

**Report 17-2
January 2017**

State Highway Program

STATE OF WISCONSIN



Legislative Audit Bureau ■

State Highway Program

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Response

From the Department of Transportation



STATE OF WISCONSIN | Legislative Audit Bureau

22 East Mifflin St., Suite 500 ■ Madison, WI 53703 ■ (608) 266-2818 ■ Hotline: 1-877-FRAUD-17 ■ www.legis.wisconsin.gov/lab

Joe Chrisman
State Auditor

January 26, 2017

Senator Robert Cowles and
Representative Samantha Kerkman, Co-chairpersons
Joint Legislative Audit Committee
State Capitol
Madison, Wisconsin 53702

Dear Senator Cowles and Representative Kerkman:

As requested by the Joint Legislative Audit Committee, we have completed an evaluation of the Department of Transportation's (DOT's) management of the state highway program. DOT is responsible for planning, designing, constructing, and maintaining the 11,758 miles of Wisconsin's state highways. In fiscal year 2015-16, it spent \$2.1 billion to do so.

Major highway projects are among the largest state highway projects and must be enumerated in statutes before DOT can construct them. At enumeration, DOT provides the Legislature with an estimate of total project costs. The cost estimates reported for 16 ongoing major highway projects increased from an estimated \$2.7 billion at enumeration to an estimated \$5.8 billion as of August 2016, or by \$3.1 billion. DOT budgeted to complete more major highway project work than could be completed with its available funding because it did not sufficiently take into account the extent to which inflation and unexpected cost increases would increase project expenditures over time.

DOT has established performance measure goals to help manage and improve its operations. If DOT had met these goals, it potentially could have saved more in recent years. However, DOT is not consistently using its performance measures to manage and improve its operations.

We make recommendations for DOT to use its funds more effectively and improve its management of the state highway program. In addition, the Legislature could consider modifying statutes to require DOT to provide it with cost estimates that include all costs associated with potential projects, including the effects of inflation, and to regularly report information to it about the ongoing costs of each major highway project.

We appreciate the courtesy and cooperation extended to us by DOT. A response from DOT follows the appendices.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Joe Chrisman'.

Joe Chrisman
State Auditor

JC/DS/ss

Report Highlights ■

The condition of Wisconsin's state highways deteriorated in recent years.

DOT budgeted to complete more major highway project work than could be completed with its available funding because it did not sufficiently take into account the effects of inflation and unexpected cost increases.

DOT took steps to control its state highway engineering, construction, and maintenance costs, but it could take additional steps.

DOT is not consistently using its performance measures to manage and improve its operations.

The Department of Transportation (DOT) is responsible for planning, designing, constructing, and maintaining the 11,758 miles of Wisconsin's state highways. DOT's expenditures for state highways increased from \$739.7 million in fiscal year (FY) 1996-97 to \$2.1 billion in FY 2015-16, or by 190.2 percent. A total of 1,647.1 full-time equivalent (FTE) staff positions were allocated to DOT's state highway program as of July 1, 2016. The state highway program includes major highway projects and Southeast Wisconsin freeway megaprojects that must be enumerated in statutes before DOT can begin to construct them, rehabilitation projects that range from resurfacing to reconstructing existing highways, and maintenance work that includes removing snow and filling potholes.

To complete this audit of DOT's state highway program, we analyzed:

- trends in program expenditures and state highway conditions;
- DOT's management of the planning, engineering, and construction phases of state highway projects, as well as its maintenance of state highways; and
- DOT's use of performance measures to help manage and improve its operations.

2015 Wisconsin Act 55, the 2015-17 Biennial Budget Act, appropriated \$1.0 million to DOT to study and report on transportation funding issues by January 1, 2017. Therefore, our

audit did not analyze funding issues. In December 2016, DOT reported on current transportation funding sources and trends, as well as options for future funding sources.

State Highway Conditions

The proportion of state highways rated in good condition decreased steadily from 53.5 percent in 2010 to 41.0 percent in 2015, according to DOT's pavement condition index, which is used to determine pavement deterioration. The condition of state highways can be measured in multiple ways. According to the international roughness index, which measures highway smoothness, the proportion of state highways in good condition in Wisconsin was considerably lower than in six other midwestern states in 2014.

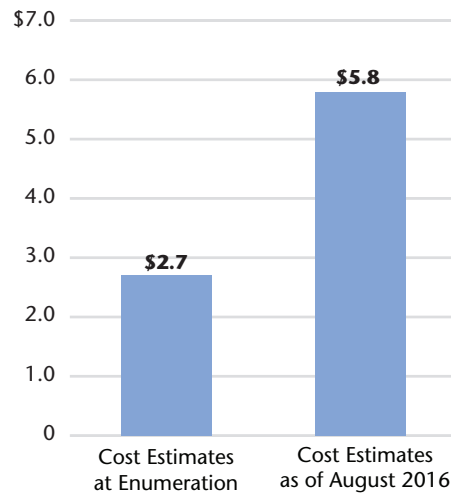
Planning

DOT provides the Governor and the Legislature with an estimate of total project costs when a major highway project is considered for enumeration. The Governor and the Legislature use these cost estimates to help determine whether to enumerate a project. We found that DOT's cost estimates were incomplete, in part, because they did not take into account that inflation would increase project expenditures over time. The estimated expenditures for 19 major highway projects completed from January 2006 through December 2015 were \$1.5 billion, which was \$772.5 million higher than DOT's cost estimates at enumeration.

We also analyzed 16 major highway projects ongoing in August 2016. The cost estimates reported by DOT in August 2016 for these 16 projects had increased by an estimated \$3.1 billion since DOT had provided the cost estimates at enumeration, as shown in Figure 1.

Figure 1

Change in the Cost Estimates of 16 Major Highway Projects Ongoing in August 2016
(in billions)



We found that DOT budgeted to complete more major highway project work than could be completed with its available funding. It did so because it did not sufficiently take into account the effects of inflation and unexpected cost increases on project expenditures. DOT indicated that unexpected cost increases caused delays in project work that it had planned to complete.

DOT determines which rehabilitation projects to construct. DOT's data indicate that these projects typically do not expand existing highways. We found that DOT has not changed the proportions of funds allocated among its five regions to complete certain rehabilitation projects since 2006, did not fully comply with administrative rules for selecting projects, and did not document why it selected particular projects to construct over other potential projects.

Engineering

Design engineers create design plans for state highway projects, and construction engineers oversee the work of construction contractors that build projects. After assigning all of its engineering staff to projects, DOT hires consultants to work on other projects that must be completed. From FY 2006-07 through FY 2014-15, work completed by DOT staff declined from 46.4 percent to 33.4 percent of

total design engineering expenditures and from 37.6 percent to 32.4 percent of total construction engineering expenditures. The proportion of engineering work that consultants can complete without hindering DOT's ability to effectively oversee consultants is unknown.

We found that DOT saved \$26.9 million by controlling engineering costs from FY 2005-06 through FY 2014-15. However, it potentially could have saved an additional \$6.6 million, or an average of \$660,000 per year, if each region had kept engineering costs at no more than the thresholds indicated by DOT's "engineering delivery cost index" performance measure.

Construction

Statutes generally require DOT to solicit bids for state highway construction contracts and award the contracts to the lowest bidders. From January 2006 through December 2015, DOT awarded 2,247 construction contracts totaling \$9.6 billion.

We found that DOT generally had effective oversight of the processes for soliciting bids and awarding construction contracts and took steps to control construction costs. However, DOT could have potentially achieved considerable additional savings if it had met its performance measure goals and certain other goals it established. We found that DOT potentially could have saved:

- \$53.1 million, or an average of \$5.9 million per year, if it had met its quarterly goals for soliciting bids on construction contracts from FY 2006-07 through FY 2014-15;
- \$44.7 million, or an average of \$4.5 million per year, if it had received two bids on each of the 363 construction contracts that had actually received only one bid from January 2006 through December 2015; and
- \$191.9 million, or an average of \$32.0 million per year, if its total costs during the construction phase of state highway projects had not exceeded its annual performance measure goals from FY 2009-10 through FY 2014-15.

Maintenance

DOT is responsible for maintaining state highways, but counties perform most maintenance work under contract with DOT, as is statutorily permitted. Maintenance work is intended to preserve state highways and includes removing snow and applying salt in the winter, sealing cracks, and filling potholes. We found that DOT generally had effective oversight of its maintenance program and took steps to control maintenance costs.

Performance Measures

We found that DOT is not consistently using its performance measures to manage and improve its operations. For example, DOT's "program effectiveness" performance measure annually assesses the extent to which certain rehabilitation projects selected by the regions aligned with the location, scope, and timing of projects identified by a model that DOT developed. DOT intends that its regions use the performance measure results to improve future project selection decisions. However, four of the five regions indicated that they do not use the results to improve future project selection.

Recommendations

We include recommendations that will help DOT use its funds more effectively ([pp. 34, 47, 50, 68, 72, 82, 85, 87, and 90](#)).

We include recommendations for DOT to improve how it manages:

- ☑ the planning phase of state highway projects ([pp. 36, 38, 39, 44, 49, 53, and 55](#));
- ☑ the engineering phase of state highway projects ([pp. 69, 74, and 75](#)); and
- ☑ the maintenance of state highways ([pp. 97, 98, 99, and 103](#)).

We include recommendations for DOT to report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to implement all of these recommendations.

We include a recommendation for DOT to report to the Joint Legislative Audit Committee by March 30, 2018, on the results of its pilot program for performance-based maintenance contracts ([p. 102](#)).

The Legislature could consider modifying statutes to:

- require DOT to include in its semiannual reports to the Transportation Projects Commission the cost estimates DOT provided at enumeration (*p. 38*);
- require DOT to provide it with cost estimates that include all costs associated with potential major highway projects, including the effects of inflation (*p. 44*);
- require DOT to regularly report information to it about the ongoing costs of each major highway project (*p. 45*) and to report this information about each project as it is defined in statutes (*p. 45*);
- require DOT to take the results of cost-benefit analyses into account when deciding whether DOT staff or consultants will complete engineering work (*p. 70*); and
- allow DOT to use the “construction manager-general contractor” method of completing a limited number of state highway projects (*p. 91*).

■ ■ ■ ■

Introduction ■

DOT's state highway program includes six main components.

DOT's state highway program includes six main components. First, the rehabilitation program includes:

- resurfacing projects, which involve placing a new surface on an existing highway but which typically do not improve a highway's capacity or characteristics, such as its width and severity of curves, or require DOT to acquire additional property to complete the projects;
- reconditioning projects, which involve resurfacing and, for example, pavement widening, shoulder paving, and safety improvements to intersections and curves, and which may require DOT to acquire additional property; and
- reconstruction projects, which involve the total rebuilding of a highway to improve its maintainability, safety, characteristics, and traffic service, including by flattening hills, lessening the severity of curves, and widening the roadbed, and which typically require DOT to acquire additional property.

Second, the major highway program includes projects costing more than a statutorily specified minimum that DOT must adjust annually, based on a transportation price index. The program includes each project that costs more than \$37.4 million as of October 2016 and that involves:

- constructing a new highway 2.5 miles or more in length;
- reconditioning or reconstructing a highway by relocating 2.5 miles or more of an existing highway or adding one or more lanes 5.0 miles or more in length to an existing highway; or
- improving to freeway standards 10.0 miles or more of an existing divided highway having two lanes or more in either direction.

The major highway program also includes each project that is not described above but, as of October 2016, costs more than \$93.5 million. These projects are known as “high-cost major highway projects.”

Third, the Southeast Wisconsin freeway megaprojects program includes each project that is enumerated in statutes, costs more than \$625.4 million as of October 2016, and is located in Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, or Waukesha County.

Fourth, the major interstate bridge program includes any project that is estimated to cost at least \$100.0 million and that involves the construction or reconstruction of a state highway bridge crossing a river between Wisconsin and another state.

Fifth, the high-cost state highway bridge program includes a project estimated to cost more than \$150.0 million involving the construction or rehabilitation of a state highway bridge. As of October 2016, statutes permitted DOT to expend program funds only for reconstructing the Hoan Bridge in Milwaukee County.

Sixth, the highway system management and operations program is responsible for maintaining existing state highways, inspecting state highway bridges, and installing and repairing intelligent transportation systems intended to improve traffic management. We focused our audit fieldwork on DOT’s management of maintenance work. DOT contracts with counties to perform most maintenance work, such as repairing potholes and damaged guardrails, removing snow, and applying salt and sand to highways during winter months.

DOT staff and contractors perform certain tasks, such as completing emergency repairs on state highways and bridges. Maintenance work occasionally includes repaving short sections of highways, but most such projects are completed under the rehabilitation program.

State highway projects typically take years to complete. DOT planning staff identify potential projects, solicit public opinion, and determine the scope of projects. Working closely with planning staff, design engineers create project design plans and other documents needed before construction can begin. Construction engineers oversee the work of the contractors that construct the projects and ensure that construction standards and other contractual requirements are met. Design engineers and construction engineers may be DOT staff or consultants working under the supervision of DOT project managers who have overall responsibility for projects.

Staff in DOT's five regions oversee the planning, engineering, and construction of most state highway projects.

Staff at eight offices in DOT's five regions, which are shown in Figure 2, oversee the planning, engineering, and construction of most state highway projects. Regional office staff also oversee maintenance work completed by counties. DOT defines state highways as either backbone state highways or non-backbone state highways. Backbone highways, which are shown in Figure 2, are certain multi-lane highways connecting the state's major population and economic regions. DOT indicates that the 1,589 miles of backbone highways carry approximately half of all traffic in the state.

Figure 2
DOT's Regions



As of April 2016, Wisconsin had 11,758 miles of state highways.

Table 1 shows the amount of Wisconsin's 11,758 miles of state highways within each of DOT's five regions as of April 2016.

Table 1

Miles of State Highways, by DOT Region
April 2016

Region	Miles	Percentage of Total
Southwest	3,381	28.8%
Northwest	3,004	25.5
North Central	2,503	21.3
Northeast	1,625	13.8
Southeast	1,245	10.6
Total	11,758	100.0%

Legislators and others have raised questions about whether DOT appropriately manages the planning, engineering, construction, and maintenance of state highways. Questions have also been raised about the condition of state highways; the reasons why the costs of some projects increased considerably from the initial cost estimates; and the extent to which DOT's traffic count projections, which help to justify initiating certain projects, are accurate.

We have previously conducted audits that analyzed various aspects of DOT's management of the state highway program, including: *Construction and Inspection of Asphalt State Highways* (March 2011), *Construction Engineering in State Highway Projects* (May 2009), *Major Highway Program* (report 03-13), *Bridge Inspection Program* (report 01-17), *Management of the Highway Program* (report 97-4), and *Transportation Programs and Revenues* (report 96-19).

To complete our current audit, we contacted DOT's central and regional office staff and the Federal Highway Administration (FHWA). We also contacted 15 organizations involved with transportation issues and all 9 regional planning commissions listed in Appendix 1. We reviewed DOT policy manuals and obtained data on state highway expenditures, revenue, staffing, and contracts with design engineering consultants, construction engineering consultants, and construction contractors. We also obtained data on performance measures DOT has established to help assess and improve its management of the state highway program.

In total, 44 of 72 county highway commissioners responded to our survey on their opinions about how DOT plans projects and maintains state highways.

Statutes require each county to have a county highway commissioner, who is statutorily responsible for overseeing the construction and maintenance of local roads. County highway commissioners also oversee maintenance work on state highways. DOT considers input from county highway commissioners when planning state highway projects. We surveyed all 72 county highway commissioners on their opinions about how DOT plans projects and maintains state highways. In total, 44 county highway commissioners (61.1 percent) responded, including 14 of 20 in the Northwest Region, 13 of 18 in the North Central Region, 8 of 16 in the Southwest Region, 7 of 11 in the Northeast Region, and 2 of 7 in the Southeast Region. Not all county highway commissioners who responded to our survey answered each question.

This audit focuses on DOT's management of the state highway program. Analyses of DOT's management of the local road, mass transit, railroad, harbor, and other programs were not in the audit's scope. We also did not analyze transportation funding issues because 2015 Wisconsin Act 55, the 2015-17 Biennial Budget Act, appropriated \$1.0 million to DOT to study methods of improving the solvency of the Transportation Fund. In December 2016, DOT reported on current transportation funding sources and trends, as well as options for future funding sources, including implementation of tolling on interstate highways.

■ ■ ■ ■

Expenditures and Staffing ■

The state highway program is funded primarily by state revenue, federal revenue, and proceeds from the sale of bonds.

The state highway program is funded primarily by state revenue, federal revenue, and proceeds from the sale of bonds. We analyzed program expenditures and found that they increased by 190.2 percent from FY 1996-97 through FY 2015-16. In addition, we found that the number of authorized FTE staff positions involved with state highways declined from December 1996 through July 2016.

Expenditures

As shown in Figure 3, the state highway program was funded in FY 2015-16 by:

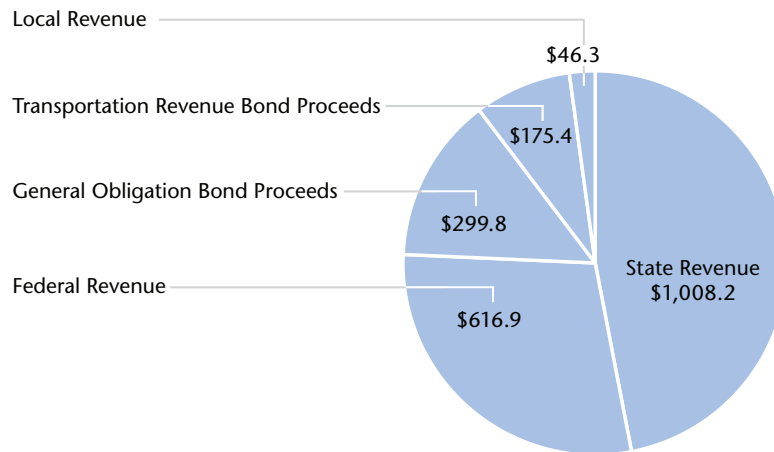
- state revenue, including proceeds from vehicle registration fees, motor fuel taxes, and driver's license fees, as well as general purpose revenue (GPR);
- federal revenue;
- general obligation bond proceeds from the sale of bonds backed by the full faith and credit of the State and repaid from the General Fund or the Transportation Fund;
- transportation revenue bond proceeds from the sale of bonds repaid by Transportation Fund

revenue specifically pledged for repayment purposes; and

- local revenue, including amounts that local governments reimbursed DOT for adding certain features, such as landscaping and parking, to state highway projects.

