate and Primary system pavements will require an investment of $734 million over the FY 2011-2012 biennium to meet currently established pavement performance targets so that no more than 18 percent of pavements are deficient. With this level of funding, the performance target for Interstate pavements would be met in 2011 and the performance target for Primary pavements would be met in 2013. However, current FY 2010 funding for the two systems combined is approximately $350 million. An additional amount of more than $33 million would be needed for the biennium to meet this level of performance.

Investment needs for Secondary system hard surfaced pavements are estimated based on cyclical needs of maintenance activities using a life cycle cost analysis approach and on maintaining the current condition of 31 percent of lane miles in deficient condition statewide. The same procedure is adopted for paved shoulders. If this performance level were to be funded, the Secondary system pavements would require an estimated $687 million investment over the FY 2011-2012 biennium. At the current level of funding, Secondary system pavements are estimated to continue to deteriorate at a minimum of three percent annually.

**Table 8 Biennial Pavement Investment Needs**

| Asset Investment | | FY 2011 $Million | FY 2012 $Million |
|---|---|---|---|
| Pavements | Interstate | $119.1 | $113.6 |
| | Primary | 251.6 | 249.7 |
| | Secondary | 338.3 | 348.4 |
| | **Total** | 708.9 | 711.7 |

## Bridges

Bridge Inventory

There are 20,920 bridges and bridge structures in Virginia, 13,228 of which structures are included in the National Bridge Inventory (NBI) and 19,394 of which structures are maintained by VDOT. Table 9 and Table 10 provide information on the distribution of bridges and large culverts in Virginia by roadway system and by construction district.

**Table 9 Number of Bridges and Large Culverts in Virginia as of July 7, 2009**

| Funding System | VDOT | | | Non-VDOT | | | All (VDOT and Non-VDOT | | |
|---|---|---|---|---|---|---|---|---|---|
| | Bridge | Culvert | Total | Bridge | Culvert | Total | Bridge | Culvert | Total |
| Interstate | 1,938 | 1,076 | 3,014 | 1 | 0 | 1 | 1,939 | 1,076 | 3,015 |
| Primary | 2,860 | 2,171 | 5,031 | 62 | 8 | 70 | 2,922 | 2,179 | 5,101 |
| Secondary | 7,081 | 4,271 | 11,352 | 114 | 87 | 201 | 7,195 | 4,358 | 11,553 |
| Urban | 0 | 0 | 0 | 838 | 328 | 1,166 | 838 | 328 | 1,166 |
| Other* | 0 | 0 | 0 | 55 | 30 | 85 | 55 | 30 | 85 |
| Total | 11,879 | 7,518 | 19,397 | 1,070 | 453 | 1,523 | 12,949 | 7,971 | 20,920 |

* Represents privately owned/maintained structures such as Metropolitan Washington Airports Service, Dulles Toll Road, etc.

**Table 10 VDOT Maintained Bridges and Large Culverts By District and System**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 258 | 898 | 2,008 | 3,164 |
| Salem | 274 | 724 | 1,873 | 2,871 |
| Lynchburg | 0 | 600 | 1,402 | 2,002 |
| Richmond | 719 | 656 | 1,024 | 2,399 |
| Hampton Roads | 535 | 255 | 466 | 1,256 |
| Fredericksburg | 106 | 239 | 450 | 795 |
| Culpeper | 147 | 483 | 1,012 | 1,642 |
| Staunton | 529 | 758 | 2,068 | 3,355 |
| Northern Virginia | 446 | 418 | 1,049 | 1,913 |
| Total | 3,014 | 5,031 | 11,352 | 19,397 |

Bridge Performance Measure, Target and Current Condition

In accordance with the Code of Federal Regulations, VDOT inspects bridges and culverts that are part of the NBI, which includes structures on public roadways and exceeding 20 feet in length measured along the centerline of the roadway. NBI structures receive detailed inspections at regular intervals not exceeding 24 months. In addition to the federal inventory and inspection requirements, VDOT also inventories and inspects bridges measuring 20 feet or less in length and large culverts having an opening of 36 square feet or greater. These are the only structures not in the NBI, and they are inspected at intervals not exceeding 48 months. Inspectors use condition ratings to describe each existing, in-place structure as compared to its as-built condition. These condition ratings are based on the Federal Highway Administration's (FHWA) criteria.

VDOT uses FHWA's criteria for identifying deficient or functionally obsolete structures, as defined below:

- Structurally Deficient - a structurally deficient bridge is one that (1) has been restricted to light vehicles only, (2) is closed to traffic, or (3) requires rehabilitation. The condition of different parts of a bridge are rated on a scale of 0 to 9, with a 9 being "excellent" and a 0 being "failed". A structurally deficient bridge is one for which the deck, the superstructure, or the substructure is rated 4 or less.
- Functionally Obsolete – a functionally obsolete bridge is one for which the deck geometry, load carrying capacity, clearances, or approach roadway alignment no longer meets today's standards.
- Sufficiency Rating - a formula developed by FHWA to rank bridges and allocate federal bridge rehabilitation funds. A sufficiency rating of a bridge varies from 0 (poor) to 100 (very good). The formula considers a bridge's structural adequacy, functional obsolescence and level of service, and essentiality for public use.

**Table 11 Bridge Performance Measure, Target and Current Performance**

| Measure | Target | Current Performance |
|---|---|---|
| Percent of bridges in fair or better condition (not structurally deficient) | ≥ 92 percent | 91 percent |

Bridge Conditions

Currently, 11,465 (55 percent) of all structures (bridges and large culverts) in Virginia are 40 years old or older, as shown in Figure 9 below.

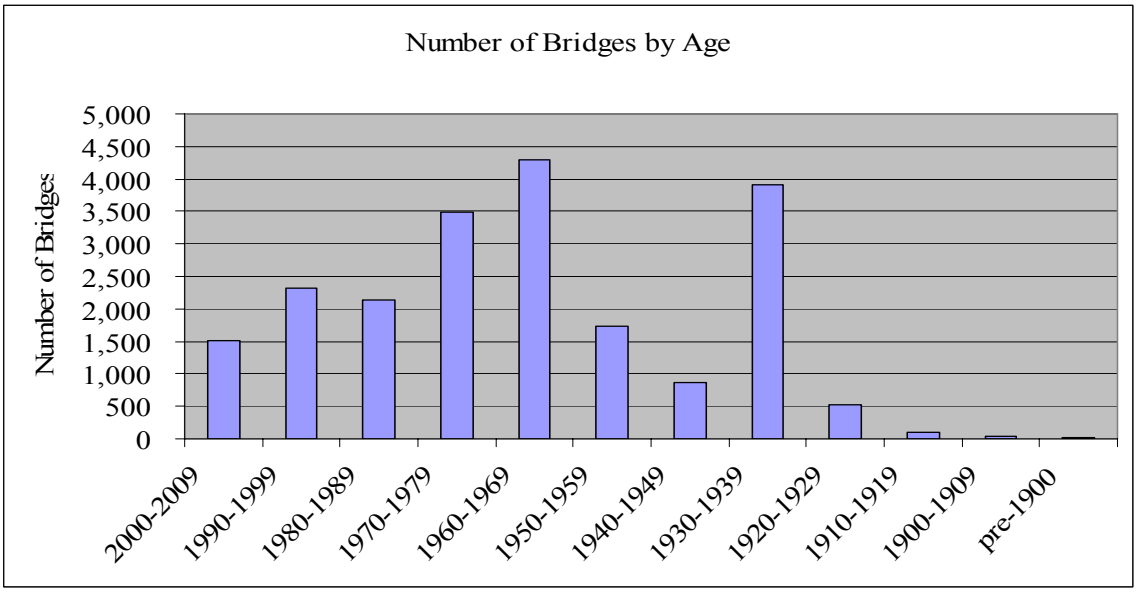


**Figure 9 Distribution of Structures by Age**

Table 12 presents the inventory of structurally deficient bridges and large culverts in Virginia by district.

**Table 12 Virginia's Inventory of Structurally Deficient Bridges and Culverts by System[1]**

| District | Interstate | Primary | Secondary | Urban | Other | Total |
|---|---|---|---|---|---|---|
| Bristol | 16 | 68 | 274 | 26 | 0 | 384 |
| Salem | 19 | 46 | 306 | 9 | 0 | 380 |
| Lynchburg | 0 | 26 | 167 | 11 | 0 | 204 |
| Richmond | 32 | 43 | 129 | 10 | 0 | 214 |
| Hampton Roads | 6 | 15 | 22 | 31 | 0 | 74 |
| Fredericksburg | 5 | 18 | 42 | 4 | 0 | 69 |
| Culpeper | 1 | 12 | 97 | 4 | 1 | 115 |
| Staunton | 7 | 43 | 234 | 8 | 0 | 292 |
| Northern Virginia | 6 | 13 | 42 | 0 | 0 | 61 |
| Total | 92 | 284 | 1,313 | 103 | 1 | 1,793 |

[1] Includes 145 structures (primarily in Urban and Other) that are not maintained by VDOT

Figure 10 below shows the distribution of bridges by their sufficiency rating and the number recommended for replacement or rehabilitation. Bridges with sufficiency ratings below 80 are eligible for federal bridge rehabilitation funds.

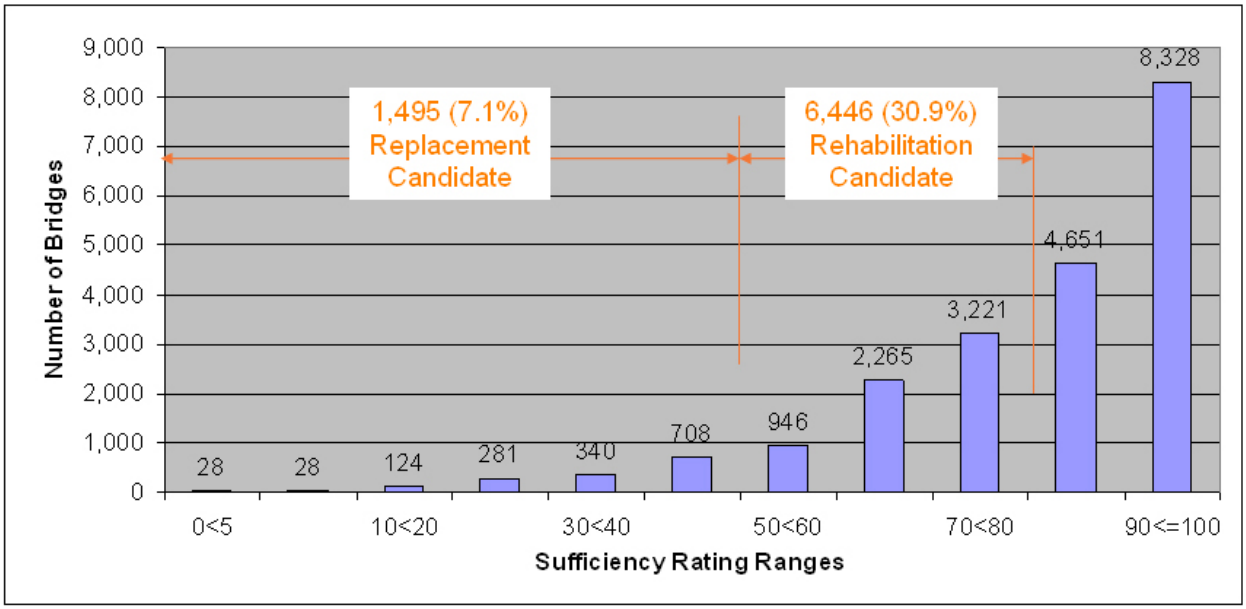


**Figure 10 Distribution of Bridge Sufficiency Ratings Identifying Candidates for Replacement and Rehabilitation**

Bridge Investment Needs

Table 13 presents the investment required to meet the bridge performance target by June 2012. Bridge investment needs are determined based on the condition of each component of each bridge (from information in bridge inspection reports), unit costs of alternative maintenance treatments for each bridge, and the least cost set of maintenance treatments across all bridges that result in each district meeting the bridge performance target. The optimal set of maintenance treatments is found by performing a computer optimization iteratively in the Bridge Management System with alternate program funding levels to find the funding level that generates the desired performance outcome.

**Table 13 Biennial Bridge Investment Needs**

| Asset Investment | | FY 2011 $Million | FY 2012 $Million |
|---|---|---|---|
| Bridges | Interstate | $69.0 | $36.0 |
| | Primary | 24.1 | 55.1 |
| | Secondary | 19.6 | 22.9 |
| | **Total** | $112.7 | $114.0 |

## Tunnels

Inventory

Tunnels are complex assets with large industrial mechanical systems and components for power, ventilation, lighting, fire suppression, drainage, communications, and operations. VDOT operates six tunnel facilities - four river tunnels and two mountain tunnels. Table 14 presents tunnel age, route, and traffic volume data for each tunnel facility. The Hampton Roads Bridge and Downtown Elizabeth River tunnels each have tubes that were built at different times. The age of each tube is shown in the table.

**Table 14 Average Daily Traffic Volume at Each Tunnel**

| Tunnel | Tunnel Age (Years) | Route | Average Daily Traffic Volume[1] (# of vehicles) |
|---|---|---|---|
| Hampton Roads Bridge Tunnel | 52, 33 | I-64 | 90,000 |
| Midtown Elizabeth River Tunnel | 47 | Rt. 58 | 34,000 |
| Downtown Elizabeth River Tunnel | 57, 22 | I-264 | 90,000 |
| Monitor-Merrimac Memorial Bridge Tunnel | 17 | I-664 | 56,000 |
| Big Walker Mountain Tunnel | 37 | I-77 | 26,000 |
| East River Mountain Tunnel | 35 | I-77 | 26,000 |

[1] Traffic volumes rounded to the nearest 1,000 vehicles per day

Tunnel Conditions.

Ongoing tunnel inspections are conducted at all facilities by a special tunnel inspection team within VDOT to assess conditions and recommend maintenance repairs, reconditioning, and replacements of the various systems and components required to be kept in good operating condition and to maintain the security of these facilities. Also, consultant services have been used to assess conditions for each of the systems within the tunnels and make recommendations for work needed.

Tunnel Investment Needs

The above mentioned tunnel inspection reports have identified approximately $60 million in maintenance repair and replacement work needed to bring VDOT's tunnels into compliance with Fire, Life, and Safety standards, and includes other major mechanical and industrial system rehabilitation work, such as replacing 30 year old communications lines and software systems, replacing ceiling tiles, lighting fixtures, and valves, and installing new drives. The work is being planned and scheduled over the next six years. The investment needs for tunnels shown in Table 15 below incorporate work planned for FY 2011 and FY 2012.

