FDOT

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

MIKE DEW
SECRETARY

April 30, 2018

Mr. James Christian, FL Division Administrator
Florida Division, Federal Highway Administration
3500 Financial Plaza, Suite 400
Tallahassee, FL 32312

Dear Mr. Christian,

Pursuant to 23 CFR Part 515 attached is the State-approved initial plan describing the Florida Department of Transportation (Department) processes for developing its risk-based Transportation Asset Management Plan (TAMP) for the National Highway System (NHS).

The development of this document was facilitated by a Steering Committee co-championed by the Director, Office of Maintenance and the Department's Performance Coordinator and included representatives from the following offices and organizations:

- Office of Work Program and Budget
- Public Transit Office
- Office of Policy Planning
- State Materials Office
- Bridge Office
- Office of Information Systems
- Pavement Management Office
- Office of Maintenance
- Safety Office
- Transportation Data and Analytics Office
- Metropolitan Planning Advisory Council (MPOAC)

For this initial document, the Department is seeking Federal Highway Administration (FHWA) review and certification of our TAMP development processes.

This document will be reviewed periodically and updated as necessary to ensure Department policies and processes are current and to fully implement all applicable federal requirements.

Sincerely,

Rudy Powell
Director, Office of Maintenance

Mr. James Christian
FHWA
April 30, 2018

cc: Mike Dew
Tom Byron
Brian Blanchard
Courtney Drummond
April Blackburn
Jim Wood
Carl Mikyska

Florida Department of Transportation

INITIAL TRANSPORTATION ASSET MANAGEMENT PLAN

April 30, 2018

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Chapter 1 Introduction

The Florida Department of Transportation (Department) has a long history of leadership in the field of transportation asset management. Many national surveys consistently rate Florida as having the nation's best pavements and bridges. This focus, and a legislative mandate to maintain consistently high ratings for pavements and bridges, sets a standard for all the Department's transportation asset management practices.

The Department's asset management practices are mission-driven and are incorporated in the agency's goals, operating policies, plans, and procedures. This business practice allows the Department to bring together a variety of disciplines and stakeholders (internal and external), to achieve a common understanding and commitment to maintain or improve performance. It also demonstrates the Department's commitment to sustainable asset stewardship, effective use of resources, and justifications for funding.

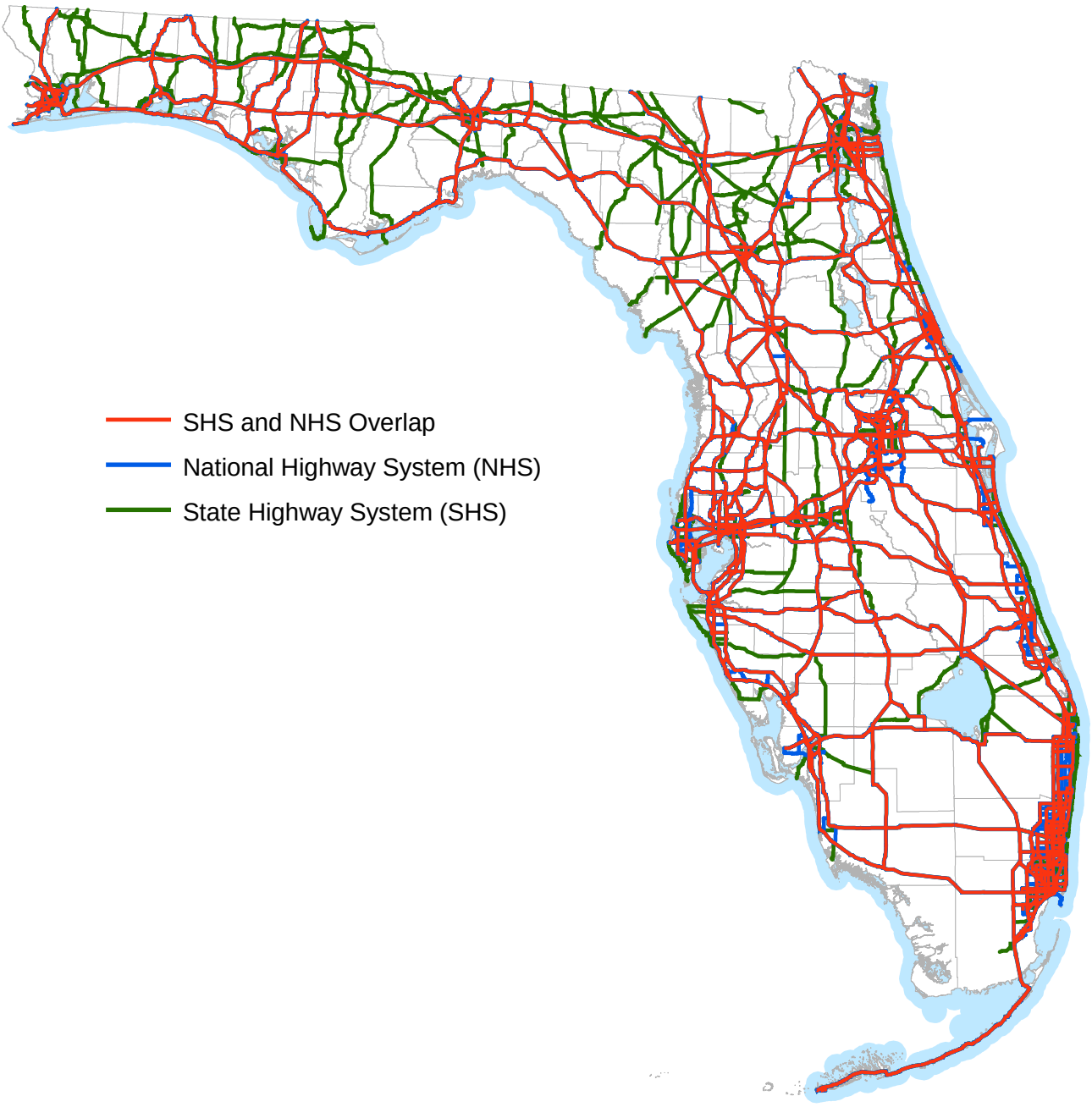
In July 2012, Congress enacted legislation titled Moving Ahead for Progress in the 21st Century or more commonly referred to as MAP-21. This law requires that each State transportation agency develop a risk-based Transportation Asset Management Plan (TAMP) for all pavements and bridges on the National Highway System (NHS).

The Department's continuous record of high performing pavements and bridges on the State Highway System (SHS), which includes the majority of the NHS (see Figure 1), affirms the strength of the agency's long-standing, existing asset management approach. This TAMP describes those processes and clarifies how they meet MAP-21.

The Department's iterative, system-wide approach to programming and prioritizing pavement and bridges, addresses risk, prevents gaps, and is built on strong financial planning and investment strategies to ensure the right needs are addressed at the right time.

Therefore, the Department will continue to use its long-standing, existing asset management approach to manage the SHS and establish performance targets for the Federal Highway Administration (FHWA) performance measures for NHS pavements and bridges. Local and federal agencies will continue to manage the portions of the NHS that are not on the SHS.

Figure 1: State and National Highway Systems



Source: FDOT, Transportation Data & Analytics Office
(As of 12/31/2017)

To help facilitate the understanding of the Department's asset management program and practices, the initial TAMP has been organized in the following chapters:

Chapter 2- Asset Management Planning and Programming

Chapter 3- Performance Measures and Targets

Chapter 4- Asset Inventory and Conditions

Chapter 5- Financial Plan and Investment Strategies

Chapter 6- Performance Gap Analysis

Chapter 7- Risk Management

Chapter 8- Life-Cycle Planning

Chapter 9- Implementation

Chapter 2 Asset Management Planning and Programming

The Department considers asset management a central tenet of its long-range planning process and has a well-established philosophy, supported by statutes, to preserve its assets before adding capacity to the transportation system. This approach sets the framework for all capacity enhancements and service additions to the transportation network. As such, this philosophy serves as a solid foundation to meet and build upon federally required asset management focused practices.

Currently, there is no central group within the Department that manages all assets, but there are several groups throughout the organization dedicated to managing their respective assets by collecting quality data on asset condition, applying best-practice analytical models for use in predicting condition trends given different budget scenarios, and prioritizing capital projects on state-owned assets as well as those owned by others.

The principal objectives of the Department's TAMP are:

- Ensure the safety and security of transportation customers;
- Minimize damage to infrastructure from vehicles;
- Achieve and maintain a state of good repair for transportation assets; and
- Reduce the vulnerability and increase the resilience of critical infrastructure to the impacts of extreme weather and events.

These objectives are the foundation for performance measures related to asset management.

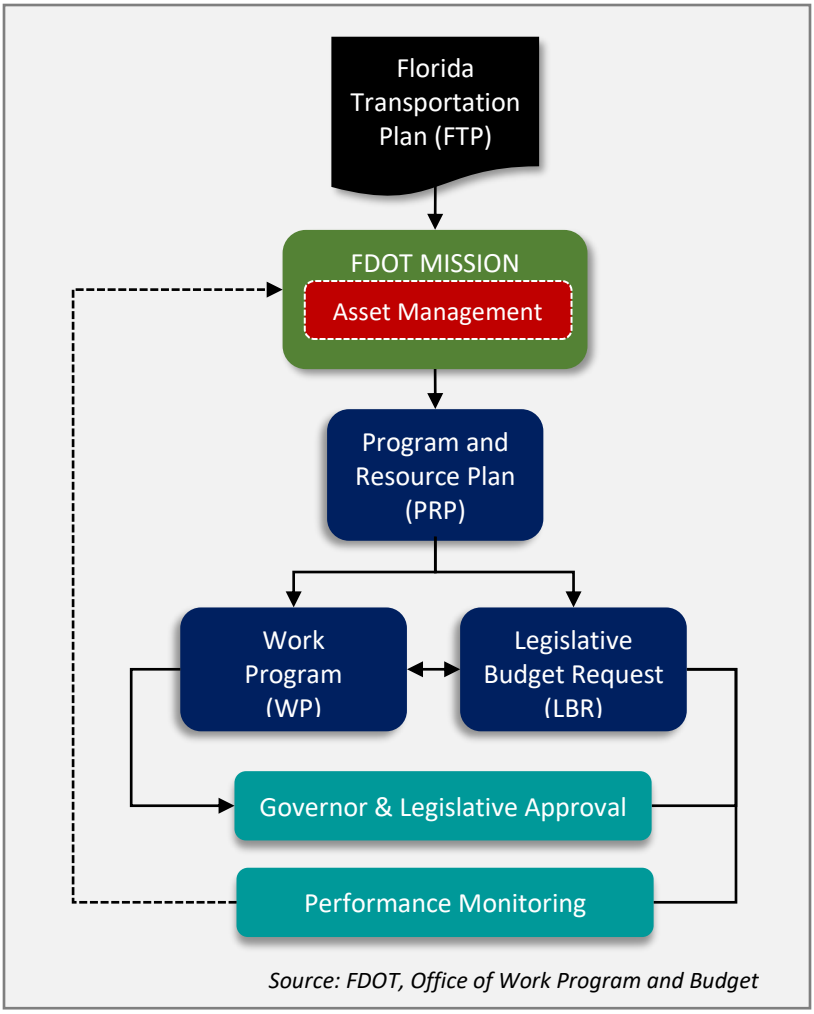
2.1 Relationship to Other Business Plans and Policies

Much of the Department's asset management story is told throughout existing policy statements and plans. These existing policy statements and plans guide the Department in its efforts to most effectively manage its transportation assets. The TAMP describes the interrelationship of these existing policy statements and plans. Figure 2 below provides a graphical representation.

The **Florida Transportation Plan (FTP)** is the single overarching statewide plan that guides Florida's transportation future. It is a plan for all of Florida; providing policy direction to the Department and all organizations that are involved in planning, implementing and managing Florida's transportation system, including statewide, regional, and local partners.

The core component of the FTP is the Policy Element, which defines the goals, objectives, and strategies for Florida's transportation future over the next 25 years. It provides guidance to state, regional, and local transportation partners in making transportation decisions. The Policy Element also establishes the framework for expenditure of state and federal transportation funds flowing through the Department's Work Program.

Figure 2: FDOT Asset Management Process



Source: FDOT, Office of Work Program and Budget

Several of the goals in the Policy Element focus on the performance of Florida's Transportation System. These include:

- **Safety and security for residents, visitors and businesses.** This is one of Florida's longstanding priorities; to ensure the safety and security of transportation customers. This goal also addresses how transportation can support broader needs. For example, response to and recovery from extreme weather events.

- **Agile, resilient and quality infrastructure.** This goal not only addresses pavement and bridges, but the conditions for all modes and emphasizes responsiveness to changing technologies and market trends, resiliency to risks and customer service and other quality measures.

- **Efficient and reliable mobility for people and freight.** This goal shifts from a focus on reducing travel time and delay to making the entire transportation system more efficient and reliable, including all modes as well as supporting regulatory processes.

The goals and objectives of the FTP not only set the stage for performance reporting but also provide statewide policy guidance for accomplishing the Department's mission to protect the State's transportation infrastructure investment.

The **FDOT Mission** is to provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity and preserves the quality of our environment and communities. The FDOT Mission is informed by the goals and objectives of the FTP, is supported by statutes and is the beginning of the Department's transportation asset management approach.

The **Program and Resource Plan (PRP)** provides the link between the FTP, the FDOT Mission, and the Department's numerous programs (as reflected in the project specific Work Program) and the Department's Legislative Budget Request (LBR). It contains the specific long-range goals and objectives from the FTP, as well as selected operating policies and performance measures, which guide the development of each program in the Department.

The Department produces a PRP, which consists of a complete 10-year projected budget for all major agency functions and programs. The PRP is a summary document that contains the approved program alternatives and funding levels by fiscal year to accomplish program goals and objectives within expected revenue. The PRP combines the Department's operating budget, fixed capital outlay buildings and grounds budget, debt service budget and Work Program details into a summary document.

The document reports the Department's planned budget in several different ways including by product area, product support, operations and maintenance, administration, etc. It also provides summary information by funding source. The PRP serves as a link between the FTP, a planning document, and the Adopted and Tentative Work Programs, documents listing all Department projects and expected spending out to a five-year horizon. The PRP establishes the programming framework by which the Work Program is developed.