Figure 3

State Highway Expenditures in FY 2015-16, by Funding Source (in millions)



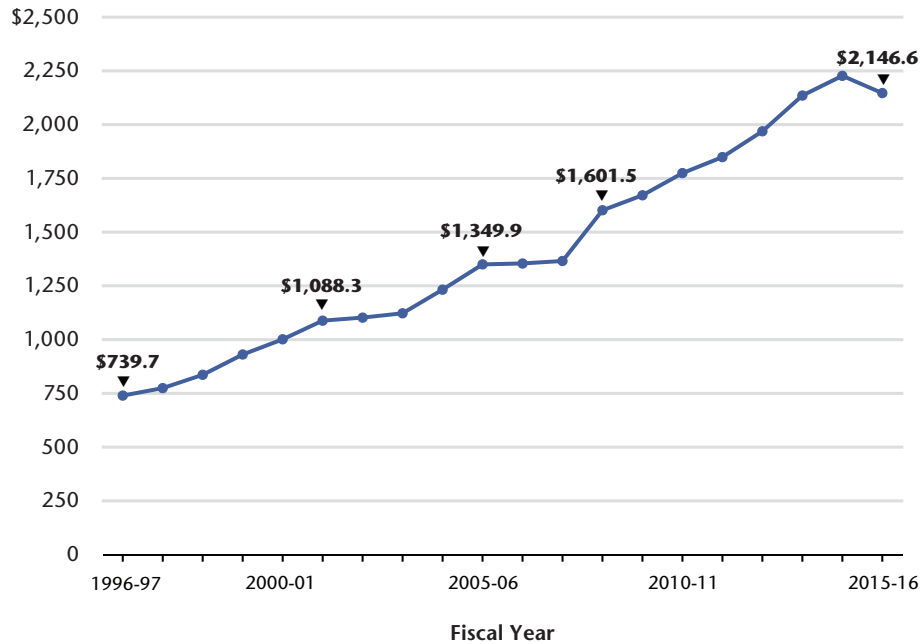
Appendix 2 shows how the state highway program was annually funded from FY 1996-97 through FY 2015-16.

State highway expenditures increased from \$739.7 million in FY 1996-97 to \$2.1 billion in FY 2015-16, or by 190.2 percent.

As shown in Figure 4, state highway expenditures increased from \$739.7 million in FY 1996-97 to \$2.1 billion in FY 2015-16, or by 190.2 percent. Appendix 3 shows annual state highway expenditures over that 20-year period.

Figure 4

State Highway Expenditures (in millions)



Some components of the state highway program, including the rehabilitation and major highway programs, existed throughout our entire audit period, while other components were statutorily created during this period. 2001 Wisconsin Act 16, the 2001-03 Biennial Budget Act, created the Southeast Wisconsin freeway rehabilitation program to finance rehabilitation projects on freeways in southeastern Wisconsin, including reconstructing the Marquette Interchange. 2009 Wisconsin Act 28, the 2009-11 Biennial Budget Act, created the major interstate bridge program. 2011 Wisconsin Act 32, the 2011-13 Biennial Budget Act, created the Southeast Wisconsin freeway megaprojects program and the high-cost bridge program.

To determine state highway expenditures, we used DOT's accounting system, which includes debt service for general obligation bonds but excludes debt service for transportation revenue bonds. Debt service for transportation revenue bonds is paid from revenues that would have otherwise been deposited into the Transportation Fund. As such, DOT's accounting system does not include such debt service, which increased from \$84.2 million in FY 1999-2000 to \$226.3 million in FY 2015-16, or by 168.8 percent.

Debt service for general obligation bonds increased from \$6.4 million in FY 1996-97 to \$211.8 million in FY 2015-16.

As shown in Table 2, debt service for general obligation bonds increased from \$6.4 million in FY 1996-97 to \$211.8 million in FY 2015-16. Over the 20-year period, expenditures for the rehabilitation and major highway programs increased considerably more than for the highway system management and operations program. Administration and planning included a variety of expenditures, including for human resources, information technology, and long-range planning. These expenditures decreased, in part, because of funding reductions required by 2009 Wisconsin Act 28, the 2009-11 Biennial Budget Act, and 2011 Wisconsin Act 32, the 2011-13 Biennial Budget Act.

Table 2
State Highway Expenditures¹
 (in millions)

	FY 1996-97	FY 2015-16	Percentage Change	Percentage Change in Constant Dollars ²
Program				
Rehabilitation	\$390.8	\$ 864.3	121.2%	47.5%
Major Highway	175.8	407.9	132.0	54.7
Highway System Management and Operations ³	146.3	275.0	88.0	25.3
Southeast Wisconsin Freeway Megaprojects ⁴	–	234.7	–	–
Debt Service for General Obligation Bonds	6.4	211.8	3,209.4	2,104.0
Major Interstate Bridge ⁵	–	71.9	–	–
High-Cost Bridge ⁴	–	64.6	–	–
Administration and Planning	20.4	16.5	(19.1)	(45.9)
Total	\$739.7	\$2,146.6	190.2	93.5

¹ Excludes debt service for transportation revenue bonds, which increased from \$84.2 million in FY 1999-2000, the first year for which this information is available, to \$226.3 million in FY 2015-16.

² Constant dollars have been adjusted to take into account the effects of inflation over time.

³ Includes state highway maintenance.

⁴ Created by 2011 Wisconsin Act 32, the 2011-13 Biennial Budget Act.

⁵ Created by 2009 Wisconsin Act 28, the 2009-11 Biennial Budget Act.

2015 Wisconsin Act 55, the 2015-17 Biennial Budget Act, authorized DOT to use \$505.8 million in general obligation and transportation revenue bonds to fund major highway projects, megaprojects, major interstate bridge projects, and high-cost bridge projects. Act 55 also

allowed DOT to request from the Joint Committee on Finance permission to use an additional \$350.0 million in general obligation bonds in the biennium to fund rehabilitation and major highway projects. In October 2015, DOT requested permission to use \$200.0 million of these bonds in FY 2015-16. In November 2015, the Joint Committee on Finance granted permission for DOT to use \$350.0 million in bonds, including \$200.0 million in FY 2015-16 and \$150.0 million in FY 2016-17. The Joint Committee on Finance directed DOT to use \$200.0 million in bond proceeds to fund major highway projects and \$150.0 million to fund rehabilitation projects.

Staffing

We requested information on the number of staff positions involved with the state highway program on July 1 of each year during our review period. However, DOT maintains such information only for December 31 in years before 2000.

The number of filled and authorized FTE staff positions involved with the state highway program declined from December 1996 to July 2016.

As shown in Table 3, the number of filled and authorized FTE staff positions involved with the state highway program declined from December 1996 to July 2016. Appendix 4 shows annual FTE staff positions over this period.

Table 3

FTE Staff Positions in the State Highway Program

	December 31, 1996	July 1, 2016	Percentage Change
Filled	1,678.6	1,545.8	(7.9)%
Vacant	64.0	101.3	58.3
Authorized	1,742.6	1,647.1	(5.5)

Different types of staff are involved with the state highway program, including:

- engineers, who are civil and structural engineers;
- engineering specialists, who work on particular project-related tasks, such as inspecting materials used to construct projects, but are not required to be engineers;

- engineering support staff, who help engineers complete various tasks;
- engineering supervisors, who oversee the work of others;
- program and planning staff, who include policy and planning analysts;
- administrative staff, who include human resources, payroll, clerical, and other staff;
- managers; and
- real estate staff, who appraise and purchase property needed for state highway projects.

Table 4 shows the types of DOT staff positions that were filled, vacant, and authorized on July 1, 2016.

Table 4

**FTE Staff Positions in the State Highway Program, by Type
July 1, 2016**

Type	Filled Positions	Vacant Positions	Authorized Positions
Engineers	677.9	39.0	716.9
Engineering Specialists	210.0	21.0	231.0
Engineering Support	108.5	10.8	119.3
Engineering Supervisors	107.0	3.0	110.0
Program and Planning	104.0	11.5	115.5
Administrative	87.5	6.0	93.5
Managers	85.0	0.0	85.0
Real Estate	80.0	6.0	86.0
Other ¹	86.0	4.0	90.0
Total	1,545.8	101.3	1,647.1

¹ Includes positions involved with financial, environmental, and electrical work.

As shown in Table 5, 73.7 percent of the state highway program's 1,545.8 FTE filled staff positions were located in DOT's five regions in July 2016. The Southeast Region, which manages megaprojects, had the most staff positions among the regions.

Table 5

Filled FTE Staff Positions in the State Highway Program, by Location
July 1, 2016

	Filled Positions	Percentage of Total
DOT Region		
Southeast	357.3	23.1%
Southwest	289.1	18.7
Northeast	186.8	12.1
Northwest	157.4	10.2
North Central	149.0	9.6
Subtotal	1,139.6	73.7
Central Office	406.3	26.3
Total	1,545.8	100.0%

■ ■ ■ ■

Condition of State Highways ■

The condition of state highways can be measured by the pavement condition index and the international roughness index.

The condition of state highways can be measured in multiple ways. DOT relies on the pavement condition index, which measures the present condition of pavement and is used to determine pavement deterioration. FHWA requires states to report annually on highway conditions as measured by the international roughness index, which determines the smoothness of a highway's pavement. DOT indicated that highway conditions are more accurately assessed by the pavement condition index because a bumpy highway may score poorly on the international roughness index, but such a score does not necessarily mean that the highway is in poor condition and needs extensive rehabilitation or maintenance work. The condition of Wisconsin's state highways deteriorated in recent years, and the proportion of Wisconsin state highways in good condition was considerably lower than in six other midwestern states in 2014.

Pavement Condition Index

In 2009, DOT began using the pavement condition index to measure the condition of state highways.

In 2009, DOT began using the pavement condition index, which was developed by the U.S. Army Corps of Engineers. The pavement condition index measures the present condition of pavement and helps DOT to determine future highway projects and necessary maintenance work. Calculating the pavement condition index over time for a given section of highway allows DOT to measure the ways in which, and the extent to which, a given section has deteriorated.

DOT has divided the state highway system into 12,995 sections that average approximately one mile in length and have not varied over time. DOT indicated that the sections were originally established so that a given section included only one pavement type, such as asphalt, and was in approximately the same condition throughout the section. DOT intends to measure the conditions of half of all sections annually, with the other half to be measured in the following year. A vehicle with specialized equipment takes high-resolution digital photographs that allow DOT to assess the types and severity of distresses of each section. DOT typically selects two 0.1-mile-long sample areas of each section, determines the condition score of each sample area, and averages the two condition scores to determine the overall score of the section.

DOT calculates the pavement condition index somewhat differently from the guidelines developed by a standard-setting organization.

DOT calculates results for the pavement condition index based on guidelines developed by ASTM International, which is an organization that develops various technical standards. However, DOT's calculations differ somewhat from these guidelines. These guidelines indicate that if a selected sample area is not representative of the entire section, such as when the sample area appears to be in worse condition than the overall section, the sample area's condition should be determined, and another sample area can be selected and its condition also determined. In contrast, when DOT determines that a selected sample area is not representative of the entire section, it excludes that "atypical" sample area and instead selects and determines the condition of a different sample area within the same section. DOT indicated that its methodology is appropriate and that determining the conditions of additional sample areas would entail unnecessary costs. We attempted to identify the number and conditions of atypical sample areas excluded from DOT's calculation, but DOT does not maintain such information.

The guidelines indicate that a given pavement section should have a "uniform construction, maintenance, usage history, and condition," which allows an accurate assessment to be made of the condition of the section. Some Wisconsin state highway sections contain multiple pavement types, such as concrete and asphalt, suggesting that these sections do not have a uniform construction, maintenance, usage history, and condition. DOT indicated that it began in 2016 to identify sections with multiple pavement types and consider whether the boundaries of these sections should be modified. DOT expects to complete this process before it measures pavement conditions in 2017.

We analyzed DOT's most recent pavement condition data at the time of our audit. Although these data should have included only conditions determined in 2014 and 2015, we found conditions determined in 2013 and earlier for 318 sections, or 2.4 percent of the

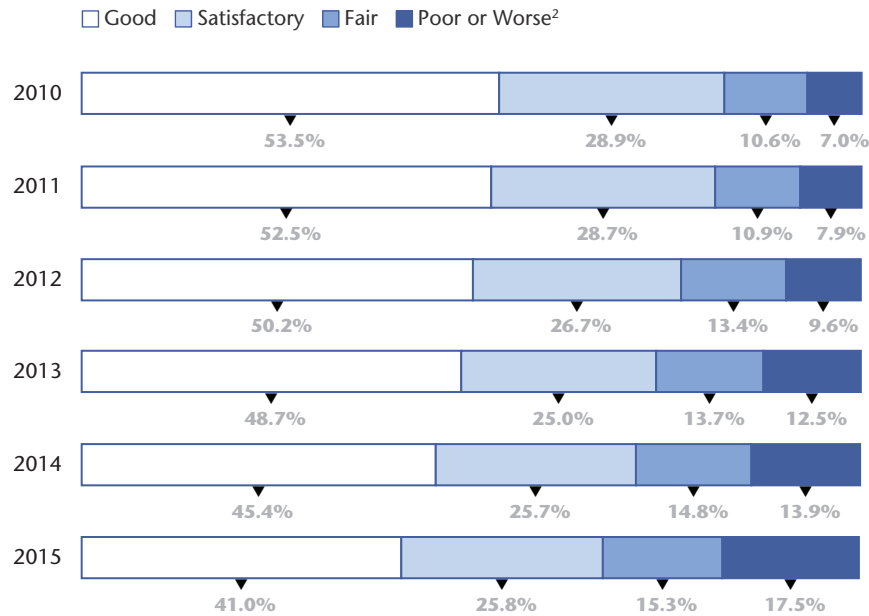
total, including sections with conditions determined as far back as 2010. DOT indicated that the conditions of certain sections may not be updated if the vehicle with specialized equipment does not photograph all sections in a given two-year period.

The proportion of state highways rated in good condition decreased steadily from 53.5 percent in 2010 to 41.0 percent in 2015.

We used DOT’s pavement condition index data to determine the condition of state highways from 2010 through 2015, which was the most recent year for which information existed at the time of our audit. As shown in Figure 5, the proportion of state highways rated in good condition by the pavement condition index decreased steadily from 53.5 percent in 2010 to 41.0 percent in 2015, while the proportion rated in poor or worse condition increased steadily from 7.0 percent in 2010 to 17.5 percent in 2015. Appendix 5 shows the condition of state highways in each county in 2015.

Figure 5

Condition of Wisconsin State Highways¹
As Measured by the Pavement Condition Index



¹ Excludes highway sections with an unknown condition, which accounted for 0.3 percent or less of all sections in any given year.

² Includes state highways rated in poor, very poor, serious, and failed condition.

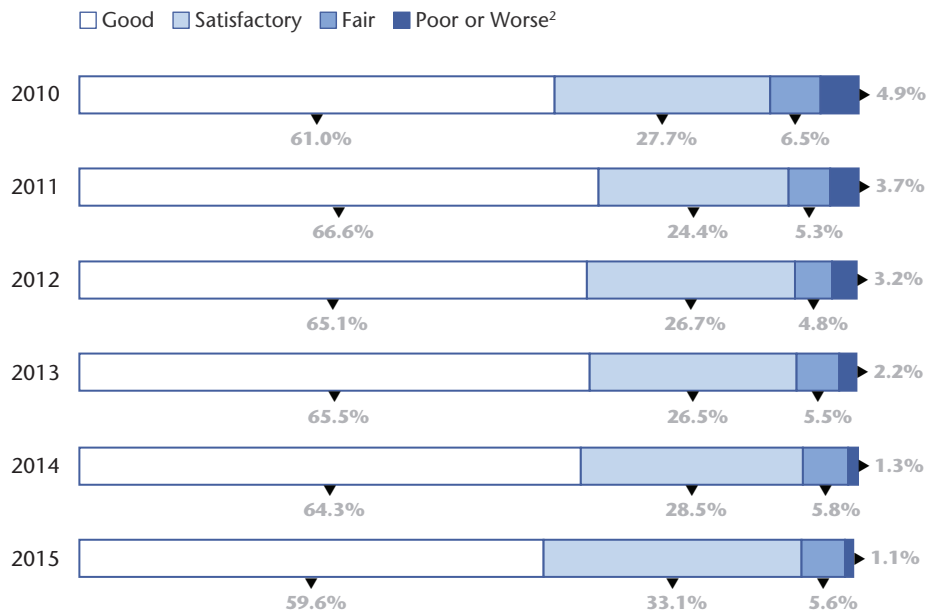
In response to a question in our survey of all 72 county highway commissioners, 32 county highway commissioners (72.7 percent of respondents) characterized the feedback they had received from the

public and others on the condition of state highways as either “somewhat negative” or “negative,” 6 county highway commissioners (13.6 percent) characterized the feedback as “somewhat positive,” and 6 county highway commissioners (13.6 percent) characterized the feedback as “neither positive nor negative.” No county highway commissioner characterized the feedback as “positive.”

As shown in Figure 6, the proportion of backbone state highways rated in good condition by the pavement condition index decreased slightly from 61.0 percent in 2010 to 59.6 percent in 2015. The proportion rated in poor or worse condition decreased steadily from 4.9 percent in 2010 to 1.1 percent in 2015. DOT indicated that it spent an increasing proportion of rehabilitation program funds on backbone highways in recent years in order to prevent a deterioration in the condition of these highways.

Figure 6

Condition of Wisconsin Backbone State Highways¹
As Measured by the Pavement Condition Index



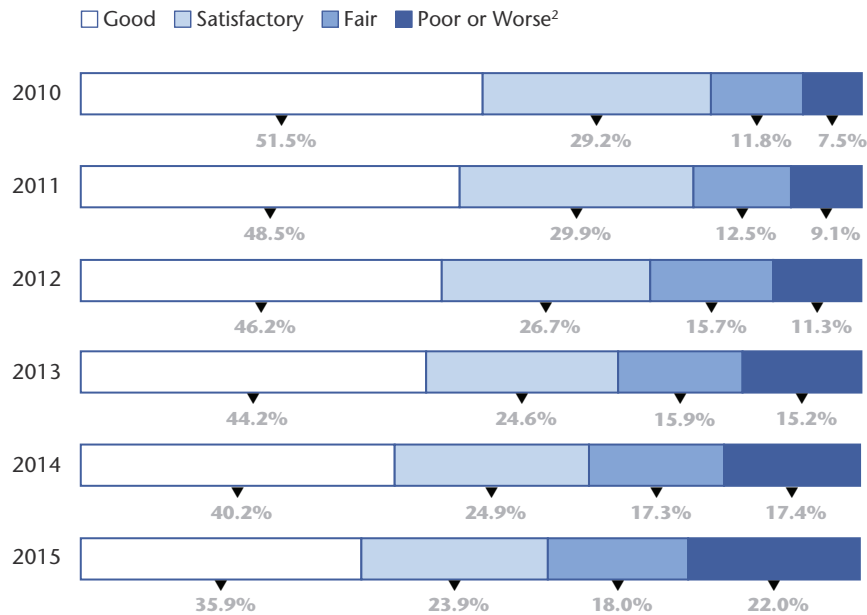
¹ Excludes highway sections with an unknown condition, which accounted for 0.7 percent or less of all sections in any given year.

² Includes state highways rated in poor, very poor, serious, and failed condition.

As shown in Figure 7, the proportion of non-backbone state highways rated in good condition by the pavement condition index decreased steadily from 51.5 percent in 2010 to 35.9 percent in 2015, while the proportion rated in poor or worse condition increased steadily from 7.5 percent in 2010 to 22.0 percent in 2015. DOT indicated that it spent a decreasing proportion of rehabilitation program funds on non-backbone highways in recent years in order to prioritize projects on backbone highways.

Figure 7

Condition of Wisconsin Non-Backbone State Highways¹
As Measured by the Pavement Condition Index



¹ Excludes highway sections with an unknown condition, which accounted for 0.2 percent or less of all sections in any given year.

² Includes state highways rated in poor, very poor, serious, and failed condition.

