NCDOT MAINTENANCE AND OPERATIONS

Performance Analysis Report

2014

Contents

1 Foreword

Dear N.C. General Assembly member,

The mission of the N.C. Department of Transportation is to connect people and places safely and efficiently, with accountability and environmental sensitivity to enhance the economy, health and well-being of North Carolina. Managing the nation's second largest highway network plays a central role in carrying out this mission.

We are responsible for operating and maintaining 163,000 lane-miles of roadways and 13,455 bridges, which together are valued at $570 billion. In addition, based on our recently released Draft State Transportation Improvement Program, we expect to add another 140 miles to our system through 51 projects to build new roadways. Given the expansive nature of this system and its critical importance to our state's mobility, economy and quality of life, it is imperative that we continue to operate and maintain our highways as efficiently as possible.

The Maintenance and Operations Performance Appraisal Report represents a new approach to highway performance reporting in North Carolina. This approach will help us be more transparent in our operations, so we can provide even better information about the state of our roads, how they are performing, and the cost of maintaining and improving them in the future. As a result, we will be able to invest more strategically in our highways across the state.

In addition, this report provides details on how our highway system's condition affects the safety and reliability of the network, and in turn, the economic and overall well-being of our state. The report also addresses new legislative requirements focused on how efficiently we deliver infrastructure improvements and serves as a basis for recommendations on ways to manage our assets and the employees who maintain our highways more cost effectively.

Over the past two years, we have made significant improvements in our budgeting process. We have transitioned from allocating funds to our field forces based on asset inventory and historical expenditures to a needs-based allocation. Given that our state's transportation needs continue to outpace available resources, we must strategically prioritize our available funding to ensure we are attaining the greatest possible return on our investment. This report, along with several other key NCDOT initiatives, helps us make decisions to achieve that goal.

Thank you for your partnership and support, as we continue to work to improve our performance and reduce costs. We look forward to sharing with you the enhancements we make to ensure our highway system meets the demands of our growing state.

Sincerely,

Anthony J. Tata

2 Executive Summary - Key Messages

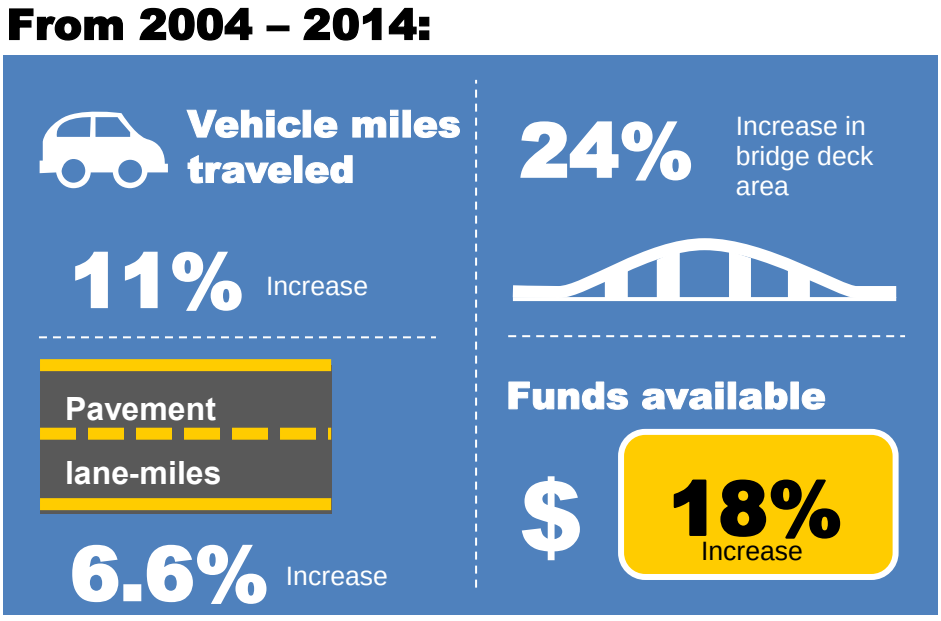
NCDOT is committed to excellence in managing the performance of our highway network. Our needs-based budgeting process ties funding to condition and performance. We are committed to investing public funds effectively, allocating funding to the priorities that need improvement. In addition to funding our priorities, we are systematically identifying further efficiencies in delivering maintenance and operations by evaluating our staffing resources and the proportion of funds directed at overhead and indirect costs. To provide transparency to our stakeholders, we have begun reporting our achievements against our plans. To meet our goals of making transportation safer, moving people and goods more efficiently, making our infrastructure last longer, and making our organization a place that works well, our three most urgent priorities are:

1) Fund the upcoming large increase in the number of bridges that will exceed average replacement age

2) Increase pavement preservation funds to prevent our pavement network from falling to a poor condition

3) Increase maintenance funding flexibility

Within the next seven years, a wave of over 2261 bridges will reach the historic average replacement age – approximately 50% more than the 1500 bridges replaced over the last 7 years. One-third of these bridges are already structurally deficient. The repairs, rehabilitation and replacements for these bridges will cost approximately $393 million per year over the next 7 years – $385 million more than we received in state and federal funds combined.



The condition of our pavements is 10 percentage points below our target of 80% of pavements being in good condition. Under current pavement preservation funding, pavement condition will deteriorate further over the next 5 years. To replace chipseal surfaces at the end of their lives, and to extend the lives of all surface types we will need $100 million over those 5 years in pavement preservation funding – $35 million more than current – to preserve our pavements cost effectively. Table 2-1 compares current funding levels (FY 2015) to funding need.

Table 2-1. Comparison of Funding Need to FY 2015 Allocation

Category	Need ($m)	State Allocation ($m)	Federal Program Allocation ($m)	Impact
i. Contract resurfacing (primary and secondary)	**$411.5**	**$408.2**		Currently fully funded
Interstate pavement resurfacing	**$101.0**		**$91.0**	
ii. Pavement preservation	**$100.9**	**$65.0**		Pavement lives will shorten, condition visibly degrading in next 4 – 5 years
iii. Routine highway, bridge and pavement maintenance, and culverts	**$899.1**	**$439.4**		Targets continue not to be met. Targets and priorities to be reviewed to optimize current funding levels and enable consistent application across the State.
iv. Disasters and emergencies	**$74.1**	**$56.5**		Shortfalls will be addressed using routine maintenance funds. Further reducing the abilities to meet targets.
v. Structurally sound bridge preservation	**$60.0**	**Note***		
vi. Structurally unsound bridge rehabilitation, repair or replacement.	**$325.0**	**$153.0**	**191.0**	
Total	**$1,870.7**	**$1,122.1**		

Note*: Structurally sound bridge preservation has no current allocation. Bridge funds needed are in addition to those provided in the STI.

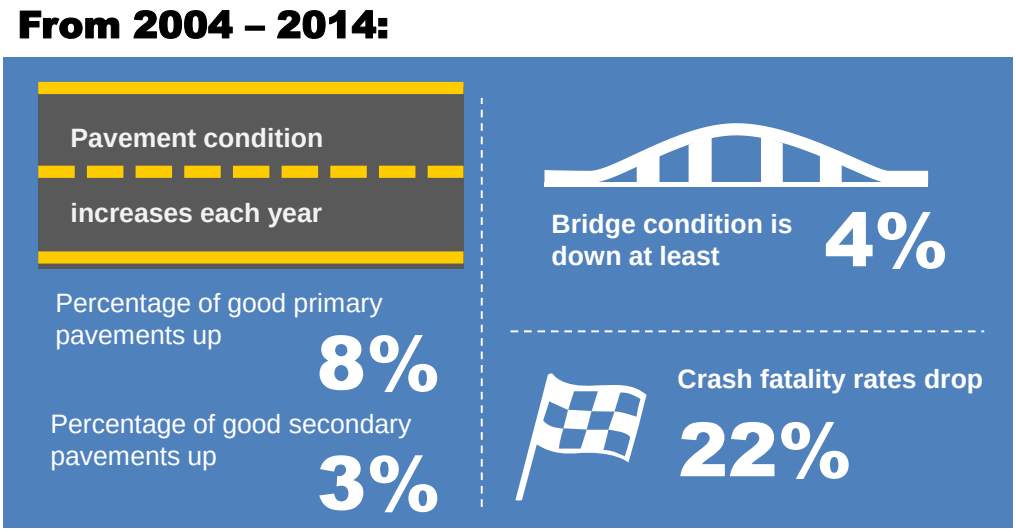
Capital projects should be accompanied by additional dedicated maintenance and operations funding. Although total maintenance funding has generally kept pace with the 10% and 20% increases in pavement and bridge inventory since 2004, the federal funding component is due to reduce significantly. To ensure a sustainable network, the maintenance and operations budget must keep pace with the lane miles added each year.

Our efforts in the following areas have contributed, and will continue to contribute, to improved safety and reduced congestion:

- Our spot safety program has contributed to a 22% decrease in the number of fatalities and injuries since 2004. Safety remains a top priority as crashes cost North Carolinians in excess of $10 billion each year.
- During the average weekday, cumulative across the state, there are 6.5 hours of traffic congestion on heavily traveled interstates. We are beginning initiatives in spot mobility as low-capital ways of reducing congestion. This program will be modeled after our spot safety program.

In our drive towards increased efficiency, within the next two years we will undertake in-depth reviews of our staff numbers and structure, and our overhead and indirect costs. These reviews will show our largest potential for cost savings and productivity improvements, enabling further efficiencies to be realized.

Our key performance indicators for the past ten years are as follows:



3 Introduction

This report represents a new generation of the Department's Maintenance Condition Report. It reflects our changing philosophy from one of condition management to one of condition and performance management, and addresses the new legislative requirements set out in Senate Bill 744, Sections 34.11. (c) items (1) through (6).

This report outlines how well our highway systems are operating and being maintained to meet our new organizational goals, and recommends initiatives to improve performance and cost efficiency.

Our goals, and the way in which maintenance and operations contribute to them, are outlined in the table below. We have focused on the goals of safety, efficient movement of people and goods, longer-lasting infrastructure, and organizational efficiency, as these are most relevant to our maintenance and operations.

Department Goals	Maintenance and Operations Activities that Influence NCDOT Goals
1. Make our transportation network **safer**	■ Reduce crashes and fatalities through spot safety program. ■ Remove hazards from highways quickly. ■ Maintain the condition of pavement surfaces, bridges and protective barriers to safe levels. ■ Maintain road markings, signage and lighting to safely guide road users.
2. Make our transportation network move people and goods more efficiently	■ Clear crash sites quickly through intensive coordination with emergency services – Optimize signals and operate and maintain Intelligent Transportation Systems Devices – Incident Management Assistance Patrol to clear sites quickly – Investigate other spot mobility options for reducing congestion including ramp metering, tolling, and low-capital alternatives – Respond to disasters and emergencies to keep the economy up and running
3. Make our infrastructure **last longer**	■ Preservation and maintenance to extend the lives of our pavements, bridges and roadway assets – reducing costs to North Carolinians over the long term. ■ Replace and rehabilitate pavements and bridges that are no longer economically viable or that limit passage of modern

Department Goals	Maintenance and Operations Activities that Influence NCDOT Goals
	commercial vehicles. ■ Clear crash sites quickly through intensive coordination with emergency services.
4. Make our organization a place that works well	■ Not associated with particular maintenance activities, but is directly impacted by our efficiency.
5. Make our organization a **great place** to work	■ Although not included as part of this report, our staffs' health and wellbeing are critical to running an efficient and effective organization.

The Department has been producing Maintenance Condition Reports since 1998. Over this period, we have collected 9 years of data about our maintenance and the condition of our pavements, bridges, and roadway. By analyzing this many years of data, we can reliably estimate the activities, and associated budget, needed to maintain the condition of our assets to achieve and sustain targets. Before the next round of this report, we will begin analyzing how the condition of our assets in turn affects the executive performance measures that quantify the safety, transportation system efficiency, infrastructure longevity, and expenditure efficiency of our transportation system. This analysis will help us prioritize available funds to activities that help us meet our targets.

This report is evolving from one that projects the budgets required to maintain the *condition* of our highway assets into the future, to one that *also* projects the budgets required to maintain our *performance*. This latest report reflects three significant departures from the previous version. This report:

1) **Highlights the relevance of condition to NCDOT's strategic objectives**. Condition alone is not sufficient to understand whether or not we will be able to meet our strategic objectives in the future. As this report develops, we will be able to better identify and prioritize those maintenance and operations activities that are most cost effective at meeting our safety and movement efficiency goals, and we will be able to recommend ways of allocating resources to achieve our targets.

2) **Examines how operations influence performance**. Previous versions of the report have focused on *maintenance* funding needs and asset *condition*. In this report, we have included operations such as travel reliability and congestion. This approach recognizes that both maintenance and operations contribute strongly to NCDOT's strategic goals.

3) **Investigates Division-level performance**. We have analyzed performance and efficiency at a Division level. By investigating Division-level performance, we can identify more effective and efficient practices to be shared across the State.

The intention is for this report to continue to be produced every two years. However, monitoring of accomplishments and performance will be undertaken on a yearly basis. As NCDOT moves towards the creation of its' Federally required Transportation Asset Management Plan, this report will help set the stage for enhanced strategic asset management decision making, driven by performance tracking.

We are currently engaged in furthering our efforts on the following programs and initiatives that will greatly influence the Department's future for increased efficiency and prioritizing operations and maintenance needs.

- “Final” State Transportation Improvement Program (STIP);
- Strategic Transportation Investments (STI);
- The Department’s Strategic Asset Management Focus and Organization;
- Highway Maintenance Improvement Program (HMIP);
- Transportation Asset Management Plan (TAMP);
- The Department’s Comprehensive Cost and Staffing Analysis (including workflow and process assessment); and
- Needs Based Budgeting.

The Department’s path forward takes into account these programs and initiatives. Through the course of the next several months there are legislative and self-imposed milestones that will inform the Department’s efforts to optimize efficiency in staffing and prioritizing needs of the operations and maintenance program. For instance, the Capital Program, better known as the STIP, has been released in draft form for public comment for the next six months. The STIP identifies project needs for the next 10 years, but will also increase operation and maintenance demands for the department.

In addition to this report, the operation and maintenance program will meet two other legislative requirements that will result in further prioritization of our operations and maintenance needs and will helps us mature as an Asset Management Organization.

1) On April 1, 2015, the Department will be submitting the first of the annual "Highway Maintenance Improvement Program" pursuant to G.S. 136-44.3A. The first HMIP will establish a 3-year pavement program. The Department plans to expand on this report in the future to include bridge and major maintenance activities.
2) As required by MAP-21, the Department will deliver a Transportation Asset Management Plan to the Federal Highway Administration by early 2016. This will include maintenance and operations needs for the next 20 plus years. The Department plans to define performance expectations and assess where our allocated budget should be applied through cross-asset optimization.

After the completion of the above items, the Department will have an enhanced view of the it’s staffing needs. This will deepen the Department’s abilities to make programmatic decisions on how we maintain our highway system to meet the demands of our growing state.

This report will provide details on how our highway system condition affects the safety, efficiency, and reliability of our highway networks; the largest driver of our state’s economy. This report also addresses new legislative requirements focusing on how efficiently we are delivering. In the future, as we further improve our monitoring and analysis, this report will form an even stronger basis for recommending improvements to how we manage our assets and organize our people to cost effectively operate and maintain our highways.

4 NCDOT Highway Asset Portfolio

The NCDOT highway assets are significant. With responsibility for maintaining both the state primary and secondary system, we manage the second largest road network in the United States. The highway assets have a replacement value in the order of $570 billion and the department is responsible for ensuring this value is retained for future generations. The table below summarizes the quantity of the major asset types we manage and their value.

Table 4-1 NCDOT highway assets

Highway Asset type	Quantity	Asset value
Bridges (number)	13,455	$60 billion
Pavement (lane miles)	163,000	$64 billion
Non-Pavement & Bridge Assets (centerline miles)	80,000	$446 billion
Large Pipes and Culverts	29,496	TBD
Total	-	$598 billion
Funding available (CPI adjusted)	$1.122 billion	

Much of the system has increased due to capital projects which carry maintenance and operations responsibilities. Total funding has roughly kept pace with the size of the asset inventory and traffic load, in large part due to federal funding for bridges. However, this funding is due to drop sharply from $270 million in 2014 to $182 million in 2015, and reduce to $50 million in 2018. Additionally, programs that improve operations (e.g., IMAP and signal maintenance) are now funded from our maintenance allocation though they are eligible for federal funding ($43 million). Although the impacts of underfunded maintenance and operations may not be seen immediately, the age profiles and deterioration rates of our assets are good indicators that we are likely to have a significant funding gap beyond FY2015.

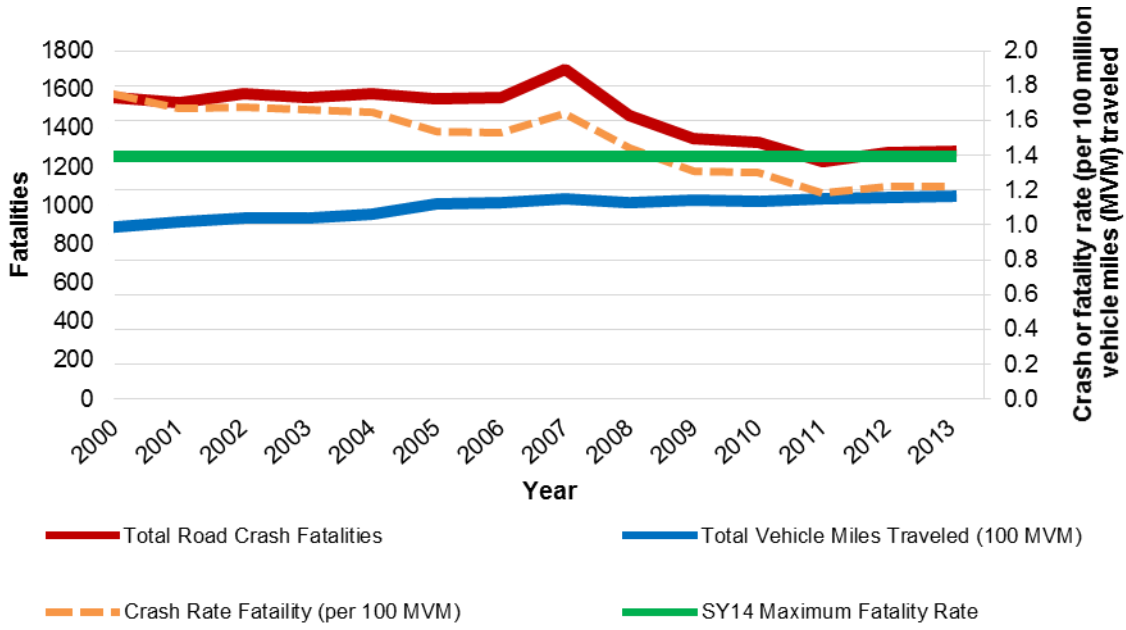
5 Make our transportation network safer

Making our transportation network safer is a key goal for NCDOT, with reducing the rate of crashes and fatalities on the state highway network a very important priority in meeting this goal. In 2013, crashes cost North Carolinians in excess of $10 billion in medical cost, lost work days, and property damage, just to name a few.

