

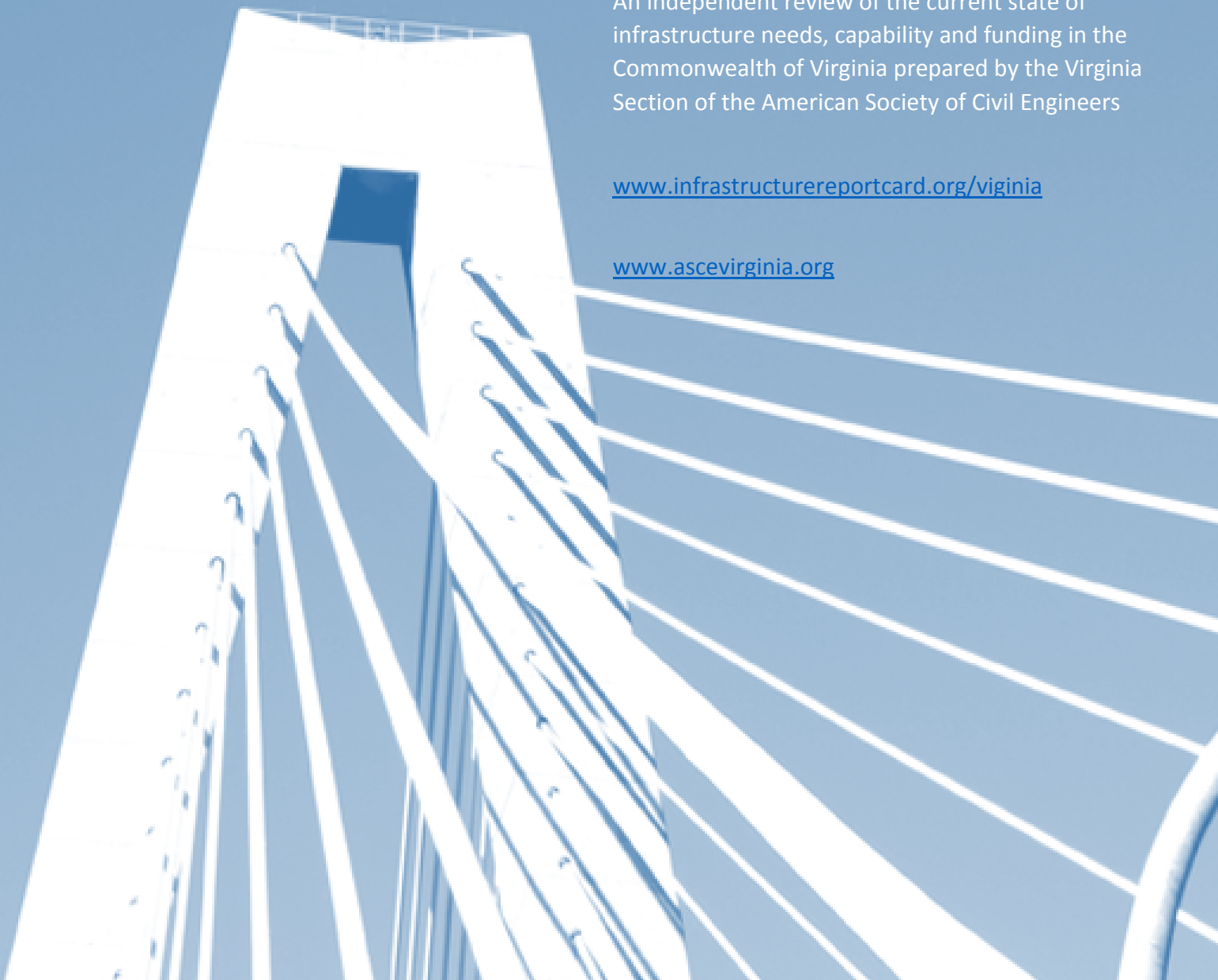


2015 REPORT CARD FOR VIRGINIA'S INFRASTRUCTURE

An independent review of the current state of infrastructure needs, capability and funding in the Commonwealth of Virginia prepared by the Virginia Section of the American Society of Civil Engineers

www.infrastructurereportcard.org/vignia

www.ascevirginia.org



EXECUTIVE SUMMARY

Who is the American Society of Civil Engineers?

The American Society of Civil Engineers (ASCE), founded in 1952, is the country's oldest, national civil engineering organization. It represents more than 140,000 civil engineers in private practice, government, industry, and academia who are dedicated to advancing the science and profession of civil engineering.

Established in 1922, the Virginia Section of the American Society of Civil Engineers (ASCE/V) represents over 3,000 members across the Commonwealth of Virginia. ASCE/V is formed into seven branches that cover the state including the Blue Ridge, Bull Run, Lynchburg, Norfolk, Peninsula, Richmond and Roanoke Branches. We also have student chapters and faculty advisors to support our work.

What is an Infrastructure Report Card?

As stewards of the infrastructure that supports our families, communities, and businesses, Virginia's civil engineers periodically assess the current condition and outlook for all types of infrastructure using the familiar form of a school report card.

ASCE assigns letter grades for each category of infrastructure that are based on eight grading criterion: Capacity, Condition, Operation and Maintenance, Funding, Future Need, Public Safety, Resilience, and Innovation. In each category of infrastructure, these grading criterion are applied differently based on available studies and reports, and based on a careful evaluation by a team of volunteers and experts, knowledgeable about each category of infrastructure.

Why Release a Report Card?

Part of ASCE's mission is to promote the public good and to use our expertise to identify important needs within our communities. If we fail to do so, we would be failing not only ourselves, but our friends, neighbors, and colleagues. We care about our communities, and as such, we need to provide our decision makers with the technical information and recommendations that they can use to make informed decisions.

Poor infrastructure hurts everyone. We are already paying for Virginia's struggling infrastructure. Every time we sit in traffic or wait for the power to come back on, we are wasting invaluable amounts of time and money. We are also losing business to those with better infrastructure. Weaknesses need to be identified as well as solutions.

Think of our infrastructure the same way you would your own home. If your roof is leaking, you can either pay a little to fix it now or wait until the whole roof caves in and you have to buy a new house. It is a similar situation with our roads, schools, and other infrastructure. While we see the need for funding today, what we need long-term is bold leadership to make the tough decisions about infrastructure, and a vision for a sustainable future.

The longer we wait, the more it will cost....now is the time for action!

Did we make the Grade in Virginia?

The 2015 Infrastructure Report Card includes ten (10) categories of infrastructure in the Commonwealth of Virginia and our grades are provided below.

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

Bridges	C
Dams	C
Drinking Water	C
Parks and Recreation	C+
Rail and Transit	C-
Roads	D
Schools	C-
Solid Waste	B-
Stormwater	C-
Wastewater	D+

Virginia's overall GPA was a "C-", up slightly from the "D+" provided by ASCE Virginia in 2009 which was our first report card at the state level. While we are maintaining the "status quo" with our 2015 grades, ASCE does not see a major improvement, and we question whether a "C-" is good enough for Virginia.

How does this compare to our National Grade?

The state report card is modeled after the national ASCE 2013 Report Card for America's infrastructure, which is our most recent. ASCE gave America's infrastructure an overall grade of "D+" which is very similar to Virginia's overall GPA in 2015.

Are there more details about the grades?

Details can be found on the ASCE websites, and details about the Virginia grades are also provided in the summary paragraphs below. Additional information is also found in the following chapters of the Full Report Card for 2015.

Bridges C

Virginia has 20,997 bridges and culverts in our inventory, and the overall health of our bridges is in decline due to age and lack of funding. 56% of Virginia's structures are approaching the end of their anticipated design life having been in service for more than 40 years. As part of this, 30% are over 50 years old. Virginia's structures must be inspected regularly, with an average of 10,700 inspection annually so their condition can be evaluated. In 2013, Virginia's inventory included 23.2% that were either structurally deficient or functionally obsolete. Of the major Virginia structures on the National Bridge inventory, about 1 in every 4 bridges are structural deficient (meaning that they require maintenance, rehabilitation, or replacement) or functionally obsolete (meaning they no longer meet today's design standards). These 4,879 structurally deficient or functionally obsolete structures are primarily a result of the gap between required and available funding. Available funds are often used to address immediate repair or replacement needs, leaving few remaining funds for preventative maintenance. Additionally, smaller structures have often been given funding which decreases the number of bridges requiring attention, but leaves a backlog of deferred maintenance on larger, more expensive structures. The statistics indicate an impending peak of replacements which may be required with the next 10 years and perhaps sooner. If needs are not addressed at a higher rate.

Dams C

Dams provide numerous benefits to Virginia including recreation, water supply, irrigation, flood control, and hydroelectric power generation. There are only two natural lakes in Virginia, Lake Drummond and Mountain Lake, however Virginia has about 4 dams within every 100 square miles. Virginia's dam inventory continues to grow older and more susceptible to damage. The majority of dams in the state were built 1950-75, and their average age is over 50 years old. With 1,789 regulated dams, Virginia ranks 11th nationally for having the most regulated dams. Dam safety officials regulate 312 high hazard dams, which is an increase of 82 dams since 2011, and 141 of these dams, or 45%, have Conditional O&M Certification, indicating that they do not meet current dam safety standards. The estimated rehabilitation cost for 440 high and significant hazard dams in Virginia is \$592M to address deficiencies. While funding for dam safety has increased since 2008, it is small by comparison to \$592M in deficiencies, and in order to ensure the safety of those downstream a continued investment in bringing all dams into full compliance with the current regulations is needed.

Drinking Water C

Virginia saw a large growth in public water systems after 1940, and now has 2,830 public water systems providing drinking water to more than 7M Virginians. Of this, 91% are served by waterworks that reported no water quality violations, however a large number of these systems have passed 70 years of age. Many require significant asset renewal in the immediate future. EPA's latest assessment showed Virginia's waterworks need nearly \$6.1B to maintain our drinking water systems over the next 20 years. However, at only 72% of the national average, we must be diligent in identifying, defining and quantifying our needs to justify increased federal funding. From 200 to 2012, Virginia was awarded \$220M in Drinking Water State Revolving Funds. This investment addresses less than 10% of the total needs in spite of increased needs, the award for 2012 was even less ... at 5% of the total need. Deferral of the necessary improvements has worked so far, but can result in degraded water service, water quality violations, health issues, and higher costs in the future. A more robust plan to maintain our drinking water infrastructure is needed to avoid future problems.

Parks and Recreation C+

Virginia's public parks and recreation facilities are a diverse combination of national, state and local destinations which provide more than \$18B in economic benefits annually from outdoor recreation in Virginia. When comparing the revenue generated by our state parks to the economic investment in the state's general fund, it represents a return on investment of almost \$11 for every \$1 of general fund spending. However Virginia has 5 new state parks which lack enough funding to develop and open to the public. Virginia also has more localities with vacant or missing positions for parks directors than was the case 5 years ago, for our last ASCE report card. For these reasons, the ASCE parks report card grade has been lowered. While park attendance in Virginia is on the rise, and our parks are consistently ranked as some of the best in the nation, leadership is needed to reverse recent trends. Open space and recreational opportunities are integral to our economy and our way of life in Virginia, and a lack of commitment to adequately fund and maintain our facilities will change things for future generations.

Rail and Transit C-

With 3,200 miles of railways across Virginia and some of the largest port facilities on the East Coast, we rank as one of the top states where freight carloads terminate, including 2 large Class I railroads and 9 Class III carriers. Amtrak and Virginia Railway Express (VRE) also have experienced explosive growth in passenger rail ridership using shared tracks for almost all of their routes. Recent reports cite limitations throughout Virginia's railroad system that prevent the railroads from routing traffic over the primary corridors, with no high speed rail strategy for transit in the works. While some improvements have been made, Virginia will have to decide how to handle a doubling of rail traffic expected by 2035 including increasing passenger traffic. Realizing the importance of rail to Virginia's movement of goods and economic vitality, Virginia developed its first dedicated source of funding, the Rail Enhancement Fund, for freight and passenger rail improvements in 2005. The Intercity Passenger Rail Operating and Capital Fund was also passed by the General Assembly in 2011, but no funding has been appropriated to the fund yet. While both funds can represent progress, the current funding is not sufficient to meet the increasing demand for rail and passenger service or to complete the much-needed rail infrastructure improvements and upgrades.

Roads D

For decades Virginia's roadways have provided safe, convenient travel for its citizens with the nation's 3rd largest state roadway system. While the condition of the Commonwealth's roadways are tolerable from a maintenance and safety standpoint, a lack of capacity results in traffic congestion and gridlock, especially in Washington DC-VA-MD and Hampton Roads regions that negatively impact commuters, industry, and the economy. The Washington DC-VA-MD metro area is ranked second worst nationally, behind Los Angeles. In total, Virginians have spent 28,000 years sitting in traffic based on a recent study, at a fuel cost of \$5B, and the average DC-VA-MD commuter experiences 74 hours of travel delay per year – nearly two full work weeks of sitting in traffic. VDOT reports current needs for condition and/or capacity improvements on most of the interstate systems in Virginia including I-64, I-81, and I-95. Looking toward 2035, significant needs exist on all interstate and freight corridors. After 20 years of the status quo in terms of funding, the 2013 legislature made a significant step with House Bill 2313 to provide funding and begin addressing these challenges. However, with a network that has grown by 14% over the last 35 years and with every dollar buying less construction work, more funding is needed to maintain safe roadways while adding needed capacity, making this a high priority issue for Virginians.

Schools C-

Currently, more than 1,800 public school buildings serve Virginia's K-12 students. To plan, construct, modernize and maintain school buildings that meet today's educational needs is a challenging task for which local communities, the state and federal government has a role. In 2013, the Virginia Department of Education completed a comprehensive report on the age and needs of our school facilities and they found that more than 60% of our schools are at least 40 years old with estimated renovation costs exceeding \$18B for schools over 30 years old. This is up from the \$8.5B in estimated funding needs which were cited in 2008. It is not clear why the costs have more than doubled in 6 years, except to show how recent investments are not keeping up with needs. In fact, school construction spending decreased from \$536M in 2008 to only \$189M in 2009, while needs continued to increase. Encouragingly, the investment has slowly rebounded to 2008 levels so that deferred maintenance can begin to be addressed. Continued investments in our children's education by providing safe and healthy learning environments is necessary to secure our future.

Solid Waste B-

In 2013, the 208 permitted solid waste facilities in Virginia processed 20.2M tons of solid waste. Approximately 15M tons originated within the Commonwealth, while an additional 5.2M tons were brought in for disposal from out-of-state sources. For in-state waste, each Virginian averages 5.75 pounds of solid waste per day which is above the national average by about 30%; however, Virginians are doing about 7% more recycling than other states, and a growing number of recycling programs now collectively approach a 50% post-consumer solid waste recovery rate. Reductions in local and imported waste in recent years, along with 11 additional waste facilities are estimated to have increased the available capacity since our last report card from 20 to 22 years, however an additional 50% source reduction could eliminate over one million tons of additional solid waste annually, with an expected savings of some \$40M per year to Virginia's economy. More work is needed to maintain or improve our 22-year capacity to meet future needs; to reduce our reliance on imported waste as a revenue source; and to continue to increase recycling and reduce in-state sources of solid waste.

Stormwater C-

Stormwater infrastructure protects the health of our streams, rivers, wetlands, and lakes. In Virginia large needs exist in many municipalities to comply with new stormwater regulations and to keep up with these needs, often with long construction time frames for capital projects making progress challenging. Recent surveys show about one-third of the infrastructure is older than 50 years and much of the remainder was built 25 to 50 years ago. While most stormwater infrastructure has a 50 to 100 year lifespan, keeping up with maintenance and using asset management planning are necessary to not undo the gains in water quality in Virginian's rivers and the Chesapeake Bay. Increased attention and funding is working in concert with increased regulatory compliance requirements, but there are shortcomings to address for state level standardized reporting, public education, and ensuring a dedicated source of funding commensurate with the economic benefits of a healthy Chesapeake Bay and Virginia ecosystems.

Wastewater D+

Adequate wastewater treatment is vitally important to a healthy environment, human health and economic vitality. Virginia has \$6.8B in wastewater needs over the next 20 years; a 45% increase from our previous report card in 2009. Factors causing this increase include adding infrastructure, more stringent federal regulations to restore water

quality, growing demands, and increases in construction costs. Virginia has \$1B in identified needs to control combined sewer overflows and prevent raw, untreated sewage from entering into Virginia's waterways. Significant additional funding is needed to put the Chesapeake Bay and Virginia's waterways on a "pollution diet" to restore water quality, including a 150-mile Chesapeake Bay "dead zone" between Baltimore and the York River in Virginia. A cleaner Chesapeake Bay is estimated to generate an additional \$8.3B in economic benefits annually to Virginia. Virginia has made progress with considerable investments and has a comprehensive plan, but has tremendous challenges ahead.

Raising the Grades: 3 Key Solutions

Solutions to raise the grades in Virginia are complex but generally include the following key solutions:

Increase Leadership in Infrastructure Renewal. Virginia's infrastructure is the responsibility of all our leaders. We need bold leadership and a vision for how strategic infrastructure investments can improve the current status quo.

Promote Comprehensive Strategies. Today's infrastructure must meet the state's needs in the best and worst of times, and also protect and improve the environment and our quality of life.

Develop Comprehensive Strategies. Virginia should prioritize and execute infrastructure strategies that put our investments where they are needed most, according to well-conceived plans that focus on comprehensive solutions that provide a long-term and robust return on investment.

Where do Public-Private Partnerships fit into things?

Civil engineers plan, design, construct, operate, and maintain our nation's infrastructure. Strained state and local government budgets combined with increasing demand have led to the implementation of public-private partnerships (P3's) in several states and localities, including Virginia. The injection of private capital into public works projects, however, has drawn some criticism and skepticism from stakeholder groups and have raised the need for a set of guiding principles for these projects as they are planned, implemented and maintained.

P3's can be an effective method of project financing and delivery, and Virginia is already a leader in successfully implementing P3's. P3's do not replace the need for public funding of infrastructure projects; however ASCE does support the use of P3's as a viable solution, as long as the public interest is well protected.

ACKNOWLEDGEMENTS

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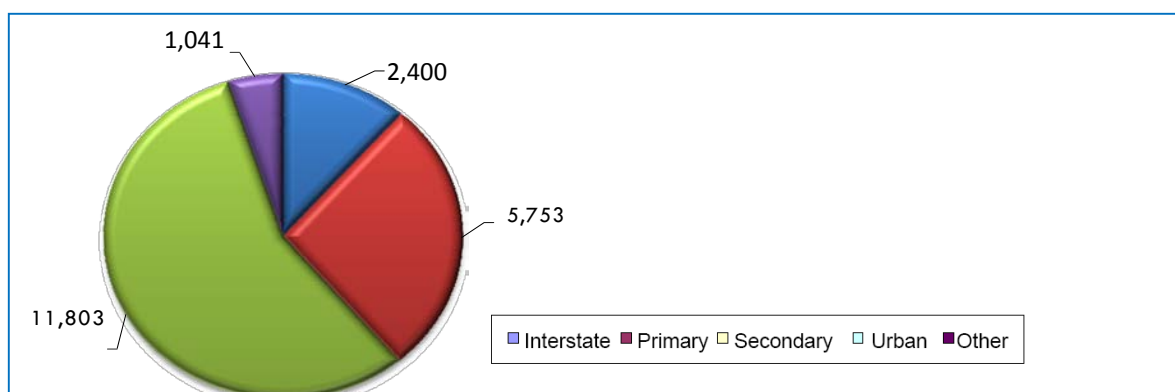
BRIDGES

2015 SUMMARY

20,997 bridges and culverts having a total estimated value of \$42 billion are contained within Virginia's roadway system inventory. All of these structures are inspected regularly with an average of 10,700 inspections annually at a cost of approximately \$26.1 million/year. Of the total inventory, 4,879 (23.1%) have been determined to be Structurally Deficient (SD) or Functionally Obsolete (FO). Of the major Virginia structures on the National Bridge Inventory, 23% are structural deficient or functionally obsolete, equating to 1 in 4 structures. The following chart shows the distribution of these structures by region (as of July 1, 2013).

	Number of Structures (Bridges and Culverts)				
	Interstate	Primary	Secondary	Urban	Total
Bristol	216	95	2,044	223	3,435
Salem	21	800	1,933	113	3,063
Lynchburg	0	663	1,392	59	2,114
Richmond	511	799	1,127	161	2,598
Hampton Roads	459	45	515	26	1,692
Fredericksburg	79	252	473	8	812
Culpeper	122	496	1,052	2	1,694
Staunton	429	82	2,135	109	3,497
NOVA	3	511	1,132	82	2,092
Grand Total	2,400	5,75	11,803	1,041	20,997

Number of Structures, State of Structures and Bridges Report, (Source: VDOT, July, 2013)



Distribution of Structures by System, State of Structures and Bridges Report, (Source: VDOT, July, 2013)

INTRODUCTION AND BACKGROUND

The Federal Highway Administration (FHWA) requires VDOT to inventory and routinely inspect all structures with lengths greater than 20 feet. In addition, VDOT inventories and inspects all bridges regardless of their length and all culverts having an opening of 36 square feet or greater. Although some localities conduct independent inspections and bridge maintenance activities, VDOT oversees work

throughout the state and is responsible allocating funding, developing maintenance guidance and programs, and implementing rehabilitation and replacement projects to maintain Virginia's bridge infrastructure.

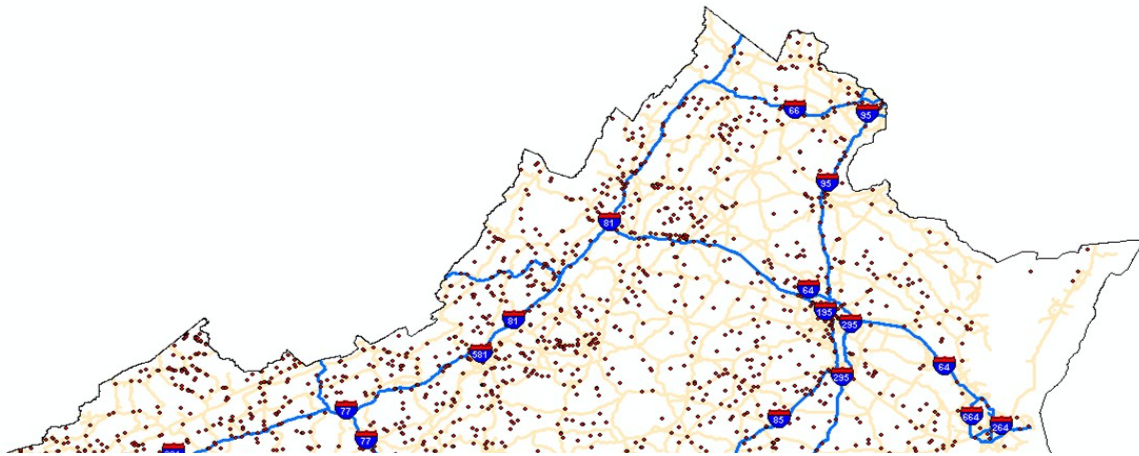
Inspection procedures and requirements are set forth in the National Bridge Inspection Standards (NBIS), as codified by federal regulation. VDOT is responsible for developing detailed guidelines for bridge inspections based on these regulatory standards. The NBIS requires bridges to be inspected a minimum of once every two years by appropriately certified inspectors; major culverts must be inspected at least once every four years.

In addition to the NBIS data, VDOT collects additional detailed information which is used to populate its' Bridge Management System (BMS) the database used to determine current and future maintenance and preservation needs of the structures. Information from the BMS was used in preparation of this report. As VDOT continually updates this information current figures may reflect slight differences from the numbers presented herein as data reports are time sensitive. Of particular significance is the ability of the BMS system to track the size of structures in addition to a simple tally of numbers. In 2013, Virginia's bridge/structure inventory included over 115 million square feet of structural surfaces, of which 23.2% is either structurally deficient or functionally obsolete. This indicates that by both number and square footage Virginia has significant bridge program needs.

The performance criterion for a Structurally Deficient (SD) asset in the NBIS is a structure that has a general condition rating of poor (4 out of 9) or worse for one or more of the following structural elements: deck, superstructure, substructure or culvert, or has an inadequate rating for the structural condition or a critical rating for waterway adequacy. Deficiencies in these elements trigger more intensive (and costly) monitoring of the structure; mandatory repairs; posting of weight and vehicle class restrictions; or closing the structure to traffic altogether.

A Functionally Obsolete (FO) structure is one that has either a deficient deck geometry; under clearance; approach roadway alignment; structural condition; or waterway adequacy. A FO designation means that the structure was built to standards lower than those used today. According to FHWA guidelines, a structure is deemed "deficient" if it is rated either SD or FO. A deficient structure may not carry both designations. Instead, it would be rated as structurally deficient, the more significant of the two conditions. The FHWA uses the combined deficient designations, SD and FO, to determine federal bridge maintenance funding allocations to each state.

History of the Federal Bridge Inspection Program – The federal bridge inspection program regulations were developed as a result of the Federal-Aid Highway Act of 1968 following the collapse of the Silver Bridge in Point Pleasant, West Virginia. The United States Secretary of Transportation establishes and maintains the National Bridge Inspection Standards (NBIS) to local and evaluate existing bridge deficiencies to ensure the safety of the traveling public. (Source: VDOT Bridge Inspection Program Definitions Documents August 2007),



Systemwide locations of Structurally Deficient Structures, State of Structures and Bridges Report
(Source: VDOT, July, 2013)

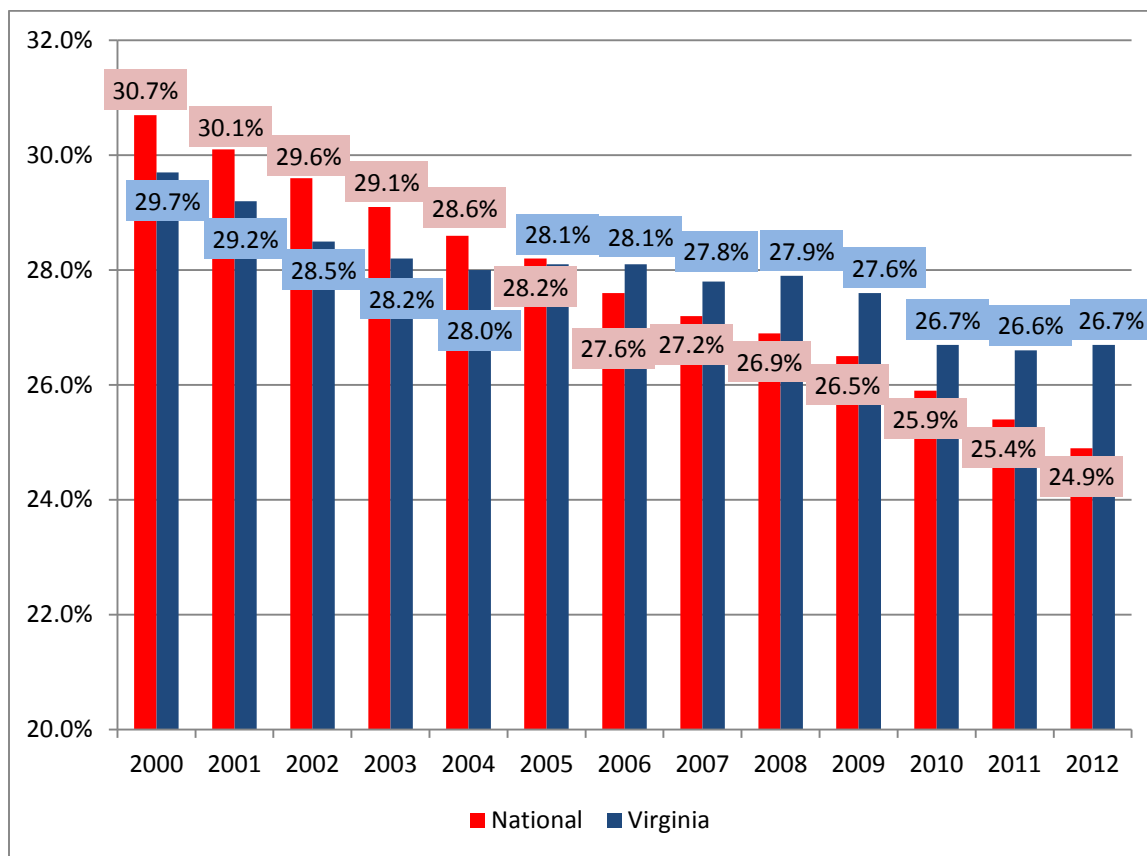
CONDITION AND ADEQUACY

As of July 2013, Virginia's road system contains 20,997 structures (bridges and culverts) statewide with an estimated value of \$42 billion; this represents a net increase of 108 structures since our 2009 report card on Virginia's bridge infrastructure. This is an increase of less than one (1%) percent.

The number of structurally deficient structures in the VDOT inventory is 1,550 (7.4%). This represents a 0.4% decrease from fiscal year 2012. The national average of structurally deficient structures is eleven (11%) percent. The number of functionally obsolete structures in the VDOT inventory is 3,329 (15.85%). The national average of functionally obsolete structures is fourteen (14%) percent. The number of weight posted structures in Virginia's inventory is 1,393 (6.63%).

In 2013 the combined number of deficient (structurally deficient and functional obsolete) structures is 4,879 (23.24%). This represents a 0.41% decrease from the previous year and a 0.76% decrease since our 2009 report card on Virginia's bridge infrastructure. (Source: Chart F.6, VDOT, July 2013)

The chart below demonstrates Virginia's progress on reducing the inventory of deficient structures between 2000 and 2012, with a cumulative reduction of four (4%) percent over the time period. This lags the national average, which saw a reduction of 5.8% over the same twelve year period.