Comparisons with Other States

Although DOT relies on the pavement condition index to measure the condition of state highways, as noted, FHWA requires states to report annually on highway conditions as measured by the international roughness index. To calculate the international roughness index, DOT uses vehicles with specialized measuring equipment that objectively calculates the smoothness of highways. FHWA uses the results to categorize each section of highway as

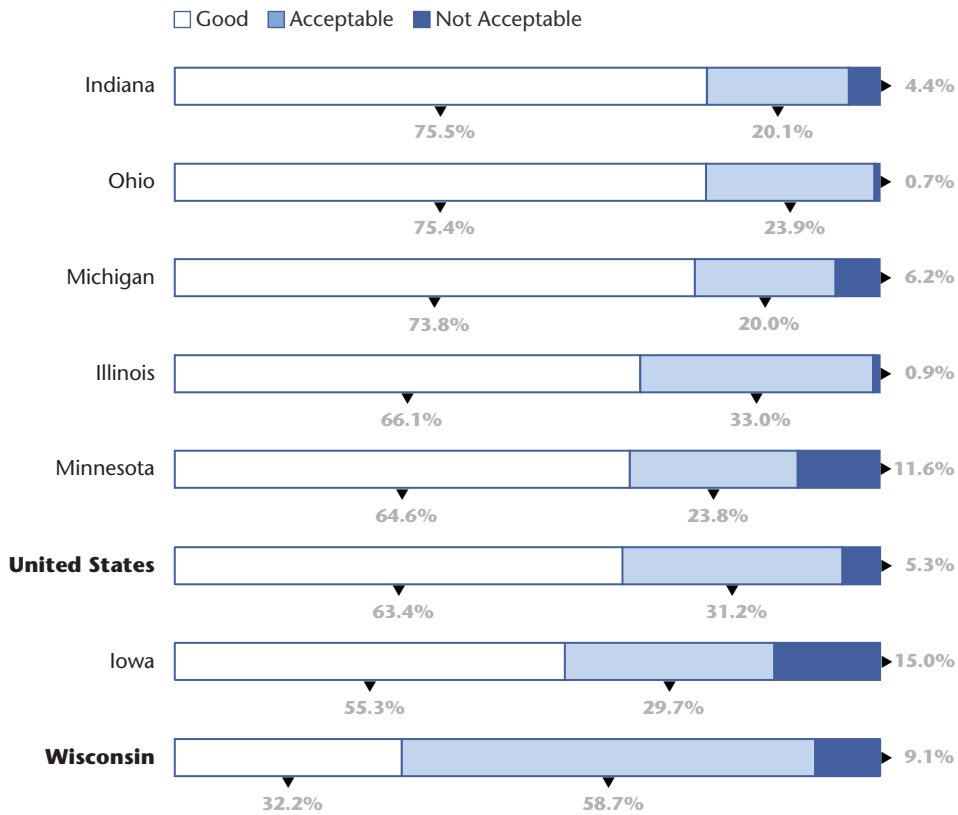
“good,” “acceptable,” or “not acceptable.” The most recent FHWA information available at the time of our audit was for 2014.

In 2014, the proportion of state highways in good condition in Wisconsin was considerably lower than in six other midwestern states.

As shown in Figure 8, 32.2 percent of Wisconsin’s state highways were in good condition in 2014, as measured by the international roughness index. The proportion of state highways in good condition in Wisconsin was considerably lower than in six other midwestern states and the entire nation.

Figure 8

Condition of State Highways, by Midwestern State¹
 As Measured by the International Roughness Index
 2014



¹ As reported to FHWA.

Wisconsin Local Roads

In addition to state highways, Wisconsin has approximately 103,000 miles of local roads. Statutes require each county and municipality to assess biennially the condition of roads under its jurisdiction. Statutes require counties and municipalities to use a pavement rating system approved by DOT and to report the results of their assessments to DOT. DOT indicated that most counties and municipalities use rating systems other than the pavement condition index. DOT provided us with assessment data for various types of paved and unpaved local roads, including concrete and asphalt roads. In 2015, at least 90.0 percent of the concrete and asphalt local roads in 46 counties were in fair or better condition. Appendix 6 shows the condition of concrete and asphalt local roads in each county in 2015.

Safety

Questions have been raised about DOT's performance measures related to highway safety. Safety depends on a number of factors, not all of which DOT controls. For example, DOT can design, construct, and maintain safer highways, but it cannot control decisions made by individuals operating vehicles on those highways. Appendix 7 contains information about DOT's three performance measures related to traffic crashes, traffic injuries, and traffic fatalities on state highways and local roads.

■ ■ ■ ■

Project Planning ■

We examined how DOT plans major highway projects, megaprojects, and rehabilitation projects. DOT can construct a major highway project or a megaproject only after the project has been enumerated in statutes, but it decides which rehabilitation projects to construct. When budgeting to complete work, we found that DOT did not sufficiently take into account the extent to which major highway project expenditures increased over time because of inflation and unexpected cost increases. We also found that DOT has not changed the proportions of funds allocated among its five regions to complete non-backbone rehabilitation projects since 2006, did not fully comply with administrative rules for selecting backbone and non-backbone rehabilitation projects, and did not document why it selected particular non-backbone rehabilitation projects over other potential projects. We make recommendations for DOT to improve how it plans projects.

Major Highway Projects

A major highway project must be enumerated in statutes before DOT is allowed to construct it.

A major highway project must be approved by the 15-person Transportation Projects Commission, which includes the Governor who serves as the chairperson, three citizens appointed by the Governor, five senators (three from the majority party and two from the minority party), and five representatives (three from the majority party and two from the minority party). DOT's secretary serves as a nonvoting member. A project approved by the Transportation Projects Commission is recommended to the Governor and the Legislature, which must enumerate the project in statutes before DOT is allowed to construct it.

Statutes govern the process for considering potential major highway projects:

- No later than March 15 of each even-numbered year, DOT must provide the Transportation Projects Commission with a list of potential projects for which it recommends being allowed to prepare environmental studies describing each project's environmental effects and estimated total costs.
- No later than April 15 of each even-numbered year, the Transportation Projects Commission must notify DOT of potential projects for which environmental studies may be prepared. Without this notification, statutes prohibit DOT from preparing such studies, which typically take at least a few years to complete and require DOT to complete a significant amount of design engineering work.
- No later than September 15 of each even-numbered year, DOT must report to the Transportation Projects Commission on the projects it suggests be recommended for enumeration in statutes.
- No later than December 15 of each even-numbered year, the Transportation Projects Commission must report to the Governor, the Legislature, and the Joint Committee on Finance on any projects it recommends for enumeration in statutes. Statutes require environmental studies to have been completed before projects may be recommended for enumeration.

As noted, the major highway program also includes projects that as of October 2016 cost more than \$93.5 million. Statutes require the Transportation Projects Commission, not the Legislature, to approve these high-cost major highway projects before DOT can construct them. As of October 2016, the Transportation Projects Commission had approved the U.S. Highway (USH) 18/151 (Verona Road) project in Dane County and the State Trunk Highway (STH) 50 (I-94 to 43rd Avenue) project in Kenosha County.

DOT has promulgated statutorily required rules for numerically evaluating potential projects before suggesting them to the Transportation Projects Commission for enumeration. These rules require DOT to evaluate how a potential project would affect the highway system and nearby communities, based on factors such as

economic impact, traffic flow, highway safety, environmental impact, and input from communities that the project would affect. DOT is required to determine a score for each factor, and only those potential projects with more than a minimum score for traffic flow and safety can be suggested to the Transportation Projects Commission. 2015 Senate Bill 360 would have eliminated the minimum-score requirement and provided DOT more discretion in evaluating potential projects. However, the Governor vetoed this bill in April 2016, in part, because certain groups and individuals affected by the bill had not been consulted.

DOT provided us with completed evaluations for the 11 projects that it had suggested to the Transportation Projects Commission from 2002 through 2014. We reviewed the information and found that DOT complied with its rules for numerically evaluating the five potential projects that it had suggested to the Transportation Projects Commission in 2002.

DOT potentially could have saved \$2.3 million if it had fully complied with its rules for numerically evaluating potential major highway projects.

We found that DOT did not fully comply with its rules for numerically evaluating the remaining six potential major highway projects. When determining a score for community input, DOT's rules require that half of the score be based on public support for, or opposition to, a potential project, as determined through informational hearings and correspondence, and that the other half be based on a potential project's consistency with current metropolitan, local, or regional transportation plans. The information DOT provided indicated that DOT did not take public opinion into account when determining the community input scores for the six potential projects suggested to the Transportation Projects Commission in 2010 and 2014 but instead based the scores entirely on metropolitan, local, or regional transportation plans. DOT indicated that it took public opinion into account by holding public meetings required by federal and state environmental laws, but it did not use public opinion to determine community input scores.

Four of these six projects were enumerated, including the STH 38 (County Trunk Highway K to Oakwood Road) project. In December 2014, the Transportation Projects Commission approved DOT's suggestion that it recommend cancelling this project because of an "absence of local consensus" on a preferred route for the highway. DOT spent \$2.3 million on this project before 2015 Wisconsin Act 55, the 2015-17 Biennial Budget Act, removed it from statutes. If DOT had taken public opinion into account when determining the community input score for this project, it may not have suggested the project to the Transportation Projects Commission and potentially could have saved \$2.3 million.

Recommendation

We recommend the Department of Transportation:

- *comply with administrative rules by taking public opinion into account when numerically evaluating potential major highway projects; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Completed Projects

When the Transportation Projects Commission recommends a project for enumeration, DOT provides the Governor, the Legislature, and the Joint Committee on Finance with an estimate of total project costs, including the costs of design engineering and construction engineering work, real estate purchases needed to complete the project, utilities work, and construction work completed by contractors. The Governor and the Legislature use these cost estimates to help determine whether to enumerate a project. We considered all 20 projects completed from January 2006 through December 2015 in order to determine the extent to which total project expenditures differed from DOT's cost estimates at enumeration. We excluded the STH 29 (Chippewa Falls to Green Bay) project, which was completed in 2011, because DOT indicated that it could not identify a significant portion of project expenditures. As a result, we examined 19 projects. To capture all project expenditures, we defined a project to be completed after DOT had incurred all expenditures, which was typically years after project construction had ended.

We found that DOT's cost estimates at enumeration were incomplete. We note that 13 of the 19 projects took 18 years or more for DOT to incur all expenditures, and the effects of inflation on project expenditures can be significant over time. Nevertheless, none of the cost estimates for the 19 projects took into account that inflation would increase project costs over time, although cost estimates for all 19 projects indicated that inflation was excluded from them. In addition, DOT indicated that its cost estimates for projects enumerated before 2011 typically excluded design engineering, construction engineering, and certain other project-related costs.

We also found that DOT's information on project expenditures was not consistently complete. DOT indicated that it was unable to readily identify some expenditures made before 2001, when it implemented a new electronic financial system. We identified \$40.9 million in project expenditures that DOT had not identified. Additional expenditures that neither we nor DOT identified may

have been made. Therefore, we present estimated expenditures for the 19 projects.

The estimated expenditures for 19 major highway projects completed from January 2006 through December 2015 were a total of \$772.5 million higher than DOT's cost estimates at enumeration.

As shown in Table 6, the estimated expenditures for 19 major highway projects completed from January 2006 through December 2015 were a total of \$772.5 million higher than the cost estimates DOT had provided to the Governor and the Legislature at enumeration. Expenditures for all 19 projects increased from DOT's cost estimates, including expenditures for 10 projects that each increased by more than 100.0 percent from DOT's cost estimates.

Table 6

**Estimated Expenditures for Major Highway Projects Completed from
January 2006 through December 2015**
(in millions)

Hwy	Project	Enumeration		Completion ¹		Change	
		Year	Cost Estimate	Year	Estimated Expenditures ²	Amount	Percentage
29	I-94 to Chippewa Falls	1991	\$ 33.4	2011	\$ 147.5	\$114.1	341.5%
53	Eau Claire Bypass	1995	79.0	2014	168.1	89.1	112.8
151	Columbus to Fond du Lac	1989	71.0	2011	159.2	88.2	124.3
794	Lake Arterial	1987	48.5	2011	131.2	82.7	170.4
64	Houlton to New Richmond	1993	49.0	2011	106.6	57.6	117.5
13	Marshfield Boulevard	1993	22.0	2011	70.8	48.8	221.9
57	Dyckesville to Sturgeon Bay	1997	42.9	2015	78.7	35.8	83.4
151	Dickeyville to Belmont	1997	65.0	2012	100.4	35.4	54.5
45	USH 41 to STH 116	1991	12.5	2010	44.4	31.9	255.5
141	STH 22 to STH 64	1997	40.3	2014	68.0	27.7	68.8
16	Oconomowoc Bypass	1995	47.0	2012	74.7	27.7	59.0
12	Whitewater Bypass	1991	8.0	2013	34.7	26.7	333.7
151	Belmont to Dodgeville	1995	63.0	2010	88.1	25.1	39.8
57	STH 54 to Dyckesville	1991	20.0	2012	43.1	23.1	115.3
11	Janesville Bypass and Beloit Bypass	1993	12.0	2007	31.7 ³	19.7	164.6
151	Fond du Lac Bypass	1993	37.0	2013	50.8	13.8	37.4
31	County Trunk Highway S to STH 11	1991	20.0	2009	32.7	12.7	63.3
141	Abrams to STH 22	1991	14.3	2010	25.8	11.5	80.5
17	Rhinelanders Relocation	2001	11.5	2011	12.4	0.9	7.7
Total			\$696.4		\$1,468.9	\$772.5	110.9

¹ We defined a project to be completed after DOT had incurred all expenditures, which was typically years after project construction had ended.

² Information provided to us was not consistently complete.

³ Estimated expenditures reflect only the Janesville Bypass because, after enumeration, the Legislature modified statutes to exclude the Beloit Bypass portion of the project.

DOT's information does not indicate precisely why expenditures for individual projects increased after enumeration.

DOT's information does not indicate precisely why expenditures for individual projects increased after enumeration. A committee of DOT staff reviewed and approved requests from project teams for "substantial" increases in project expenditures, but it did not keep meeting minutes. The central office indicated that it has incomplete email messages, and only since May 2014, discussing these increases but that it would take months of effort to compile the messages for us.

DOT should maintain in a central location complete information on project expenditures and the precise reasons why expenditures increase, especially since these increases can be considerable. Such information will help to provide accountability for increases in expenditures, will allow DOT to respond authoritatively to questions from legislators and others about the increases, and will provide information that DOT can use to provide more-accurate cost estimates for other projects being considered for enumeration.

Recommendation

We recommend the Department of Transportation:

- *maintain in a central location complete information on all expenditures for each major highway project and the reasons for increases in project expenditures; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Semiannual Reports

In response to our recommendation in report 03-13, statutes were modified to require DOT to report certain information to the Transportation Projects Commission every February and August. Statutes require these semiannual reports to show the actual and estimated project costs for each enumerated major highway project and megaproject and, to the extent feasible, separately show the costs of environmental studies, compliance, and mitigation. Statutes require the information to be presented cumulatively since a project's inception and updated for the period since the preceding report. Statutes also require the reports to identify the annual funds needed to complete each project.

DOT's semiannual reports to the Transportation Projects Commission do not present complete project costs.

We found that DOT's semiannual reports to the Transportation Projects Commission do not present complete costs of enumerated projects. First, these reports exclude the pre-enumeration costs of environmental studies, each of which can cost more than \$22.0 million, for projects enumerated in 2011 and later. Information on the amount of these excluded costs as of August 2016 was not readily available. Second, the August 2016 report excluded \$51.0 million in costs funded by the rehabilitation program, such as when DOT completed work on alternate routes to accommodate diverted traffic during a project's construction and such as when DOT completed work on rehabilitation projects that increased in cost and, as a result, became high-cost major highway projects. Although such costs are excluded from the semiannual reports, such costs are associated with eight ongoing major highway projects in DOT's financial system. We also note that the semiannual reports do not separately show any costs for environmental compliance and mitigation.

Although statutes require DOT's semiannual reports to show the estimated cost for each enumerated project, we found that since the February 2015 report the cost estimate for the I-39/90 (Madison to Illinois) project has excluded \$70.5 million in estimated costs to construct a new interchange at I-39/90 and USH 12/18. DOT had included these costs in earlier reports but removed them pending completion of an environmental study for the interchange portion of the project.

For planning, design, and construction purposes, DOT sometimes combines multiple enumerated projects into one project and sometimes splits an enumerated project into multiple projects, and it tracks project costs according to how it combines and splits projects. When DOT combines multiple enumerated projects into one project or splits an enumerated project into multiple projects, the semiannual reports show information based on how DOT combines or splits projects, rather than how the projects are enumerated, as is statutorily required. As a result, it is not possible to use the reports to determine the estimated and actual costs of all projects as they are enumerated.

Excluding some costs makes it difficult for the Transportation Projects Commission and others to know complete project costs. Therefore, DOT should consistently include all statutorily required information in its semiannual reports, including all actual and expected costs of each major highway project.

☑ Recommendation

We recommend the Department of Transportation:

- *comply with statutes by consistently including all required information in its semiannual reports to the Transportation Projects Commission, including all actual and expected costs of each major highway project enumerated in statutes; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

The Legislature could consider modifying statutes to require DOT to include in the semiannual reports the cost estimates DOT provided at enumeration.

Statutes do not require the semiannual reports to include the cost estimates DOT provided at enumeration. Without these cost estimates, it is difficult to track the extent to which project costs change after enumeration. The Legislature could consider modifying statutes to require DOT to include in the semiannual reports the cost estimates DOT provided at enumeration.

Posting Project Information Online

Statutes require DOT to make available on its website certain information, including any semiannual report submitted to the Transportation Projects Commission and any materials or documents, except for its recommendations, used at a Transportation Projects Commission meeting. Statutes specify when this information should be posted on the website but do not specify how long it should remain online, and they do not require meeting minutes to be posted on the website. As of October 2016, only the August 2016 semiannual report was on DOT's website. No materials, documents, or minutes associated with meetings of the Transportation Projects Commission were on DOT's website.

We requested the materials, documents, and minutes for all meetings of the Transportation Projects Commission since 1983. DOT's records retention policies require it to retain such information for 15 years. DOT provided us with such information for all meetings held in the past 15 years and minutes for all but two meetings held more than 15 years ago. From January 2000 through December 2016, the Transportation Projects Commission met nine times.

DOT should maintain on its website the materials, documents, and minutes associated with Transportation Projects Commission meetings, as well as all semiannual reports, which will allow legislators and others to examine why major highway projects were

recommended for enumeration and consider how significant amounts of public funds are being spent.

Recommendation

We recommend the Department of Transportation:

- *maintain on its website the materials, documents, and minutes for Transportation Projects Commission meetings for at least 15 years after a given meeting, as well as all statutorily required semiannual reports submitted to the Transportation Projects Commission; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Ongoing Projects

We used information from DOT's semiannual reports to analyze the extent to which cost estimates for 16 major highway projects ongoing in August 2016 had increased since enumeration. We defined a project to be ongoing if DOT had not incurred all expenditures for it. We did not analyze the STH 23 (STH 67 to USH 41) project, which was enumerated in 1999 without a cost estimate because the Transportation Projects Commission had not recommended it for enumeration. To conduct our analysis, we relied on DOT's cost estimates at enumeration and its semiannual reports, which were the best available sources of information. As noted, DOT's cost estimates at enumeration were incomplete, in part, because the cost estimates did not take into account that inflation would increase project expenditures over time. Cost estimates for 12 of the 16 projects indicated that inflation was excluded from them, but cost estimates for the remaining 4 projects did not indicate that inflation was excluded from them. We also noted that DOT's semiannual reports do not present complete project costs.