In **2013** **crashes** on our highways cost North Carolina in excess of **$10 billion**

North Carolina's fatality rate is slightly above the national average, at 1.22 per 100 million vehicle-miles (MVM) traveled compared to an average of 1.14. Fatalities have been reducing since 2007 (see figure 5-1), partly due to the Departments' spot safety program. The spot safety program identifies locations where crash rates are higher than usual, then evaluates alternatives for reducing crash rates at those locations. These evaluations are based on an analysis of safety interventions we have used in the past, and how effective they are in different types of situations. We prioritize the interventions that are most cost effective at reducing crashes and fatalities.

Figure 5-1. Trends in road safety 2000-2013



As part of our Highway Safety Improvement Program, we are identifying and tracking potentially hazardous locations. We report the number of potentially hazardous locations we investigate each year, and the outcomes of those investigations. So far in FY15, we have identified the following: 1834

potentially hazardous intersection locations, 636 potentially hazardous section locations, and 100 potentially hazardous bicycle/pedestrian intersection locations. Once we identify these locations, they become part of our safety program. We evaluate the costs and benefits of rectifying the hazards, and let contracts to address the locations having the largest benefit/cost ratio.

In addition to our spot safety program, we are working to clear incidents quickly, as 20% of all crashes are secondary crashes, and the likelihood of a secondary crash increases by 2.8 percent for every minute that the primary incident remains a hazard.[1]

Each year we perform approximately $131 million in maintenance activities to make transportation safer. Examples include:

- Provide signage, and road markings, for advance warning and visibility.
- Provide signal maintenance and operations.
- Provide guardrail to minimize the severity of a crash should a vehicle veer off the road.
- Repair pavement shoulders; reducing drop-offs and high shoulders can reduce crash rates by 8%, and fatality rates by up to 48%.[2]
- Coordinate with local agencies and emergency services to manage incidents more efficiently.

Current Performance

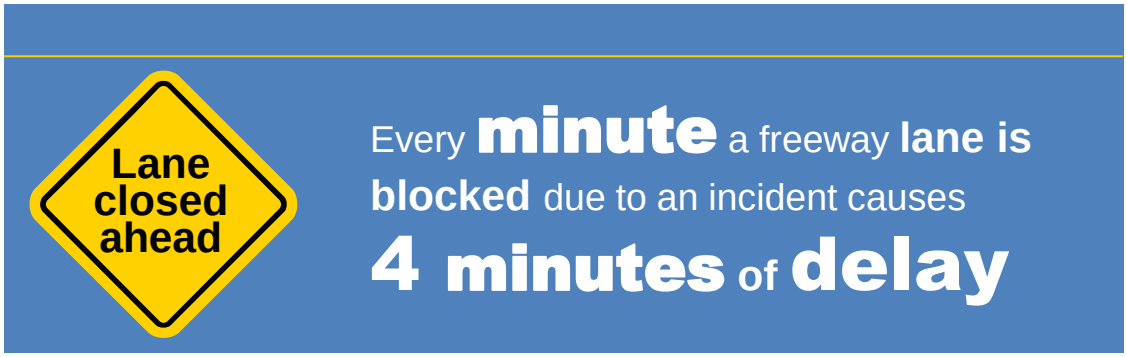
The Appendix contains the current performance of safety-related assets.

- We are meeting our overall targets for providing adequate signage, guidance and advance warning to motorists. Additionally, we exceed our targets on the secondary system while on our primary and interstate system we are below target for pavement markers, words and symbols.
- The number of fatalities and injuries has reduced by 18% and 23% respectively since 2000. This substantial improvement is partially due to our spot safety program.

[1] Karlaftis, Latoski& Sinha Richards."ITS Impacts on Safety and Traffic Management: An Investigation of Secondary Crash Causes", *ITS Journal,* 1999, Vol. 5.

[2] April 01 -- WPRFC Meeting Handout -- Reference 1, 2.

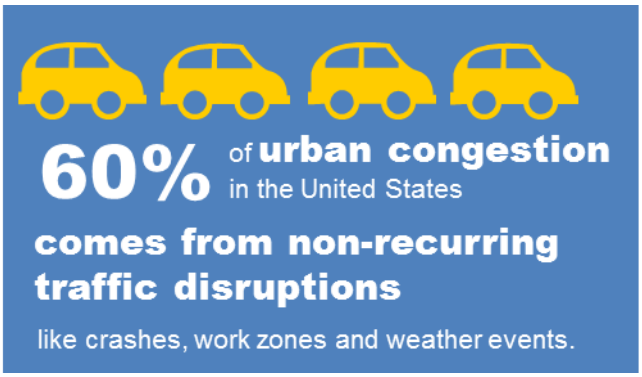
6 Make our transportation network move people and goods more efficiently



When confronted with congestion problems, it can be tempting to think: “build more.” But current realities indicate that a major source of loss of performance – urban and rural – is the result of operational problems. There are many non-capital alternatives addressing our problems while being fiscally prudent.

Approximately 40% of urban congestion comes from bottlenecks; places where traffic flow is constricted. Our low-cost solutions include:

- Adding turn lanes
- Optimizing traffic signals
- Time-of-day operations
- Active traffic management
- Metering ramps



About 60% of urban congestion in the United States comes from non-recurring traffic disruptions such as crashes, work zones and weather events. Our low-cost solutions include:

- Traffic Management Centers using traffic cameras and dynamic message signs to provide real-time information to travelers so that they can choose alternative routes.
- Incident Management Assistance Patrols (IMAP) monitors the State’s most heavily traveled roadways to manage incidents that disrupt traffic and to assist disabled motorists. IMAP reduces accident clearance times and minimizes congestion. Every minute a freeway lane is blocked due to an incident, it results in 4 minutes of travel delay time. It also reduces the likelihood of a secondary crash increases by 2.8% for every minute that the primary incident remains a hazard; 20% of all crashes are secondary crashes.

- Coordinating and creating shared incident response goals with responders (fire, police, EMS, etc.) in order to keep congestion down.

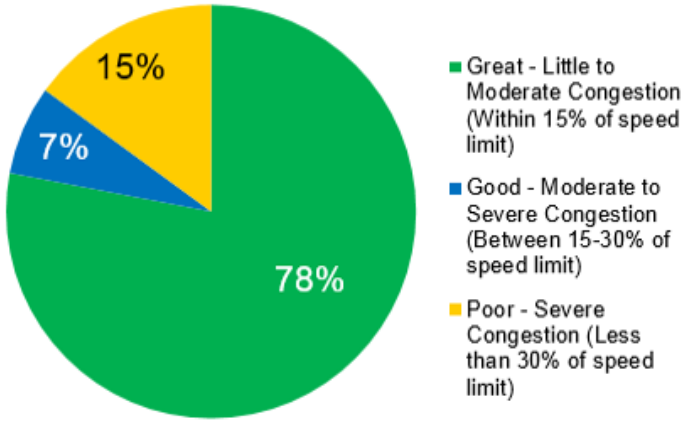
Although traffic congestion declined from 2010 – 2013 in the State's largest urban areas, it is starting to rebound in 2014.

Travel Congestion

Interstates with 50,000 or more vehicles per day are the most heavily traveled roads in the state and make up only 461 centerline miles of the highway network (less than 1% of the total network) but carry 60% of the total interstate traffic and 13% of the total statewide traffic.

During the worst hour on these heavily traveled interstates, 78% of these roads experienced little to moderate levels of congestion, 7% experienced moderate to severe congestion, and 15% experienced severe congestion. On the heavily traveled non-interstates (mostly roads with traffic signals and driveways with over 20,000 vehicles) it took on average 20% longer to travel in the worst hour compared to how long it would take to travel at the speed limit.

Figure 6-1. Heavily traveled interstate. Percentage of interstate having these levels of congestion



Travel Time Index is a measure of how much longer a trip takes than the trip should take. If a 20-minute trip takes 30 minutes, the Travel Time Index for this trip is 30/20 = 1.50. This means the trip took 50% longer than it should. NCDOT uses the posted speed limit to determine how long a trip should take on a freeway.

NCDOT assesses the worst hour of weekday congestion on the network. This worst hour is the time of day when speeds were the slowest, on average, over the entire year (2013). This worst hour varies by location. Severe congestion is defined as a trip taking 30% longer than it would take without congestion traveling at the speed limit. Figure 6-2 and 6-3 identify areas of severe congestion based on the 2013 worst hourly Travel Time Index for heavily traveled interstates

Figure 6-2. Interstate miles of severe congestion by county.

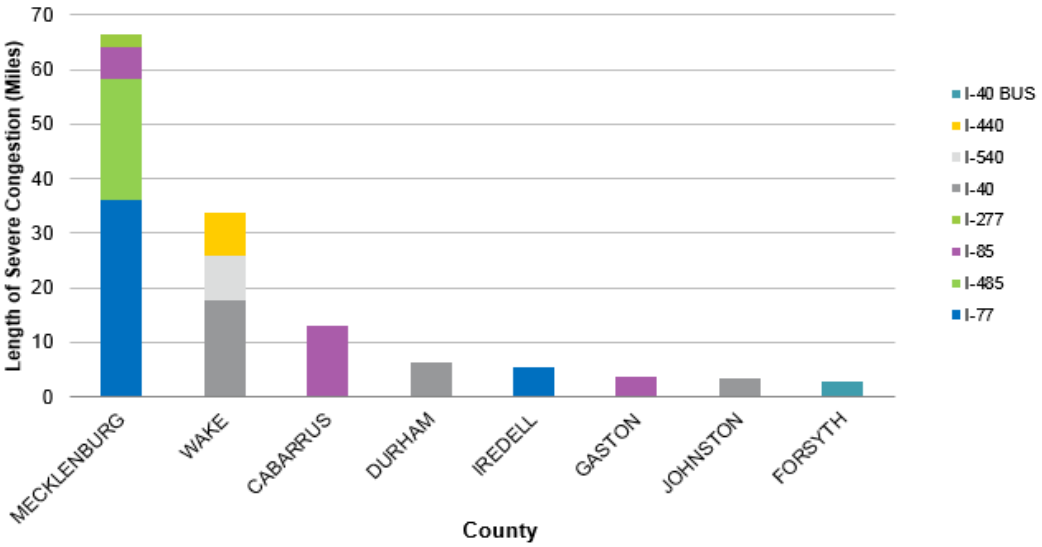
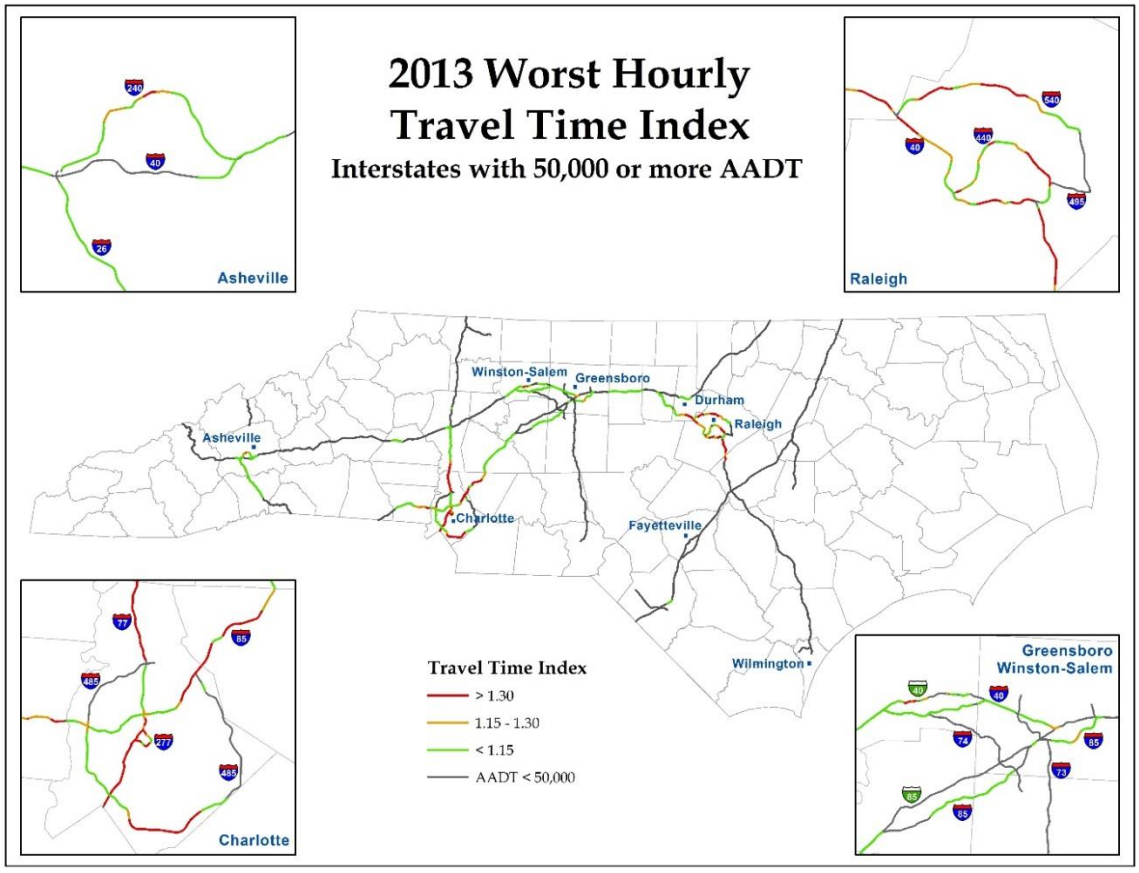


Figure 6-3. Travel Time Index for routes with AADT > 50,000 vehicles per day. (Not all sections could be mapped)



Overall, in 2013 it took 17% more time for travelers to travel the most heavily traveled interstates during their worst hours as compared to the time it would have taken them to travel those same roads at the speed limit. During the average weekday, there are 6.5 hours of traffic congestion on heavily traveled interstates across the state. Congested travel is defined as travel where speeds are 30% or more below the speed limit. To address these problem areas the Transportation Investment Program targets projects through the Strategic Transportation Investment (STI) program.

On heavily traveled interstates in 2013:

It took on average

17% more time

if you chose to travel during the worst peak hour.

There were on average

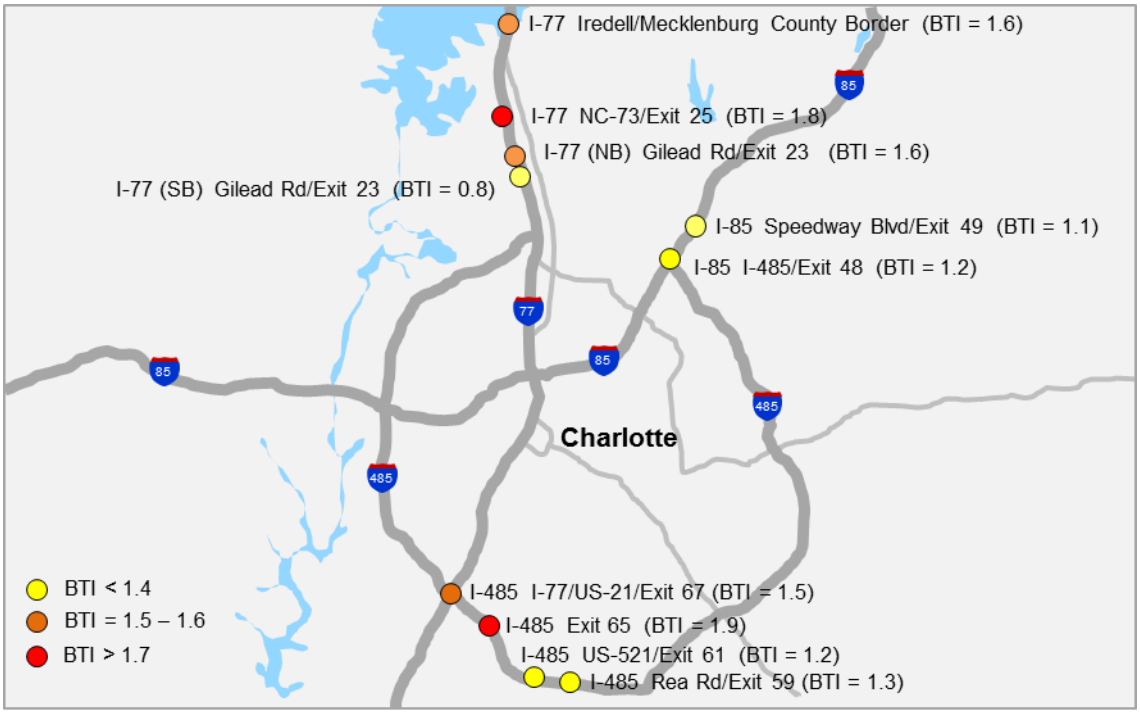
6.5 congested hours of travel per weekday

across the state.

Travel Time Reliability

In addition to wanting travel to be uncongested, travelers want trips to be reliable. Different trip purposes have different tolerances for trip unreliability. To get to the shopping center it may be acceptable to be 15 minutes late. To catch a plane or attend a job interview it may not be acceptable. Travel time reliability defines how much extra time needs to be allowed to arrive on time. An accepted measure for travel time reliability is Buffer Time Index (BTI). For example, BTI of 0.8 means that a traveler must plan to allow an additional 0.8 times, or 80% more time, than the speed limit would suggest, in order to be 95% certain that they would reach their destination in time. The BTI represents how much extra time a traveler needs to allow to be on time 95% of the time. In 2013 there were some highly traveled interstate segments that took almost 3 times as long as they should to travel through. The top 10 least reliable interstate locations are all in the Charlotte area, as indicted in Figure 6-4.

Figure 6-4. Top 10 most congested NCDOT interstate locations – worst travel time reliability (Buffer Time Index)



Note: Buffer Time Index (BTI) is how much extra time one must allow to be on time 95% of the time.

Incident Clearance Time

Incidents such as accidents, work zones, and weather make travel unreliable. NCDOT works to reduce the duration of incident clearance so that traffic flow can resume and people and goods can reach their destinations. In 2014, the State's average incident clearance time was 68 minutes. This clearance time represented an increase from previous years. When comparing to the U.S. target of "90% of incidents cleared within 90 minutes." NCDOT is currently achieving 84% of incidents cleared within 90 minutes.

Ways to Reduce Congestion and Improve Mobility

To improve mobility and reduce congestion NCDOT recommends the following:

- **Fund NCDOT's Spot Mobility Program**. Approximately 40% of urban congestion comes from bottlenecks; places where traffic flow is constricted. Strategies such as turn lanes, optimized traffic signals, time-of-day operations, active traffic management, and ramp

metering are low-cost/high-impact improvements that can be deployed quickly to mitigate localized congestion. Spot Mobility projects are prioritized based on their mobility and reliability values as well as local priority. Once completed, projects are evaluated to quantify their benefits. This program is being piloted in 2015 with safety funds and is anticipated to show great return on investment. It will need dedicated funding to be sustainable. Improving bottlenecks will improve the travel time index, reduce the number of congested hours and reduce the cost of congestion.