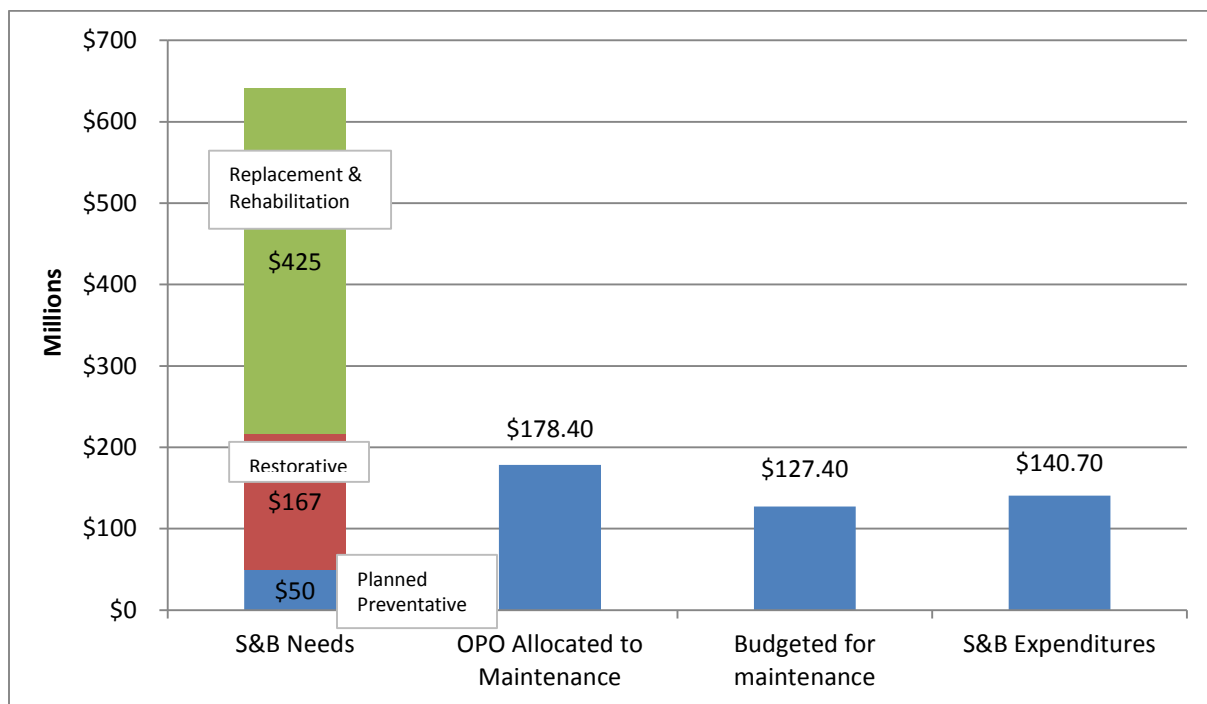
Comparing Virginia's SD and FO Structures with National Average, State of Structures and Bridges Report

Note: Percentages are based on National Bridge Inventory structures only

(Source: VDOT, January, 2013)

While the number of structurally deficient structures has decreased, the overall condition of the inventory has not improved. This slow decrease in overall condition can primarily be attributed to our aging infrastructure for bridges and the gap between required and available funding. Allocated funds are often used to address structures in immediate need of repair or replacement, leaving less money than required for preventative maintenance. Another significant factor affecting long term performance relates to the selection of structures scheduled for replacement or major rehabilitation. In recent years available funding in the construction program has often led to the selection of smaller structures for this work. This has resulted in a notable reduction in the number of poor structures. However, in selecting smaller, less expensive structures for replacement and rehabilitation, a backlog is developing of deferred maintenance on larger, more expensive structures that require significant work.

The chart below compares the total amounts of the VDOT Structure and Bridge Maintenance Program needs, allocations provided to the District Maintenance Managers by the VDOT Operations Planning Office, the actual budgets set by the District Maintenance Managers and the expenditures for Fiscal Year 2013.

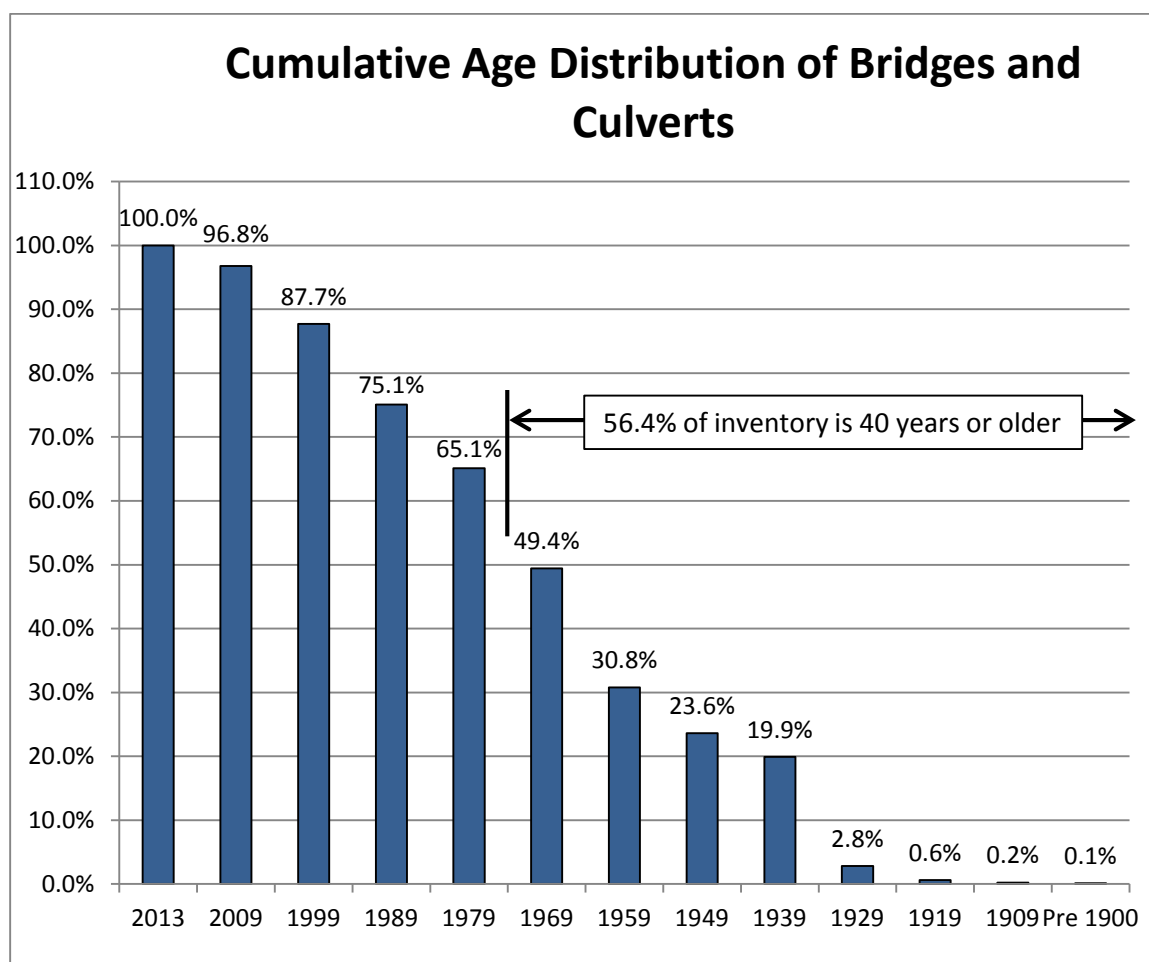


Structure & Bridge Fiscal Year 2013 Maintenance Program Overview
 (Source: VDOT, January, 2013)

Along with the new MAP-21 funds in FY14, the Governor's Transportation Package of 2012 introduced new Commonwealth Transportation Board (CTB) funding in FY14. These funds are being allocated to fully fund existing projects in the Six Year Improvement Plan. The CTB has identified 25% of the CTB funding to be directed to the Commonwealth's bridge program from FY14 through FY20. These projects were chosen at the discretion of the CTB members. CTB funds can be designated to any bridge regardless of system classification at the discretion of the CTB. The funds are currently designated to sunset in FY20.

Moving forward with the MAP-21 funds for the S&B Construction Program, it would be advantageous for the VDOT Programming Division Office to align funding types and levels with classification of the structurally deficient inventory. NHS and NBI status are playing a more important role into the types of money VDOT may use on structurally deficient bridges for rehabilitation and replacements in the construction program.

The design life of newly constructed bridges is typically 75 years in the United States; however older bridges (pre-1980) were typically designed for a 50 year design life. Design life is a theoretical number based on expected bridge loadings and programmed maintenance; actual performance is monitored to determine the service life of the structure. The service life of bridges can be extended with proper operation and maintenance; conversely without proper maintenance service life can be significantly reduced. Fifty-six (56.4%) percent of Virginia's inventory, or 11,842 structures are approaching the end of their anticipated design life in that they have been in service for over 40 years. As part of this, over thirty percent, 30%, of the Virginia inventory is over 50 years old. The following chart shows the number of structures represented by the various decades of construction in Virginia



Cumulative Age Distribution of Structures with National Average, State of Structures and Bridges Report
(Source: VDOT, January, 2013)

These Virginia's bridge structure statistics indicate that our maintenance requirements will continue to grow, (i.e. as structures age they require more maintenance). **The statistics also indicate an impending peak of replacements which will be required within the next 10 years and perhaps sooner if maintenance needs are not addressed.**

An additional impact on these replacement costs is the need to address the strategic significance of high volume/highly visibility bridges and to protect those structures from groups with hostile intent. This new security issue with our infrastructure increases the cost of operation, management and construction due to physical protection and security requirements for these bridges.

INVESTMENT NEEDS AND FUNDING DEDICATED

The age of all Virginia's bridges listed in the 2013 NBI places us with the 20th oldest inventory in nation based on number of structures and age. Using the 2013 NBI reported square footage and ages, Virginia ranks as having the 41st oldest system of bridges in the nation. Even though the age of Virginia's bridge inventory based on the number of structures is 45 years calculating the age of the structures based on the surface area of each structure reduces this number to 34 years, which implies Virginia has built larger and longer structures more recently.

Comments below are from the VDOT Financial Report June 30, 2013

House Bill 2313 Virginia's Road to the Future

During Fiscal Year 2013 Governor Bob McDonnell signed Virginia's Road to the Future (HB 2313), the state's first comprehensive transportation funding plan approved in 27 years. This historic legislation will provide more than \$3.4 billion in additional statewide transportation funding, more than \$1.5 billion in additional funding for Northern Virginia, and more than \$1 billion in additional funding for Hampton Roads, over the next five years alone. During the first five years, HB 2313 will:

- Generate more than \$1.8 billion in additional funding for maintenance, thereby eliminating maintenance crossover transfers.
- Provide \$660 million in dedicated new construction funding, which, when combined with the elimination of maintenance crossover, will grow construction spending by more than \$2.4 billion.
- Increase funding for Virginia's transit providers by \$509 million.
- Provide more than \$256 million in funding for intercity passenger rail, the first dedicated state funding for this vital service.
- Generate additional revenue for Virginia's airports and seaports.
- Generate annually between \$272 million to \$335 million in Northern Virginia and \$172 million to \$226 million in Hampton Roads for regional transportation priorities.

VDOT also continues to improve Virginia's highways thru the Stimulus Funding from the American Recovery and Reinvestment Act (Stimulus Act).

The American Recovery and Reinvestment Act of 2009 (ARRA) was signed into law by President Obama on February 17, 2009. Virginia received a total of \$694.5 million in highway funding from ARRA to invest in improving our transportation system. VDOT's priorities are to address deficient pavements, structurally deficient bridges and much needed highway capacity to improve the economic competitiveness of the Commonwealth and to offer safe reliable transportation options for all Virginians. All of VDOT's ARRA funding of \$694.5 million was obligated prior to fiscal year 2012. ARRA expenditures incurred by VDOT during fiscal year 2013 amounted to \$87.8 million, bringing total ARRA Expenditures to date since FY 2009 to \$533.2 million. This leaves \$161.3 million in ARRA obligated funds for current or future projects to improve our transportation infrastructure, or twenty three (23.2%) percent.

Economic Factors and the 2015 Budget

The current economic conditions in Virginia and nationwide are impacting the budgets and activities of the Virginia Department of Transportation (VDOT) both directly and indirectly. The following are key issues or events that are impacting future fiscal years governmental activities:

- Transportation Department revenues are anticipated to be \$4.7 billion at the state level, an 11 percent increase from the FY 2013 Budget. Funding for transportation was also addressed at the state level during the 2013 General Assembly Session by House Bill 2313 (Chapter 766). The revenues generated by HB 2313 breathe new life into Virginia's transportation program and provide substantial, sustainable revenues. Estimated revenues for 2014 reflect the first year of implementation of major changes to revenue dedicated to transportation due to HB 2313.
- Construction fund transfers to cover the Highway Maintenance and Operating Fund's funding deficit will be greatly diminished with the revenues provided. The anticipated crossover for FY 2014 is \$413 million. With the revenue forecast provided, it was anticipated that crossover would not be necessary by FY 2017 due to the increased funding in HB 2313.
- Substantial investments were also made in regions of the state that experience traffic congestion and greater transportation needs. Northern Virginia and Hampton Roads were provided the ability to create dedicated revenue streams locally to assist in addressing their needs. The total estimated revenue for both regions for FY 2014 is \$451.8 million.

Federal revenue projections are declining at the same time as Virginia is implementing solutions at the state level, as described above.

Prior to approval of the final proposed FY14-19 SYIP, VDOT leadership presented a summary of key items related to development of the FY14-19 SYIP. The presentation included key projects which were funded as a result of identified priorities, as well as an update to guiding principles to include funding of deficient bridges and paving projects. A copy of the presentation is available on the CTB's website and can be viewed here:

http://www.ctb.virginia.gov/resources/2013/june/pres2/Presentation_Agenda_Item_3_Final_FY_2014-2019_SYIP_CTB_Presentation_Revised_ZZ.pdf.

The CTB formally adopted the FY14-19 SYIP on June 19, 2013.

In Fiscal Year 2015, VDOT will allocate \$1.2 billion on highway system acquisition and construction, a 15% reduction from Fiscal Year 2014. This reduction is primarily due to the planned bond allocations for projects provided in 2014 and anticipated reductions in state revenue.

The Fiscal Year 2015 (FY 2015) budget for the Virginia Department of Transportation (VDOT) identifies the estimated revenues and the distribution of the revenues to the related transportation programs. It is based on the most recent official state revenue forecast from December 2013 and estimated federal

funding. The VDOT Budget for FY 2015 totals \$4,348,496,996, a 6.6% decrease from the FY 2014 Budget of \$4,656,293,838.

From the 2008 Report Card, the VDOT Budget has increased 14%, from \$3,794,639,873.

The following chart from VDOT's 2013 budget report shows the breakdown of revenues and intended uses, (HMOF is the abbreviation for Virginia's Highway Maintenance and Operations Fund the largest state operating fund for transportation initiatives, including bridge maintenance).

Source	HMOF	Construction *	Federal	Bonds	Other	TOTAL
Sales Tax on Motor Fuels	\$573,000,000	\$84,523,800	-	-	\$28,600,000	\$686,123,800
Motor Vehicles Sales and Use Tax	653,500,000	174,792,700	-	-	-	828,292,700
Motor Vehicle License Tax	232,800,000	17,628,800	-	-	-	250,428,800
Retail Sales and Use Tax	270,500,000	428,600,200	-	-	-	699,100,200
International registration Plan	63,500,000	-	-	-	-	63,500,000
CPR Bonds	-	-	-	-	-	-
GARVEE Bonds	-	-	-	-	-	-
Other Revenue to Support Bond Programs	-	-	-	-	107,527,258	107,527,258
Insurance Premium Revenue	-	-	-	-	140,100,000	140,100,000
Local	-	202,777,696	-	-	-	202,777,696
Regional Transportation Funds	-	-	-	-	455,204,467	455,204,467
Other Sources	49,258,469	19,521,198	-	-	28,573,941	97,353,608
Federal	-	-	818,088,467	-	-	818,088,467
Transfer to HMOF	300,631,350	(300,631,350)	-	-	-	-
Transfer from HMOF for MWAA	(100,000,000)	100,000,000	-	-	-	-
TOTAL	\$2,043,189,819	\$727,213,044	\$818,088,467	-	\$760,005,666	\$4,348,496,996

* Includes Highway Share of TTF and other special funds.

** Other Sources includes VDOT Toll Facility Revenue, Cell Tower Lease Revenue, E-Z Pass Operations, Unallocated Balances and other miscellaneous items.

VDOT Budgetary Overviews, Fiscal Year 2013 Budget Report, (Source: VDOT, 2013)

SUMMARY

As the bridge and structures component of Virginia's transportation system is heavily regulated by federal authorities, a significant component of Virginia's grade for the bridges category is based upon a comparative analysis of program performance with the nation as a whole.

Increased improvements in Virginia's metrics are on the horizon due to passage of House Bill 2313 which provides increased funding for the transportation program, and the implementation of HB 2, the prioritization of projects. These two bills recently passed in the Virginia General Assembly reflect a focus to improve the infrastructure in the Commonwealth.

While the number of SD structures in Virginia has decreased the overall condition of the inventory has not improved. The selection of smaller structures for replacement has reduced the number of SD structures in the inventory it is producing a backlog of larger more costly structures that require maintenance or replacement.

Due to the detailed list of needs contained in VDOT's State of the Structures and Bridges Report and as Virginia ranks in the middle of federally reported bridge performance metrics, ASCE-VA has assigned an overall grade of "C" to the Bridges segment of the Commonwealth's transportation system for the 2013 Report Card. This relative grade reflects average performance of the bridge program in comparison to other states, and is not an indication that maintaining an inventory of structures with 1 in 4 inadequate for current service levels is acceptable from a program performance objective.

Information from ASCE's 2013 National Report Card is presented below to provide comparative perspective on Virginia's grade and program.

While the overall number of deficient bridges continues to decline, there is still a long road ahead. With the total number of structurally deficient or functionally obsolete bridges at more than 20%, the nation needs to remain focused on aging bridges and work diligently to decrease the total number to below 15% over the next decade. Most importantly, states will have to focus on repairing or replacing those large-scale bridges in urban areas where their upkeep has been consistently deferred due to the significant cost to repair these structures.

Federal, state, and local bridge investments are not keeping pace with the growing costs of aging bridges. The FHWA estimates that the current cost to repair or replace only the deficient bridges eligible under the Federal Highway Bridge Program is almost \$76 billion. This total is up from 2009, when FHWA estimated that the total cost was \$71 billion.

Raising the Grades: Solutions that Work Now

- Make the repair of structurally deficient urban bridges a top national priority through the implementation of a risk-based prioritization model.
- Increase annual investment levels for bridge repair, reconstruction, and renovation by approximately \$8 billion annually from all levels of government, to a total annual funding level of \$20.5 billion.

- Develop a national strategic plan for addressing the nation's structurally deficient and functionally obsolete bridges in the upcoming decades, including long-term transportation research in order to develop more resilient bridges.
- Set a national goal to decrease the number of just structurally deficient bridges to 8% by 2020 and decrease the percentage of the population driving over all deficient bridges by 75% by 2020.

Conclusions and Recommendations / Policy options

Virginia has an excellent database of defined repair and maintenance needs for the bridge structures around the state. Current investments are reducing the backlog of maintenance and repair needs, although not on par with national rates, the trend has been a reduction of needs over the last eight years. New construction to address growing transportation demands is stagnant. In order to improve the performance of Virginia's bridges and enhance the safety and reliability of these structures, the following recommendations should be pursued:

- Set a long term, statewide goal to ultimately have no bridges classified as structurally deficient or functionally obsolete.
- Reduce the number of structurally deficient and functionally obsolete bridges by 2% per year until the long term goal is met by year 2020.
- Acknowledge that bridge (and roadway) deterioration results in high proportion from truck traffic, especially for interstate and primary highways, and account for this when considering funding sources and mechanisms.
- Acquire the needed funding to fulfill the short term and long term goals listed above. This would prevent bridges from being closed and allow the improvement of bridges, statewide.
- Continue to monitor, document and manage the condition of the Commonwealth's structures and bridges using VDOT's current organizational approach, consistent with Federal guidelines.
- Expand the use of remote monitoring of the Commonwealth's most significant bridges and structures.
- Give additional weight to considering renovation, as an alternative to replacement, to obtain sufficiency. Provide the needed flexibility in standards and policy. Account for life-cycle costs in this consideration.
- Invest in research and better designs for new and renovated bridges that make them easier and less expensive to maintain and that extend their useful life.

DAMS

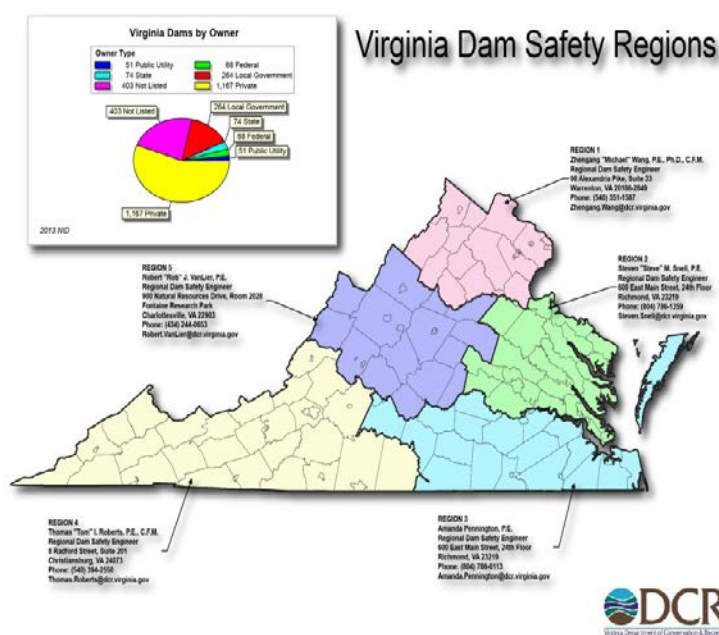
SUMMARY

Dams provide numerous benefits to Virginia citizens including recreation, water supply, irrigation, flood control, and hydroelectric power generation. There are only two natural lakes in Virginia, Lake Drummond and Mountain Lake; all other lakes in Virginia have been created by dams. Virginia has about 4 dams within every 100 square miles in the state. Virginia's dam inventory continues to grow older and more susceptible to damage. The majority of dams in the state were constructed between 1950-75, and their average age is over 50 years old. With 2,741 regulated dams, Virginia ranks 11th nationally for most regulated dams. Dam safety officials regulate 357 high hazard dams, which is an increase of 1272 dams since 2011, and 101 of these dams have a Conditional O&M Certificate, indicating that they do not meet current dam safety standards. The bulk of Virginia's dams are privately owned but proof of long term financial stability isn't required which is problematic as rehabilitation and regular maintenance can be expensive. The estimated rehabilitation cost for 795 high and significant hazard dams in Virginia is \$592 million. While funding for dam safety has increased significantly since 2008, it is still insufficient to rehabilitate dams to meet current dam safety standards and ensure the safety of those downstream.

BACKGROUND

Dams provide numerous benefits to Virginia citizens including places for recreation, water supply, irrigation, flood control, and hydroelectric power generation. Dams improve water quality, act to moderate flooding, and are important components of our urban and rural infrastructure; therefore, it is critical that they are constructed, operated and maintained in accordance with state and federal standards to preserve all of these vital functions. It is interesting to note there are only two natural lakes in Virginia, Lake Drummond in the Dismal Swamp and Mountain Lake in Giles County; all other lakes in Virginia have been created by dams.

Numerous federal agencies are also involved with dam regulation, management, and technical assistance in Virginia. They include the US Department of Agriculture's National Resources Conservation Service (USDA/NRCS), Federal Energy Regulatory Commission (FERC),



Virginia DCR Regions and Virginia Dams on NID, Source: VADCR/2014 NID

Nuclear Regulatory Commission (NRC), US Army Corps of Engineers, Mine Safety and Health Administration (MSHA) and the Federal Emergency Management Agency (FEMA). However, the bulk of dams in Virginia are privately owned and depend on private funds to maintain and operate these structures. Unfortunately, Virginia regulations do not require proof of long term financial stability as part of dam construction permitting; therefore, the long term viability of privately owned dams is often problematic as rehabilitation can be expensive and regular maintenance can be easily overlooked.

SAFETY

Dam safety is directly tied to land use, population density, and the ability to pay for dam operation, maintenance, and rehabilitation. Dams are designated high hazard dams when failure or mis-operation is expected to result in loss of life or cause significant economic losses, including damages to downstream property or critical infrastructure, environmental damage, or disruption of lifeline facilities. The Department of Conservation and Recreation (DCR), Division of Dam Safety and Floodplain Management regulates 357 high hazard dams, an increase of 127 dams since 2011; of these dams:

- 101 have a Regular Operation and Maintenance (O&M) Certificate, indicating that they meet current dam safety standards.
- 182 of these dams have a Conditional O&M Certificate, indicating that they do not meet current dam safety standards, in most cases, due to such reasons as needing increased spillway capacity, inundation mapping, and/or an emergency action plan (EAP).
- 74 high hazard dams have no O&M Certificate and one has an agricultural exemption.

According to the National Inventory of Dams (NID), 77 (62%) of the high and significant hazard dams in Virginia, respectively, have EAPs which is higher than the national average. The Virginia dam safety program includes a staff of five regional dam safety engineers, a dam safety consultant for Soil and Water Conservation District (SWCD) and State Park dams, a dam safety engineer for the Simplified Dam Breach inundation Mapping Program, an enforcement attorney, and a program director. Three staff members are new since 2009; however, the monitoring and inspection program remains under-staffed for the number of dams that must be inspected. Each field official is responsible for managing about 62 high hazard dams as well as significant and low hazard dams, assuming equal distribution of structures. This exceeds the Association of State Dam Safety Officials recommended ratio of 50 dams per inspector.

Virginia's Dam Safety Regulations were updated in 2008 to significantly expand the scope and coverage of the Commonwealth's program. These regulations have gone from below average to becoming a model for many other dam safety programs in the nation. They are a positive step towards providing the regulatory tools needed by DCR staff to assist dam owners with bringing the inventory of dams up to acceptable levels. However, with these stronger regulations there comes an ever-increasing cost of dam ownership. Virginia has made a strong effort to mitigate this burden by including ground breaking provisions in the regulations which attempt to control downstream development in the dam break inundation zones, and by establishing the Dam Safety, Flood Prevention and Protection Assistance

Fund, which has been a recent source of funding for dam engineering evaluations and some rehabilitation work.

While funding for dam safety has increased significantly since 2008, it is still inadequate to rehabilitate dams to meet current dam safety standards. Meanwhile, Virginia's dam inventory continues to grow older and more susceptible to damage. The majority of dams in the state are earthen embankments originally constructed between 1950 and 1975, with an average age of over 50 years. Virginia's population has also grown by 4.9 million people between 1950 and 2012 placing increasing numbers of people and valuable property within dam break inundation zones, increasing the consequences of a dam failure. Recognizing these risks, the new regulations classify a dam as high hazard if inundation studies project that the failure of a dam will result in the probable loss of one or more lives, or significant property damage. Recent inundation studies have resulted in re-classification of many former significant and low hazard dams as high hazard dams.

CONDITION AND ADEQUACY

In 2004, tropical storm Gaston dropped 10-12 inches of rain in Central Virginia, causing serious damage to 22 dams and breaching or overtopping 29 more. The majority of these failures occurred in a two-day period in Chesterfield, Henrico, and Hanover Counties, some of the more populated areas of the state. The vulnerability of these structures to larger storm events was clearly demonstrated. Storm damage in Richmond alone totaled over \$20 million, and there were three fatalities associated with the storm.

This event and other similar events led DCR to the use of the 100% Probable Maximum Flood (PMF) as the spillway design flood for dams in the 2008 regulations, consistent with federal dam safety criteria. In Virginia this PMF relates to receiving between 28-38 inches of rain in a 24-hour duration, which is the Probable Maximum Precipitation (PMP). While this seems a very conservative design practice, storms approaching this magnitude occur periodically in the Mid-Atlantic region as evidenced in Nelson County in 1969 (28 inches of rain in eight hours) and in Madison County in 1995 (30 inches of rain in 16 hours). These storms are estimated to have exceeded 80% of the PMP in these local areas.

Working with the Virginia General Assembly, the House and Senate recently passed and the Governor signed two bills requiring a study to update statewide PMP values for Virginia. Since existing PMP studies are over 35 years old, additional storms will be analyzed and new PMP values will be determined using updated methodologies and local data, drawing on lessons from other states. Potential reductions in PMP for Virginia may have an impact on the auxiliary spillway requirements for high and significant hazard dams and may reduce rehabilitation costs to dam owners. Whatever the outcome, a new scientifically based study will be completed by the end of 2015, supporting PMP values and enabling increased enforcement of the required auxiliary spillway capacity for high and significant hazard dams.

According to DCR records, 17 high hazard dams are currently being altered without state or federal funding. Many other dams in the Commonwealth have been subject to little or no appropriate maintenance. Despite regulatory requirements for inspection and maintenance of impoundments, most property owners' associations with small lakes do not budget annually for dam maintenance.