The cost estimates reported by DOT in August 2016 for 16 ongoing major highway projects had increased by an estimated \$3.1 billion from the cost estimates DOT had provided at enumeration.

As shown in Table 7, the cost estimates reported by DOT in August 2016 for 16 ongoing major highway projects had increased by an estimated \$3.1 billion from the cost estimates DOT had provided to the Governor and the Legislature at enumeration. Cost estimates for all 16 projects increased, including cost estimates for 8 projects that each increased by more than 100.0 percent. Cost estimates may increase further in future years because significant work remains to be completed on recently enumerated projects.

Table 7

Estimated Change in the Cost Estimates of Major Highway Projects Ongoing in August 2016¹
(in millions)

Highway	Project	Enumeration		Cost Estimate as of August 2016 ²	Change	
		Year	Cost Estimate		Amount	Percentage
41	Neenah to Oshkosh and Suamico to De Pere	2003	\$ 430.0	\$1,400.0	\$ 970.0	225.6%
39/90	Madison to Illinois	2011	715.0	1,200.9	485.9	68.0
10	Appleton to Marshfield	1989	125.0	547.4	422.4	337.9
26	Janesville to Watertown	2001	187.0	435.1	248.1	132.7
39/51	Wausau Beltline	2001	120.5	290.7	170.2	141.2
12	Lake Delton to Sauk City	1997	50.0	208.8	158.8	317.6
18/151	Verona Road	2011	150.0	283.3	133.3	88.9
41	Oconto to Peshtigo	1999	79.0	179.6	100.6	127.3
10/441	County Trunk Highway CB to USH 10	2011	390.0	482.0	92.0	23.6
12	Sauk City to Middleton	1993	51.0	140.4	89.4	175.3
53	La Crosse Corridor	1997	67.1	143.2	76.1	113.4
11	Burlington Bypass	1997	71.7	123.3	51.6	72.0
14	Viroqua to Westby	2003	41.0	68.3	27.3	66.6
15	STH 76 to New London	2011	125.0	146.0	21.0	16.8
18	Prairie du Chien to STH 60	2003	29.2	44.5	15.3	52.4
50	I-94 to 43 rd Ave	2014	93.0	97.8	4.8	5.2
Total			\$2,724.5	\$5,791.3	\$3,066.8	112.6

¹ An ongoing project is one for which DOT could still incur expenditures.

² Information provided to us was not consistently complete.

DOT indicated that its cost estimates for ongoing projects increased after enumeration, in part, because its former method of determining cost estimates was less accurate than its current method. DOT first used its current method to determine cost estimates for three projects enumerated in 2011. We question the accuracy of DOT's current method because from enumeration to August 2016, the cost estimate for the I-39/90 (Madison to Illinois) project increased by \$485.9 million, the cost estimate for the USH 10/STH 441 (County Trunk Highway CB to USH 10) project increased by \$92.0 million, and the cost estimate for the STH 15 (STH 76 to New London) project increased by \$21.0 million. DOT

did not use its current method to determine the cost estimate for the USH 18/151 (Verona Road) project, which was also enumerated in 2011, because this project began as a rehabilitation project and subsequently became a high-cost major highway project.

Improving Program Budgeting

To determine when project construction can begin, statutes require the Transportation Projects Commission to presume that current funding for the major highway program will be annually adjusted in future fiscal years to reflect inflation as measured by the U.S. consumer price index (CPI), which reflects changes in the prices of a large number of goods and services throughout the country. Statutes do not provide guidance on how DOT should consider the effects of inflation on project expenditures over the considerable amount of time required to complete major highway projects.

DOT budgeted to complete more project work than could be completed with its available funding because it did not sufficiently take into account inflation and unexpected cost increases.

We found that DOT did not sufficiently take into account the extent to which major highway project expenditures increased over time because of inflation and unexpected cost increases. As a result, DOT budgeted to complete more project work than could be completed with its available funding. DOT indicated that unexpected cost increases caused delays in project work that it had planned to complete.

For its project planning, DOT presumes that the amount of major highway program funding it will receive in future years will increase at the rate of inflation as measured by the CPI. Similarly, DOT presumes that a given project's expenditures will increase in future years at the rate of inflation as measured by the CPI. It then plans to complete an amount of project work in future years such that it will spend all available program funding.

In its semiannual reports, DOT annually updates the cost estimate for each major highway project based on the actual inflationary effects on the project. The actual inflation reflects the changes in prices DOT paid for concrete, steel, and other construction items in the prior year, instead of changes in prices as measured by the CPI. For each project enumerated in 2011, we compared the actual inflation, as presented in DOT's semiannual reports, with CPI-measured inflation.

As shown in Table 8, the actual inflation associated with the four major highway projects enumerated in 2011 was \$103.2 million more than CPI-measured inflation over the five-year period from June 2011 through June 2016. As a result, DOT did not sufficiently take into account the extent to which inflation would increase project expenditures.

Table 8

**Comparison of Actual Inflation to CPI-Measured Inflation on
Major Highway Projects Enumerated in June 2011**
June 2011 to June 2016
(in millions)

Highway	Project	Actual Inflation ¹	CPI-Measured Inflation	Difference
39/90	Madison to Illinois	\$123.4	\$ 58.3	\$ 65.1
18/151	Verona Road	32.3	10.5	21.8
10/441	County Trunk Highway CB to USH 10	42.0	26.2	15.8
15	STH 76 to New London	9.0	8.5	0.5
Total		\$206.7	\$103.5	\$103.2

¹ As reported by DOT in its semiannual reports to the Transportation Projects Commission.

Project costs increase after enumeration for reasons other than inflation. Appendix 8 contains our review of the reasons for cost increases on five ongoing projects for which DOT expects total costs to be considerably higher than the cost estimates at enumeration: the I-39/90 (Madison to Illinois) project, the USH 18/151 (Verona Road) project, the I-39/USH 51 (Wausau Beltline) project, the I-41 (Neenah to Oshkosh and Suamico to De Pere) project, and the STH 11 (Burlington Bypass) project. We found that DOT could not have avoided some cost increases, such as when federal legislation designated USH 41 as an interstate highway, which required design changes that increased project costs. However, a number of cost increases resulted from DOT's decisions, such as to upgrade existing highways in order to increase safety for the driving public. Other cost increases occurred because DOT did not include the costs of design engineering and construction engineering in the cost estimate at enumeration for projects enumerated before 2011.

To some extent, DOT's cost estimates at enumeration take into account unexpected cost increases. For each major highway project, DOT determines a contingency amount for these unexpected cost increases. For example, DOT's cost estimate at enumeration for the I-39/90 (Madison to Illinois) project included a \$104.0 million contingency. If a project's estimated costs increased after enumeration, other than as a result of inflation, DOT did not sufficiently take into account unexpected cost increases and,

therefore, budgeted to complete more project work than could be completed with its available funding.

At enumeration, DOT did not sufficiently take into account unexpected cost increases on major highway projects.

At enumeration, DOT did not sufficiently take into account unexpected cost increases on major highway projects. We examined the four projects enumerated in 2011 in order to determine the extent to which estimated costs increased after enumeration, other than as a result of inflation. According to DOT's semiannual reports, as of August 2016 unexpected costs accounted for:

- \$362.5 million of the \$485.9 million increase in the cost estimate for the I-39/90 (Madison to Illinois) project, or 74.6 percent;
- \$101.0 million of the \$133.3 million increase in the cost estimate for the USH 18/151 (Verona Road) project, or 75.8 percent;
- \$50.0 million of the \$92.0 million increase in the cost estimate for the USH 10/STH 441 (County Trunk Highway CB to USH 10) project, or 54.3 percent; and
- \$12.0 million of the \$21.0 million increase in the cost estimate for STH 15 (STH 76 to New London) project, or 57.1 percent.

If the actual inflation associated with projects is substantially higher than CPI-measured inflation or if unexpected project costs are substantially higher than DOT's contingency amount, DOT must delay projects in order to defer project costs until future years or request the appropriation of additional funds, unless additional federal revenue becomes available. Although accurately estimating actual inflation and determining a contingency amount for a project is challenging, DOT should examine previously enumerated projects and determine why those projects increased in cost after enumeration and assess why its cost estimates did not anticipate the total costs of these projects. Knowing this information can help it to determine more-accurate cost estimates of future projects. At enumeration, DOT should provide the Governor and the Legislature with cost estimates that presume the actual inflation associated with projects will likely be higher than CPI-measured inflation and that include more-accurate contingency amounts. Doing so will allow the Governor and the Legislature to know with greater certainty how much projects will cost and will allow DOT to plan future project work that can be completed with program funding that it presumes it will receive in future years.

☑ Recommendation

We recommend the Department of Transportation:

- *determine why previously enumerated projects increased in cost after enumeration and assess why its cost estimates did not anticipate the total cost of these projects;*
- *use the benefits of this information to help determine more-accurate cost estimates of future major highway projects;*
- *provide the Governor and the Legislature with cost estimates for major highway projects that presume the actual inflation associated with projects will likely be higher than consumer price index-measured inflation and that include more-accurate contingency amounts;*
- *use these cost estimates to plan future major highway project work that can be completed with program funding that it presumes it will receive in future years; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address these recommendations.*

Issues for Legislative Consideration

The Legislature could consider modifying statutes to require DOT to provide it with cost estimates that include all costs associated with potential major highway projects, including the effects of inflation.

Statutes do not specify how DOT should determine the cost estimates of potential major highway projects that are provided to the Governor and the Legislature at enumeration. The Legislature could consider modifying statutes to require DOT to provide it with cost estimates at enumeration that include design engineering and construction engineering costs, the costs of environmental studies, related costs funded by the rehabilitation program, and all other costs associated with a given project. To be helpful, such cost estimates also need to include an accurate estimate of the effects of inflation over time on project costs, as well as a more-accurate estimate of the extent to which unexpected project costs will increase after enumeration. More-accurate cost estimates would also increase the likelihood that DOT could complete enumerated projects as quickly as it had indicated at enumeration and without the appropriation of additional funds.

The Legislature could consider modifying statutes to require DOT to regularly report information to it about the ongoing costs of each major highway project.

Statutes require DOT to report ongoing project costs to the Transportation Projects Commission, but they do not require DOT to report such information to the Legislature. The Legislature could consider modifying statutes to require that DOT semiannually or annually report to it information about each enumerated major highway project, including:

- the complete expected cost of a project at enumeration and the year when DOT expects to complete the project;
- total project costs incurred, as of the date of the report;
- the current complete expected cost of a project, as of the date of the report;
- the reasons for any changes since the prior report in the current complete expected cost of a project; and
- whether DOT anticipates being able to complete a project as scheduled without requiring the appropriation of additional funds.

The Legislature could consider requiring DOT to report information about each enumerated major highway project as it is defined in statutes.

As noted, DOT sometimes combines multiple enumerated projects into one project and sometimes splits an enumerated project into multiple projects for planning, design, and construction purposes. It tracks and reports project costs according to how it combines and splits projects, making it difficult to determine the costs of projects as they are enumerated. Therefore, the Legislature could consider requiring DOT to report information about each enumerated major highway project as it is defined in statutes.

With such information, the Legislature could better monitor any changes in the costs of major highway projects before deciding the appropriate funding levels for the major highway program. In addition, such information would help the Legislature decide whether to enumerate additional projects.

Southeast Wisconsin Freeway Megaprojects

As of October 2016, statutes enumerated two megaprojects: the I-94 North-South Corridor (I-94 from the Mitchell Interchange to Illinois) megaproject and the Zoo Interchange megaproject in Milwaukee County. We reviewed information about the cost estimates for these megaprojects, which were enumerated in 2007. DOT did not provide

the Governor, the Legislature, or the Joint Committee on Finance with an estimate of total megaproject costs at enumeration because it indicated that it first needed to complete additional engineering work.

DOT's information indicates that the cost estimate for one megaproject decreased considerably, and the cost estimate for the other increased slightly.

In 2008 and 2011, DOT completed environmental studies that contain cost estimates for the two megaprojects. These estimates may be more accurate than many of DOT's cost estimates for major highway projects, in part, because they were prepared later in the design engineering phase and took inflation into account. DOT's information indicates that:

- the cost estimate for the I-94 North-South Corridor (I-94 from the Mitchell Interchange to Illinois) megaproject decreased from \$1.90 billion, as indicated in the environmental study, to \$1.65 billion in August 2016, or by \$250.0 million; and
- the cost estimate for the Zoo Interchange megaproject increased from \$1.710 billion, as indicated in the environmental study, to \$1.718 billion in August 2016, or by \$7.8 million.

DOT's information indicated that, unlike most major highway projects, neither megaproject's cost estimate increased significantly through August 2016. DOT indicated that this resulted, in part, because it had communicated with contractors about its plans months before it solicited bids for construction contracts. Because neither megaproject's cost estimate increased significantly through the time period we examined, we did not examine the planning of megaprojects in detail.

Rehabilitation Projects

We determined the extent to which rehabilitation projects expand the state highway system, such as by adding lane miles, as opposed to repairing the existing system without adding capacity. DOT's data indicate whether a given project expanded the state highway system. We used these data to determine that \$521.5 million of the \$6.6 billion, or 7.9 percent, of construction projects completed under the rehabilitation program from January 2006 through December 2015 involved expansion of the state highway system.

In deciding which rehabilitation projects to undertake, DOT's central office develops an eight-year schedule of proposed projects on backbone highways statewide, while each region develops a six-year schedule of proposed projects on non-backbone highways in the

region. Effective project selection maximizes available funds and helps to ensure the quality of state highways. For FY 2016-17, DOT allocated \$233.0 million in rehabilitation projects on backbone highways and \$307.0 million in rehabilitation projects on non-backbone highways, excluding engineering and other project-related costs.

Administrative rules require DOT to equitably allocate statewide the funds to complete rehabilitation projects on non-backbone highways. The central office allocates to each region a proportion of the total funds available for each fiscal year. We found that the proportions have not changed since 2006 to reflect changing highway system needs in each region, and that policies do not describe how these proportions are to be determined. DOT provided information that was prepared in response to our request for documentation of how the regional allocations were determined. This information provided a conceptual basis for how the proportions were determined but did not show how DOT calculated the proportions. As a result, it was not possible to independently assess whether DOT appropriately allocated funds for projects on non-backbone highways. DOT indicated that it plans to revise the proportion of funds allocated to each region using a new allocation method that is under development.

DOT should update its method for allocating funds to each region for projects on non-backbone highways, including the factors it will take into account to determine the allocations, and specify the updated method in its policies. Doing so will help DOT use its funds more effectively to complete the most-needed projects and help DOT allocate funds more equitably among the regions, as required by DOT's administrative rules.

☑ Recommendation

We recommend the Department of Transportation:

- *update its method for annually allocating funds to each region for rehabilitation projects on non-backbone highways and specify this method in its policies; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

DOT did not fully comply with administrative rules for selecting rehabilitation projects on backbone and non-backbone highways.

We found that DOT did not fully comply with administrative rules for selecting rehabilitation projects on backbone and non-backbone highways. First, rules require DOT to develop a range of options for project schedules requiring varying amounts of funds. The range of options is intended to provide the Governor and the Legislature with choices as they determine how much to appropriate, but DOT has not developed various options. DOT policies indicate that developing a range of options “proved to be too complicated and labor-intensive to carry out effectively.” Instead, DOT identifies potential projects and determines which of these projects it can complete, given the amount of program funds available.

Second, rules require DOT’s central office to review and evaluate each region’s proposed schedule of rehabilitation projects on non-backbone highways and produce a single statewide schedule of proposed projects. Instead, DOT policies provide that each region selects such projects. DOT indicated that the central office plays a minimal role in selecting them.

Third, after each biennial budget is enacted, rules require DOT to hold public hearings on the schedule of proposed projects and use the public’s feedback to develop the projects. DOT indicated that it had not held such hearings since 2008 because few people attended them, and that information about the proposed projects is publicly available on its website. Such hearings are distinct from the project-specific public hearings that are required by federal and state environmental laws and that DOT indicated it holds for individual projects.

Fourth, DOT does not fully comply with rules that prescribe how individual rehabilitation projects are to be selected. Rules require DOT to use the pavement serviceability index, which is a way to measure the condition of state highways, to help evaluate potential projects. However, DOT has used the pavement condition index as the primary measure to assess highway conditions since 2009 because it believes the pavement condition index is more accurate than the pavement serviceability index.

In addition, we found that no region documented why it selected particular rehabilitation projects on non-backbone highways over other potential rehabilitation projects. The central office provides each region with detailed data pertaining to factors such as highway condition and safety. The regions indicated that they examined these data, but no region was able to provide documentation showing how it used these data to select from among potential projects. Documenting why particular projects on non-backbone highways were selected will allow DOT managers to review these selection decisions and respond authoritatively to questions from legislators

and others about project selection decisions. In addition, such documentation will provide increased transparency regarding how significant amounts of public funds are spent.

DOT must comply with its legislatively approved rules for selecting rehabilitation projects. Because these rules were promulgated in 1981, they may no longer reflect DOT's preferred method of selecting projects. If so, DOT could seek to modify its rules.

Recommendation

We recommend the Department of Transportation:

- *comply with its administrative rules for selecting rehabilitation projects on backbone and non-backbone highways;*
- *document why it selects particular rehabilitation projects on non-backbone highways over other potential rehabilitation projects; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address these recommendations.*

Program Effectiveness

It is important for DOT to use its funds to complete the most-needed projects. DOT's "program effectiveness" performance measure annually assesses the extent to which the rehabilitation projects on non-backbone highways that had been selected by the regions aligned with the location, scope, and timing of projects identified by a model that DOT developed. This model incorporates data on the condition of state highways, traffic levels, the number of accidents, and other factors. DOT intends that its regions use the performance measure results to improve their future decisions in selecting rehabilitation projects.

DOT should use the results of the program effectiveness performance measure to improve future project selection, which will help DOT use its funds more effectively.

The central office indicated that the performance measure is an effective way to assess decisions to select rehabilitation projects and provides regions with feedback for improving future project selection. However, staff who select projects on non-backbone highways in four DOT regions indicated that they do not use the results of the program effectiveness performance measure to improve future project selection. We note that three regions did not meet the performance measure goal pertaining to project scope in

2015. The regions should use the results to improve future project selection, which will help DOT use its funds more effectively.