**Table 15 Biennial Investment Needs for Tunnels**

| Tunnel Investment Needs | System | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Tunnels | Interstate | $27.6 | $32.9 |
| | Primary | 4.3 | 1.8 |
| | Total | $32.0 | $34.7 |

## Traffic and Safety Asset Investments

Traffic and Safety asset investments include major repair and replacement of signs, pavements marking and markers, and guardrail. Biennial investment needs for traffic and safety assets are $158 million in FY 2011 and $162 million in FY 2012 as shown in Table 16. Needs for individual traffic and safety assets are presented below.

**Table 16 Biennial Investment Needs for Traffic and Safety Assets**

| Asset Investment Needs | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Traffic and Safety Assets | Interstate | $50.4 | $43.8 |
| | Primary | 75.8 | 84.9 |
| | Secondary | 32.1 | 33.1 |
| | Sub-Total | $158.3 | $161.8 |

### Signs

Standard traffic signs are regulated in size, color, shape, and message by the federal government, and conform to FHWA's Manual on Uniform Traffic Control Devices (MUTCD). At VDOT, signs are typically made of 0.100 gauge aluminum, covered with reflective sheeting, and contain either a silk-screened or pressed on reflective message or image. A sign typically has a warranty of 12 years for the reflectivity of the panel. VDOT uses standard and custom signs on the roadway, which include more than 10,000 sign types ranging from deer crossing to speed limit signs. Sign supports are part of the sign assembly, and can be made of either metal or wood.

#### Sign Inventory

Prior to this needs assessment, estimates of sign inventory and condition were based on a random condition survey performed every two years. For this needs assessment, digital video collected as part of the 2008 pavement condition assessment was used to provide an inventory of signs on 100 percent of the Interstate and Primary systems and approximately 20 percent of the Secondary system. The sample from the Secondary system was extrapolated to provide an estimate of the entire Secondary system sign inventory. The results of the recent data collection effort indicate that signs were undercounted in previous needs assessments by approximately 40 percent.

Current information on sign inventory is shown in Table 17. Signs are not distributed evenly by system as can be seen when compared to the distribution of lane miles shown in Table 4. Although the Interstate accounts for just over four percent of total lane miles, eight percent of all signs are on the Interstate. The Primary system accounts for just over 17 percent of total lane

miles, but has 37 percent of all signs. The Secondary system, which accounts for about 80 percent of all lane miles, has the lowest density of signs.

**Table 17 VDOT Sign Inventory by System**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 5,985 | 30,770 | 31,062 | 67,817 |
| Salem | 6,477 | 38,499 | 49,448 | 94,424 |
| Lynchburg | 0 | 35,981 | 32,229 | 68,211 |
| Richmond | 11,295 | 32,989 | 52,168 | 96,452 |
| Hampton Roads | 9,411 | 22,961 | 19,397 | 51,769 |
| Fredericksburg | 2,630 | 30,967 | 35,754 | 69,351 |
| Culpeper | 2,243 | 26,937 | 35,174 | 64,354 |
| Staunton | 9,529 | 30,158 | 41,897 | 81,584 |
| Northern Virginia | 12,665 | 23,610 | 111,163 | 147,437 |
| Total | 60,234 | 272,873 | 408,293 | 741,400 |

Sign Condition

Condition information for signs was last collected by the 2007 random condition survey. That assessment indicated that 92 percent, 95 percent, and 90 percent of signs on the Interstate, Primary and Secondary systems, respectively, were in conditions that required no work.

Sign maintenance is generally performed by VDOT with the exception of ordinary repairs to signs on the Interstate system, which are performed by Turnkey Asset Management Services (TAMS) contractors. Biennial investment needs for signs, shown in Table 18, are based on the estimated inventory of sign assemblies on each roadway category, expected useful life, and frequency of maintenance activity to meet the service standards on each roadway category.

Sign Investment Needs

As shown in Table 18, the biennial needs for signs by system are estimated at approximately $98 million.

**Table 18 Biennial Investment Needs for Signs**

| Asset Investment Needs | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Signs | Interstate | $23.1 | $15.7 |
| | Primary | 15.1 | 22.3 |
| | Secondary | 10.6 | 11.0 |
| | Sub-Total | 48.8 | 49.0 |

Pavement Marking

Pavement markings are non-durable (latex paint) or durable (epoxy, thermoplastic, or tape) lines which demark lanes of traffic from one another, or the edge of the traveling roadway from the shoulder. Pavement marking lines can be of varying widths and color. Width and design type

of markings for traffic lanes is dictated by MUTCD, and includes “solid”, “skip”, “double solid” or “passing zone” (solid/skip).

In terms of VDOT standards and practices, only durable pavement markings (epoxy, thermoplastic, or tape) are applied to Interstate roadways. Typically, durable markings are also applied to high volume Primary roads, with latex paint applied predominantly on Primary and Secondary roads. Currently, thermoplastic paint is the most commonly used pavement marking material (close to 50 percent).

VDOT is responsible for all pavement marking application and maintenance, except for markings applied by TAMS contracts as part of minor pavement repairs. Most pavement marking is associated with plant mix pavement schedules, since all new pavement surfaces must be marked.

Pavement Marking Inventory

Estimates of pavement marking inventory and condition in the 2007 biennial needs report were based on extrapolated data from the 2007 random condition survey. No new inventory data has been collected for pavement marking. However, an approximation of VDOT’s pavement marking inventory can be derived using pavement inventory and policies regarding the application of pavement marking. The derived pavement marking inventory is shown in Table 19.

There are estimated to be over 45,000 miles of pavement markings on VDOT maintained roads, distributed by system and district as shown in Table 19. A majority of pavement markings are thermoplastic materials (48 percent), while 28 percent are tape, and 23 percent are latex.

**Table 19 Miles of Pavement Marking by District and System**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 605 | 5,063 | 98 | 5,766 |
| Salem | 577 | 4,286 | 348 | 5,211 |
| Lynchburg | 0 | 4,393 | 208 | 4,602 |
| Richmond | 1,429 | 5,213 | 667 | 7,310 |
| Hampton Roads | 945 | 2,828 | 183 | 3,955 |
| Fredericksburg | 251 | 3,230 | 319 | 3,800 |
| Culpeper | 328 | 3,069 | 167 | 3,563 |
| Staunton | 1,115 | 4,277 | 187 | 5,579 |
| Northern Virginia | 686 | 2,123 | 2,618 | 5,428 |
| Total | 5,936 | 34,482 | 4,797 | 45,215 |

Pavement Marking Condition

As stated above, a statewide inventory and condition assessment was last performed on pavement markings in 2007. That assessment indicated that 69.4 percent, 33.5 percent, and 28.3

percent of pavement markings on the Interstate, Primary, and Secondary systems, respectively, were in conditions that required no work.

Pavement Marking Investment Needs

Investment needs for pavement marking, shown in Table 20, are based on the known inventory of paved roadway, policies regarding the application of pavement marking, and unit costs for each type of pavement marking material. For example, the paving cycle on Interstate pavements is approximately 12 years. Interstate pavement requires six inch tape to be applied when the pavement is resurfaced (embedded in the new pavement). Tape lasts approximately six years, after which thermoplastic or epoxy marking, which each last about three years, should be applied in year six and again in year nine. Hence, each year, the equivalent of $1/12^{th}$ of the Interstate network can be expected to require pavement marking equal to the cost of tape plus two times the cost of thermoplastic or epoxy. Similar policy based rules for the Primary and Secondary systems were used to derive investment needs for pavement marking.

**Table 20 Biennial Investment Needs for Pavement Marking**

| Asset Investment Needs | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Pavement Marking | Interstate | $19.7 | $20.3 |
| | Primary | 40.8 | 42.1 |
| | Secondary | 4.1 | 4.3 |
| | Sub-Total | 64.7 | 66.7 |

Pavement Messages

Pavement messages are markings of words or easily-recognized standard symbols on the pavement that complement signs and provide information about regulations pertaining to a lane or an approach to an intersection, a warning of conditions ahead, or guidance on what lane to use to reach certain destinations, routes, or directions. VDOT is responsible for all pavement message application and maintenance.

Pavement Message Inventory

Prior to this needs assessment, the statewide inventory of pavement messages was unknown Based digital video data collection conducted as part of the 2008 pavement condition assessment, there are estimated to be over 144,000 pavement messages on VDOT maintained roads, distributed as shown in Table 21 below. Seventy-one percent of pavement messages are on the Secondary system, followed by 28 percent on the Primary system. Pavement messages in Northern Virginia and Richmond districts combined represent over half (55 percent) of VDOT's pavement message inventory.

**Table 21 Number of Pavement Messages by District and System**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 99 | 2,473 | 3,673 | 6,244 |
| Salem | 415 | 4,119 | 6,422 | 10,956 |
| Lynchburg | - | 1,916 | 2,473 | 4,389 |
| Richmond | 179 | 6,666 | 12,641 | 19,486 |
| Hampton Roads | 517 | 5,196 | 3,096 | 8,809 |
| Fredericksburg | 71 | 4,247 | 8,261 | 12,580 |
| Culpeper | 29 | 2,701 | 7,881 | 10,611 |
| Staunton | 155 | 5,147 | 5,581 | 10,882 |
| Northern Virginia | 488 | 7,966 | 51,971 | 60,425 |
| Total | 1,953 | 40,430 | 101,999 | 144,383 |

Pavement Message Condition

With inventory data now available, investment needs are based on unit costs and life-cycle replacement schedules. Messages, like pavement markings must be replaced when pavement is resurfaced and at other intervals when materials lose their reflectivity. Like pavement marking, similar business rules were applied to determine when messages should be replaced.

Pavement Message Investment Needs

Investment needs, shown in Table 22, were derived by applying the business rules and unit costs to the inventory data now available.

**Table 22 Biennial Investment Needs for Pavement Messages**

| Asset Investment Needs | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Pavement Messages | Interstate | $0.1 | $0.2 |
| | Primary | 2.3 | 2.3 |
| | Secondary | 5.7 | 5.9 |
| | Sub-Total | 8.0 | 8.4 |

Pavement Markers

Pavement Marker Inventory

Pavement markers are small reflective devices typically adhered to the road surface to identify centerlines, edge lines, and other road elements or features. For this needs assessment, a statewide inventory of pavement markers was estimated using a similar approach as for pavement markings. Estimates of the inventory, shown in Table 23, are based on the lane miles of pavement and policies guiding where markers should be used. Markers are predominately used on Interstate and Primary system roads.

**Table 23 Number of Pavement Markers by District and System**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 18,561 | 40,047 | 127 | 58,735 |
| Salem | 17,051 | 52,093 | 1,184 | 70,328 |
| Lynchburg | - | 47,395 | 289 | 47,684 |
| Richmond | 53,001 | 75,044 | 8,862 | 136,907 |
| Hampton Roads | 36,549 | 41,820 | 993 | 79,362 |
| Fredericksburg | 12,394 | 49,143 | 2,598 | 64,135 |
| Culpeper | 9,215 | 26,104 | 2,009 | 37,328 |
| Staunton | 31,111 | 35,442 | 448 | 67,001 |
| Northern Virginia | 30,880 | 51,772 | 55,862 | 138,514 |
| Total | 208,762 | 418,860 | 72,372 | 699,994 |

Pavement Marker Conditions

Where recommended, markers are replaced each time the pavement is resurfaced. Depending on the system, traffic volumes and other factors, pavement is typically resurfaced every nine to twelve years. During the period between each resurfacing, pavement marker lenses should be replaced every three years.

Pavement Marker Investment Needs

The investment needed to maintain and replace pavement markers is based on lens replacement and marker replacement at intervals recommended by best practice policies. Table 24 shows the pavement marker investment needs for FY 2011 and FY 2012.

**Table 24 Biennial Investment Needs for Pavement Markers**

| Asset Investment Needs | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Pavement Markers | Interstate | $1.9 | $2.0 |
| | Primary | 3.9 | 4.0 |
| | Secondary | 0.7 | 0.7 |
| | Sub-Total | 6.5 | 6.7 |

Guardrail

Guardrail is a barrier installed on the right-of-way to reduce the potential for, and severity of, accidents involving vehicles running off the road. Guardrail is designed to gently contain, hold and redirect a vehicle back onto the roadway if it should leave the travel lane. It is an important safety feature of any roadway system and should have minimal deficiencies in order to perform properly.

Guardrail Inventory

Prior to this needs assessment, estimates of guardrail inventory and condition were based on a random condition survey performed every two years. For this needs assessment, digital video collected as part of the 2008 pavement condition assessment was used to provide an inventory of guardrail on 100 percent of the Interstate and Primary systems and approximately 20 percent of the Secondary system. The sample from the Secondary system was extrapolated to provide an estimate of the entire Secondary system guardrail inventory. The results of the recent data collection effort indicate that guardrail was undercounted in previous needs assessments by approximately 16 percent.

Based on the recent data collection effort, there are an estimated 6,286 miles of guardrail on VDOT maintained roads, distributed by district and system as shown in Table 25. Federal standards for guardrail have changed several times over the last 40 years and as a result, VDOT has several different types of guardrail on the roadway system, including. GR-2, GR-8, GR-3, MB-3, and MB-5.

**Table 25 VDOT Guardrail Inventory by System (miles)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 193 | 594 | 406 | 1,193 |
| Salem | 265 | 413 | 167 | 844 |
| Lynchburg | 0 | 365 | 143 | 508 |
| Richmond | 487 | 365 | 181 | 1,032 |
| Hampton Roads | 288 | 75 | 36 | 399 |
| Fredericksburg | 93 | 175 | 68 | 336 |
| Culpeper | 99 | 230 | 98 | 427 |
| Staunton | 371 | 263 | 175 | 809 |
| Northern Virginia | 274 | 205 | 260 | 739 |
| Total | 2,068 | 2,684 | 1,534 | 6,286 |

Guardrail Conditions

The digital video used to capture inventory data is not adequate to determine condition of guardrail, other than sections with obvious damage. The last statewide condition assessment of guardrail was performed in 2007. That assessment indicated that 98.5 percent, 98.4 percent, and 97.5 percent of guardrail on the Interstate, Primary and Secondary systems respectively were in a condition that required no work.

While the last assessment indicated that less than three percent of guardrail is in need of repair, a large proportion (approximately 50 percent) of guardrail is no longer compliant with current National Cooperative Highway Research Program 350 standards. Guardrail may remain in satisfactory condition for many years until it is hit or damaged by storms, erosion or other factors. When damage occurs, replacement of the guardrail and guardrail posts and terminals is usually called for. Non-compliant guardrail is generally replaced as part of paving operations, particularly if the project uses federal funds.