The **Work Program (WP)** is a five-year plan that provides details on when and where specific projects and services will be provided and how these projects and services will be funded using available revenue.

The **Legislative Budget Request (LBR)** is the Department's request to the Governor and Legislature for spending authority to do the work of the agency for the next fiscal year.

Performance Monitoring is conducted using measures to show progress towards the attainment of the Department's goals and objectives.

Chapter 3 Performance Measures and Targets

Florida has a long-established and highly effective approach to preservation and maintenance of its pavement and bridge assets. The current practices for asset management are rooted in the Department's strong adherence to performance targets and an organizational philosophy, supported by legislative mandate, to maintain the existing infrastructure before pursuing capacity projects.

The Department is mandated by statute, s. 334.046, to preserve the state's transportation infrastructure to specific standards. The standards for pavements, bridges and maintenance were derived over time, from the Department's use of output measures and engineering input, to evaluate the performance of the transportation system, long before outcome based measures were required.

The Department utilizes strong management tools for pavements and bridges, coupled with a thorough reporting and review process to ensure systemwide performance meets target levels.

3.1 Pavement Assets

For the Department's performance measurement reporting for the SHS, the performance measure and target for pavements on the SHS is:

- Ensure at least 80 percent of the pavement on the SHS meets the Department standard.

Pavement meeting Department standards is defined as pavement for which each of the three rating factors (ride quality, crack severity and rutting) are scored 6.5 or above on a ten-point scale.

For the purposes of performance measurement reporting to the FHWA for pavements on the NHS, the Department will use the following FHWA performance measures:

- Percentage of Interstate pavements in Good condition;
- Percentage of Interstate pavements in Poor condition;
- Percentage of non-Interstate NHS pavements in Good condition; and
- Percentage of non-Interstate NHS pavements in Poor condition.

Per the FHWA Rule (23 CFR 490.315), the minimum condition for Interstate pavements is that no more than 5 percent should be in Poor condition. There are no minimum condition requirements for the non-Interstate NHS pavements.

The Department will establish targets for the FHWA performance measures for pavements on the NHS, that will be enveloped by the Department's performance measures and targets for pavements on the SHS.

The table below shows the FDOT and FHWA performance measures and targets for pavements.

Table 1: Pavement Targets

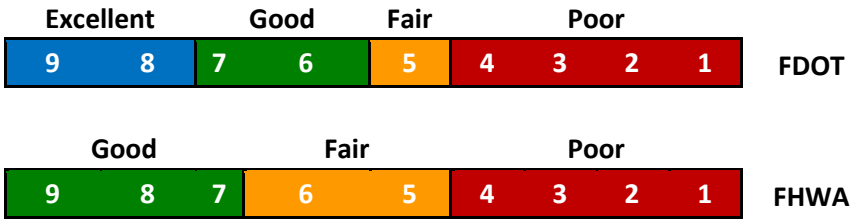
FDOT Performance Measure	FDOT Target	FHWA Performance Measure	FHWA Target[1]
% of lane miles on SHS with pavement condition rating of either Excellent or Good.	80%	% of Interstate pavements in Good condition	TBD
		% of Interstate pavements in Poor condition	TBD
		% of non-Interstate NHS pavements in Good condition	TBD
		% of non-Interstate NHS pavements in Poor condition	TBD

Source: FDOT, Office of Maintenance

3.2 Bridge Assets

Florida uses the National Bridge Inventory (NBI) rating as its primary performance measure. NBI includes information on approximately 600,000 of the Nation's bridges located on public roads. It presents a state-by-state summary analysis of the number, location, and general condition of highway bridges within each state. The ratings are based upon inspection results on each of the bridge's primary elements: deck, superstructure, and substructure. Figure 3 shows the Department's criteria for assessing bridge condition and the criteria used by FHWA.

Figure 3: FDOT and FHWA National Bridge Inventory (NBI) Rating Criteria



For the Department's performance measurement reporting for bridges on the SHS, the performance measures and targets using the Department's scale is:

- 90 percent of SHS bridges in "Excellent" or "Good" condition measured by number of bridges.

For the purposes of performance measurement reporting to the FHWA for bridges on the NHS, the FHWA performance measures using the FHWA scale are:

[1] Pavement targets will be established by May 20, 2018, as specified in the PM2 rule, and will be included in the fully compliant asset management plan due June 30, 2019.

- Percentage of NHS bridges in Good condition measured by deck area; and
- Percentage of NHS bridges in Poor condition measured by deck area.

Per the FHWA Rule (23 CFR 490.411), the minimum condition level for bridges is that only 10 percent or less of the total deck area of NHS bridges be classified as Structurally Deficient; in Poor condition.

The Department will establish targets for the FHWA performance measures for bridges on the NHS, that will be enveloped by the Department's performance measures and targets for bridges on the SHS.

For example, the Department's requirement that 90 percent of SHS bridges must be in "Excellent or "Good" condition means that no more than 10 percent can be in "Poor" or "Fair" condition per the Department's scale. Based on the FHWA Rule (23 CFR 490.411), the target for the maximum percentage of deck area of NHS bridges in "Poor" condition cannot exceed 10 percent per the FHWA scale.

This means that the Department's performance measure and target already envelopes the FHWA performance measure and maximum target. There is a difference in measurement, by number of bridges versus by deck area, but that difference is not significant enough to change the outcome.

The table below shows the FDOT and FHWA performance measures and targets for bridges.

Table 2: Bridge Targets

FDOT Performance Measure	FDOT Target	FHWA Performance Measure	FHWA Target[2]
% of bridges on SHS with condition rating of either Excellent or Good by number of bridges	90%	% of NHS bridges classified as in Good condition by deck area	TBD
		% of NHS bridges classified as in Poor condition by deck area	TBD

Source: FDOT, Office of Maintenance

[2] Bridge targets will be established by May 20, 2018, as specified in the PM2 rule, and will be included in the fully compliant asset management plan due June 30, 2019.

Chapter 4 Asset Inventory and Conditions

The practice of developing an inventory and condition assessment sets the stage for all other phases of asset management. Therefore, to manage transportation assets effectively, two fundamental questions need to be addressed. First, what facilities does the Department own and manage? Second, what condition are those assets in?

4.1 Pavement Assets

Inventory

The table below provides an inventory of the pavement assets by state (on-system) and local (off-system) ownership. The information is presented in centerline and lane miles for the SHS, NHS, Interstate and Non-Interstate NHS. Centerline miles represent the length of the road, while lane miles represent the length and lane count for a road. As previously stated, the SHS includes the majority of the NHS.

Table 3: Inventory Summary of Pavements

	SHS		NHS		Interstate		Non-Interstate NHS	
	Centerline Miles	Lane Miles	Centerline Miles	Lane Miles	Centerline Miles	Lane Miles	Centerline Miles	Lane Miles
On-System	12,107	44,181	8,207	34,272	1,495	8,388	6,712	25,884
Off-System			575	2,464			575	2,464
Total	**12,107**	**44,181**	**8,782**	**36,736**	**1,495**	**8,388**	**7,287**	**28,347**

Note: Due to rounding, totals may not agree.
Source: FDOT, Transportation Data & Analytics Office (As of 12/31/2017)

State Highway System (SHS) Condition Based on FDOT Performance Measures

The Department conducts annual Pavement Condition Surveys (PCS) to monitor and report on the performance and condition of pavements on the SHS per Florida Statutes 334.24, 334.046 and 335.07 as well as the Federal Highway Administration (FHWA)/FDOT Federal Aid Partnership Agreement No. 700-000-005-a.

Ride Quality Rating:
The Department quantifies the pavement Ride Quality or Smoothness using the International Roughness Index (IRI). This index is derived from a pavement surface longitudinal profile as measured using vehicle-based equipment operating at highway speed. IRI is also the rating system required by FHWA in annual highway inventory summaries. It is generated using a standard algorithm (ASTM E1926) and varies from zero, indicating pavement in virtually perfect condition, to infinity. Higher scores indicate worse ride quality. Ranges of IRI are converted to a rating system with a scale from zero to ten (RR_{10}) with ten indicating a pavement in perfect condition.

Rut Rating:
The same vehicle based equipment used for Ride Quality measurements also measures rutting for flexible pavements in 1/8-inch increments of depth. Each rut depth increment deducts one point from a perfect total of 10. The overall rutting score for the road segment is equal to the average of the scores for each wheel path.

Crack and Defect Rating:
Due to the physical differences between flexible and rigid pavements, defect metrics differ. For flexible pavement, the defect is measured considering its type, severity and the extent, in percent, to which the road surface is affected by the defect.

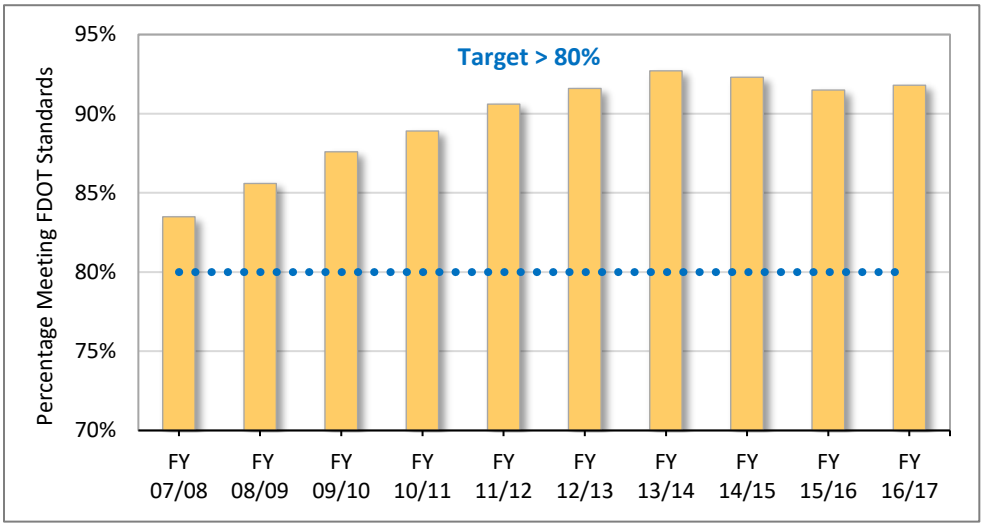
The defect-predominate type is then used to establish a score based on its severity and extent for the areas inside and outside of wheel paths. These scores are added together and subtracted from ten to calculate the Crack Rating (CR). Higher values of CR indicate better condition.

For rigid pavement, the Department defines ten defect metrics: surface deterioration, spalling, patching, transverse cracking, longitudinal cracking, corner cracking, shattered slab, faulting, pumping, and joint quality. These metrics reflect both the natural deterioration of the concrete surface and structural components unique to concrete slabs, such as faulting (vertical displacement of joints) and joint quality. The metrics are weighted according to both standard and segment-specific priorities, and the result is deducted from 100 and divided by 10 to calculate the Crack/Defect Rating on a 10 scale.

<u>2017 Pavement Condition Survey Results</u>
Pavement on the SHS is in Good condition. As shown in Figure 4 below, over 90 percent of the SHS pavements met the Department standards as of 2017. Over the past ten years, performance has improved dramatically. A combination of factors, including enhanced design approaches, better selection of materials and improved construction practices as well as preventive maintenance efforts are responsible for this increase.

Figure 4: SHS Pavements Meeting FDOT Standards

Currently, 91.8 percent of pavements on the SHS exceed FDOT standards.

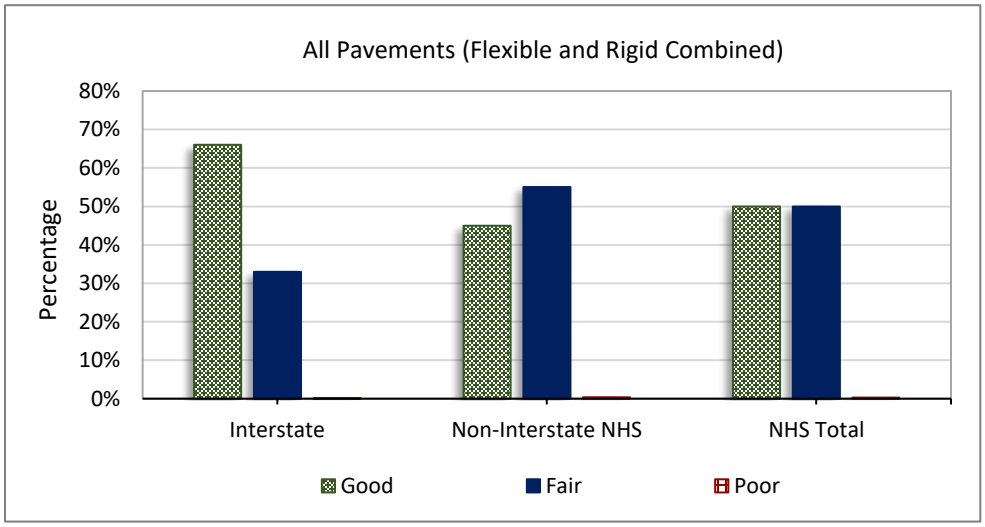


Source: FDOT, State Materials Office

National Highway System (NHS) Condition Based on FHWA Performance Measures

Figures 5 through 7 present the condition of the NHS pavements based on the FHWA performance measures. Data from the 2017/2018 PCS was used to generate the values. Off-system data was collected January through March 2017. Overall, the pavement on the NHS is in Good condition with relatively few lane miles in Poor condition. Note, approximately 3 percent of the pavement on the SHS, which contains the majority of the NHS, is comprised of rigid pavement.