Recommendation

We recommend the Department of Transportation:

- *use the results of the program effectiveness performance measure to improve how it selects rehabilitation projects on non-backbone highways; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Solicitation of Local Input

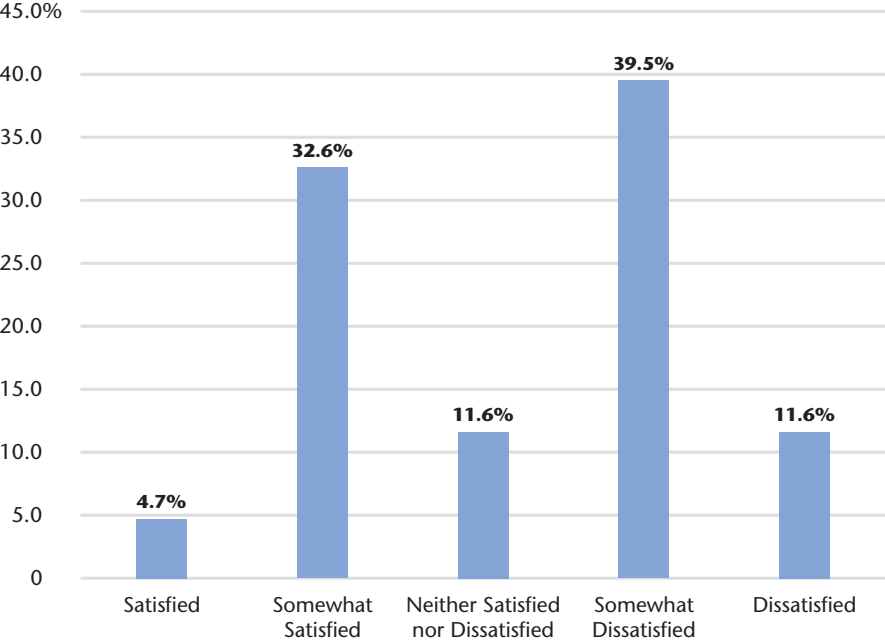
All nine regional planning commissions indicated that they were satisfied with DOT's consideration of their input when planning projects.

When planning rehabilitation projects, DOT solicits input from regional planning commissions and county highway departments. All nine regional planning commissions indicated that they were satisfied with DOT's consideration of their input.

We surveyed all 72 county highway commissioners about their satisfaction with DOT's consideration of their input when planning rehabilitation projects. As indicated in Figure 9, 51.1 percent of the 43 county highway commissioners who responded to our survey question indicated that they were either somewhat dissatisfied or dissatisfied, while 37.3 percent were either somewhat satisfied or satisfied. In response to our survey, many county highway commissioners also indicated that they would like DOT to consult with them more often about the selection, scope, and timing of rehabilitation projects.

Figure 9

Satisfaction of County Highway Commissioners with DOT’s Consideration of Their Input When Planning Rehabilitation Projects



Traffic Count Forecasts

DOT forecasts traffic counts on highway segments up to 30 years into the future, which helps it to plan projects.

DOT regularly determines the average daily number of vehicles that drive over each of the 7,506 segments that comprise the state highway system. It uses this information to forecast traffic counts on individual segments up to approximately 30 years in the future. These forecasts help DOT to determine whether it will suggest a potential major highway project to the Transportation Projects Commission or plan a rehabilitation project. These forecasts also help DOT to determine a project’s scope. For example, if DOT forecasts that traffic counts may increase beyond certain thresholds, it may plan to build additional highway lanes or increase pavement thickness.

DOT uses two methods to forecast traffic counts. First, the Traffic Analysis Forecasting Information System statistically analyzes trends in historical traffic counts to forecast traffic counts. The system can be used for any state highway project in Wisconsin. Second, travel demand models use various assumptions about future conditions, such as the number of households and jobs in a given area, to forecast the numbers and routes of trips that individuals may make in the future. DOT uses 11 travel demand

models that cover part or all of 29 counties and can be used only for projects in those areas. In addition, DOT is testing a statewide travel demand model that it indicated will improve the accuracy of forecasts in areas of the state where no travel demand model currently exists.

When DOT is considering a project in an area of the state covered by a travel demand model, policies require it to review the results of the model and the results of the Traffic Analysis Forecasting Information System and document the basis of the traffic count forecast. Policies indicate that DOT should consider the results of the two methods, use analytical judgment to determine the final forecast, and document its assumptions.

DOT did not consistently document the assumptions it used to determine 28 of 30 traffic forecasts that we reviewed.

To assess DOT's adherence to policies for documenting its assumptions, we reviewed documentation for 30 traffic forecasts that DOT completed between August 2013 and March 2016 for rehabilitation and major highway projects. We found that DOT did not consistently document the assumptions it used to determine 28 of these 30 traffic forecasts. When determining 18 traffic forecasts, DOT averaged the results of the travel demand model and the Traffic Analysis Forecasting Information System but did not document why it did so. For example, for a segment of USH 51 in Madison, the travel demand model forecasted a traffic count of 38,600 vehicles per day, and the Traffic Analysis Forecasting Information System forecasted a traffic count of 67,730 vehicles per day. DOT averaged these two results and determined a final forecast of 53,165 vehicles per day, but it did not document the assumptions that supported this decision.

DOT also did not document the assumptions it used to determine ten other traffic forecasts:

- When determining eight traffic forecasts, DOT used the results of the travel demand model without averaging those results with the results that it had calculated with the Traffic Analysis Forecasting Information System. DOT did not document the assumptions that supported these decisions.
- When determining one traffic forecast, DOT used the results of the travel demand model without calculating the results using the Traffic Analysis Forecasting Information System. DOT did not document the assumptions that supported this decision.

- When determining one traffic forecast, DOT calculated the results of both the travel demand model and the Traffic Analysis Forecasting Information System. Its traffic forecast did not match either of the two results and was not an average of the two results. DOT did not document the assumptions that supported this decision.

In May 2014, DOT invited staff from transportation departments in other states to provide it with feedback on how it determines traffic forecasts. This feedback indicated that DOT should enhance its practices by “documenting the processes, assumptions, and data” used to produce forecasts. Consistently documenting the procedures and assumptions is important to allow DOT managers and others to later review this information, including the assumptions and rationale used to determine traffic forecasts, and make necessary improvements if these forecasts prove to be inaccurate.

Recommendation

We recommend the Department of Transportation:

- *consistently document the procedures and assumptions used to determine traffic forecasts and use this information to improve its traffic forecasts; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

To assess the accuracy of DOT’s traffic forecasts on projects open to traffic, we examined 15 major highway projects enumerated from 1989 to 2001. For each project, DOT had calculated at least three actual traffic counts over time on a given highway segment after the project was open to traffic. There were at least three such traffic counts available for 65 highway segments within the boundaries of the 15 projects. For each of these 65 highway segments, we determined whether the three most recent actual traffic counts were, on average, lower or higher than expected, based on DOT’s traffic forecasts.

As shown in Table 9, we found that the averages of the actual traffic counts on 48 of the 65 highway segments, or 73.8 percent, within the boundaries of the 15 major highway projects were higher than expected, based on DOT’s traffic forecasts. In contrast, the averages of the actual traffic counts on 17 segments, or 26.2 percent, were lower than expected. The end date of DOT’s forecasts had been

reached for only 2 of the 15 projects, involving 4 of 65 highway traffic segments. Definitive conclusions about the accuracy of DOT’s forecasts cannot be made until the end dates of DOT’s multi-decade forecasts are reached.

Table 9
Accuracy of DOT’s Traffic Forecasts, by Highway Segment
 15 Major Highway Projects¹

	Highway Segments	Percentage of Total
Actual Traffic Counts Were Lower than Expected by:		
50.1% to 100.0%	1	1.5%
25.1% to 50.0%	5	7.7
0.1% to 25.0%	11	16.9
Subtotal	17	26.2
Actual Traffic Counts Were Higher than Expected by:		
0.1% to 25.0%	28	43.1
25.1% to 50.0%	6	9.2
50.1% to 100.0%	6	9.2
More than 100.0%	8	12.3
Subtotal	48	73.8
Total	65	100.0%

¹ Based on actual traffic counts available at the time of our audit. Definitive conclusions about the accuracy of DOT’s traffic forecasts cannot be made until the end dates of DOT’s multi-decade forecasts are reached.

Central office staff determine forecasts for all state highway projects in four regions. In contrast, the Southeast Region determines forecasts for projects in its region because of the workload involved with, and specialized expertise needed for, planning projects in urbanized areas. The Southeast Region forecasts traffic counts by using the Traffic Analysis Forecasting Information System, but it contracts with the Southeast Wisconsin Regional Planning Commission (SEWRPC) to forecast traffic counts by using a travel demand model. The Southeast Region must approve all forecasts determined by SEWRPC.

DOT could not provide documentation of its reviews of the forecasts of traffic counts determined by a regional planning commission.

The Southeast Region indicated that it reviews and approves SEWRPC's forecasts for megaprojects and other costly state highway projects, but it could not provide documentation of these reviews, other than emailed questions to SEWRPC regarding those forecasts. The Southeast Region indicated that it is developing a checklist for consistently reviewing SEWRPC's forecasts and documenting these reviews.

Recommendation

We recommend the Department of Transportation:

- *ensure it thoroughly reviews forecasts of traffic counts performed under contract by other entities in order to determine the accuracy of those forecasts; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

■ ■ ■ ■

Design Engineering and Construction Engineering ■

Design engineers create design plans for state highway projects, and construction engineers oversee construction contractors.

Design engineers create design plans for state highway projects, complete environmental and other project-related documentation, and estimate the costs to construct projects. Construction engineers oversee the work of construction contractors to ensure that construction standards and other contractual requirements are met. DOT's reliance on consultants to complete such engineering work increased substantially from FY 2006-07 through FY 2014-15. We found that DOT took steps to control engineering costs. However, we make recommendations for DOT to take additional steps to save funds and improve the quality of design plans.

Expenditures

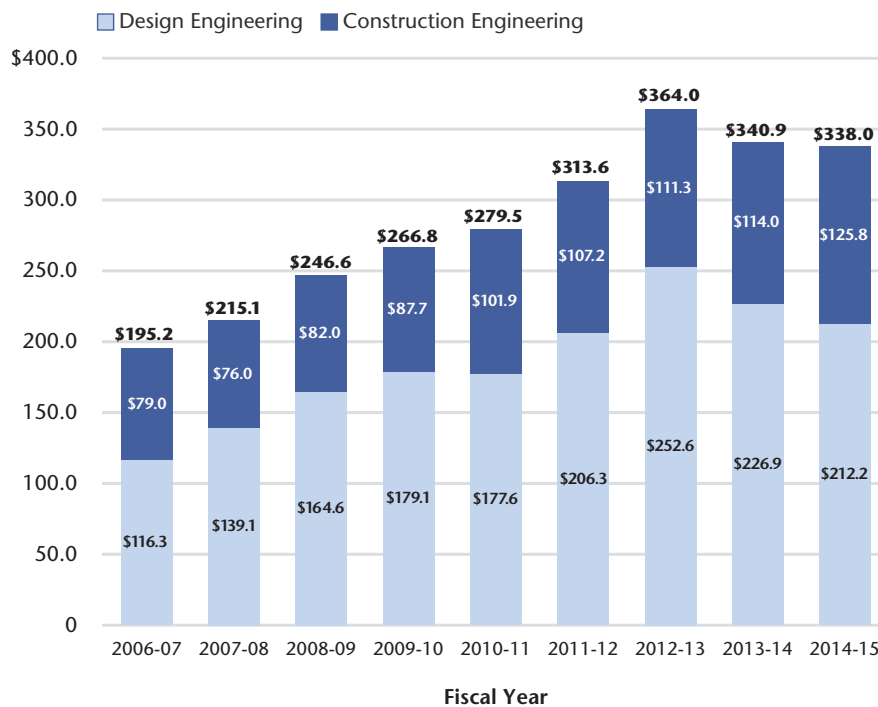
To determine design engineering and construction engineering expenditures on state highway projects, we used DOT's accounting system to determine DOT staff salaries and fringe benefits. The accounting system did not allow us to determine DOT's expenditures for overhead, such as rent and utilities, managing consultant contracts, determining engineering standards, and overseeing the design engineering and construction engineering phases of projects. DOT provided summary information for these expenditures, which we could not independently confirm by using DOT's accounting system. As a result, the engineering expenditures we present are estimates. At the time of our fieldwork, this summary information was not available for FY 2015-16.

Engineering expenditures increased from an estimated \$195.2 million in FY 2006-07 to an estimated \$338.0 million in FY 2014-15.

As shown in Figure 10, engineering expenditures increased from an estimated \$195.2 million in FY 2006-07 to an estimated \$338.0 million in FY 2014-15. In FY 2014-15, design engineering expenditures represented 62.8 percent of total engineering expenditures, and construction engineering expenditures represented 37.2 percent.

Figure 10

Estimated Engineering Expenditures for State Highway Projects (in millions)



Hiring Consultants

After assigning all of its engineering staff to projects, DOT hires consultants to work on other projects that must be completed.

The regions indicated that DOT assigns its engineering staff to projects based on considerations such as staff expertise, interests, availability, and professional development needs. After assigning all of its staff, DOT hires consultants to work on other projects that must be completed. In addition, DOT indicated that it hires consultants to survey project sites and provide specialized engineering services. Federal law requires consultants be hired based on their qualifications, rather than the cost of their services.

Consultants must typically meet certain qualifications to be eligible to work for DOT. DOT conducts bimonthly solicitations for design contracts, and eligible consultants indicate their interest in particular contracts. For each design contract, policies typically require DOT to compile a list of at least five qualified consultants and rank them in order of preference, based on information such as expertise, prior work experience, and the results of prior performance evaluations. DOT negotiates with consultants in their ranked order until it agrees upon what it considers to be a fair and reasonable price for a given contract.

Each year, DOT conducts an annual solicitation for construction engineering contracts associated with construction projects scheduled for the following year, and it interviews eligible consultants that indicated their interest in specific contracts. Based on these interviews and information such as expertise, prior work experience, and the results of prior performance evaluations, policies require DOT to rank the consultants in order of preference. DOT negotiates with consultants in their ranked order until it agrees upon what it considers to be a fair and reasonable price for a given contract.

From January 2006 through December 2015, DOT executed 4,487 design engineering and construction engineering contracts totaling \$1.4 billion.

Because the construction season occurs on a calendar-year basis, we examined the number of contracts DOT executed in a given calendar year. As shown in Table 10, DOT executed 4,487 design engineering and construction engineering contracts totaling \$1.4 billion from January 2006 through December 2015. The average design engineering contract was executed for \$329,800, and the median contract was executed for \$70,100. The average construction engineering contract was executed for \$292,700, and the median contract was executed for \$88,200.

Table 10

Engineering Contracts Executed, by Year

Year	Design Engineering		Construction Engineering		Total	
	Number	Contract Amount (in millions)	Number	Contract Amount (in millions)	Number	Contract Amount (in millions)
2006	238	\$ 42.4	227	\$ 33.9	465	\$ 76.3
2007	234	60.6	173	23.1	407	83.7
2008	256	86.9	205	41.3	461	128.2
2009	264	74.4	238	54.3	502	128.7
2010	243	54.5	220	67.2	463	121.8
2011	267	144.7	213	65.6	480	210.3
2012	281	136.4	183	63.0	464	199.4
2013	265	96.1	205	89.9	470	185.9
2014	263	74.7	179	74.5	442	149.2
2015	188	53.4	145	69.0	333	122.4
Total	2,499	\$824.1	1,988	\$581.8	4,487	\$1,405.9

Profit Rates

We examined in greater detail the two most-common types of contracts that policies allow DOT to use. Under a “lump sum” contract, DOT pays a consultant a specified amount to provide engineering services, including a specified profit rate based on qualifying expenses, and this amount does not change unless the scope of work changes materially. Under an “actual cost plus fixed fee” contract, DOT pays a consultant for all allowable costs, up to a maximum amount, plus a specified profit rate based on qualifying expenses. Policies indicate that a lump sum contract is appropriate when a project’s scope, estimated cost, risk levels, scheduling complexity, and duration are sufficiently known to permit the determination of fair and reasonable compensation. An actual cost plus fixed fee contract is appropriate when a project’s scope is well defined but the precise extent, complexity, or duration of work is unknown at contract negotiation. From January 2006 through December 2015, DOT executed 795 lump sum contracts and 3,211 actual cost plus fixed fee contracts.

For contracts solicited before January 2013, DOT negotiated the profit rates with consultants. Since then, policies require DOT to publish the profit rate at solicitation and not negotiate it. Policies

indicate that the profit rate should typically be from 6.0 percent to 12.0 percent of qualifying expenses, but it should not exceed 15.0 percent. DOT’s policies indicate that the precise percentage for a given contract is based on the effort needed to complete the work, the work’s stability and predictability, the uniqueness of the required work and expertise, a consultant’s liability and risk of claims arising from its work, the risk of inflation during the contract’s duration, and the administrative effort needed to complete the work.

Profit rates of certain design engineering and construction engineering contracts executed from January 2006 through December 2015 typically ranged from 7.0 percent to 8.9 percent.

We used DOT’s data to determine the profit rates of all lump sum and actual cost plus fixed fee contracts executed for design engineering and construction engineering work from January 2006 through December 2015. As indicated in Table 11, profit rates typically ranged from 7.0 percent to 8.9 percent. Over this ten-year period, the average profit rate was 7.5 percent for design engineering contracts and 7.3 percent for construction engineering contracts. Average profit rates for design engineering contracts declined from 8.2 percent in 2006 to 7.0 percent in 2015, while average profit rates for construction engineering contracts remained fairly constant during this ten-year period. Average profit rates for lump sum and actual cost plus fixed fee contracts were similar and varied only slightly among the five regions.

Table 11

Profit Rates in Engineering Contracts¹
 Contracts Executed from January 2006 through December 2015

Profit Rate	Design Engineering		Construction Engineering	
	Number	Percentage of Total	Number	Percentage of Total
Less than 6.0%	35	1.7%	45	2.5%
6.0% to 6.9%	256	12.1	317	17.8
7.0% to 7.9%	920	43.4	914	51.3
8.0% to 8.9%	680	32.1	421	23.6
9.0% to 9.9%	158	7.5	30	1.7
10.0% to 12.0%	44	2.1	24	1.3
12.1% to 15.0%	0	0.0	0	0.0
Greater than 15.0%	1	<0.1	0	0.0
Unknown	26	1.2	30	1.7
Total	2,120	100.0%	1,781	100.0%

¹ Includes lump sum and actual cost plus fixed fee contracts. Excludes 105 contracts with no profit rates.

We obtained information about the contract with a profit rate greater than 15.0 percent. DOT executed a \$100,700 design engineering contract with a 15.3 percent profit rate in August 2008.

Issues with Hiring Consultants

Questions have long been raised about the extent to which DOT hires consultants to complete engineering work. Federal law requires DOT to be in charge of all projects involving federal funds, even if a consultant performs the engineering work. In report 97-4, we noted that from FY 1987-88 through FY 1995-96:

- the proportion of all design engineering work completed by DOT staff declined from 71.0 percent to 55.9 percent; and
- the proportion of all construction engineering work completed by DOT staff declined from 91.8 percent to 68.3 percent.

The proportion of engineering work that consultants can complete without hindering DOT's ability to effectively oversee consultants is unknown.

The proportion of engineering work that consultants can complete without hindering DOT's ability to effectively oversee consultants is unknown. In January 2008, the federal Government Accountability Office found that as state transportation staff become further removed from day-to-day project management, the less able they are to develop the experience, skills, and expertise needed to effectively oversee consultants and construction contractors.

In its 2013-15 Biennial Budget Request, DOT requested an additional 180.0 FTE engineering and technical positions because it indicated that it did not have the staff necessary to oversee projects and consultants appropriately and to complete other engineering work. 2013 Wisconsin Act 20, the 2013-15 Biennial Budget Act, authorized these positions but did not provide additional funds. Instead, most staff in these positions were to complete work that otherwise would have been completed by consultants.