Guardrail Investment Needs

Investment needs for guardrail and guardrail terminals shown in Table 26 are based on new estimates of inventory, estimates from the 2007 random condition assessment of the annual quantity of repair or replacement, updated unit costs, and upgrades to approximately two percent of the inventory annually as part of paving projects.

**Table 26 Biennial Investment Needs for Guardrail and Guardrail Terminals**

| Asset Investment Needs | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Guardrail and Terminals | Interstate | $5.5 | $5.6 |
| | Primary | 13.8 | 14.2 |
| | Secondary | 11.0 | 11.3 |
| | Sub-Total | 30.2 | 31.1 |

**Signal and Technology Asset Investments**

Signal and Technology Asset Inventory

Signal and technology assets include traffic signals and "Intelligent Transportation System" (ITS) assets, such as cameras, traffic sensors, dynamic message signs (DMS), and HOV gates. Technology assets are used extensively by traffic operations centers to monitor traffic conditions and manage traffic flow and incidents.

Table 27 below summarizes VDOT's inventory of signalized intersections and flashers by district and system. Each signal shown in the inventory represents a signalized intersection or flasher with all associated components. The VDOT maintained signal inventory grows at a rate of approximately 100 new signals each year.

**Table 27 VDOT Statewide Signal and Flasher Inventory**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 6 | 106 | 1 | 113 |
| Salem | 4 | 182 | 10 | 196 |
| Lynchburg | 0 | 122 | 11 | 133 |
| Richmond | 21 | 604 | 94 | 719 |
| Hampton Roads | 1 | 190 | 32 | 223 |
| Fredericksburg | 8 | 200 | 61 | 269 |
| Culpeper | 2 | 108 | 24 | 134 |
| Staunton | 29 | 221 | 17 | 267 |
| Northern Virginia | 1 | 520 | 832 | 1,353 |
| Total | 72 | 2,253 | 1,082 | 3,407 |

The current statewide inventory of Signal and technology assets is shown in Table 28 below.

**Table 28 Statewide Inventory of Signal and Technology Assets**

| Asset | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Traffic Signals | 72 | 2,253 | 1,082 | 3,407 |
| Lane Use Signals | 29 | 0 | 0 | 29 |
| Ramp Meters | 24 | 0 | 0 | 24 |
| Traffic Sensors | 600 | 0 | 0 | 600 |
| Cameras | 567 | 56 | 1 | 624 |
| Dynamic Message Signs | 398 | 83 | 36 | 517 |
| Portable Message Signs | 52 | 4 | 0 | 56 |
| Weather Sensors | 54 | 20 | 0 | 74 |
| Variable Speed Limit Sign | 46 | 0 | 0 | 46 |
| Hurricane Gates | 134 | 0 | 0 | 134 |
| HOV Gates | 184 | 0 | 0 | 184 |
| Hazard Advisory Radio | 15 | 5 | 1 | 21 |

Signal and Technology Asset Conditions

Condition data on the statewide inventory of signals and technology assets was not available for this needs assessment. However, information on the age, expected useful life, and recommended cycles of preventative maintenance and replacement for each asset type were used to develop a maintenance management model that generates needs information. Investment activities for traffic signal systems and ITS assets include repair and replacement required to restore a damaged or deteriorated asset to design, functionality, and capability. Repair actions are normally triggered by trouble calls regarding signal malfunction. Replacement maintenance refers to the replacement or complete restoration of assets that cannot be repaired.

Signal and technology assets are electronic devices and hence, are susceptible to damage and deterioration caused by exposure to moisture, dirt, and extreme temperatures. Most ITS assets and components have a useful life of between five and 15 years, but they play a critical role in providing emergency and safety response services. For this reason, replacement of major components or entire units of ITS devices is considered asset investment.

Signal and Technology Asset Investment Needs

Biennial needs for signals and ITS assets, shown in Table 29 below, are based on a model recently developed for determining needs that uses current and projected future inventory counts, expected useful life of assets and their major components, recommended schedules for preventative maintenance and life-cycle replacement of components or entire assets, unit costs for each type of work or part, and the frequency of work required to deliver the service level standards for signals and ITS assets shown in Appendix B.

**Table 29 Biennial Investment Needs for Signal and Technology Assets**

| Traffic and Safety Assets | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Traffic Signals | Interstate | $0.9 | $1.0 |
| | Primary | 28.9 | 29.9 |
| | Secondary | 12.2 | 12.9 |
| | Sub-Total | $42.1 | $43.8 |
| ITS Assets | Interstate | $39.1 | $13.4 |
| | Primary | 6.9 | 1.1 |
| | Secondary | 2.6 | 5.6 |
| | Sub-Total | $48.6 | $20.2 |
| | Total | $90.6 | $64.0 |

## *Maintenance and Operations Services*

Central to VDOT's new approach to maintenance and operations is the definition of maintenance and operations services. Developing service definitions and service levels for all the critical services provided by the Department is a large undertaking involving extensive research and engagement of many subject matter experts from across the agency.

Each maintenance and operations activity tracked by the agency has been classified as a component of one of five major Service Areas, shown in Figure 7, and further classified as either "asset investment" or "service". Within the five Service Areas are "Service Groups" which are further delineations of each Service Area. Table 30 below shows the biennial service needs for all service areas and service groups. The following sections will further describe each Service Area and Service Group. Also attached as Appendix B is the VDOT Service Level document that was used to develop the services portion of the biennial needs.

Funds needed to deliver maintenance and operations services over the biennium total $1.595 billion or approximately 42 percent of the total biennial needs.

Maintenance and operations "services" include all activities not considered asset investment. This includes:

- Ordinary maintenance of pavements, bridges, tunnels, signs, guardrail, pavement marking, signals and technology assets, such as asphalt and concrete patching, cleaning, debris and liter pick up, flushing, inspection, electrical/mechanical repair, and utility payments;
- All maintenance work on other assets; and
- All operational and administrative services such as snow and ice removal, Safety Service Patrol and other emergency and safety response services, 511 and other traveler information services, ferry service, traffic operations, facility operations, signal timing optimization, traffic engineering studies, planning and preliminary engineering for

maintenance and operations, traffic count program, land use permits, and program management and direction.

**Table 30 Biennial Service Needs for Service Areas and Service Groups**

| Service Area | Service Group | FY 2011 $Million | FY 2012 $Million |
|---|---|---|---|
| Emergency and Safety Response | Incident and clearance management | $8.7 | $9.0 |
| | Snow and ice control | 88.9 | 91.6 |
| | Traffic operations | 52.9 | 54.4 |
| | Asset maintenance services | 26.5 | 27.8 |
| | Sub-Total | $177.1 | $182.7 |
| Traffic and Safety Services | Asset maintenance services | $31.3 | $32.2 |
| | Other traffic and safety services | 31.1 | 33.4 |
| | Sub-Total | $62.5 | $65.6 |
| Roadway Services | Pavement management | $127.1 | $130.7 |
| | Bridge management | 46.0 | 52.8 |
| | Tunnel management | 12.4 | 12.7 |
| | Sub-Total | $185.4 | $196.2 |
| Roadside Services | Drainage management | $69.1 | $71.0 |
| | Vegetation management | 73.3 | 75.1 |
| | Barriers management | 2.1 | 2.2 |
| | Other roadside services | 4.8 | 5.0 |
| | Sub-Total | $149.4 | $153.2 |
| Facility, Equipment, and Other Services | Ferry service | $17.1 | $18.6 |
| | Safety rest area management | 12.6 | 13.0 |
| | Fleet equipment management | 42.7 | 44.3 |
| | Parking and ride lot management | 0.2 | 0.2 |
| | Sidewalk and trail management | 1.7 | 1.8 |
| | Other | 133.3 | 137.6 |
| | Sub-Total | $207.6 | $215.4 |
| | **Grand Total** | **$782.0** | **$813.1** |

**Emergency and Safety Response Services**

Emergency and safety response services include incident response and clearance management, snow and ice control, traffic management and traveler information, and ordinary maintenance services for technology assets. Table 31 below shows emergency and safety response services biennial needs.

**Table 31 Emergency and Safety Response Services Biennial Needs**

| Emergency and Safety Response Services | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Emergency and Safety Response | Incident and clearance management | $8.7 | $9.0 |
| | Snow and ice control | 88.9 | 91.6 |
| | Traffic operations | 52.9 | 54.4 |
| | Asset maintenance services | 26.5 | 27.8 |
| | Sub-Total | $177.1 | $182.7 |

Incident and Clearance Management

Incident response and clearance management services are coordinated through one of five traffic operations centers (TOC) across the state and the statewide customer service call center located at the TOC in the Richmond District. VDOT contracts for safety service patrols (SSPs) along urban Interstates in Northern Virginia, Fredericksburg and Hampton Roads. Turnkey Asset Maintenance Services (TAMS) contractors provide similar incident response services on Interstates not covered by SSPs. VDOT maintenance crews provide these services on all other VDOT maintained roads.

The function of SSPs is to reduce delays caused by non-recurring congestion, particularly crashes and breakdowns on the Interstate. For every minute of delay it takes four minutes for the traffic to return to normal operating speeds. SSPs are mobile units specifically operated in high congestion corridors to employ "quick clearance" techniques and return traffic to normal operation. They also serve motorists who break down and need assistance. Moving vehicles as quickly as possible reduces rubbernecking and secondary crashes.

Timeliness of response and hours of service are the most important factors to consider in delivering this service. In areas where SSPs operate, biennial needs are based on the staffing, equipment, and support needed to operate those services at their current level. In areas on Interstates where TAMS contractors provide incident response services, needs are based on the estimated portion of the TAMS contracts devoted to incident management. In areas where VDOT maintenance staff provide incident management services, needs are based on actual expenditure data from FY 2009.

Snow and Ice Control

One of the most important services VDOT provides is snow and ice control management. Winter storms can create dangerous driving conditions, leave people stranded, and bring economic activity to a standstill. Service standards for snow and ice control focus on planning, pre-treating, and returning roads to bare pavement as soon as possible. Snow and ice control services are delivered through a combination of TAMS contractors on the Interstate, and VDOT staff or other contractors on the Primary and Secondary systems. Biennial service needs for snow and ice control on the Primary and Secondary systems are based on a three year average of expenditures for that service, with the exception of de-icing which became a higher priority in FY 2009 and hence, is based on FY 2009 expenditures only. Needs for snow and ice control on

the Interstate are based on an estimate of the portion of current TAMS contracts devoted to snow and ice control.

Traffic Operations

Traffic operations services includes traffic management services provided through VDOT's five traffic operations centers (TOCs) and the customer service call center located in the Richmond district, all utility costs associated with traffic operations centers, as well as planning and engineering for TOCs. VDOT's TOCs are high-tech communications hubs managing some of the nation's busiest roadways. Controllers at the TOCs oversee hundreds of miles of roads utilizing extensive networks of technology. The TOCs use weather and environmental sensors to monitor rain, snow and ice conditions, traffic sensors to monitor traffic and to alert operators of conditions indicating a possible crash, and dynamic message signs and hazard advisory radios (HAR) to alert the public of traffic conditions. The TOCs also provide traffic and road condition information to the Emergency Operations Center in Richmond, radio stations, and the 511 telephone and web services. In addition to congestion mitigation, incident management and traffic planning efforts, the TOCs also play an integral role during hurricane and other emergency evacuations.

Biennial needs for traffic operations services are based on the value of current contracts for traffic operations services at the TOCs, and on planned system repairs and upgrades at TOCs for FY 2011 and FY 2012.

Asset Maintenance Services for Signal and Technology Assets

Signal timing operations services include the periodic review and updating of traffic signal timing schedules to reflect changes in traffic patterns, with the goal of minimizing delay and optimizing throughput.

Preventive maintenance activities include a set of checks and procedures to be performed at regularly scheduled intervals for the upkeep of traffic signal equipment, as well as inspection, record keeping, cleaning, and replacement based on the function and rated service life of the components. For signal systems, operations include all actions necessary for their proper functioning, including reviewing and updating timing plans, monitoring signal operations (with control software), updating system parameters, and dispatching crews to address operating concerns.

Biennial needs for signal and technology asset maintenance services are based on a model recently developed for determining needs that uses current and future inventory counts, expected useful life of assets and their major components, unit costs for each type of work and component, and the frequency of work required to deliver the service standards for signals. The model takes into account factors such as travel time to and from the job site, setting up work zones, preventative maintenance schedules and frequency of unexpected maintenance calls.

**Roadway Services**

Roadway services include pavement management, bridge management, and tunnel management services. These consist of non-investment, ordinary maintenance activities on pavements, bridges and tunnels. Biennial service needs for pavement management, bridge management and tunnel management shown in Table 32 are based on the current inventory of assets, the unit cost of each activity and the frequency of performing each activity needed to achieve the service levels for each category of roadway. Timely response to potholes and the general appearance of pavements, bridges and tunnels are the focus of service levels for these assets.

**Table 32 Biennial Needs for Roadway Services**

| Roadway Services | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Roadway Services | Pavement management | $127.1 | $130.7 |
| | Bridge management | 46.0 | 52.8 |
| | Tunnel management | 12.4 | 12.7 |
| | Sub-Total | 185.4 | $196.2 |

Pavement Management

Pavement management services include ordinary maintenance activities such as pot-hole repair and debris removal on hard-surfaced pavements. In addition, it includes activities such as machining, grading, shaping, and dust control on unpaved roads. Quickly responding to pot-holes on pavements is critical to reduce vehicle damage and potential safety concerns. Service standards for paved and unpaved roads address their appearance and the timeliness of response to pot-hole repair.

Biennial service needs for hard surfaced Primary and Secondary system roads used expenditures from FY 2009 to develop the service needs. On the Interstate, pavement management services are delivered by TAMS contractors. The portion of TAMS contracts devoted to pavement management is used as a proxy for Interstate pavement services needs. Needs for non-hard surfaced pavements and unpaved shoulders are estimated using the inventory lane-miles and the costs for typical maintenance activities required on a cyclical basis.

Bridge Management

Bridge management services include ordinary maintenance activities such as deck washing, debris removal from channels, flushing culverts and bridge joints, bridge inspection, and moveable bridge operations on the seven movable bridges shown in Table 33.

Biennial needs for bridge management services on Primary and Secondary system roads used expenditures from FY 2009 to develop the service needs. On Interstate system, needs are based on that portion of TAMs contracts devoted to bridge services. TAMS contractors do not provide bridge inspection services. Needs for bridge inspection services are based on FY 2010 budgets. Needs for moveable bridge operations are based on the value of current contracts for those services.