- **Fund Intelligent Transportation Systems (ITS) Device operations and maintenance**, Incident Management Assistance Patrol, and Traffic Management Center Operations, to optimum levels. About 60% of urban congestion in the United States comes from nonrecurring traffic disruptions such as crashes, work zones and weather events. NCDOT uses its ITS, TMC's and IMAP to address these sources of delay.
    - NCDOT has made significant investments in Traffic Cameras and Dynamic Message Signs across the state over the last 15 years. These tools allow NCDOT to monitor traffic and provide real time information to travelers. By knowing where congestion is occurring travelers can make better route choices and spend less time sitting in traffic. Seeing incidents on traffic cameras also gives other response agencies a firsthand view of that to which they are responding.
    - IMAP currently patrols 60% of the State's most heavily traveled interstates to manage incidents that disrupt traffic and assist disabled motorists (coverage extends to half the interstate counties). IMAP units are trained to work with first responders to clear incidents more quickly and restore traffic flow. While responders are tending to law enforcement and medical tasks, IMAP can focus on restoring traffic flow. IMAP helps to reduce accident clearance times. This gets people and freight moving again. By assisting motorists, IMAP helps keep small incidents from becoming big incidents.
    - TMCs are the nerve center of these operations, turning data into useful information that is used by the media, emergency managers and citizens to make travel decisions. These tools keep traffic moving and let travelers know when it is not. When TMC's are able to detect accidents more quickly and dispatch DOT response resources more efficiently they reduce accident clearance time. Informing the public about the disruptions using traffic camera images and Dynamic Message Signs allows the public to make better choices.
- **Fund signal system optimization**. NCDOT also optimizes traffic signal timing to keep traffic moving on signalized corridors. Adjustments in signal timing can improve traffic flow which reduces delays and improves safety. Signal system timing improvements can improve the travel time index on a corridor and reduce the hours and costs of congestion.
- **Create shared incident clearance goals for quicker clearance of traffic crashes**. When a significant crash occurs on an Interstate highway there are many responders: law enforcement, fire fighters, EMS, tow truck drivers and NCDOT. Each responding agency has a job to do. NCDOT is focused on getting the road reopened quickly to traffic to minimize the queue and get traffic moving again. Since a high percentage of congestion is caused by crashes, shared incident clearance goals between responders would help everyone to understand the impacts incident have on traffic and incentivize agencies to work better together to minimize delay to travelers. This coordination could include preplanned detours so that agencies could mobilize quickly. This level of coordination would decrease accident clearance time and minimize the frustration drivers experience from these unexpected disruptions.
- **Innovative congestion reduction alternatives.** The Department is exploring and implementing a number of innovative alternatives to reduce congestion including demand management, ramp metering, variable tolling, managed lanes, superstreets, quadrant lefts, Diverging Diamond Interchanges (DDIs), and time-of-day signal operations.

Implementing these recommendations will help minimize congestion and delays to help keep goods and people moving across the State.

Disaster and Emergencies

It is critical for the State to open roadways for passage after any kind of disaster or emergency. Quick removal of snow or other debris from roadways allows for efficient movement of people and goods across and through the State. Clear passage promotes interstate commerce and expedites recovery for businesses, governments and families.

Emergencies and disasters are unpredictable, but weather events such as snowstorms and mudslides happen routinely all across the State. The State has an excellent history of responding to these events and NCDOT responds promptly and effectively in order to provide access for North Carolinians.

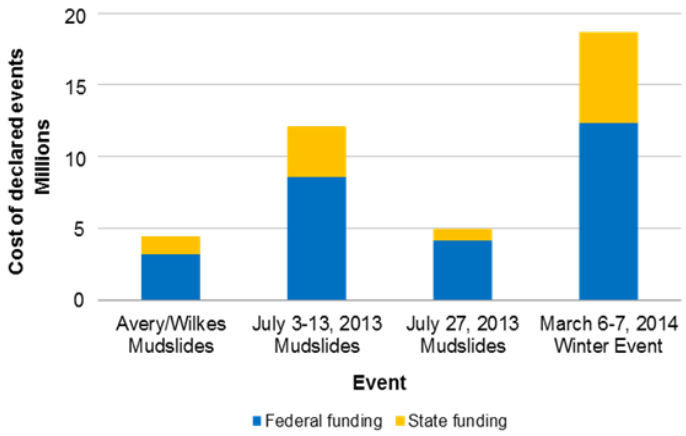
We categorize disasters in three ways:

- **Declared Events –** large-scale disasters such as hurricanes and tornados causing massive infrastructure damage as well as depositing large amounts of debris on the right of way.
- **Non-declared events –** smaller mudslides, tornados, or pipe washouts that do not qualify for federal assistance.
- **Snow and Ice –** typical winter events, which require roads to be cleared of snow, fallen trees, and power lines.

Declared Events

The State historically experiences several declared events per year. “Declared” events are largely reimbursed by the federal government through FHWA and FEMA, but NCDOT is also responsible for a portion of the response and recovery costs. Figure 6-5 shows that in FY 2014, the State experienced four events that met the threshold for a federal declaration. NCDOT expended $70 million on these events and expects to be reimbursed 67% of this; meaning NCDOT will spend $12 million on these events out of maintenance dollars.

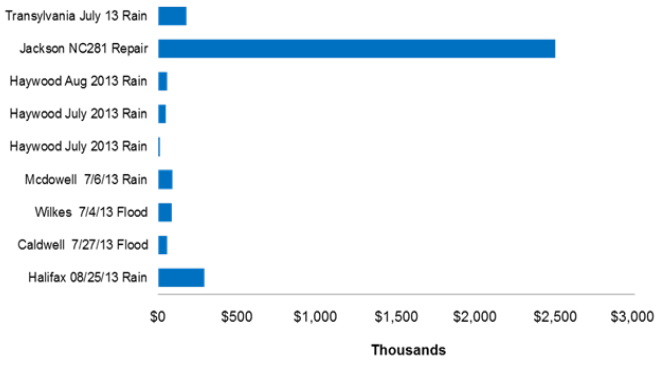
Figure 6-5. FY 2014 Cost of declared events.



Non-Declared

Non-declared events comprise the smaller events that do not qualify for federal assistance. In FY 2014, nine smaller events also plagued NCDOT with pipe collapses that did not meet disaster declaration thresholds (see Figure 6-6). These events highlight the difficult emergency recovery decisions made by NCDOT. Restoring vital services means divisions must make difficult choices balancing budgets, maintenance priorities, and connectivity.

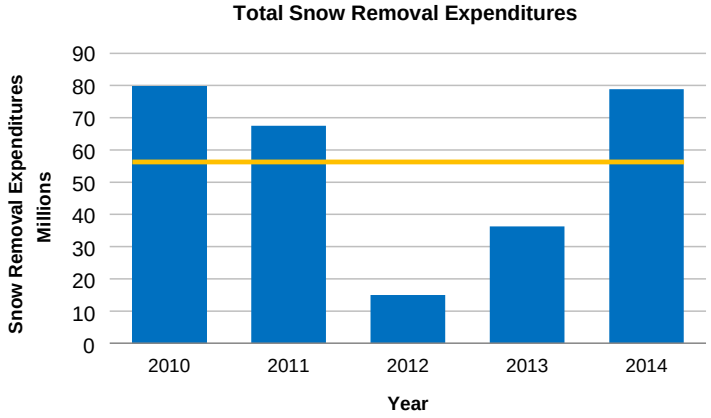
Figure 6-6. FY 2014 Damage caused by non-declared events.



Snow and Ice

Snow removal expenditure is highly variable from year to year, as shown in the figure adjacent. Although average expenditure has been $55 million, expenditures have ranged from $15 million in 2012 to $80 million in 2010. Historically, we have budgeted $30 million for snow and ice, but recent years' expenditures show that we need to budget more.

Figure 6-7. Total snow removal expenditure.



In FY 2014, NCDOT was required to fund $95 million to respond to and recover from these events. Such events are highly variable; over the past five years, snow response alone averaged $55 million (see Figure 6-7). We will be required to continue responding to these events to get our economy up and running after disasters and emergencies.

To cover funding deficits caused by these unforeseen events, we have used funds from routine highway maintenance, cutting into much-needed funds for maintaining our existing assets at target levels. The condition of our roadside appurtenances (such as graffiti, mowing, litter, and plant beds etc.) could be impacted as well as the routine maintenance for our pavements and bridges.

7 Make our infrastructure last longer

Maintaining and improving the condition of pavements and renewing an aging bridge inventory are key priorities for NCDOT.

Over the next seven years, in excess of 2,200 bridges, with a replacement cost of $5.4 billion, will reach their average historic replacement age of 60 years. Preservation, rehabilitation and replacement of these bridges is expected to cost at least $385 million per year over the next seven years – $232 million more than our current combined federal and state allocation for structurally unsound bridges.

Over the same time-frame we have estimated that it will cost $512 million per year to keep our pavement condition at/near our target levels of service. This is $39 million more than our current allocation for pavements, with the majority of this additional cost, $35 million required for more pavement preservation (i.e., re-sealing our large volume of chipseal pavements).

This section discusses the historical condition (performance), levels of investment and estimated future condition and investment needs for maintaining the following key NCDOT infrastructure:

- Pavements
- Bridges
- Roadway Assets (with a focus on drainage systems)

To assess how well we are delivering our projects, we monitor our project delivery rates. Our preliminary analysis shows that our delivery rates are high – in FY 2014, we completed 93% of our planned bridge replacements.

Infrastructure - Pavements

Overall pavement condition has been improving, but more funding is required to be allocated to pavement preservation activities in order to maintain current condition levels.

Existing Condition

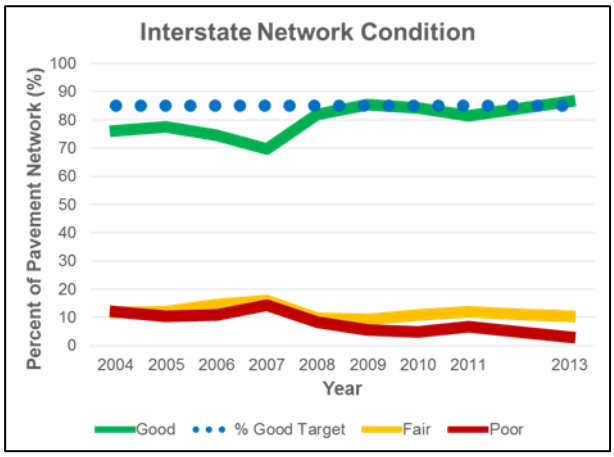
The graphs included below show historical pavement condition for the primary and secondary networks from 2004 to 2013. Pavements in “good” condition comprise those with a pavements condition index (PCI) greater than 80, “fair” are those between 80 and 60, and “poor” are those less than 60.

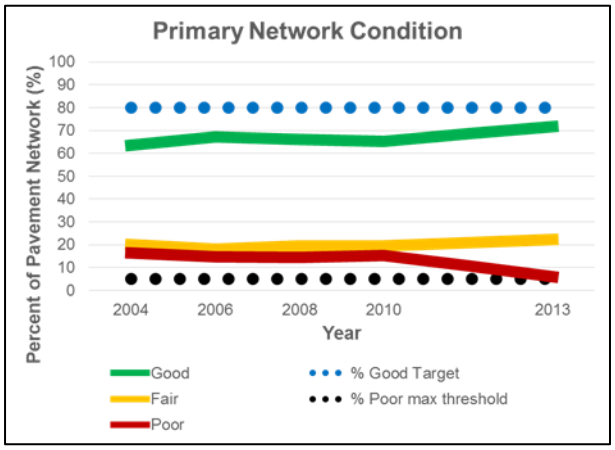
The condition of our pavements is influenced by activities funded through our routine highway maintenance, pavement preservation, and contract resurfacing program. It is not necessarily the total dollars spent that is important, but the mix of pavement maintenance and treatments we undertake that governs the total cost of meeting our targets.

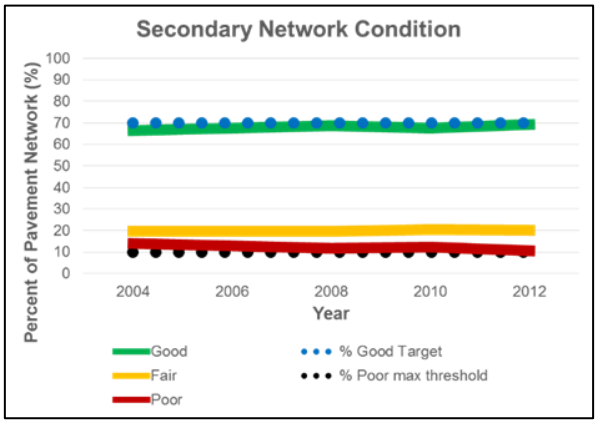
Statewide, NCDOT’s interstate pavements have consistently been close to their target of 85% of pavement miles being in good condition (Figure 7-1).

The secondary system has also recently approached its target of 70% of pavement miles being in good condition (Figure 7-3). Although the condition on the primary system has been improving in recent years, primary system pavements are still eight percentage points off their target of 80% (Figure 7-2). These statistics suggests that investments in interstate and secondary pavements have been adequate, and recent investments in the primary system are trending in the right direction.

Figures 7-1, 7-2 and 7-3. Pavement condition since 2004







Expected Performance – Future Funding

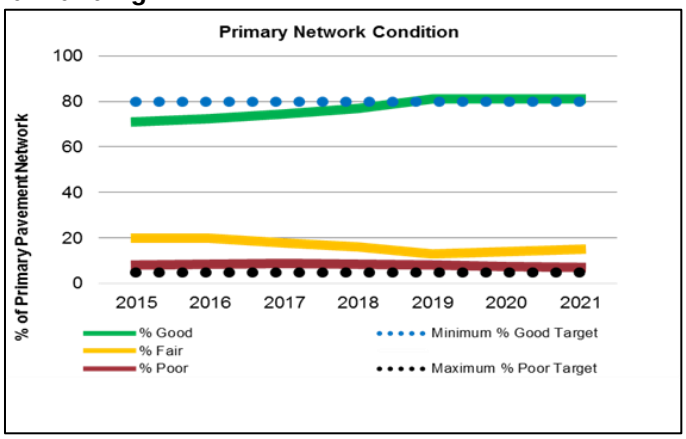
The preservation and resurfacing funding requirements to achieve and sustain the performance standards have been estimated at $512 million per year, comprising $224 million on the primary system and $289 million on the secondary network, compared to the 2015 allocation of $473 million. Additional pavement preservation funds of $39 million per year, over 2015 allocation levels, are required to meet and sustain the established performance standards across the network.

The funding need has been calculated to attain the target condition on the primary network over the next seven years and then sustain condition at that level, based on a mix of pavement maintenance, preservation, and resurfacing activities. The projected pavement condition under full 'needs' funding is shown in Figure 7-4.

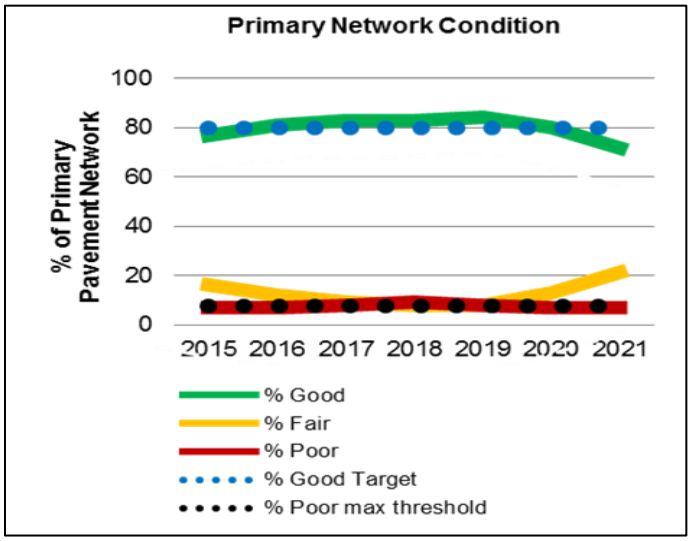
For the primary system to reach its target of 80% of pavements in good condition, it will require an 8 percentage point improvement. For the secondary system, we are targeting to keep overall pavement condition steady, with the proportion of pavements rated in good condition at around 70%.

If pavement funding continues at current levels for the next seven years, Figures 7-5 and 7-6 demonstrate our expected drop in pavement condition. The percent of the primary network in good condition will deteriorate from 77% to 72%, and the percent of the secondary network in good condition will remain relatively steady at 71%. The primary deteriorates while the secondary remains stable because it is less costly to maintain the secondary system at target levels; chipseal treatments on the secondary system help to maintain the system in good condition, while more costly treatments are required on the primary system.

Figure 7-4. Seven year condition projection based on full funding



Figures 7-5 and 7-6. Projected pavement condition based on current allocation



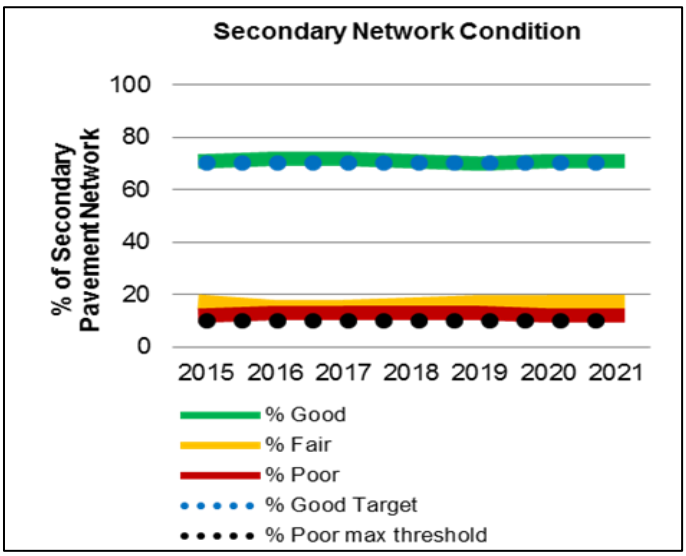


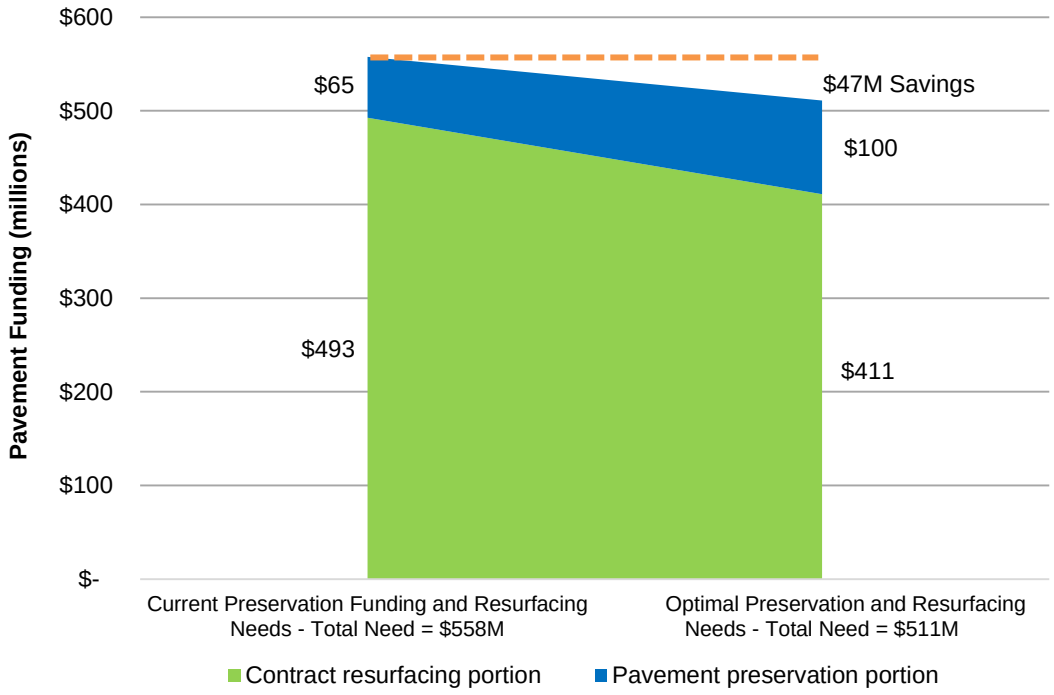
Figure 7-7 shows that an increase in pavement preservation funds can reduce the overall funding required to meet and sustain target condition and performance levels. This is because preservation activities extend pavement life, and we can extend time between resurfacing.