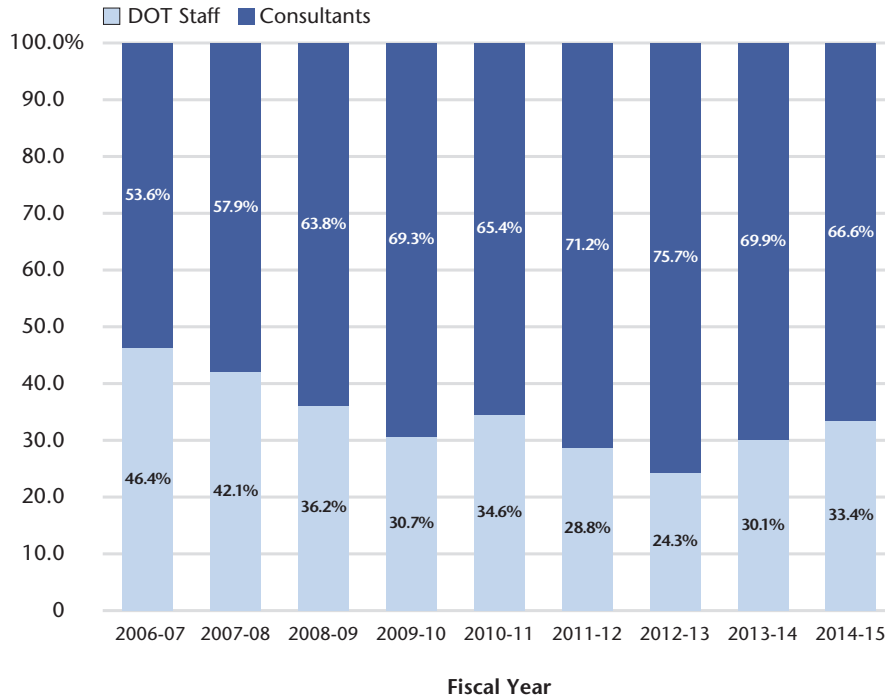
From October 2013 through June 2014, DOT filled the 180.0 FTE positions, including 140.0 FTE positions in the regions and 40.0 FTE positions in the central office. Four regions indicated that these positions had increased their ability to complete engineering work with DOT staff, but one region indicated that these positions had only minimally improved its ability to do so.

In FY 2014-15, DOT staff accounted for 33.4 percent of all design engineering expenditures.

As shown in Figure 11, work completed by DOT staff declined from 46.4 percent of total design engineering expenditures in FY 2006-07 to 24.3 percent in FY 2012-13, but it then increased to 33.4 percent in FY 2014-15. Engineers hired as a result of 2013 Wisconsin Act 20 likely contributed to this increase. Appendix 9 shows annual design engineering expenditures for work completed by DOT staff and consultants over the ten-year period.

Figure 11

Proportion of Total Design Engineering Expenditures for Work Completed by DOT Staff and Consultants

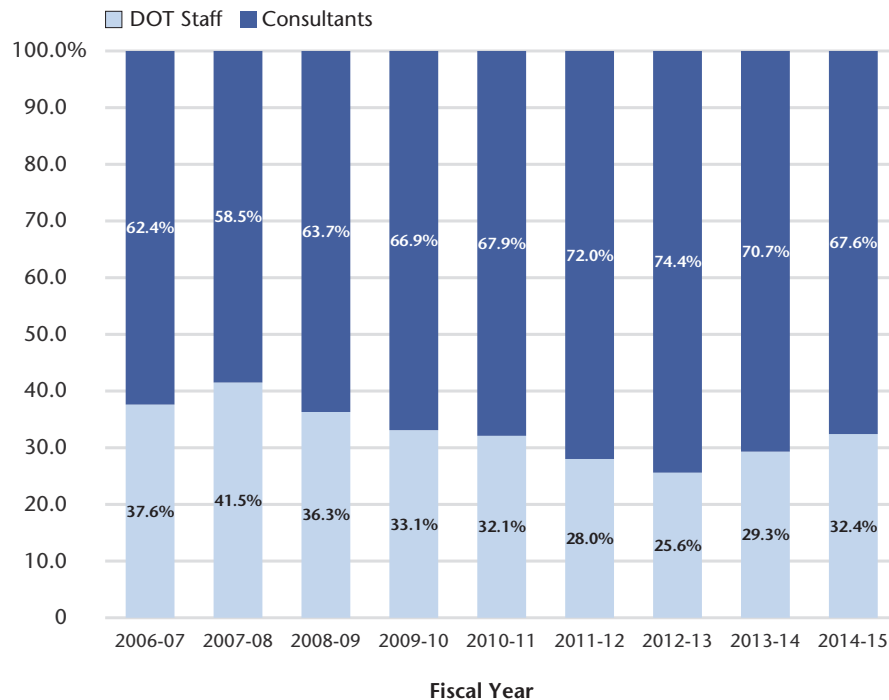


In FY 2014-15, DOT staff accounted for 32.4 percent of all construction engineering expenditures.

As shown in Figure 12, work completed by DOT staff declined from 37.6 percent of total construction engineering expenditures in FY 2006-07 to 25.6 percent in FY 2012-13, but it then increased to 32.4 percent in FY 2014-15. Engineers hired as a result of 2013 Wisconsin Act 20 likely contributed to this increase. Appendix 9 shows annual construction engineering expenditures for work completed by DOT staff and consultants over the ten-year period.

Figure 12

**Proportion of Total Construction Engineering Expenditures for
Work Completed by DOT Staff and Consultants**



FHWA expressed concerns to us about DOT's engineers, including that:

- the engineers have relatively little experience;
- the engineers have a high rate of turnover, in part, because the private sector pays considerably higher salaries than DOT pays; and
- the engineers serving as project managers have heavy workloads, which makes it difficult to oversee projects effectively.

We determined the experience level of civil and structural engineers, who work as design engineers and construction engineers. An engineer who has obtained a qualifying educational degree, has at least four to six years of engineering experience, and passed engineering examinations is registered as a professional engineer. As of July 2016, DOT employed 680 civil and structural engineers in the state highway program, including:

- 132 entry-level engineers, 5 of whom were professional engineers, who worked under the close supervision of more-experienced staff;
- 218 senior engineers, 95 of whom were professional engineers, who had the expertise to work with increased independence; and
- 330 advanced engineers, all of whom were professional engineers, who had the expertise to work with little supervisory oversight.

In July 2016, DOT also employed 130 engineering supervisors and managers, all of whom were professional engineers.

We used DOT's data to determine annual turnover among entry-level, senior, and advanced engineers, as well as among engineering supervisors and managers. We found that turnover among these engineers was 3.3 percent from July 2013 to July 2014, 2.8 percent from July 2014 to July 2015, and 5.4 percent from July 2015 to July 2016.

FHWA indicated that a project manager who is responsible for approximately 15 projects or more may have a heavy workload that could affect his or her ability to effectively oversee projects. The precise number of projects that a project manager can oversee varies depending on factors such as the project manager's level of experience and the size and complexity of the projects. In response to our October 2016 request to DOT for current workloads, we found that project managers were each responsible for an average of 6.3 projects in the Southeast Region, 11.0 projects in the Southwest Region, 13.6 projects in the North Central Region, 14.3 projects in the Northeast Region, and 24.5 projects in the Northwest Region. All five regions indicated that some project managers were responsible for 15 projects or more, including at least six who were each responsible for more than 30 projects.

Controlling Engineering Costs

The actual amounts of design engineering contracts executed and completed from January 2006 through December 2015 increased 16.2 percent over the contract amounts.

For engineering contracts executed and completed from January 2006 through December 2015, we determined the extent to which total amounts differed from contract amounts. As shown in Table 12, the actual amounts for design engineering contracts increased 16.2 percent over the contract amounts. Regions indicated that costs can increase if, after contract execution, design standards change or a highway's condition deteriorates and requires additional design work. Regions were uncertain why the actual

amounts for construction engineering contracts decreased 4.1 percent from the contract amounts. Appendix 10 provides additional information on the contract and actual amounts of engineering contracts.

Table 12

Change in Engineering Contract Costs
 Contracts Executed and Completed from January 2006 through December 2015

	Number	Amount (in millions)			Percentage Change
		Contract	Actual	Change	
Design Engineering	1,841	\$424.6	\$493.5	\$68.8	16.2%
Construction Engineering	1,723	380.9	365.3	(15.5)	(4.1)
Total	3,564	\$805.5	\$858.8	\$53.3	6.6

Engineering Delivery Cost Index

The engineering delivery cost index performance measure evaluates DOT’s effectiveness and efficiency in completing engineering work.

More than 20 years ago, DOT established a performance measure, called the “engineering delivery cost index,” to evaluate its effectiveness and efficiency in completing engineering work on state highway projects. First, DOT calculates design engineering costs as a percentage of the construction contract amounts in each fiscal year. Second, DOT calculates construction engineering costs as a percentage of the total construction costs in each fiscal year. Third, DOT sums the two percentages and seeks to keep this total to less than 25.0 percent. DOT has not established separate goals for design engineering and construction engineering work.

In report 97-4, we noted it was inappropriate to sum the two percentages because the design engineering percentage is based on construction contract amounts, but the construction engineering percentage is based on total construction costs. In addition, the design engineering percentage for a given fiscal year is based on different projects than the construction engineering percentage. During our current audit, we found that DOT continued to calculate its measure in this inappropriate manner.

Regions were unable to provide examples of how they used the results of the engineering delivery cost index to improve engineering efficiency.

Regions indicated that they discussed the results of the engineering delivery cost index but were unable to provide examples of how they used these results to improve engineering efficiency. However, the Northeast Region uses the measure's two component parts to separately examine the design engineering and construction engineering costs of projects. It established goals for keeping design engineering costs at no more than 15.0 percent of each project's contract amount and construction engineering costs at no more than 10.0 percent of each project's total construction costs. If engineering costs exceed either threshold, the Northeast Region indicated that it tries to make adjustments to control future engineering costs.

DOT potentially could have saved an additional \$6.6 million over ten years if each region had kept engineering costs at no more than two thresholds.

We determined the amount DOT saved from FY 2005-06 through FY 2014-15 as a result of individual regions keeping annual design engineering costs at no more than 15.0 percent of contract amounts or keeping annual construction engineering costs at no more than 10.0 percent of total construction costs. For example, the Southeast Region kept its design engineering costs at no more than 15.0 percent of contract amounts in seven of the ten years, and it kept its construction engineering costs at no more than 10.0 percent in three of the ten years. Only the Northwest Region kept both design engineering and construction engineering costs at no more than those two thresholds in all ten years. We found that DOT saved \$26.9 million by controlling engineering costs during this ten-year period, but it potentially could have saved an additional \$6.6 million if each region had kept its engineering costs at no more than those two thresholds in each of the ten years. Saving the additional \$660,000 per year, on average, potentially would have allowed DOT to complete additional engineering work.

Performance measure results show that the regions controlled engineering costs to varying degrees, indicating that best practices may exist and could be shared among the regions. In August 2016, while our audit was ongoing, DOT convened a statewide group to consider ways to improve the measure and use the measure's results to identify best practices for controlling engineering costs. DOT indicated that it is considering various improvements to the measure.

DOT should improve how it calculates its performance measure in order to make the results more useful to regions as they seek to control engineering costs. Rather than setting an overall goal, it could establish separate goals for the costs of design engineering work and construction engineering work, as the Northeast Region has done. Although regions indicated that they discuss best practices for controlling engineering costs, DOT should more formally use the measure's results to determine ways to control costs.

☑ Recommendation

We recommend the Department of Transportation:

- *modify its engineering delivery cost index performance measure, such as by establishing separate annual goals for the costs of design engineering work and construction engineering work;*
- *annually calculate whether each region met its goals;*
- *use the results of these calculations to control engineering costs; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address these recommendations.*

Cost-Benefit Analyses

Before contracting for engineering work that is estimated to cost more than \$300,000, statutes require DOT to complete a cost-benefit analysis.

Before contracting for engineering work that is estimated to cost more than \$300,000, statutes require DOT to complete a cost-benefit analysis. Statutes do not require DOT to use the results of the cost-benefit analyses to decide whether to contract for services. 2013 Wisconsin Act 20, the 2013-15 Biennial Budget Act, increased the threshold for completing a cost-benefit analysis from more than \$25,000 to more than \$300,000, beginning in July 2013. A cost-benefit analysis must compare the total cost, quality, technical expertise, and timeliness of work if it were performed by DOT staff with the total cost, quality, technical expertise, and timeliness of the work if it were performed by a consultant.

DOT provided 182 cost-benefit analyses completed from July 2013 through December 2015 in response to our request for all cost-benefit analyses for design engineering and construction engineering work over this time period. DOT typically completed a cost-benefit analysis only after it had decided that a consultant would complete the engineering work. As noted, the regions indicated that DOT first assigns its staff to projects and then hires consultants for other work that must be completed. We found that:

- 164 cost-benefit analyses (90.1 percent) indicated that DOT staff could complete the work for a total of \$14.0 million less than consultants could complete it;

- 9 cost-benefit analyses (4.9 percent) indicated that consultants could complete the work for a total of \$323,100 less than DOT staff could complete it; and
- 9 cost-benefit analyses (4.9 percent) indicated that DOT staff did not have the requisite expertise to complete the work.

In order to compare the total cost of work if it were performed by DOT staff or a consultant, the cost-benefit analyses are based on the estimated hourly rates to complete particular engineering tasks. The hourly rates indicated that DOT staff could complete some tasks at less cost than consultants, and that consultants could complete other tasks at less cost than DOT staff. DOT policies require these hourly rates to be updated “periodically.” We found that 66 of the 182 cost-benefit analyses (36.3 percent) used hourly rates more than one year old, including 28 cost-benefit analyses (15.4 percent) that used hourly rates more than two years old and sometimes dating to January 2009. DOT updated its hourly rates in January 2009 and, most recently, in March 2013. The hourly rates for some tasks changed considerably from January 2009 to March 2013. DOT indicated that it intends to update the hourly rates.

DOT should regularly update the hourly rates to complete engineering tasks. By doing so, the cost-benefit analyses will more accurately indicate the costs at which DOT staff and consultants can complete the work.

Recommendation

We recommend the Department of Transportation:

- *modify its policies to require its staff to annually update the hourly rates used to complete cost-benefit analyses; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

The Legislature could consider modifying statutes to require DOT to take into account the results of cost-benefit analyses, which could help DOT use its funds more effectively.

The Legislature could consider modifying statutes to require DOT to take the results of cost-benefit analyses into account when deciding whether DOT staff or consultants will complete engineering work. In prior years, the decision of whether to hire a consultant often may have been straightforward because DOT had so few engineers that it hired consultants to perform most work. However, such decisions may not be as straightforward in the future because the newly hired engineers and technical staff in the 180.0 FTE positions can complete some work that consultants would have otherwise completed. As a result, the cost-benefit analyses could help DOT use its funds more effectively.

Value Engineering

Value engineers recommend ways to improve quality and minimize costs on projects.

During the design phase of a project, consultants hired by DOT as value engineers recommend ways to improve quality, minimize costs, simplify construction, or increase the public's safety. For example, they may recommend DOT construct a different type of interchange not identified in preliminary design plans. The National Highway System includes approximately 6,300 miles of interstate and other main state highways in Wisconsin. Federal law requires value engineering studies on highway projects on the National Highway System expected to cost \$50.0 million or more and bridge projects on the National Highway System expected to cost \$40.0 million or more. DOT policies indicate that value engineering studies may also be beneficial for projects estimated to cost between \$25.0 million and \$50.0 million, and DOT indicated that studies are being completed for such projects.

Value engineers propose their recommendations to the project team, which decides which recommendations to accept. Recommendations may be rejected if, for example, they differ from previously made commitments, such as if DOT had indicated to a local government that it would construct a project in a particular manner. DOT's regions indicated that recommendations can be useful, but that value engineers were sometimes unaware of environmental factors and the public's expressed interests or concerns regarding projects.

DOT annually reports to FHWA the recommendations proposed and accepted for each project. DOT's value engineering report for federal fiscal year (FFY) 2014-15 included \$34.8 million in recommendations accepted for seven projects. Consultants were paid \$445,600 for the value engineering studies associated with this report.

We examined value engineering information reported to FHWA by DOT and transportation departments in other states from

FFY 2009-10 through FFY 2013-14, which was the most recent year for which information was available for other states at the time of our audit. During this five-year period, DOT paid consultants \$1.8 million for completing value engineering studies.

As shown in Table 13, DOT accepted \$208.9 million in value engineering recommendations, or 51.1 percent of the amount of proposed recommendations, from FFY 2009-10 through FFY 2013-14. Among six other midwestern states, only Indiana accepted a higher amount of recommendations.

Table 13

Value Engineering Recommendations
 FFY 2009-10 through FFY 2013-14
 (in millions)

	Proposed Amount	Accepted Amount	Percentage Accepted
Indiana	\$ 275.4	\$ 217.4	78.9%
Wisconsin	409.0	208.9	51.1
Minnesota	386.8	193.2	49.9
Ohio	310.1	115.8	37.3
Iowa	99.5	36.8	37.0
Illinois	232.6	64.4	27.7
Michigan	229.2	44.9	19.6
United States	16,958.1	7,023.0	41.4

DOT publicly stated that value engineering saved \$89.5 million from FFY 2010-11 through FFY 2013-14. However, value engineering reports indicate that the recommendations represent estimated costs that DOT may avoid in future years when projects are constructed, rather than savings realized when the recommendations are accepted.

DOT does not verify actual savings realized as a result of value engineering recommendations.

DOT does not verify actual savings realized as a result of value engineering recommendations. Verifying savings could be challenging because it is difficult to determine the actual amounts saved as a result of not constructing interchanges and other design features. A recommendation in DOT’s value engineering report for FFY 2013-14 identified \$107.6 million in savings that may occur over a 30-year period on a series of projects along the I-39 corridor. The

extent to which these savings will actually be realized is unknown. This report included another recommendation to save \$8.7 million, which DOT included in its report to FHWA, but noted that the “cost savings estimate is likely unrealistic.”

Providing design engineers with guidance on incorporating value engineering recommendations into future project designs will help DOT use its funds more effectively.

DOT indicated that value engineers sometimes make similar recommendations, for multiple projects, that are accepted by different project teams. However, DOT does not determine if recommendations can be applied more broadly to other projects in order to reduce design costs and improve design quality. Providing design engineers with guidance on incorporating value engineering recommendations into future project designs will improve design quality and help DOT use its funds more effectively.

☑ Recommendation

We recommend the Department of Transportation:

- *provide design engineers with guidance on how and when to incorporate value engineering recommendations into future projects in order to reduce costs and improve design quality; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Increasing Design Engineering Quality

Two DOT performance measures assess design engineering quality. The “engineering estimate accuracy” performance measure assesses how accurately design engineers estimated the amounts of construction contracts, while the “design quality index” assesses the quality of design plans.

Engineering Estimate Accuracy

Design engineers estimate the contract amount DOT will need to award for constructing a project.

Based on a project’s design plans, design engineers estimate the contract amount DOT will need to award for constructing the project. Accurate estimates help DOT to determine the number and value of projects that can be awarded in a given fiscal year, provide a benchmark for assessing the awarded contract amounts, and reduce funding and scheduling uncertainty. If DOT awards contracts for considerably more than the estimated amounts, other planned projects may need to be delayed. Awarding contracts for considerably less than expected can also be disruptive if the

additional available funds require DOT to construct other projects sooner than anticipated. FHWA guidelines indicate that at least 50.0 percent of awarded contract amounts should be within 10.0 percent of the estimated amounts.