**Table 33 State Maintained Moveable Bridges**

| Bridge | Location | Route |
|---|---|---|
| Gwyn Island Bridge | Mathews | Route 223/633 |
| Eltham Bridge | King William County | Route 30/33 |
| Benjamin Harrison Bridge | Prince George County | Route 156 |
| Berkley Bridge | Norfolk | Interstate 264 |
| High Rise Bridge | Chesapeake | I-64 |
| James River Bridge | Newport News/ Isle of Wight (Suffolk) | U.S. Route 17 |
| Coleman Bridge | Yorktown/ Gloucester | U.S. Route 17 |

Tunnel Management

Tunnel management services are provided for the six state maintained tunnel facilities. Services include ordinary maintenance activities such as tunnel washing, patching, and tile repair. Tunnel management also includes the activities required to operate the tunnels 24 hours a day, seven days a week as well as the cost of utilities.

Tunnel management service needs are based on activities planned for FY 2011 and FY 2012, and on current contracts for tunnel operations services.

**Traffic and Safety Services**

Traffic and safety services includes ordinary maintenance services on signs, guardrail, lighting, and other traffic and safety assets, as well as integrated directional signing, traffic counts, traffic engineering, and signal mast arm and overhead sign inspection services. Biennial needs for traffic and safety services are shown in Table 34.

**Table 34 Biennial Needs for Traffic and Safety Services**

| Traffic and Safety Services | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Traffic and Safety Services | Asset maintenance services | $31.3 | $32.2 |
| | Other traffic and safety services | 31.1 | 33.4 |
| | Sub-Total | $62.5 | $65.6 |

Asset Maintenance Services for Traffic and Safety Assets

Maintenance services on traffic and safety assets include ordinary maintenance such as cleaning and debris removal, and preventative maintenance such as inspection. These types of maintenance services are generally performed by VDOT with the exception of ordinary repairs to signs on the Interstate system, which are performed by TAMS contractors.
Biennial needs for asset maintenance services on signs, guardrail, pavement marking, messages and markers, and highway lighting on the Primary and Secondary systems are based on, the estimated inventory of each asset type on each roadway category, the expected useful life of each

asset type, the unit cost of each maintenance activity, and the frequency of maintenance needed to meet the service standards on each roadway category. For all other traffic and safety assets, biennial maintenance service needs used expenditures from FY 2009 to develop the service level needs. With the exception of pavement marking, TAMS contractors deliver these services on the Interstate system. Hence, maintenance service needs for all traffic and safety assets on the Interstate system other than pavement marking are based on an estimate of the portion of TAMS contracts devoted to traffic and safety asset maintenance services.

Other Traffic and Safety Services

Other traffic and safety services include signing programs, traffic count services, and other traffic engineering services. The Integrated Directional Signing Program is a program promoting and regulating the use of signs for travel services and attractions. It is fee based and self funded. The Federal Highway Administration requires VDOT to submit annual information on the size and utilization of the state system of roads. The focus of Traffic Counts Program is to collect, analyze and prepare information for VDOT's annual submission to the FHWA, although the data is used for many other reasons by VDOT. VDOT also receives frequent external requests for traffic data. Biennial needs for this service are based on the number of locations where counts will be conducted and the unit cost of data collection. Traffic engineering services include safety studies, signal warrants, speed zone studies, work zone analysis and planning, and special studies. Biennial needs for traffic engineering services used FY 2009 expenditures to develop service level needs.

## Roadside Services

Roadside services include drainage management, vegetation management, barrier management and other roadside services. Table 35 shows biennial roadside services needs.

**Table 35 Biennial Roadside Services Needs**

| Roadside Services | | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|---|
| Roadside Services | Drainage management | $69.1 | $71.0 |
| | Vegetation management | 73.3 | 75.1 |
| | Barriers management | 2.1 | 2.2 |
| | Other roadside services | 4.8 | 5.0 |
| | Sub-Total | $149.4 | $153.2 |

Drainage Management

Drainage management includes all maintenance activities performed on drainage assets such as ditches, pipes, curb and gutter, slopes, rock slide protection, retaining walls, and storm water basins. These assets work as a system to move water off of and way from pavements and bridges where it can contribute to more rapid deterioration of those assets. The size, capacity and configuration of drainage assets such as pipes and ditches are specified to accommodate water equivalent to 50 year storm events. While their physical condition does not necessarily determine whether they perform adequately, it is closely associated with their performance.

Service standards for drainage focus on their performance and on the timeliness of maintenance when these assets fail.

Tables 36 through 39 show the current estimated inventory of drainage assets on VDOT maintained roads. The majority of paved ditches are located on the Secondary system (48 percent), followed by Primary system (26 percent) and Interstate system (26 percent). The biennial needs for drainage management on Primary and Secondary system roads are based on estimated inventory, unit cost of maintenance, and the frequency of work required to achieve the service standards. Needs for drainage assets for which inventory data is not available used FY 2009 expenditures to develop service level needs. On the Interstate, these needs are based on an estimate of the portion of TAMS contracts devoted to providing drainage management services.

**Table 36 Estimated Statewide Paved Ditch Inventory (miles)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 85 | 56 | 34 | 174 |
| Salem | 59 | 98 | 100 | 256 |
| Lynchburg | 0 | 87 | 103 | 190 |
| Richmond | 145 | 93 | 360 | 597 |
| Hampton Roads | 32 | 14 | 53 | 99 |
| Fredericksburg | 6 | 63 | 57 | 126 |
| Culpeper | 38 | 30 | 76 | 145 |
| Staunton | 107 | 45 | 36 | 188 |
| Northern Virginia | 16 | 20 | 96 | 132 |
| Total | 487 | 506 | 914 | 1,907 |

**Table 37 Estimated Statewide Unpaved Ditch Inventory (miles)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 186 | 211 | 591 | 989 |
| Salem | 226 | 435 | 873 | 1,534 |
| Lynchburg | 0 | 509 | 1,512 | 2,021 |
| Richmond | 457 | 930 | 2,193 | 3,580 |
| Hampton Roads | 190 | 709 | 2,439 | 3,339 |
| Fredericksburg | 52 | 519 | 1,872 | 2,443 |
| Culpeper | 131 | 291 | 731 | 1,153 |
| Staunton | 411 | 343 | 675 | 1,428 |
| Northern Virginia | 81 | 296 | 598 | 974 |
| Total | 1,734 | 4,244 | 11,485 | 17,462 |

**Table 38 Estimated Statewide Curb and Gutter Inventory (miles)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 25 | 126 | 50 | 201 |
| Salem | 2 | 182 | 312 | 495 |
| Lynchburg | 0 | 137 | 39 | 177 |
| Richmond | 76 | 308 | 678 | 1,062 |
| Hampton Roads | 67 | 120 | 131 | 317 |
| Fredericksburg | 0 | 165 | 113 | 278 |
| Culpeper | 3 | 47 | 225 | 275 |
| Staunton | 1 | 152 | 200 | 354 |
| Northern Virginia | 85 | 311 | 4,845 | 5,241 |
| Total | 259 | 1,547 | 6,593 | 8,399 |

**Table 39 Estimated Statewide Cross Pipe Inventory (each)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 1,152 | 11,876 | 51,050 | 64,078 |
| Salem | 1,067 | 6,803 | 44,500 | 52,369 |
| Lynchburg | 0 | 8,385 | 27,531 | 35,916 |
| Richmond | 2,582 | 7,771 | 30,115 | 40,468 |
| Hampton Roads | 1,009 | 3,683 | 13,849 | 18,541 |
| Fredericksburg | 348 | 4,754 | 17,926 | 23,028 |
| Culpeper | 596 | 5,016 | 20,754 | 26,366 |
| Staunton | 2,006 | 7,809 | 33,931 | 43,746 |
| Northern Virginia | 448 | 1,772 | 12,370 | 14,591 |
| Total | 9,208 | 57,869 | 252,026 | 319,103 |

Vegetation Management

Vegetation management services are concerned with roadside aesthetics and appearance, but the priority is on maintaining sight distances that enable safe travel. Tables 40 and 41 below show estimated inventories of the most prominent types of vegetation. Needs for vegetation management services are based on the new service standards, unit costs of work, frequencies of work and the estimated inventories for turf, brush and trees, and on annual expenditures for wildflower plots and other ornamental landscaping. Previously, VDOT mowed and trimmed trees in the right of way as a matter of aesthetics, regardless of whether it had any impact on sight distance. As part of the VDOT Blueprint for the Future, less effort will be put into cutting vegetation that has no impact on safe sight distances.

Vegetation management services on the Interstate system are provided by TAMS contractors. Thus, biennial needs these services on the Interstate system are based on an estimate of the portion of TAMS contracts devoted to delivering these services. On Primary and Secondary system roads, biennial vegetation management service needs for trees, turf and brush are based on estimated inventories, unit cost of services, and the frequency of work needed to meet service standards. Needs for all other vegetation and roadside services used expenditures from FY 2009 to develop service level needs.

**Table 40 Estimated Statewide Turf Inventory (acres)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 1,392 | 5,789 | 8,044 | 15,225 |
| Salem | 1,197 | 6,231 | 10,518 | 17,946 |
| Lynchburg | 0 | 6,424 | 8,157 | 14,581 |
| Richmond | 2,516 | 6,950 | 10,268 | 19,734 |
| Hampton Roads | 1,599 | 7,252 | 7,041 | 15,892 |
| Fredericksburg | 453 | 4,369 | 6,112 | 10,934 |
| Culpeper | 677 | 4,039 | 5,601 | 10,317 |
| Staunton | 2,652 | 4,138 | 7,248 | 14,038 |
| Northern Virginia | 981 | 2,686 | 7,678 | 11,345 |
| Total | 11,467 | 47,878 | 70,665 | 130,010 |

**Table 41 Estimated Statewide Brush Inventory (acres)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 60 | 623 | 3,480 | 4,164 |
| Salem | 52 | 616 | 4,027 | 4,694 |
| Lynchburg | 0 | 567 | 3,390 | 3,957 |
| Richmond | 108 | 648 | 2,922 | 3,678 |
| Hampton Roads | 69 | 671 | 1,894 | 2,634 |
| Fredericksburg | 19 | 371 | 2,067 | 2,457 |
| Culpeper | 29 | 403 | 2,119 | 2,552 |
| Staunton | 114 | 548 | 2,832 | 3,494 |
| Northern Virginia | 42 | 321 | 957 | 1,319 |
| Total | 494 | 4,768 | 23,688 | 28,950 |

Barriers Management

Barrier management includes all maintenance activities associated with sound walls, fences and other barriers to noise, people or animals. The current inventory of sound walls is shown in Table 42. Estimates on the miles of fencing are not available. Biennial needs for sound walls is based on current inventory, unit cost of maintenance and the estimates for the frequency of maintenance needed to attain established service standards. Otherwise, biennial needs for barrier management used FY 2009 expenditures to develop service level needs.

**Table 42 Statewide Sound Wall Inventory (miles)**

| District | Interstate | Primary | Secondary | Total |
|---|---|---|---|---|
| Bristol | 1.56 | 0.00 | 0.00 | 1.56 |
| Salem | 0.39 | 0.48 | 0.00 | 0.86 |
| Lynchburg | 0.00 | 1.03 | 0.00 | 1.03 |
| Richmond | 4.87 | 5.62 | 0.00 | 10.49 |
| Hampton Roads | 23.54 | 3.76 | 0.00 | 27.30 |
| Fredericksburg | 0.00 | 0.05 | 0.00 | 0.05 |
| Culpeper | 0.00 | 0.60 | 0.00 | 0.60 |
| Northern Virginia | 21.42 | 11.46 | 0.36 | 33.23 |
| Total | 51.78 | 22.99 | 0.36 | 75.13 |

Other Roadside Services

Regulation of outdoor advertising and junkyards, Adopt-A-Highway, and wildlife management are classified as "other roadside services". Biennial needs for these services are based on current expenditure required to deliver these services.

**Facilities, Equipment and Management Services**

Facilities, equipment and other services include ferry operations, safety rest areas and welcome center management, parking lots, paths and trail management, fleet equipment management, and other management services. Biennial needs for facilities, equipment and other management services are shown in Table 43 below.

**Table 43 Biennial Needs for Facilities, Equipment and Other Services**

| Facilities, Equipment and Management Services | FY 2011 ($Millions) | FY 2012 ($Millions) |
|---|---|---|
| Ferry service | $17.1 | $18.6 |
| Safety rest area management | 12.6 | 13.0 |
| Fleet equipment management | 42.7 | 44.3 |
| Parking and ride lot management | 0.2 | 0.2 |
| Sidewalk and trail management | 1.7 | 1.8 |
| Other services | 133.3 | 137.6 |
| Sub-Total | $207.6 | $215.4 |

Ferry Service

VDOT operates four ferry services, utilizing seven ferry boats. The needs in this report reflect that operation of the Hatton Ferry has been transferred to Albemarle County. Table 44 provides information on the carrying capacity and the age of each ferry boat. Biennial needs for ferry services are based on current expenditures to deliver services at current levels. These needs assume the service reductions associated with the Blueprint will be permanent. No replacement ferry needs are included in the report. While the vessel *Virginia* is past her useful life, a replacement, estimated at $30 million, must be programmed as a new capital project in the Six-Year Improvement Program.

**Table 44 Summary of VDOT Ferry Boats**

| Vessel | Year Built | Capacity | Ferry Service |
|---|---|---|---|
| Virginia | 1936 | 28 cars | Jamestown-Scotland Ferry |
| Surry | 1979 | 50 cars | Jamestown-Scotland Ferry |
| Williamsburg | 1983 | 50 cars | Jamestown-Scotland Ferry |
| Pocahontas | 1995 | 70 cars | Jamestown-Scotland Ferry |
| Northumberland | 1985 | 2 cars | Sunnybank Ferry |
| Lancaster | 1985 | 2 cars | Merry Point Ferry |
| The Hatton | 1986 | 2 cars | The Hatton Ferry |

Safety Rest Area Management

Safety rest areas provide traveler services and short-term car and truck parking for drivers to rest. These facilities include buildings, shelters, tables, plumbing/sanitation systems, HVAC systems, parking lots, ramps, curb and gutter, lighting, fencing, and vegetation. VDOT owns 42 safety rest areas, 11 of which also serve as welcome centers. In July 2009, 19 safety rest areas were closed as a cost cutting measure due to the current budget shortfall. This saved the agency approximately nine million dollars per year. The biennial needs include $28 million to cover the cost of demolishing and removing all 19 closed rest areas by FY 2012.