In our current situation, if $100 million of pavement preservation funds were made available, then the FY 2015 contract resurfacing allocation of $408 million would be nearly adequate to meet and sustain our targets over the next seven years. Total pavement preservation and resurfacing funding need would be $511 million.

However, at the current pavement preservation allocation of $65 million, we would need to increase contract resurfacing to approximately $493 million, for a total of $558 million, in order to meet and sustain our target pavement condition for the next seven years.

An additional $35 million in pavement preservation funds would result in a net savings of $47 million.

Figure 7-7. Pavement investment required to meet and sustain targets

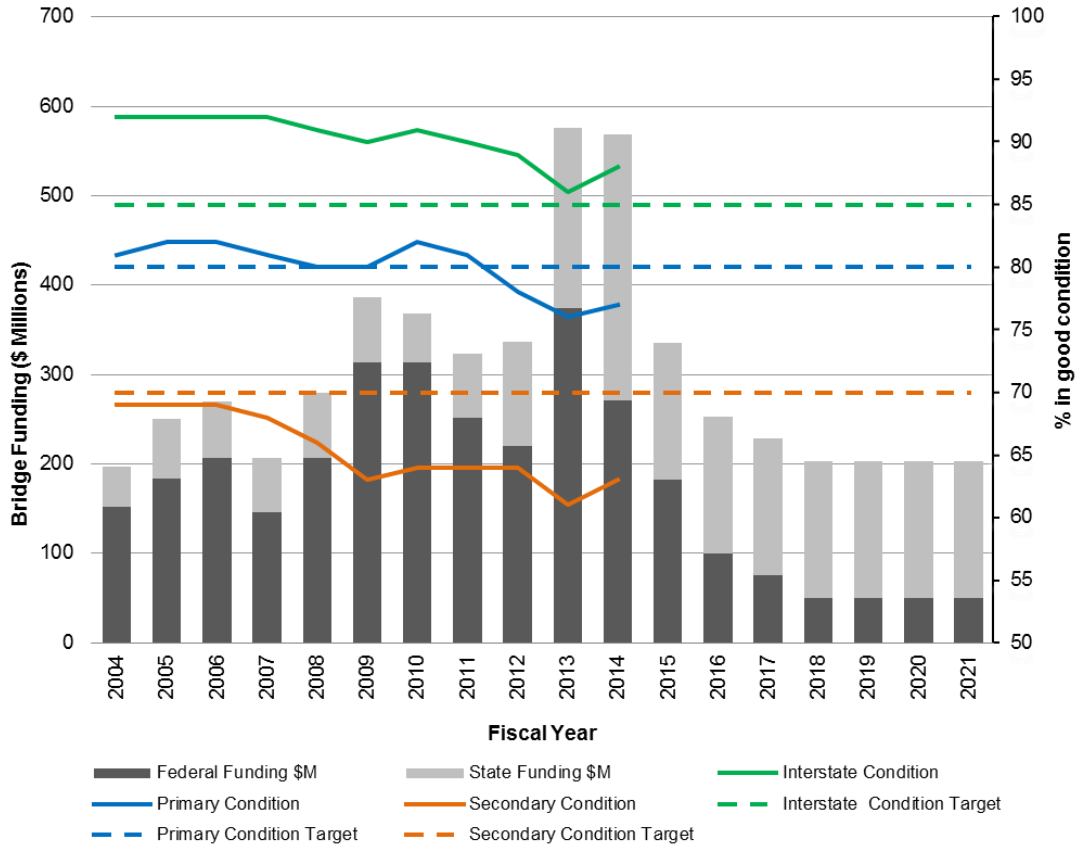


Infrastructure – Bridges

*Bridges that are considered structurally deficient, and require rehabilitation or replacement.

Overall, bridge condition has been deteriorating system-wide. Additional funding is required to prevent further deterioration, as 50% more of our bridges are set to reach the average replacement age of 60 years over the next seven years compared to the past 7 years. The federal funding component is also set to decrease exacerbating the funding deficit (see Figure 7-8).

Figure 7-8. Historic and future expected bridge funding, against historic condition.



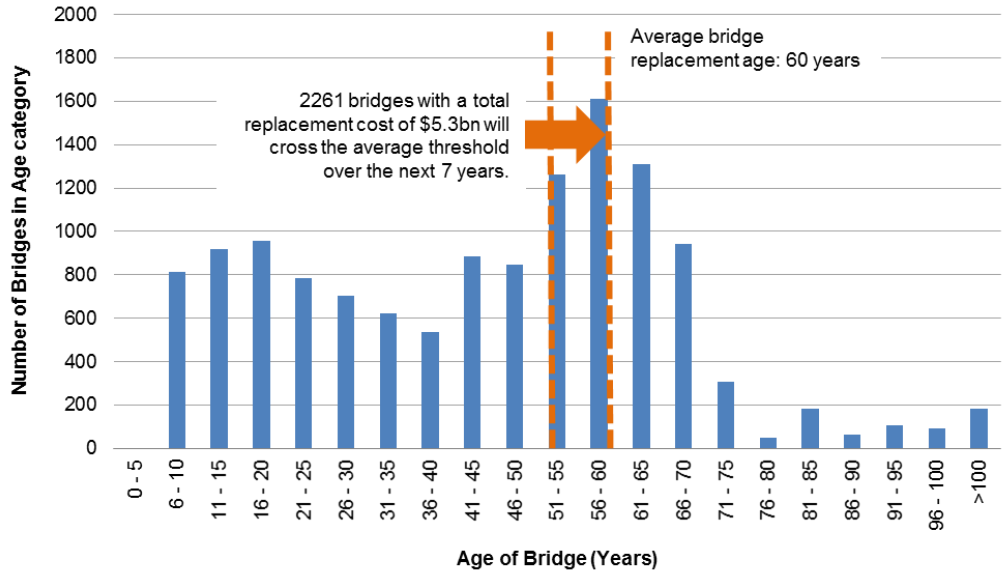
Existing Condition

Our condition targets are based on a percentage of the bridges considered to be in good condition – having only minor needs. While the recent increases in funding has reduced the rate at which our bridge network is deteriorating, more funds are needed to meet and sustain our targets. Bridges on the secondary network in particular are well below the target of 70%. The graph above shows both historic federal and state combined funding up to FY 2015, and expected funding from 2016 to 2021. In addition to significant reductions in funding for bridges, a large proportion of our bridges are reaching their expected replacement age.

Age profile of NCDOT's bridge inventory

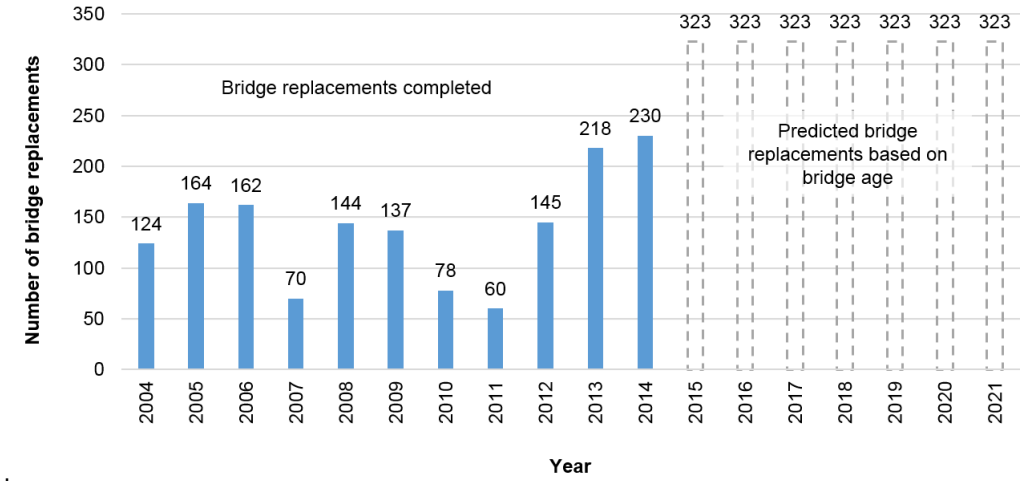
The ability to meet targets is only going to become more difficult as the age of the bridge asset increases. Bridge deterioration has resulted in the historical average replacement age to occur at 60 years (see Figure 7-9).

Figure 7-9. Current bridge age profile



Over the next seven years an additional 2261 bridges will cross the 60-year age threshold – implying that we must prepare to replace or rehabilitate at least this many bridges, which equates to approximately 323 bridges per year. This number of bridges is approximately 50% greater than the 218 bridge replacements in 2013 (see Figure 7-10).

Figure 7-10. Bridge replacements completed and required



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Expected Performance – Future Bridge Funding Needs

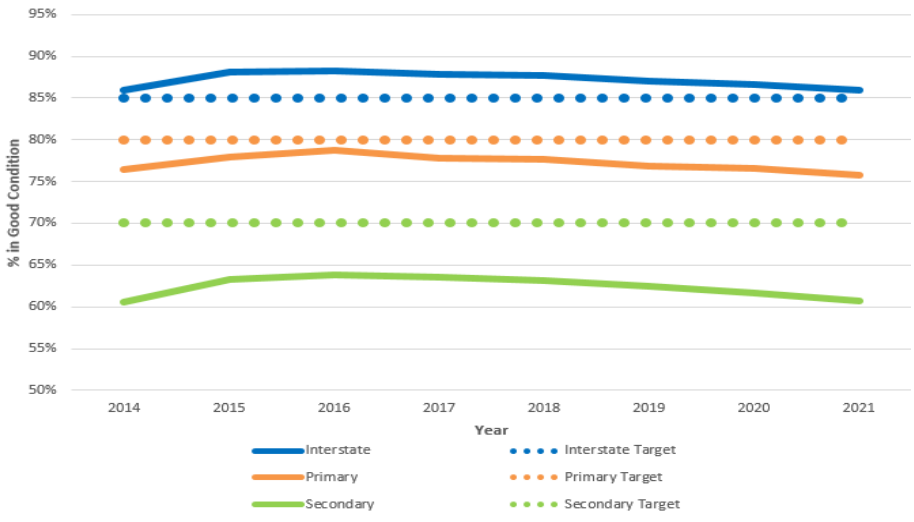
The majority of future bridge funding over the next seven years will go to address this aging bridge population. The majority of these bridges will require replacement, and service disruptions to perform necessary maintenance will become more frequent.

Current funding levels will be inadequate to address the aging bridge population and the condition of the network will fall (see Figure 7-11). In order to achieve and sustain the established performance standards, state funding will need to increase from the $153 million allocated in 2015 to $385 million per year in 2018.

Funding for rehabilitation and preventative maintenance would delay the need for replacement, extending the service life of bridges from 60 years to approximately 75 years. Furthermore, by investing in preserving our structurally sound bridges we can reduce the number of unsound bridges and funding needed to replace or rehabilitate them.

Investing funds to preserve sound bridges would markedly curb the rate of deterioration and reduce future costs to replace unsound bridges. On average, for each $1 spent preserving sound bridges today, a savings of $5 dollars would be realized in the future.

Figure 7-11. Predicted bridge condition based on current funding



Infrastructure – Roadway Assets

Roadway routine maintenance may be described as work activities performed on a recurring basis to provide the traveling public with safe and reliable highway facilities. Roadway routine maintenance consists of work activities associated with the maintenance and upkeep of the roadway. These work activities fall into two categories including non-assessed or cyclical and assessed or performance based activities.

Non-assessed routine maintenance activities are those necessary for the operation of the highway system that do not have direct performance measures associated with them. Some examples and their cost ($ millions) include roadway hazard removal ($19-$23), mowing ($21-$26) , litter pickup ($33-$40).

Assessed routine maintenance activities are those for which we have maintenance condition information. Some of these include shoulders ($47-$57) and ditches ($21-$26), drainage assets ($86-$106) and traffic assets ($115-$140).

Overall, our roadway assets are meeting target, although for individual activities performance varies. In the previous chapter, the performance of the safety-related roadway assets of signage and markings were discussed. In this chapter, we discuss the roadway assets that extend the lives of our pavements and bridges by keeping the water out of them; our drainage assets.

We repair shoulders, maintain ditches and pipes to extend the lives of our pavements. Clogged ditches, misshaped shoulders, and blocked or broken pipes retain water, which gets into our pavements, accelerating their deterioration. To extend the lives of our pavements, we aim to ensure our drainage systems are fully functioning on at least 95% of our interstates, 90% of our primary system, and 85% of our secondary system.

The following tables summarize the activities we undertake, and the standards we attach to them, with the aim of meeting our goals. For Goal 1, Make our transportation network safer, we are meeting target in most areas. Where we are not meeting target, as for vegetation (brush and tree), pavement markers and words and symbols, additional funds will be required to meet our targets. The current system condition indicates that, provided routine maintenance funding remains stable, we should be able to continue to meet our safety goals. Note that our safety goals also depend on the underlying condition of our assets, which we address in the goal “Make our infrastructure last longer.” Based on current performance, we have estimated that we need $234 million for our maintenance and operations activities to adequately contribute to our safety goals.

				System		
Asset group	Activity	Purpose	Maintenance Standard	Interstate	Primary	Secondary
Goal 1: Make our transportation network safer						
Target				95	90	80
Pavements	Unpaved Shoulders	Minimize incident severity	Drop offs < 3 inches; Shoulder height < 2 inches	95	94	95
Target				90	85	80
Roadside	Vegetation (Brush & Tree)	Provide sight distance	Distance from travel way	87	83	82
	Guardrail	Reduce incident severity				

Asset group	Activity	Purpose	Maintenance Standard	System		
				Interstate	Primary	Secondary
Goal 1: Make our transportation network safer						
Target				90	85	80
Traffic	Roadway Lighting	Reduce night-time crashes				
	Ground Mounted Signs	Provide advance notice	Visible and legible	94	94	89
	Long Line Pvmt Markings	Provide guidance	Present, visible	96	96	90
	Overhead Signs	Provide guidance	Visible and legible	99	97	
	Pavement Markers	Provide guidance	Present and reflective	87	70	
	Words and Symbols	Provide guidance	Present, visible	71	92	91

The estimated need for maintenance and operations activities to move people and goods more efficiently is $105 million. The major activity is incident clearance.

Asset group	Activity	Purpose	Maintenance Standard	System		
				Interstate	Primary	Secondary
Goal 2: Make our transportation network move people and goods more efficiently						
Target				70	-	-
Traffic	Incident Clearance Time	Reduce risk of secondary crashes	Average incident clearing time (min)	68		

Based on current performance, which is shown in the table below, we need to invest approximately $679 million in order to make our infrastructure last longer. The activities comprise contract resurfacing, pavement preservation, and routine maintenance. We also need more than $455 million to maintain our bridges effectively and efficiently, and $201 million to maintain our roadway (drainage) assets, including culverts.

Asset group	Activity	Purpose	Maintenance Standard	System		
				Interstate	Primary	Secondary
Goal 3: Make our infrastructure last longer						
Target				85	80	70
Pavement	Pavement Maintenance	Extend pavement lives		87	72	69
	Preservation	Extend pavement lives				
	Reconstruction	Extend pavement lives				
	Resurfacing	Continue to provide assets				
	Unpaved	Extend unpaved road lives				

				System		
Asset group	Activity	Purpose	Maintenance Standard	Interstate	Primary	Secondary
Goal 3: Make our infrastructure last longer						
Target				90	80	70
Bridge	Bridge Maintenance	Extend the life of bridges		88	77	63
	Bridge Preservation	Continue to provide bridge services				
	Target			85	80	75
	NBIS Culvert	Extend the life of culverts	>= 6	86	87	89
	Target			80	70	60
	Non-NBIS Culvert	Extend the life of culverts	"Good"	81	72	56
	Target			95	92	85
	Overhead Sign Structures	Extend the life of signs	Condition Rating = Good	88	94	84
Target				90	85	80
Drainage	Boxes (Blocked or Damaged)	Keep water out; extend life	Grates & outlet pipes blocked <50%, undamaged	85	89	91
	Crossline Pipes (Blocked)	Keep water out; extend life	More than 50% open	87	80	81
	Crossline Pipes (Damaged)	Keep water out; extend life	No deficiency affecting functionality	97	95	94
	Curb & Gutter (Blocked)	Keep water out; extend life	No obstruction greater than 2 inches for 2 feet	96	96	97
	Ditches (Lateral Ditches)	Keep water out; extend life	No blocked, eroded, or nonfunctioning ditches	98	94	93
	Storm water devices	Protect the environment		94	94	94

The remaining activities we undertake are largely for the purpose of providing a well maintained roadside. Although this is not a primary goal of NCDOT, we are proud of the appearance of our road corridors and supporting infrastructure, and we believe they contribute to our economy because people enjoy driving in North Carolina. We need $112 million per year to provide this experience.

8 Make our organization a place that works well

An organization that works well monitors its accomplishments against its intentions, and aims to be more efficient in the work it does. In this section, we report our quantities of bridges replaced, pavements resurfaced and pavements preserved against our plans. We are pleased to report that we have accomplished between 93-100% of what we had planned.

To begin assessing our efficiency in maintenance operations, we have reported our staff numbers per lane-mile and our indirect costs. On their own, these statistics do not indicate a particular level of efficiency. However, at this stage we have used them as a benchmark and to help identify regional differences in maintenance operations.

Deliver Effectively

To ensure we are delivering effectively, we have evaluated our accomplishments against our plans. Where we recognized discrepancies between planned and actual accomplishments, we are investigating the reasons and implementing action plans where required. These discrepancies may be due to incorrect assumptions about costs, more urgent funding requirements that arose during the year, or other reasons. In order to more accurately forecast budget requirements and the condition and performance that we can expect from these investments, we must understand the reasons for these differences and mitigate them where possible.

Table 8-1. Planned vs Actual Accomplishments (FY14)

Activity	FY14 Planned	FY14 Actual	Accomplishment Rate
Number of bridges replaced or preserved	450	420	93%
Lane-miles of pavement resurfaced	4,990	4,990	100%
Lane-miles of pavement preserved	See note	2345	

Note: Pavement preservation funds were not allocated in FY14, divisions had to identify alternative funds during the course of the year for undertaking pavement preservation. As a result there was no planned amount

Deliver Efficiently

We are committed to minimizing our costs so that we can continue to deliver high levels of service to North Carolinians even while funding decreases. We intend to undertake a large-spanning cost investigation, which will identify the largest costs that contribute to maintaining and operating the state highway asset, and the largest potential for reducing costs across the organization. This analysis will include the following items, all of which we have already begun to assess. These items are in the order that we believe have the largest potential for cost savings, at this stage:

1) Opportunities for adjusting our levels of service

2) Lower-cost maintenance and operations alternatives

3) Minimizing indirect costs of highway maintenance

4) Efficient staffing levels

5) Fleet utilization

Our next step is to identify, between and within each of these analysis areas - the items with the largest potential cost savings.