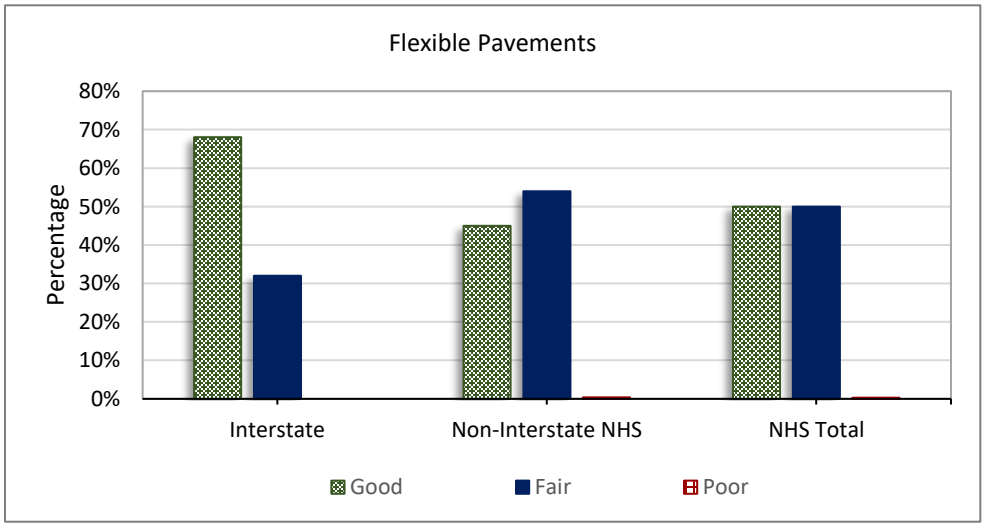
Figure 5: All Pavements (Flexible and Rigid Combined)



0.1 percent of all pavements on the Interstate are in Poor condition.

Source: FDOT, State Materials Office.

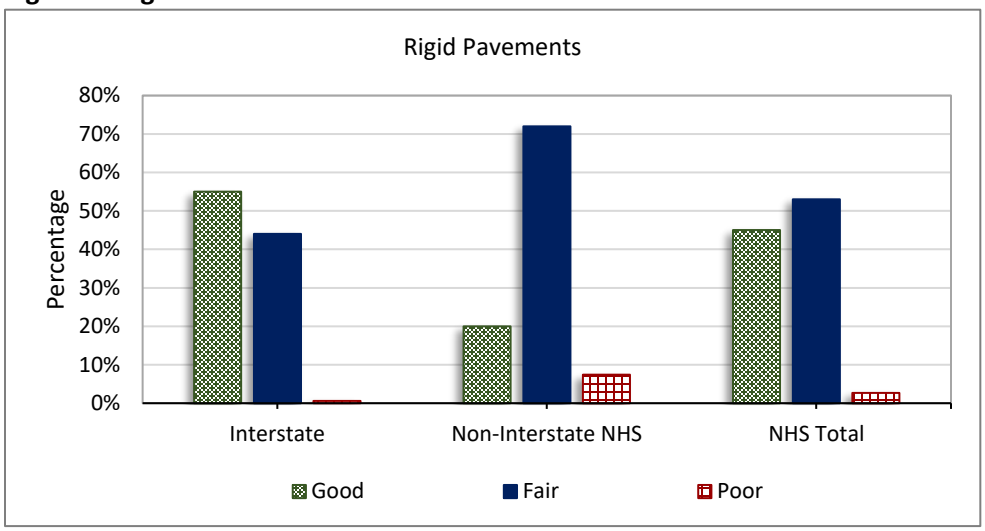
Figure 6: Flexible Pavements



None of the flexible pavements on the Interstate are in Poor condition.

Source: FDOT, State Materials Office.

Figure 7: Rigid Pavements



0.6 percent of the rigid pavements on the Interstate are in Poor condition.

Source: FDOT, State Materials Office.

4.2 Bridge Assets

Inventory

Bridges per federal definition have a clear opening of greater than 20 feet along the direction of the roadway between abutments, spring lines of arches, extreme ends of openings for multiple boxes, or extreme ends of openings for multiple pipes. The table below provides an inventory of the state and local bridges.

Table 4: Inventory Summary of Bridges

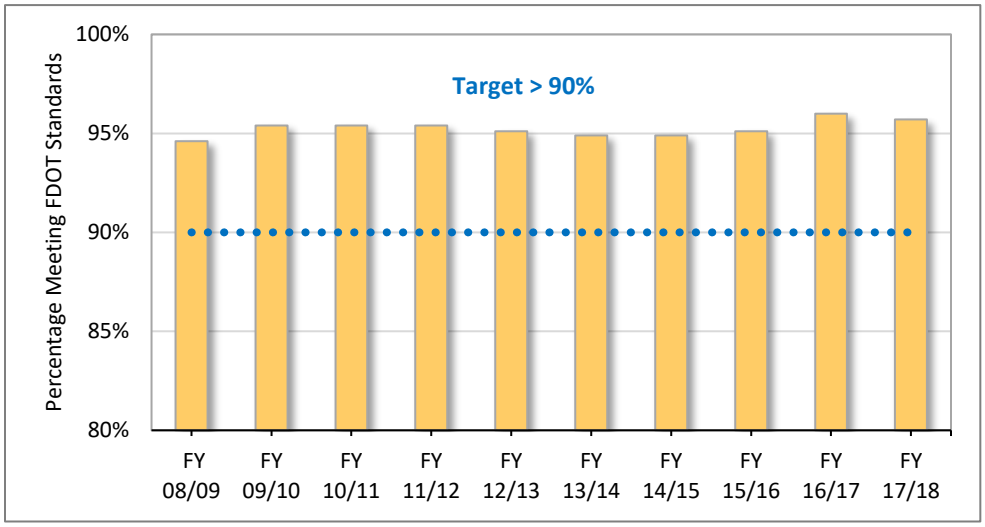
	Number of Bridges		Number of Bridges
State Owned Total	6,926	State Owned NHS	5,414
Locally Owned Total	5,633	Locally Owned NHS	148
Florida NBI Total	12,559	**NHS Total**	**5,562**

Note: This information is based on the FDOT Office of Maintenance 2017 Annual Bridge Inventory Report. Source: FDOT, Office of Maintenance

State Highway System (SHS) Condition Based on FDOT Performance Measures

As shown in Figure 8, for the past decade 94 percent or more of the State's bridges have met the Department's performance measures and targets. This established history demonstrates the state's bridges are in a state of good repair and do not exhibit signs of structural deterioration. In fact, less than 1 percent of the State's total bridges are posted with weight restrictions.

Figure 8: SHS Bridges Meeting FDOT Standards



95.7 percent of state maintained bridges are in Good or Excellent condition as of FY2017/2018.

Source: FDOT, Office of Maintenance 2017 Annual Bridge Inventory Report

National Highway System (NHS) Condition Based on FHWA Performance Measures

Table 5 shows the percentage of NHS bridge deck area in Good and Poor condition as defined by the FHWA scale. For state owned NHS bridges, more than 68 percent of the total NHS deck area is in Good condition and less than 2 percent is in Poor condition. For locally owned bridges, more than 72 percent of the total NHS deck area is in Good condition and none are in Poor condition.

Table 5: Percentage of NHS Bridge Deck Area in Good and Poor Condition

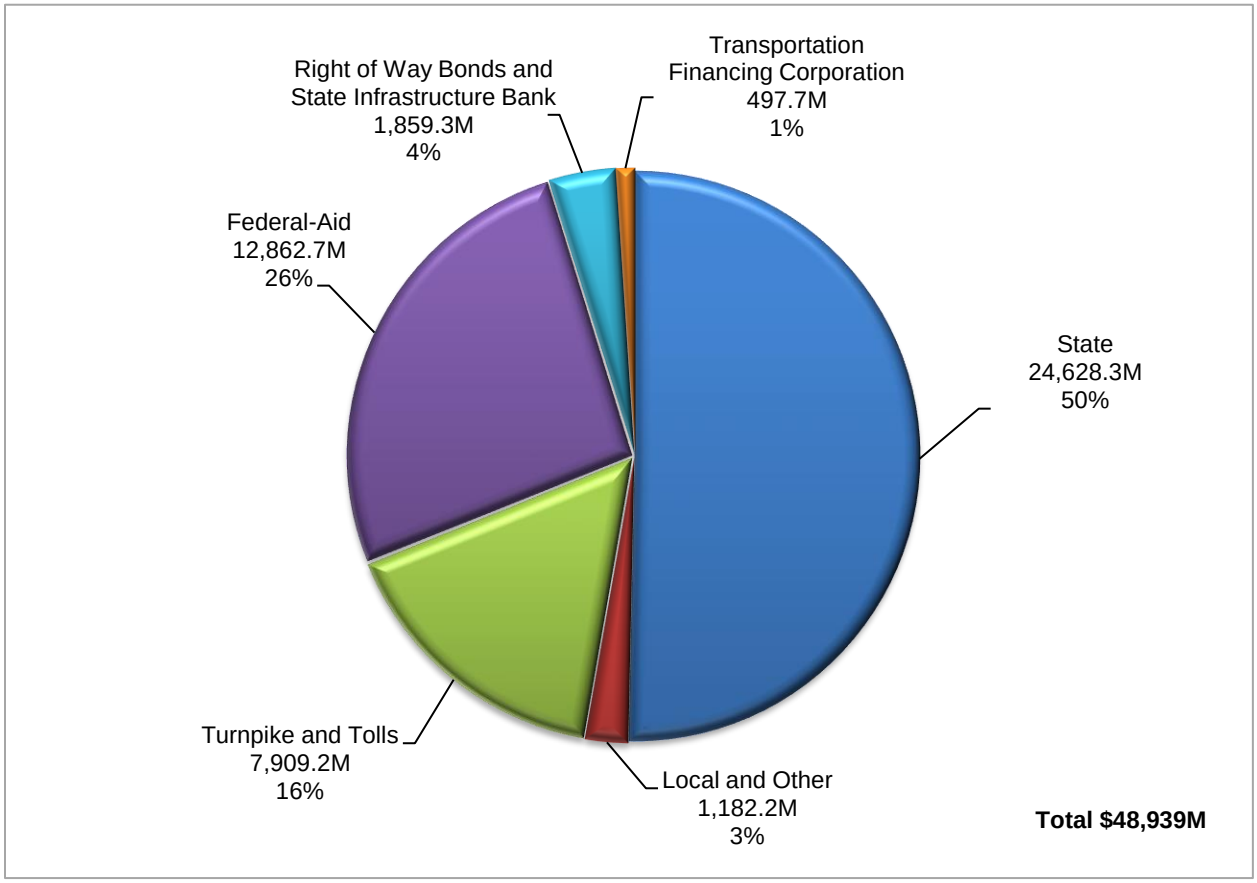
	Deck Area (ft^2)	Good Area (ft^2)	Percentage of Area in Good Condition	Poor Area (ft^2)	Percentage of Area in Poor Condition
State Owned NHS	124,887,335	84,990,921	68.1%	1,523,449	1.2%
Locally Owned NHS	4,728,981	3,422,266	72.4%	0	0%
NHS Total	**129,616,316**	**88,413,187**	**68.2%**	**1,523,449**	**1.2%**

Source: FDOT, Office of Maintenance 2017 Annual Bridge Inventory Report.

Chapter 5 Financial Plan and Investment Strategies

The largest source of funding for Florida's asset management activities is state-generated revenues. Other major sources, as shown in Figure 9, come from federal-aid, tolls, right of way bonds, state infrastructure bank, local and other, and transportation financing corporation.

Figure 9: Five-Year Adopted Work Program Total Funding by Source (FY2018-2022)



Source: FDOT, Office of Work Program and Budget

Transportation revenue receipts from fuel taxes make up over 50 percent of the revenue portfolio; state fuel taxes are indexed to offset the impacts of inflation each January. Based on movement in the Consumer Price Index (CPI), Florida's State Highway Fuel Sales Tax and the State Comprehensive Enhanced Transportation System (SCETS) Tax are adjusted annually. The other major fuel tax sources are not adjusted annually, however, and their buying power diminishes over time.

The remaining revenue portfolio is comprised of motor vehicle registration fees, tag and title fees, documentary stamp taxes, and Turnpike and other Department owned toll facilities.

5.1 Systemwide Valuation

Pursuant to the Governmental Accounting Standards Board Statement No. 34 (GASB-34)[3], Basic Financial Statements – and Management's Discussion and Analysis – for State and Local Governments, the state has adopted an alternative process to account for its roadways, bridges and other infrastructure assets included in the SHS. Under this alternative method, the Department has made the commitment to maintain these assets at levels established by the Department and approved by the Florida Legislature.

In order to utilize this method, the state is required to:

- Maintain an asset management system that includes an up-to-date inventory of eligible infrastructure assets.
- Perform condition assessments of eligible assets and summarize the results using a measurement scale.
- Estimate each year the annual amount to maintain and preserve the assets at the condition level established and disclosed by the state.
- Document that the assets are being preserved approximately at, or above, the established condition level.

The state does expense certain maintenance and preservation costs. However, no depreciation expense is reported for these assets, nor are amounts capitalized in connection with improvements that lengthen the lives of these assets, unless the improvements also increase their service potential.

As required, the Department maintains an inventory of these assets and performs periodic condition assessments to establish that the predetermined condition level is being maintained. In addition, the Department makes annual estimates of the amounts that must be expended to maintain these assets at the predetermined condition levels.

5.1.1 State (On-System) Assets

The table below shows the value of the SHS (which contains the majority of the NHS) infrastructure assets for roadways and bridges and the turnpike.

Table 6: Value of State (On-System) Assets

	Value	Work in Progress	Right of Way	Total
Roadways & Bridges	$48,429,256,746	$2,881,175,272	$13,734,320,461	$65,044,752,479
Turnpike	$8,918,407,000	$1,235,160,000	$1,157,524,000	$11,311,091,000
				$76,355,843,479

Source: FDOT, Office of the Comptroller (As of 6/30/2017)

[3] This statement establishes new financial reporting requirements for state and local governments throughout the United States. For the first time, governments' audited financial statements contain information about the full cost of providing public services, including infrastructure.

5.1.2 Local (Off-System) Assets

There are over 400 municipalities in Florida. Cost information for the NHS infrastructure assets that are not a part of the SHS, is not readily available. The financial statements for all the counties and cities containing the off-system assets would have to be collected and analyzed. This would be an exhaustive process, requiring many man-hours and time that would not allow the Department to meet required deadlines, as specified in the rules. Therefore, it was necessary to estimate the value of the off-system pavements and bridges.