The engineering estimate accuracy performance measure assesses the extent to which the awarded amounts of state highway construction contracts in a given fiscal year are within 10.0 percent of the estimated amounts. Through FY 2012-13, DOT's goal was for 50.0 percent of the awarded amounts to be within 10.0 percent of the estimated amounts. Since FY 2013-14, DOT's goal has been for 60.0 percent of the awarded amounts to be within 10.0 percent of the estimated amounts. DOT did not meet its goals from FY 2006-07 through FY 2014-15.

The estimated amounts of the 2,247 state highway construction contracts awarded from January 2006 through December 2015 were often inaccurate.

We found that the estimated amounts of the 2,247 state highway construction contracts awarded from January 2006 through December 2015 were often inaccurate. As shown in Table 14, only 40.2 percent of the 2,247 awarded contract amounts were within 10.0 percent of the estimated amounts, while 18.6 percent were at least 25.0 percent lower or higher than the estimated amounts. DOT indicated that it can be challenging to accurately predict the costs of certain construction items such as asphalt, the price of which depends, in part, on the price of oil, which can change quickly.

Table 14

State Highway Construction Contracts: Awarded Amounts versus Estimated Amounts
Contracts Executed from January 2006 through December 2015

	Number	Percentage of Total
Awarded Amounts Were Lower than Estimated Amounts by:		
25.0% or More	244	10.9%
10.1% to 24.9%	619	27.5
Awarded Amounts Were Within +/- 10.0% of Estimated Amounts		
	903	40.2
Awarded Amounts Were Higher than Estimated Amounts by:		
10.1% to 24.9%	308	13.7
25.0% or More	173	7.7
Total	2,247	100.0%

In February 2015, FHWA reported that the awarded contract amounts for 48.0 percent of 1,611 projects throughout the nation in 2012 and 2013 were within 10.0 percent of the estimated amounts. The proportion of DOT's awarded contract amounts that was within 10.0 percent of the estimated amounts was 44.7 percent in FY 2011-12, 44.1 percent in FY 2012-13, 48.7 percent in FY 2013-14, and 42.9 percent in FY 2014-15.

DOT has attempted to improve the accuracy of the estimated amounts. If a contract is awarded for more than 5.0 percent higher, or more than 10.0 percent lower, than the estimated amount, the central office provides the region with detailed information about the winning bid. This information is intended to help design engineers to improve the estimated amounts on future projects. Since November 2014, DOT has also required design engineers to document how they determined the estimated amounts. DOT indicated that this documentation is reviewed by the regions and the central office. In spite of these efforts, DOT has not met its performance measure goal in recent years. Continued efforts are required for DOT to improve the accuracy of the estimated amounts of state highway construction contracts and meet its performance measure goal.

Recommendation

We recommend the Department of Transportation:

- *continue its efforts to improve the accuracy of the estimated amounts of state highway construction contracts and meet its performance measure goal; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Design Quality Index

DOT's "design quality index" performance measure annually assesses the quality of the design plans for projects constructed during a given fiscal year and is intended, in part, to provide information for improving future design plans. After construction, construction engineers and contractors rate various aspects of the design plans they used to construct the projects. The design plans are rated on a 100-point scale, with 100 being the highest score. DOT's goal is for the average score of all projects rated in a given fiscal year to be 80.0 points or higher.

We reviewed the performance measure's results for FY 2013-14 and FY 2014-15 and found that DOT exceeded its statewide goal of 80.0 points. However, we found differences among the regions in the average scores for design plans for rehabilitation projects and major highway projects. For example, the North Central Region's design plans for major highway projects constructed in FY 2014-15 were rated an average of 70.9 points, while the Southwest Region's design plans were rated an average of 85.9 points.

DOT's regions did not consistently use the design quality index to improve design plans.

We found that DOT's regions did not consistently use the design quality index to improve design plans. Three regions indicated that they met regularly to discuss the measure's results and determine best practices. One staff member in the fourth region indicated that the results were used to improve design plans, but three other staff members who manage projects in that region indicated that they did not use the results to improve design plans. Staff in the fifth region also indicated that they did not use the results to improve design plans.

Although design engineers may receive informal feedback from construction engineers and contractors about the quality of design plans, the design quality index provides formal, specific feedback that can be used to improve design plans. As noted, design engineers frequently did not accurately estimate the cost of awarded contracts. Therefore, they could benefit from feedback from the design quality index.

Recommendation

We recommend the Department of Transportation:

- *consistently use the results of the design quality index performance measure to improve the quality of design plans for state highway projects; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

■ ■ ■ ■

Construction ■

Statutes generally require DOT to solicit bids for state highway construction contracts and award each contract to the lowest competent and responsible bidder. DOT solicits bids from prequalified contractors most months of the year. We found that DOT generally had effective oversight of the processes for soliciting bids and awarding construction contracts and took steps to control construction costs. However, DOT could have potentially achieved considerable additional savings if it had met its performance measure goals and certain other goals it established. We make recommendations for DOT to take additional actions to save funds, which potentially would allow DOT to complete additional construction work.

Construction Contracts

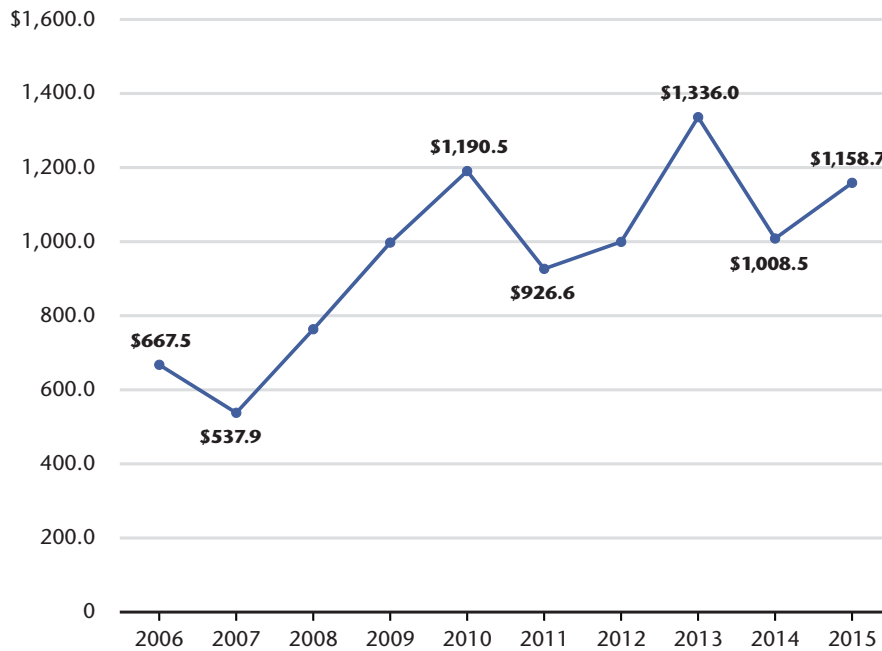
From January 2006 through December 2015, DOT awarded 2,247 state highway construction contracts totaling \$9.6 billion.

From January 2006 through December 2015, DOT awarded 2,247 state highway construction contracts totaling \$9.6 billion. As shown in Figure 13, the annual amount of awarded contracts increased from \$667.5 million in 2006 to almost \$1.2 billion in 2015. Awarded amounts increased in 2009 and 2010, in part, because of funds from the federal American Recovery and Reinvestment Act of 2009 and several large construction projects, such as the I-94 North-South Corridor (I-94 from the Mitchell Interchange to Illinois) and the Zoo Interchange megaprojects. The 2,247 contracts were awarded for an average of \$4.3 million, but the amounts of individual contracts varied considerably. Although 44 contracts

were each awarded for less than \$100,000, 52 contracts were each awarded for more than \$25.0 million, including a \$314.6 million contract associated with the Zoo Interchange megaproject.

Figure 13

Amount of State Highway Construction Contracts
(in millions)



As shown in Table 15, \$3.1 billion of the \$9.6 billion (32.5 percent) in state highway construction contracts awarded from January 2006 through December 2015 was for projects in the Southeast Region, while \$976.4 million (10.2 percent) was for projects in the North Central Region.

Table 15

State Highway Construction Contracts, by DOT Region
Contracts Awarded from January 2006 through December 2015

DOT Region	Contracts	Amount (in millions)	Percentage of Total
Southeast	492	\$3,118.5	32.5%
Southwest	569	2,151.2	22.4
Northeast	427	2,143.9	22.4
Northwest	415	1,196.1	12.5
North Central	344	976.4	10.2
Total	2,247	\$9,586.2	100.0%

Statutes permit DOT to require contractors to submit information on their financial ability, equipment, and work experience before allowing them to bid on projects. DOT policies generally require contractors to be prequalified before submitting bids. Based on a contractor's assets, liabilities, work history, and other factors, DOT determines the total amount and types of work, such as concrete or asphalt work, a contractor is prequalified to perform at any given point in time. From January 2006 through December 2015, DOT awarded 2,247 construction contracts to 183 contractors, including 10 contractors awarded a total of \$5.5 billion, or 57.3 percent of the \$9.6 billion awarded. As of February 2016, 279 contractors were prequalified to submit bids.

Controlling Construction Costs

DOT tries to control state highway construction costs in a number of ways.

DOT tries to control state highway construction costs in a number of ways, including by:

- establishing quarterly goals for soliciting bids for contracts;
- attempting to increase the number of bids for a given contract;
- analyzing bids submitted by contractors;
- providing financial incentives to contractors that propose ways to reduce costs; and

- monitoring total construction costs, including the use of contract change orders.

Goals for Soliciting Bids

DOT policies establish quarterly goals for soliciting bids for state highway construction contracts.

DOT policies establish quarterly goals for soliciting bids for state highway construction contracts. These goals currently indicate that:

- 24.0 percent of the total contract amount solicited in a given fiscal year should be solicited from July through September;
- 30.0 percent should be solicited from October through December;
- 37.0 percent should be solicited from January through March; and
- 9.0 percent should be solicited from April through June.

These goals indicate that 67.0 percent of the total contract amount solicited in a given fiscal year should be solicited from October through March, when DOT indicated that contractors are looking for project work for the upcoming construction season and may be more likely to submit lower bids. In contrast, DOT indicated that contractors tend to submit higher bids in summer months, when they are more likely to have sufficient work for the current construction season and have relatively little time to complete work before the construction season ends. We examined all construction contracts executed from FY 2006-07 through FY 2014-15. We found that the winning bids submitted by contractors for solicitations held during the quarters from October through December and from January through March were generally lower, compared to the amounts estimated by design engineers, than the winning bids submitted in the other two quarters. As a result, DOT benefited financially when soliciting contracts from October through March.

DOT did not meet its quarterly goals for soliciting bids from FY 2006-07 through FY 2014-15.

We determined the extent to which DOT met its quarterly goals for soliciting bids during each fiscal year and summarized the annual results over a nine-year period. As shown in Table 16, DOT did not meet its quarterly goals for soliciting bids during the nine-year period from FY 2006-07 through FY 2014-15. It awarded smaller amounts than anticipated by its goals during the October through December quarter and the January through March quarter. In contrast, it awarded larger amounts than anticipated during the other two quarters.

Table 16

**Quarterly Goals for Soliciting Bids for State Highway Construction Contracts
Versus Actual Amounts Awarded**
FY 2006-07 through FY 2014-15
(in millions)

Fiscal Year Quarter	Quarterly Goal ¹	Actual Amount Awarded	Difference
July through September	\$1,938.9	\$2,448.1	\$ 509.2
October through December	2,547.9	1,417.2	(1,130.6)
January through March	2,961.3	2,238.0	(723.3)
April through June	1,044.8	2,389.6	1,344.8
Total	\$8,492.9	\$8,492.9	

¹ Amounts that should have been solicited according to DOT's goals.

Although DOT works to meet its quarterly goals, bids may not be solicited as planned for a number of reasons, such as delays in acquiring the real estate needed to construct projects and completing environmental studies. DOT also indicated that if winning bids early in a fiscal year are lower than expected, or if it unexpectedly receives additional funds, it may later in the fiscal year solicit bids for additional contracts that otherwise would have been solicited in future fiscal years.

DOT potentially could have saved \$53.1 million over nine years if it had met its quarterly goals for soliciting bids on construction contracts.

It is not possible to know what the winning bids would have been if DOT had met its quarterly goals from FY 2006-07 through FY 2014-15. However, if DOT had met its quarterly goals and the variation of the winning bids from the estimated amounts had been the same as the actual variation for a given quarter, DOT potentially could have awarded contracts for \$53.1 million less than it actually awarded them over the nine-year period, or an average of \$5.9 million per year. Saving funds in this manner potentially would have allowed DOT to complete additional construction work. DOT should continue its efforts to meet its quarterly goals, including by planning to solicit bids for more contracts from October through March of a given fiscal year.

Recommendation

We recommend the Department of Transportation:

- *continue its efforts to meet its quarterly goals for soliciting bids on state highway construction contracts; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Number of Bids

FHWA provides a method for determining the level of bidding competitiveness for a given contract. The more bids received and the closer the winning bid is to the estimated amount determined by design engineers, the greater the level of competitiveness indicated by FHWA's method. We used FHWA's method to assess the bids DOT received for the 2,247 construction contracts awarded from January 2006 through December 2015 and found that there was "excellent" competitiveness on 155 contracts (6.9 percent), "adequate" competitiveness on 1,547 contracts (68.8 percent), and less than adequate competitiveness on 545 contracts (24.3 percent). Competitiveness was less than adequate on 60.6 percent of contracts that received one bid. Competitiveness generally increased from 2006 through 2011 but then decreased through 2015.

The 2,247 construction contracts awarded from January 2006 through December 2015 received an average of 3.5 bids each. Over this ten-year period, 363 contracts (16.2 percent) totaling \$1.1 billion received only one bid each, as shown in Table 17. One contract received 21 bids, which was the largest number of bids.

Table 17

Number of Bids per State Highway Construction Contract
Contracts Awarded from January 2006 through December 2015

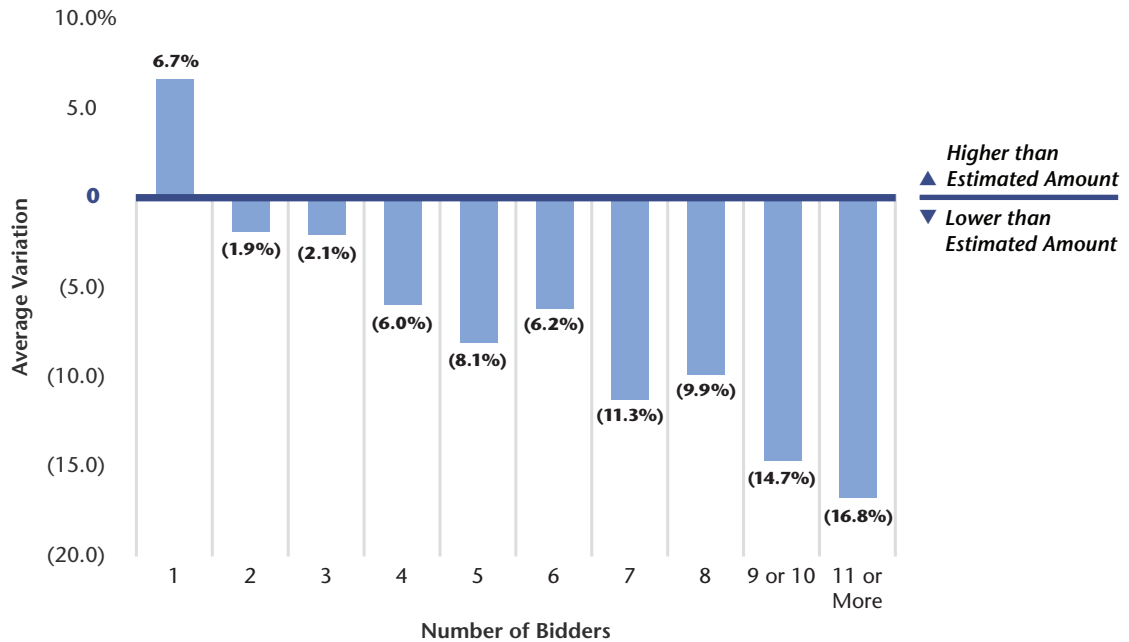
Number of Bids	Contracts		Value	
	Number	Percentage of Total	Amount (in millions)	Percentage of Total
1	363	16.2%	\$1,145.4	11.9%
2	524	23.3	1,824.9	19.0
3	452	20.1	2,094.5	21.8
4	304	13.5	1,554.9	16.2
5	230	10.2	1,317.1	13.7
6	135	6.0	725.9	7.6
7	101	4.5	442.5	4.6
8	77	3.4	311.8	3.3
9 or 10	45	2.0	135.8	1.4
11 or More	16	0.7	33.4	0.3
Total	2,247	100.0%	\$9,586.2	100.0%

The average winning bid for construction contracts that received only one bid was 6.7 percent more than the estimated amount that design engineers had determined.

As shown in Figure 14, the winning bid for a construction contract that received one bid was, on average, 6.7 percent more than the estimated amount that design engineers had determined. Winning bids for 220 of these 363 contracts were \$81.5 million more than the estimated amounts, while winning bids for 143 of these 363 contracts were \$58.2 million less than the estimated amounts. Overall, winning bids for the 363 contracts totaled \$23.3 million more than the estimated amounts. In contrast, the winning bids for contracts that received more than one bid were lower, on average, than the estimated amounts. In general, the more bids on a given contract, the lower the average winning bid compared to the estimated amount.

Figure 14

Average Variation of the Winning Bid from the Estimated Amount for State Highway Construction Contracts, by Number of Bidders
 Contracts Awarded from January 2006 through December 2015



DOT potentially could have saved \$44.7 million over ten years if it had received two bids on the 363 contracts that had actually received only one bid.

It is not possible to know what the winning bids would have been if DOT had received multiple bids on the 363 contracts that each received one bid from January 2006 through December 2015. However, if DOT had received two bids on each of these 363 contracts and the average winning bid had been 1.9 percent less than the estimated amounts, DOT potentially could have awarded these contracts for \$44.7 million less than it actually awarded them over the ten-year period, or an average of \$4.5 million per year. Saving funds in this manner potentially would have allowed DOT to complete additional construction work.

DOT cannot directly control the number of bidders on contracts, but it has attempted to increase the number of bidders. First, in June 2016 DOT began a statewide initiative to provide prequalified contractors with preliminary project design plans four to seven months before solicitation for certain contracts, rather than the typical five weeks. Allowing contractors additional time to review the design plans and determine construction costs more precisely may increase the number of bids and lower the winning bid amounts. Second, the Southeast Region, which oversees large construction projects, hopes that the additional time to review

design plans will allow contractors to form joint ventures and submit bids for contracts that individual contractors would not be able to complete. Third, in December 2015 DOT began to allow contractors that view bidding documents for certain projects to remain anonymous until the project contracts are awarded, rather than making this information publicly available before bidding takes place, which typically occurs. DOT believes that more contractors may submit bids, and at lower prices, if contractors are uncertain which of their competitors are interested in submitting bids. At the time of our audit, too little time had elapsed for us to assess the effectiveness of these initiatives.