Opportunities for adjusting our levels of service

Due to limited funding, adjustments to the levels of service or maintenance practices are being considered. A number of options to provide more cost-effective preventative maintenance are outlined below:

- **Adjust our standards.** We have established standards that determine the amount or frequency of all our maintenance activities. These standards have been refined over time in response to public feedback and based on previous funding levels. However, with reduced overall funding, we may consider re-evaluating our standards based their impact on the safety and economic efficiency of our transportation system. Changing our standards will require an adjustment on the part of members of the public and our staff, and would be accompanied by educational program.
- **Reverting to chipseal**. For many low-volume roads, chipseals cost the least to maintain over the life of the pavement. At approximately $12,500 per lane-mile, chipseal is only ¼ the cost of resurfacing ($50,000 per lane-mile).The plant-mix surface does not last 4 times as long as the chipseal surface, nor does it cost less to maintain annually; chipseal is often a more cost effective solution, especially for our low volume secondary roads. Preservation activities are often less costly, both in the short and long run, than resurfacing or reconstruction.

Lower-cost maintenance and operations alternatives

We are currently utilizing low-cost maintenance treatments through the following.

- **Operational technique improvements**. New ways to manage behavior and improving the operation of the existing infrastructure are alternatives to building something new. These approaches also reduce the scope of asset requiring maintenance. Operational techniques such as signal optimization can also reduce congestion at a significantly lower cost than building new and / or higher-capacity assets. We are proud of our operations and undertake and monitor the success of many of these initiatives already.
- **Lower-cost and more resilient materials**. We are working with suppliers and researchers to identify materials that are either lower cost, or that last longer and therefore have lower costs over the life of the asset. We are currently in the process of replacing our highway and facility lights with LED fixtures and replacing our overhead signs with reflective sheeting signs to reduce or eliminate the need for sign lighting.
- **Timing treatments correctly to minimize costs**. The adage of “a stitch in time saves nine” is true in highway maintenance. There are many alternatives for treating pavements and bridges to extend their lives and improve their performance. The relative cost-benefit of each treatment alternative depends on its timing. Our computer models identify the best treatments that will cost the least over the lives of our assets while attaining our goals, where possible or attaining the greatest level of performance possible. We have worked

with the Universities of North Carolina at Charlotte and East Carolina to refine our condition prediction models for bridges and pavements.

- **Bridge Preservation Activities.** Bridge preservation activities extend bridges' lives, delaying the costs associated with replacements. With current average replacement lives of 60 years, more bridge preservation could extend their lives to 75 years. Bridge preservation funds can also reduce the proportion of structurally deficient bridges over the medium to long term. By delaying the time to more serious deficiencies, bridge preservation activities are also good for the economy. As bridges become more deficient, they need to be shut down for longer periods for repair. Preservation activities keep bridges in good condition longer, meaning fewer shutdowns are required, and traffic flow is increased overall.

Minimizing the indirect cost of highway maintenance

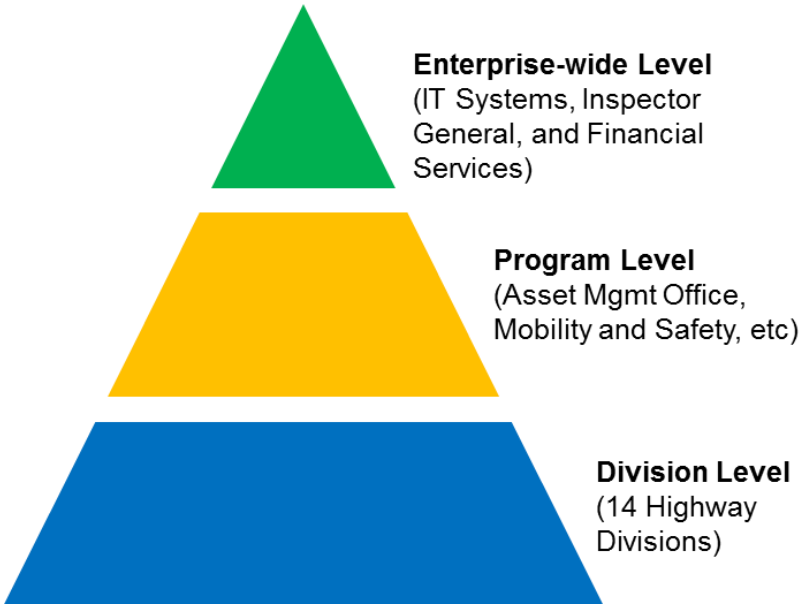
In order to better understand the breakdown between direct and indirect costs of delivering highway maintenance and operations activities, we have undertaken a number of initiatives. Collectively, these analyses represent but a first step towards better understanding our cost structure.

We have conducted an analysis of the way we allocate indirect costs attributable to delivering highway maintenance and operations activities. This analysis evaluated current allocation processes and, based on leading practices from other DOTs, assessed the extent to which we may not be fully accounting for indirect costs related to our highway maintenance and operations activities. In addition, we defined which maintenance activities, within Divisions, we consider to be indirect activities. Previously, these costs were recorded in one cost center (called "OneDOT"). Starting this fiscal year, indirect activities will no longer be charged as one rolled-up cost to OneDOT.

Altogether, these analyses defined three types of indirect costs related to our delivery of highway maintenance services:

- Division costs, Program-level costs, and Enterprise-wide costs.
- Division indirect costs refer to the costs associated with indirect activities performed by the 14 Highway Divisions.
- Program-level costs refer to departmental level indirect costs support specific departments and areas within NCDOT related to highway maintenance (e.g., State Asset Management, Mobility and Safety, etc.).

Figure 8-1. Types of Indirect Highway Maintenance Costs



- Enterprise-wide costs are defined as organization-wide indirect costs supporting NCDOT as a whole. These costs are "overheads" and include items like information technology and legal services.

Examples of each are detailed below; a detailed breakdown of the key indirect costs across these levels is detailed in Figure 8-2.

- **Indirect Division Costs – 129 Activities (Across the 14 Highway Divisions – O&M Only)**
  - Inspections and surveys
  - Office engineering
  - Training – leadership, safety, and technical
  - Drug and Alcohol testing
- **Indirect Program Costs – 19 Cost Centers (Across the Division of Highways)**
  - Mobility and Safety
  - State Asset Management
  - Materials and Testing
- **Enterprise-Wide Costs – 6 Cost Centers (Across all of NCDOT)**
  - Information technology systems
  - Inspector General
  - Financial services / accounting

Figure 8-2. Breakdown of Top Indirect Costs

Due to the nature of current time reporting – data is not perfectly accurate – as well as how indirect costs are catalogued and tracked across the organization, the figure reported above represents an estimate, and is more appropriately referred to as a range rather than a single, fixed value. When combined and fully allocated, indirect costs represent approximately 10-15% of our FY14 spending on delivering highway maintenance and operations activiites. At the Division level, costs of indirect activites alone (excluding program and enterprise-wide costs) range from 4-8%. To improve upon this variability between Divisions, as well as to increase the quality of the data reported at all cost levels, we will be undertaking a series of further initiatives. These will include activities such as:

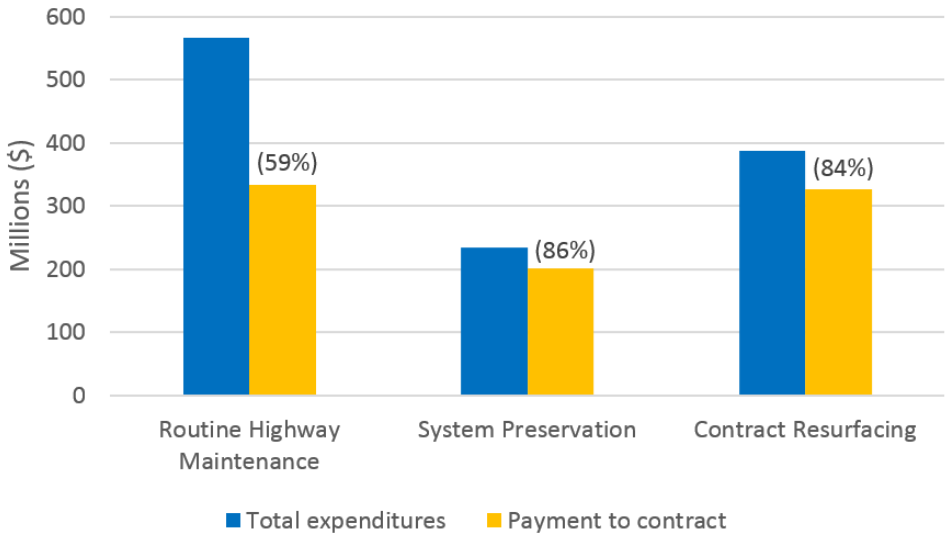
- Conducting a time study (investigating charging patterns and simplifying time coding processes);
- Consider developing a formal cost allocation plan that incorporates all three levels of costs; and

Collectively these efforts will help us to better understand our business performance and become a more efficient organization, driving increased value for money in the key activities which we deliver.

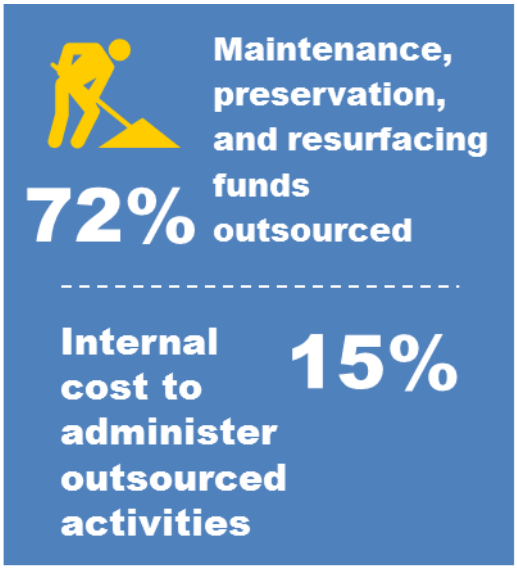
Efficient staffing levels, distribution and structure

Our staff is fundamental to delivering our maintenance and operations. Their detailed knowledge of local conditions and causes associated with asset deterioration help ensure we choose the right treatments at the right time.

Figure 8-2. FY14 Amount of funds outsourced



In recent years, we have begun contracting out more of the work we do, and changing the way we use our staff, in order to make more efficient use of our available resources. Figure 8-2 identifies the maintenance we contract out. It adds up to 72% of our total funds. Outsourcing is most cost effective when we do not have the requisite skills in-house, or when work is sporadic. We have also established a framework for sharing staff across Divisions, which helps to ensure that our staff's skills are fully utilized.



Changes in the industry have also required that we work differently. For example, more stringent safety standards mean that more staff is required for traffic control; road users expect not to be inconvenienced during the day, so we have increased our night-time operations.

We need to be flexible enough to respond to increases and reductions in funding, redistributing resources to geographic areas and asset types where the need is greatest. Over the next six months, we are committed to conduct a detailed staffing study that evaluates the number and distribution of staff needs for our current and future maintenance and operations.

As part of this staffing study, we will:

- **Align the number of staff with current and expected maintenance and operations activities.** For the variety and quantity of activities we do, we will assess efficient crew sizes, supervisors and other administrative and supporting functions in each Division. We

will also evaluate the structure of our Divisions. As the Divisions have outsourced more and more, staffing requirements have shifted. Given the large volume of outsourcing and position reductions that has occurred over the past 10 years, it may be more efficient to redistribute resources. Some employees may transition to contract administrators.

- **Explore two main delivery mechanisms for maintenance and operations activities**: in-house and outsourcing. Both of these alternatives carry certain risks, costs, and benefits, and we will evaluate each in turn. The cost and staffing structures for these alternatives differ significantly; typically, 15% of the value of the contract is required to fund the management and administration of an outsourced contract. We currently spend 72% of our maintenance funds on outsourcing. We will assess the risks, costs, and benefits of delivering the program through contractors. If we choose to outsource more of our maintenance and operations activities, we must maintain the quality of work on the state highway network. We will investigate the resources required to do this well.
- **Consider variability and seasonality of work**. Variable and seasonal work can leave staff and vehicles under-utilized and in some situations over-utilized. Where contractors are available, outsourcing can be a good delivery option for variable work.

This evaluation process includes setting a *baseline* for the number of maintenance and operations staff required under expected funding. Based on the lane-miles and cycles of maintenance we have prioritized and can afford to do, we are establishing the required crew sizes, number of crews, supervisors, and support and administrative staff required to undertake this work. We will report on these optimal crew sizes and structures at Division level, and will recommend redistributions as appropriate.

Our current staff numbers are shown in Table 8-2. In previous years, staff numbers have been cut according to the number of vacancies; however, this approach has left us with a suboptimal staffing structure. As a starting point to examining staffing efficiency, we have identified the number of lane-miles per staff member, as shown below, and discussed reasons for differences between Divisions with Division Engineers. Although this assessment extends to all employees, and not only those involved in maintenance and operations, it is the beginning of a dialogue about what is required and how Divisions can be more efficient in their delivery.

Table 8-2 shows that for Divisions that manage fewer lane-miles per employee, such as Division 1, the area covered by each employee is greater. For other Divisions that cover fewer lane-miles per employee, such as 13 and 14, more staff are required regardless of the metric because of both high levels of snow, which requires significant resources to manage, and because of the mountainous terrain, which takes longer to travel. The number of division positions shown below includes construction, maintenance, and operations employees.

Table 8-2 Division staffing levels

Division	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Avg	Total
2004 Positions	646	622	622	644	733	611	604	617	542	662	700	603	606	652	633	8,864
2014 Positions	555	530	526	557	643	522	525	536	455	557	590	479	534	587	543	7,596
2014 Filled Positions	515	443	446	531	565	477	452	494	428	469	516	437	507	560	489	6,840
Vacancy rate (%)	7	16	15	5	12	9	14	8	6	16	13	9	5	5	10	
L-M/ employee	18	19	22	24	22	25	22	26	24	20	19	26	19	16	22	
Population served/position	475	941	1314	1055	2257	1303	1731	969	1644	2588	632	1549	942	609	1286	
Area served /position (S.M.)	8	8	8	6	5	8	5	8	5	4	6	5	6	7	6	

We have already begun assessing staffing for fleet and equipment maintenance.[3] Overall we have found there is inadequate staff to maintain our current fleet and facilities. Divisions are developing strategies to address reallocation of resources to right-size shops with some shops being closed and consolidated. Similar analysis will be extended to other maintenance and operations activities.

Fleet utilization

Since 2010, in order to maintain an efficient fleet, we have been assessing how fully our vehicle and equipment fleet is utilized. We conduct our studies biannually to identify under-utilized vehicles and equipment. As part of these studies, we assess whether it is most economic for underutilized equipment to be designated as available for sharing with other Divisions, or sold. In many instances, we have chosen to rent equipment rather than maintain our own.

As part of this initiative, we identify, analysis, and justify vehicles and equipment that have a utilization less than 20%. Within our current fleet we have designated 485 pieces of vehicles and equipment as available for sharing or transfer to other Divisions, and approximately 150 pieces of vehicles and equipment for sale. We are selling more equipment than we are buying and sing alternative arrangements for our equipment needs such as rental agreements.

[3] Refer NCDOT Statewide VERT VEU Complement

9 Prioritizing Funds

In the past two years, we have made significant improvements in our allocation process starting from allocating funds to our field forces primarily based on asset inventory and historical expenditures, to a method of calculating needs to determine our budgets. This needs based budgeting analysis is based on detailed information on the condition of our highway assets and historic expenditures. Using this analysis, we can calculate the costs to maintain the condition of our assets well into the future.

The average annual cost to meet and sustain established performance standards for the state highway system is defined as the funding need. For 2015 the funding allocation is $1.122 billion. In addition to state funding, in FY 2015 we received $191 million in federal aid for our bridge program and $91 million for interstate maintenance, bringing our total funding to $1.404 billion. The total investment required (needed to meet and sustain our targets) of $1.870 billion is approximately 30% greater than the $1.404 billion total that was allocated to highway maintenance in 2015. The details of this are shown in Table 9-1.

Table 9-1. Comparison of Funding Need to FY 2015 Allocation

Categories:	Need	State Allocation	Federal Allocation	Impact[4]
i. Contract resurfacing (Primary and Secondary)	**$411,480,000**	**$408,173,000**		Currently fully funded
Interstate pavement resurfacing	**$101,000,000**		**$91,000,000**	
ii. Pavement preservation	**$100,947,000**	**$65,045,000**		Pavement lives will shorten, condition visibly degrading in next 4-5 years
iii. Routine highway, bridge and pavement maintenance, and culverts	**$899, 127,000**	**$439,413,000**		Targets continue not to be met. Targets and priorities to be reviewed to optimize current funding levels and enable consistent application across the State.
Primary[5]	$456,514,000	$154,626,000		
Secondary[6]	$442,613,000	$284,796,000		
iv. Disasters and emergencies	**$74,133,000**	**$56,500,000**		Shortfalls will be addressed using routine maintenance funds. Further reducing the abilities to meet targets.
Primary	$43,443,000	$33,118,000		
Secondary	$30,670,000	$23,382,000		
v. Structurally sound bridge preservation	**$60,000,000**	**Note[7]**		
Primary	$48.000,000			

[4]These performance indicators are under further development and will be measured and reported in future reports
[5] Includes a proportion of General Maintenance Reserve
[6] Includes a proportion of General Maintenance Reserve
[7] Allow bridge program funding to be used for sound bridge preservation. Bridge funds needed are in addition to those provided in the STI.

Categories:	Need	State Allocation	Federal Allocation	Impact[4]
Secondary	$12,000,000			
vi. Structurally unsound bridge rehabilitation, repair or replacement.	**$325,000,000**	**$153,008,000**	**$191,000.000**	More of our bridges will become structurally deficient as they exceed their average replacement age at higher rates than previously seen
Primary	$195,000,000	$91,805,000		
Secondary	$130,000,000	$61,203,000		
Total	**$1,870,668,000**	**$1,122,139,000**	**$282,000,000**	

NCDOT has identified several priorities for maintenance and operations. These priorities align with the Department's strategic goals and include: Safety, Effective maintenance of our pavement, bridge, and drainage assets, and efficient movement of people and goods. At this time, the Department is identifying the individual work activities that drive each priority.

Our current priorities are to fund the bridge program and pavement preservation. At current and projected conditions, these investments will have the most significant impacts on the safety, movement efficiency, longevity, and economic efficiency of our state highway system. Although our needs are furthest from allocation in the routine maintenance funding program, these activities do not have as strong an influence on our goals at this time.

The guiding principles by which we would ideally prioritize our allocations and work activities are as follows:

- Activities required to meet each executive performance measure.
- Activities required to meet higher priority goals. The goals, in order of priority, are: 1) Make our transportation network safer; 2) Make our transportation network move people and goods more efficiently; 3) Make our infrastructure last longer; 4) Make our organization a place that works well.
- Activities that achieve a greater gain in executive performance measures (i.e., up to the target) for a lower cost take priority over activities that achieve a lower gain in the same measure (i.e., the more cost-effective activities take priority). For activities that contribute to more than one executive performance measure may have a higher priority.
- For executive performance metrics that are not currently meeting target and are trending further away from target, the activities that will reverse the trend take priority over activities that will not reverse the trend. Also, activities that improve these executive performance metrics will take priority over activities that contribute primarily to executive performance measures that are trending upwards – particularly if those targets are already being met.
- Lastly, activity priorities are also influenced by other factors, e.g., statutory requirements, and local community needs.

Over the next several years this report section will evolve to clearly show the impact of shifting funds from one activity to another and how those changes influence NCDOT's goals. This will be based on the ability of each activity to influence NCDOT's goals and executive performance measures.

Table 9-2 below presents NCDOT's key funding areas. The table has been populated with allocation data that identifies which funding program would be reduced or increased based on appropriation changes. The proposed changes are based on the identified priorities and maximize the Department's ability to provide a safe, reliable, and economically effective state highway system.