Using the Department's value for roadways and bridges in Table 6, average cost per centerline mile was determined. Note, the Department does not segregate its roadway and bridge values, so the number derived is the total average cost per centerline mile for on-system roadways and bridges. This average cost was then applied to the total off-system (local) centerline miles in order to determine the value of the off-system roadways and bridges. The value of the off-system right of way was estimated similarly.

Calculation of Average Costs

Roadway and Bridge Costs per CLM	=	(FDOT R&B) ÷ CLM
where: FDOT R&B	=	value of FDOT roadways and bridges
CLM[4]	=	number of on-system centerline miles
Roadway and Bridge Costs per CLM	=	**($48,429,256,746) ÷ (12,105 CLM)**
	=	**$4,000,764.70 cost per CLM**
Right of Way Costs per CLM	=	(FDOT ROW) ÷ CLM
where: FDOT ROW	=	value of FDOT right of way
CLM	=	number of on-system centerline miles
Right of Way Costs per CLM	=	**($13,734,320,461) ÷ (12,105 CLM)**
	=	**$1,134,598.96 cost per CLM**

Table 7: Value of Local (Off-System) Assets

	Off-System Centerline Miles	Cost per Centerline Mile	Total
Roadways and Bridges	575	$4,000,764.70	$2,300,437,705
Right of Way	575	$1,134,598.96	$652,394,404
			$2,952,832,109

Sources: FDOT, Office of the Comptroller and Transportation Data & Analytics Office

[4] The number of CLM for the SHS, as of 6/30/2017, was 12,105. This number was used by the FDOT, Office of the Comptroller to derive values for the on-system assets. It differs from Table 3, which shows 12,107 CLM as of 12/31/2017.

5.2 Investment Priorities and Direction

To preserve transportation infrastructure investments, the Department resurfaces and rehabilitates roads; inspects, repairs, and replaces bridges; and conducts routine maintenance activities such as patching, mowing, litter removal, maintenance of pavement markers and sign replacement. Regular maintenance and preservation of the transportation system keeps it operating efficiently, extends its useful life, and postpones the need for costly reconstruction or replacement.

Included in Florida Statutes are requirements which must be considered as the Department plans and develops an integrated, balanced statewide transportation system. Preservation of the existing transportation infrastructure is of the upmost importance. Section 334.046(4), Florida Statutes, specifies that preserving the state's transportation infrastructure includes:

- Ensuring that 80 percent of the pavement on the State Highway System (SHS) meets Department standards;
- Ensuring that 90 percent of Department-maintained bridges meet Department standards; and
- Ensuring that the Department achieves 100 percent of the acceptable maintenance standard on the SHS.

To adhere to the statutory guidelines, the Department prioritizes funding allocations to ensure the investments made in the current transportation system are adequately preserved and maintained before funding is allocated for capacity improvements. Thus, the Department addresses both preservation and capacity needs systematically. This approach is specified in the FTP, as well as in Florida Statutes as noted above.

Every July 1, the Secretary of the Department adopts the Five-Year Work Program. While the Department implements the projects planned for the first year of the Adopted Work Program, it also starts developing the Work Program for the next cycle, which begins with the last four years of the Work Program just adopted with a new fifth year added. The process of developing the next Five-Year Work Program involves a series of Program Planning Workshops which are held in May and June of each year.

These annual workshops provide an opportunity for the Executive Team (i.e., FDOT Secretary, Assistant and District Secretaries) to set priorities, provide direction, and make funding decisions. The primary objective of these workshops is to determine the level of funding to be allocated over the next 5 to 10 years, which is documented in the 10-year PRP, to preserve the existing transportation system, covering maintenance, resurfacing, bridge repair and bridge replacement.

Local projects are also included in the discussions. The state's 27 Metropolitan Planning Organizations (MPOs) develop their list of priority projects in coordination with the Department's District Offices. Those projects, along with projects from the District are sent to Central Office for the workshops and development of the Work Program. With so many MPOs, the Department is proud of the strong collaborative working relationship that we enjoy.

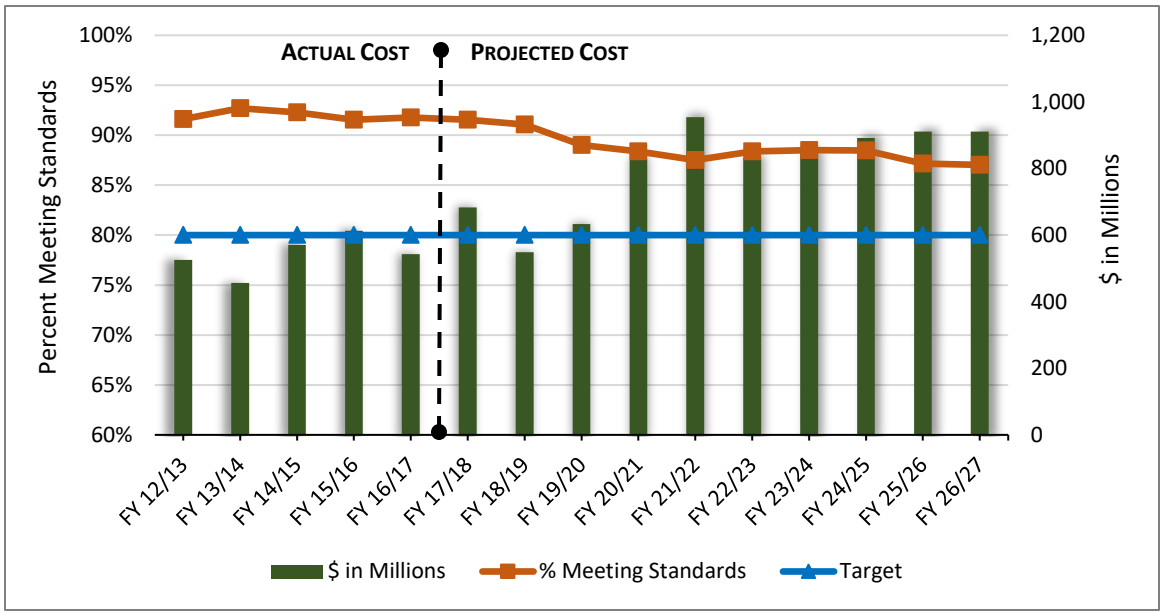
During the workshops, presentations are made which provide an assessment of prior years' performance, projection for future performance, and recommended funding levels which ensures all preservation related performance objectives will be met annually as outlined in the Five-Year Work Program and beyond. Executive direction on funding level and priority is also provided during the workshops.

The Department has quantitative measures which describe the current condition of the system, such as the percentage of pavement that meets Department standards, the percentage of bridges which meet Department standards, and the maintenance condition rating (or percent of desired maintenance rating achieved).

5.3 Pavement Allocation

The Department allocates funds to ensure at least 80 percent of pavement on the SHS meets Department standards. Figure 10 below, shows over 90 percent of the SHS has met Department standards over the past five years and over 85 percent of the SHS is projected to meet Department standards through FY 2027. This significantly exceeds the statutory requirement. The Department is able to meet the pavement condition standard by balancing resurfacing needs with SHS pavement deterioration rates.

Figure 10: SHS Projected to Meet Standards & Amount of Funding Planned



Source: FDOT, Office of Work Program and Budget, PRP for July 1, 2017 Adopted, Resurfacing Program Area

While the Department is very proud of how well the pavement has been performing over the years, it is important to consider the impact of improved materials, design and construction practices on pavement life and manage the investment accordingly and appropriately.

During the annual program planning workshops a few years ago, the actual pavement condition was near 95 percent. During that time, the Department reduced the amount of funding set aside for resurfacing for a couple of years, then began ramping it back up beginning in FY 2021.

Over $800 million per year has been set aside for resurfacing work to begin in FY 2021. Of course, the pavement condition is evaluated every year and projections are made for future conditions. Resurfacing funds will be adjusted appropriately to ensure the statutory requirements are met and that all pavement on the SHS are safe for travel.

5.4 Bridge Allocation

The Department allocates funds to ensure at least 90 percent of Department maintained bridges meet Department standards and that all bridges which are open to the public are safe for travel. As shown in Figure 11 below, the Department has exceeded the statutory requirement for bridges over the past five years.

Bridges are inspected at least once every two years. The exception to this are a class of low risk bridges that will be inspected every four years. Bridges in poor condition are inspected more frequently. Funds are set aside for both bridge repairs and replacements.

Routine repairs help extend the life of the Department's bridges. Each year the five-year allocation of bridge repair funding is evaluated to ensure all the needed repairs can be accomplished with the funding provided. In addition, the Department has a policy that a structure is programmed for corrective action within six years of being identified as structurally deficient or weight restricted.

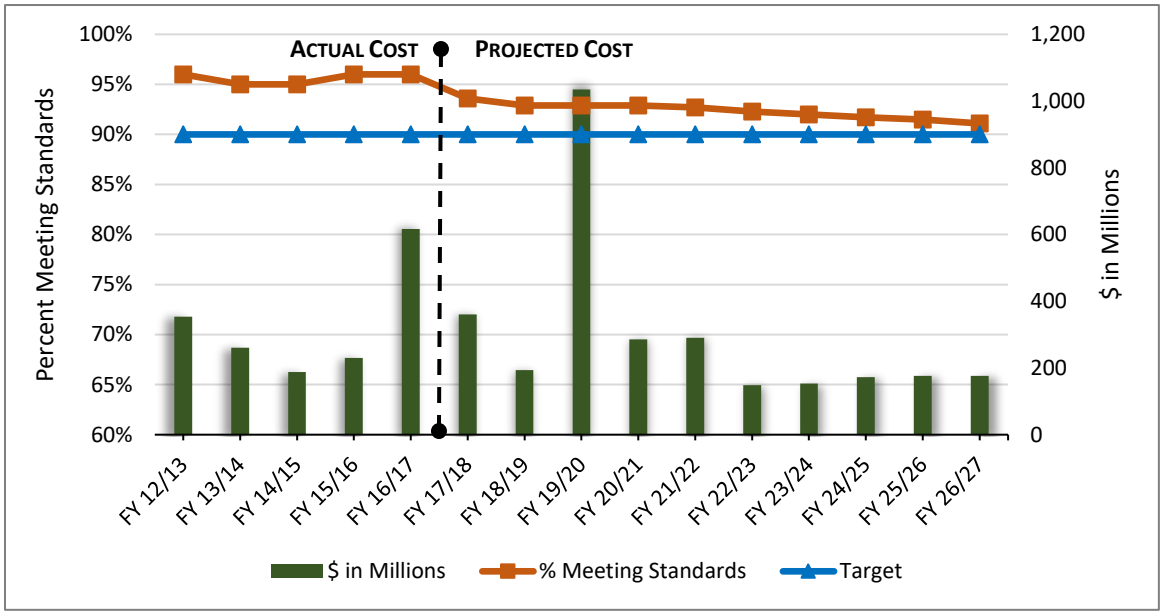
The cost of replacing bridges varies significantly. Some bridges can exceed $500 million and require significant planning and coordination with the impacted residents and governments. The Department adds any bridge which needs to be replaced to the new 5th year when developing the Work Program.

Over $150 million has been set aside each year for bridge repair and replacement. Funding is then added to the new 5th year as needed to address bridges which need to be replaced.

In Figure 11, there are a couple of spikes shown in funding. In FY2017 the $423 million Pensacola Bay Bridge was let to contract. The large spike in FY2020 reflects the planned replacement of the northbound span of the Howard Frankland Bridge in Tampa, which is estimated to cost $730 million.[5]

[5] Figures for the Howard Frankland and Pensacola Bay Bridges are for construction phases reported in the Bridge Program and Resource Plan Category in the year specified from the July 1, 2017 Adopted Work Program.

Figure 11: Bridges Projected to Meet Standards & Amount of Funding Planned



Source: FDOT, Office of Work Program and Budget PRP for July 1, 2017 Adopted, Bridge Program Area

The Department projects that bridge conditions will remain above the 90 percent standard in the future. Funding is provided to ensure the 90 percent standard is met and to ensure that all bridges open to the public are safe for travel.

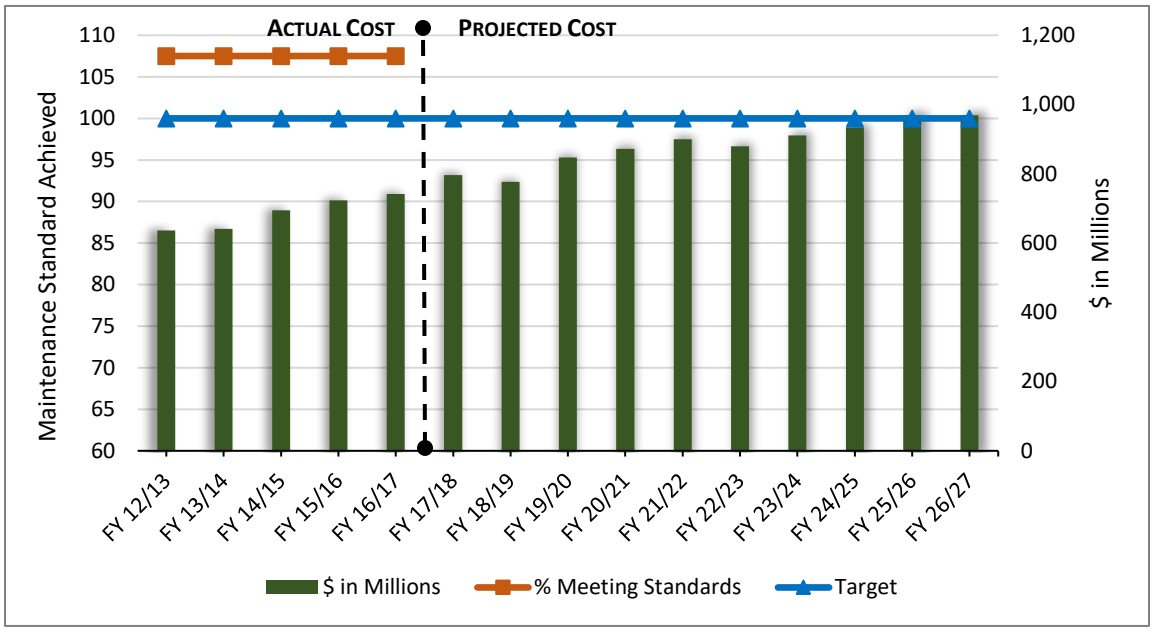
5.5 Maintenance Allocation

The Department is proud of the way the SHS is maintained. The Maintenance Rating Program uses visual and mechanical evaluation of routine highway maintenance conditions to rate maintenance levels on the SHS.