INVESTMENT NEEDS AND FUNDING

As of 2011, it is estimated that 117 of the 221 identified high hazard dams were in need of rehabilitation for a total cost of \$168 million. DCR also estimated that 323 of 398 significant hazard dams were in need of rehabilitation for a total cost of \$424 million. Thus, the total estimated rehabilitation cost for 440 high and significant hazard dams in Virginia was \$592 million. This cost, which will be borne primarily by dam owners, averages a cost of \$1.36 million per dam, based on the projected number of structures requiring upgrades.

DCR's Division of Dam Safety currently does not have enough staff or funding to manage the additional dams and requirements that must be addressed under the new regulations. The Division's direct funding has decreased by about \$1 million since 2009; however, an increase in grant funding has partially compensated for that reduction. Based on Virginia's 2015-2016 biennial budget, total funding for dams will increase significantly.

Recent Funding for Dams							
Year	DCR Dam Safety Division Funding	DCR Grant Funding for Dam Safety & Flood Prevention and Protection	Assistance to SWCDs Used for Dams*	State Parks (Capital Projects Only)	Game & Inland Fisheries (Capital Projects Only)	Other State Owned Dams	Total Funding for Dams
2009	\$ 2,564,174	\$ -	\$ 858,185				\$ 3,422,359
2010	\$ 1,951,612	\$ -	\$ 922,860				\$ 2,874,472
2011	\$ 1,528,671	\$ 885,000	\$ 752,372				\$ 3,166,043
2012	\$ 1,542,213	\$ 765,000	\$ 687,725				\$ 2,994,938
2013	\$ 1,542,213	\$ 939,193	\$ 1,170,251		\$ 9,700,000	\$ 5,823,900	\$ 19,175,557
2014	\$ 1,542,213	\$ 900,000	\$ 956,764	\$ 660,000			\$ 4,058,977
2015	\$ 2,802,779	\$ 1,596,000	\$ 1,156,109				\$ 5,554,888
2016	\$ 2,802,779	\$ 1,596,000	\$ 1,156,109				\$ 5,554,888

*Estimate based on 10% of financial assistance plus 100% funding for maintenance and small repairs

Available funding is used to cover many aspects of the dam program. For example, \$20 million funding provided by the 2008 Virginia Public Building Authority for rehabilitation to state owned dams has been used to perform dam breach inundation studies and prepare inundation maps for all 104 SWCD dams and 15 State Park dams. Also, rehabilitation of four SWCD dams is planned with the remainder of these bond funds. At relatively low cost, the Division has implemented a series of initiatives to improve dam safety and assist dam owners:

- Begun implementation of a DamWatch, an early warning system that will collect rainfall and stream gauge data from live sources and distribute alerts and notifications of potential heavy storms to dam owners and emergency responders.
- Implemented a Dam First Aid Initiative that provides training to dam owners and emergency responders and has placed, throughout the state, trailers equipped with siphons, pumps, generators, and other equipment to provide emergency repairs to dams.
- Communicate regularly with stakeholders through a new E-Newsletter.

- Utilize the DCR Grant Funding for Dam Safety & Flood Prevention and Protection to provide grants and loans to dam owners to improve dam safety.
- Conduct four dam safety workshops per year for dam owners and one per year for engineers.
- Enforcement actions for urgent dam safety issues.
- Added three staff members since 2008.
- Implemented a new provision of the dam safety regulations by performing a simplified dam break inundation zone analysis for owners of low hazard dams without current inundation maps. This analysis will aid in reducing development in inundation zones and keeping low hazard dams from becoming high or significant hazard.
- Developed Flood Risk, a Virginia-North Carolina partnership for floodplain mapping.
- Continuing Dam Dragnet program to identify unpermitted dams and to establish contact with the dam owners to communicate the risks and requirements involved. Fifty two unregulated dams, with the potential to be classified as high hazard dams, have been identified.

In addition, recent funding of \$16 million (shown in the above table) is being used for design and construction of rehabilitation to SWCD- and Commonwealth-owned dams.

Federal funding of dam rehabilitation work in Virginia has improved over the past several years, with DCR and the Natural Resources Conservation Service (NRCS) partnering to fund work on Marrowbone Dam in Henry County; Inch Branch Dam, Mills Creek Dam, Robinson Hollow Dam, and Toms Branch Dam in Augusta County; and Huntsman Lake Dam and Royal Lake Dam in Fairfax County. Construction was completed on the Marrowbone Creek Dam in 2005 at a cost of \$2.6 million. Costs for the rehabilitation of the Augusta County dams were about \$5.4 million; Royal Lake upgrades cost \$2.5 million; and Huntsman Lake Dam is projected to cost \$2.4 million. Additional rehabilitation, funded in part with stimulus money, was performed for Lake Barton Dam (\$2.6 million) and Woodglen Lake Dam (\$2.1 million) in 2009; both of these lakes are also in Fairfax County. In addition, some of the additional funding (\$1.2 million) will be used for state match of NRCS funding for the rehabilitation of Todd Lake Dam in Augusta County.

Also, in 2014, Congress passed the Farm Bill which included an appropriation of \$250 million for dam rehabilitation nationwide. Virginia received funding for the rehabilitation of seven dams in July 2014.

CONCLUSIONS AND RECOMMENDATIONS

The Dam Safety Program in Virginia has improved significantly over the past few years. The improvements in the available resources and the state and federal level demonstrate progress but continued investments in dam safety are needed in the years ahead. The new dam safety regulations have provided measurable performance standards consistent with federal dam safety criteria. These regulations continue to be refined to allow the dams in most need of rehabilitation to be identified. Guidelines for implementation of these regulations continue to be developed. Relatively low-cost

initiatives allow dam owners to better maintain their dams and to begin the process of rehabilitation of their dams. While at a slow pace, dams are being rehabilitated and state funding for dam safety has increased. Unfortunately, other regulated dams continue to age. While numerous high hazard dams within Virginia have continued on extensions to conditional permits for many years, several appear to be progressing toward upgrades required for safe operation.

Virginia has a growing inventory of defined rehabilitation and upgrade needs for dam structures around the state. Current investments and funding mechanisms have improved but need to be continued and significantly supplemented to address the growing needs of this vital aspect of our infrastructure. At the Commonwealth level, this could include increased funding for the rehabilitation of SWCD- and Commonwealth-owned dams and expansion of the revolving loan fund to assist the owners of privately owned dams.

The dam safety regulation changes are a positive step. Only legislation that strengthens dam safety regulations should be considered due to the safety implications for those living, working, or traveling downstream of dams. DCR is to be commended for steps taken to implement these regulations and the significant initiatives. The following key recommendations should also be pursued:

- DCR should continue to place a priority on completing Emergency Action Plans (EAPs) on all regulated dams to ensure downstream citizens are aware of potential dam hazards and to reduce development in flood inundation zones through effective local land use planning. This effort will assist with public education and outreach and build support for sustained funding of Virginia's dam safety program.
- DCR's Division of Dam Safety staffing levels should be aligned with the Association of Dam Safety Officials recommendations with one staff person per 50 dams being regulated. Initial staff focus should be on updating the regulated dam inventory, conducting an accurate statewide needs assessment, and developing EAPs for all regulated structures.
- DCR should finalize guidelines and standards for dam break inundation zone mapping to provide statewide program consistency. This would expedite preparation of plan development and regulatory review and reduce errors and inconsistency in analysis.
- DCR should simplify and streamline the process of submittal and approval of information on dams to the state inventory to improve efficiency as more dams will need to be managed with limited resources. E-filing would be of great benefit. Detailed and accurate data will be instrumental in obtaining continued federal funding.
- DCR should continue to implement the current initiatives to improve dam safety, to assist dam owners maintaining their dams, and to bring them up to current dam safety standards, on a case by case basis.
- DCR should develop a standard enforcement guideline for dam safety issues, ensuring timely and responsive direction to owners, focused on minimizing immediate and significant threats to public safety and property.

- DCR should require a financial plan and life-cycle stability certification for new dam construction permits identifying a permanent source of revenue for the entity with legal responsibility to maintain and operate new dams constructed in Virginia.

DRINKING WATER

2015 SUMMARY

National Grade

In its *2013 Report Card for America's Infrastructure* the American Society of Civil Engineers graded drinking water systems nationwide a “D”. This is a slight improvement over the 2009 grade of “D-”.

NATIONAL
DRINKING WATER 2013
GRADE D

Although the quality of drinking water in the United States remains universally high, America's drinking water systems are aging and must be upgraded or expanded to meet increasing demands and requirements. Deferral of the necessary improvements can result in degrading water service and higher costs in the future.

The 2013 national report anticipates urgent investment needs of as much as \$40 billion per year over the next 25 years. In 2007 EPA's conservative estimate was an average of \$16.7 billion per year over a 20-year term. “Congressional appropriations have declined over the five-year period 2008 to 2012, totaling only \$6.9 billion—an average of \$1.38 billion annually or \$27.6 billion over 20 years, 8% of EPA's identified needs over 20 years.”

Virginia Grade

Assignment of an overall grade of “C” to Virginia's drinking water infrastructure was based on the proven ability to meet four specific criteria:

- Compliance with Safe Drinking Water Act (SDWA) standards
- Routine identification and report of existing and future funding needs
- Acquisition of adequate existing and future funding to capitalize needs
- Capacity Development Strategy

VIRGINIA
DRINKING WATER 2013
GRADE C

Virginia's latest Annual Public Water Systems Compliance Report for calendar year 2011 indicates that there were 2,830 authorized public water systems providing drinking water to more than seven million Virginians. Of this number, 91.8 percent are served by waterworks that reported no SDWA violations.

EPA's 2007 assessment of Virginia's waterworks needs is nearly \$6.1 billion to maintain these systems over the next 20 years. However, at only 72 percent of the national average, we must be more diligent in identifying, defining and quantifying our needs to appropriately justify increased federal funding awards.

For fiscal years 2000 through 2012 Virginia was awarded \$200.9M in Drinking Water State Revolving Funds. Divided by the projected need of \$2,187.8M for the same period, this investment is only 9.2 percent of the total need. In spite of increased needs, our award for FY 2012 was even less at 5 percent.

CONTENTS

This 2013 Virginia Infrastructure Report Card on Drinking Water includes the following contents:

- Summary
- Introduction and Background
- Condition and Adequacy
- Investment Needs and Funding Dedicated
- Basis of Grade and Results
- Observations
- Conclusions, Recommendations & Policy Options

INTRODUCTION AND BACKGROUND

The U.S. Congress adopted the Safe Drinking Water Act (SDWA) in 1974 and amendments in 1986 and 1996. The SDWA is the main Federal law that protects the quality of actual and potential drinking water from above ground and underground sources. The program emphasizes providing funds to small and disadvantaged communities, initially focused primarily on the source of supply and treatment and encourages pollution prevention as a tool for ensuring safe drinking water.

The Act authorizes the U.S. Environmental Protection Agency (EPA) to establish minimum standards and oversee compliance to protect drinking water and requires all states, localities, water suppliers, owners and operators of public water systems to comply with these primary, health-related standards. Under the authority of SDWA the EPA established the Public Water System Supervision (PWSS) Program which allows states and territories to seek EPA approval to administer their own PWSS Programs. The authority to run a PWSS Program is called “primacy”. For a state to receive primacy, EPA must determine that the state meets certain requirements laid out in the SDWA and its regulations, including the adoption of drinking water regulations that are at least as stringent as the Federal regulations and a demonstration that they can enforce the program requirements.

The 1996 amendments recognize source water protection, operator training, funding for water system improvements, and public information as important components of safe drinking water. These amendments also require that the EPA conduct an assessment of the nation’s public water systems’ infrastructure needs every four years and use the findings to allocate Drinking Water State Revolving Fund (DWSRF) capitalization grants to states. The DWSRF was established to help public water systems obtain funding for infrastructure improvements necessary to protect public health and comply with drinking water regulations. A public water system (PWS) is defined as a system for the provision to the public of water for drinking or domestic use through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves at least 25 individuals.

The Commonwealth of Virginia created the Virginia Department of Health (VDH) in 1908, which has maintained primacy since 1977 and has received DWSRF funds since 1997. In 2003 the VDH established the Office of Drinking Water (ODW) which is responsible for regulatory oversight of public water supplies in accordance with Federal and State statutes. The ODW accomplishes its mission by: monitoring drinking water quality, applying engineering judgment, providing technical assistance and training, managing the Virginia DWSRF which provides funding for capital improvements, seeking other funding sources and enforcing drinking water regulations and standards of the Virginia *Waterworks Regulations*, the Virginia Public Water Supply Law and the federal SDWA.

EPA’s Drinking Water Infrastructure Needs Survey and Assessment			Basis of DWSRF Funds Allocation
Assessment	Survey Data	Released	FY
1	1995	February 1997	1998-2001
2	1999	February 2001	2002-2005
3	2003	June, 2005	2006-2009
4	2007	March 26, 2009	2010-2013

CONDITION AND ADEQUACY

Drinking Water Consumption

From the raw water source to the consumer’s consumption the amount of water available decreases with each step in the provision process including:

- Raw water withdrawn
- Drinking water produced by treatment
- Drinking water conveyed
- Drinking water metered or delivered
- Drinking water actually used for drinking and domestic purposes

One of the fundamental challenges confronting PWSs is the effort required to keep these reductions as low as is economically and physically possible.

In order to ensure that population projections are based upon uniform, broadly accepted, and sound principles the Code of Virginia requires the Virginia Employment Commission to prepare official population projections for the Commonwealth. The following population estimates and projections were prepared by the Weldon Cooper Center for Public Service of the University of Virginia under contract to the Virginia Employment Commission. Based on this data Virginia's population is projected to grow by 20.6 percent between 2010 and 2030 and another 9.2 percent between 2030 and 2040. The calculations tabulated below anticipate that Virginia PWSs will continue to serve 88.7 percent of the total population and that a consumption rate of 102 gallons per day per person will remain constant. This analysis indicates the need for an additional capacity of between 75 and 80 mgd every ten years for the next three decades.

Estimated Drinking Water Consumption				
Year	Number of people	People served by waterworks	Water consumed (gals per day)	Increase (by decade)
2010	8,001,024	7,093,464	723,533,346	
2011 (Estimate)	8,104,384	7,185,100	732,880,200	
2012 (Estimate)	8,185,867	7,257,340	740,248,715	
2020 (Projection)	8,811,512	7,812,018	796,825,851	73,292,505
2030 (Projection)	9,645,281	8,551,212	872,223,659	75,397,808
2040 (Projection)	10,530,228	9,335,779	952,249,499	80,025,840

At this time even improved conservation efforts can not offset the increasing demand for drinking water necessary to sustain Virginia's population growth and public health. These demands are in competition with drought availability and others for the use of our finite water resources.

Capacity Development Strategy

The SDWA requires a strategy to address the capacity of all existing waterworks. The ODW has developed a comprehensive Capacity Development Strategy, dated May 1, 2000, that includes all of the SDWA required elements, has been approved by the EPA and is currently under review for revisions. The ODW personnel performed a technical, managerial and financial capacity assessment of existing waterworks and use the assessment to assist waterworks in complying. Reports on the status and effectiveness of the Capacity Development Program are reported to the EPA annually. Reports on the efficacy of the strategy are prepared and submitted to the Governor of Virginia every three years.

Elements of the Capacity Development Strategy include the Source Water Assessment and Protection Programs. The Source Water Assessment Program (SWAP) began in April 2003 when the ODW conducted initial assessments on all active public water supplies and assigned susceptibility rankings to each source. Subsequent assessments are made on new supplies and to update historical records of existing supplies. Waterworks owners of many sources that were designated as "highly susceptible" have developed Source Water Protection Plans (SWPPs) to address the conditions that caused the susceptibility.

The voluntary Source Water Protection Program assists small water systems serving less than 10,000 people with the development of SWPPs including plans for groundwater source protection that are also called Wellhead Protection Plans. On May 26, 2005 EPA approved Virginia's Wellhead Protection Program which involves participation by local governments in land use management and development of local planning and zoning ordinances.

The most recent efficacy report for October 1, 2008 to September 30, 2011 concluded that: “The Capacity Development Strategy proves to be an effective tool to improve the technical, managerial, and financial components of Virginia’s public waterworks ability to reliably produce and deliver safe drinking water to consumers.”

Facilities Infrastructure of Waterworks

For planning purposes the *Waterworks Regulations* require that waterworks be designed to provide for the estimated population 10 to 30 years into the future under predicted growth conditions. The American Water Works Association and the American Society of Civil Engineers’ third edition of the book entitled *Water Treatment Plant Design*, the standard treatise on this topic, states that master planning studies often develop the water supply and treatment needs for 30 to 50 years into the future. The Virginia Department of Environmental Quality (DEQ) utilizes a 50 year water supply planning horizon policy. During the preparation of construction contract documents the useful economic or design life of the proposed facilities is considered. In contrast to the theoretical planning and design phases, the expectations of the facilities’ actual duration during the operations phase can be unreasonable, in spite of deferred maintenance driven by financial considerations.

Virginia saw large growth in all aspects of its public water systems after 1940. As a large number of these systems have pasted 70 years of age, many require significant asset renewal in the immediate future.

Water systems in Virginia routinely rely on treatment and pumping facilities that have exceeded a typical 20 year life and on pipes and storage tanks that have been in service over 100 years. In many cases these facilities have exceeded their design lives and there may be no current plans for replacement. The Capacity Development Program currently promotes and works with waterworks on Asset Management Plans. If replacement plans exist, implementation is contingent on the availability of funds.

The EPA 2002 Clean Water and Drinking Water Infrastructure Gap Analysis Report, projects that by 2020, 45 percent of water and sewer pipes in the U.S. will require replacement.

EPA’s Drinking Water Infrastructure Needs Survey and Assessment has been conducted for the four data years noted below and the findings are reported as 20-year needs in millions of dollars. The following chart shows the assessed needs by project type and the percentage each type is of the total. Between 1995 and 2007 transmission/distribution and treatment needs have increased by 14 to 15 percent each while source needs have decreased by 30 percent.

20-Year Needs by Project Type											
in millions of data year dollars											
Data Year	Transmission /Distribution		Source		Treatment		Storage		Other		Total
2007	3,806	63%	196	3%	1,293	21%	723	12%	44	1%	6,062
2003	1,987	69%	403	14%	324	11%	134	5%	18	1%	2,865
1999	1,024	50%	519	25%	282	14%	190	9%	41	2%	2,055
1995	1,417	48%	966	33%	219	7%	276	9%	67	2%	2,944

Virginia Waterworks Statistics and Compliance Summary

Virginia’s latest Annual Public Water Systems Compliance Report for calendar year 2011 was submitted to the EPA on June 2012. The report indicates that there were 2,830 authorized public water systems providing drinking water to nearly 7.2 million people or 89 percent of Virginia’s population. Of these public water systems 1,643 or 58% are non-community waterworks that serve widely distributed areas throughout the State and are limited by size, technological capabilities and age of facilities.

Virginia Waterworks Statistics			
From Annual Public Water Systems Compliance Report for CY 2011			
Type of Waterworks	Examples	Number	% of Total
Community	Cities, Counties & Towns	1,187	42.0%
Transient Non-community	Rest stops & Restaurants	1,096	38.7%
Non-transient Non-community	Schools & Factories	547	19.3%
Total		2,830	100.0%
Waterworks reporting no violations		2,115	74.7%
Waterworks reporting violations		715	25.3%
Total waterworks		2,830	100.0%
Population served by waterworks reporting no violations		6,592,800	91.8%
Population served by waterworks reporting violations		592,300	8.2%
Population served by all waterworks		7,185,100	100.0%
Virginia Population Served			
Population served by all waterworks		7,185,100	88.7%
Population not served by waterworks		919,284	11.3%
Population statewide (2011 estimate)		8,104,384	100.0%

The Safe Drinking Water Act requires compliance in the categories of: maximum contaminant levels (MCLs), monitoring, treatment technique (TT) and consumer notification (CN). Between calendar years 2007 and 2011 the number of waterworks in noncompliance and the total number of violations were both reduced by nearly 20 percent. However, the remaining 80 percent in violation continue to affect an estimated 592,300 people.

Virginia ACR Summary						
CY	# of PWS in Viols	Number of Violations				
		MCLs	Monitor	TT	CN	Total
2011	715	304	1,406	37	318	2,065
2007	890	430	1,765	96	284	2,575
Reduction	19.7%	29.3%	20.3%	61.5%	-12.0%	19.8%

ODW Input

An informal poll of the ODW Field Offices in February and March 2013 asked what the greatest challenges to providing safe drinking water are. The feedback fell into four general categories:

- Need for mentoring programs and internships for operators,
- Waterworks compliance with increased regulatory requirements,
- Aging infrastructure, and
- Lack of experienced waterworks operators.

Water Rates

The average monthly water rates shown in this chart are from Draper Aden Associates' *The 24th Annual Water and Wastewater Rate Report*. The report utilizes a control group of 20 water and wastewater providers who represent a cross section of utilities across the Commonwealth and who have consistently participated in annual surveys throughout the time period indicated. The rates reflect residential charges based on consumption of 5,000 gallons per month.

These rates indicate an increase of 46.8 percent over the past ten years. If continuation of this trend over the next 20 years is necessary to maintain current levels of service, then water rates will need to increase by 93.6 percent.

Virginia Waterworks Rates		
Year	Avg. Water Rate	Annual Increase
2012	\$27.25	6.0%
2011	\$25.70	2.8%
2010	\$25.00	6.0%
2009	\$23.58	4.8%
2008	\$22.50	4.2%
2007	\$21.59	8.3%
2006	\$19.94	2.2%
2005	\$19.52	7.0%
2004	\$18.25	1.6%
2003	\$17.97	4.0%
2002	\$17.28	

INVESTMENT NEEDS AND FUNDING DEDICATED

EPA's Drinking Water Infrastructure Needs Survey and Assessment has been conducted for the four data years noted below. The findings are reported as 20-year needs and are used to allocate Drinking Water State Revolving Fund (DWSRF) capitalization grants for subsequent fiscal years. The following chart shows the assessed needs on an annualized basis and compares them to the actual funding awarded by fiscal year.

EPA Needs Assessment & DWSRF Awards					
(for Virginia in millions of dollars)					
Data Year	FY	20 yr Need	Need / Yr	Award	% of Need
2007	2012	\$6,061.9	\$303.1	\$15.2	5.0%
	2011		\$303.1	\$16.0	5.3%
	2010		\$303.1	\$23.0	7.6%
	ARRA			\$20.8	14.5%
	2009		\$143.3	\$17.4	12.1%
	2008		\$143.3	\$9.8	6.9%
	2007		\$143.3	\$8.8	6.1%
	2006		\$143.3	\$11.4	8.0%
2003		\$2,865.0			
	2005		\$102.8	\$11.5	11.2%
	2004		\$102.8	\$11.1	10.8%
	2003		\$102.8	\$11.1	10.8%
	2002		\$102.8	\$15.2	14.8%
1999		\$2,055.4			
	2001		\$147.2	\$15.1	10.3%
	2000		\$147.2	\$14.6	9.9%
1995		\$2,943.9			
Totals			\$2,187.8	\$200.9	9.2%

For fiscal years 2000 through 2012 Virginia was awarded \$200.9M in DWSRF funds. This program requires a 20 percent state match, so Virginia contributed an additional \$40.2M for a total investment of \$241.1M over the 13 year period. Divided by the projected need of \$2,187.8M for the same period, this investment is about 11 percent of the total need.

Using the 20-year need from EPA's 2007 assessment of \$323,991.4M for the nation and \$6,061.9M for Virginia and the 2010 population of 308,745,538 for the nation and 8,001,024 for Virginia equates to a 20-year need of \$1,049 per person for the nation and \$758 per person for Virginia. The ratio of \$758 per person for Virginia divided by \$1,049 per person for the nation equals 72 percent. This fact may mean that Virginia's waterworks needs are not as severe as the national average based on EPA's criteria. Another interpretation is that Virginia's waterworks may have unidentified needs.

Actions to appropriately justify an increased share of the available federal funding awards may be warranted.

BASIS OF GRADE AND RESULTS

Basis of Grade

Assigning an overall grade to Virginia's drinking water infrastructure is based on the proven ability to meet four specific criteria:

Compliance with Safe Drinking Water Act (SDWA) standards

The score on this criterion is the percent of consumers served by waterworks reporting no violations versus all consumers, and is based on Virginia's latest Annual Public Water Systems Compliance Report for calendar year 2011. This is a change from the *2009 Virginia Infrastructure Report Card* which used the percentage of public water systems in compliance versus all public water systems.

Routine identification and report of existing and future funding needs

There is a continual need to inventory, assess and manage waterworks assets. The assessment includes identification of existing and future needs. Because the identification and reporting of needs are required on a routine basis, this criterion has been assigned a score of 84, Above Average, "B".

Waterworks' acquisition of adequate existing and future funding to capitalize needs

This score is the percentage of the needs that are funded by the DWSRF only. For this reporting period it is based exclusively on the average of EPA Needs Assessment and DWSRF awards for the period between FY 2000 and FY 2012. Nothing is meant to imply that Federal funding is the only source of revenue available.

Capacity Development Strategy

Because the Strategy has proven to be effective in improving Virginia waterworks' ability to provide safe drinking water, this criterion has been assigned a score of 84, Above Average, "B".

Weighting

The intention and goal is to continually make the grading criteria easily measurable and quantifiable. Similarly each criterion has been assigned a weighted value in recognition of their relative importance. This will allow for a uniform determination and comparison of results with future report cards.

Results

The results of the 2013 Virginia Infrastructure Report Card for Drinking Water are:

Rating of Virginia's Drinking Water Infrastructure			
Criteria	Score	Grade	Weight
Compliance with SDWA Standards	92	Excellent (A-)	40%
Identification/Report of Needs	84	Above Average (B)	30%
Acquisition of Funding	9	Poor (F-)	20%
Capacity Development Strategy	84	Above Average (B)	10%
RESULT	72	Average (C)	100%



OBSERVATIONS

Alternative Public Agencies

“Community” type waterworks are typically local municipal government owned utilities. Local municipal governments in Virginia have several choices of alternative agencies for provision of drinking water. Examples include utility departments, public service authorities and sanitary districts. The fundamental distinction is who is responsible for paying the costs.

Cost Recovery

There appears to be a basic misunderstanding of the operation of water systems concerning cost recovery by some waterworks. Activities that are necessary to provide water services include operations, maintenance, financing, debt service, billing and collection and have associated costs. Other expenses include depreciation and replacement costs. Complete cost recovery addresses all expenses and is usually designed to meet the requirements of an enterprise fund.

Enterprise Funds

Many waterworks are intended to be operated as “enterprise funds”. In the generally accepted accounting principles (GAAP) of government, an enterprise fund is an account that is financed and operated in a manner similar to private, commercial business. The intent is that the cost of providing public drinking water services will be recovered through charges to the consumers that are sufficient to make the providing agency self-supporting.

Traditions

Many consumers have grown accustomed to:

- Safe drinking water with rare limits on the volume and quality available and without considering its necessity for their health,
- Rates and charges that have been less than full cost recovery and insufficient for infrastructure rehabilitation, and
- Reliance on government solutions and subsidies.

Virginia Waterworks Historical Timeline	
Year	Event
1610	Proclamation for clean water supply at Jamestown
1825	Lynchburg constructs & operates a water supply system 2nd oldest system in the U.S.
1910	90 waterworks in Virginia
1912	Report by Commissioner of Health on water supply purity
1912-1974	Continual maintenance of State drinking water program
1916	1st waterworks permit issued to Martinsville
1934	1st Short School offered
1974	<i>Waterworks Regulations</i> adopted

CONCLUSIONS, RECOMMENDATIONS AND POLICY OPTIONS

Conclusions

- The safety and quality of drinking water provided by public water systems in Virginia have improved significantly since their commencement in 1825.
- Continued improvement of our public water systems to maintain our drinking water quality is now negatively impacted by deferred remediation of the infrastructure and insufficient funding and investment.
- As a result consumers currently rely on aging waterworks systems and must acquire the monies needed to make the necessary improvements.
- Waterworks have an immediate responsibility to remedy the condition of the public water system infrastructure to ensure continued availability of safe drinking water.

Recommendations

The shared objective is to ensure that Virginia citizens have access to an adequate supply of affordable and safe drinking water. To accomplish this objective, it is recommended that Virginia waterworks engage in the following activities:

1. Protect existing raw water sources used for drinking water and develop additional new ones.
2. Monitor and minimize differences between withdrawal, treatment and metered water volumes.
3. Implement and maintain proactive leak detection and reduction, conservation measures and reuse strategies.
4. Continually communicate and educate consumers on the value of drinking water to their health, the actual cost to provide drinking water and its low cost relative to higher cost, lower priority commodities.

5. Conduct comprehensive and diligent assessments that identify, define and document our infrastructure needs to better inform the consumers, to maintain our eligibility for funding and appropriately justify increased funding awards.
6. Actively pursue grant and loan funding from all possible resources. Establish collaborative funding partnerships for assembly of the largest and most complete financial packages possible.
7. Utilize Governmental Accounting Standards Board (GASB) accounting principles for asset depreciation, replacement costs and full cost recovery and rate structures that can fund needed capital improvements, promote self-supporting operations and minimize financial dependency on others.
8. Examine low interest rate refinance options for existing debts and utilize savings for necessary capital improvements
9. Establish and maintain business practices that attract and retain a qualified administrative and technical workforce for waterworks operations. Utilize mentorship programs to promote continuing education, advancement and preservation of institutional knowledge.