Biennial needs for safety rest areas assume VDOT will continue to operate only 23 rest areas at a cost of $12.6 million and $13 million in FY 2011 and FY 2012 respectively based on current property management contracts. There are also $7.2 million in needs to improve on and off ramps at the 23 open rest areas in order to bring them into compliance with safety requirements. There are a number of long-term capital improvement needs for the rest areas that typically would be taken up in the capital outlay program. These needs include renovation, rebuilding of deteriorating facilities, expansion of parking to meet current demand, and public water and sewer system improvements.

Fleet Equipment Management

VDOT owns and maintains over 32,000 pieces of equipment with a replacement value of $534 million. The equipment ranges from bulldozers and motor graders to chainsaws and weed eaters, and is maintained in 83 VDOT repair shops all over the state. Large equipment is issued and charged (rented) to districts at rates that allocate the cost of the program to where the equipment is used. There are currently 8,342 rental equipment units.

A number of equipment shops are being closed and operations being consolidated as part of VDOT's Blueprint for the Future. In addition to planned shop consolidation, the biennial needs for fleet equipment management assume:

- The fleet of rental equipment will decrease from its current inventory of 8,342 units and level off to 7,600 units in FY 2011 and FY 2012 as the Blueprint is fully implemented;
- Replacement needs as a percentage of the overall inventory will remain constant at 13.4 percent per annum;
- Depreciation dollars will continue to decline in FY 2011 and FY 2012 as the overall fleet ages due to lack of steady replacement funding;
- Equipment prices will escalate in FY 2010 due to new engine emission requirements and off-road equipment prices are expected to increase in FY 2012 again due to new engine emission requirements; and
- VDOT has and continues to use blended biodiesel fuel (B-20) in the Hampton Roads district to meet requirements of the Energy Policy Act (EPACT):
    - VDOT has found that using biodiesel is a practical and cost-effective method of earning EPACT fleet credits, when needed.
    - VDOT typically uses approximately 60,000 gallons of B-20 each year.

- The volume of B-20 that VDOT uses is mostly dependent upon the quantity of Alternative Fuel Vehicle (AFV) credits needed for EPACT requirements and is based on the quantity of new vehicles purchased that are not available as AFVs and are rated at less than 8500 GVW.
- VDOT will switch to using bio-diesel for all equipment in June 2010 as required by Executive Order 82 (2009)

Park and Ride Lot Management

Park and Ride lots provide commuters with convenient locations to park and take public transportation or car pool. VDOT maintains 309 parking lots with a total parking capacity of 59,316 cars. Parking lot facilities include property, grounds, fencing, lighting, security, pavement, pavement marking, signs, and in some cases guardrail. Parking lot management includes all maintenance activities associated with the facility. Biennial needs for park and ride lot management services are based on current expenditure data to deliver the service levels as described in Appendix B.

Sidewalk and Trail Management

VDOT maintains and extensive network of sidewalks and bike/pedestrian trails. Sidewalk and trail management includes all maintenance activities associated with these assets. Biennial needs for sidewalk and trail management services are based on current expenditures required to deliver the service levels as described in Appendix B.

Other Services

Other services include all services not directly associated with services already defined above. Examples of other services include data collection, inventory management, land use permits, Secondary street acceptance, maintenance and operations research, security, and management and direction for the maintenance and operations program. Biennial needs for these services are based on current expenditures required to deliver these services. Staffing and organizational changes as a result of VDOT's Blueprint for the Future will streamline maintenance and operations program management and direction, thereby reducing the cost of these services. However, at this time, the estimated cost reduction (savings) is not known. As these savings are identified over this remaining fiscal year, they will be used to offset this fiscal year's budget reductions and to cover costs in other assets and service needs.

## *Summary*

This report presents needs for both investments in major assets and the delivery of services over the next biennium. This Biennial 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 this assessment are based on some form of performance or service level model, compared to 75 percent in the 2007 assessment. 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.

Based on updated data and expanded use of the modeling approach, the investment needs for the biennium are approximately $3.784 billion, or $1.885 billion and $1.899 billion for FY 2011 and FY 2012 respectively. The FY 2011 and FY 2012 planned maintenance budgets in the FY 2010-2015 Six Year Maintenance and Operations Program are $1.410 billion and $1.451 billion, respectively. The gap between the program budget and the FY 2011 and FY 2012 needs is approximately $923 million, or approximately $461.5 million annually. Figures 11 and 12 show the approved FY 2010 budget amounts compared to the estimated FY 2011 needs, broken out for asset investment categories (Figure 11) and services categories (Figure 12). The figures show where the gaps exist between current funding and estimated need to meet performance targets and service levels.

While Interstate and Primary pavement conditions improved slightly in 2009, additional funding is needed to reach the performance targets for FY 2011 and FY 2013. Secondary system pavements require significant additional investment to maintain the current condition of 31 percent of lane miles in deficient condition statewide. The condition of bridges and structures can continue to meet performance targets based on current funding. Other assets related to traffic safety and technology can not meet performance standards at current and proposed funding levels as shown in the Six Year Maintenance and Operations Budget Program as adopted by the CTB in June 2009. Service levels may not be sustained at the current levels, depending on future weather events and other emergency response duties VDOT is called upon to perform.

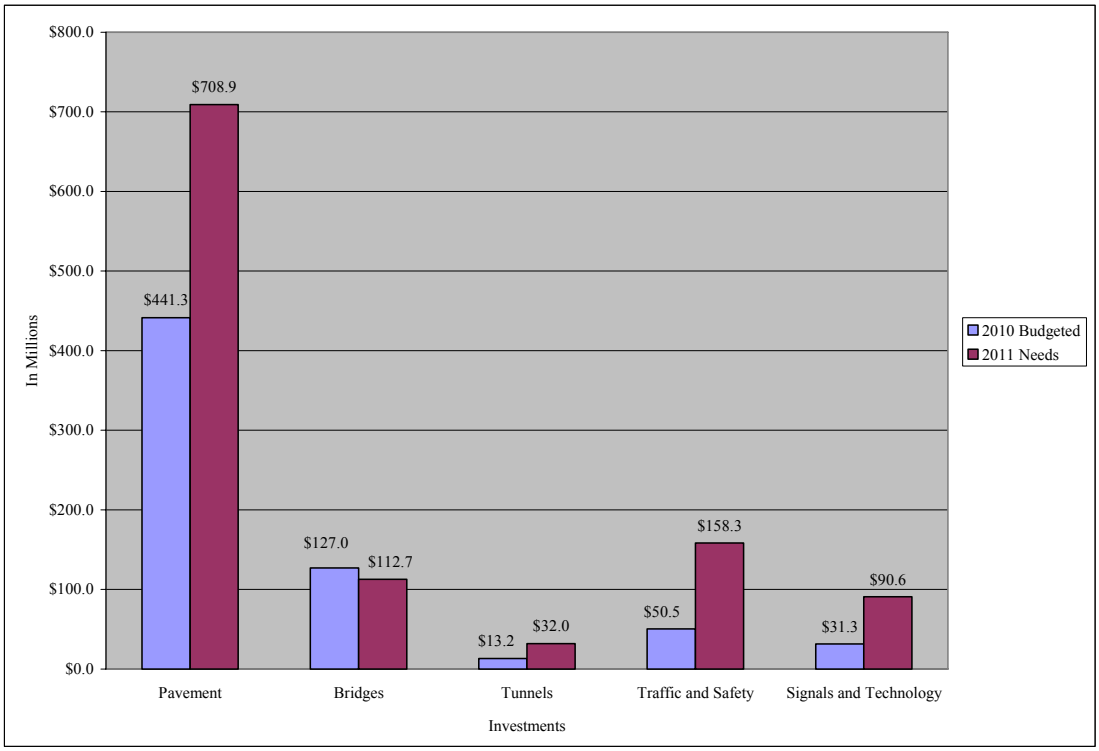


**Figure 11 Comparison of FY 2010 Budget and FY 2011 Estimated Needs for Asset Investments**

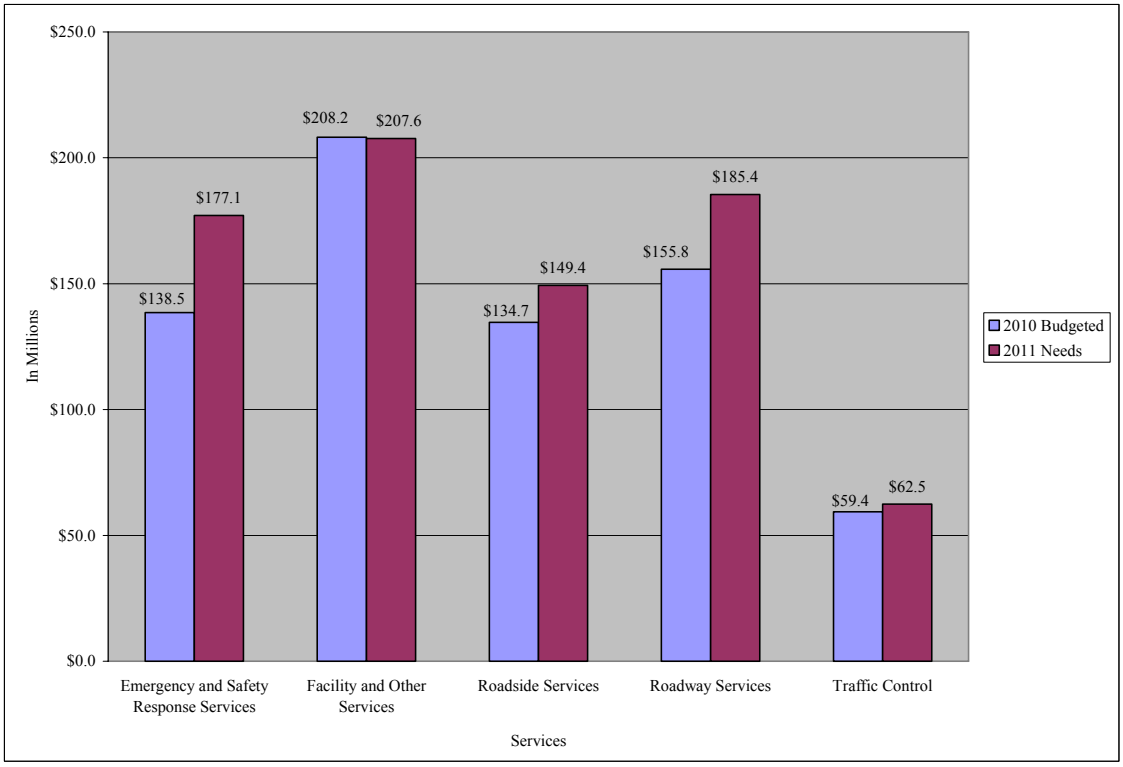


**Figure 12 Comparison of FY 2010 Budget and FY 2011 Services Needs**

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# Current Performance Measures, Targets and Trends on Locally Maintained Roads

In Chapter 118 of the 2004 Act of Assembly, the General Assembly modified §§ 33.1-23.5:1 and 33.1-41.1 of the *Code of Virginia* pertaining to local payment programs. The changes included additional financial accountability and essential performance measurements for localities receiving payments for maintenance and construction activities. VDOT collaborated with a group of local government stakeholders, the Virginia First Cities Coalition, and the Virginia Municipal League to establish a program that met the intent of this legislation utilizing available reporting mechanisms and nationally recognized performance measurement methodologies.

The Local Assistance Division published "Local Performance and Accountability for Transportation Funding" in April of 2007. The report covered financial accountability and performance measurement on bridges and pavements for localities receiving payments for maintenance and construction activities. This is the second report in response to that process requiring biennial performance reporting.

**Bridge Performance**

VDOT displays bridge conditions in "real time" on the maintenance Dashboard for localities that have bridge inspection data. The Dashboard presents bridge ratings in the form of green (non-deficient, General Condition Rating between 1 and 3), yellow (functionally obsolete, General Condition Rating between 4 and 5) or red (structurally deficient, General Condition Rating between 6 and 9).

The current bridge performance target is different from the data reported in 2007. In 2007, the target was that less than 40 percent of bridges with a General Condition Rating (GCR) less than six (bridges coded red and yellow on the dashboard). The performance rating now considers bridges with a GCR of four or less (red on the dashboard) as structurally deficient. Bridges are considered structurally deficient if they have been restricted to light vehicles, are closed to traffic, or require rehabilitation. Structurally deficient means there are elements of the bridge that need to be monitored and/or repaired.

The goal is to have no more than eight percent of Virginia bridges and culverts rated as structurally deficient (so the combination of yellow and green should be 92 percent or greater). As of April 2009, bridge inspections indicated that 8.27 percent of the bridges on the locally maintained system were structurally deficient. A total of 1,270 bridges were inspected, representing 70 municipalities and two counties. This information was collected from VDOT's Dashboard and is presented in Table 45.

**Pavement Performance**

The Highway Performance Monitoring System is a highway information system utilized by the FHWA that includes data on the extent, condition, performance, use, and operating characteristics of the nation's highways. The Highway Performance Monitoring System includes information on pavement condition for sample segments based on International Roughness Index

(IRI), which is the worldwide standard for measuring pavement smoothness established by the World Bank.

Based on federal pavement rating criteria, pavements have a good ride quality if the IRI is less than 100. As the IRI increases, the ride quality decreases. Pavements with an IRI between 100 and 170 are considered fair. Local pavements with an IRI of 170 or greater are considered to be poor quality. This report uses the same criteria for pavement performance as the 2007 report.

The IRI ratings for this report are based on samples collected for the Highway Performance Monitoring System data during 2007. That data was collected in 62 localities (including two counties) representing 75 percent of those localities maintaining their own transportation systems. The sampled routes represent approximately five percent of the lane miles currently maintained by those local governments. The data included in this sample implies that 17 percent of locally maintained pavements are deemed as having poor quality based on pavement roughness (having an IRI of 170 or greater). Results are shown in Table 46.

Although, this information is beneficial, it is not comparable to VDOT's own pavement performance measurement system and does not provide for a direct correlation in reporting performance. Until a more global measure of pavement performance is developed and implemented, the IRI data from Highway Performance Monitoring System will be used as an interim indicator of pavement performance for localities. Meanwhile, data from the Highway Performance Monitoring System will be reported, but a specific performance target will not be established.