Table 9-2. Maintenance and Operations Priorities – Proposed adjustments for possible appropriation changes

Budget scenario	Contract resurfacing	Pavement preservation	Routine highway maintenance	Disasters and emergencies	Structurally unsound bridge maintenance	Impact on delivery
+$700M **(Full needs)**	10M	35M	465M	20M	170M	Fully funds our pavement resurfacing, preservation and bridge, and routine highway maintenance
+$600M	10M	35M	365M	20M	170M	Fully funds our pavement resurfacing, preservation, and bridge
+$400M	10M	35M	165M	20M	170M	Fully funds our pavement resurfacing, preservation, and bridge
+$200M	10M	35M	35M	20M	100M	Fully funds our pavement resurfacing and preservation
Current funding levels						
-$100M	-75M		-25M			
-$200M	-75M		-75M		-50M	
-$300M	-100M		-150M		-50M	
Priority	6	2	5	1	3	
Reason for priority	A small additional amount is required in resurfacing to meet and sustain pavement condition targets.	Pavement condition is furthest from target. Funding required to extend pavement lives.	Although our safety and drainage assets are generally meeting target, more funding is required for routine pavement maintenance and some safety assets.	We respond to disasters and emergencies as our number one priority to keep North Carolinians safe and to keep the economy moving.	Large looming increase in the number of structurally unsound bridges.	

Our proposed adjustments for any appropriation changes are for FY15 only. Note that federal funding for bridges in FY15 is $182 million, but this amount is due to reduce to $100 million in FY16, $75 million in FY17, and $50 million between FY17 and FY20. In the future, if our state funding for bridges remains static, the table above will be adjusted to put a greater share of the state appropriations to the bridge program.

10 Key Findings and Future Actions

Table 10-1. Summary of Observations and Recommendations

Goal	Observations	Recommendations
Safety	Fatalities and injuries The number of fatalities and injuries has reduced by 18% and 23% since 2000. This substantial improvement is in part due to spot safety program.	Continue to fund spot safety program.
Moving people and goods more efficiently	Accident clearance time Our accident clearance process is improving, largely due to better coordination with local law enforcement and emergency operation centers.	Continue coordinating with emergency services.
	Congestion The amount of time North Carolinians spend in traffic has been reducing, in part due to the interstate improvement projects.	To further reduce congestion, consider funding the spot congestion program.
Longer Lasting Infrastructure	Aging bridge network Over the next seven years, 2261 bridges with a replacement cost of $5.4 billion will reach the historic average replacement age of 60 years. Repair, rehabilitation and replacement of these bridges is expected to cost at least $385 million per year over the next seven years - $232 million more than our expected annual combined federal and state allocation for structurally unsound bridges. Otherwise, we will have to close or load restrict bridges, reducing network reliability and congestion.	Provide $385 million more for bridge replacements and rehabilitation.
	Preserving our pavement network Under current allocations, our pavement condition is expected to deteriorate significantly beginning in Year 5. This deterioration is largely due to our large volume of chipseal pavements for which pavement preservation funding is inadequate. At current condition levels, for every $1 we spend on contract resurfacing, we need to invest $0.25 in pavement preservation.	Provide an additional $35 million for pavement preservation. Maintain contract resurfacing at current levels.
	Our drainage assets, which are required to extend the lives of our pavements and bridges, are adequately funded and currently meeting targets.	
	Funding the maintenance and operations of new assets With a looming reduction in federal bridge funding and to ensure a sustainable network, the maintenance and operations budget must increase with the volume of assets and account for inflation.	Develop a policy in which STI and other capital projects are tied to an adequate increase in maintenance and operations funding.

Organization Working Well	Delivery We have an 100% delivery rate on our contract resurfacing and pavement preservation, and 93% bridge replacements and preservation.	Continue to adequately manage and resource these activities.
	Staff numbers and structure Staff numbers have been reduced by legislature mandating removing vacancies. As a result, current staffing numbers and structure within Divisions do not reflect the most efficient organizational structure.	Perform a detailed staffing study to calculate the base staff numbers in each Division from which we can then supplement with contract resources as needs fluctuate.
	Indirect costs We have identified a number of indirect costs and activities, the largest of which are agency-wide IT systems, assessments and inspections, and office engineering. We recognize that many of these costs are not “overheads” that can be reduced, but we are beginning to investigate, at a high level, areas for increased efficiency.	Perform a detailed study identifying areas for increased cost efficiency, and improved methods of accounting for indirect costs and activities.

The North Carolina highway network is becoming safer, with fatalities and injuries falling, accident clearance times improving and congestion times dropping. The condition of the network, however, continues to fall as well. Pavements and bridges are both currently below target and expected to fall even further over the next seven years.

Our most valuable physical asset, our pavements, will fail sooner than they have in the past due to a reduced prioritization of pavement preservation. Realizing the need for this function, the 2013-14 Legislature created a pavement preservation funding source. The funding level of $65 million is lower than needed to adequately maintain our good pavements. Funding for pavement preservation needs to be $103 million. Contract resurfacing is adequately funded at $408 million.

Current funding levels will not be adequate to replace the 2261 bridges that will reach their average replacement age over the same seven year period. Funding for bridge replacements needs to be increased by $385 million in order to stem the tide of bridges reaching their average replacement life.

Staffing numbers need to be evaluated to ensure appropriate staffing in each division. This review will also include an analysis of contract availability, temporary labor pools, and inmate labor.

All of our current and statewide executive performance measures are contained in the Statewide Dashboard in the Appendix.

Table 10-2 Future Actions

Page	Description	Plan/Schedule
6,7	Creation of a Transportation Asset Management Plan Develop a policy in which STI and other capital projects are tied to an adequate increase in maintenance and operations funding	Oct. 1, 2016
31	Perform a detailed study identifying areas for increased cost efficiency, and improved methods of accounting for indirect costs and activities Consider developing a formal cost allocation plan that incorporates all three levels of indirect costs Conducting a time study (investigating charging patterns and simplifying time coding processes, and crew productivity)	Develop a detail action plan by May 1, 2015

Page	Description	Plan/Schedule
28	Investigate reasons for differences in planned and actual accomplishments and implement action plan	May 1, 2015
29	Evaluate our standards based on their impact on the safety and economic efficiency of our transportation system	June 1, 2015
32, 33	Align the number of staff with current and expected maintenance and operations activities. Assess efficient crew sizes Explore two main delivery mechanisms for maintenance and operations activities: in-house and outsourcing	Part of staffing plan – Mar. 1, 2015

11 Appendices

- Legislative requirements – Where to find it
- Statewide Performance Dashboard
- Divisional Performance
  - **Dashboard**
  - **Pavements (including list of most deficient roads)**
  - **Bridges (including list of most deficient bridges)**
  - **Other Areas (Staffing and Indirect costs)**
- Calculating the cost of crashes

Legislative Requirements – Where to find it

The following table sets out where to find the specific legislative requirements this report is intended to address. In the timeframe available it has not been possible to fully address all the requirements but there are areas where this document goes further, including:

- **Aligning with NCDOT Goals –** To enable effective decision making we need to understand how maintenance and operations contribute to the goals of the organization. We have started the process of making this connection; and,
- **Connecting maintenance and capital investment –** Identifying where capital funding influences the cost of maintenance and operations.

Ref	Legislative Requirement	Section	Complete	Comment
1	(1) Annual cost to meet and sustain performance standards for the state highway system, delineated by costs to the primary or secondary system. Must be split to include the following categories of work:	9	Yes	
2	i. contract resurfacing			
3	ii. pavement preservation			
4	iii. routine highway maintenance			
5	iv. disasters and emergencies			
6	v. structurally sound bridge maintenance			
7	vi. structurally unsound bridge rehabilitation, repair, or replacement			
8	(2) Projected system condition and corresponding optimal funding requirements for a seven-year plan to sustain established performance standards.	7	Yes	*Also* continuously improving our projected system condition models and the way we calculate our needs.
9	The report shall also identify target levels of service for each maintenance activity	Appendix	Yes	(Ref “Our Standards for Meeting Goals”)
10	and assess performance by division including project delivery rates	Appendix	Yes	*Also* showing condition trends. (Ref “Divisional Dashboard”)
11	The report shall also…assess historical program performance	8 and Appendix	Partly	FY14 staffing and project delivery rates available.

Ref	Legislative Requirement	Section	Complete	Comment
	across divisions, including staffing.			***Future:*** Continue to report historic trends as data becomes available.
12	Direct and indirect costs	8 and Appendix	Partly	Current figure but not trend. ***Future****:* Perform a detailed study identifying areas for increased cost efficiency, and improved methods of accounting for indirect costs and activities. (See table 10-2)
13	Recommend resource allocations and distribution methods to achieve each target	8	Partly	Proposed investigations into staff numbers and overheads.
14	(3) Significant variations in condition among Divisions.	Appendix	Yes	Requires more interpretation around reasons for variation.(Ref “Division Dashboard”)
15	Examine how well Divisions do the following based on need: Streamline project delivery	Appendix	Partly	***Future***: Investigate reasons for differences in planned and actual accomplishments and implement action plan. (See table 10-2)
16	Project delivery rates	8	Yes	***Future:*** Investigate reasons for differences in planned and actual accomplishments and implement action plan. (See table 10-2)
17	Examine how well Divisions do the following based on need: Prioritize spending based on needs.	Appendix	Partly	Maintenance activity scores to determine if the right amount of activities on the right systems overall. ***Future***: Review division work plans to ensure priority needs are addressed
18	Make recommendations on how to improve these processes: Streamline project delivery, maximize efficiency, and prioritize spending based on need.	8	Partly	Have proposed detailed studies into staffing structure and overheads. ***Future***: Show approx. quantity of each maintenance and operations activity required to meet goals.
19	Analyze the cost of delivering maintenance by division (limited to pavements).	Appendix	Yes	Presented as Need per Division ***Future***: Investigate lower-cost delivery, materials, and timing.
20	(4) An assessment of the level of congestion throughout the primary system based on traffic data,	6	Yes	***Future:*** *Also* aim to report cost of delay.
21	ranking of most congested areas based on travel time reliability and average number of congested hours	6	Yes	
22	Recommendation for congestion reduction and mobility	6	Yes	***Future:*** *Also* aim to provide support (cost and benefit) for

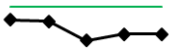
Ref	Legislative Requirement	Section	Complete	Comment
	improvement			recommendations.
23	(5) Recommend appropriate staffing levels.	8	No	***Future***: Detailed staffing investigation.
24	(6) A cross-divisional comparison summary document.	Appendix	Yes	(Ref “Divisional Dashboard”)

Statewide Performance Dashboard

The following statewide dashboard compiles the state-wide executive performance metrics that the Division of Highways influences through its maintenance and operations. The metrics are grouped by strategic goal. The dashboard shows five-year trends, where available, and identifies which objectives were met in 2014. This data was taken from NCDOT Annual Performance Reports except where otherwise noted.

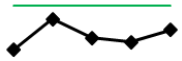
Overall, the reliability of our transportation system has improved substantially. However, the safety of our transportation system has remained relatively static, meeting target in some areas but not others. Although the condition of our bridges and pavements has improved slightly, we remain far from our targets; hence our focus on increasing funding for our bridge replacement and pavement preservation activities.

NCDOT Performance Measures and Historic Achievements by Goal

Performance Measure	Previous Period FY12 (unless stated)	Current Period FY13(unless otherwise stated)	Target	Target Met	Five-Year Trend 2009-2013 (unless otherwise stated)	Desired Trend	Commentary
Make transportation safer							
Statewide network crash rate. Rate of crashes per 100 million vehicle miles traveled.	230	237	234 or less	x			The safety of our networks has improved in terms of the fatality rate, but has remained relatively static in terms of crash rate.
Statewide network fatality rate. Rate of highway fatalities per 100 million vehicle miles traveled.	1.22	1.24	1.39 or less	✓			
Cost of crashes to North Carolina each year.	-	>$10. billion	-	-	New Measure		
Make our transportation network move people and goods more efficiently							
Average statewide accident clearance time.	62 min 2013	68 min 2014	70 min. or less	✓			We have a reliable and connected transportation system that continues to improve. We continue to reduce the time our road users are exposed to congestion.
Travel time index for surveyed interstates. Actual travel time compared to ideal travel time.	0.98	0.97 2014	1.02 or less	✓	 4 year trend		
Statewide congested hours (on highly traveled interstates).	6.5 hours per week (2013)						

Green Line is Target

NCDOT Performance Measures and Historic Achievements by Goal

Performance Measure	Previous Period	Current Period	Target	Target Met	Five-Year Trend	Desired Trend	Commentary
Make our infrastructure last longer							
Percentage of bridges rated in good condition.	64.9% 2013	68.6% 2014	75% or greater	x	 2010-2014 trend		The effectiveness with which we maintain our infrastructure has improved, with the percentages of bridges and pavements in good condition steadily increasing.
Percentage of pavement miles rated in good condition.	69.4% 2012	70.4% 2013	80% or greater[8]	x	 2010-2014 trend		
[9]Average highway feature condition score (excluding pavement and bridges).	87.1 2010	89.7 2012	84 or greater	✓	Info not sufficient		
Make our organization a place that works well							
Percentage of the overall budget for administrative costs.	5.5%	5.3%	7.6% or less	✓			The effectiveness and efficiency with which we deliver and maintain our infrastructure is improving, only missing target for the STIP projects let on schedule. Our administrative costs are low and continue to reduce.

Green Line is Target

[8] Target is lane-mile and vehicle-mile travelled weighted average of interstate, primary and secondary systems. Targets are: Interstate: >=85% good, ; Primary >=80% good, ; Secondary >=70% good,
[9]Scores produced biannually.

Division Performance

To ensure that Division funding will result in relatively consistent performance across the states, we have also assessed performance and projections at Division level. Division level reporting also helps to identify specific areas where further investment may be required, and to identify highly efficient practices in some Divisions that may be shared across others. A Division level dashboard is provided below, with more detail on past and future asset performance.

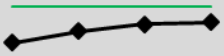
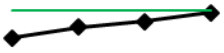
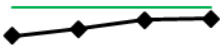
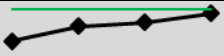
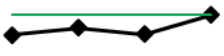
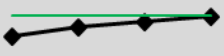
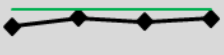
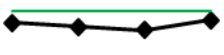
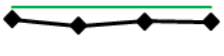
The dashboard shows that in two-thirds of Divisions, the Infrastructure Health Index (IHI), a combined performance measure for pavements, bridges, and roadway assets, has been steadily increasing since 2008, but is beginning to level out short of target levels. This leveling out of performance may soon lead to a deterioration in condition. To meet and sustain established performance standards, additional investment of up to $587 million may be required over the next seven years (dependent on federal funding levels).

The Division level dashboard shows the proportion of pavements and bridges currently in poor condition or structurally deficient, the historic IHI, and projected IHI given current funding levels. In addition, the dashboard shows each Division's full needs, and the quantity of work accomplished in the previous financial year. Finally, the dashboard compares staffing levels and indirect costs across Divisions.

The Division-level information on the following pages include:

- Safety Statistics
- Pavements – Condition, expected performance and most deficient segments
- Bridges – Condition, expected performance and most deficient segments
- Delivery and efficiency statistics
- The Division Dashboard

Division Dashboard – Overall Performance (Green Line = Target)

Div.	Bridges structurally deficient 2013	Pavements poor 2013	Infrastructure Health Index (IHI) 2008-2014	Allocated budget FY15 ($M)	Projected IHI With Current Funding 2015-2021	Projected IHI Trend
1	15%	11%		65.0		
2	14%	15%		67.0		
3	20%	12%		78.8		
4	10%	6%		75.1		
5	9%	11%		85.6		
6	16%	5%		73.1		
7	18%	8%		76.9		
8	9%	6%		71.9		
9	19%	9%		67.6		
10	14%	10%		78.2		
11	24%	10%		65.4		
12	13%	10%		68.7		
13	17%	9%		66.5		
14	20%	12%		77.0		
SW	16%	9%		1016.8[10]		

[10] Does not include statewide off-the-top allocation.

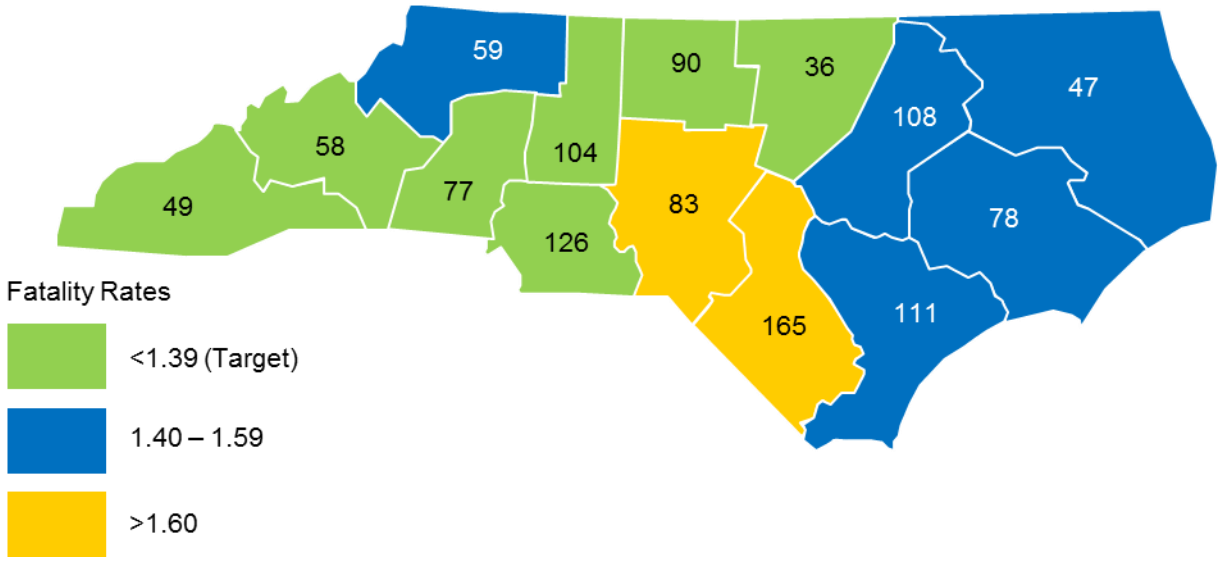
Division Dashboard

Div.	Need($m) 7-year avg to meet performance targets	Need/ lane-mile ($'000)	2014 Accomplishments (lane miles, number of bridges)			Lane Miles/ Employee	Indirect costs[11]
			Resurf.	**Preserv.**	**Bridge.**		
1	131	12.3	359	14	21	18	8.1%
2	113	11.7	457	130	25	19	7.4%
3	149	12.8	335	239	5	22	7.9%
4	141	10.2	540	236	23	24	8.2%
5	152	10.1	500	326	16	22	7.1%
6	130	10.2	342	4.4	22	25	4.5%
7	148	12.0	390	96	18	22	7.8%
8	134	9.7	432	145	22	26	6.5%
9	129	11.8	167	244	16	24	8.8%
10	150	12.8	213	37	22	20	6.5%
11	109	10.0	253	187	6	19	4.7%
12	124	10.1	565	386	9	26	8.8%
13	123	12.8	242	184	8	19	4.8%
14	140	15.0	195	155	17	16	4.7%
SW	1,873	11.4	4,991	2,345	230		

[11] % of costs not directly attributable to the maintenance activity

Division Performance – Crashes and Fatalities

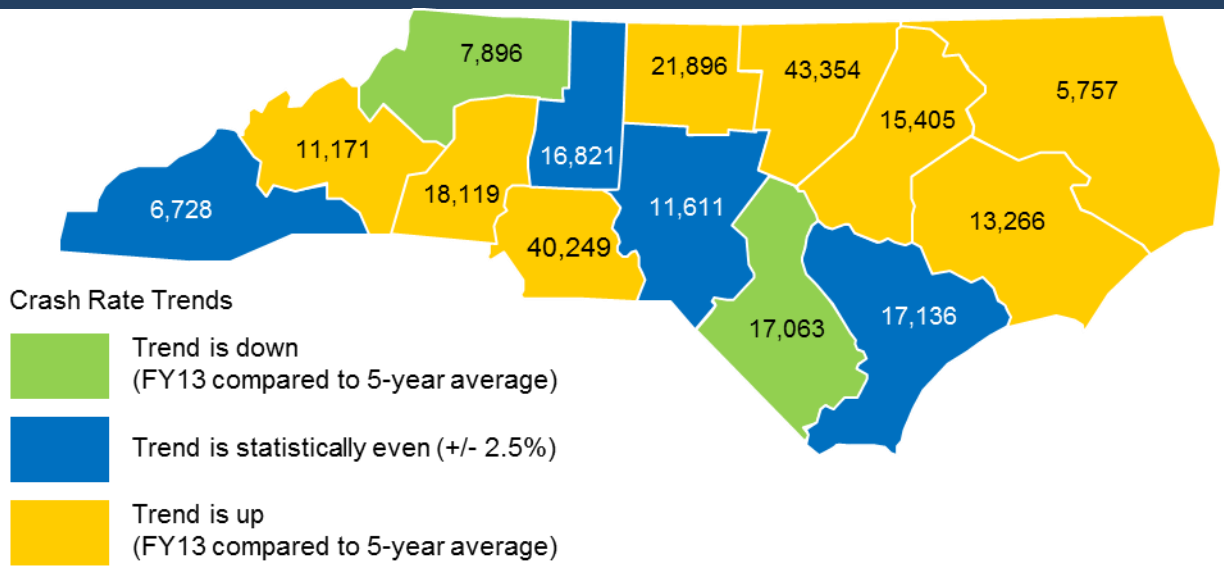
Fatality Numbers and Rate



Color coding indicates: Fatality Rate for 2013 (calendar year), Target rate (fatalities per 1 million vehicle miles travelled) = 1.39 or less.