As shown in Figure 12 below, the Department allocates funds to ensure 100 percent of the maintenance standard is achieved. The acceptable maintenance standard is based on the Department's evaluation of its performance using the Maintenance Rating Program (MRP). This system grades five broad highway components (roadway, roadside, vegetation/aesthetics, traffic services, and drainage) and arrives at a maintenance rating of 0 to 100. The Department's standard is to achieve and maintain an overall maintenance rating of 80.

While the maintenance standard has been exceeded over the last five years, the objective is to continue to meet the standard. The Department projects the funding allocated for maintenance will be sufficient to achieve 100 percent of the standard in the future.

Figure 12: Maintenance Standard Projected to be Achieved & Amount of Funding Planned



Note: The Department does not project future maintenance conditions. Sufficient funding is provided annually to achieve 100 percent of the maintenance standards.

Source: FDOT, Office of Work Program and Budget PRP for July 1, 2017 Adopted, Operations & Maintenance Program Area.

5.6 Summary

The primary source of funding for Florida's asset management activities comes from state-generated revenues. Only twenty-six percent of funding comes from federal sources. As mandated by statute, the Department allocates funding directly "off the top" to ensure investments made in the current transportation system are adequately preserved and maintained before funding is allocated for capacity improvements.

This minimizes the financial and budget risks associated with maintaining a state of good repair for the State's pavements and bridges.

The life cycle of the assets is also considered in the financial plan and investment strategies. As explained in Chapter 8, the Department's pavement and bridge management systems utilize funding, past performance history and other data as input to help optimize project selection for decision-makers.

To date, Florida has achieved an envious state of being able to maintain performance on highways and bridges above Department standards.

Even with planned modifications to the maintenance and resurfacing programs, the Department will continue to meet its objectives and performance targets. In doing so, the Department will continue to provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity and preserves the quality of Florida's environment and communities. That is the mission of the Department, which reflects the national goals for the federal-aid highway program.

Chapter 6 Performance Gap Analysis

One of the Department's main responsibilities is to keep the SHS in a state of good repair. The system currently is in excellent condition, based on many national surveys which consistently rate Florida as having the nation's best pavements and bridges. This is a direct result of the Department inspecting and maintaining the pavement and bridge assets to Department standards.

6.1 Funding Gap

There is no gap between the existing and required funding levels to maintain pavements and bridges on the SHS, which includes much of the NHS, to standards.

As discussed previously, the Department's measures and targets for both pavement and bridges are mandated by Florida Statute. Through these statutory provisions, Florida has established a well-recognized approach to first preserve existing assets and protect the public's investment in its highways and bridges. The strong mandated measures and targets, coupled with the Department's commitment to adopting innovative approaches for meeting these condition targets, allow the Department to ensure a well-established and strong approach to maintenance and preservation activities.

The Department allocates funds "off the top" to ensure the pavement and bridge targets are met. Therefore, the financial and budget risks associated with maintaining a state of good repair for the State's pavements and bridges are minimized.

If funding shortages were to develop the Department will follow its established process of funding preservation activities ahead of capacity projects. That is, the priority will be to use available state funds for preservation activities on the SHS, which includes most of the NHS.

6.2 Pavement Condition Gap

There is no gap between the existing condition and desired condition of pavements on the SHS, which includes the majority of the NHS.

Currently, close to ninety-two percent of the SHS pavements meet Department standards. As explained in Chapter 8, *the Department's pavement management system and practices ensures there is no gap between the existing and desired conditions.* The Department will ensure continued high levels of performance for pavement condition through strategies such as:

- Balance the programming of resurfacing projects in relation to needs and optimize the timing of projects through the pavement management system.

- Coordinate with the Department's Motor Carrier Size and Weight Office and the Florida Highway Patrol's Office of Commercial Vehicle Enforcement to minimize the illegal operation of overweight commercial motor vehicles on Florida's public roads and bridges.

- Facilitate training and technical assistance to support local governments in conducting pavement condition surveys and ratings.

- Identify and where practicable, implement practices which reduce the time and cost of preserving the SHS.

- Promote research, development, and deployment of state-of-the-art materials, technology, and methodologies for transportation infrastructure design, construction, maintenance, and operations.

- Incorporate the risks of extreme weather and other environmental conditions into planning, project development, design, and operations.

- Through the TAMP, coordinate the Department performance metrics with the FHWA performance metrics to ensure the FHWA performance target metrics are achieved.

6.3 Bridge Condition Gap

There is no gap between the existing condition and desired condition of bridges on the SHS, which includes the majority of the NHS.

Currently, ninety-six percent of the SHS bridges meet Department standards, which exceeds the statutory minimum of 90 percent. As explained in Chapter 8, *the Department's bridge management system ensures there is no gap between the existing and desired conditions.* For bridges, the Department will ensure continued progress to maintain its core measures of bridge condition through strategies such as:

- Program priority repair projects for all Department-maintained bridges in the Work Program.

- Program the replacement or repair of all structurally deficient Department-maintained bridges and those bridges posted for weight restriction within six years of deficiency identification.

- Program the replacement of all other Department-maintained bridges designated for economy replacement within nine years of identification.

- Coordinate with the Department's Motor Carrier Size and Weight Office and Florida Highway Patrol's Office of Commercial Vehicle Enforcement to reduce the illegal operation of overweight commercial motor vehicles on Florida's public roads and bridges.

- Continue to monitor bridges scheduled to be replaced and make interim repairs, as necessary, to safeguard the traveling public.

- Pursue research, development, and deployment of state-of-the-art materials, technology, and methodologies for transportation infrastructure design, construction, maintenance, and operations.

- Incorporate the risks of extreme weather and other environmental conditions into planning, project development, design, and operations.

- Through the TAMP, coordinate the Department performance metrics with the FHWA performance metrics to ensure the FHWA performance target metrics are achieved.

6.4 State Highway System (SHS) vs. National Highway System (NHS)

The Department will continue to use its existing, long-standing transportation asset management approach and practices to establish FHWA targets corresponding to the FHWA performance measures. The Department will establish FHWA targets which are enveloped by the Department's existing performance measures and targets to ensure no gaps remain between existing and desired conditions.

There is a small percentage of off-system (locally owned) pavement and bridge assets that are part of the NHS but are under the jurisdiction of the local governments and located within the boundaries of the Metropolitan Planning Organizations (MPOs). For pavement, it's approximately 6.5 percent of the total NHS centerline miles and for bridges, it's approximately 2.7 percent of the total NHS bridges and 3.6 percent of the total NHS bridge deck area.

The Department collects data for the locally owned assets through its pavement and bridge management systems. This information is used to inform the list of local priority projects, which are developed by the MPOs in coordination with the Department's District Offices. These project priorities serve as the basis for the districtwide prioritization process, which feeds into the development of the statewide Work Program.

This helps to ensure the Department is adequately addressing the needs of the entire NHS (both on-system and off-system). State and/or federal funds are used by the Department to supplement local agencies' efforts for managing and maintaining their assets. So, even if the off-system assets were to fall below standards, the risk associated with maintaining a state of good repair would be minimal.

Chapter 7 Risk Management

Different industries use many different definitions of risk and risk management. Many consider risks to include both possible threats and possible opportunities for mitigation. The International Organization for Standardization defines risk as "the effect of uncertainty on objectives" and notes that uncertainty could be positive or negative. Other definitions equate risk to variability or to the chance that desired outcomes won't be achieved.

The Department defines risk as the probability of certain outcomes related to rare, but expected outside influences. The Department is committed to considering risk as an integral part of its asset management program. Therefore, Risk Management as used in the Department is a continuous process whereby data is collected and evaluated with relation to established goals and objectives. In fact, the FTP recommends that the Department incorporate the risk of service interruption into its priority-setting process.

So, risks will be identified at the agency, program and asset levels. Agency level risks are risks that affect the mission, vision and overall results of the asset management program. For example, legislative actions or economic changes. Program level risks are risks that affect the Department's ability to deliver projects and meet targets within a program. For example, construction cost variations, materials price volatility or data quality. Asset level risks are risks that affect the scope, cost, schedule, quality of projects or the condition of specific assets. They relate to specific projects. For example, cost overruns, material and workmanship deficiencies, or climatic events.

7.1 Agency and Program Level Risks

At the agency and program levels, there is very minimal risk associated with funding shortages and cost increases which ultimately may result in service interruptions. The Department's primary source of funding for asset management activities comes from state-generated revenues. Funding allocations for pavements and bridges are taken directly "off the top" to ensure assets are maintained in a state of good repair. There have been occasions where state-generated revenues have been re-directed by the legislature; however, the Department is still obligated by statute (s. 334.046, F.S.) to meet the standards before doing anything else.

7.2 Pavement Asset Level Risks

For pavement assets, the Department has a robust, long-standing, pavement management program that has developed to the point that risks which may lead to service interruptions have been mitigated or minimized.

Risks associated with funding shortages and cost increases, which include material shortages, are mitigated as discussed above. Risks associated with material and workmanship deficiencies are mitigated by long-standing construction specifications and construction engineering and inspection practices including, but not limited to, research, contractor and consultant pre-qualification requirements, approved products, materials testing certifications, and collaboration with industry groups.

Based on years of proven performance, the Department has determined that a thin mill and overlay pavement preservation technique coupled with the pavement condition survey is best suited for the SHS; therefore, there are no risks associated with the use of other shorter-term pavement preservation techniques. Event risks such as floods, fires, vehicular incidents, etc. are minimized due to the Department's "off the top" funding allocation structure for rehabilitation and maintenance activities and Work Program process.

There are emerging technologies that may impact maintenance and operations activities. Possibly the most transformational is the connected and automated vehicle (CAV) technologies. The implementation of these technologies will require careful consideration and may dramatically change how the Department manages its pavement assets. An emerging trend is in data collection and data processing. Real-time information on assets or motor vehicle records all hold promise for transportation-related policy and planning decisions. Improved data analytics could also impact the predictability of pavement performance and identify critical areas for targeted maintenance activities.

The Department plans to continue participating in pooled fund studies, as well as national and state-sponsored research efforts to stay abreast of the potential impacts of these emerging technologies.

In summary, for pavement assets, the Department continuously monitors and manages risks through the agency's Pavement Management System and practices which allow the Department to meet its goals and continue to preserve the performance of the system.

7.2 Bridge Asset Level Risks

The same as pavement assets, bridge asset risks associated with funding shortages and cost increases, which include material shortages, are mitigated as discussed above. Risks associated with material and workmanship deficiencies are mitigated by long-standing construction specifications and construction engineering and inspection practices including, but not limited to, research, contractor and consultant pre-qualification requirements, approved products, materials testing certifications, and collaboration with industry groups.

Event risks, such as hurricanes, tornadoes, wildfires, floods, collision, advanced deterioration and fatigue can occur which may impact bridge assets resulting in long term service interruptions. The causes are, at least in part, outside the Department's control and subject to random external factors. These events are considered to be risks, which are quantified in terms of the likelihood of occurrence.

They can cause a bridge to be damaged or destroyed, delivering a consequence to the agency (the cost to repair or replace the structure) and an impact on the public (safety, disruption of transportation service and of the larger economy).

Event risks are modeled probabilistically. At a given bridge site, an event risk can occur with various levels of severity that can be forecast only with a broad concept of probability distribution. Once an event occurs, the damage to the structure and impact on the public are also probabilistic, subject to a limited degree of agency control.

For bridge management purposes, the main decision variable in the risk analysis is the selection and timing of programmed actions to increase the resilience of the Department's structures, thus indirectly influencing the social costs caused by risks. The controllable costs of structure resilience and operational strategies are combined with the more random future outputs of agency, user and non-user costs due to risks, to produce forecasts of life cycle costs.

If a project is delayed, this lengthens the period of higher risk costs, resulting in an increase in the life cycle costs. The benefit of accelerating a project by one year is the one-year savings in life cycle cost. Therefore, the Department will include probabilistic models of risk in its life cycle costs analysis of projects.

For bridge assets, Risk Registers will be developed and used to evaluate each identified risk in terms of the likelihood of occurrence and the resulting consequence of its occurrence. By properly identifying and understanding the risks, the Department can prioritize areas that need mitigation or contingency planning in the context of asset management. This process will allow for Department-wide consideration and practice.

While necessary data will be continuously collected, the Risk Registers and prioritization effort will be revisited periodically to update and verify risk models. By regularly revisiting the risks, the Department will be well positioned to address emerging issues that may impact its ability to provide continuity of service.

Chapter 8 Life-Cycle Planning

The overriding principle in project selection is meeting established performance targets. The Department has a well-established philosophy, codified in statute, to direct funding and to maintain performance targets. The life cycle approaches described here supplement that decision making process, ensuring that Florida's pavements and bridges remain at or above established targets.

8.1 Pavement Assets

The Department uses an in-house-developed Pavement Management System (PMS) to manage its pavement assets. As explained in Chapter 4, every year pavement condition surveys are conducted to monitor and collect the performance and condition of the entire SHS in support of the Department's pavement management program. The pavement data is processed and stored in the PMS which contains more than 38 years of historic pavement condition data.

The Department also collects data for state and locally owned assets through the Highway Performance Monitoring System (HPMS). This data is used for assessing and reporting highway system performance under FHWA's strategic planning process and is provided to the local owners upon request.

With such robust historic information, the Department has a very good understanding of how its pavements deteriorate. So, the rate of deterioration is balanced by the rate of resurfacing. Projects are chosen in accordance with the criteria of safety, preservation of the system, ride and other metrics as needed to maintain the integrity of the SHS.