## Table 45 Locality Bridge Performance Summary

| LOCALITY BRIDGE PERFORMANCE SUMMARY - MARCH 2009 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Locality** | **R** | **Y** | **G** | **Total** | **Deficient** | **Locality** | **R** | **Y** | **G** | **Total** | **Deficient** |
| Abingdon | 0 | 1 | 9 | 10 | 0% | Luray | 1 | 4 | 4 | 9 | 11% |
| Alexandria | 0 | 4 | 14 | 18 | 0% | Lynchburg | 9 | 18 | 41 | 68 | 13% |
| **Arlington** | 0 | 8 | 14 | 22 | 0% | Manassas | 0 | 0 | 11 | 11 | 0% |
| Ashland | 0 | 0 | 1 | 1 | 0% | Manassas Park | 0 | 0 | 1 | 1 | 0% |
| Bedford | 1 | 0 | 3 | 4 | 25% | Marion | 2 | 4 | 5 | 11 | 18% |
| Big Stone Gap | 2 | 1 | 3 | 6 | 33% | Martinsville | 0 | 0 | 10 | 10 | 0% |
| Blacksburg | 0 | 0 | 4 | 4 | 0% | Narrows | 0 | 0 | 2 | 2 | 0% |
| Blackstone | 1 | 0 | 0 | 1 | 100% | Newport News | 1 | 9 | 31 | 41 | 2% |
| Bluefield | 3 | 2 | 7 | 12 | 25% | Norfolk | 1 | 17 | 20 | 38 | 3% |
| Bristol | 6 | 3 | 22 | 31 | 19% | Norton | 2 | 2 | 8 | 12 | 17% |
| Buena Vista | 0 | 2 | 16 | 18 | 0% | Orange | 0 | 0 | 1 | 1 | 0% |
| Charlottesville | 3 | 3 | 9 | 15 | 20% | Petersburg | 0 | 5 | 23 | 28 | 0% |
| Chesapeake | 12 | 24 | 48 | 84 | 14% | Portsmouth | 2 | 2 | 2 | 6 | 33% |
| Chesterfield | 0 | 0 | 1 | 1 | 0% | Pulaski | 2 | 4 | 9 | 15 | 13% |
| Christiansburg | 0 | 2 | 4 | 6 | 0% | Radford | 0 | 0 | 2 | 2 | 0% |
| Clifton Forge | 1 | 1 | 5 | 7 | 14% | Richlands | 3 | 2 | 5 | 10 | 30% |
| Colonial Heights | 0 | 1 | 6 | 7 | 0% | Richmond | 8 | 30 | 70 | 108 | 7% |
| Covington | 0 | 0 | 7 | 7 | 0% | Roanoke | 1 | 24 | 49 | 74 | 1% |
| Culpeper | 0 | 2 | 5 | 7 | 0% | Rocky Mount | 1 | 1 | 1 | 3 | 33% |
| Danville | 0 | 12 | 27 | 39 | 0% | Salem | 4 | 2 | 11 | 17 | 24% |
| Elkton | 0 | 0 | 1 | 1 | 0% | Saltville | 1 | 0 | 3 | 4 | 25% |
| Emporia | 1 | 1 | 4 | 6 | 17% | Smithfield | 0 | 1 | 6 | 7 | 0% |
| Fairfax | 0 | 1 | 5 | 6 | 0% | South Boston | 3 | 0 | 4 | 7 | 43% |
| Farmville | 0 | 0 | 4 | 4 | 0% | Staunton | 0 | 1 | 18 | 19 | 0% |
| Fredericksburg | 4 | 0 | 9 | 13 | 31% | Suffolk | 8 | 18 | 87 | 113 | 7% |
| Front Royal | 1 | 3 | 7 | 11 | 9% | Tazewell | 6 | 0 | 6 | 12 | 50% |
| Galax | 0 | 3 | 2 | 5 | 0% | Vienna | 0 | 1 | 5 | 6 | 0% |
| Grottoes | 0 | 0 | 2 | 2 | 0% | Vinton | 0 | 1 | 1 | 2 | 0% |
| Hampton | 2 | 13 | 22 | 37 | 5% | Virginia Beach | 4 | 18 | 55 | 77 | 5% |
| Harrisonburg | 0 | 6 | 23 | 29 | 0% | Warrenton | 0 | 0 | 3 | 3 | 0% |
| **Henrico** | 2 | 7 | 54 | 63 | 3% | Waynesboro | 4 | 4 | 10 | 18 | 22% |
| Herndon | 0 | 0 | 5 | 5 | 0% | Williamsburg | 0 | 2 | 3 | 5 | 0% |
| Hopewell | 1 | 0 | 2 | 3 | 33% | Winchester | 0 | 0 | 7 | 7 | 0% |
| Lebanon | 0 | 2 | 3 | 5 | 0% | Wise | 0 | 0 | 1 | 1 | 0% |
| Leesburg | 0 | 3 | 15 | 18 | 0% | Woodstock | 0 | 1 | 3 | 4 | 0% |
| Lexington | 1 | 4 | 3 | 8 | 13% | Wytheville | 1 | 0 | 1 | 2 | 50% |
| | | | | | | | | | | | |
| Total of RED (GCR of 0-3) | | | | | 105 | | | | | | |
| Total of YELLOW (GCR 4-5) | | | | | 280 | | | | | | |
| Total of GREEN (GCR 6-9) | | | | | 885 | | | | | | |
| Total Local Bridges Inspected | | | | | 1270 | | | | | | |
| **Local System Deficiency** | | | | | **8.27%** | | | | | | |

## Table 46 Locality Pavement Performance Summary

| PAVEMENT SAMPLE SUMMARY (HPMS) - JUNE 2007 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Samples | | | | Samples | | |
| **Locality** | **Total** | **Deficient** | **%Deficient** | **Locality** | **Total** | **Deficient** | **%Deficient** |
| Abingdon | 4 | 0 | 0% | Luray | | | |
| Alexandria | 19 | 5 | 26% | Lynchburg | 41 | 5 | 12% |
| Altavista | | | | Manassas | 8 | 1 | 13% |
| **Arlington** | 23 | 0 | 0% | Manassas Park | | | |
| Ashland | 2 | 0 | 0% | Marion | 4 | 1 | 25% |
| Bedford | 17 | 2 | 12% | Martinsville | 10 | 3 | 30% |
| Big Stone Gap | 1 | 0 | 0% | Narrows | | | |
| Blacksburg | 11 | 0 | 0% | Newport News | 38 | 13 | 34% |
| Blackstone | | | | Norfolk | 34 | 14 | 41% |
| Bluefield | 7 | 0 | 0% | Norton | | | |
| Bridgewater | 5 | 1 | 20% | Orange | | | |
| Bristol | 30 | 4 | 13% | Pearisburg | | | |
| Buena Vista | 11 | 1 | 9% | Petersburg | 46 | 12 | 26% |
| Charlottesville | 38 | 7 | 18% | Poquoson | 4 | 0 | 0% |
| Chase City | | | | Portsmouth | 8 | 2 | 25% |
| Chesapeake | 41 | 3 | 7% | Pulaski | 11 | 1 | 9% |
| Chincoteague | | | | Purcellville | | | |
| Christiansburg | 13 | 1 | 8% | Radford | 9 | 3 | 33% |
| Clifton Forge | 3 | 1 | 33% | Richlands | | | |
| Colonial Heights | 14 | 1 | 7% | Richmond | 63 | 21 | 33% |
| Covington | 13 | 1 | 8% | Roanoke | 48 | 7 | 15% |
| Culpeper | 10 | 4 | 40% | Rocky Mount | | | |
| Danville | 46 | 2 | 4% | Salem | 21 | 4 | 19% |
| Dumfries | | | | Saltville | | | |
| Elkton | | | | Smithfield | 1 | 0 | 0% |
| Emporia | 3 | 0 | 0% | South Boston | 6 | 0 | 0% |
| Fairfax | 1 | 0 | 0% | South Hill | | | |
| Falls Church | 2 | 0 | 0% | Staunton | 14 | 1 | 7% |
| Farmville | 15 | 7 | 47% | Strasburg | | | |
| Franklin | 7 | 2 | 29% | Suffolk | 30 | 2 | 7% |
| Fredericksburg | 21 | 6 | 29% | Tazewell | | | |
| Front Royal | 7 | 4 | 57% | Vienna | 1 | 0 | 0% |
| Galax | 10 | 1 | 10% | Vinton | 2 | 0 | 0% |
| Grottoes | | | | Virginia Beach | 54 | 4 | 7% |
| Hampton | 26 | 1 | 4% | Warrenton | 3 | 1 | 33% |
| Harrisonburg | 29 | 1 | 3% | Waynesboro | 10 | 2 | 20% |
| **Henrico** | 18 | 0 | 0% | Williamsburg | 3 | 0 | 0% |
| Herndon | 3 | 0 | 0% | Winchester | 26 | 12 | 46% |
| Hopewell | 14 | 4 | 29% | Wise | 1 | 0 | 0% |
| Lebanon | 2 | 0 | 0% | Woodstock | | | |
| Leesburg | 1 | 0 | 0% | Wytheville | 10 | 0 | 0% |
| Lexington | 12 | 2 | 17% | | | | |
| Pink shadows represent localities with no samples | | | | 62 Localities with ratings (2 Counties included) | | | |
| Blue shadow represents Counties only | | | | **STATEWIDE** | **985** | **170** | **17%** |

# Appendix A – Statutory Requirements

Section 33.1-13.02 of the *Code of Virginia* requires the Virginia Department of Transportation (VDOT) to report by September 15th of each odd-numbered year on the condition of and needs for maintaining and operating the existing surface transportation infrastructure based on an asset management methodology. This section of the *Code* reads as follows:

*No later than September 15 of each odd-numbered year, the Virginia Department of Transportation shall submit to the Governor, the Joint Legislative Audit and Review Commission, and the Commonwealth Transportation Board a report on the condition of and needs for maintaining and operating the existing transportation infrastructure in the Commonwealth for all asset management and maintenance, based on an asset management methodology. Such methodology shall, in accordance with generally accepted engineering principles and business practices, identify and prioritize maintenance and operations needs, including those for pavement, technology, bridges and other structures, pipes and draining, and congestion management and reduction. Reports shall include (i) the performance standards to be used to determine those needs, (ii) an estimate, for the upcoming two fiscal years, of the budget required to meet them, (iii) employment level goals for the next two years, and (iv) the percentage of asset management under private contract.*

**Statutory Requirements for Reporting of Performance on Local Roads**

*§ 33.1-41.1. Payments to cities and certain towns for maintenance of certain highways.*

*The Commonwealth Transportation Commissioner, subject to the approval of the Commonwealth Transportation Board, shall make payments for maintenance, construction, or reconstruction of highways, as hereinafter provided, to all cities and towns eligible for allocation of construction funds for urban highways under § 33.1-23.3. Such payments, however, shall only be made if those highways functionally classified as principal and minor arterial roads are maintained to a standard satisfactory to the Department of Transportation. Whenever any city or town qualifies under this section for allocation of funds, such qualification shall continue to apply to such city or town regardless of any subsequent change in population and shall cease to apply only when so specifically provided by an act of the General Assembly. All allocations made prior to July 1, 2001, to cities and towns meeting the criteria of the foregoing provisions of this section are hereby confirmed.*

*No payments shall be made by the Commissioner to any such city or town unless the portion of the highway for which such payment is made either (a) has (i) an unrestricted right-of-way at least 50 feet wide and (ii) a hard-surface width of at least 30 feet; or (b) has (i) an unrestricted right-of-way at least 80 feet wide, (ii) a hard-surface width of at least 24 feet, and (iii) approved engineering plans for the ultimate construction of an additional hard-surface width of at least 24 feet within the same right-of-way; or (c) (i) is a cul-de-sac, (ii) has an unrestricted right-of-way at least 40 feet wide, and (iii) has a turnaround that meets applicable standards set by the Department of Transportation; or (d) either (i) has been paved and has constituted part of the Primary or Secondary system of state highways prior to annexation or incorporation or (ii) has constituted part of the Secondary system of state highways prior to annexation or incorporation*

*and is paved to a minimum width of 16 feet subsequent to such annexation or incorporation and with the further exception of streets or portions thereof which have previously been maintained under the provisions of § 33.1-79 or § 33.1-82; or (e) was eligible for and receiving such payments under the laws of the Commonwealth in effect on June 30, 1985; or (f) is a street established prior to July 1, 1950, which has an unrestricted right-of-way width of not less than 30 feet and a hard-surface width of not less than 16 feet; or (g) is a street functionally classified as a local street and constructed on or after January 1, 1996, which at the time of approval by the city or town met the criteria for pavement width and right-of-way of the then-current edition of the subdivision street requirements manual for Secondary roads of the Department of Transportation (24 VAC 30-90-10 et seq.); (h) is a street previously eligible to receive street payments that is located in the City of Norfolk and the City of Richmond and is closed to public travel, pursuant to legislation enacted by the governing body of the city in which it is located, for public safety reasons, within the boundaries of a publicly funded housing development owned and operated by the local housing authority; or (i) is a local street, otherwise eligible, containing one or more physical protuberances placed within the right-of-way for the purpose of controlling the speed of traffic.*

*However, the Commissioner may waive the requirements as to hard-surface pavement or right-of-way width for highways where the width modification is at the request of the local governing body and is to protect the quality of the affected local government's drinking water supply or, for highways constructed on or after July 1, 1994, to accommodate some other special circumstance where such action would not compromise the health, safety, or welfare of the public. The modification is subject to such conditions as the Commissioner may prescribe.*

*For the purpose of calculating allocations and making payments under this section, the Department shall divide affected highways into two categories, which shall be distinct from but based on functional classifications established by the Federal Highway Administration: (i) principal and minor arterial roads and (ii) collector roads and local streets. Payments to affected localities shall be based on the number of moving-lane-miles of highways or portions thereof available to peak-hour traffic in each category of highways in that locality. For the fiscal year 1986, payment to each city and town shall be an amount equal to $7,787 per moving-lane-mile for principal and minor arterials and $4,572 per moving-lane-mile for collector roads and local streets.*

*The Department of Transportation shall establish a statewide maintenance index of the unit costs for labor, equipment, and materials used on roads and bridges in the fiscal year 1986, and use changes in that index to calculate and put into effect annual changes in the base per-lane-mile rate payable under this section.*

*The fund allocated by the Board shall be paid in equal sums in each quarter of the fiscal year, and no payment shall be made without the approval of the Board.*

*The chief administrative officer of the city or town receiving this fund shall make annual categorical reports of expenditures to the Board, in such form as the Board shall prescribe, accounting for all expenditures, certifying that none of the money received has been expended for other than maintenance, construction or reconstruction of the streets, and reporting on their*

*performance as specified in subdivision B 3 of § 33.1-23.02. Such reports shall be included in the scope of the annual audit of each municipality conducted by independent certified public accountants.*

**Statutory Definitions for Maintenance, Operations, and Asset Management**

§ 33.1-23.02. *Definition of the terms "maintenance" and "asset management."*

*A. For the purpose of this title, unless otherwise explicitly provided, the term "maintenance" shall include ordinary maintenance, maintenance replacement, operations that include but are not limited to traffic signal synchronization, incident management, other intelligent transportation system functions, and any other categories of maintenance which may be designated by the Commissioner.*

*B. 1. For the purposes of this title, unless otherwise explicitly provided, the term "asset management" shall mean 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.*

*2. The Department shall develop asset management practices in the operation and maintenance of the state system of highways.*

*3. The Commissioner shall advise the Board, on or before June 30 of even-numbered years, of performance targets and outcomes that are expected to be achieved, based upon the funding identified for maintenance, over the biennium beginning July 1 of that year. In addition, not later than September 30 of even-numbered years, the Commissioner shall advise the Board on the Department's accomplishments relative to the expected outcomes and budget expenditures for the biennium ending June 30 of that year and also advise the Board as to the methodology used to determine maintenance needs and the justification as to the maintenance funding by source.*

**Statutory Requirements for Funding Maintenance and Operations**

§ 33.1-23.1. *Allocation of funds among highway systems.*

*A. The Commonwealth Transportation Board shall allocate each year from all funds made available for highway purposes such amount as it deems reasonable and necessary for the maintenance of roads within the Interstate system of highways, the Primary system of state highways, the Secondary system of state highways and for city and town street maintenance payments made pursuant to § 33.1-41.1 and payments made to counties which have withdrawn or elect to withdraw from the Secondary system of state highways pursuant to § 33.1-23.5:1.*

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# Appendix B – Maintenance and Operations Service Levels

Central to the Virginia Department of Transportation's (VDOT's) new approach to maintenance and operations is the definition of maintenance and operations services. Developing service definitions and service levels for all critical services provided by the Department is a large undertaking involving extensive research and engagement of many subject matter experts from across the agency. This work in underway and ongoing. The following is taken from the current working version of the Maintenance and Operations Service Levels document. The service levels in this document were used in assessing needs for the services portion of the biennial needs assessment.