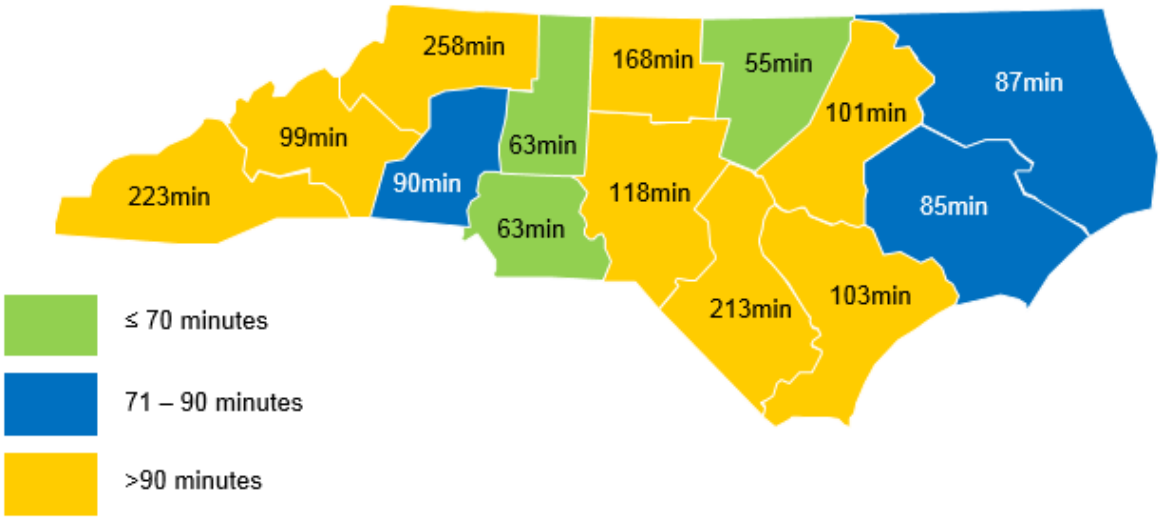
Number indicates – Total number of fatalities (2013)

Crash Numbers and rate trend



Number indicates – Total number of crashes (2013)

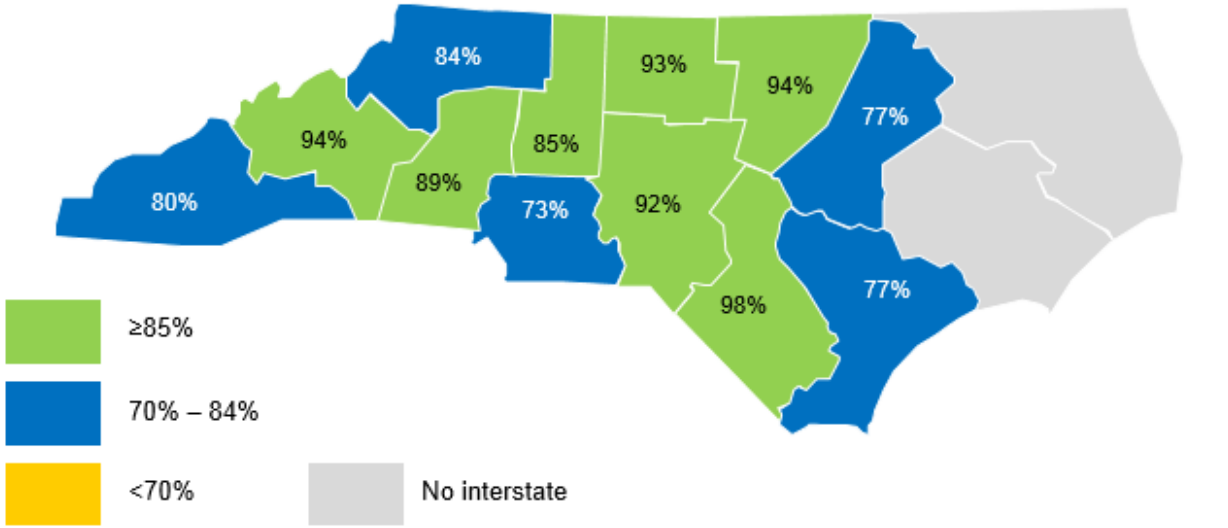
Average Accident Clearance Time



July 2013 – June 2014, Target Clearance Time = 70 Minutes.

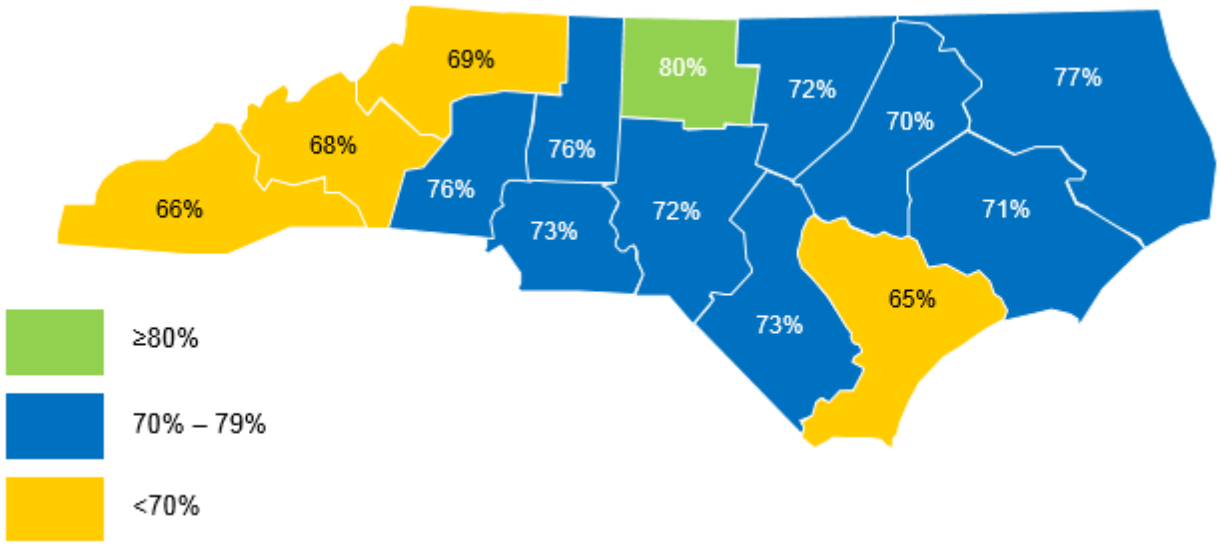
Division Performance - Pavements

Pavement Condition – Interstate



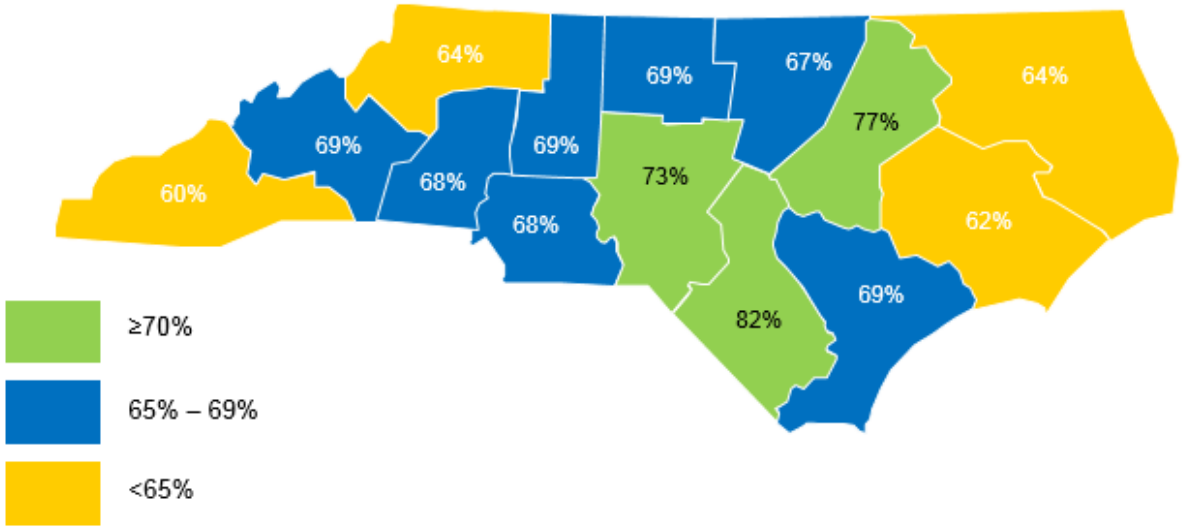
Percentage of pavement miles in good condition (as at October 2014), Target percentage = 85%.
Note: Division 1 interstate miles are maintained by Division 4

Pavement Condition – Primary (excluding interstates)



Percentage of pavement miles in good condition (as at October 2014), Target percentage = 80%.

Pavement Condition - Secondary

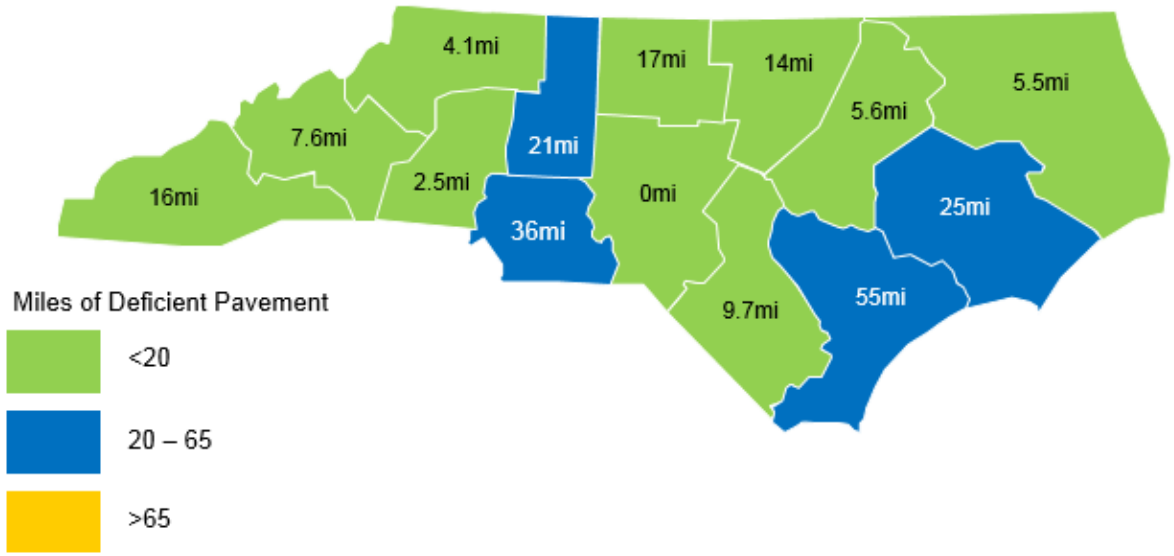


Percentage of pavement miles in good condition (as at October 2014), Target percentage = 70%.

Miles of Most Deficient Pavements (by Division)

Most deficient route: route that has a composite score of less than 60. A route in this condition might have the following characteristics; light severity transverse cracking, light severity rutting, light severity patching and approximately 50% of the surface will have light to moderate severity alligator cracking.

Miles of Most Deficient Pavement per Division (Routes with >15,000 AADT for SR routes only)



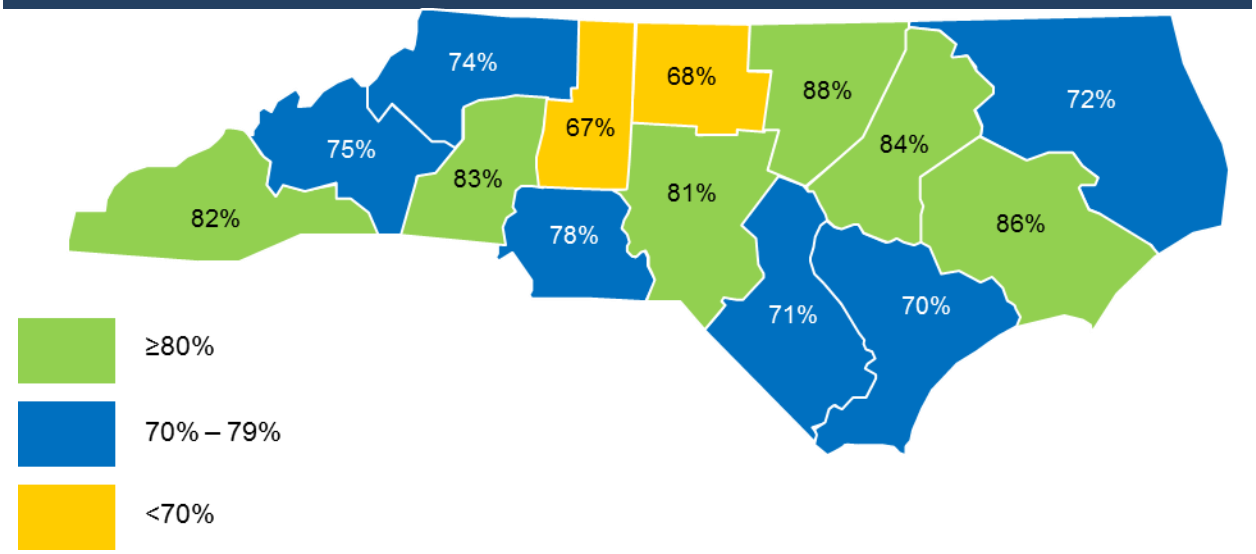
Most Deficient Pavement Sections – By Division

Division	County	System	Route	Length (miles)	Surface Material
1	021-Chowan	Primary	NC 32	3.361	Concrete
1	028-Dare	Primary	NC 400	0.870	Asphalt
1	028-Dare	Primary	NC 400 Connector	0.130	Asphalt
1	094-Washington	Primary	NC 149	1.170	Asphalt
2	007-Beaufort	Primary	NC 171	3.990	Asphalt
2	007-Beaufort	Secondary	SR 1306	1.844	Asphalt
2	007-Beaufort	Primary	US 17 Bus	6.037	Asphalt
2	025-Craven	Primary	NC 41	0.310	Asphalt
2	074-Pitt	Primary	NC 222	13.045	Asphalt
3	031-Duplin	Primary	NC 24 Bus	4.132	Asphalt
3	031-Duplin	Primary	US 117 Alt	2.227	Asphalt
3	065-New Hanover	Secondary	SR 1175	5.893	Asphalt
3	065-New Hanover	Secondary	SR 1595	0.403	Asphalt
3	067-Onslow	Primary	NC 172	7.727	Asphalt
3	082-Sampson	Primary	US 701	34.826	Asphalt
4	064-Nash	Primary	NC 43 Bus	0.250	Asphalt
4	064-Nash	Primary	NC 98	1.630	Asphalt
4	096-Wayne	Secondary	SR 1565	2.590	Asphalt
4	096-Wayne	Secondary	SR 1900	1.160	Asphalt
5	035-Franklin	Primary	NC 97	0.884	Asphalt
5	039-Granville	Primary	US 158 Bus	3.741	Asphalt

Division	County	System	Route	Length (miles)	Surface Material
5	092-Wake	Secondary	SR 1892	0.938	Asphalt
5	092-Wake	Secondary	SR 2538	1.854	Asphalt
5	092-Wake	Secondary	SR 2911	3.546	Asphalt
5	092-Wake	Secondary	SR 3007	1.445	Asphalt
5	092-Wake	Secondary	SR 3555	1.235	Asphalt
5	092-Wake	Secondary	SR 5233	1.002	Asphalt
6	024-Columbus	Primary	US 701 Bus	6.736	Asphalt
6	026-Cumberland	Secondary	SR 1415	2.979	Asphalt
7	041-Guilford	Primary	NC 22	1.064	Asphalt
7	041-Guilford	Secondary	SR 1300	6.093	Asphalt
7	041-Guilford	Secondary	SR 3163	2.277	Asphalt
7	041-Guilford	Secondary	SR 4121	8.080	Asphalt
9	029-Davidson	Primary	NC 68	1.825	Asphalt
9	029-Davidson	Primary	US 29	0.368	Concrete
9	034-Forsyth	Secondary	SR 1892	0.213	Asphalt
9	034-Forsyth	Secondary	SR 3938	0.259	Asphalt
9	034-Forsyth	Secondary	SR 4000	5.368	Asphalt
9	034-Forsyth	Secondary	SR 4309	1.428	Asphalt
9	034-Forsyth	Secondary	SR 4315	11.828	Asphalt
10	013-Cabarrus	Secondary	SR 1394	9.421	Asphalt
10	013-Cabarrus	Secondary	SR 1680	0.649	Asphalt
10	060-Mecklenburg	Primary	I-277	2.726	Concrete
10	060-Mecklenburg	Primary	NC 16	1.000	Concrete
10	060-Mecklenburg	Secondary	SR 1441	1.444	Asphalt
10	060-Mecklenburg	Secondary	SR 2108	3.442	Asphalt
10	060-Mecklenburg	Secondary	SR 2472	2.515	Asphalt
10	060-Mecklenburg	Secondary	SR 2540	4.272	Asphalt
10	060-Mecklenburg	Secondary	SR 2935	3.262	Asphalt
10	060-Mecklenburg	Secondary	SR 3300	2.578	Asphalt
10	060-Mecklenburg	Secondary	SR 3585	2.580	Asphalt
10	060-Mecklenburg	Secondary	SR 3640	0.208	Asphalt
10	060-Mecklenburg	Secondary	SR 3815	1.588	Asphalt
10	060-Mecklenburg	Secondary	SR 4904	0.140	Asphalt
10	084-Stanly	Secondary	SR 1474	0.637	Asphalt
11	086-Surry	Primary	US 601 Bus	4.113	Asphalt
12	023-Cleveland	Primary	NC 120	0.105	Asphalt
12	049-Iredell	Primary	I-40	2.431	Concrete
13	011-Buncombe	Primary	I-240	3.145	Concrete
13	011-Buncombe	Primary	I-26	3.402	Concrete
13	011-Buncombe	Secondary	SR 1674	1.064	Asphalt
14	045-Henderson	Primary	I-26	9.742	Concrete
14	088-Transylvania	Primary	US 178	6.713	Asphalt