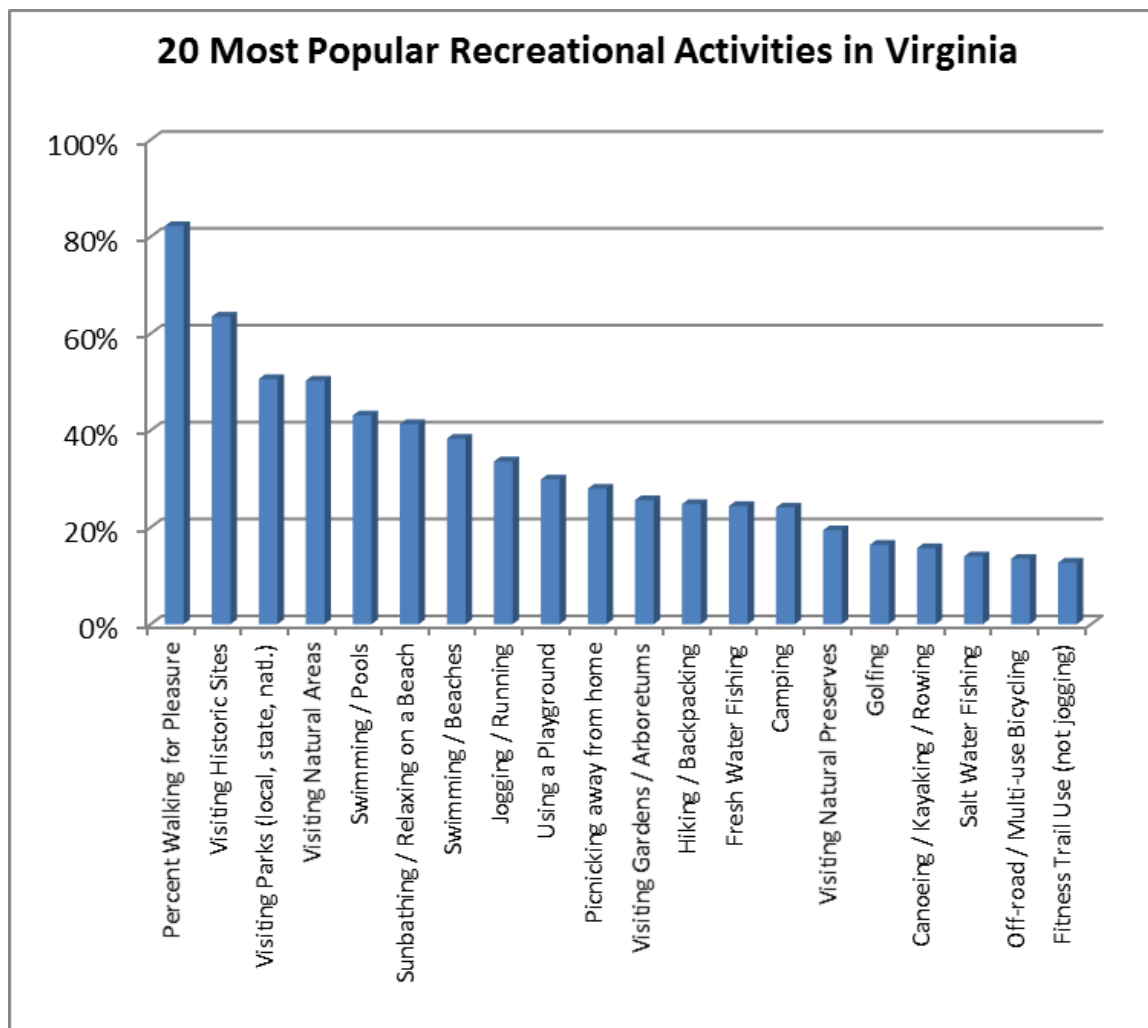
Policy Options

1. Engage DEQ in conducting routine statewide water resource planning and defining strategic water supply alternatives.
2. Determine a means to reward waterworks who implement and maintain proactive leak reduction, conservation measures and re-use strategies.
3. Reward long term compliant waterworks with less frequent reporting requirements.

PARKS AND RECREATION

2015 Summary

Virginia's public parks and recreation infrastructure are a diverse combination of national, state and local parks and facilities. This system of parks is described in the Virginia Outdoors Plan (VOP) which is the state's official document for land conservation, outdoor recreation and open space planning. The 2013 VOP was the 10th edition, and it was based heavily on the 2011 Virginia Outdoors Demand Survey (VODS). Both reports encompass all aspects of our parks and recreational infrastructure in Virginia, and they provide an excellent basis for the information contained in this ASCE state report card. A ranking of the most popular activities is shown below (VODS, 2011)



Future updates to this ASCE report card should continue “hand in hand” with revisions to the Virginia Outdoors Plan and the Virginia Outdoors Demand Survey, so that ASCE can help promote a better understanding of infrastructure needs and opportunities in a cooperative and complimentary way. This report card also highlights the economic contributions of outdoor recreation in Virginia and its influence on tourism as part of the larger infrastructure conversation. Connections between outdoor recreation and tourism are very strong in Virginia, and the Virginia Tourism Plan embraces the economic importance of outdoor recreation. Long-term projections show that participation in tourism and outdoor recreation has grown steadily since the 1980’s however during the recent economic downturn, 40% of outdoor participants cut back on non-essentials, including outdoor recreation. In spite of this economic downturn, a report from the Outdoor Industry Association shows Virginia still receives more than \$18 billion in economic benefits annually from outdoor recreation, as described in more detail below.

ASCE National Report Card

National
Parks
2013
GRADE
C-

In its 2013 assessment of national infrastructure needs, the American Society of Civil Engineers graded the nation’s public parks and recreation facilities a “**C-**” based primarily on the continued loss of open space in our urban areas despite vigorous state and local spending; the unaddressed \$11 billion backlog of maintenance needs for the National Park Service (up from \$7 billion) as well as more than \$18 billion in unmet local needs that were reported in 2011.

Positive notes in the ASCE national report card included the citation of wide public support for parks and recreation initiatives, with over 140 million Americans making use of parks in their daily lives. These activities also contributed \$646 billion to the nation’s economy, supporting 6.1 million jobs nationwide.

Federal Lands

Federal recreational lands in Virginia are primarily managed by the National Park Service, the USDA Forest Service, and the US Fish and Wildlife Service.

National Park Service

The National Park Service (NPS) has a significant presence in Virginia with 20 parks and a combined land area of approximately 400,000 acres. The NPS parks in Virginia have 14 million visitors annually and generate \$263 million in economic activity, providing 6,100 jobs statewide. This is approximately 2% of the total travel and tourism-related spending in the state. The NPS also enhances the capacity of the state, local communities and private organizations through its partnership programs and outreach activities.



USDA Forest Service

In addition to the NPS facilities, the United States Department of Agriculture’s Forest Service manages the 1.8 million-acre George Washington and Jefferson National Forests (GW-Jeff) in Virginia. Virginia’s national forest lands constitute nearly 50% of the total outdoor space that is accessible to the public in

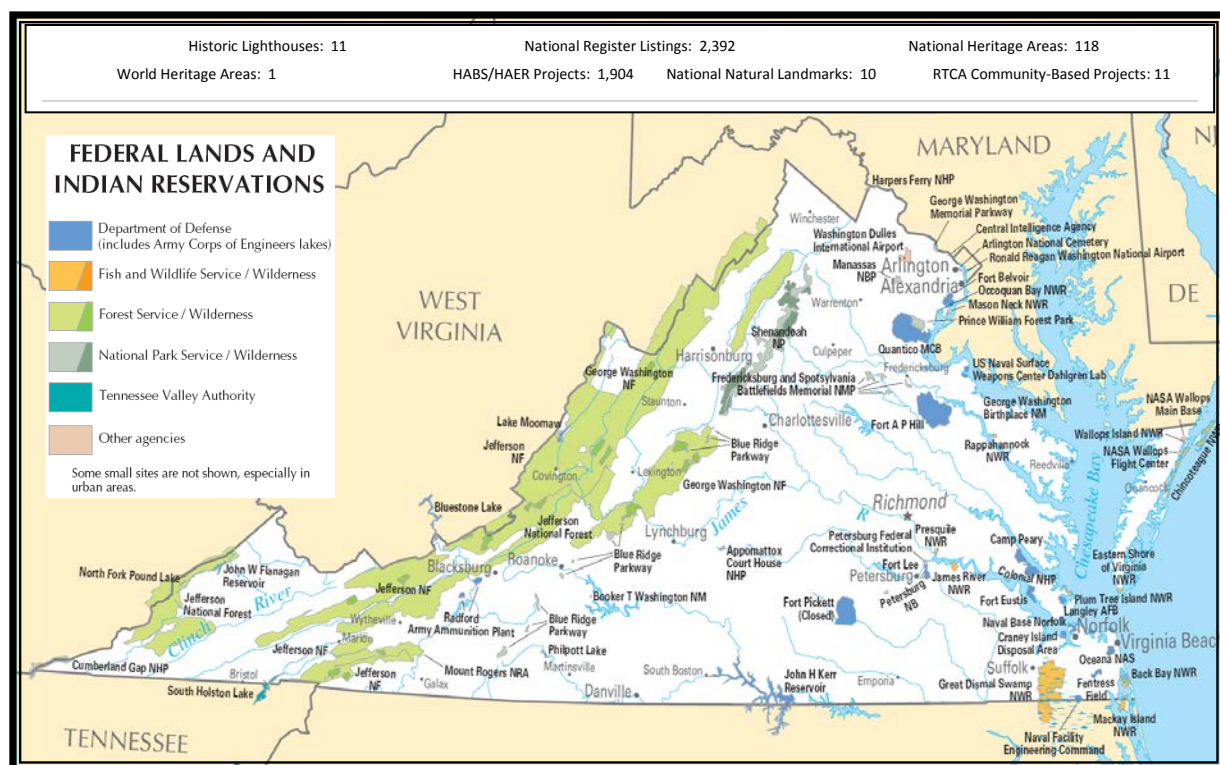
the Commonwealth. The National Forests stretch the length of the western portion of the state, through 31 counties, and offer more than 2,000 miles of trails.

Recreational use at the George Washington and Jefferson National Forests for fiscal year 2011 was estimated at 2.3 million visits, up from an estimated 1.63 million in 2006. The lands provide the only publicly managed motorized trails in Virginia and include comprehensive equestrian trail systems with campgrounds, a range of trail types and lengths, and support facilities for horse riders. The estimated economic impact is more than \$203 million annually.

US Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) manages 14 National Wildlife Refuges (NWR) and one national fish hatchery in Virginia, comprising more than 150,000 acres. The refuges are managed primarily to provide habitat and to protect natural ecosystems however, they also provide outdoor recreation opportunities.

The refuges help fulfill conservation objectives to preserve, restore and enhance natural ecosystems including endangered or threatened species; perpetuate migratory bird resources; preserve the natural diversity of plants and animals; and provide an understanding of wildlife ecology while offering visitors safe, wholesome and enjoyable recreational experiences. The figure below shows the geographic distribution of these federal recreational assets around Virginia.



Federal Parks, Forests and Monuments (Source: National Atlas, U.S. Dept. of Interior, 2003)

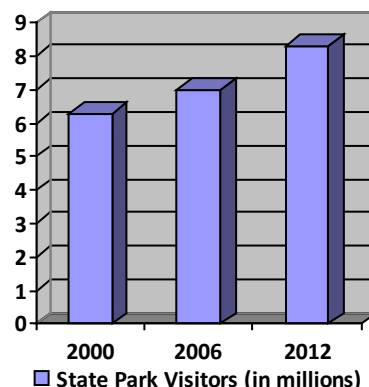
State Lands

The federal lands described above are complimented in Virginia by a large number of state facilities including parks, historical sites and natural areas.

Department of Conservation and Recreation

Virginia opened its first 6 state parks, in 1936. Since then, the development and demand for state park facilities in Virginia has continued to grow. As of 2013, the Virginia Department of Conservation and Recreation (DCR) was managing 40 state parks with more than 70,000 acres of parklands, which includes four state parks which are “land-banked” and are still under development at this time.

Through the continued expansion of state parks, attendance and popularity has also grown. Attendance at state parks in 2012 exceeded 8.3 million with a projected economic impact close to \$199 million. This compares to 7.0 million visitors in 2006; and 6.3 million visitors in 2000. When comparing the revenue generated by state parks to the economic investment in the state’s general fund, it represents **a return on investment of almost \$11 for every \$1 of general fund spending**. This is particularly important for many of the rural communities in which state parks are often located.



Virginia Department of Forestry

While the majority of Virginia’s forests are privately owned, the Virginia Department of Forestry (VDOF) manages almost 70,000 acres of state forest land. This includes 2 seed nurseries and 19 forests. These forests are extremely diverse and important in cleansing the air, purifying water, providing forest products (and jobs) and supporting outdoor recreation. The forest products, wildlife habitat and aesthetic contributions of Virginia’s forests cannot be overlooked, since they create an ecological balance that improves our quality of life.

With 15.8 million acres of forested land, including public and private lands, Virginia is 58% forested by current estimates. According to the U.S. Forest Service, however, urban growth and development in Virginia continues to create a net loss of forested land. Recent estimates are an average net loss of 16,000 acres per year.

This continued loss of forest land has an adverse impact on the timber industry, where forests in Virginia provide more than 144,000 jobs, with \$23.4 billion in revenue including \$350 million received annually by private landowners for harvested timber. Societal and ecological benefits of forestry are reported to add another \$4.1 billion annually.

Virginia Department of Game & Inland Fisheries

The Department of Game and Inland Fisheries (DGIF) manages the Commonwealth’s wildlife population and inland fisheries, and assists in protecting state and federally threatened or endangered species. The mission of DGIF is to maintain optimum populations of all species of wildlife and fish to serve the needs of the Commonwealth; to provide opportunities to enjoy wildlife, inland fishing, boating and related outdoor recreation; and to promote safety for persons and property in connection with fishing, boating, and hunting.



DGIF also provides access to lands owned by both public and private entities through cooperative management agreements and by acquiring and managing wildlife management areas. There are 39 wildlife management areas in Virginia comprising over 200,000 acres. DGIF also maintains 4 wildlife refuges totaling an additional 1,060 acres of wildlife habitat where hunting and fishing are not permitted.

Of 54 outdoor recreation activities in the 2011 Virginia Outdoor Demand Survey, fresh water fishing was the 13th most popular activity. License fees for fishing help DGIF maintain access to 35 public fishing lakes (totaling over 3,318 acres); fund contract fishery operations on 24 large reservoirs and 166 small impoundments (totaling over 173,000 acres); and assist the DGIF with the maintenance of public access and the management of 3,000 miles of native and stocked trout waters, as well as 25,000 miles of warm water streams and rivers. According to a 2011 USFWS National Survey, Virginia's economic benefits from fishing, including both fresh and salt water, was \$1.1 billion for 833,000 anglers.

Virginia's Watchable Wildlife Program is also worth noting for its tourism connections. The program supports the expansion of wildlife viewing opportunities and promotes wildlife-conservation awareness and education. One example, the Virginia Birding and Wildlife Trail, was the first statewide wildlife viewing trail developed anywhere in the United States. The trail links over 650 sites statewide, and encourages improvement of wildlife habitats in local communities. Additionally, the Virginia Master Naturalist Program continues to be very successful in promoting citizen volunteers to participate in local programs.

Virginia Marine Resources Commission

In addition to the outstanding freshwater fishing resources managed by DGIF, the Commonwealth of Virginia is endowed with more than 5,242 miles of tidal shoreline, encompassing 2,300 square miles of water surface and 1,472,000 acres of state-owned bottom lands. These submerged lands, greater in land area than the entire State of Delaware, harbor some 21,000 acres of Chesapeake Bay grasses. Oversight of these resources is managed by the Virginia Marine Resources Commission (VMRC), the lead agency for protecting our state's saltwater and tidal environment.

These lands are a public resource and a valuable habitat for shellfish, crabs and finfish. Along the fringes of the coves, creeks, great rivers and bays of the Chesapeake estuary are 225,000 acres of vegetated tidal wetlands. These vegetated areas, particularly the salt marshes, provide a vital spawning and nursery area and are an important element of the food chain for the marine resources of the Commonwealth.

Local Parks

The national and state parks across Virginia are mostly dedicated to preservation, conservation, historical sites, and natural resource interpretation. They also tend to lean heavily on passive recreational opportunities (i.e. hiking, hunting, camping, and picnicking). This means our local parks are essential to accommodating active and passive recreational needs within the communities they serve.

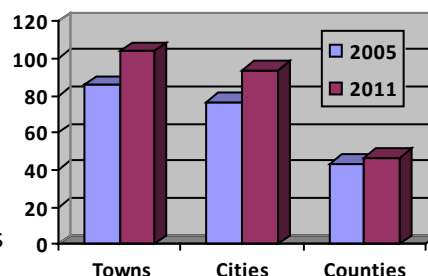


Chesapeake Bay Region – 2002 Landsat Image
(Source: USGS EROS Datacenter)

As stated in the 2013 Virginia Outdoors Plan, “local and regional parks and recreational facilities are the foundation of the Commonwealth’s outdoor recreation system.” It is the local jurisdictions and local clubs/organizations that provide athletic fields, multi-use courts, playgrounds, community centers, trails, zoos, gardens, and other recreational facilities to their citizens.

Our local parks also provide some of the best opportunities to develop youth sports programs which build fitness and social skills such as teamwork and competitiveness in our children. This vital link to our community supplements the sometimes shrinking youth sports programs in the public schools and contributes to healthy living objectives. In some ways, the contributions of local parks to our communities can be one of the best benefits derived from a well developed and maintained local park system. Local parks and the associated structured recreation programs can be a positive influence to the economy and the health of a community. In heavily urbanized areas, local parks and trails are the underpinning for connectivity and a framework for diverse social and cultural community events.

The front line for planning and implementing local parks is our local parks and recreation departments. Virginia currently has 71 counties, 21 towns and all but one city that provide full-time parks and recreation departments. Funding of park services varies from locality to locality, with towns spending more per capita (\$103.57) than cities (\$93.47) or counties (\$46.62). 2011 spending is reported to have increased from the 2005 report, as shown to the right.



Since late 2006/07, most Virginia localities have experienced reduced operating budgets due to the economic downturn. This is not to say that there has been no growth in parkland acquisition and development; but rather, limited forward movement for all but the most proactive communities typically. In addition, some localities have reduced or eliminated government recreation services, leaving gaps that may or may not be met by other providers (i.e. YMCA, Boys and Girls Clubs, etc.). This reduction in service stands in opposition to the growing evidence that local parks contribute to improved and sustained individual health.

In our national and state parks, maintenance of facilities has been difficult to fund in recent years and likewise this has proven challenging to local parks. “Doing more with less” has been the mantra. In an effort to maintain municipal and local parks, agencies have had to impose or raise user fees, partner more often with local stakeholders, and develop sponsorship packages in an effort to offset costs; or, strategically reduce the level of maintenance standards across park systems. Many localities have deferred funding for capital improvement and maintenance projects, creating a backlog of needs.



Economic Impacts

The economic impact of outdoor recreation on tourism relies on a well developed and connected park system. Citizens need outdoor recreation opportunities close to where they live. Over 50% of those surveyed in 2011 visited local, state or national parks. The high importance Virginia citizens place on parks means local, regional and state parks and recreation resources along with private lands, including public-private partnerships and volunteerism are important in meeting Virginia’s outdoor recreation needs collectively.

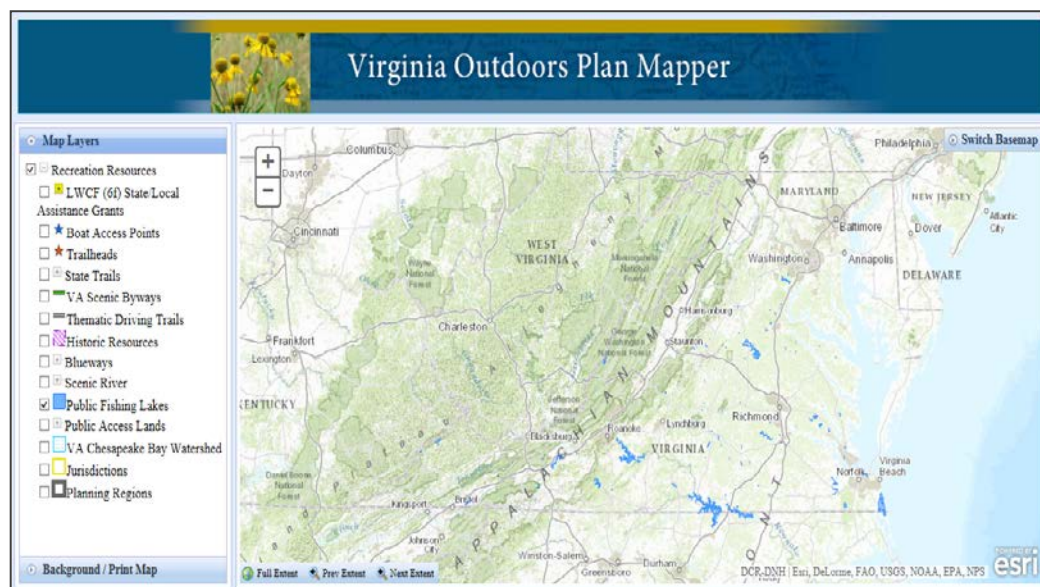
According to the Virginia Auditor of Public Accounts in the 2011 *Comparative Report on Local Government Revenues and Expenditures* statewide per capita spending on parks is \$62.81. This low cost for public parks can be attributed to the fact that many outdoor recreation facilities are supported by user fees, friends groups, and park foundations. These groups link to private sector resources and provide private funding and volunteer support to supplement outdoor recreation across the Commonwealth.

New Interactive Mapping

The 2013 Virginia Outdoor Plan (VOP) takes advantage of technological advancements and meets the changing needs for recreation planning by “going digital”. The VOP Mapper is the first VOP-focused interactive mapping website, developed to provide a single, integrated source for mapping and information about all of Virginia’s recreation resources.

For this reason, this 2014 Report Card eliminates many of the images in the 2009 report card which showed state maps of different amenities by category. Instead, we encourage our readers to go to the VOP Mapping Website when planning outdoor recreation activities.

(http://www.dcr.virginia.gov/recreational_planning/vopmapper.shtml).



Planning for the Future

The Virginia Outdoors Demand Survey (VODS) is conducted every 5 years. It is used to measure attitudes about outdoor recreation and demand for recreational activities. Recreation providers across the Commonwealth also use the survey results to guide strategic planning for facilities at the local level. Respondents who consider access to outdoor recreation as “very important” increased slightly in 2011, from 50 to 56 percent. The majority of respondents, and especially middle-aged respondents, participate in outdoor recreation “mostly on weekends” according to the latest survey. Respondents aged 18-24 were especially likely to consider such access to be “very important.”

Participation in recreation related to tourism has increased steadily since the 1980's. The Virginia Tourism Plan embraces outdoor recreation as a top activity for travelers. The economic impact of the tourism industry in 2011 was \$20.4 billion, with international travelers providing \$390 million of that. Tourism is the state's fifth largest non-farm industry, supporting 207,000 jobs. This makes outdoor recreation a key to economic development across the Commonwealth.

The Virginia Outdoors Plan (VOP) is a comprehensive document that addresses all aspects of outdoor recreation. Along with the Virginia Outdoors Survey and other related studies, these plans provide a framework for maintaining and improving the park system and should continue to be developed on a periodic basis. In addition, local and regional planning agencies are needed, with full-time directors, to champion and implement the strategies established in the plans. Local leaders can also help encourage land use planning at the local level, including conservation and preservation, clustering of development plans where appropriate to reduce environmental impacts, and other smart growth and green design initiatives.

The Virginia Outdoors Plan (VOP) is a guide for outdoor recreation that:

- Identifies Virginia's long-range outdoor recreation and land conservation needs.
- Assists governmental agencies, local and regional planners and private-sector partners.
- Highlights the importance of state-recognized scenic resources.
- Identifies outdoor recreation trends.
- Supports outdoor recreation and land conservation across the Commonwealth.

ASCE REPORT CARD GRADE: C+

Assigning an overall grade to Virginia's parks and recreational infrastructure is based on an evaluation of the accessibility, reliability, current and future capacity, sustainability and economic trends of Virginia's recreation areas. The ASCE Virginia Section is lowering the report card grade for parks in Virginia from "B-" to a "C+" because:

1. The maintenance backlog for the National Park Service has jumped from 7 to 11 billion, and continues to climb. This same type of downward spiral is reflected in Virginia's National Parks as well as other recreational types of facilities at the federal, state and local levels.
2. DCR has four "land banked" parks with inadequate funding for continued development and access improvements, park staffing or long-term maintenance needs. These unfinished projects are evidence of a lack of understanding as to the economic, societal and health benefits of these new state parks to the local communities.
3. Virginia has more localities with vacant or missing positions for parks directors than we had 4 years ago. This includes 26 counties mostly in the Northern Neck, Southside Virginia and Southwest Virginia.
4. There have been no additional general obligation bonds since 2002 to continue the acquisition of lands, and the development of state parks.

On the positive side (...and why it's not a "C-")

1. The state has begun developing 4 "land banked" state parks. They just need funding to make the facilities fully functional and open to the public.

2. The state recently acquired the Natural Bridge and surrounding properties protecting this landmark from development impacts for future generations and preserving it as a tourist destination.
3. The economic benefits of state parks in Virginia continue to increase with the development of our parks. For every dollar spent, there is 11 dollars in revenue generated. This is strongly linked to tourism benefits in current plans and the VOP Mapper will make it even easier for tourists to find recreational destinations of all types.

Virginia's favorable rating as compared to the "C-" grade for the ASCE national report card is primarily due the wide variety and diverse nature of recreational opportunities available to Virginians. Existing facilities are very diverse and the inventory of state and local parks continues to grow.

Recommendations

Virginia
Parks
2015
GRADE
C+

Due to the diverse infrastructure and tremendous natural resources available to Virginians through our parks and recreation facilities, the number and types of recommendations can be quite extensive. This report card focuses on recommendations tied to economics since those can help sustain future needs and improve report card grades. Our top recommendations for state, local and regional parks include:

1. Create a source of dedicated funds for outdoor recreation, including fully funding the Land and Water Conservation Fund, Recreation Trails Program and Transportation Enhancement Program at the federal and state levels.
2. Continue efforts to increase State Park funding to achieve full staff levels at all existing parks, and to develop and operate "land-banked" parks as a top priority.
3. Continue to communicate the economic, tourism, and health benefits of outdoor recreation activities, prioritizing the expansion of the most popular activities in Virginia to elected officials, business and community leaders.
4. Develop better estimates for the overall cost of infrastructure operations and maintenance within our parks, and encourage park user fees to help defray those costs, including fully staffing our parks, creating jobs and maximizing the enjoyment and satisfaction of park visitors and tourists, to maximize the economic and tourism benefits.
5. Develop programs and processes to encourage conservation and recreational easements for small acreage areas in cities and urban environments.

RAIL AND TRANSIT

OVERVIEW

Rail

While highway miles in Virginia have shown a significant increase, active rail miles have actually decreased since 1930. For the vast majority of the railway, freight and passenger rail generally share the same network. Eleven freight and two passenger railroads operate on more than 3,200 miles of railway throughout Virginia. Over the next two decades, the forecast is for significant growth in the demand for freight movement into, out of, within and through Virginia. One of the largest driving factors to this anticipated increase is the growth of the Virginia Ports.

Much of the Commonwealth's railway infrastructure will be challenged by the growth due to the amount, type and location of freight movement as well as the increased passenger traffic over the shared rail corridors. The largest commodity in tonnage carried by rail is coal (61%) and it is carried primarily by two Class I freight operators, CSX and Norfolk Southern.

The two passenger railroads operating in Virginia have experienced explosive growth in annual ridership and they will be challenged by capacity constraints such as increasing freight rail operations on the shared railway and capital needs increases. According to the most recent data from the Association of American Railroads (2012), Virginia ranked 4th and 16th for tonnage of freight terminated and originated while ranking 19th for most miles of rail within the 50 states. This volume imbalance per mile of track emphasizes the importance of each mile of rail within the Commonwealth. Realizing the importance of rail to Virginia's movement of goods and economic vitality, Virginia developed its first dedicated source of funding, the Rail Enhancement Fund, for freight and passenger rail improvements in 2005.

Transit

In many areas of the Commonwealth, transit services are an essential part of the transportation infrastructure. Transit increases access and mobility for Virginia residents by enabling more efficient use of the transportation network, saving time, conserving energy, and providing economic benefits to the customers and communities served. Nationally, transit ridership growth is far exceeding population growth and, "since 1995, transit ridership is up 37.2%, which outpaces the national population growth of 20.3%," says Michael Melaniphy, APTA president and CEO.

Transit ridership in Virginia grew by 20 percent between FY2002 and FY2006 and as of the latest numbers in 2011, this trend continued with 6.4% growth between 2010 and 2011.

Funding levels at the federal level for transit have not grown proportionally with the demand for transit forcing Virginia and local municipalities to fund the deficit.

Introduction and Background

Rail History

Railroads are a significant part of Virginia's present and a critical part of the future solutions for effective movement of people and goods, especially as energy costs and fuel prices continue to rise. In 2012 (most current data available) Virginia moved more than 1,000,000 rail carloads that terminated in Virginia and ranked 8th out of the 50 states for this measure. Amtrak, Virginia's largest passenger rail agency carried a record 31.6 million passengers in Fiscal Year 2013 and recorded its 10th ridership record over 11 years. With 3,200 miles of shared railway throughout Virginia, the rail infrastructure has been built on a complex history of smaller companies responding to economic and transportation needs.