## *Purpose*

This document has three purposes:

- To provide a framework for developing a new approach to delivering maintenance and operations services in the context of a declining resource environment
- To provide a tool for communicating VDOT's maintenance and operations services to the people we serve.
- To serve as the basis for a revised comprehensive VDOT Maintenance and Operations Manual, to be developed by June 30, 2011.

A revised VDOT Maintenance and Operations Manual is under development. The manual will describe the various means by which VDOT will deliver a range of maintenance and operations services to the traveling public. Finally, the manual will also serve as an instructional resource for VDOT personnel who oversee and implement these services. The following sections describe the VDOT's primary goal, our service areas, and services themselves, all of which provide a framework for delivery of maintenance and operations services.

## *Safety and the Centerline*

VDOT's approach to delivering maintenance and operations services begins with the overriding principle and goal of ensuring the safety of the traveling public. Therefore, all VDOT maintenance and operations services shall be delivered in accordance with the following priorities:

1. The first priority in all maintenance and operations activities shall be work that is directed specifically to the immediate safety of the traveling public.
2. The second priority in all maintenance and operations activities shall be to those activities which contribute primarily to the preservation of the travel service and critical safety elements.
3. All other activities intended primarily for aesthetics, upgrading (construction), or other items not relating to safety and/or the preservation of the travel surface, shall not be done in lieu of work categorized as priority one or two.

Furthermore, in order to achieve our top priorities while carrying out these services, maintenance and operation services will be delivered by applying a *centerline-out approach* as follows*:*

- Safety dictates our services provided from the centerline of the roadway out.
- Financial resources dictate our services from the roadway shoulders out.

## *Maintenance and Operations Service Areas*

Following this safety and centerline out approach, VDOT's maintenance and operation services can be generally placed into the following service areas:

1. Emergency and Safety Response Services
   - 1.1. Incident Response/Clearance Management
     - Crashes and Accidents
     - Hurricane and Severe Weather Events
     - Hazardous Materials Spills
     - Terrorist Events
   - 1.2. Snow and Ice Control Management
   - 1.3. Traffic Operation Center Management
2. Roadway Services
   - 2.1. Road Surface Management
   - 2.2. Bridge Management
   - 2.3. Tunnel Management
3. Traffic Control Services
   - 3.1. Signs and Pavement Marking Management
   - 3.2. Lights and Guardrail Management
4. Roadside Services
   - 4.1. Drainage Management
   - 4.2. Vegetation Control Management
   - 4.3. Mowing Services
   - 4.4. Obstruction/Hazardous Debris Management
   - 4.5. Sound Barriers Management
   - 4.6. Fence Management
5. Facility Services
   - 5.1. Safety Rest Area and Waysides
   - 5.2. Park and Ride Lot Management
   - 5.3. Sidewalks/Trail Management

The following sections describe the method used to evaluate each service area or combination of service areas for a framework to achieve VDOT's top priorities.

## *Maintenance and Operations Framework*

Ensuring the safety of motorists on Virginia's roadways is VDOT's highest priority. During the current economic crisis within Virginia and abroad, VDOT is re-examining each of our service areas to ensure that the limited funding available is targeted solely towards meeting safety and centerline priorities.

In order to begin the re-examination, VDOT compiled and reviewed a number of other state DOT maintenance and operations' documentation. Borrowing from components of a program developed by the Washington State Department of Transportation, a service level approach was adopted to describe general service levels for each roadway category. In addition, program components from Ontario Canada were borrowed relative to developing critical service response times for non-routine activities.

As routine service levels and critical response time services apply to specific roadways for maintenance and operations purposes, Virginia's roads can be best categorized according to known service level demands and the magnitude of safety risks to motorists. The roadway categories, service levels, and critical service response times provide the framework from which we will manage and deliver these services as described in the following sections.

**Roadway Categories**

Four categories of roadways have been developed to broadly reflect these prioritized demands and risks as represented in Table 1 below.

**Table 1: Roadway Category Matrix**

| Average Daily Traffic (ADT) | Interstate and Other Limited Access Routes | Primaries | Secondaries | Unpaved Roads |
|---|---|---|---|---|
| 200,000+ | 1 | | | |
| 100,000 | 1 | | | |
| 50,000 | 1 | 1 | 1 | |
| 25,000 | 1 | 1 | 1 | |
| 10,000 | 1 | 1 | 1 | |
| 5,000 | 1 | 2 | 2 | |
| 2,500 | 2 | 3 | 3 | |
| 1,000 | | 3 | 3 | 4 |
| 750 | | | 4 | 5 |
| 450 | | | 4 | 5 |
| 100 | | | 4 | 5 |
| 50 | | | 4 | 5 |
| <50 | | | 4 | 5 |

**Routine Service Levels**

Service levels range from A to E. Level A indicates a "like new" state. Level E indicates the most advanced or severe state of disrepair or potential safety concerns. These service levels can be integrated or correlated into the roadway category matrix in order for VDOT maintenance and operations services to achieve our top priority.

The Roadway Category Routine Service Levels become the framework for delivery of all maintenance and operations services. Each service area requires unique defining criteria, and is spelled out in the relevant section below. For example, drawing on Road Surface Management service levels:

- Service Level A: Pavement with few unrepaired potholes, ruts, or unsealed cracks. No drop-off at the pavement edge. The shoulder is generally clean and free of debris.
- Service Level E: Pavement has an extensive amount of unrepaired potholes, ruts, or unsealed cracks. Extensive erosion or drop-off has developed at the pavement edge. The paved shoulder contains debris build-up that would prevent bicycle and pedestrian use, be a hazard to vehicles, and be unsightly. Unpaved roads are impassable.

In general, higher roadway categories require higher levels of service. Acceptable service levels for each roadway category are described below according to service area. Maintenance and operations action is mandated when the state of a road drops below the indicated service level. For example, the acceptable service level for a category 1 road surface has been established as a Service Level B, described below:

- Service Level B: Pavement has a minor amount of unrepaired potholes, ruts, or unsealed cracks. A minor amount of drop-off and minor erosion is at the pavement edge. The paved shoulder contains a small amount of debris build-up at the edge.

If and when any element of the category 1 road surface were to deteriorate beyond an acceptable condition, corrective actions and or repairs will be scheduled and implemented based on available resources When service is performed, every effort will be made to return the roadway to it's acceptable level or better.

**Critical Service Response Times**
If the safety or integrity of any roadway element or structure has been compromised in a manner that presents an immediate hazard to the traveling public, the road will be closed or necessary actions and repairs will be implemented immediately.

In addition to roadway category routine service levels, certain roadway conditions warrant critical responses regardless of the roadway category or service level. Such activities are included in certain roadway service areas and represented as Critical Service Response Times. Critical Service Response times are intended to be measured programmatically and over time and not individual occurrences.

## *Service Levels*
The following sections describe the routine service levels and critical service response times within each of VDOT's maintenance and operations service areas.

### 1. Emergency and Safety Response Services

In all cases, VDOT incident response will conform to the ER-1 SOP.

### 1.1. Incident Response/Clearance Management

**Service Level A:** Emergency Response Team arrival is within 15 minutes, 24/7. Coverage and observation is 100% of system between maintenance/TAMS operators, cameras and SSP. This service level is consistent with a 24/7 Safety Service Patrol (SSP) operation.

**Service Level B:** Emergency Response Team arrival within 30 minutes during peak travel periods and 60 minutes during non-peak periods. Coverage and observation is 80% of system, between maintenance/TAMS operators, cameras and SSP. This service level is consistent with a partial/peak hour SSP operation.

**Service Level C:** During normal business hours, Emergency Response Team arrival within 30 minutes upon notification or discovery. After hours, Emergency Response Team arrival within 60 minutes upon notification, discovery or when requested by local or state authorities. Limited active coverage or observation. This service level is consistent with TAMS Contractor response.

**Service Level D:** During normal business hours, Emergency Response Team arrival within 60 minutes. After hours, Emergency Response Team arrival within 2 hours upon notification, discovery or requested by local or state authorities. Very limited or no active coverage or observation. This service level is consistent with VDOT Maintenance response.

**Service Level E:** No Emergency Response Team. VDOT responds when specifically requested by local or state authorities, and does not commit resources unless a review to assess asset damages indicates otherwise. No active observation.

**Table 2: Incident Response and SSP Service Levels**

| Roadway Category | Incident Response |
|---|---|
| Tunnels | A |
| 1 (designated route) | B |
| 1 (non-designated route) | C |
| 2 | D |
| 3 | D |
| 4 | D |
| 5 | E |

### 1.2. Snow and Ice Control Management

**Service Level A:** Snow or ice buildup encountered rarely. Full scale snow and ice control plans are implemented. Anti-icing services are provided. Bare pavement attained as soon as possible. Travel delays may be experienced in severe storms.

**Service Level B:** Snow or ice build up encountered at times but infrequent. Anti-icing services may be provided. Travel delays may be experienced in moderate storms and roads may have patches of black ice, slush, or packed snow.

**Service Level C:** Snow or ice buildup encountered regularly. Roads are plowed and opened within 24 hours or once higher service level roads are complete. Travel delays will be experienced in moderate storms and roads are likely to have patches of black ice, slush, or packed snow.

**Service Level D:** Compact snow buildup encountered regularly. Roads are plowed and opened within 48 hours or once higher service level roads are complete. Traveler will experience delays and slow travel during snow and ice events.

**Service Level E:** Closed periodically or for the duration of the winter season.

**Table 3: Snow and Ice Control Service Levels**

| Roadway Category | Snow and Ice Control |
|---|---|
| 1 | A |
| 2 | B |
| 3 | C |
| 4 | D |
| 5 | D |

## 1.3. TOC Management

### 1.3.1. Traffic Operations Center (TOC) facility

#### 1.3.1.1. Routine Service Levels:

**Service Level A:** Operational and staffed 24/7 with hot redundancy/backup systems. High level security.

**Service Level B:** Operational and staffed 24/7 with cold redundancy/backup systems. Moderate level security.

**Service Level C:** Operational and staffed less than 24/7 and 4 hour backup capability. Moderate level security.

**Service level D:** Operational and staffed for planned special events only, no backup capability and minimal level security.

**Service Level E:** Not fully operational or staffed. Basic level security.

**Table 4: TOC Facility Service Levels**

| Roadway Category | TOC Facility |
|---|---|
| Tunnels, Reversible Roadways | A |
| 1 | B |
| 2 | B |
| 3 | B |
| 4 | B |
| 5 | B |

### 1.3.2. Traffic Signal Operations

#### 1.3.2.1. Routine Service Levels:

**Service Level A:** All signals are connected in real-time to an active traffic signal control system with network control of intersections. Full system detection available.

**Service Level B:** Most signals can be accessed remotely, operate in traffic responsive mode and are monitored at least quarterly to adjust signal timing parameters. Most system detectors are available.

**Service Level C:** Most signals can be accessed remotely, operate in coordinated systems, either time based or traffic responsive, and are monitored every 2-4 years to adjust signal timing parameters. Some system detection available.

**Service level D:** Few signals can be accessed remotely, only time based signal coordination and are monitored every 5 years to adjust signal timing parameters. No system detectors.

**Service Level E:** No traffic signal timing coordination performed.

**Table 5: Traffic Signal Operations Service Levels**

| Roadway Category | Traffic Signal Operations |
|---|---|
| Tunnels, Reversible Roadways | A |
| 1 (designated routes)<br>1 (non-designated routes) | B<br>C |
| 2 | D |
| 3 | D |
| 4 | E |
| 5 | E |

### 1.3.3. Traffic Cameras, Changeable Message Signs and Other ITS Devices

#### 1.3.3.1. Routine Service Levels:

**Service Level A:** All locations fully operational, operational 99.9% of time and response time less than 2 hours.

**Service Level B:** 98% of locations fully operational and available 98% of time. Response time less than 4 hours for cameras available to the public and 24 hours for cameras not available to the public.

**Service Level C:** 90% of locations fully operational and available 95% of time. Response time is 48 hours.

**Service level D:** 50% of locations fully operational and available 75% of time. Response time is 5 days.

**Service Level E:** No camera service, cameras out of service or end of useful life.

**Table 6: Traffic Cameras Service Levels**

| Roadway Category | Traffic Cameras |
|---|---|
| Tunnels, Reversible Roadways | A |
| 1 | B |
| 2 | C |
| 3 | D |
| 4 | E |
| 5 | E |

## 2. Roadway Services

### 2.1. Road Surface Management

### 2.1.1. Critical Service Response Times

Potholes that meet the critical dimensions in Table 7: Pothole Patching Response Times will be addressed according to the times listed, regardless of routine service level.