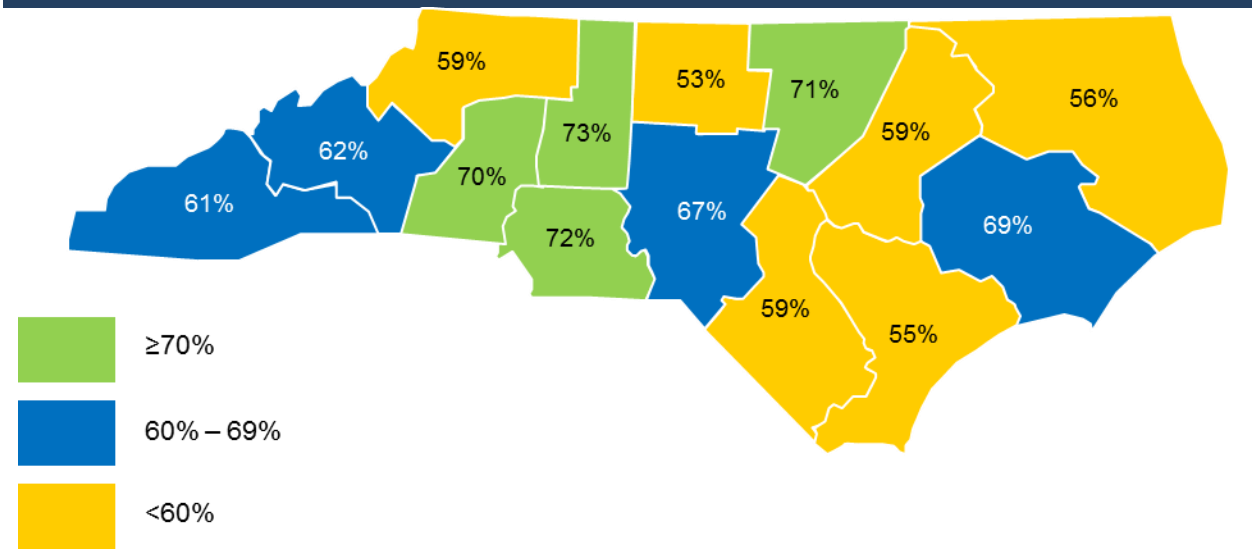
Division Performance – Bridges

Bridges - Primary (Including Interstate)



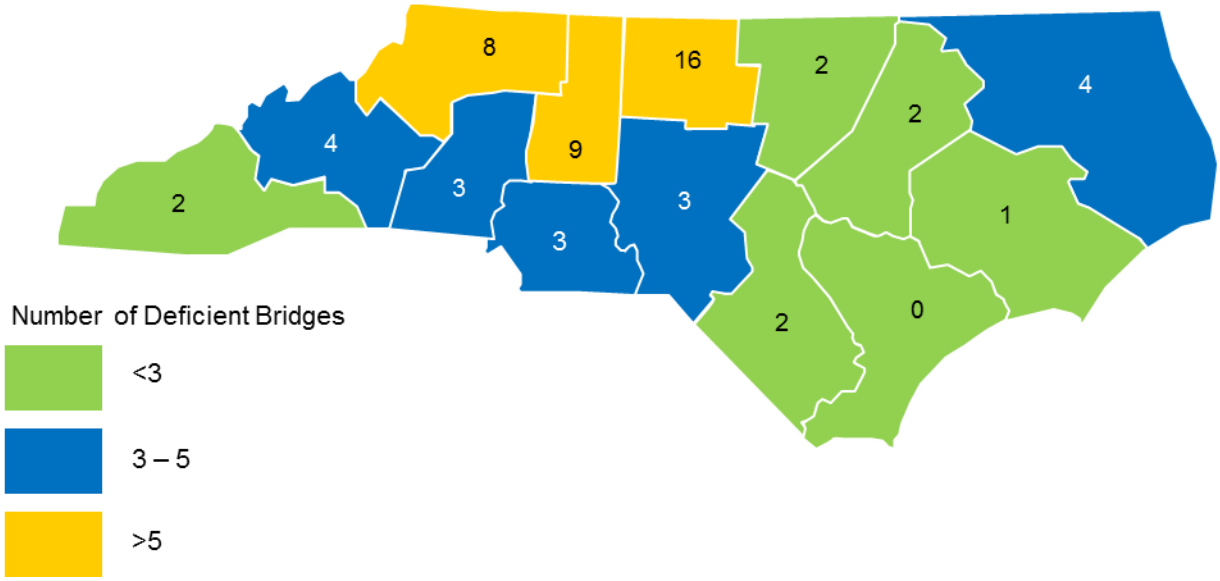
Percentage of bridges in good condition (as at October 2014), Target percentage = 80%.

Bridges – Secondary

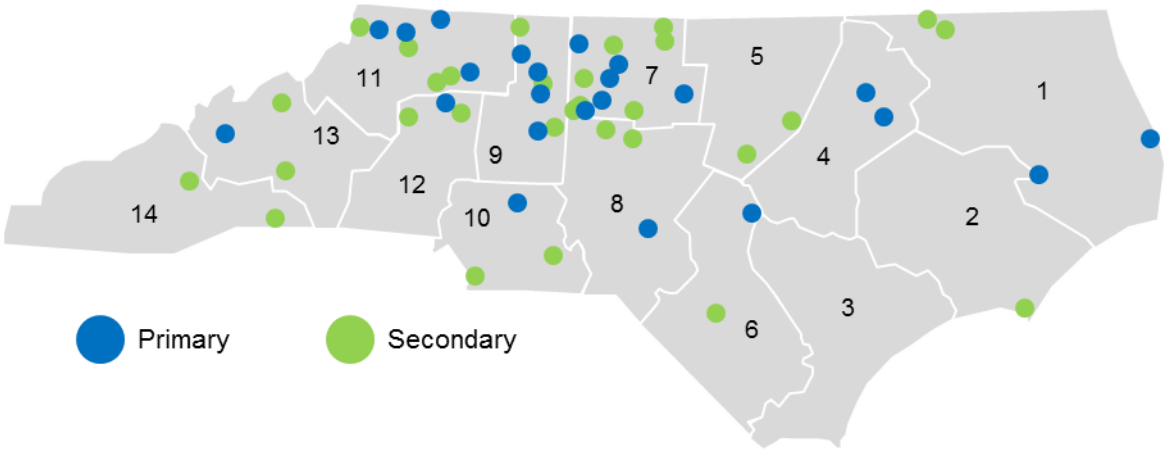


Percentage of bridges in good condition (as at October 2014), Target percentage = 70%.

Most Deficient Bridges (by Division)



Bridge locations:



A bridge is considered “structurally deficient” if one of the three primary components is found to be in poor condition or worse. For the most deficient bridges, listed below, all three of the primary components are in poor condition or worse.

Most Deficient Bridges – By Division

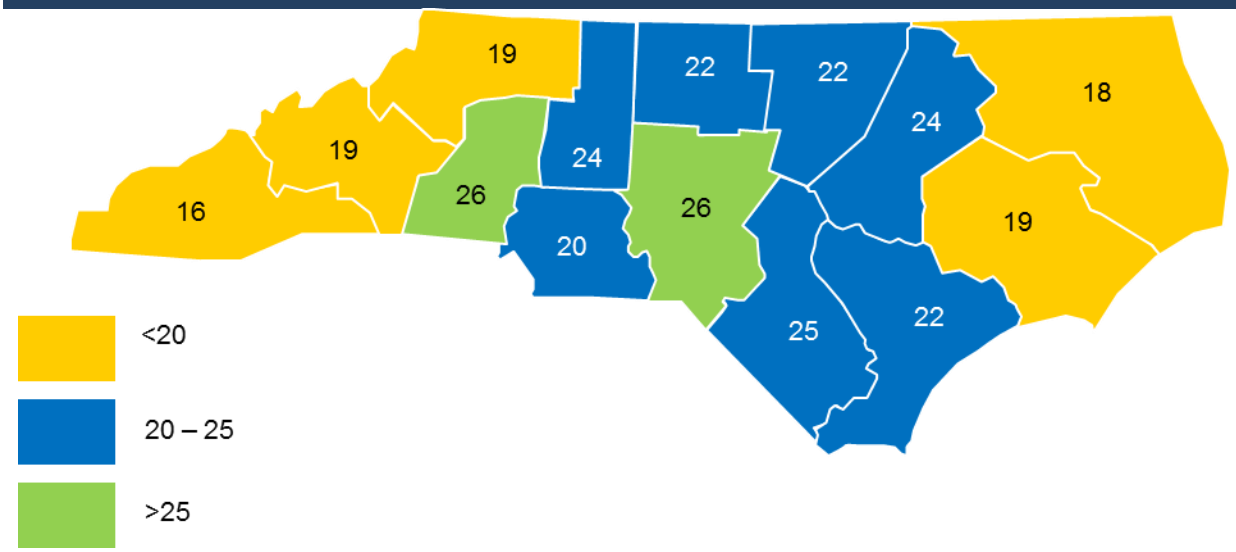
ID	Div.	County	Route	Crossing
1	1	HERTFORD	SR1300	TURKEY CREEK
2	1	DARE	NC12	OREGON INLET
3	1	HYDE	US264	BURGESS MILL CREEK
4	1	NORTHAMPTON	SR1339	MEHERRIN RIVER
5	2	CARTERET	SR1335	THE STRAITS
6	4	EDGECOMBE	US64 ALT.	HARTS MILL RUN
7	4	NASH	US301	SWIFT CREEK

ID	Div.	County	Route	Crossing
8	5	WAKE	SR2782	ECHO CREEK
9	5	WAKE	SR1001	MOCASSIN CREEK
10	6	ROBESON	SR1955	TEN MILE SWAMP
11	6	HARNETT	SR1808	I95
12	7	CASWELL	SR1523	N.FORK RATTLESNAKE CRK.
13	7	ALAMANCE	SR1124	N.PRONG STINKING QTR.CR.
14	7	CASWELL	SR1780	COUNTRY LINE CREEK
15	7	GUILFORD	SR2128	REEDY FORK CREEK
16	7	GUILFORD	SR1523	DEEP RIVER
17	7	GUILFORD	US29,70,I85BUS LP.	DEEP RIVER
18	7	GUILFORD	US29,70,I85BUS.LP.	DEEP RIVER
19	7	GUILFORD	SR1486	BOULDIN BRANCH
20	7	ROCKINGHAM	US29 BUS.	US29
21	7	ROCKINGHAM	US311	REED CREEK
22	7	ORANGE	US70	ENO RIVER
23	7	ROCKINGHAM	SR1998	S. PRONG TERRY'S CREEK
24	7	GUILFORD	I40,I85BUS.RMP WBL	US29, US70 & US220 NBL
25	7	GUILFORD	WILLOW ROAD	I40, I85 BUS.
26	7	GUILFORD	SR1970	SOUTHERN RAILWAY
27	7	GUILFORD	SR4771	US29
28	8	RANDOLPH	SR2106	LITTLE POLECAT CREEK
29	8	CHATHAM	SR1303	PRONG OF ROCKY RIVER
30	8	MOORE	NC22	NICKS CREEK
31	9	DAVIDSON	SR2160	BRANCH OF HAMBY CREEK
32	9	STOKES	SR1402	BIG CREEK
33	9	DAVIDSON	NC8	US29&70/I85BUS. LOOP
34	9	FORSYTH	I40 BUS	SR4315(LIBERTY ST)
35	9	FORSYTH	SR1725	I40 BUS
36	9	FORSYTH	CHURCH ST	I40 BUS
37	9	FORSYTH	SR2264	NORFOLK & WESTERN RR
38	9	FORSYTH	NC8	LICK FORK CREEK
39	9	STOKES	US52 NBL	LITTLE YADKIN RIVER
40	10	ANSON	SR1639	JACKS BRANCH
41	10	UNION	SR1301	TWELVE MILE CREEK
42	10	CABARRUS	NC73	DUTCH BUFFALO CREEK
43	11	WILKES	SR2316	CREEK
44	11	WILKES	SR2418	CLERCY BRANCH
45	11	WILKES	SR1501	CREEK
46	11	ASHE	SR1310	LITTLE LAUREL CREEK
47	11	ALLEGHANY	NC18	LITTLE RIVER
48	11	ASHE	NC88	BUFFALO CREEK

ID	Div.	County	Route	Crossing
49	11	ASHE	NC88	CRANBERRY CREEK
50	11	YADKIN	US21BUS	I-77
51	12	IREDELL	NC115	ROCKY CREEK
52	12	ALEXANDER	SR1348	MIDDLE LITTLE RIVER
53	12	IREDELL	SR1892	OLIN CREEK
54	13	MCDOWELL	SR1102	CROOKED CREEK
55	13	YANCEY	SR1317	BRUSH CREEK
56	13	MADISON	NC251 NBL	IVY CREEK
57	13	MADISON	NC251 SBL	IVY CREEK
58	14	POLK	SR1125	UT TO NORTH PACOLET RIVE
59	14	HAYWOOD	SR1876	WEST FORK PIGEON RIVER

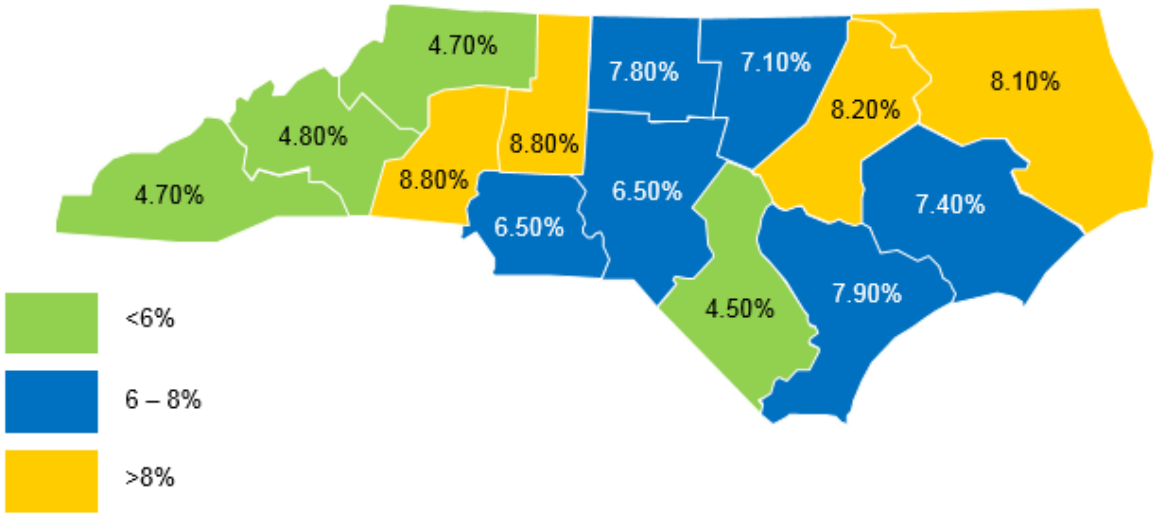
Division Performance – Delivery (Cost and Rate)

Lane miles / employee



Lane miles per division employee (as at November 2014).

Indirect Cost Percentage



Division – Project Delivery Rates (Pavements)

FY 2014 Resurfacing Planned vs. Actual				FY 2014 Preservation Planned vs. Actual		
Division	Scheduled FY 2014 (Lane-Miles)	Completed FY 2014 (Lane-Miles)	Delivery Rate	Scheduled FY 2014 (Lane-Miles)	Completed FY 2014 (Lane-Miles)	Delivery Rate
1	358.79	358.79	100%	14.00	14.00	100%
2	457.34	457.34	100%	129.78	129.78	100%
3	335.10	335.10	100%	238.70	238.70	100%
4	540.00	540.00	100%	236.32	236.32	100%
5	499.98	499.98	100%	325.76	325.76	100%
6	341.94	341.94	100%	4.36	4.36	100%
7	390.47	390.47	100%	95.68	95.68	100%
8	431.93	431.93	100%	145.26	145.26	100%
9	167.44	167.44	100%	243.74	243.74	100%
10	213.48	213.48	100%	37.14	37.14	100%
11	253.07	253.07	100%	186.74	186.74	100%
12	565.00	565.00	100%	386.30	386.30	100%
13	241.82	241.82	100%	183.64	183.64	100%
14	194.98	194.98	100%	154.90	154.90	100%
SW	4991.34	4991.34	100%	2,345.18	2,345.18	100%

Division – Project Delivery Rates (Bridges)

FY 2014 Bridge Replacements Planned vs. Actual				FY 2014 Bridge Preservation Planned vs. Actual		
Division	Planned Projects	Accepted Projects	Delivery Rate	Plan Projects	Completed Projects	Delivery Rate
1	21	21	100%	17	13	76%
2	25	25	100%	7	7	100%
3	5	5	100%	19	17	89%
4	24	23	96%	-	0	-
5	19	16	84%	15	15	100%
6	23	22	96%	11	11	100%
7	21	18	86%	24	18	75%
8	22	22	100%	11	11	100%
9	16	16	100%	26	26	100%
10	22	22	100%	21	21	100%
11	6	6	100%	6	6	100%
12	10	9	90%	21	21	100%
13	8	8	100%	8	8	100%
14	22	17	77%	20	16	80%
SW	244	230	94%	206	190	92%

Calculating the cost of crashes

We have calculated the cost of crashes based on the *reported* number of crashes in each of the crash categories listed. The crash costs include medical, public service, victim work loss, employer cost, travel delay, property damage, and quality of life values.

The total cost of crashes was $10.1 billion in 2012 dollars.To determine Property Damage PDO crashes, a weighted average (approx. 67%) was taken of the total crashes. The weighted average for PDO was determined from Table 2 in the memo, “2012 Standardized Crash Cost Estimates for North Carolina” dated December 13, 2013. The crash costs were retrieved from Table 4 in the same memo.

The Cost of Crashes In 2013

Severity	Description of severity	# of Crashes (2013)	Cost Per Crash (2012 dollars)	Total Cost for Severity Category (2012 dollars)
K	Killed	1,172	$4,600,000	$5,391,200,000
A	Type Injury - Disabling	1,713	$270,000	$462,510,000
B	Type Injury - Evident	17,410	$80,000	$1,392,800,000
C	Type Injury - Possible	50,503	$40,000	$2,020,120,000
PDO	Property Damage Only	149,505	$5,400	$807,327,000
			Total	**$10,073,957,000**