Virginia's rail system dates from the 1800's. The records indicate that the first railroad incorporated in Virginia was the Richmond and Danville Railroad in 1847. Its main line, connecting Richmond and Danville, was opened in 1856. Because its charter prohibited the acquisition of any but connecting lines, the Richmond and Danville Railroad created the Richmond and West Point Terminal Railway and Warehouse Company in 1880, to acquire properties not directly connected with it. The Richmond and Danville Railroad and the Richmond Terminal Company went into receivership in the mid-1890s, were reorganized and emerged from bankruptcy in 1894 as the Southern Railway Company, which controlled over 4,000 miles of line at its inception.

The Norfolk and Western Railroad was organized in 1881 from the Atlantic, Mississippi and Ohio Railroad. The Atlantic, Mississippi and Ohio had been created in 1870 by the merger of three Virginia railroads with antebellum origins: the Norfolk and Petersburg (connecting these two cities), the Southside (running from Petersburg to Lynchburg), and the Virginia and Tennessee (running from Lynchburg to Bristol on the Tennessee border). The Norfolk and Western Railroad rapidly became associated with the mineral development of the southwestern part of Virginia and West Virginia. In mid-1881 it acquired the franchises to four other lines: the New River Railroad; the New River Railroad, Mining and Manufacturing Company; the Bluestone Railroad; and the East River Railroad. In 1890, it acquired the Shenandoah Valley Railroad, which ran from Roanoke, Virginia, to Hagerstown, Maryland. Its program of expansion in the early 1890s, coupled with the economic depression of the 1890s, forced the railroad into receivership in 1895. It emerged as the reorganized Norfolk and Western Railway the next year, in 1896.

Today the Virginia freight rail system is comprised of two classes of railroad companies: two Class I freight railroad systems – Norfolk Southern (2,100 miles) and CSX (1,050 miles); and nine Class III (short-line) line-haul carriers (approximately 489 route miles). The Class I railroads are defined as line-haul freight railroads exceeding \$319.4 million in annual operating revenue. The Class III railroads are defined as line-haul carriers with less than \$24 million in operating revenues. There are no Class II railroads in Virginia. Two passenger systems, Amtrak and Virginia Railway Express (VRE), utilize the private track freight railway system in their operations.

Transit

In this infrastructure report transit includes traditional mass transit (i.e. bus, fixed route rail, vans, and ferryboats) and passenger rail. The Virginia Department of Rail and Public Transportation (DRPT) is the state agency supporting the state's transit systems. DRPT is the designated recipient and administrator of federal funds for the FTA as well as state grant programs. DRPT also provides technical assistance to local transit systems in the areas of: key corridor and system specific capital and operations planning; financial planning, vehicle purchases and inspections, marketing, training, program project management, project development, and program compliance. Local governments in the Commonwealth are typically the direct owners and operators of the transit systems, making DRPT the state agency coordinating local activities and providing financial support. Based on DRPT statistics, the Commonwealth experienced continued growth in transit ridership and service effectiveness in recent years. Transit operators also outperformed the national averages on key performance indicators.

The Commonwealth of Virginia has more than 50 transit agencies and most only operate buses and/or vans. The largest, Washington Metropolitan Area Transit Authority (WMATA), has a fleet of more than 1,500 buses that cover 325 routes. Hampton Roads Transit (HRT) constructed and completed the first Virginia light transit system in 2010 (called "the Tide") to supplement their existing bus and ferry network. Ridership for the Tide has exceeded original projections (prior to construction) since opening; however, in the last year (2013) ridership has decreased. HRT is working closely with the City of Virginia Beach and the City of Norfolk to plan the next leg of light rail transit, which is anticipated to help connect Norfolk to other areas within Hampton Roads and should also bolster ridership. HRT also operates buses and vans, and a fleet of 3 ferryboats that operate from Norfolk/Portsmouth and James City/Surry County.

In 2007, Amtrak had eight passenger routes serving Virginia and operated 20 daily intercity trains and two tri-weekly trains. Virginia Railway Express, founded in 1992, provides a transportation alternative to driving congested highways from Northern Virginia suburbs to the business districts of Alexandria, Crystal City, and Washington, DC. As more commuters and travelers choose Amtrak for their travel needs, investments need to be made in the tracks, bridges, tunnels, signal systems and other infrastructure or we will be faced with increased infrastructure-related service disruptions that will compromise our state's economy and cause users to reconsider their choices for transportation, reducing ridership.

CONDITION AND ADEQUACY

Rail

Today's critical issues for Virginia's railroads include the following:

- Upgrade of existing stations (including platform extensions and park and ride lots) to accommodate higher volumes of rail passengers and changing expectations of the traveling public.
- Continue to develop plans for high-speed rail solutions along Virginia's golden crescent, connecting Virginia into the Southeast High Speed Rail Corridor.

- Maintain and upkeep existing rail infrastructure (rail, signal systems and tunnels) to maintain or improve safety and avoid delays.
- Evaluate bridge and tunnel structures as part of the system maintenance.
- Modernize aging rail infrastructure to handle heavier, larger railcars and higher speeds.
- Improve the accessibility of ports via railways, and connect Inland ports, intermodal yards, and “integrated logistics centers”. Improve the system as necessary to reduce freight costs and travel time.
- Address increased demand for passenger rail service where it conflicts with the private freight railroad business on shared rail lines.
- Continue to promote the diversion of long haul trucks to rail, reducing traffic congestion on roadways and improving safety.

By 2035 Virginia will have to decide how to handle a doubling of rail traffic, while offsetting investment needs in other modes of transportation, to have comprehensive solutions to meet all needs.

Transit

Virginia’s transit operators are performing well against the national averages and that of neighboring states as born out by the following results of the 2007 Virginia Transit Performance Report.

Ridership. From FY2002 to FY2006, transit ridership in Virginia grew by 20 percent compared to a national growth rate of 4 percent and in 2011 alone, 6.3 percent growth was achieved. The Virginia transit agencies reporting the highest ridership growth were Williamsburg Area Transit (2,875 percent) and Loudon County Transit (184 percent). The Virginia transit systems with the most annual passenger trips were the Washington Metropolitan Area Transit Authority (WMATA) at 115.7 million passenger trips and Hampton Roads Transit (HRT) at 21.2 million.

Total Transit Miles Operated. Between FY2002 and FY2006, the total transit miles operated in Virginia, measured in vehicle revenue miles, grew by 13.1 million, or 20 percent. The nation’s growth in vehicle revenue miles for the same period was 7 percent.

System Efficiency. Measured as the operating cost per passenger trip, system efficiency is higher for transit systems which serve passengers at a lower operating cost. From FY2002-FY2006, Virginia’s operating cost per passenger trip grew from \$2.34 to \$2.73, a 17 percent increase. However, this was a slower cost increase than the national increase of 24 percent. For the same period the operating cost per passenger trip was lower in Virginia, than in the three neighboring states of North Carolina (\$3.42), Maryland (\$3.95), and Tennessee (\$4.15). The Williamsburg Area Transit decreased its operating cost per passenger trip by 89 percent from \$10.63 to \$1.13 per trip, the lowest in the state, due mainly to increases in ridership. Loudoun County Transit experienced a 39 percent decrease in the operating cost per passenger trip, for the same reason.

System Effectiveness. System effectiveness is measured in terms of the number of passenger trips served per vehicle revenue hour. Therefore, the more trips served per hour, the more

effective the transit system. Between FY2002 and FY2006, passenger trips per vehicle revenue hour in Virginia increased one percent compared to a national decline of three percent. In FY2006 the national average was 38 trips per vehicle revenue hour compared to 37 passenger trips per revenue hour served by Virginia transit operators. At 63 passenger trips per vehicle hour, Virginia Railway Express had the highest number of trips served per hour among Virginia transit agencies. Williamsburg Area Transit had the greatest system effectiveness among Virginia bus operators with 44 trips per hour and the greatest increase at 529 percent. Loudoun County Transit saw a 127 percent increase.

State Funding. In FY2006 the level of state government funding available to transit operators was 42 percent higher than in FY2002. Nationally, state funding available to transit operators grew 13 percent from FY2002 to FY2006. In Virginia the state funding for capital and operating expenses has fluctuated from year to year. In 2007 the General Assembly passed House Bill 3202 which was anticipated to provide a record increase of about \$103 million in state and regional transit funding.

Local Government Funding. Combined local government capital and operating funds available for transit operators in Virginia grew by 38 percent from FY2002 to FY2006. When broken down, the available local operating funds grew by 28 percent and the available local capital funds grew by 98 percent between FY2002 and FY2006. For the same period local government funding, nationally, for transit operators grew by 20 percent with an 18 percent decline in capital funds and a 40 percent increase in operating funds.

Farebox Recovery. Farebox recovery is significantly impacted by fare policies adopted on the local level. Transit operators in Virginia paid for approximately 41 percent of their operating cost through collection of fares in FY2006 which was equal to the percent of costs paid through fares nationally. This represented an 11 percent growth rate from FY2002. The national growth rate was only 5 percent between FY2002 and FY2006. Of the Virginia transit agencies Loudoun County had the highest rate of farebox recovery at 77 percent. The City of Fairfax CUE bus system had the greatest increase in the percentage of operating expenses covered by fares collected at 98 percent. Williamsburg Area Transit had an increase of 93 percent.

Average Age of Vehicles. The average age of transit vehicles in Virginia rose from 6.1 to 7.4 years (not including WMATA's vehicles which were not included in the survey) from FY2002 to FY2006, a 22 percent increase. However, the national average age of vehicles was 9.4 years in FY2006. Therefore, the average age of Virginia vehicles are 21 percent below the national average.

INVESTMENT NEEDS AND FUNDING DEDICATED

Rail

Virginia needs to invest in upgrades to the freight rail system infrastructure to accommodate the increasing levels of traffic for both freight and passenger rail. There are significant limitations throughout Virginia's railroad system that prevent the railroads from routing traffic over the

primary corridors. According to the Association of American Railroads study released in September 2007, the most heavily used rail line in Virginia is the CSX north-south line, which combines freight and passenger movements. The CSX north-south line is the only line in Virginia's railroad system that is considered to be operating at Level of Service (LOS) D, near capacity. Other rail lines have significant unused or "latent" capacity which can be utilized if certain improvements are made. The most pressing rail infrastructure improvements where the investment of funds would yield significant results are:

- Assess current bridge and tunnel inventory for condition and ability to meet double-stacking and increasing freight loads, and make investments where warranted.
- Perform asset management of rail, supporting ballast and other infrastructure needs and promptly perform necessary maintenance.
- Develop rail improvements to reduce congestion and improve reliability in the most heavily traveled corridors with bypass and parallel lines
- Upgrade track speed, weight capacity, and clearances to reduce travel time, improve reliability and safety.
- Improve track alignments to increase reliability and reduce accidents
- Improve short-haul rail to increase speed, capacity, and reliability.

Four funding sources are specifically authorized to support Virginia's capital improvements on privately owned rail lines.

1. The Rail Enhancement Fund – Established in 2005 to provide dedicated state funding for acquiring, leasing, and/or improving railways or railroad equipment, rolling stock, rights of way, or facilities for freight and/or passenger rail transportation. Source: a portion of the three percent vehicle rental tax and the interest earned on cash balances.
2. The Rail Preservation Fund – Established in 1991 to provide state financial support to preserve, continue, and increase the productivity, safety and efficiency of shortline railway transportation logistics. Source: \$3 million annual allocation of highway construction funds and the interest earned on cash balances.
3. Capital Project Bonds – Established in 2007, includes a minimum of 4.3 percent of available bond funds specifically for rail transportation until a total of \$3 billion of authorized bonds are fully allocated in FY2018.
4. The Rail Industrial Access Fund – Established in 1986 to provide financial support for projects that provide freight rail access to businesses in conjunction with the Virginia Economic Development Partnership, County and Municipal Economic Development Departments, railroads and private industry. Funding for this program is expected to average \$1.5 million per year in future years.
5. Intercity Passenger Rail Operating and Capital Fund – Passed by the General Assembly in 2011. While no money has been appropriated to the fund yet, the legislation gave the Commonwealth Transportation Board and General Assembly the flexibility to allocate existing transportation revenues into the fund.

The DRPT 2008 Statewide Rail Resource Allocation Plan was developed to provide a clear vision and strategy to address the rail needs in the Commonwealth. The plan identifies several potential projects to address rail needs in Virginia. A Rail Action Plan was developed to provide funding strategies and detailed implementation plans.

Transit

Virginia provides financial support for public transportation systems in the Commonwealth to support capital and operating expenses for transit systems through DRPT. State funding is often used to help provide matching funds for federal grants from the Federal Transit Administration. Local governments are typically the direct owners and operators of the transit systems and provide significant financial support to maintain transit systems in their localities. Transit increases access and mobility for Virginia residents by enabling more efficient use of the transportation network. The growing demand for transit will only increase with unmet needs. Therefore, a sustainable source of funding for new or expanded transit services is critical to the future success of rail transit in Virginia. The state should consider additional funding for fixed route transit providers where the population densities justify the investment. Additionally, the United States Congress should authorize new federal surface transportation policies utilizing a needs-based approach to determine funding.

BASIS OF GRADE

Rail

The vast majority of Virginia's freight and passenger rail system is privately owned which limits the availability of public information to assess the overall condition. The Virginia Department of Rail and Public Transportation (DRPT) as the leading state agency for rail (and transit), is responsible for providing transportation solutions and focusing on projects that deliver public benefits for the investment of public funds. DRPT has led some key accomplishments recently, including the creation of the first dedicated source of rail funding at the state level – the Rail Enhancement Fund in 2005. The Intercity Passenger Rail Operating and Capital Fund was also passed by the General Assembly in 2011. While no money has been appropriated to the fund yet, the legislation gave the Commonwealth Transportation Board and the General Assembly the flexibility to allocate existing transportation revenues into the fund.

While both funds show significant progress, the current funding is not sufficient to meet the increasing demand for rail and passenger service or to complete the much-needed rail infrastructure improvements and upgrades in the short term. Rail infrastructure projects are competing with other transportation projects for the limited public funds in the midst of an economic recovery. Demand and the ability to accommodate the exponential growth far exceed Amtrak and VRE's ability to provide this valuable service.

The Virginia Section of ASCE gives Virginia's freight and passenger railroads a grade of **D**.

Transit

Virginia has shown improvement across all performance indicators except for fare box recovery, which remained flat while the costs of providing the service have increased. This creates a significant funding gap.

Funding levels for all modes of transit need to grow in order to meet the increasing demands on the transit infrastructure. Transit agencies have also endeavored to upgrade shelters and other rider amenities to meet evolving safety and ADA compliance measures often without public funding to keep pace with regulatory requirements.

The Virginia Section of ASCE gives transit in Virginia a grade of **C-**.

CONCLUSIONS AND RECOMMENDATIONS

Rail

Given the current funding levels for freight and passenger rail, infrastructure upgrades are far behind increasing ridership and freight demands. Given that the increasing demands are primarily on a shared rail system, the need for additional rail infrastructure that also accommodates high speed trains cannot be understated. The demand for rail service continues to outpace state resources not just in Virginia but in neighboring states. Rail tracks are privately owned by freight companies, which is an additional challenge because of the responsibility to return shareholder value. In short, there are competing and contradictory demands for the limited resource of railways in Virginia.

The recommendations of the ASCE Virginia Section are:

- Continue and advance feasibility studies for high speed rail (90mph-110mph) and incorporate the recommended improvements into the overall plan.
- Educate the public and elected officials on the value of rail transportation in addition to highway transportation
- Ensure a multi-modal approach to freight and passenger rail planning and design
- Maintain and improve rail system performance with ongoing evaluation of critical infrastructure such as bridges and tunnels as part of the overall plan.
- Support and encourage entrepreneurial public-private partnerships and transit oriented development which increase ridership and lower operating costs.
- Consider appropriate increases of fares and user fees for passenger rail service;

- Increase state funding to meet identified needs for critical infrastructure projects and move forward on Governor McCaulliffe's \$13.1B transportation program announced in 2014.

Transit

Virginia's transit agencies have been efficient in their use of limited funds to meet the increased demand for service. Virginia's transit operators are performing well when compared with the national average and neighboring states. Transit services have also become an essential part of the transportation infrastructure and provide essential relief to other transportation alternatives. As access to transit increases, mobility for transit customers will increase and reduce the burden on the Virginia's overcrowded highways and roads and reduce the dependence on fossil fuels and provide a significant benefit to the quality of life in Virginia.

ASCE Virginia Section makes the following recommendations for transit:

- Implement a Federal funding framework for high speed rail to improve passenger rail service and connect Virginia to the Southeast Rail Corridor
- Provide additional funding mechanisms to support safety and ADA compliance mandates for bus shelters and other rider amenities
- Promote multi-modal transportation by providing amenities such as bike racks on buses and on shelters
- Continue to identify ways to maximize performance of transit service by increasing the performance indicators: ridership, vehicle revenue miles, system efficiency, and system effectiveness
- Provide additional state and local funding to offset operating and capital costs for fixed route transit where population densities merit
- Consider increasing fare box revenues for all modes of transit as appropriate
- Replace aging transit vehicles to maintain or lower the average vehicle age

ROADS

OVERVIEW

The Commonwealth of Virginia's roadway infrastructure is in serious decline. For decades, the roadway system has provided a safe and convenient means of travel for Virginia's citizens and has been a vital network of arteries feeding Virginia's business and industrial needs for movement of goods and services. While the physical condition of the Commonwealth's roadways is tolerable, the increasing demands on the system's capacity and resulting congestion are choking the major urban areas and becoming a negative influence on business decision makers, commuters, and tourists.

During the 2013 Virginia General Assembly session, transportation funding was addressed in historical measure by House Bill 2313. The revenues generated through HB 2313 can breathe new life into the Virginia transportation programⁱ. Prior to this, the most recent increase in revenues for transportation was over 20 years ago. However, even with the increased funding for the transportation system, maintenance needs for transportation are reducing the amount of funding available for needed improvements to operations and capacity.

The performance of the roadway network is measured by three key components; highway safety, condition of the roadway infrastructure, and traffic congestion. Highway safety is generally improving, as evidenced by a decrease in traffic related incidences, fatalities, and severe injuries. The condition of roadway infrastructure to include pavement, signage, and barrier systems generally meets and/or exceeds the target assessment goals set by VDOT. However, congestion in Virginia continues to have a negative impact on Virginia's economy and mobility, with Northern Virginia ranked second in the nation for the most congested regions, and Hampton Roads ranked twenty sixth, putting our economic future at risk.

Highway safety and physical conditions are positive aspects of the existing road system with improved performance over the past several years. However, this could be expected due to the statutory mandate to fund maintenance and safety needs as our first priority in Virginia. The positive aspects of highway safety and condition are significantly offset by the impact of congestion in Virginia. The impacts of congestion are numerous and significant – increased travel time, decreased economic development in Virginia, decreased service to Virginia's port facilities, more expensive goods and services, higher consumption of natural resources, job loss, reduced economic health and a reduction in overall quality of life in Virginia.

Depending on the impacts of HB 2313 on funding, it is yet to be determined if Virginia can continue to maintain our roadways and improve safety on our vast highway system which includes the 3rd largest state maintained roadway network in the nation. Further, Virginia needs to find solutions for increasing traffic congestion and rising construction costs for our roadways, or find alternative modes of transportation to meet demand. This is especially true in the most congested regions of the Commonwealth, Northern Virginia and Hampton Roads, where the traffic congestion is already having a negative impact on the economy. Considering the attributes receiving adequate or high marks, they are strongly offset by the lack of funding for capacity improvements to relieve congestion – resulting in an overall grade of D+. While this is an improvement over the D- grade in 2009, it is still one of the most significant concerns in our 2015 infrastructure report card because of the tremendous impacts of our roadways on the economy.

INTRODUCTION AND BACKGROUND

Virginia's transportation infrastructure supports business, tourism, and economic growth, as well as daily life of our citizens. Continued growth in population, vehicular travel, and freight throughout has increased demands on a system that is struggling to keep pace. The additional strain on our roadways accelerates deterioration, creating a need for continuous investment in maintenance and upgrades.

Highway and roadway systems have been the backbone of our society's economy. From farm roads to the Interstate Highway System, roadways provide a vital link to economic centers including getting goods to market and raw materials to industry. A strong transportation highway and roadway system is vital to a strong economy and personal freedom. The Commonwealth of Virginia's highway and roadway system is the result of significant investment by past generations who could see the need to make investments in the present to reap rewards in the future. In the present day, however, this system of roadways has come to be taken for granted in recent years and the need to keep pace with population growth and capacity demands has been neglected for reasons too complex to review here.

The 2013 General Assembly session, addressed the significant need for transportation funding by enacting HB 2313. The revenues generated by HB 2313 will provide dedicated revenue sources to transportation, and the most significant contributions will come from, the taxes collected on the sale of fuel. Other sources of revenue include a percentage of the Retail Sale and Use Tax as well as the Motor Vehicle Sales and Use Tax. HB 2313 also increased the regional state and sale tax in both Northern Virginia and Hampton Roads planning districts for additional congestion relief at the local level.

HOUSE BILL (HB) 2313

House Bill 2313 provided revenues and appropriations primarily for transportation and makes several changes to the revenues collected by the Commonwealth and the distributions of such revenues. The major sources of revenue dedicated to transportation include:

- Motor Fuel Taxes
- Motor Vehicles Sales and Use Tax
- State Sales and Use Tax
- Motor Vehicle License Fees
- International Registration Plan
- Recordation of Tax
- Auto Insurance Premiums dedicated to the Priority Transportation Fund
- Regional Tax to the planning district of Northern Virginia and Hampton Roads

The impact of HB 2313 on Transportation Funding is reflected in the table below as indicated in *VDOT's 2013 Annual Report*.

IMPACT OF HB 2313 ON TRANSPORTATION FUNDING

Revenue Source	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019*	6-Year Total
Eliminate 17.5 cents/gallon tax on motor fuel (gasoline and diesel)	\$ (871.1)	\$ (889.3)	\$ (907.4)	\$ (922.6)	\$ (938.2)	\$ (954.5)	\$ (5,483.1)
3.5% Sales and Use Tax on gasoline and 6% on diesel	626.3	723.0	749.6	778.5	804.7	831.8	4,513.9
1.6% increase in Sales and Use Tax on gasoline if Marketplace Equity Act (MEA) is not approved by January 1, 2015		89.6	220.5	225.5	229.2	233.0	997.8
Net of Gas Tax Change	\$ (244.8)	\$ (76.7)	\$ 62.7	\$ 81.4	\$ 95.7	\$ 110.3	\$ 28.6
0.3% Sales and Use Tax increase (5.3% total)	265.8	301.2	313.2	325.2	336.3	347.8	1,889.5
\$64 Alternative Fuel Vehicle Fee	6.5	7.3	8.3	9.6	10.9	12.4	55.0
Increase titling tax from 3% to 4.15%	184.0	213.7	228.0	246.3	246.5	246.7	1,365.2
Net tax/fee increases	\$ 456.3	\$ 522.2	\$ 549.5	\$ 581.1	\$ 593.7	\$ 606.9	\$ 3,309.7
Total New Revenue	\$ 211.5	\$ 445.5	\$ 612.2	\$ 662.5	\$ 689.4	\$ 717.1	\$ 3,338.2
Incremental Sales Tax Commitment Over 4 Years (0.5% to 0.675%) - No increased transfer after FY 2015 without MEA	49.0	101.7	105.6	109.6	113.3	117.1	596.2
Additional Funding for Transportation	\$ 260.5	\$ 547.2	\$ 717.8	\$ 772.1	\$ 802.7	\$ 834.2	\$ 3,934.4

*Projected

Prior to HB 2313 the Virginia legislature had tried and failed repeatedly to implement the funding necessary to meet even the basic improvement needs for many years. To a large extent this reflects the lack of will of the citizens to increase taxes to fund improvements. In November 2002 for example, the Commonwealth's citizens soundly defeated two regional referendums to increase taxes for transportation projects. Reasons often cited for the defeat included lack of confidence in the Virginia Department of Transportation to spend the money wisely and lack of assurance from the legislature that the money would go for transportation rather than into some other fund.

The following sections of this document and describe the physical condition of the roadway system, the ability of the system to meet demand, the impacts on the roadway users, the financial status of the transportation program, and strategies for congestion mitigation. Following the "report card" theme, each major component is given a letter grade loosely based on the concept of evaluating a student's performance in our typical education system.

PERFORMANCE AND CONDITION

With more than eight million people living and working in Virginia and millions of tourist and business travelers, the transportation system is critical to support all the travel needs of the public and to ensure a thriving economy. As of 2010, the most recent year for which this data is available, VDOT maintained 126,530 lane miles of interstate, primary, secondary, and frontage roads, making it the third largest state maintained highway system in the country.

The surface transportation system has a direct impact on the health and vitality of the state's economy and quality of life. A well maintained and operated transportation system ensures safe travel conditions, decreased wear and tear on vehicles, and reduced travel delay. The key performance measures to determine the adequacy of Virginia's roadway network are highway safety, traffic congestion, and condition of roadway infrastructure.

HIGHWAY SAFETY

From the *2014 Virginia Highway Safety Plan*, Virginia's Transportation Safety Officials have analyzed the highway safety problems and presented corrective strategies to improve highway safety. Below is a summary of accident data provided by the *Department of Motor Vehicles 2013 Traffic Crash Facts*. This data indicates that even though the number of licensed drivers has increased in Virginia, the number of total crashes and injuries related to these crashes have both decreased. Also, alcohol related incidents have also been reduced.

Summary : 2003 - 2013

Year	Death Rate*	Vehicles Registered	Licensed Drivers	Vehicular Mileage**	Alcohol Related***			Total Crashes	Total Fatalities	Total Injuries
					Crashes	Fatalities	Injuries			
2003	1.23	6,833,735	5,257,516	76,830	11,388	361	7,819	154,849	942	78,842
2004	1.17	7,037,698	5,313,167	78,877	11,504	343	7,911	153,907	922	78,486
2005	1.18	7,246,709	5,362,140	80,335	11,495	322	7,512	153,849	946	76,023
2006	1.19	7,386,061	5,394,888	81,094	11,736	374	7,543	151,693	961	73,349
2007	1.25	7,500,308	5,436,825	82,077	11,215	378	7,130	145,405	1,026	68,822
2008	1.00	7,503,924	5,475,069	82,278	10,294	354	7,000	135,282	821	69,130
2009	0.93	7,495,574	5,501,878	80,938	9,366	316	6,256	116,744	756	62,976
2010	0.90	7,565,848	5,569,524	82,414	8,221	274	5,578	116,385	740	61,418
2011	0.94	7,636,407	5,662,416	80,974	8,411	245	5,465	120,513	764	63,382
2012	0.96	7,706,795	5,730,175	80,954	8,777	229	5,861	123,579	775	67,004
2013	0.92	7,799,339	5,822,361	80,258	8,047	253	5,288	121,763	741	65,114

* Per 100 million miles with 2013 estimated.

** In millions with 2013 estimated. Mileage estimated from 2013 was calculated using gasoline consumption; starting in 2002, annual vehicle miles of travel are based on vehicle count using a program developed by the Virginia DOT's Traffic Monitor System.

*** Determined using medical examiner data in addition to police reports.

The Virginia Highway Safety Plan implemented a Performance Report with an emphasis on eleven core targets in 2012. These targets are measureable highway safety performance measures based on the highway safety problems identified.

- Virginia's fatalities were 775 for 2012. Virginia did not meet its goal of 741.
- Virginia's serious injuries were 10,130 for 2012. Virginia surpassed its goal of 10,335.
- Virginia's fatalities per 100 million vehicle miles traveled (VMT) were 0.96 for 2012. Virginia did not meet its goal of 0.90.
- Virginia's rural fatalities per 100 million VMT were 1.15 for 2012. Virginia surpassed its goal of 1.30.
- Virginia's urban fatalities per 100 million VMT were 0.79 for 2012. Virginia did not meet its goal of 0.51.
- Virginia's unrestrained passenger vehicle fatalities were 295 for 2012. Virginia did not meet its goal of 294.
- Virginia's impaired driving fatalities were 222 for 2012. Virginia surpassed its goal of 225.
- Virginia's speed related fatalities were 262 for 2012. Virginia did not meet its goal of 242.
- Virginia's motorcycle fatalities were 78 for 2012. Virginia surpassed its goal of 87.
- Virginia's young drivers age 20 or younger fatalities were 96 for 2012. Virginia did not meet its goal of 86.
- Virginia's pedestrian/bicycle fatalities were 100 for 2012. Virginia did not meet its goal of 74.