**Table 7: Pothole (100 sq"x 3" deep or greater) Patching Response Times**

| Roadway Category | Roadway Response Time | Shoulder Response Time |
|---|---|---|
| 1 | 4 days | 4 days |
| 2 | 4 days | 4 days |
| 3 | 30 days | 30 days |
| 4/5 | Annual Maintenance | Annual Maintenance |

**NOTE: A pothole with the potential to cause injury or vehicle damage will be repaired in less than 24 hours regardless of roadway category.**

### 2.1.2. Routine Service Levels:

**Service Level A**: Pavement with few unrepaired potholes, ruts, or unsealed cracks. No drop-off at the Road surface edge. The shoulder is generally clean and free of debris.

**Service Level B:** Road surface has a minor amount of unrepaired potholes, ruts, or unsealed cracks. A minor amount of drop-off and minor erosion is at the Road surface edge. The shoulder contains a small amount of debris build-up at the edge.

**Service Level C:** Road surface has a moderate amount of unrepaired potholes, ruts, or unsealed cracks. A moderate amount of drop-off has developed from at the Road surface edge with some erosion. The shoulder contains a noticeable debris build-up that may be unsightly.

**Service Level D:** Road surface has a significant amount of unrepaired potholes, ruts or unsealed cracks. A significant drop-off has developed at the Road surface edge with noticeable erosion. The shoulder contains significant debris that would restrict bicycle or pedestrian use, and be unsightly. In addition to the above, unpaved roads have washboarding

**Service Level E:** Road surface has an extensive amount of unrepaired potholes, ruts, or unsealed cracks. Extensive erosion or drop-off has developed at the Road surface edge. The shoulder contains debris build-up that would prevent bicycle and pedestrian use, be a hazard to vehicles, and be unsightly. Unpaved roads are impassable. Dust control is not routinely performed.

**Table 8: Road surface Management Service Levels**

| Roadway Category | Service Level |
|---|---|
| 1 | B |
| 2 | B |
| 3 | B |
| 4 | C |
| 5 | D |

**NOTE: Dust control on unpaved roadways will be performed on an as needed basis as field conditions and budgetary resources dictate.**

## 2.2 Structure & Bridge Management

All repairs and maintenance to structures and bridges are conducted according to inspection reports or discovery. Service levels for the riding surface of bridges (bridge decks) are described below.

### 2.2.1 Critical Service Response Times.

A bridge deck defect with the potential to cause injury or vehicle damage will be repaired in less than 24 hours from discovery or notification. Other defects that meet the critical dimensions in

Table 9: Bridge Deck (100 sq"x 2" deep or greater) Patching will be addressed according to the times listed.

**Table 9: Bridge Deck (100 sq"x 2" deep or greater) Patching Response Times**

| Roadway Category | Time |
|---|---|
| 1 | 4 days |
| 2 | 4 days |
| 3 | 30 days |
| 4/5 | Up to 60 days |

### 2.2.2 Routine Service Levels:

**Service Level A:** Deck Surface with few unrepaired potholes, or unsealed cracks. The shoulder is generally clean and free of debris.

**Service Level B:** Deck Surface has a minor amount of unrepaired potholes, or unsealed cracks. The paved shoulder contains a small amount of debris build-up at the edge.

**Service Level C:** Deck Surface has a moderate amount of unrepaired potholes, or unsealed cracks. The paved shoulder contains a noticeable debris build-up that may be unsightly.

**Service level D:** Deck Surface has a significant amount of unrepaired potholes or unsealed cracks. The paved shoulder contains significant debris that would restrict bicycle or pedestrian use, and be unsightly.

**Service Level E:** Deck Surface has an extensive amount of unrepaired potholes or unsealed cracks. The paved shoulder contains debris build-up that would prevent bicycle and pedestrian use, be a hazard to vehicles, and be unsightly.

**Table 10: Bridge Deck Service Levels**

| Roadway Category | Service Level |
|---|---|
| 1 | B |
| 2 | B |
| 3 | B |
| 4 | B |
| 5 | B |

### 2.3 Tunnel Management

Facility-specific manuals shall be adhered to and dictate both critical and routine services.

## 3. Traffic Control Services

### 3.1. Signals, Signs, and Pavement Marking Management

#### 3.1.1. Critical Service Response Times

All repairs and maintenance to signal poles and overhead sign structures are conducted according to inspection reports or discovery. If a traffic signal or intersection traffic control is not functioning properly or as designed, the minimum standard is to deploy resources as soon as practicable after becoming aware of the need to restore its function. General response times for functional deficiencies of other traffic control elements are listed in Table 11, and will be addressed accordingly, regardless of routine service levels.

**Table 11: Signals, Signs, and Pavement Marking Response Time**

| Roadway Category | Intersection Control (i.e. Traffic Signals, stop signs & yield signs) | Other Regulatory & Warning Signs | Pavement Markings |
|---|---|---|---|
| 1 | 2 hours | 7 days | 30 days |
| 2 | 4 hours | 14 days | 60 days |
| 3 | 4 hours | 21 days | 90 days |
| 4 | 4 hours | 30 days | 120 days |
| 5 | 4 hours | 30 days | N/A |

#### 3.1.2. Routine Service Levels:

Traffic signals and striping are maintained to a serviceable level and according to manufacturers' specifications or the Area VDOT Traffic Engineer.

**Service Level A:** All stripes, signs and delineators are visible at night. All traffic signals are fully functional.

**Service Level B:** Minor amount of stripes, signs and delineators have lost some night reflectivity, are worn, or missing. Traffic signals are operating as intended.

**Service Level C:** Moderate amount of stripes, signs and delineators have lost some night reflectivity, are worn, or missing. Traffic signals are not operating as intended.

**Service Level D:** Significant amount of stripes, signs and delineators have lost night reflectivity, are worn, or missing. Traffic signals nonfunctioning, or signal failure mitigated.

**Service Level E:** Extensive amount of stripes, signs and delineators have lost night reflectivity, are worn, missing, or do not exist. Traffic signals absent.

**Table 12: Signs, and Pavement Marking Service Levels**

| Roadway Category | Regulatory & Warning Signs | Pavement Marking |
|---|---|---|
| 1 | B | B |
| 2 | B | B |
| 3 | C | C |
| 4 | C | n/a |
| 5 | C | n/a |

## 3.2. Lighting

### 3.2.1. Critical Response Times

Lighting (to include lighting on overhead signage) that is not functioning properly or as designed which have the potential to cause a decrease in roadway or sign visibility, the minimum standard shall be to deploy resources as soon as practicable after becoming aware of the need to restore its function.

### 3.2.2. Routine Service Levels

**Service Level A:** All lighting is fully functional.

**Service Level B:** Lighting is experiencing minimal outages or down time.

**Service Level C:** Lighting is experiencing moderate outages or down time.

**Service Level D:** Lighting is experiencing frequent outages or down time.

**Service Level E:** Lighting must be turned off or shut down.

**Table 13 Lighting Service Levels**

| Roadway Category | Roadway Lighting | Sign Lighting |
|---|---|---|
| 1 | B | B |
| 2 | C | C |
| 3 | C | C |
| 4 | C | C |
| 5 | n/a | C |

## 3.3. Guardrail Management

### 3.3.1. Critical Response Times

Guardrail damage or deterioration, where ability to offer hazard protection is compromised, will be scheduled for repair within 48 hours from discovery or notification.

### 3.3.2. Routine Service Levels

**Service Level A:** Guardrail meets current design/safety standards and does not show any significant damage.

**Service Level B:** Guardrail meets current design/safety standards and has sustained minor visible damage.

**Service Level C:** Guardrail meets original design/safety standards and has sustained minor visible damage.

**Service Level D:** Guardrail does not meet original design/safety standards or has sustained significant visible damage, but offers some hazard protection.

**Service Level E:** Guardrail provides limited or no hazard protection.

**Table 14 Guardrail Service Levels**

| Roadway Category | Guardrail |
|---|---|
| 1 | B |
| 2 | C |
| 3 | C |
| 4 | C |
| 5 | C |

## 4. Roadside Services

### 4.1. Drainage Management

If the safety or integrity of a roadway or adjacent property is impacted due to a blocked drainage structure, flooding, or erosion, necessary repairs are implemented immediately upon notification or discovery.

### 4.1.1. Routine Service Levels

**Service Level A:** Ditches, curbs, gutters and culverts flow freely. Storm drains are free of blockages, and slopes are stable. No standing water on pavement.

**Service Level B:** Ditches, curbs, gutters and culverts have minor silt and debris build-up. Storm drains have minor blockages. Minor puddling may occur during normal storm events.

**Service Level C:** Ditches, curbs, gutters and culverts have moderate silt and debris build-up. Storm drains have moderate blockages and slopes have moderate erosion or slides. There may be some standing water on shoulder and in ditches during major storm events.

**Service Level D:** Ditches, curbs, gutters and culverts have significant silt and debris build-up. Storm drains have significant blockages. Erosion or slides may encroach or threaten the roadway. Standing water in traveled lane during normal storm event.

**Service Level E:** Ditches, curbs, gutters and culverts have extensive silt and debris build-up. Drains are blocked. Erosion and slides threaten roadway. Water will be over the roadway during normal storm events.

**Table 15: Drainage Service Levels**

| Roadway Category | Service Level |
|---|---|
| 1 | B |
| 2 | B |
| 3 | C |
| 4 | C |
| 5 | D |

### 4.1.2. Stormwater Management

Facility-specific manuals shall be adhered to and dictate both critical and routine services.

## 4.2. Vegetation Control Management Routine Service Levels:

Sight distance and clear zones shall be maintained at all times in accordance with VDOT Road Design Manual.

**Roadside Service Level A:** Roadside has minimal visible litter, no noxious weeds, nuisance vegetation. Ditch lines, guardrails, signs, or sight lines are unobstructed.

**Roadside Service Level B:** Roadside has a minor amount of visible litter, noxious weeds, nuisance vegetation. Some ditch lines and guardrails are slightly obscured by encroaching vegetation. Some signs and sightlines are at risk of being obscured by vegetation.

**Roadside Service Level C:** Roadside has a moderate amount of visible litter, noxious weeds, nuisance vegetation. Vegetation is starting to encroach on the pavement edge, moderately obscuring ditch lines and guardrails. Some signs and sightlines are being obscured by vegetation.

**Roadside Service Level D:** Roadside has a significant amount of visible litter*, noxious weeds, nuisance vegetation. Vegetation is encroaching on the pavement edge, significantly obscuring ditch lines, guardrails, signs, and sight lines.

**Roadside Service Level E:** Roadside has an extensive amount of visible litter*, noxious weeds, nuisance vegetation. Vegetation has encroached on the pavement, extensively obscuring ditch lines, guardrails, signs, and sight lines.

* No litter removal is performed by VDOT. Adopt-a-Highway and local and state correctional partnerships for litter removal will be optimized for all Roadside Service Levels, and exclusively for service levels D and E.

Landscape plan beds and wildflower beds meet a separate performance measure and will be addressed in a separate document.

### 4.3. Mowing Routine Service Levels

*VDOT Maintenance and Operations Manual (TBD), Required Mowing Practices* shall be utilized for statewide mowing services. Sight distance lines shall be maintained on all roadways and service levels at crossovers and intersections; excluding commercial and private entrances. No provision for the clearing of sight lines for commercial and private entrances is included in the prescribed mowing levels of service; that responsibility does not rest with the Department.

**Service Level A:** ROW line to ROW line is mowed once a year. The shoulder between ditch line and pavement edge is mowed no more than four cycles annually.

**Service Level B:** ROW line to ROW line is mowed once every three years. The shoulder between ditch line and pavement edge is mowed no more than three cycles annually.

**Service Level C:** Only one swath from the pavement edge is mowed no more than two cycles annually.

**Service Level D:** Mowing occurs for safety only; cut to remove sight distance problems at intersections and cross overs only.

**Service Level E:** No mowing. Only encroaching brush and trees are cut or removed.

**Table 16: Roadside and Mowing Service Levels**

| Roadway Category | Roadside Service Level | Mowing Service Level |
|---|---|---|
| 1 | B | B |
| 2 | B | C |
| 3 | B | C |
| 4 | D | D |
| 5 | D | D |

### 4.4. Obstruction/Hazardous Debris Management

Obstructions or hazardous debris that may impair roadway safety or integrity are removed immediately upon notification or discovery. Other obstructions or debris shall be removed in accordance with the response times in Table 17.

**Table 17: Obstruction/Hazardous Debris Response Time**

| Highway Class | Response Time |
|---|---|
| 1 | < 1 day |
| 2 | 3 days |
| 3 | 14 days |
| 4 | 30 days |
| 5 | 30 days |

### 4.5. Sound Barriers Management Routine Service Levels

All repairs and maintenance to bridges are conducted according to bridge inspection reports or discovery.

**Fence Management Critical Response Times**

Fence damage that may impair roadway safety or integrity is corrected immediately upon notification or discovery. Other damage shall be repaired in accordance with the response times in Table 18.

**Table 18: Fence Repair Response Times**

| Highway Class | Response Time |
|---|---|
| 1 | 30 day |
| 2 | 60 days |
| 3 | 90 days |
| 4/5 | N/A |

## 5. Facility Services

### 5.1. Safety Rest Area and Waysides

Facility-specific manuals shall be adhered to and dictate both critical and routine services.

### 5.2. Park and Ride Lot Management

Facility-specific manuals shall be adhered to and dictate both critical and routine services.

### 5.3. Sidewalks/Trail Management Routine Service Levels

**Service Level A:** Travel surface with few unrepaired potholes, ruts, or unsealed cracks. No drop-off at the surface edge. Surface is generally clean and free of debris.

**Service Level B:** Travel surface has a minor amount of unrepaired potholes, ruts, or unsealed cracks. A minor amount of drop-off and minor erosion is at the surface edge. Surface contains a small amount of debris build-up at the edge.

**Service Level C:** Travel surface has a moderate amount of unrepaired potholes, ruts, or unsealed cracks. A moderate amount of drop-off has developed from at the surface edge with some erosion. The surface contains a noticeable debris build-up that may be unsightly.

**Service Level D:** Travel surface has a significant amount of unrepaired potholes, ruts or unsealed cracks. A significant drop-off has developed at the surface edge with noticeable erosion. The surface contains significant debris that would restrict bicycle or pedestrian use, and be unsightly.

**Service Level E:** Travel surface has an extensive amount of unrepaired potholes, ruts, or unsealed cracks. Extensive erosion or drop-off has developed at the surface edge. The surface contains debris build-up that would prevent bicycle and pedestrian use and be unsightly.

**Table 19: Travel Surface Management Service Levels**

| Roadway Category | Service Level |
|---|---|
| 1 | B |
| 2 | B |
| 3 | B |
| 4 | B |
| 5 | Na |