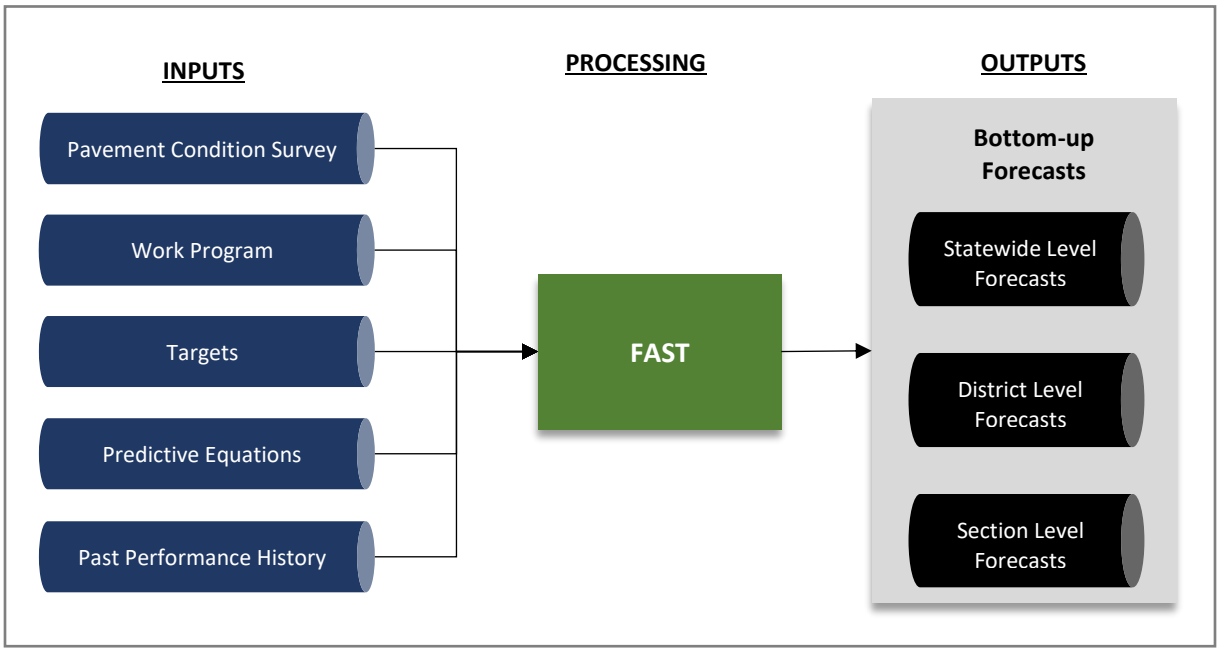
Prior to 2009, the Department used a formulaic approach to pavement resurfacing project selection (target setting). Based on average pavement life, this approach dictated that 5.3 percent of the statewide lane-miles be resurfaced based on deficiencies.

The Florida Analysis System for Targets (FAST) was created to provide a stronger analytic approach to the resurfacing program to meet the 80 percent non-deficient statewide standard. FAST is the engine of the Department's PMS. One of the inputs to FAST is the Work Program, which includes projects from all the modal offices as well as the Metropolitan Planning Organizations (MPOs). This allows FAST to better prioritize pavement projects in conjunction with planned projects from the other offices.

Based on historical performance information in each district, FAST relies upon customized regression equations to forecast performance. Crack ratings and other predictive indicators are also used to estimate the optimal allocations. This allows for a more detailed forecast analysis, allowing pavement management staff to run a variety of funding scenarios with a Benefit-to-Cost algorithm, to help optimize project selection for decision-makers. FAST also provides the ability to calculate future resurfacing allocations based on forecasted conditions, impact analysis for the funding scenarios, and has improved section level condition forecasts across the SHS.

FAST is very accurate on a system-wide level, however some section level projections remain difficult to estimate.

Figure 13: Florida Analysis System for Targets (FAST)



Source: FDOT, Pavement Management Office

The Department currently designs pavements with a standard design life of 20 years. This allows for statewide consistency in pavement life, although there have been expected differences between pavements in the various regions of the State.

For economic valuation, the Department assumes the following:

- A discount rate of 3.5 percent on all pavement treatments.
- A construction cost inflation rate as shown in Table 8 below. The construction cost inflation factors may be adjusted due to site-specific factors.
- No depreciation expense is reported for Florida infrastructure assets, nor are amounts capitalized relating to improvements that lengthen the lives of such assets, unless the improvements also increase their service potential.

The Department tracks the capital costs of pavement projects as well as the costs to maintain pavement to a specific level of service. However, reliable cost data for maintenance, subsequent stages of construction, or corrective work and salvage value are not always available.

The Department selects pavement materials based on life cycle costs. The selection of pavement type is a process in which the highway engineer or administrator makes a judgment on many factors such as traffic, soils, weather, materials, construction, economic costs, maintenance, and environment. The pavement type selection may be dictated by an overriding consideration for one or more of these factors.

Table 8: FDOT Work Program Highway Construction Cost Inflation Factors, 2017-2037

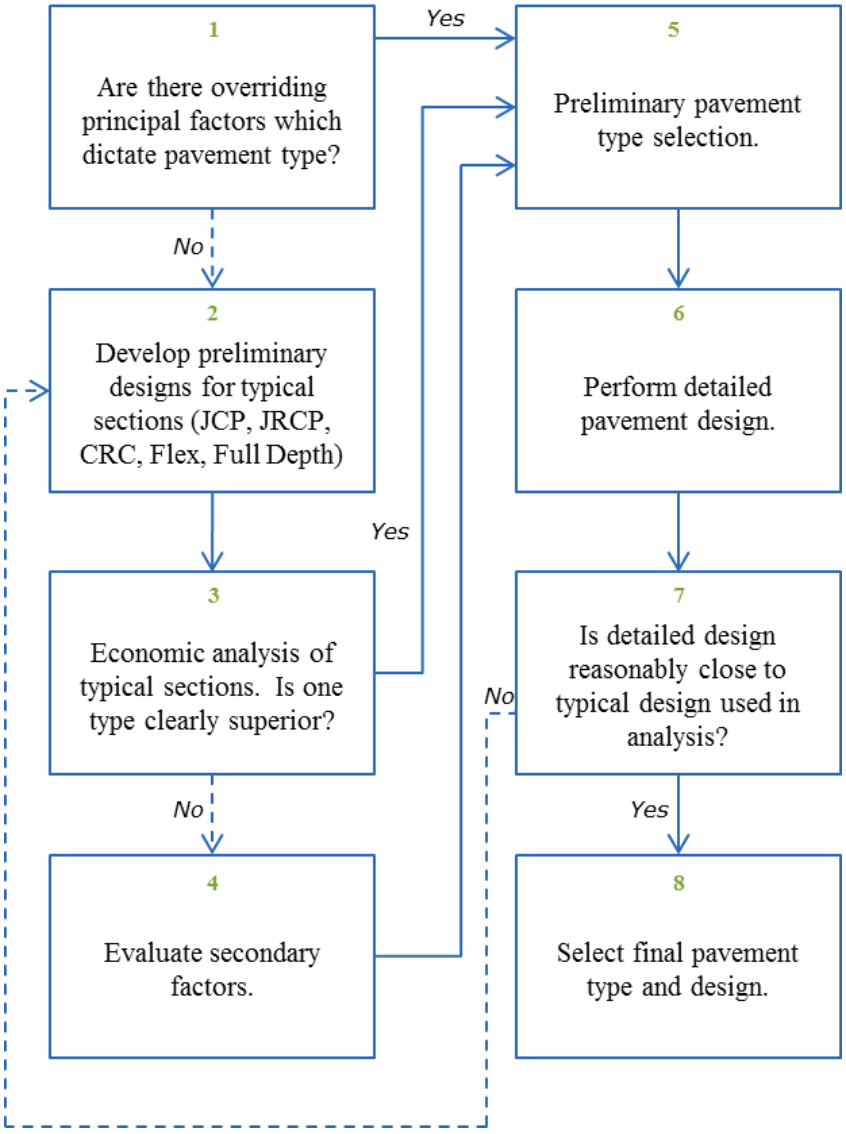
Year	Inflation Factor	Present Day Cost (PDC) Multiplier	Year	Inflation Factor	Present Day Cost (PDC) Multiplier
2017	Base	1.000	**2028**	3.3%	1.365
2018	2.7%	1.027	**2029**	3.3%	1.410
2019	2.8%	1.056	**2030**	3.3%	1.457
2020	2.6%	1.083	**2031**	3.3%	1.505
2021	2.5%	1.110	**2032**	3.3%	1.555
2022	2.7%	1.140	**2033**	3.3%	1.606
2023	2.8%	1.172	**2034**	3.3%	1.659
2024	2.9%	1.206	**2035**	3.3%	1.714
2025	3.0%	1.242	**2036**	3.3%	1.770
2026	3.1%	1.281	**2037**	3.3%	1.829
2027	3.2%	1.322			

Source: FDOT, Office of Work Program and Budget (Fiscal Year 2017 is July 1, 2016 to June 30, 2017)

Where there are no overriding factors and several alternate pavement treatments or types would serve satisfactorily, the Department uses cost comparison to assist in determining pavement type. These comparisons include the initial cost of the pavement and the cost to maintain the service level desired. It should be recognized that such procedures are not precise since reliable cost data for maintenance, subsequent stages of construction, or corrective work and salvage value are not always available, and costs often need to be projected to some future point in time.

Figure 14 below, shows the typical approach for pavement selection decision making within the Department. In stage three of the process, the economic costs are considered, including the maintenance cost component. User costs are not considered in this analysis. Costs are compared based on the net present value incorporating the construction cost inflation and discount rate.

Figure 14: Pavement Type Selection Process



Source: Adapted from Pavement Type Selection Manual, October 2013

The Department selects pavement type based on life cycle costs. Replacement or reconstruction is required when an asset has reached the end of its service life and can no longer be extended through resurfacing, repair, or rehabilitation. New resurfacing projects are programmed three years into the future and resurfacing dollars are allocated for the new 5th year of the Five-Year Work Program based on expected pavement condition ratings.

8.2 Bridge Assets

The Department uses AASHTOWare™ Bridge Management Software (BrM), formerly Pontis, to inform bridge management decision making. BrM 5.2.2 is the Department's current production version. It has the capability to collect inspection and inventory data, and with the Department's customization, produce inspection reports and other reports required by the Department. The BrM 5.3 has additional features including performing various life cycle cost analysis and benefit cost analysis.

The Department collects inventory and condition data for state as well as locally owned assets through the Department's bridge inspection program. Data is provided to the local bridge owners upon request. The bridge inspection program plays an integral part in the asset management of the bridge inventory in that much of the data concerning bridge condition and performance is gathered from inspections. Also, bridge repair work and bridge replacements based on condition are initiated through the inspection process.

Inspectors use the Department's Bridge Inspection Field Guide to ensure bridges are inspected consistently and systematically. Bridges are inspected at least once every two years to assess their condition and to identify structures that require further maintenance, rehabilitation, or replacement. Bridges in Poor condition are inspected more frequently. The exception to this are a class of low risk bridges that will be inspected every four years. Special inspections are conducted after major weather events, such as floods and hurricanes.

The inventory and condition data collected is stored in the bridge management system database. The data is updated during each inspection event and after construction that results in changes to the inventory data. The Department processes the data using BrM and has developed customized bridge inspection, inventory and other frequently used standard reports. In addition, the Department collects state specific data which is also stored in the database.

From 1998 through December 2016 the Department inspected bridges with the Commonly Recognized Elements (CoRe) for bridge inspections. This data and other research was used to develop the Department's bridge deterioration curves. The Department recently moved to the new AASHTO Bridge Management Elements (BME) for bridge inspections. With this move, a research project was performed to create a starting point to predict deterioration of the BMEs. Once several cycles of element condition have been collected, the deterioration models will be updated. This will allow the Department to predict future deterioration of the bridges using BrM or other appropriate software.

In terms of benefit/cost, the Department does perform benefit cost analysis over the life cycle of the bridge assets. The analysis includes "no action" options and is conducted using the most suitable software based on the type of evaluation.

For example, for a system level analysis of a bridge (either District or Statewide) the objective is to coordinate the overall bridge inventory condition with the budgetary needs. The Office of Maintenance will periodically perform statewide system analysis to review overall system performance versus budgetary needs.

This includes looking at tradeoffs between funding and performance of the system or various subsets of the system. The District Structures Maintenance Offices in each District also periodically performs a districtwide system analysis to assist each District in managing its bridge inventory.

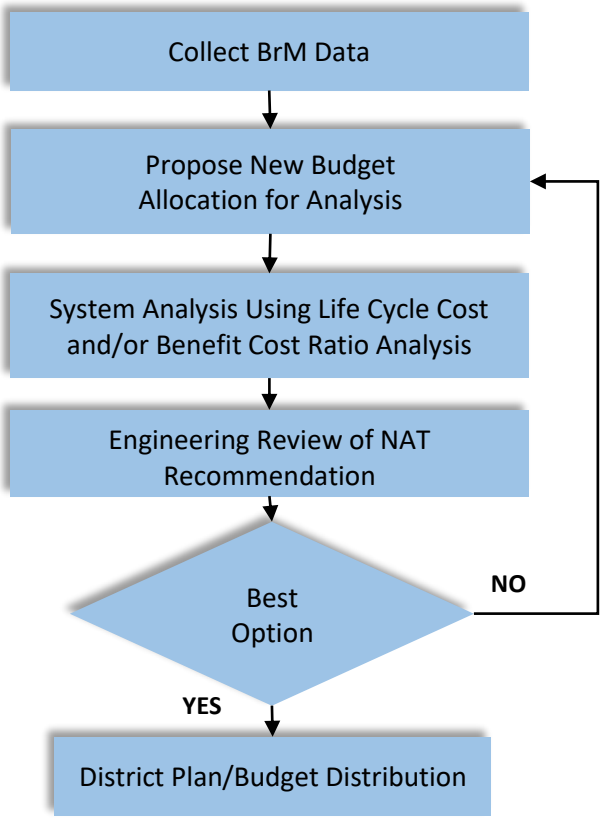
This level of analysis may also provide a general view of weaknesses and strengths in the inventory, and areas of work to emphasize to achieve maximum performance. The Department will evaluate the system analysis capabilities of the BrM Bridge Management System to determine if it meets the needs of the Department. The Department may also use the Network Analysis Tool (NAT) which is a decision support tool developed through Department sponsored research.