Below is a summary of these performance measures to show trends over the past four years (2008-2012):

Ten Core Performance Measures (2008-2012 Trends)

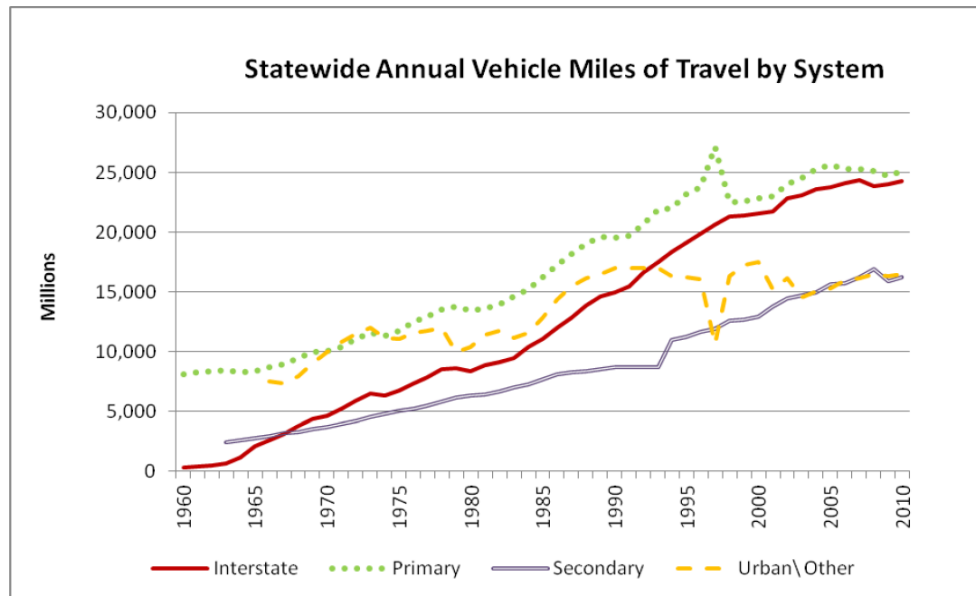
	2008	2009	2010	2011	2012	5-Year Average	Goal
Fatalities	825	758	740	764	776	773	760
Serious Injuries	16,540	13,120	11,736	10,900	10,130	12,485	9,061
Fatalities/100M VMT	1.00	0.94	0.90	0.95	0.96	0.95	0.93
Rural Fatalities (per 100M VMT)	1.59	1.41	1.03	1.24	1.15	1.28	1.05
Urban Fatalities (per 100M VMT)	0.66	0.65	0.45	0.53	0.79	0.62	0.72
Unrestrained Passenger Vehicle Occupant Fatalities	374	322	302	301	295	319	286
Alcohol Impaired Driving Fatalities (BAC=0.08+)	276	243	207	224	222	234	211
Speed-Related Fatalities	245	302	269	287	262	273	257
Motorcycle Fatalities	86	77	86	90	78	83	73
Unhelmeted Motorcycle Fatalities	6	6	1	1	4	4	1
Drivers Age 20 or Younger Involved in Fatal Crashes	145	111	101	90	96	109	88
Pedestrian Fatalities	75	74	73	75	100	79	96

Through driver education, community safety projects, police enforcement, roadway safety programs, and media outreach; Virginia is making a concerted effort to improve highway safety. Highway safety is generally improving, as evidenced by the decrease in traffic related deaths and severe injuries. While these factors and others contribute to increased roadway safety, such as improved enforcement, safer vehicles, and faster response times; there were 7 out of 11 core targets that were missed in 2012. Continued monitoring and improvement in the 11 core targets identified by the Virginia Highway Safety Plan is key to our continued success in improving highway safety.

CONDITION OF ROADWAY INFRASTRUCTURE

Growth of the highway system, increased demand on the highway system, and the state of the economy are the key factors that affect VDOT's ability to maintain Virginia's state maintained roadway network. As of 2010, VDOT maintains 126,530 lane miles of interstate, primary, secondary, and frontage roads; making it the third largest state maintained highway system in the country. The roadway network that VDOT maintains has grown more than 14 percent in the last 35 years, nearly 200 lane miles per year.

Not only has the size of the VDOT maintained roadway network increased, but the usage of the system has increased by over 70% in the last 35 years.



The increased travel demand on the roadway network has a negative impact on the longevity of pavement, guardrail, and traffic management systems. For example, over 50 percent of the existing guardrail infrastructure is not fully compliant with current FHWA/AASHTO standards. Many of the safety assets, including signing, lighting, dynamic message signs, road cameras and hardware and software that support technology in use today are past their current life cycles.

Another factor that contributes to VDOT's ability to provide adequate funds for highway maintenance and operations is the reduction in buying power, which is caused by the rising cost of highway construction costs. This slows the rate of growth in the size of the state highway system. In 2007, \$10 million would purchase 282 lane miles of pavement overlays; today \$10 million purchases only 157 lane miles of pavement overlays. This is a reduction in lane miles for pavement overlays of six percent per year, on average, which is much higher than the costs for inflation in many other market categories.

Pavement Condition Assessment

A digital pavement condition assessment is conducted each year on the interstate and primary systems in Virginia, and the condition assessment for the secondary system has also been developed over the last five years. Pavement conditions are measured numerically using the Critical Condition Index (CCI) and collected using vehicles outfitted with equipment that measures roughness, rutting, cracking and other physical distress. The CCI ranges from 0 to 100 are summarized below, where pavements with a CCI below 60 are considered to be deficient.

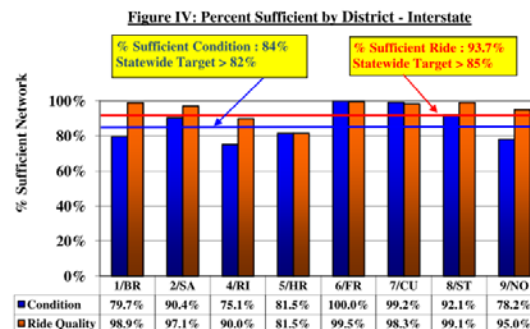
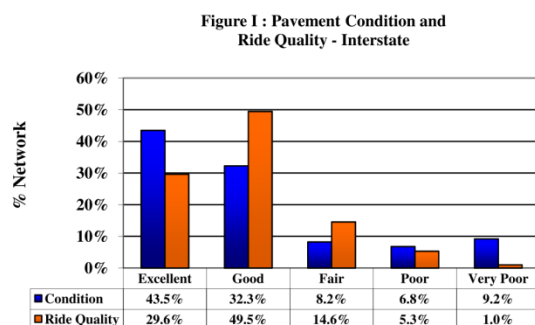
Pavement Condition	Index Scale (CCI)	Ride Quality	IRI Rating (inch/mile)	
			Interstate & Primary	Secondary Roads
Excellent	90 and above	Excellent	< 60	< 95
Good	70-89	Good	60 to 99	95 to 169
Fair	60-69	Fair	100 to 139	170 to 219
Poor	50-59	Poor	140 to 199	220 to 279
Very Poor	49 and below	Very Poor	≥ 200	≥ 280

Pavement ride quality is also assessed using the International Roughness Index (IRI), a measure of road roughness. A pavement section with an IRI value of less than 140 is considered adequate for interstate and primary roads.

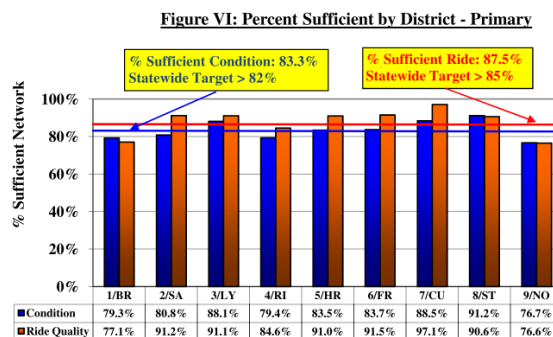
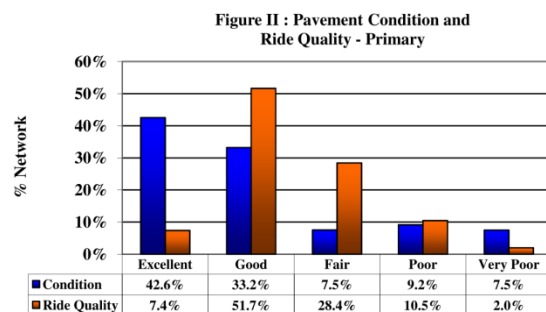
For interstate, primary, and secondary systems; the statewide pavement condition and ride quality summary is presented in the figures below. The statewide performance target for interstate and primary pavements rated sufficient is 82% or better. Similarly, the performance for statewide sufficient ride quality for interstate and primary pavement systems is 85% or better. Approximately 84% of the interstate network has been rated to be 'sufficient' condition and 93.7% has sufficient ride quality. Figure IV illustrates the pavement condition and ride quality for the interstate system in each district along with statewide statistics.

VDOT District Abbreviations

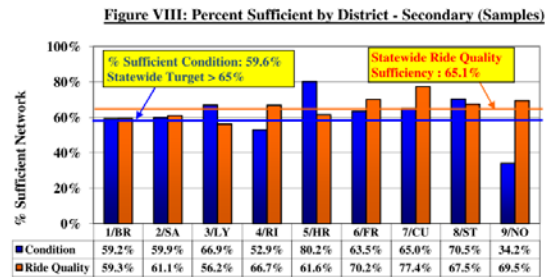
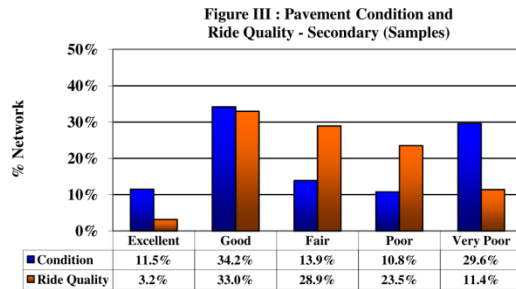
1/BR = Bristol, 2/SA = Salem, 3/LY = Lynchburg, 4/RI = Richmond, 5/HR Hampton Roads, 6/FR = Fredericksburg, 7/CU = Culpeper, 8/ST = Staunton, 9/NO = Northern Virginia



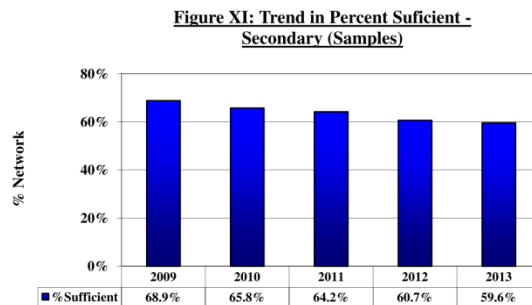
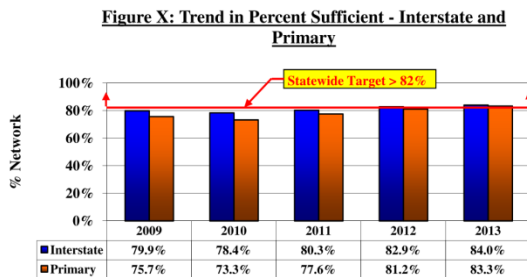
Approximately 83.3% of the primary network has been rated to be 'sufficient' pavement condition and 87.5% has sufficient ride quality. Figure VI illustrates the pavement condition and ride quality for the primary system in each district along with statewide statistics.



The secondary pavement network has not been surveyed in its entirety. In 2013, 16,192 lane miles of data was assessed for VDOT, which is approximately 20% of VDOT's maintained secondary roadways. Since sample data was selected from every county in the state, this is a good representation of the secondary pavement conditions across the state. Approximately 59.6% of the secondary network has been rated to be 'sufficient' condition and 65.1% has sufficient ride quality. Figure VIII illustrates the pavement condition and ride quality for the secondary system in each district along with statewide statistics.



The trends over recent years for the interstate, primary, and secondary networks are shown in the figures below. As you can see the interstate and primary pavement systems have been steadily improving over the last several years, while the secondary system pavement condition has been declining, based on the sample selection.



Traffic and Safety Equipment Condition Assessment

Traffic and safety assets include signs, pavement markings, guardrail, traffic barriers, signals and lights. The condition assessments for each of these traffic and safety components are presented below.

Signs

The assessment for signs includes ground mounted signs, overhead signs, parapet mounted signs, road edge delineators, object marking delineators, Integrated Directional Signing Program (IDSP), and a new sign condition inspection program. VDOT currently has over 665,000 signs to operate and maintains throughout the state. In 2007 a condition assessment was collected for ground mounted signs, the assessment indicated that 92.2 percent of interstate, 94.8 percent of primary, and 93.6 percent of secondary signs required no repair or replacements. Based on this condition assessment, more than \$60 million per year is invested to replace and maintain the sign infrastructure.

Guardrail and Traffic Barriers

Guardrail and traffic barriers are installed to reduce the potential for, and severity of, accidents involving vehicles running off the road. They are designed to contain and redirect a vehicle onto the roadway if it should leave the travel lane. Inventory for guardrail and traffic barrier was derived from 2008 through 2010 in a condition assessment which covered 100 percent of the interstate and primary systems and approximately 65 percent of the secondary system. It is estimated that VDOT maintains 6,532 miles of guardrail and 367 miles of traffic barrier. The last statewide assessment of guardrail was performed in 2007, which indicated that 98.3 percent of interstate, 98.4 percent of primary, and 97.9 percent of secondary systems were in a condition that required no repair.

While the 2007 condition assessment indicated that less than three percent of guardrail is in need of repair, approximately 50 percent of guardrail is no longer fully compliant with current National Cooperative Highway Research Program 350 standards. Based on the condition assessment and life cycle replacement and maintenance needs, more than \$60 million per year is invested in this infrastructure statewide.

Signal Systems

VDOT operates and maintains 3,244 signal systems throughout the state, and the system grows at a rate of 100 new signalized intersections per year. Condition data on the statewide signal inventory was not available. However, based on an analytical model developed in 2009 the life cycle replacement and maintenance investment needs are estimated at over \$45 million per year.

TRAFFIC CONGESTION

As part of more strategic planning for transportation investments it is important to have effective measures to gauge how our transportation system is performing. A key measure of traffic congestion is the Travel Time Index (TTI). TTI represents the ratio of peak travel times to off-peak travel times, with 1.00 meaning that traffic is distributed fairly evenly throughout the day, while 1.20 indicates that travel times during peak hour are 20% higher than off-peak hours.

According to the *VTrans 2035 Update*, with a TTI of 1.33 the Washington DC-VA-MD metro area is the nation's second most congested urban area, just behind Los Angeles. The average commuter in the DC metro-area experiences 74 hours of travel delay per year – nearly two full work weeks of sitting in traffic congestion. Virginia Beach has a 1.18 TTI, making it the 26th most congested urban area in the nation, while Richmond's TTI of 1.06 is below the average for comparably sized cities.

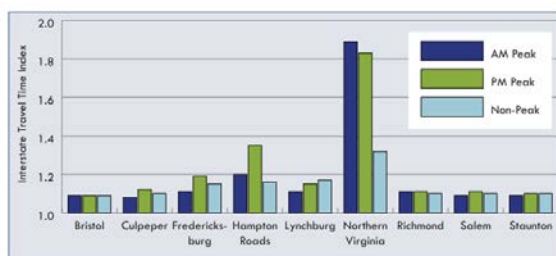


Fig. 3-6: Interstate Travel Time Index by Construction District (2010)

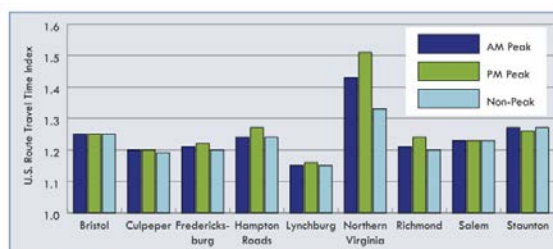


Fig. 3-7: U.S. Route Travel Time Index by Construction District (2010)

The TTI data for 2010 shows that delays occur throughout the state, with the most significant delays in Northern Virginia where interstate TTI ranges from 1.83 to 1.89. Conversely, Bristol has the lowest interstate TTI with an average values of 1.09 reported.

To relate congestion of the roadway to the impact on the roadway user and to the economy in general, the following statistics were taken from the *2012 Urban Mobility Report*. The table below lists the impacts of congestion on the drivers in three of Virginia's urban areas, including the Washington, DC-VA-MD urban area (the Virginia Department of Transportation accepts the Washington, DC-VA-MD urban area as a proxy for Northern Virginia).

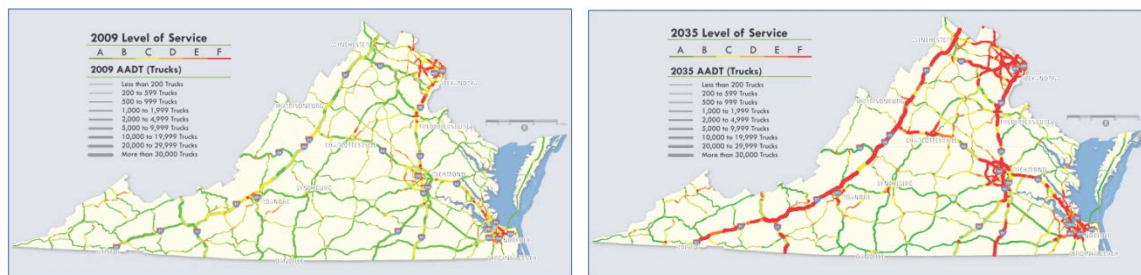
2012 Urban Mobility Report Data			
Urban Area	Annual Travel Delay (hrs)	Wasted Fuel (gal)	Total Congestion Cost \$ million
Richmond	19,499,000	7,944,000	398
Virginia Beach	46,172,000	19,633,000	932
Washington, DC-VA-MD	179,331,000	85,103,000	3,771
Total	245,002,000	112,680,000	5,101

Viewed another way, the total time Virginians spent in traffic delay in the three urban areas evaluated by the study, was 28,000 years at a fuel cost of \$5,101,000,000.

Truck and Freight Movement

Excessive congestion can have a serious impact on Virginia's economy when it impedes the movement of freight traffic. To identify areas where this occurs, VDOT has overlaid level of service data on corridors with high volumes of truck traffic.

Virginia's interstate system carries the lion's share of the truck traffic; I-85, I-95, I-64 especially between Richmond and Hampton Roads, and I-77 are the heaviest volume truck routes in the state. The data from 2009 indicate significant freight bottlenecks on I-81 near Roanoke and I-64 near the Hampton Roads Bridge Tunnel. The level of service on I-95 shows a need for improvements north of Richmond, around Fredericksburg, and at Quantico. Meanwhile, the projected 2035 level of service indicates needs on all interstate freight corridors. This no-build analysis also displays a need for improvements in the major urban areas of Northern Virginia, Richmond, and Hampton Roads



SCHOOLS

OVERVIEW

National Grade 2013

In its *2013 Report Card for America's Infrastructure* the American Society of Civil Engineers graded school systems nationwide a **D+**. This is a slight improvement over the 2009 grade of **D**.



Almost half of America's public school buildings were built to educate the baby boomers – a generation that is now retiring from the workforce. Public school enrollment is projected to gradually increase through 2019, yet state and local school construction funding continues to decline. National spending on school construction has diminished to approximately \$10 billion in 2012, about half the level spent prior to the recession, while the condition of school facilities continues to be a significant concern for communities. Experts now estimate the investment needed to modernize and maintain our nation's school facilities is at least \$270 billion or more. However, due to the absence of national data on school facilities for more than a decade, a complete picture of the condition of our Nation's schools remains mostly unknown.

School facilities exist to provide students a productive learning experience, but poor facility conditions have been shown to affect student performance. School facilities also play a role in the community as emergency shelters during natural and man-made disasters, and they must be resilient and maintained to meet standards for emergencies.

The condition of K-12 school facilities in the United States is primarily a local and state responsibility, and there is limited national information. The most recent comprehensive report on school facilities collecting similar state-by-state information was released more than a decade ago. This report, U.S. Department of Education Condition of America's Public School Facilities: 1999, identified an investment of \$127 billion needed to bring the nation's schools into good operating condition. School facilities experts estimate that today's necessary renovations and maintenance of the nation's school facilities could cost \$270 billion or more.

An update to the U.S. Department of Education Condition of America's Public School Facilities: 1999 has been started. The March 2014 report has updated tables, but the report write-up was not modified. The data shows the following updates:

Data	1999	2014
Average age of the main instructional building	40 years	44 years
Average functional age of schools based on the most recent renovation	16 years	19 years
The renovation occurred on average	11 years ago	12 years ago
Percent of schools needing to spend money to put the school's onsite buildings into good overall condition	75%	50%
Cost per student at these school to bring into overall good condition	\$3,800	Not provided
Total amount needed by the schools	\$127 billion	\$197 billion
Public Schools with Written Long-Range Facilities Plans	65%	60%
Original Building in Adequate or Better Condition*	81%	76%
Permanent Additions in Adequate or Better Condition*	84%	Not Provided
Temporary Buildings in Adequate of Better Condition*	81%	55%
% Reporting Permanent Buildings in Poor Condition*	4 to 6%	3%
% Reporting Temporary Buildings in Poor Condition*	1 to 2%	9%

Note * – The data in the tables are not provided in the exact same format.

School construction projects are not only driven by a facilities' condition, but also by capacity needs. In the fall of 2012, more than 49.8 million students entered public schools, up modestly from 49.3 million in 2009. These students attend school in more than 98,800 public school facilities. The 1999 Condition Report showed that close to 10% of schools reported enrollment 25% greater than the permanent building capacity. Student populations are still projected to grow gradually over the next 5 years. Total elementary and secondary enrollment is anticipated to set new records every year from 2010 to 2019, but funding is not projected to be as readily available, suggesting that the number of schools experiencing excess capacity may increase.

Highlighting a need for significant operations and maintenance, the 1999 Condition Report identified that over 59,000 schools – representing 76% of America's schools – needed to “spend money on repairs, renovations, or modernizations to put the school into good overall condition.” Some states and localities have made great strides to reduce their facilities' investment needs and modernize their schools, and even at the federal level some action is being considered. In 2011, a federal school facilities modernization effort was introduced in Congress to fund \$30 billion against the current investment backlog and upgrade about 35,000 deteriorating school buildings. Although there are no current data, these efforts show wide recognition that school facility repair and upgrade needs in the nation are significant.”

In 1995 the GAO did an extensive survey and analysis and found that America needed \$113 billion (\$216 billion in today's construction dollars) to bring its school building inventory into good repair.

Virginia Grade

Assignment of an overall grade of “C-” to Virginia's schools infrastructure was based on the following specific criteria:

- Virginia has a statewide infrastructure assessment
- Virginia has had an increase in infrastructure spending since 2009
- Enrollment trends in the state generally match nationwide trends since 2009



Contents

This 2013 Virginia Infrastructure Report Card on Schools includes the following contents:

- Summary
- Introduction and Background
- Condition and Adequacy
- Investment Needs and Funding Dedicated
- Basis of Grade and Results
- Conclusions, Recommendations & Policy Options
- References
- Acknowledgments

SUMMARY

The ASCE National Report card in 2013 provided the following figures:

- Public school districts in Virginia spent a total of **\$4.4 billion** on capital outlays for school construction, acquisition of land and renovating existing structures in fiscal years 2005–2008.
- It is estimated that Virginia schools have **\$8.5 billion** in infrastructure funding needs.

From the Virginia Department of Education - School Construction Cost Data webpage, Final Annual Reports are available for 2012-13 and years previous. A current active report for 2013-14 is also available and the final report will be generated after June 30, 2014 for the current fiscal year. From the Reports there is a trend upwards in spending from the low of \$189,530,014 in 2009-10.

The increase in spending since 2009 and the percentage of spending as compared to statewide needs shows that Virginia is investing more on average than many others throughout the nation. It also justifies an increase in the 2009 ASCE report card grade for Virginia Schools of D+. These facts balanced against the continued work that is needed and described below, results in a 2013 ASCE report card grade of C.

Summary of School Construction Cost Data	
Years	Total Spent on School construction
2007-08	\$611,726,460
2008-09	\$536,476,492
2009-10	\$189,530,014
2010-11	\$354,923,470
2011-12	\$472,075,573
2012-13	\$720,009,898
2013-14 ⁺	\$641,097,721

+ = In Progress

INTRODUCTION AND BACKGROUND

There are currently more than 1,800 public school buildings serving Virginia's K-12 students. The issues involved in providing and planning adequate school facilities are complex and require thoughtful consideration. To plan and construct school buildings that meet today's educational needs, are easy to maintain and are economical to build is an important and challenging task.

How the Virginia Department of Education (VDOE) helps

VDOE provides leadership and technical services to Virginia's public school facilities in the following key areas:

- School facility planning
- School building guidelines
- Energy efficiency and high performance buildings
- School construction cost data
- School construction project submission
- Facility conferences and training
- School safety
- Playground safety
- School facility studies
- Resources and information

National Enrollment Trends

Total public school enrollment is expected to rise from 2011 to 2020. Data from a U.S. Department of Energy fact sheet is as follows:

“Total enrollment in public and private elementary and secondary schools (pre-kindergarten through grade 12) grew rapidly during the 1950s and 1960s, reaching a peak year in 1971. This enrollment rise reflected what is known as the "baby boom," a dramatic increase in births following World War II. Between 1971 and 1984, total elementary and secondary school enrollment decreased every year, reflecting the decline in the size of the school-age population over that period. After these years of decline, enrollment in elementary and secondary schools started increasing in fall 1985, began hitting new record levels in the mid-1990s, and continued to reach new record levels every year through 2006. Enrollment in fall 2009 (54.9 million) was slightly lower than in fall 2006 (55.3 million); however, enrollments are projected to begin rising again after 2010.”

“Public school enrollment at the elementary level (pre-kindergarten through grade 8) rose from 29.9 million in fall 1990 to 34.2 million in fall 2003. After a decrease of less than 1 percent between fall 2003 and fall 2004, elementary enrollment generally increased to a projected total of 34.9 million for fall 2011. Public elementary enrollment is projected to continue a pattern of annual increases through 2020 (the last year for which NCES has projected school enrollment). Public school enrollment at the secondary level (grades 9 through 12) rose from 11.3 million in 1990 to 15.1 million in 2007, with a projected enrollment of 14.5 million for 2011. Public secondary enrollment is projected to show a decrease of 4 percent between 2007 and 2012, and then increase again through 2020. Public secondary school enrollment in 2020 is expected to be about 5 percent higher than in 2012. Total public elementary and secondary enrollment is projected to set new records every year from 2011 to 2020.” (U.S. Department of Education)

Enrollment in elementary and secondary schools, by control and level of institution: Selected years, fall 1969 through fall 2020 [In thousands]							
Year	Total	Public			Private ¹		
		Total	Pre-kindergarten -Grade 8	Grades 9-12	Total	Pre-kindergarten - Grade 8	Grades 9-12
1969	51,050	45,550	32,513	13,037	5,500 ²	4,200 ²	1,300 ²
1980	46,208	40,877	27,647	13,231	5,331	3,992	1,339
1985	44,979	39,422	27,034	12,388	5,557	4,195	1,362
1990	46,864	41,217	29,876	11,341	5,648 ²	4,512 ²	1,136 ²
1995	50,759	44,840	32,338	12,502	5,918	4,756	1,163
2000	53,373	47,204	33,686	13,517	6,169 ²	4,906 ²	1,264 ²
2005	55,187	49,113	34,204	14,909	6,073	4,724	1,349
2006	55,307	49,316	34,235	15,081	5,991 ²	4,631 ²	1,360 ²
2007	55,203	49,293	34,205	15,087	5,910	4,546	1,364
2008	54,973	49,266	34,286	14,980	5,707 ²	4,365 ²	1,342 ²
2009	54,862	49,373	34,418	14,955	5,488	4,179	1,309
2010 ³	54,704	49,306	34,637	14,668	5,398	4,092	1,306
2015 ³	55,836	50,659	35,829	14,830	5,176	4,042	1,134
2016 ³	56,214	51,038	36,161	14,877	5,176	4,073	1,103
2017 ³	56,617	51,430	36,491	14,939	5,187	4,110	1,007
2018 ³	57,009	51,803	36,803	15,000	5,206	4,146	1,060
2019 ³	57,438	52,204	37,121	15,083	5,234	4,181	1,052
2020 ³	57,939	52,666	37,444	15,222	5,273	4,216	1,056

¹ Beginning in fall 1980, data include estimates for an expanded universe of private schools. Therefore, direct comparisons with earlier years should be avoided.

² Estimated.

³ Projected.

NOTE: Elementary and secondary enrollment includes students in local public school systems and in most private schools (religiously affiliated and nonsectarian), but generally excludes homeschooled children and students in sub collegiate departments of colleges and in federal schools. Based on the National Household Education Survey, the homeschooled children numbered approximately 1.5 million in 2007. Excludes preprimary pupils in private schools that do not offer kindergarten or above. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics (2012). *Digest of Education Statistics, 2011* (NCES 2012-001), [Table 3](#).

State Enrollment Trends

Unlike the National Enrollment trend that dipped after 2006, Virginia public school enrollment increased steadily from 2000 to 2010.

Years	Total Enrollment for Virginia
2000-01	1,144,915
2001-02	1,163,091
2002-03	1,177,229
2003-04	1,192,092
2004-05	1,204,739
2005-06	1,213,616
2006-07	1,220,440
2007-08	1,230,857
2008-09	1,235,795
2009-10	1,245,340
2010-11	1,251,440
2011-12	Not Available
2012-13	Not Available
2013-14	Not Available

(U.S. Department of Education)
Common Core of Data (CCD), "State Non-fiscal Public Elementary/Secondary Education Survey"

Condition and Adequacy

Virginia ranked NO. 10 in a report entitled "Building Minds, Minding Buildings: School Infrastructure Funding Need". States were ranked from highest to lowest amount of funding needed. Virginia was estimated to need \$8,536,780,554. Virginia student enrollment in 2008 was listed at 1,246,549. It was predicted that the enrollment change from 2009 – 2016 would be 106,092. Virginia did have a statewide school infrastructure assessment, but the assessment did not meet the criteria for inclusion. Virginia was graded in this report was matched to North Carolina. A cost of \$7,086 base year per pupil need (\$) was used. The maximum need in the 50 states was \$25,400,000,000 in California, and the minimum need was \$325,741,824 in Vermont. The need identified in all 50 states totaled \$254,606,228,518.