The NAT is an excel based application that combines the results of the Project Level Analysis Tool (PLAT) to provide a network level perspective on the tradeoffs between funding and performance of the entire bridge inventory or a specified portion of the inventory.

The inventory analyzed may be broken down by District, Functional Class, or Structure Type. Various performance measures may be analyzed such as percent Good/Excellent condition, health index, paint health index, or life cycle costs. In addition, the application allows for the use of specific budgets or desired performance levels. A flow chart of the system level analysis process is shown in Figure 15.

Figure 15: Bridge - System Level Performance Analysis

Please refer to the next page for a description of the flowchart elements.



Source: FDOT, Office of Maintenance

Flowchart Element Descriptions

Collect BrM Data – The data in BrM is collected as part of the bridge inspection process. This data is an input into analyses performed by various software.

Propose New Budget Allocation for Analysis – The analysis process uses an assumed budgetary value input into the system. Because of the analysis, the budget may change to support the performance objectives.

System Analysis Using Life Cycle Cost and/or Benefit Cost Ratio Analysis – The System Analysis may utilize one or both Life Cycle Cost Analysis or Benefit Cost Ratio Analysis to produce its conclusions. This process is run internally.

Engineering Review of Network Analysis Tool (NAT) Recommendations – District or Central Office personnel will consider the recommendations to objectives, priorities, and budgetary restraints. If the recommendations are acceptable, the program will proceed. If the recommendations are not acceptable, input parameters are modified and the analysis is rerun for new recommendations.

District Plan/Budget Distribution – Once the recommendations are accepted, a budget will be established and work need priorities will be established.

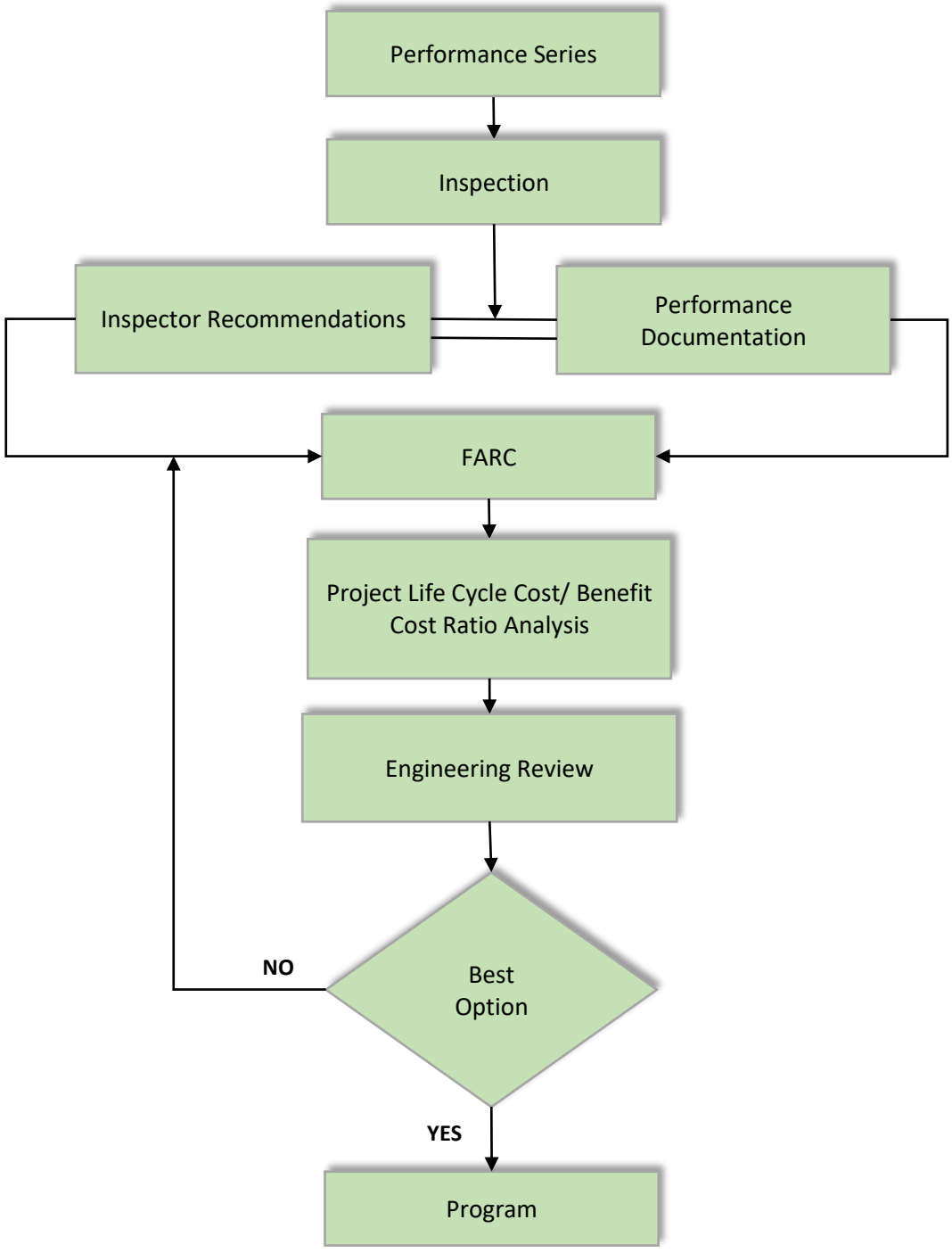
The Department uses the Project Level Analysis Tool (PLAT) to conduct bridge project level analysis. This is also an Excel based tool that was developed through Department sponsored research. It uses data from the BrM database and performs life cycle analysis at the bridge level. PLAT automatically analyzes three scenarios; do nothing, repair and replace.

Risks of natural and man-made hazards are quantified as social costs to the public and the Department. User costs due to functional deficiencies and delays are estimated. Benefits are determined by the reduction in social and user costs due to the actions performed. This is compared to the costs of the proposed project to determine a benefit cost ratio.

PLAT also allows the user to customize and evaluate the impact of the timing of projects. The user can place proposed projects in any year of a ten-year period and the tool will project the element level deterioration until the project is executed. The elements that are part of the project are assumed to return to Good condition (or state 1) and deterioration is assumed to begin again. This allows the user to observe the associated impacts of the project and adjust as necessary.

Figure 16 below illustrates the Department's project level analysis for bridges.

Figure 16: Bridge - Project Level Performance Analysis



Please refer to the next page for a description of the flowchart elements.

Source: FDOT, Office of Maintenance

Flowchart Element Descriptions

Performance Series – The performance of the bridge as an entire system, or the individual bridge elements is measured against numerous external affects. A Performance Series is an incremental change in the bridge condition that can be measured, as a result of these external affects. These conditions can act slowly, such as with rusting steel, or they can act quickly, such as with wave impact from storm surge. The Series represents a chronological history of the system, sub-system or element performance based on condition or functionality. With regard to risk management, the Performance Series represents the fundamental unit of measure for establishing risk and Life-Cycle Costs.

Inspection – The bridge inspection process identifies changes in bridge element condition, performance of bridge preservation systems, and performance of the bridge system and bridge elements. Through the generated bridge inspection report the updated inspection information is recorded into the BrM system.

Inspector Recommendations - The Inspection Report lists work need recommendations based on the inspection observations. These work needs may involve either structural repairs or preservation needs.

Performance Documentation – Historical documentation relating to structural performance of the bridge elements for the specific bridge and related bridges will be accessed and used in the decision-making process.

FARC – The Feasible Action Review Committee (FARC) consists of District bridge maintenance personnel and, as necessary, asset maintenance personnel. The Committee's primary purpose is to identify, prioritize, and schedule bridge (and other ancillary structure) work needs. As part of the decision-making process the FARC will utilize input from various sources, including modal plans. The FARC will have responsibility for executing the final decisions concerning bridge work needs.

Project Life Cycle Cost and Benefit Cost Ratio Analysis – As part of the decision-making process the FARC will reference BrM and PLAT asset management programming concerning Life Cycle Cost and Benefit Cost Ratio Analysis. Results of the analyses will be recorded and referenced in the final decision process.

Engineering Review – The FARC will coordinate with District production and operations management during the Project Level decision-making process. Decisions will be modified as necessary to align with the goals and objectives of the District and the FTP. The FARC will record results of the coordination meetings.

Best Option – The FARC will consider input from: the inspectors; bridge element performance history; Life Cycle Cost and Benefit Cost Ratio Analysis; and District and State planning goals and objectives. The FARC will decide whether the work action sufficiently satisfies all inputs. If the work action sufficiently satisfies the requirements, the work action is prioritized and programmed. If the work action does not satisfy the requirements, the committee will consider an alternative course of action.

Program – The District Bridge Maintenance Office will assign the work action for disposition to the appropriate group: maintenance yard; internal personnel; consultant or asset maintenance contractor. A key component of the Department's bridge management system is the consideration of short and long-term budgeting needs for bridge repair and replacement. These needs are developed at the District level and are based on the bridge inspection process and NBI inspection data stored in the BrM system. Each District bridge maintenance office conducts periodic meetings to review inspector recommendations from inspection reports and to identify work needs. The work needs are then prioritized by District staff and candidate construction projects are created, including project budgets. The Department's Central Office collects all the District bridge work needs and creates a statewide Bridge Work Plan. That statement of needs is submitted to the Office of Work Program and Budget and is included for discussion at the Department's annual summer Program Planning Workshops for development of the Five-Year Work Program.

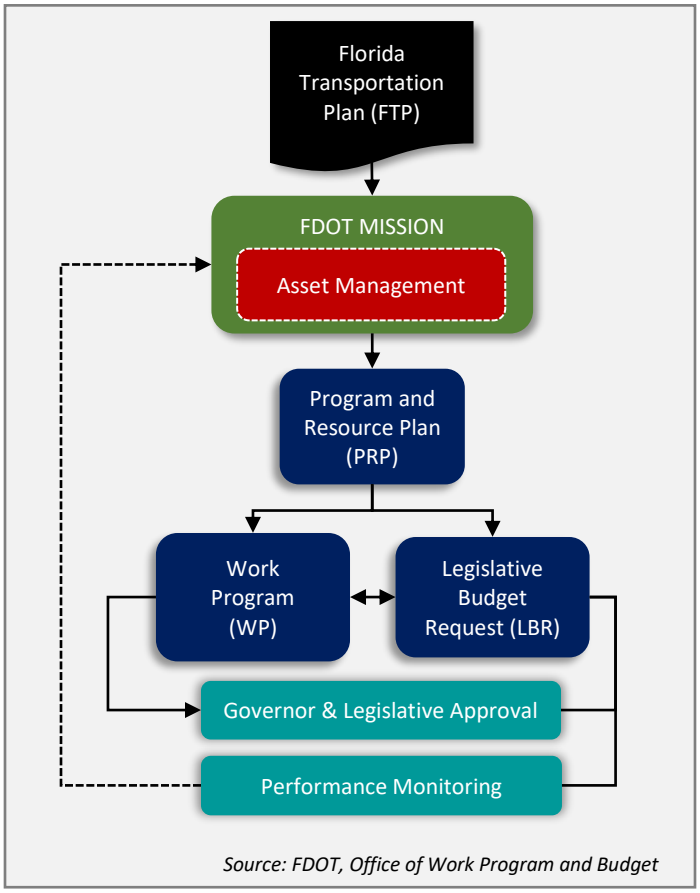
Chapter 9 Implementation

Implementation of the processes described in this TAMP are ongoing as they are the Department's current approach to asset management for the SHS, which includes the majority of the NHS. It's how the Department does business (see Figure 17).

To meet the Federal requirements for the risk-based asset management plan, the Department's leadership established a Steering Committee to facilitate the development and oversee the review and updating of the TAMP. The committee is co-championed by the Director, Office of Maintenance and the Department's Performance Coordinator and includes representatives from the following offices and organizations:

- Office of Work Program and Budget
- Public Transit Office
- Office of Policy Planning
- State Materials Office
- Bridge Office
- Office of Information Systems
- Pavement Management Office
- Office of Maintenance
- Safety Office
- Transportation Data and Analytics Office
- Metropolitan Planning Advisory Council (MPOAC)

Figure 17: FDOT Asset Management Process



Source: FDOT, Office of Work Program and Budget

The Department's Performance Management Policy (Topic No. 000-525-052-b) links performance measures to planning and programming decision making.

This helps to inform decisions and provides feedback on the transportation system performance, agency operations and program outcomes.

Performance management encompasses asset management and performance measurement reflecting the Department's priorities for accountability and stewardship of resources.

As stated in the policy, the Department will implement performance management agency-wide by:

- Regularly reporting on performance measures spanning the Department's operations including, but not limited to, transportation system performance measures, production measures and mission-related measures;

- Establishing and maintaining transportation system performance core measures that align with our mission, priorities, and long-term goals;

- Ensuring that our asset management efforts include useful measures of performance;

- Building performance measures into our plans and programs to advance performance-based planning and programming practices;

- Establishing and tracking future performance targets;

- Collaborating among Central Office and District Office staff, including a yearly performance measurement workshop to begin an annual cycle of performance report development;

- Collaborating with MPOs, transit operators and other stakeholders as appropriate for a coordinated approach to performance measurement; and

- Consistently reporting and communicating performance results to be used in informing planning and programming decision making.

Furthermore, because performance management depends on reliable data, Department program and office managers are responsible for coordinating the measures they use to achieve consistent reporting of measures.

In terms of updates to the TAMP, the Steering Committee will meet as necessary until submission of the final TAMP in 2019 to:

- Respond to comments from the FHWA Review and Certification Process;
- Develop the Pavement and Bridge targets; and
- Address the Risk Management Analysis

Longer-term, the TAMP will be:

- Reviewed periodically by the Steering Committee to ensure Department policies and processes are current; and
- Updated and resubmitted every 4 years per rule requirements for FHWA process certification/re-certification

This schedule will support continued improvement of the Department's asset management practices and enable the Department to continue to provide solid stewardship of Florida's transportation assets.