Virginia

Schools Infrastructure Funding Needs = **\$8,536,780,554**

Over 60% of Virginia Schools Could Potentially Benefit in Years Ahead From Change to Federal Historic Rehabilitation Tax Credit

Governor McDonnell Releases Comprehensive Study of All K-12 Facilities in the Commonwealth

817 Facilities 50 Years or Older; Additional 410 Facilities are 40 to 50 Years Old

RICHMOND – 1,227 of Virginia’s school buildings and facilities, more than 60%, are 40 years or older according to a new comprehensive study ordered by Governor Bob McDonnell and concluded at the beginning of this month. The governor today released the results of the study that looked at all existing Virginia public school buildings, including those not currently being used. The study was compiled by the Secretary of Education and the Department of Education. The governor [ordered the report in August](#) in order to gain a more accurate picture of the current state of the Commonwealth’s educational infrastructure, and to demonstrate how a change to the Federal Historic Rehabilitation Tax Credit, to allow for its use in the renovation of older school buildings for continued service as public educational facilities, could benefit the Commonwealth specifically, and the nation in general. To benefit from the Tax Credit a building must be considered historic, and facilities 50 years or older are most likely to qualify.

The governor’s state inventory found:

Summary of divisions/schools reported:

• Number of School Divisions reporting (100%):	132
• Number of schools reported:	2,030
• Number of schools 50 years <u>or older</u> *:	817
• Number of schools <u>40-50 years old</u> *:	410
• Total student capacity of buildings:	842,481

Speaking about the inventory, Governor McDonnell commented, “The Department of Education’s review of Virginia’s public school buildings found 1,227 school buildings and facilities in Virginia that could potentially be eligible, now or in the next ten years, for the Federal Historic Rehabilitation Tax Credit. These buildings exist in every region of the state, and service hundreds of thousands of Virginia students. Eliminating the ‘prior use’ rule is a commonsense, bipartisan issue supported by Senator Mark Warner, Senator Tim Kaine, Majority Leader Eric Cantor, Governor-elect Terry McAuliffe, and many others. It would enable the private sector to invest in modernizing our schools, while simultaneously saving our localities money. This inventory demonstrates in real numbers what establishing equity in this existing federal tax policy would mean for our communities and our students, and I hope it will prove to be helpful in the ongoing efforts to get this legislation passed at the federal level.”

Paul Goldman, former Chairman of the Democratic Party of Virginia, advisor to Governors Mark Warner and Doug Wilder, and longtime proponent of modernizing the federal law, commented, “By fixing a bureaucratic glitch in the IRS code - stuck there for 27 years - Virginia localities could have modern 21st century K-12 facilities at a cost of 35-40% less than the federal government requires them to pay now.”

An investment in public school maintenance, repair and renewal will yield valuable benefits for our public education system, for our environment, and for our economy:

- **For Education** - There is consistent evidence that if you provide a quality physical environment for teaching and learning, student performance is improved. Quality teachers are attracted to and remain in better facilities, attendance for students and teachers is improved, and students can concentrate and learn better in quality buildings. Investing in school maintenance and repair can support our nation's efforts to dramatically improve the results of our public education system.

- **For the Environment** - The labor and natural resources embodied within our public school buildings – most of which are over 40 years old – are important assets, which can be sustained or squandered. Maintenance and renewal of existing buildings means lower operating costs for energy use and preserves valuable resources, reducing landfill waste and demand for new construction materials.

- **For our Economy** - The work of maintaining, repairing and renewing our public school buildings will be labor intensive. Making progress on the most critically needed maintenance, repair and renewal efforts with a federal investment of \$27 billion, just 10% of the minimum estimate for deferred maintenance, repair and renewals can provide important productive work to between 160,000 to 235,000 people in the private and public sectors. This would essentially be employment for 2-3 people per school across the country – a manageable infusion of labor for school districts all with projects ready to be undertaken immediately. If we match these investments to those districts most in need of maintenance and repair efforts, these funds will also be targeted at low-income communities most in need of educational improvements and economic support.

In the Earthman report, the author reaches four conclusions illustrating that the school environment does affect academic achievement. They are listed below:

1. School building design features and components have been proven to have a measurable influence upon student learning. Among the influential features and components are those impacting temperature, lighting, acoustics and age. Researchers have found a negative impact upon student performance in buildings where deficiencies in any of these features exist. In addition, overcrowded school buildings and classrooms have been found to be a negative influence upon student performance, especially for minority/poverty students.
2. The overall impact a school building has on students can be either positive or negative, depending upon the condition of the building. In cases where students attend school in substandard buildings they are definitely handicapped in their academic achievement. Correlation studies show a strong positive relationship between overall building conditions and student achievement.
3. Ethnographic and perception studies indicate that poor school facilities negatively impact teacher effectiveness and performance, and therefore have a negative impact on student performance.

4. Recent studies regarding the number of students in schools as compared with its capacity provide ample evidence that overcrowding conditions are a negative influence upon students and teachers.... (Earthman)

Investment Needs and Funding Dedicated

From the Virginia Department of Education - School Construction Cost Data webpage, Final Annual Reports are available for 2012-13 and years previous. A current active report for 2013-14 is available and the final report will be generated after June 30, 2014 for 2013-14. Funding dedicated:

School Construction Cost Data for 2007-2008				
Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	14	\$193,747,969	\$30,333,690	\$224,081,659
New Middle School(s)	2	\$54,843,234	\$8,278,669	\$63,121,903
New High School(s)	2	\$73,787,522	\$15,163,071	\$88,950,593
New Combined or Other Schools	6	\$146,873,075	\$13,542,882	\$160,415,957
Additions and Renovations Under Contract	Many			\$75,156,348
Total for 2007-08				\$611,726,460

School Construction Cost Data for 2008-2009				
Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	4	\$53,162,535	\$13,029,974	\$66,192,509
New Middle School(s)	4	\$99,400,579	\$19,102,352	\$118,502,931
New High School(s)		\$243,181,003	\$52,163,660	\$295,344,663
New Combined or Other Schools				\$0
Additions and Renovations Under Contract	Many			\$56,436,389
Total for 2008-09				\$536,476,492

School Construction Cost Data for 2009-2010

Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	6	\$72,993,048	\$14,201,317	\$87,194,365
New Middle School(s)	3	58,703,578	10,586,422	\$69,290,000
New High School(s)	0			\$0
New Combined or Other Schools	0			\$0
Additions and Renovations Under Contract	Many			\$33,045,649
Total for 2009-10				\$189,530,014

School Construction Cost Data for 2010-2011

Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	3	\$38,686,665	\$7,444,335	\$46,131,000
New Middle School(s)	0			\$0
New High School(s)	3	\$137,945,376	\$34,516,623	\$172,461,999
New Combined or Other Schools	2	\$26,699,604	\$5,254,196	\$31,953,800
Additions and Renovations Under Contract	Many			\$104,376,671
Total for 2010-11				\$354,923,470

School Construction Cost Data for 2011-2012

Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	6	\$82,168,085	\$14,675,843	\$96,843,928
New Middle School(s)	0			\$0
New High School(s)	1	\$58,909,096	\$15,013,694	\$73,922,790
New Combined or Other Schools	1	\$22,602,000	\$5,800,000	\$28,402,000
Additions and Renovations Under Contract	Many			\$272,906,855
Total for 2011-12				\$472,075,573

School Construction Cost Data for 2012-2013				
Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	7	\$86,081,899	\$18,626,712	\$104,708,611
New Middle School(s)	3	\$71,213,981	\$8,771,583	\$79,985,564
New High School(s)	4	\$186,129,914	\$39,780,091	\$225,910,005
New Combined or Other Schools	1	\$45,100,000	\$11,500,000	\$56,600,000
Additions and Renovations Under Contract	Many			\$252,805,718
Total for 2012-13				\$720,009,898

School Construction Cost Data for 2013-2014 (In Progress)				
Type	# of	Building Cost	Site Cost	Total Cost
New Elementary School(s)	1	\$44,385,928	\$8,205,880	\$52,591,808
New Middle School(s)	0			\$0
New High School(s)	4	\$228,086,852	\$40,449,632	\$268,536,484
New Combined or Other Schools	1	\$31,961,348	\$4,695,397	\$36,656,745
Additions and Renovations Under Contract	Many			\$375,015,150
Total for 2013-14				\$732,800,187

Basis of Grade and Results

Basis of Grade

Assigning an overall grade to Virginia's school's infrastructure is based on the National grade and on the four specific criteria used to adjust the National grade.

National School Infrastructure Grade | D+

Virginia ranked #10 nationally in school infrastructure costs.

Adequate existing and future funding to capitalize needs

This score is based on the increase in capital funds being spent on school infrastructure.

Virginia has a Statewide Infrastructure Assessment

The score on this criterion reflects Virginia having a statewide infrastructure assessment that could be used to compare Virginia's school infrastructure needs to those nationally however the assessment could not be used for this report card. Virginia's school infrastructure needs were determined in report by using North Carolina numbers.

Routine identification and report of existing and future funding needs

There is a continual need to inventory, assess and manage funding needs. The assessment includes identification of existing and future needs. Because the identification and reporting of needs are required on a routine basis, this criterion has been assigned a low score.

Enrollment Matches National Trends

Enrollment trends in Virginia closely match national trends. This criterion has been assigned a score of 84, Above Average, "B".

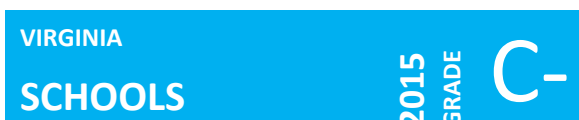
Weighting

The intention and goal is to continually make the grading criteria easily measurable and quantifiable. Similarly each criterion has been assigned a weighted value in recognition of their relative importance. This will allow for a uniform determination and comparison of results with future report cards. The 2009 Virginia Infrastructure Report Card only reported the national grade.

Results

The results of the 2013 Virginia Infrastructure Report Card for Schools are:

Rating of Virginia's Infrastructure			
Criteria	Score	Grade	Weight
National Grade	68	Below Average (D+)	40%
Funding Availability	90	Above Average (B)	20%
Statewide Assessment	75	Average (C)	15%
Identify Needs	50	Poor (F)	15%
Enrollment Matches National Trends	90	Above Average (B)	10%
RESULT	73	Average (C-)	100%



Conclusions, Recommendations and Policy Options

National Conclusions

With the significant decrease in school construction spending over the last four years and the increase in the number of facilities and the number of students attending those facilities, the lack of national and comparable data to assess the condition and capacity needs of school facilities is concerning. Even at the state level, often only a limited amount of information is collected from the school districts and a limited number of staff devoted to providing facility operators with asset management plans and project maintenance needs for the state. Databases and asset management plans outlining the condition of our nation's schools are essential to identifying issues system wide and making efficient school facilities investments as they are needed.

Raising the Grades: Solutions that Work Now

- **Publish regular updates of the report on the Condition of America's Public School Facilities** to ensure a clear view of conditions nationwide
- **Encourage school districts** to adopt regular, comprehensive major maintenance, renewal, and construction programs
- **Expand federal and state tax credits and matching funds** to support increased use of school construction bonds and simplify the process for local school districts to obtain facility construction financing for improvements and modernizations
- **Explore alternative financing**, including lease financing and financing as well as ownership and use arrangements, to facilitate school construction projects
- **Implement comprehensive preventive maintenance programs** for each school district's assets to extend the life of school facilities
- **Require life-cycle cost analysis principles** and multi-use possibilities to evaluate the total costs of projects to capture efficiency and promote sustainability
- **Encourage school facility reviews** on a state level and provide input to develop a national database of conditions and available funding"
- **Update 1995 GAO Study** to provide a current evaluation of our school infrastructure

Recommendations

The shared objective is to ensure that Virginia students are being taught in schools that are healthy and safe. Healthy and safe schools are in good repair and overcrowding is minimized or eliminated. . To accomplish this objective, it is recommended that Virginia engage in the following activities:

1. Continue to explore alternative financing.

2. Encourage school districts to adopt regular, comprehensive major maintenance, renewal, and construction programs.
3. Encourage school districts to participate in statewide and national infrastructure surveys.

Policy Options

1. Engage GAO in updating the 1995 report which is outdated.
2. Virginia Department of Education to utilize 1995 GAO report to develop and conduct a survey for the schools in Virginia
3. Reward school districts for participating in statewide and national infrastructure surveys

SOLID WASTE

SOLID WASTE MANAGEMENT

In 2013, the 208 permitted solid waste facilities in Virginia processed 20.2 million tons of solid waste representing an 8.3 percent decrease from the figures reported in the ASCE-VA 2009 IRC report. Of this amount approximately 15.0 million tons originated within the Commonwealth, while 5.2 million tons were imported from out of state (25.74 percent).

Based on the 2013 population estimate of 8.26 million persons for Virginia this equates to an annual in-state solid waste generation rate of approximately 1.8 tons per person or a per capita generation rate of 9.86 pounds per day per person. 2013 data is used for this report in that is the most recent data available at the time of report preparation.

Breaking this down to the 8.66 million tons directly attributable to municipal solid waste generated in Virginia, equates to an annual average of 1.05 tons per person, or 5.75 pounds per day per person which exceeds the national average of 4.38 pounds per day per person by 1.36 pounds per day (31 percent higher).

“In 2012, Americans generated about 251 million tons of trash and recycled and composted almost 87 million tons of this material, equivalent to a 34.5 percent recycling rate ... On average, Americans recycled and composted 1.51 pounds out of our individual waste generation rate of 4.38 pounds per person per day.” – USEPA, 2012 Report

Based on the 2013 VA DEQ solid waste reports, Virginia localities achieved a recycling rate of 41.2 percent, exceeding the 2012 national average of 34.5 percent by nearly 7 percent. In addition, computer manufacturers recovered 2,058 tons of computer and related electronic waste (e-waste) from within Virginia in 2013. Both of these are positive trends for the state, with a growing number of recycling programs now collectively approaching a 50 percent post-consumer solid waste recovery rate.

These figures indicate Virginia is effectively meeting waste recovery and recycling standards but is not effectively dealing with source reduction as a proactive management measure. Furthermore, importing 25.74 percent of the total solid waste tonnage from out-of-state indicates a dependence on external sources of revenue to sustain current solid waste facility capital funding. This can make Virginia vulnerable to external economic factors that can jeopardize solid waste infrastructure funding and long term maintenance.

DATA SOURCES

This report card analysis relies upon annual solid waste statistics in the 2013 annual solid waste report issued by the Virginia Department of Environmental Quality (DEQ), enabling a 5-year comparison to the 2009 ASCE-VA report card which was based upon the 2008 DEQ annual solid waste report.

**TABLE 1 – SUMMARY OF SOLID WASTE VOLUME -
COMPARISON OVER 5 YEARS (2009 – 2014)**

Criteria	2009	2014
Number of Facilities	197	208
Solid Waste Generated in Virginia (in million tons)	15.4	15.0
Solid Waste Imported to Virginia (in million tons)	6.6	5.2
Total Solid Waste (in million tons)	22.0	20.2

Due to the reduction in solid waste being locally generated (lowered by 0.4 million tons) and imported (lowered by 1.4 million tons), in combination with an increase in the number of facilities (11 additional facilities), the existing capacity is estimated to have increased from 20 years to 22 years approximately, since the publishing of a 2009 ASCE-VA report card.

DATA ANALYSIS

The following evaluation criteria were selected for preparing the grading for the 2014 Solid Waste infrastructure assessment.

TABLE 2: SOLID WASTE EVALUATION CRITERIA

Component	A	B	C	D	F
Sustainable Funding	Equal to Bonding Terms	80 - 90% of Bond Terms	70 - 80% of Bond Terms	60 - 70% of Bond Terms	Less than 60% of Bond Terms
Existing Capacity	30 years	25 Years	20 Years	15 Years	10 years
Source Reductions	20 Percent	15 Percent	10 Percent	5 Percent	0 Percent
Progressive Standards / Recycling	90% of all Cities, Towns and Counties	All Cities and Towns, 50% of Counties	Large Cities and 50% of Towns and Counties	Just Large Cities	Limited Cities

Sustainable Funding

Funding of solid waste infrastructure is primarily a local government obligation, with many localities owning and operating their own landfills either as part of a regional agreement (or compact) or as individual not-for-profit entities. This coupled with ample, open real estate for landfill operations in more

rural areas may enable Virginia to maintain very reasonable disposal fees (typically 10-15 percent below the national average of \$44/ton currently).

Given the expected longevity of our existing capacity of approximately 22 years, bonding of new facilities over 20 years is a reasonable cycle currently, with any additional capacity that can be capitalized beyond that (25 or 30 year financing) as an attractive business model.

Existing Capacity

It is estimated that existing solid waste infrastructure has a remaining capacity of nearly 22 years at current generation rates (including importation of solid waste). This accounting does not include any factors for additional progress in per capita waste reduction or population growth but it is a reasonable simplistic figure for comparative analysis. This figure is a slight improvement over the 2009 report card, which indicated an expected capacity approximately 20 years.

Source Reductions

Per capita solid waste generation rates in Virginia exceeded the national average by some 31 percent in the most recent DEQ report. Closing this gap could return significant revenue to other positive infrastructure needs. A simple 50% improvement in source reduction would eliminate over a million tons of solid waste annually, with an expected savings of some \$40 million per year to Virginia's economy. This would also more than double Virginia's current rate of source reductions.

Progressive Standards / Recycling

Virginia has passed progressive standards for e-waste reduction using principles of market based responsibility, by making manufacturers responsible for managing product recycling as part of their normal business practices, similar to the tire recycling fee program. This self-sustaining, user fee based regulatory approach to e-waste has proven effective in changing personal and corporate accountability for solid waste management and should serve a model for enhanced regulation of other sectors. Two examples include bio-persistent pharmaceuticals and enhanced litter control programs. Growing and expanding these progressive programs to the less populated and less affluent parts of Virginia will be a challenge moving forward but can be facilitated by increased communication and collaboration between successful locality programs and others looking to expand and improve their programs. State level involvement and leadership in promoting successful locality programs could help build success.

2015 GRADING AND RECOMMENDATIONS

The final 2015 grade for Solid Waste infrastructure in Virginia is a grade of B-. This is almost a full letter grade improvement over the C grade assigned in the 2009 ASCE Virginia Infrastructure Report Card and represents reductions in the per capita rate of solid waste generated in Virginia since 2009 and the improvement of recycling rates which exceed the national average by nearly 7 percent.

Although Solid Waste infrastructure has improved in Virginia since 2009, there are several emerging issues which are of concern and need to be priorities moving forward.

1. Annual report figures highlight large discrepancies in recycling rates achieved by localities and solid waste generation rates; improved statistical analysis of data should be employed to foster data

reliability and consistency. Statewide support of successful locality waste reduction strategies should be communicated and shared as models for improved performance across the Commonwealth, especially in the less populated and affluent areas, so that waste generation rates are further reduced statewide, hopefully reducing the 31% gap when compared to national averages.

2. Statewide guidance on the collection and processing of bio-persistent pharmaceuticals should be developed as a model ordinance for locality adoption to facilitate consistent approaches to the latest national standards for the collection and disposal of expired or excess pharmaceuticals continuing our recent successes with adopting progressive programs at the local level.
3. Recommend statutory specifications for qualified litter prevention programs across the Commonwealth should be developed as a model ordinance. Litter control costs should be assigned to those generating market responsibilities (similar to mandatory E-waste recycling under the Computer Recovery and Recycling Act). Principle sources of litter should also be further defined based on biennial surveys to develop sustainable program recommendations for litter reduction and costs. Further research into effective nationwide strategies that reduce litter impacts to the environment should also be incorporated into these recommendations.
4. The sustainability of waste management facilities should be indexed to bond funding cycles, using a common bond index for amortization rate and period, and should include per capita figures for sustainable funding of local and regional solid waste management systems to ensure long term municipal waste facility solvency, and reduce our dependency on importing waste from other states.
5. The potential impact of recent legislation allowing the landfilling of coal ash residue in municipal solid waste landfills should be further assessed, to more clearly determine impacts to available landfill capacity given that 72.8% of solid waste is disposed of via landfills in Virginia. A more detailed understanding of the impacts from coal ash residue will be needed to maintain and continue to improve future report card grades.

STORMWATER

2015 SUMMARY

Stormwater infrastructure protects the health of our streams, rivers, wetlands, and lakes. In Virginia large needs exist in many municipalities to comply with new stormwater regulations and to keep up with these needs, often with long construction time frames for capital projects making progress challenging. Recent surveys show about one-third of the infrastructure is older than 50 years and much of the remainder was built 25 to 50 years ago. While most stormwater infrastructure has a 50 to 100 year lifespan, keeping up with maintenance and using asset management planning are necessary to not undo the gains in water quality in Virginia's rivers and the Chesapeake Bay. Increased attention and funding is working in concert with increased regulatory compliance requirements, but there are shortcomings to address for state level standardized reporting, public education, and ensuring a dedicated source of funding commensurate with the economic benefits of a healthy Chesapeake Bay and Virginia ecosystems

STORMWATER DRAINAGE SYSTEMS

Within the past several years, the stormwater regulations brought about by increased enforcement of the Clean Water Act and attention to non-point source runoff has increased awareness of the sources generating storm water pollution loads. These regulations enforced through the MS4 permits have provided information to the citizens and the politicians through Public information programs. Increasing political pressure brought to bear through the action of many environmental groups have focused attention on the water quality problems and need for increased revenues dedicated to solving the stormwater problem. The response by the legislative bodies and many of the administrative staff has been positive in that the problem has been more recognized, and attention is being given to the need for action. However, the need is huge due to the long period of and lack of maintenance and construction of capital projects. The problem is compounded because recent laws and regulations to control pollutant loads in stormwater and their effects on water quality in streams, rivers and the Chesapeake Bay, have increased the need for revenue to construct, operate and maintain water quality facilities and meet water quality standards by the application of pollutant load restrictions. These funding shortfalls diminish the ability to initiate capital improvement projects that reduce flooding and solve drainage problems, and to construct and properly operate and maintain stormwater quality facilities.

Virginia laws and regulations require local governments to enforce erosion and sediment control and stormwater quality, and the Stormwater Phase I and Phase II permit programs. Still funds for stormwater infrastructure needs are difficult to obtain; revenue often comes from a municipality's general funds. Politically, the creation and use of a dedicated revenue source, such as a stormwater utility, continues to be difficult.

DATA COLLECTION

Communities of various sizes were surveyed regarding their existing stormwater systems for the previous ASCE Report Card. Many questions on that 2009 survey were answered either in a general way or intuitively because specific data did not exist. Some localities had more data than others, especially those that were preparing to renew their MS4 permit. In the 2014 survey, the same data was requested but the answers were of a higher quality, again due to the fact that the last permit required compliance actions that necessitated collection of information and programs intending improvements to the system and reduction in pollutant loads. A copy of the survey questionnaire is provided as Attachment A. The Cities and Counties queried are listed in Table 1.

TABLE 1 CITIES AND COUNTIES PROVIDING DATA					
	2009	2014		2009	2014
Chesapeake	x		Hampton	x	
Newport News	x	x	Norfolk	x	
Poquoson	x		Portsmouth	x	
Roanoke	x	x	Staunton	x	x
Suffolk	x		Virginia Beach	x	x
Williamsburg	x		Blacksburg	x	
Ashland	x	x	Harrisonburg	x	
Richmond	x		Charlottesville		x

DATA ANALYSIS

The collected data was assembled in a spreadsheet for analysis. The spreadsheet shows data ranges and averages, where applicable, and, for some items, calculations were performed to show cost per square mile or per 1000 people served, which were also averaged. Some items of interest are shown in Table 2.

TABLE 2 Stormwater Data		
	Average	Range
Miles of storm sewer per square mile	7.99	0.72 – 15.03
Miles of storm sewer per 1000 people	4.67	1.98 – 10.00
Worth of storm sewer per square mile	\$8.48m	\$0.74m - \$21.26m
Worth of storm sewer per 1000 people	\$5.19m	\$2.09m - \$12.27m
Actual operating and maintenance budget per square mile	\$0.0496m	\$0.003m - \$0.201m
Actual operating and maintenance budget per 1000 people	\$0.03m	\$0.001m - \$0.088m
Desired operating and maintenance budget per square mile	\$0.0952m	\$0.006m - \$0.402m
Desired operating and maintenance budget per 1000 people	\$0.06m	\$0.003m - \$0.177m

For grading, several components were selected. The criteria for each are shown in table 3.

TABLE 3 CRITERIA FOR STORM WATER INFRASTRUCTURE SCORING					
Component	A	B	C	D	F
Data Base Mapping	80 - 100% GIS	50 - 80% GIS	Less than 50% GIS	No GIS	No GIS
	80 - 100% Maps	80 - 100% Maps	50 - 80% Maps	30 - 50% Maps	Less than 30% Maps
Funding O&M Needs	Dedicated w/sufficient O&M budget	Dedicated but need 25 - 100% more than current funds	Dedicated but need over 100% more than current funds	Not dedicated and need 100 - 200% more than current funds	Not dedicated and need 200% or more than current funding
Age	Less than 25%	25 - 50%	50 - 75%	75 - 100%	Over 100%
	more than 50 years old	more than 50 years old	more than 50 years old	more than 50 years old	more than 50 years old
Condition Assessment	Asset Management Plan in place	Ongoing program to evaluate	Periodic inspection	Reactive only	No program
Maintenance Budget	Budget 2% or more of total worth	Budget 2% to 1% of total worth	Budget 1% to 0.1% of total worth	Budget 0.1% to 0.05% of total worth	Budget less than 0.05% of total worth
CIP Budget	Budget 2% or more of total worth	Budget 0.5% to 1% of total worth	Budget 1.0% to 0.5% of total worth	Budget 0.5% to 0.1% of total worth	Budget less than 0.1% of total worth
Policies	Active; LID; recognized; well staffed	Active; strong program; well staffed	Good program; adequate staff	Weak program; minimal staff	Minimal; only part time staff

Database

Geographic information systems (GIS) have improved record keeping of mapped data as required by the NPDES. Most of the localities surveyed have a GIS mapping program underway, and many have GIS mapping that is 100% complete. Several of the municipalities have an Asset Management system that tracks the condition, maintenance records, and rehabilitation and replacement forecast. The grade for this component is “B”. It is recommended in the next report card survey that the use of an Asset Management system be added as a question.

Funding Operations and Maintenance

The grade for this component was based on the type of funding mechanism. A dedicated source, such as a Stormwater Utility, was considered the most desirable, and reliance on general funds was least desirable. This was coupled with the comments made about the current budgetary shortfall for program administration, operations and maintenance (O&M). Half the communities surveyed have a Stormwater Utility, but the percent of increased need for O&M funding approached 200% in the survey results. The grade for this component is “D”.

Age

Of the communities surveyed, 8 out of 14 indicated their storm sewer system as in moderate condition. For the communities surveyed, the analysis showed that 34% of the stormwater infrastructure was older than 50 years, 29% between 25 – 50 years and the remainder less than 25 years old. With the generally expected useful life of storm sewer systems being in the 50 – 100 years range, it would appear that generally this criteria is more positive than negative. We gave this component a “C” rating.

Condition Assessment

This component was based on the interview or discussion with the community staff, the websites, and a review of the staffing within the stormwater department if one has been established. Overall this is a subjective grade, and we have given this component a “C” rating.

Maintenance Budget

This component is measured by its comparison to the total worth of the system. The larger systems would be expected to have both a larger total worth as well as an O&M budget, so the percentage does produce comparability. The percentage values for the cities ranking are subjective. This budget would certainly increase in older cities and will increase as permit conditions become more stringent. The staffing component of this category includes both the operational staff and the maintenance staff. In general, the staffing has increased within the municipalities and it is expected it will continue due to the emphasis being placed on staffing and funding in the new permits. Overall we have assigned a grade of “C”.

CIP Budget

This component is measured by its comparison to the total worth of the system. The basic premise is that the useful life of a storm drain is 50 to 100 years and on average the replacement cost should be 1% to 2% of the worth to remain even. We have assigned a grade of “D” to this component.

Policies

The criteria for policies are another subjective area. The interviews provide some data on the use of new technologies such as Low Impact Development and Sustainability which is considered a plus. A Stormwater Utility also indicates a positive attitude towards financing. Similarly, the use of GIS and Asset Management Systems indicates a positive approach to record keeping. The number of BMP's and maintenance further show a policy of operational understanding. Overall, because of the subjectivity and the fact that this is overlapping with other issues, the overall ranking in importance was reduced and a grade of "C" was given. Within this category, the next report card data collection effort should include information on the use of trenchless technology, LID design, sustainable design, and use of innovative methods.

RANKING AND GRADE

Each of the components was individually graded using the criteria set forth in Table 3. The individual components were ranked to assign a level of importance. This data is shown in Table 4.

TABLE 4 RANKING AND GRADE			
	Grade	Rank	
Data Base	B (4)	1	4
Funding	D (2)	5	10
Age	B (4)	4	16
Condition Assessment	C (3)	3	9
Maintenance Budget	C (3)	6	18
CIP Budget	D (2)	7	14
Policies	C (3)	2	6
Resulting Grade	C-	28	67

The resulting grade of all the components after ranking gives the stormwater infrastructure C-. This is slightly higher than the report card grade we assigned to Virginia's stormwater infrastructure in 2009. This is because increased attention and funding is working in concert with increased regulatory compliance requirements, but there are still shortcomings to address as noted in the recommendations below.

RECOMMENDATIONS

1. A State level data collection and records management system should be established with the first step being an analysis of the existing data found in the Stormwater NPDES MS4 permits. This data should be developed as a Benchmark.
2. A standard reporting format should be developed for all Communities to simplify reporting and analysis of data at the state level, and to reduce reporting costs.
3. All stormwater industry leaders should encourage the continued emphasis on education of the general public, local government staff and elected officials on the Stormwater Infrastructure and the relationship of its components to clean water and a healthy ecosystem.

4. All stormwater industry leaders should encourage a dedicated funding mechanism at the local level, such as a Stormwater Utility, by local governments for Operation and Maintenance and Capital Improvements of the Stormwater Infrastructure to improve sustainability and performance of our stormwater infrastructure. Further, funding at the state level should be commensurate with the economic benefits of a healthy ecosystem including the Chesapeake Bay.

WASTEWATER

2015 SUMMARY

The latest Clean Water Needs Survey Report identified a \$6.8 billion need for wastewater infrastructure in the State of Virginia, which is a 45% increase from the \$4.7 billion published in the 2009 ASCE infrastructure report card. That 45% increase is up from a 20% increase noted in the previous report. Significant additional funding is needed to meet EPA mandates for an ambitious “pollution diet” with rigorous accountability measures to restore clean water in the Chesapeake Bay and Virginia’s waterways. This includes complying with EPA Consent Orders to reduce sanitary sewer overflows and reducing nutrients from treatment plant discharges. Virginia has \$1 billion of identified needs to control combined sewer overflows alone, which allows raw untreated sewage to discharge to Virginia’s waterways.

Wastewater Category **D**

Virginia has \$6.8 billion of needs over the next 20 years; a 45% increase from the previous report. Virginia has made progress and has a comprehensive plan but has tremendous challenges ahead.

Factors include aging infrastructure, regulations for nutrient reduction, reducing infiltration from wet weather flows, increasing capacity, meeting demands for growth, and increases in construction costs are all driving this increasing funding need. To address this need, various federal, state, and local funding sources are supporting projects that focus on improvements to our current wastewater infrastructure.

Unfortunately, residents of Virginia are ultimately responsible for addressing this need, with an 88% increase in wastewater rates over the last 10 years. With the continuing occurrence of sanitary sewer overflows (SSO) and high nutrient discharge violations, it is clear that improvements in wastewater system efficiency and reliability must be achieved through sustained funding and improved operations if we are to adequately protect our valuable water resources and meet regulatory requirements.

Discharge from Virginia’s estimated 746 municipal wastewater treatment facilities is the sixth largest source of nitrogen pollution in the Chesapeake Bay. Nitrogen contributes to the Bay’s 150-mile “dead zone” from Baltimore to the York River. **Virginia has an estimated \$3.3 billion of wastewater treatment needs.**

There are an estimated 746 municipal **wastewater treatment** facilities serving over 2 million households in Virginia. The majority of these treatment facilities discharge treated wastewater into a receiving water body. This discharge has the potential to introduce excess nutrient concentrations into aquatic environments, resulting in ecosystem degradation. Additionally, raw untreated wastewater sewage is discharged directly into our streams and waterways after significant rainfall events due to sanitary sewer overflows (SSO). The SSO are caused by failing sewer pipes and joints allowing elevated groundwater levels to infiltrate into the collection system exceeding pipe capacities. Increased flows in sewer pipelines can even exceed treatment plant capacities potentially causing raw untreated sewage to discharge to receiving waterways. The volume of wastewater to treat increases significantly as does the cost to treat due to increased flows. Further, Virginia

Virginia cities have invested \$428 million in controlling combined sewer overflows. **Virginia has a documented \$616 million of controlling combined sewer overflow needs.**

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has three cities, Richmond, Lynchburg and Alexandria that have **combined sewer systems** (CSS) in portions of their city that convey both stormwater and sanitary sewage together in the same piping system. During periods of rainfall that exceed the capacity of the collection system, the treatment plant is bypassed and raw untreated sewage is allowed to discharge to Virginia's rivers by combined sewer overflows (CSO).

Pipeline conveyance system malfunctions are the largest contributor to sanitary sewer overflows (SSO) which adversely affect the environment. These negative environmental impacts include a reduction in aquatic species, declining public health, and economic losses through industry and recreational tourism. Aging infrastructure is the main concern with many pipelines and structures nearing the end of their useful life. As such, they represent a majority of the funding needs to evaluate, monitor, rehabilitate and/or replace pipelines and structures. Root intrusion, joint failure, structural failure, and clogging are typical issues related to the failure of aging pipe lines. Increased federal regulatory requirements and Consent Order and Decree requirements for managing wet weather flows and nutrient reduction for wastewater treatment plant discharges represent significant funding needs.

By 2020, an estimated 45 percent of water and sewer pipes in Virginia will need major renovation or replacement, sustained funding and improved operations are needed. **Virginia has an estimated \$2.9 billion of pipeline conveyance needs.**

Upgrading and replacing aging facilities and infrastructure is required for compliance with the mandated Clean Water Act (CWA), Chesapeake Bay 2000, and the new Chesapeake Bay Watershed (June 2014) agreement regulations, as well as keeping up with demands caused by continued population growth and economic development. The discharge of high nutrient loads into receiving waters has led to publicized fish

Funding needs for wastewater infrastructure is up 45% from 2008 to a total of \$6.8 billion.

The economic benefits of a cleaner Chesapeake Bay are \$8.3 billion per year to Virginia. ¹

kills, "dead zones", and a reduction in recreational water use, a result of which has been stricter basin-specific regulations. The state currently has a number of projects underway in different localities that



The State Water Control Law mandates the protection of existing high-quality state waters and provides for the restoration of all other state waters so they will permit **reasonable public uses and will support the growth of aquatic life.**

are addressing some causes of these issues, but additional projects in other areas of the state are necessary. Increases in treatment costs, aging infrastructure, and reductions in state and local budgets are creating financial strains on individual utilities to remain compliant with strict state and federal regulations. Ultimately, the residents of Virginia will bear the burden of the utilities' financial strains with increased wastewater rates and higher taxes. If funding needs are not met, the state can expect a reduction in public health and environmental quality, which have seen vast improvements over the past thirty years.

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INTRODUCTION AND BACKGROUND

The water quality of Virginia's creeks, streams, rivers, estuaries, and coastal waters are necessary for maintaining both human and environmental health, as well as sustained economic development. With over 3,000 square miles of surface water in the state, a large segment of the population in Virginia lives in close proximity to a water body. A substantial portion of the Virginia economy is dependent on the availability of clean water. Fishing, agriculture, military installations, water-based tourism, ecotourism and shipbuilding attract large numbers of people and generate revenue for the state. For example, the Chesapeake Bay, which is the largest estuary in the country, runs along much of the eastern portion of the state. It generates significant revenue for the state through both tourism and the fishing industry.

The quality of these surface waters is directly impacted by the management of the states wastewater treatment systems. The state has an estimated 746 municipal wastewater treatment facilities, serving approximately two-thirds of the households in the state, a majority of which discharge treated effluent into a water body. High nutrient levels in the effluent play a role in the high percentage of impaired bodies of water in the state (Table 1). The Chesapeake Bay had a 150-mile "dead zone" between Baltimore, MD and the York River in Virginia. This is a result of excess nutrients in the water, with the number one and predominant source of nutrients attributed to surface water runoff. Wastewater treatment plants were cited as the second highest rate of nitrogen pollution. Of the wastewater plants discharging into the Chesapeake Bay ecosystem, one quarter are located in Virginia.

With an estimated thirteen percent increase in the state's population over the next ten years, demands for adequate wastewater treatment and disposal are expected to place immense strains on current systems as well as drive up costs for system expansions and new facilities.



TABLE 1. IMPAIRED AREA BY WATERBODY TYPE (2004 – 2012)

Waterbody Type	2004	2006	2008	2012	% of Total*
Rivers & Streams 52,257 miles	6,931 miles	9,002 miles	10,543 miles	13,140 miles	25%
Lakes 116,364 acres	89,834 acres	109,208 acres	94,044 acres	94,041 acres	81%
Estuaries 2,684 miles	1,907 miles	2,216 miles	2,182 miles	2,134 miles	80%

* % of total is based on data from 2012 survey, Information taken from 2008 Water Quality Assessment by Virginia Department of Environmental Quality (VA DEQ).

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Virginia utilizes many government entities with varying responsibilities to oversee our wastewater infrastructure. These responsibilities range from regulatory groups to groups that manage economic resources distributed to individual localities. For example, the Virginia Resources Authority is responsible for overseeing the distribution of low interest State Revolving Fund (SRF) loans for infrastructure. The distribution of state and local funds is impacted by the apparent need seen by the general public and its officials. Unfortunately in many cases, the population is unaware of the deteriorating condition of the wastewater system, and much needed economic support is routed elsewhere.

Additionally, these loans help reduce the level of cost placed on individual localities. For instance, a small rural system must charge higher rates to residents due to a smaller local economy to cover costs, whereas a larger system can often avoid charging higher rates. These smaller localities could benefit from funds to improve their wastewater infrastructure. Seven percent of the population was serviced by small treatment systems and this comprised fourteen percent of the total state need.

CONDITION AND ADEQUACY

By the year 2020, an estimated 13% of the nation's water and wastewater pipes will be classified as being in poor condition, 23% in very poor condition, and 9% beyond their lifespan. Considering these estimates, along with the estimated 13% increase in Virginia's population by 2020, it is evident that the state will have issues with regards to the conveyance of increased volumes of raw wastewater to the plants. Virginia has been addressing this issue, through the Clean Water State Revolving Fund (CWSRF) providing loans for plant expansion projects.

Table 2 provides a description of the design life in years of different components that make up wastewater infrastructure. In general, older pipe materials have longer useful life spans when compared to newer installed materials, however the tentative retirement dates align from oldest to newest materials. The types of material used in wastewater infrastructure follow historic trends revolving around population booms, infrastructure construction overhauls, and federal legislation. These historic periods include the 1890's, World War I, the "Roaring 20's", post-World War II, and the passing of the Clean Water Act in the early 1970's¹⁵. Based on these historic time periods and the estimated years of design life, much of the wastewater infrastructure is approaching or has surpassed the useful portion of its design life.

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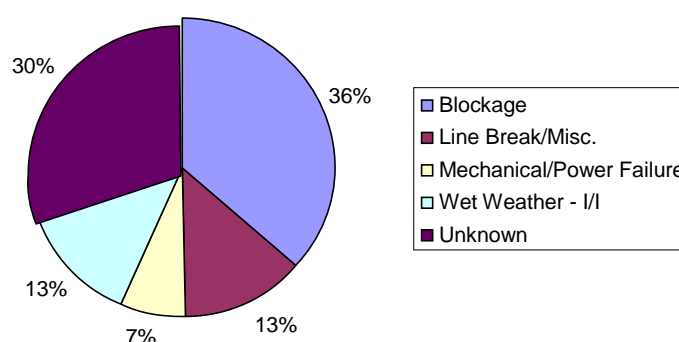
TABLE 2. APPROXIMATE DESIGN LIFE OF WASTEWATER INFRASTRUCTURE COMPONENTS

Components	Years of Design Life
Collection Systems	80-100
Treatment Plant-Concrete Structures	50
Treatment Plant-Mechanical & Electrical	15-25
Pumping Stations-Concrete Structures	50
Pumping Stations-Mechanical & Electrical	15
Interceptors	90-100

Data was taken from the Clean Water and Drinking Water Infrastructure Gap Analysis Report by the U.S. EPA.

A good indicator of the condition of a wastewater system is the frequency of sanitary sewer overflows (SSO). The nation has an estimated 23,000 to 75,000 SSO events each year, resulting in a loss of between 3 and 10 billion gallons of untreated wastewater. Figure 1 provides a breakdown of the causes of SSO events for EPA region 3, which includes Virginia. One primary cause of SSOs can be attributed to aging infrastructure, which over time degrades and eventually fails.

FIGURE 1. PERCENTAGE OF SSO EVENTS BY CAUSE FOR EPA REGION 3.



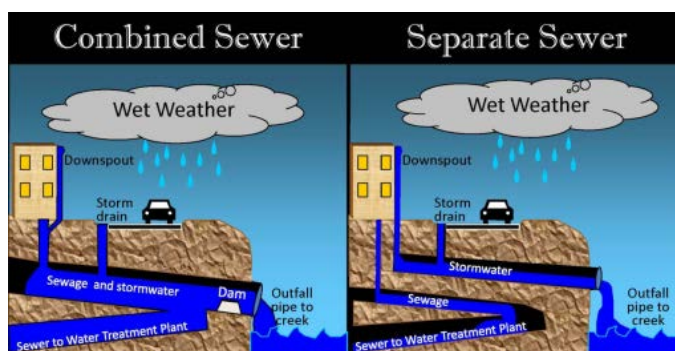
Data taken from 2004 Report on Control and Impacts of CSOs and SSOs by the U.S. EPA.

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Combined Sewer Systems

In Virginia, the cities of Richmond, Lynchburg and Alexandria are known to have combined sewer systems. These combined sewer systems (CSS) carry both stormwater and sanitary sewage and are designed to overflow to rivers and streams whenever there is significant rainfall. This causes raw untreated sewage to discharge to Virginia's rivers and

waterways. The CSS systems require a separate permit from the Virginia DEQ. CSS permits require nine technology-based minimum controls and a long-term control plan that includes water quality impact considerations.



Rainfall in combined sewers causes raw untreated sewage to discharge to waterways. Rainfall amounts as little as 0.2 inches per hour cause overflows.

Graphics Source: www.phillyriverinfo.org

The City of Richmond reports having invested \$242 million to control combined sewer overflows and has documented another \$500 million; and Lynchburg reports having invested \$186 million and documents another \$314 million. The City of Alexandria has estimated needs of \$200 million. This would bring the total funding needs of Virginia to control CSO events at over \$1 billion.

When assessing the condition of wastewater infrastructure, it is necessary to look at both existing structures as well as gaps where new structures are needed. A report by The Rural Community Assistance Partnership (RCAP) found that Virginia ranked 7th for highest percent of occupied rural housing units lacking complete plumbing facilities and 16th in the nation for highest percent of all occupied housing units lacking complete plumbing facilities¹¹. The report also showed that between 1990 and 2000, the state had reduced the number of public housing units lacking complete plumbing facilities by 50%.

Total Maximum Daily Load (TMDL) - Chesapeake Bay Milestones

On May 15, 2014, EPA received the second set of two-year milestones from Chesapeake Bay jurisdictions as part of the "**pollution diet**" or Bay TMDL. The milestones outline steps the Bay jurisdictions will take in the next two years to reduce nitrogen, phosphorus and sediment pollution to the Chesapeake Bay and the regions rivers and streams, and what reductions those measures will achieve.[20]

The TMDL – the largest ever developed by EPA – identifies the necessary pollution reductions of nitrogen, phosphorus and sediment across Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and the District of Columbia and sets pollution limits necessary to meet applicable water quality

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standards in the Bay and its tidal rivers. Specifically, the TMDL sets Bay watershed limits of 185.9 million pounds of nitrogen, 12.5 million pounds of phosphorus and 6.45 billion pounds of sediment per year – a 25 percent reduction in nitrogen, 24 percent reduction in phosphorus and 20 percent reduction in sediment is required. These pollution limits are further divided by jurisdiction and major river basin based on state-of-the-art modeling tools, extensive monitoring data, peer-reviewed science and close interaction with jurisdiction partners.

Achieving these reductions will not be easy, but VADEQ is taking action and addressing these challenges. and as of 2008 have developed 546 Total Maximum Daily Load (TMDL) allocations for tributary segments within Virginia, with another 217 slated in the future. This still leaves over 1,500 TMDLs to be developed in order to cover the Virginia portion of the Bay watershed entirely. There is limited funding for performing TMDL studies to develop the rest of the tributary allocations; however, federal mandates will still require the Chesapeake Bay TMDLs be completed.

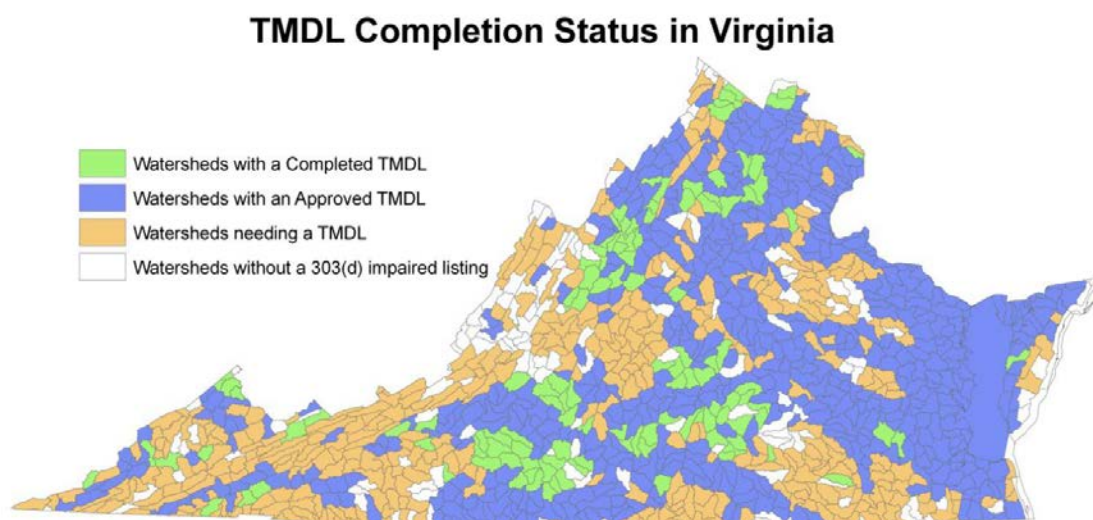


FIGURE 2. TMDL COMPLETION STATUS IN VIRGINIA

These efforts to improve stormwater quality are targeted on making Virginia's water "fishable and swimmable" in accordance with the U.S. Clean Water Act enacted over 38 years ago. In 2014, of the 52 beaches monitored in Virginia, there were 113 days of posted swimming advisories, 32 times when two or more consecutive days were posted as a swimming advisory, and two locations that had repeated and lengthy posted advisories. Virginia still has a significant number of waterways which have fish consumption advisories posted, indicating there is still significant work to be done.

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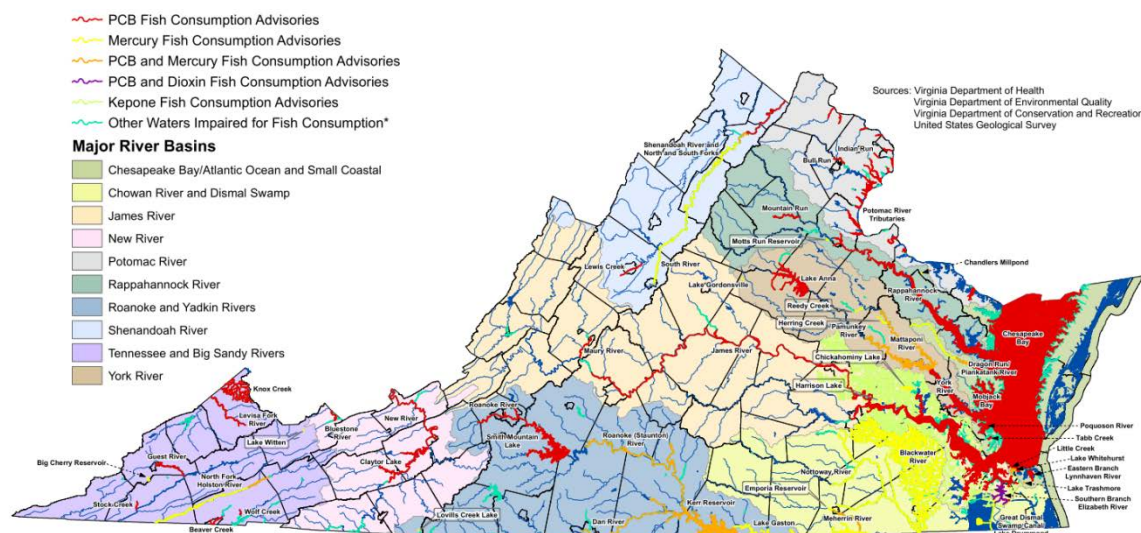


FIGURE 3. VA WATERS UNDER FISH COMPSUMPTION ADVISORIES ((SOURCE: VADEQ 2012 305(B)/303(D) REPORT)

INVESTMENT NEEDS AND FUNDING DEDICATED

In the past, Virginia has made use of state and federal funding programs for maintenance of wastewater infrastructure in order to offset the cost for individual households. With rising costs for construction, maintenance, and necessary upgrades to public treatment facilities, these programs have provided a means for our state's localities to cost effectively comply with federal clean water regulations.

In the Clean Watershed Needs Survey, the Environmental Protection Agency (EPA) reported a need of \$6.8 billion in Virginia which is a forty-five (45%) percent increase from the previous 2004 report¹. The national average need for wastewater infrastructure per capita is \$971. Virginia falls in the \$500-\$1,000 range of per capita need¹. It is necessary to address this need identified by the EPA in order to meet water quality and water-related public health goals of the Clean Water Act for the State of Virginia. The need is focused on upgrades and improvements for wastewater treatment plants, addition and rehabilitation of wastewater collection and conveyance systems, and the reduction of sanitary sewer overflows.

\$3.2 billion is needed to meet EPA Consent Order driven capital improvements for the wastewater treatment system serving Hampton Roads municipalities to reduce wet weather flows, provide capacity and treatment plant upgrades. [25]

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TABLE 3: TOTAL VIRGINIA DOCUMENTED NEEDS BY CATEGORY (UP TO 20 YEARS) ¹

Categories	Funding Needs (\$, million) Tab. B-1
Secondary wastewater treatment	1,522
Advanced wastewater treatment	1,804
Infiltration/inflow correction	366
Sewer replacement/rehabilitation	1,427
New collector sewers & appurtenances	733
New interceptor sewers & appurtenances	380
Combined sewer overflow correction	616
TOTAL	6,848

It should be noted, the cities of Richmond and Lynchburg have studies documenting cumulative needs of over \$814 million to further control raw untreated sewage from discharging to Virginia's streams and rivers due to combined sewer systems. This is greater than the \$616 million reported in Table 3 for combined sewer overflow correction. When included with Alexandria's estimated \$200 million that exceeds \$1 billion of funding needs to control CSO in Virginia

Providing funding for Wastewater Infrastructure supports jobs. The Hampton Roads Sanitation District will have a total regional economic impact of \$4.7 Billion over the next 10 years and will support 3,060 jobs each year.

To address this need, the state has taken advantage of grants and low interest loan opportunities under the guidance of specific state agencies. For example, the Virginia Clean Water SRF Loan Program has provided over one billion dollars in loans since 1987, which has successfully funded over 250 wastewater projects through the state. Another example is the Water Quality Improvement Fund (WQIF) which is limited to design and installation of nutrient reduction technology at Chesapeake Bay watershed publicly owned wastewater treatment plants. For 2014 WQIF has approved proceeds of \$106 million, since 1998 WQIF has provided \$849 million of funds. Table 4 provides a list of the major funding sources and dollar amounts the state will be benefiting from. A number of funding programs specifically target rural communities and small treatment systems. These funding programs provide economic assistance to struggling localities in the form of employment, as well as for the improvement of public and environmental health within the community by enhancing public facilities. These programs also

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encourage the development of economically and environmentally sustainable projects such as “green” infrastructure, alternative energy sources, and water reuse.

According to the “FY 2014 Chesapeake Bay and Virginia Waters Clean-Up Plan” which is a consolidated progress report required by the Code of Virginia, “for the fiscal years 2016 – 2021, an estimate of \$1.55 billion may be required from state and federal funds as well as farmer financial contributions to meet statewide water quality goals by 2025. Further, projected funding needs from state sources for implementation of agricultural best management practices from FY16 through the FY17-FY18 are estimated to be \$333.65 million. This Fiscal Year 17-18 funding schedule will not provide the estimated funding necessary to achieve 60% of the Chesapeake Bay agricultural implementation by 2017. Despite this fiscal challenge, it is anticipated that the Commonwealth’s 2017 Bay goal will still be met by over-achievement in other sectors, specifically wastewater treatment plants.

TABLE 4: FUNDING AGENCIES, FUNDING TYPES AND DOLLAR AMOUNT OF FUNDS ALLOCATED TO THE STATE OF VIRGINIA FOR FY 2014.

Funding Agency/Manager	Funding Type	Amount of Funding (\$, million)
Virginia State Revolving Loan Fund	State Loans (21 projects)	139.4
Water Quality Improvement Fund	Grant	106.0
Virginia Nutrient Trading Program	Nutrient Trading	520.0
Water Quality Improvement Funds	Construction Bonds	250.0

*** Represents funding allocated at the national level.**

Unfortunately, it is clear that this level of funding falls short of all the previously described needs placing a great deal of pressure on localities to find alternative sources of funding. The gaps in funding have led to increased public wastewater rates, with communities bearing 95% of clean water costs. The average wastewater rate for the state in 2008 was \$27.74, which equates a 9.5% increase from the previous year and a 65% increase since 1998. The national average for that same year was slightly higher at \$29.17. Although Virginia falls well below the EPA’s current measure of affordability for wastewater rates based on household income, the burden of increasing these rates during a time of economic recovery will be strongly felt.

BASIS OF GRADE

The State of Virginia currently lacks the necessary statistical data on the condition of our wastewater infrastructure to determine an objectively measured grade. Further, funding needs are broad and projected over long periods of time and are difficult to compare with specific, short-term funding allocations. As a result of this, a subjective grade was determined from a panel of experienced professionals in the field of wastewater engineering. The subjective grade was based on the following:

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- The evaluation of conditions since the 2009 ASCE Virginia Infrastructure Report Card. Condition comparisons include, infrastructure conditions, funding needs, federal regulatory mandates in-place and scheduled reduction requirements.
- The significant increase of funding needed to address wastewater treatment for nutrient reduction, pipeline and conveyance evaluation, monitoring and replacement, and combined sewer overflow correction. The current \$6.8 billion need is an increase of 45% over the previous report in 2009, which had a stated need of \$4.5 billion.
- The cost of complying with federal mandates associated with the Clean Water Act and the Chesapeake Bay 2000 agreement and the new Chesapeake Bay Watershed Agreement (June 2014)
- The urgency of protecting water quality in the Chesapeake Bay and other valuable Virginia waterways as they impact the quality of life and economic prosperity of the Commonwealth.
- Comparison with the ACSE National Wastewater Report Card grade of D based on:
 - The national and Virginia's per capita need.
 - Virginia's ranking of 16th in the nation for highest percentage of total occupied housing units lacking complete plumbing facilities.
 - The national and Virginia's monthly wastewater rates.
- Virginia is utilizing a number of state and federal resources to address the recognized \$6.8 billion dollar wastewater infrastructure need. These include the Virginia SRLF, WQIF, grants, construction bonds, nutrient trading program, and sewer rate increases by localities. These resources are funding projects that address current infrastructure issues.
- It is assumed that the majority of Virginia's wastewater infrastructure was installed prior to the 1980's. A good indication of infrastructure age is the majority of SSOs occurring in Region 3 has been identified to be caused by blockages, line breaks, and mechanical failures, adding validity to the previous assumption. Using accepted materials lifespan estimates, along with these two points, it is clear that Virginia faces significant challenges to meet the needs of replacing an ageing wastewater infrastructure.

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Conclusions and Recommendations

The Virginia Section of the American Society of Civil Engineers assigns a grade of D to Virginia's Wastewater Infrastructure. This is a reduction from the 2009 grade assigned of D+. Virginia has made considerable investments in wastewater infrastructure improvements and has made considerable progress in reducing the levels of nutrients being discharged to the Bay. However, in a 4-year period the estimated wastewater infrastructure needs have increased 45% to \$6.8 billion up from \$4.7 billion. The previous 4-year period had an increase of 20%, this reflects a significant, continual upward trend of increasing needs. Continued and increasing federal regulations for reducing nutrient discharges and sanitary sewer overflows will contribute to this trend of increasing costs including increased emphasis on improving water quality in the Chesapeake Bay. Funding needs to control combined sewer overflows are reported at \$814 million in documented needs from Richmond and Lynchburg. Including reported needs of \$200 million from Alexandria, brings the total to over \$1 billion to control CSO in Virginia.

Wastewater Category **D**

Virginia has \$6.8 billion of needs over the next 20 years; a 45% increase from the previous report. Additional funding is needed to meet EPA mandates for an ambitious "pollution diet" with rigorous accountability measures to restore clean water in the Chesapeake Bay and Virginia's waterways. This includes complying with EPA Consent Orders to reduce sanitary sewer overflows and reducing nutrients from treatment plant discharges. Virginia has \$1 billion of needs to control combined sewer overflows which allows raw untreated sewage to discharge to Virginia's waterways.

In order to preserve the integrity of our wastewater systems, the following recommendations are made:

- The Virginia Section of the American Society of Civil Engineers encourages local, state, and federal officials to support long-term funding of wastewater infrastructure projects designed to reduce the funding gap. The purpose of these funded projects is to improve the quality of both public and environmental health, while allowing for sustainable economic growth.
- Included in any future government stimulus packages and grants should be funding for projects specifically addressing wastewater infrastructure.
- State and localities should promote asset management projects that allow better oversight of current wastewater infrastructure and assessment of age, condition and future needs.



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