Appendix A: Program and Resource Plan Summary FY 2017/18 to 2025/26

FLORIDA DEPARTMENT OF TRANSPORTATION — OWPB

18Adopt01 — 2016/17 PROGRAM AND RESOURCE PLAN SUMMARY — 10-Jul-17

WORK PROGRAM — FISCAL YEARS 2017/18 TO 2025/26 — 10:01 AM

FILE: 1-July-2017 — (MILLIONS OF $)

(Excludes Hurricanes)	ACTUAL	PLAN	First Five Years						Next Four Years					10 YR.
PROGRAM AREAS	15/16	16/17	17/18	18/19	19/20	20/21	21/22	TOTAL	22/23	23/24	24/25	25/26	TOTAL	TOTAL
I. PRODUCT	5,746.5	5,957.0	8,476.1	6,448.5	5,858.6	5,851.1	5,995.0	**32,629.2**	6,671.8	6,582.4	5,732.9	5,711.1	24,698.3	**63,284.4**
A.State Highway System (SHS)	2,883.9	3,023.9	4,110.0	3,407.2	2,382.0	2,750.4	2,924.4	15,574.0	3,717.8	3,665.6	2,707.4	2,672.0	12,762.9	31,360.7
B.Other Roads	275.4	303.2	417.7	368.3	319.7	287.3	255.1	1,648.1	302.9	307.9	313.2	318.9	1,242.9	3,194.1
C.Right of Way Land	421.3	440.5	997.1	482.7	393.8	567.6	499.7	2,940.9	433.1	345.9	360.5	318.3	1,457.8	4,839.2
D.Aviation	349.6	241.9	260.0	234.5	210.8	255.9	190.5	1,151.7	225.6	232.1	239.0	246.3	943.1	2,336.7
E.Transit	507.1	329.4	767.1	565.9	413.0	403.9	427.4	2,577.3	479.2	487.0	495.4	504.4	1,966.0	4,872.8
F.Rail	119.9	143.4	372.4	272.5	177.6	150.1	154.7	1,127.3	177.0	181.5	186.3	191.4	736.2	2,006.9
G.Intermodal Access	86.0	41.6	117.2	61.2	39.6	43.7	45.3	307.0	56.3	57.6	58.9	60.3	233.1	581.7
H.Seaports	106.2	138.4	206.3	135.3	113.9	117.9	106.5	679.9	128.9	132.5	136.3	140.4	538.1	1,356.4
I.Safety	154.3	135.5	185.3	179.4	140.7	160.5	147.4	813.2	169.9	170.7	171.1	171.5	683.1	1,631.9
J.Resurfacing	612.7	542.7	682.9	548.3	633.0	827.9	953.8	3,645.9	832.3	848.2	892.1	911.3	3,483.8	7,672.5
K.Bridge	230.3	616.4	360.0	193.1	1,034.6	285.8	290.3	2,163.9	148.9	153.4	172.7	176.3	651.3	3,431.6
II. PRODUCT SUPPORT	1,640.5	1,654.2	1,999.9	1,476.6	1,302.4	1,277.5	1,093.0	**7,149.4**	1,351.1	1,495.9	1,358.8	1,303.2	5,509.0	**14,312.5**
A.Preliminary Engineering	931.7	978.6	1,074.1	765.4	674.3	729.3	558.9	3,802.0	700.7	797.3	712.4	682.2	2,892.6	7,673.2
B.Construction Eng. Inspection	427.8	379.2	554.8	450.3	363.3	311.7	284.6	1,964.8	384.0	429.4	369.1	344.0	1,526.5	3,870.5
C.Right of Way Support	96.2	88.7	144.5	80.8	92.4	68.8	75.1	461.6	80.6	78.7	83.2	77.6	320.1	870.4
D.Environmental Mitigation	27.1	29.8	35.1	5.3	8.4	0.8	4.6	54.3	7.4	7.4	6.0	6.1	26.9	111.0
E.Material & Research	42.0	42.5	45.6	47.7	45.7	47.5	48.8	235.4	50.1	51.7	53.3	55.0	210.1	487.9
F.Planning & Environment	103.7	123.0	133.4	114.2	104.9	105.5	106.5	564.4	113.3	115.8	118.6	121.4	469.1	1,156.5
G.Public Transport. Ops.	12.0	12.4	12.3	12.8	13.4	13.9	14.4	66.9	15.0	15.6	16.2	16.9	63.8	143.1
III. OPER. & MAINTENANCE	1,133.8	1,203.8	1,351.1	1,350.0	1,383.9	1,435.1	1,438.3	**6,958.3**	1,508.6	1,472.1	1,587.8	1,662.7	6,231.2	**14,393.4**
A.Operations & Maintenance	723.3	741.7	795.8	814.8	847.1	872.0	899.7	4,229.4	879.3	910.9	934.3	969.4	3,693.9	8,665.0
B.Traffic Engineering & Opers.	141.2	169.4	218.8	200.9	206.9	225.8	214.5	1,066.9	214.1	219.4	225.0	231.0	889.4	2,125.7
C.Toll Operations	269.4	292.7	336.5	334.2	329.9	337.3	324.1	1,662.0	415.3	341.9	428.5	462.4	1,648.0	3,602.7
IV. ADMINISTRATION	150.3	144.3	160.0	176.4	182.3	188.4	194.8	**901.9**	199.5	206.9	214.7	222.7	843.8	**1,890.1**
A.Administration	86.0	87.0	91.6	93.8	97.2	100.7	104.4	487.7	108.2	112.1	116.2	120.5	457.0	1,031.7
B.Fixed Capital Outlay	18.2	8.2	8.2	20.0	20.0	20.0	20.0	88.2	18.1	18.7	19.2	19.8	75.8	172.2
C.Office Information Systems	46.0	49.1	60.2	62.6	65.1	67.7	70.4	326.0	73.2	76.2	79.2	82.4	311.0	686.1
TOTAL PROGRAM	8,671.1	8,959.2	11,987.1	9,451.5	8,727.2	8,752.1	8,721.0	**47,638.8**	9,731.0	9,757.4	8,894.2	8,899.7	37,282.3	**93,880.4**
		49.7%												
V. OTHER	178.4	177.0	177.6	224.4	246.3	309.1	343.3	**1,300.6**	367.4	375.0	371.3	369.1	1,482.8	**2,960.4**
A.Local Govt. Reimbursement	1.0	1.3	2.6	17.8	0.8	7.5	0.0	28.7	5.7	5.8	5.9	6.1	23.6	53.5
B.Other	177.4	175.8	175.0	206.6	245.5	301.6	343.3	1,272.0	361.7	369.2	365.3	363.0	1,459.2	2,907.0
TOTAL BUDGET	8,849.5	9,136.3	12,164.8	9,675.8	8,973.4	9,061.1	9,064.3	**48,939.5**	10,098.4	10,132.5	9,265.4	9,268.7	38,765.1	**96,840.8**
HIGHLIGHTS:														
1.Construction	3,967.0	4,449.6	5,535.0	4,520.0	4,350.4	4,148.8	4,408.0	22,962.3	5,001.7	4,971.9	4,078.6	4,067.7	18,119.9	45,531.9
2.FLP (w/o TD Commission)	1,117.8	840.3	1,667.2	1,216.6	902.0	918.6	871.6	5,576.0	1,014.2	1,037.9	1,063.1	1,090.0	4,205.2	10,621.5
3.Product Support Consultant	1,281.9	1,277.8	1,549.2	1,123.0	945.6	935.5	737.6	5,291.0	973.3	1,110.0	960.0	899.5	3,942.8	10,511.7
a.Preliminary Engineering	829.2	873.4	969.8	656.9	561.5	612.0	436.9	3,237.1	573.8	665.4	575.1	539.4	2,353.8	6,464.3
b.Construction Eng. Inspection	427.8	379.2	554.8	450.3	363.3	311.7	284.6	1,964.8	384.0	429.4	369.1	344.0	1,526.5	3,870.5
c.Right of Way Support	24.8	25.3	24.6	15.8	20.8	11.8	16.1	89.1	15.4	15.3	15.7	16.1	62.6	176.9

Appendix B: Historical Program and Resource Plans 2007/08 to 2016/17

17-HISTORY
PROGRAM PLAN HISTORY

PROGRAM AND RESOURCE PLAN SUMMARY
FISCAL YEARS 2007/08 TO 2016/17
($ IN MILLIONS)

PROGRAM AREAS	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
I. PRODUCT	4,290.3	3,618.0	3,475.0	3,837.1	4,484.6	4,342.1	5,691.4	5,817.0	5,746.5	5,957.0
A. Intrastate - Exp.**	**1290.0**	**819.9**	**1080.1**	**1295.5**	**1217.0**	**2054.5**	**3134.0**			
B. Other Arterials - Exp.**	**785.5**	**729.3**	**647.6**	**471.6**	**747.2**	**239.0**	**395.0**			
A. State Highway System (SHS)								3082.1	2883.9	3023.9
B. Other Roads								350.8	275.4	303.2
C. Right Of Way	391.0	378.1	206.6	148.1	240.1	253.1	342.1	385.8	421.3	440.5
D. Aviation	167.6	205.0	160.6	121.9	190.7	181.4	181.6	320.9	349.6	241.9
E. Transit	328.6	306.1	299.9	346.8	497.5	338.7	376.3	449.7	507.1	329.4
F. Rail	115.0	100.8	58.8	275.6	330.4	71.5	113.4	177.5	119.9	143.4
G. Intermodal Access	106.3	93.2	49.3	57.1	146.6	99.7	36.0	35.3	86.0	41.6
H. Ports	182.4	53.5	46.9	52.3	118.2	113.9	259.9	134.2	106.2	138.4
I. Safety	70.7	71.5	136.6	130.5	117.3	110.8	136.6	121.8	154.3	135.5
J. Resurfacing	592.0	608.0	545.4	581.7	523.8	525.9	455.8	570.8	612.7	542.7
K. Bridge	258.3	252.6	243.1	356.0	355.8	353.5	260.7	187.9	230.3	616.4
L. Trans. Outreach Prog.	3.0									
II. PRODUCT SUPPORT	1,277.3	1,076.9	1,031.4	1,096.9	1,327.3	1,375.6	1,360.0	1,479.2	1,640.5	1,654.2
A. Prel. Eng.	708.2	563.3	557.7	593.8	790.1	758.3	721.6	831.5	931.7	978.6
B. Const Eng Insp.	309.5	278.5	250.7	289.4	304.7	368	343	365.9	427.8	379.2
C. R/W Support	63.9	61	55.3	54.5	63.9	72.7	77.8	77	96.2	88.7
D. Environ. Mitigation	36.2	30.9	22.4	8.9	20.3	9.3	42	41.8	27.1	29.8
E. Material & Res.	42.8	37.6	42.5	43.9	41	39.3	43.8	40.1	42	42.5
F. Planning	105.6	94.7	91.6	94.1	97.1	116.3	119.1	110.6	103.7	123
G. Pub. Trans Oper./FLP	11.1	10.8	11.1	12.4	10.2	11.8	12.8	12.3	12	12.4
III. OPERAT.& MAINT.	852.1	875.8	1,052.9	1,046.7	890.8	970.3	942.2	1,076.2	1,133.8	1,203.8
A. Routine Maint.	507.1	571.5	655.8	676.1	610.0	636.4	641.2	694.6	723.3	741.7
B. Traffic Eng.	68.5	73.1	71.6	75.0	81.8	82.1	100.1	124.0	141.2	169.4
C. Toll/Turnpike Ops.	236.6	194.9	286.6	254.5	166.9	223.2	192.6	257.6	269.4	292.7
D. Motor Carr. Comp.	39.9	36.3	38.8	41.2	32.0	28.6	8.2			
IV. ADMINISTRATION	153.6	143.6	138.2	147.2	116.0	123.9	137.9	143.2	150.3	144.3
A. Admin.	106.6	105.8	105.4	96.2	78.3	80.4	81.9	85.3	86.0	87.0
B. Fixed Capital	11.8	7.9	8.1	9.4	2.1	5.6	16.3	16.5	18.2	8.2
C. Office Info Sys.	35.2	29.8	24.6	41.5	35.6	37.8	39.7	41.4	46.0	49.1
TOTAL PROGRAM	6,573.4	5,714.2	5,697.5	6,127.9	6,818.7	6,811.8	8,131.5	8,515.6	8,671.1	8,959.2
V. OTHER	195.8	200.2	207.2	203.0	206.1	200.5	177.6	172.8	178.4	177.0
A. Local Govt. Reimb.	57.3	64.3	49.3	45.1	22.4	39.2	12.0	0.8	1.0	1.3
B. Other	138.4	135.8	157.9	157.9	183.7	161.3	165.6	172.0	177.4	175.8
TOTAL BUDGET	6,769.2	5,914.3	5,904.7	6,330.9	7,024.9	7,012.3	8,309.1	8,688.4	8,849.5	9,136.3
HIGHLIGHTS:										
1. Hwy & Br(incl R/W)	3,387.5	2,859.5	2,859.4	2,983.4	3,201.2	3,536.8	4,724.2	4,699.3	4,577.9	5,062.2
2. Construction	2,845.8	2,342.8	2,500.1	2,720.5	2,858.3	3,171.0	4,194.1	4,129.6	3,967.0	4,449.6
3. PTO Total (W/O TDC)	788.7	651.6	513.1	751.7	1,181.3	696.9	855.6	1,054.0	1,117.8	840.3
4. Prod.Supt.Consult	878.1	755.4	722.2	794.2	1,021.1	1,040.8	984.0	1,111.7	1,281.9	1,277.8
5. Program less Trnpk.	5,880.2	5,199.7	5,232.7	5,813.9	6,264.5	5,701.9	7,378.8	7,495.4	7,782.7	8,075.2
6. Cash Balance	843.7	411.8	312.0	437.3	558.9	710.8	1,167.9	677.8	630.4	347.7