DOT could potentially achieve significant savings if it received multiple bids for all contracts. For example, DOT could consider expanding its initiative to provide prequalified contractors with preliminary design plans, and it could consider whether certain large contracts could be split into multiple smaller contracts, which could possibly increase the number of contractors with the ability to bid on these smaller contracts.

☑ Recommendation

We recommend the Department of Transportation:

- *continue its efforts to increase the number of bids it receives for state highway construction contracts; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Analysis of Submitted Bids

DOT has a credible method for analyzing bids submitted by contractors. Five weeks before solicitation, DOT typically makes publicly available a project's bid documents, which are based on the work of design engineers. Bid documents list each construction item, such as asphalt and concrete pipes, needed to complete a project and the estimated quantities needed of each item. When bidding, a contractor includes its proposed price for each unit of a given item, such as a ton of asphalt. A contractor's overall bid amount is calculated by multiplying each item's estimated quantity by the contractor's proposed price and then summing the total for each item.

Policies require DOT to review all submitted bids and reject a bid for various reasons, including if a bid is "materially unbalanced." A materially unbalanced bid does not reflect a contractor's reasonable

costs for actual labor, equipment, and materials, as well as a reasonable amount of profit, overhead, and other indirect costs. As a result, DOT has reasonable doubt that the bid will result in the lowest cost to complete the work. A materially unbalanced bid could occur because the bid documents contain significant errors. DOT indicated that it electronically reviews all bids. If this review indicates that one or more contractors may have submitted unbalanced bids, DOT conducts an unbalanced bid analysis to determine whether the estimated quantities of construction items in the bid documents were inaccurate and need to be revised. Based on this analysis, DOT may award a contract to the contractor with the lowest bid, or it may reject all bids, revise the bid documents, and award the contract at a later date, as is statutorily permitted.

From January 2013 through December 2015, DOT conducted 21 unbalanced bid analyses. Based on these analyses, DOT awarded 18 construction contracts as planned but rejected all bids for 2 contracts in 2013 and 1 contract in 2014. Rejecting all bids indicates the bid documents contained significant errors. The bid documents for the contract not awarded as scheduled in 2014 contained errors regarding the quantities of ten construction items. For example, the bid documents had initially estimated that 11,450 tons of a particular type of asphalt would be needed to complete the project, but the unbalanced bid analysis determined that 0 tons would actually be needed. We examined in greater detail all nine unbalanced bid analyses completed in 2015 and found that DOT in most instances made only minor revisions to the estimated quantities of construction items. DOT's central office indicated that because unbalanced bid analyses occur so infrequently, there were no patterns in design plan errors that could be shared with the regions.

Cost Reduction Incentives

To encourage innovation, DOT policies provide for cost reduction incentives. If a contractor proposes to use improved work methods, new construction products, or improved equipment on state highway construction projects, DOT may accept the proposal if its costs will decrease and the proposal does not impair a project's essential characteristics or introduce inappropriate risks. A contractor is then awarded a financial incentive worth half the value of its idea. DOT annually reports information about cost reduction incentives to FHWA.

DOT awarded contractors cost reduction incentives totaling \$14.2 million from FFY 2006-07 through FFY 2013-14.

As shown in Table 18, DOT awarded contractors 190 cost reduction incentives totaling \$14.2 million from FFY 2006-07 through FFY 2013-14, which was the most recent year for which information existed at the time of our audit. In FFY 2013-14, DOT awarded the third-highest amount of cost reduction incentives among all states.

Table 18

Cost Reduction Incentives¹

Federal Fiscal Year	Number	Amount (in millions)
2006-07	12	\$ 0.4
2007-08	9	0.5
2008-09	18	1.7
2009-10	43	1.6
2010-11	31	1.9
2011-12	28	1.4
2012-13	26	2.0
2013-14	23	4.7
Total	190	\$14.2

¹ As reported by DOT to FHWA.

Some regions indicated that they were uncertain when they should execute a contract change order, which does not result in a financial incentive being paid, or instead award a cost reduction incentive. One region was similarly uncertain whether completely eliminating a construction item is “innovative” and should qualify as a cost reduction incentive. This uncertainty occurred, in part, because DOT’s policies do not clearly specify the circumstances in which cost reduction incentives should be awarded. DOT should revise its policies to more clearly specify the types of innovative work methods, construction products, and equipment that merit a contractor being awarded a cost reduction incentive. Doing so will help DOT use its funds more effectively.

Recommendation

We recommend the Department of Transportation:

- *revise its policies to more clearly specify in which circumstances a cost reduction incentive for innovation should be awarded to contractors; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Contract change orders modify construction contracts in specified circumstances.

Total Construction Costs

Total costs during the construction phase of state highway projects can exceed contracted amounts for a variety of reasons. Construction contracts allow DOT to issue contract change orders, which modify the contracts in specified circumstances, including when:

- DOT requires a contractor to complete additional work not contractually specified or complete work materially different from contractually specified work;
- DOT modifies in a material way the quantity of contractually specified construction items;
- DOT extends the amount of time to complete contract work as a result of, for example, archeological or historical finds or the presence of hazardous substances; and
- the physical conditions at a project's site differ materially from those indicated in the contract.

DOT executed \$245.2 million in contract change orders on the 1,904 state highway construction contracts awarded and completed from January 2006 through December 2015. These contract change orders represented 4.0 percent of the \$6.1 billion awarded amount of the contracts. The 12,204 contract change orders increased contract costs by an average of \$20,100 each. DOT's regions indicated that they monitor and attempt to limit the extent to which they use contract change orders.

As shown in Table 19, contract change orders as a percentage of the awarded amounts were lowest for projects in the Northeast Region and highest for projects in the Southeast Region.

Table 19

Contract Change Orders for State Highway Construction Contracts
Contracts Awarded and Completed from January 2006 through December 2015

DOT Region	Contracts	Completed Contracts		
		Contract Change Orders (in millions)	Total Awarded Contract (in millions)	Contract Change Orders as a Percentage of the Total Awarded Contract
Northeast	367	\$ 41.0	\$1,411.0	2.9%
Southwest	492	48.7	1,527.8	3.2
Northwest	330	25.7	762.2	3.4
North Central	310	33.8	822.1	4.1
Southeast	405	96.1	1,538.2	6.2
Total	1,904	\$245.2	\$6,061.3	4.0

DOT's on-budget performance measure evaluates the extent to which total construction costs of certain projects exceeded the awarded contract amounts.

Total construction costs can exceed contracted amounts for a variety of reasons, not all of which occur as a result of contract change orders. For example, costs may increase if bad weather delays a project's completion. DOT's "on-budget" performance measure annually evaluates the extent to which total construction costs of major highway projects, rehabilitation projects, megaprojects, and local road projects exceeded the awarded contract amounts. The measure is intended to help DOT manage its funds and schedule projects more effectively and accurately.

Through FY 2012-13, DOT's annual goal was to have the total construction costs of projects completed in a given fiscal year not exceed 100.0 percent of the awarded contract amounts for those projects. In FY 2013-14 and FY 2014-15, DOT increased its goal to 103.0 percent. DOT indicated that it did so, in part, because although controlling costs is important, its main priority is to construct quality projects, which may require cost increases. For example, the soil condition of a project's location may differ from the condition that design engineers had predicted, necessitating increased construction costs. We note that Minnesota's transportation department indicated that its project costs were approximately 106.0 percent of the awarded contract amounts during the three-year period from 2010 through 2012.

Until recently, DOT's methodology for calculating its performance measure raised concerns because it did not include all projects in its calculations. Early in 2016, while our audit was ongoing, DOT changed its methodology in several ways, and its measure now includes all projects.

DOT potentially could have saved \$191.9 million if it had met its annual on-budget performance measure goals for state highway projects completed over a six-year period.

We determined the amount DOT would have saved if it had met its annual on-budget performance measure goals for state highway projects completed from FY 2009-10 through FY 2014-15, which was the six-year period for which data were available at the time of our audit. DOT potentially could have saved \$191.9 million if it had met its annual goals for the state highway projects completed during this six-year period, or an average of \$32.0 million per year. Saving funds in this manner potentially would have allowed DOT to complete additional construction work. DOT should continue its efforts to control costs during the construction phase of state highway projects and meet its performance measure goal. DOT could control costs, in part, by limiting the amount of contract change orders.

Recommendation

We recommend the Department of Transportation:

- *continue its efforts to control costs during the construction phase of state highway projects and meet its performance measure goal; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Issue for Legislative Consideration

Statutes generally require DOT to award construction contracts to the lowest bidders, but federal law allows state transportation departments to use alternative contracting methods. Under the construction manager-general contractor method of completing a project, which statutes currently prohibit, DOT would hire a construction manager to provide a project's design engineers with input, such as about the constructability, price, and risks associated with various aspects of the design plans. Before completion of the design plans, the construction manager would be allowed to submit a guaranteed maximum price to construct the project. DOT could accept this proposal and award a construction contract to the construction manager, which would become the project's general

contractor, or it could solicit bids from other contractors and then award the construction contract to the lowest bidder.

Potential advantages of the construction manager-general contractor method include reduced construction costs that could occur, in part, because a project's contractor is involved in the design phase, which reduces the contractor's uncertainty and risks and, therefore, its guaranteed maximum price. On the other hand, some contractors may not have the ability or willingness to be involved in the design phase, reducing the level of competition, and cost savings may not be realized if DOT does not award construction contracts to the low bidders but instead to the construction manager-general contractor.

Minnesota's transportation department is statutorily allowed to use the construction manager-general contractor method on ten projects. As of August 2016, it indicated that it had contracted for two such projects, and that the contracted amounts for both projects were less than its estimated costs.

The Governor's 2015-17 Biennial Budget Request included a provision that proposed to modify statutes to allow DOT to use the construction manager-general contractor method to complete up to three projects, but the Joint Committee on Finance removed this provision. DOT's 2017-19 Biennial Budget Request includes a similar provision.

The Legislature could consider modifying statutes to allow DOT to use the construction manager-general contractor method to complete a limited number of projects.

The Legislature could consider modifying statutes to allow DOT to use the construction manager-general contractor method to complete a limited number of projects in order to determine whether cost savings can be achieved. Determining cost savings can be challenging, particularly because it is not known how much would have been spent to award construction contracts to the low bidders, rather than to the construction manager-general contractors. Nevertheless, the Legislature could require DOT to report to it on whether project costs were reduced and how DOT made this determination.

■ ■ ■ ■

Maintenance ■

DOT is responsible for maintaining state highways, but counties perform most maintenance work under contract with DOT, as is statutorily permitted. Routine maintenance work is intended to preserve state highways and includes removing snow and applying salt in the winter, applying protective coatings and sealing cracks, filling potholes, and repairing damaged guardrails. It may also include small projects completed because of adverse weather or accidents that damaged highways and bridges. More costly or larger projects are completed under the rehabilitation program. We found that DOT generally had effective oversight of its maintenance program, including work completed by counties, and took steps to control maintenance costs. However, DOT could improve its oversight of the program, and we make recommendations for improvements.

Routine Maintenance

DOT's central office determines an annual budget for routine maintenance work in each county. A county's budget is based on factors such as the number of bridges, rest areas, and miles of state highways in the county and the type and amount of maintenance work that is generally needed each year. Each calendar year, DOT and each county execute a routine maintenance agreement that outlines the county's responsibilities for completing maintenance work that year. In 2016, DOT's priorities were to fully fund winter-related work, such as plowing snow and applying salt, and to focus on safety-related work, such as decreasing the drop-off of unpaved

highway shoulders and removing hazardous debris from shoulders. DOT instructed counties to limit some types of work, such as mowing vegetation along highways only once per season, because it indicated that available funds were constrained.

Almost 70.0 percent of county highway commissioners who responded to our survey indicated their routine maintenance agreements accurately reflect maintenance needs in their counties.

In response to a question in our survey of all 72 county highway commissioners, 30 county highway commissioners (69.8 percent of respondents) indicated that their current routine maintenance agreements accurately reflect maintenance needs in their counties. In contrast, 12 county highway commissioners (27.9 percent) indicated that their agreements do not accurately reflect maintenance needs, in part because additional funds are needed to mow vegetation and maintain highway pavement.

DOT's regions indicated that they consult with counties to identify and plan specific routine maintenance work. In response to our survey question, 32 county highway commissioners (74.4 percent of respondents) indicated that their offices had weekly contact with DOT, and 6 county highway commissioners (14.0 percent) indicated that their offices had daily contact with DOT.

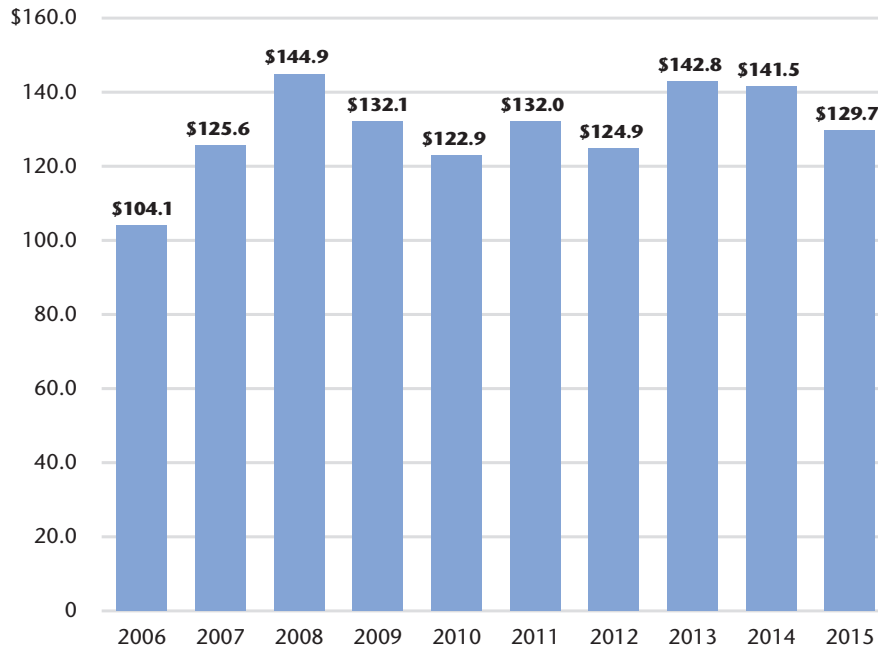
In 2015, routine maintenance expenditures totaled \$129.7 million.

Figure 15 shows DOT's annual expenditures for routine maintenance work from 2006 through 2015, excluding expenditures for winter salt, which DOT tracks separately. In 2015, routine maintenance expenditures totaled \$129.7 million. In 2013 and 2014, additional funds were appropriated through the s. 13.10, Wis. Stats., process because severe winter weather had necessitated additional snowplowing and additional winter maintenance work. Appendix 11 shows each county's routine maintenance expenditures in 2015.

As shown in Table 20, most county highway commissioners who responded to our survey question indicated that routine maintenance funds in 2015 were less than adequate to meet the needs of roadways (such as repairing pavements and shoulders) and roadsides (such as mowing vegetation). Most county highway commissioners indicated funds were equal to winter-related needs.

Figure 15

Routine Maintenance Expenditures for State Highways¹
(in millions)



¹ Excludes expenditures for salt used on state highways during the winter.

Table 20

County Highway Commissioner Opinions on the Adequacy of Routine Maintenance Funds for State Highways in 2015, by Type of Work¹

Type of Work	Funds Were:			Do Not Know/ Not Applicable
	More than Adequate	Equal to Needs	Less than Adequate	
Roadways	0.0%	29.5%	70.5%	0.0%
Roadsides	0.0	22.7	77.3	0.0
Winter	6.8	75.0	13.6	4.5
Bridges	0.0	50.0	38.6	11.4

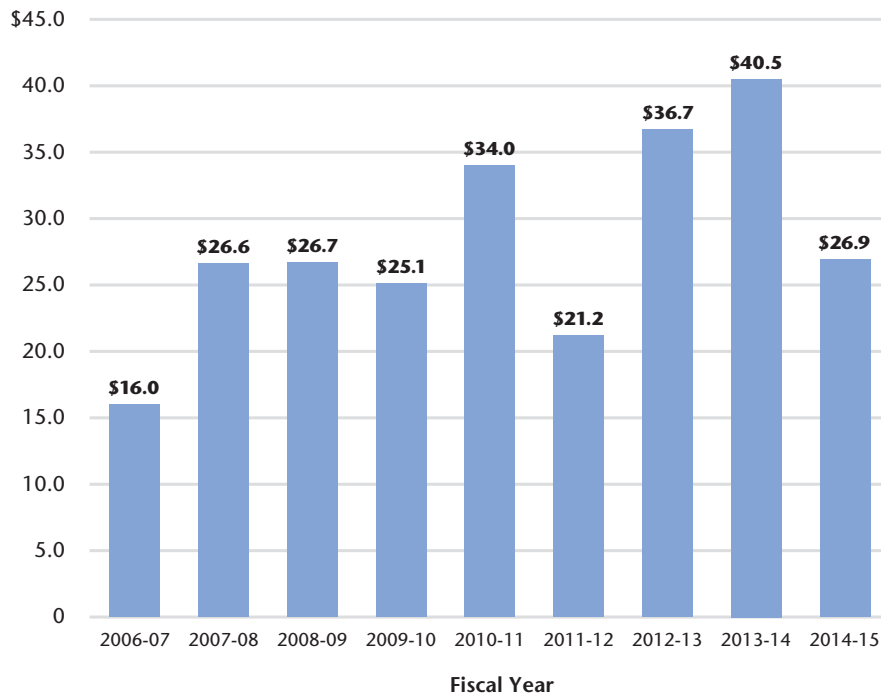
¹ According to 44 county highway commissioners who responded to our survey question.

Winter-related expenditures increased from \$24.6 million in 2006 (23.6 percent of total routine maintenance expenditures) to \$42.3 million in 2015 (32.6 percent). Because such expenditures depend on the weather, they often varied considerably from year to year and totaled \$67.6 million in 2013 and \$65.7 million in 2014, two of the three largest annual totals during our ten-year audit period. In both those years, winter-related expenditures represented almost half of all routine maintenance expenditures.

DOT tracks expenditures for winter salt on a fiscal year basis and pays for winter salt from its highway system management and operations appropriation, rather than its routine maintenance appropriation. As shown in Figure 16, annual expenditures for winter salt varied in recent years, depending on the number and severity of winter storms. In FY 2014-15, expenditures for winter salt totaled \$26.9 million. Appendix 12 shows winter salt expenditures incurred in each county in FY 2014-15.

Figure 16

Winter Salt Expenditures for State Highways
(in millions)



DOT developed a pilot program that is intended to optimize snowplow routes.

2011 Wisconsin Act 32, the 2011-13 Biennial Budget Act, created the Transportation Finance and Policy Commission to examine issues related to the future of transportation finance. The Commission included DOT’s secretary, who served as a nonvoting member; six citizens appointed by the Governor; and one citizen appointed by each of the Senate Majority Leader, Senate Minority Leader, Speaker of the Assembly, and Assembly Minority Leader. In its final report issued in January 2013, the Commission recommended that maintenance costs could be reduced if adjacent counties cooperated when establishing snowplow routes that, for example, minimized travel times and reduced the number of drivers needed. To optimize the efficiency of routes across county borders, DOT developed a pilot program that it plans to implement in several counties during the 2016-17 winter season. In December 2016, DOT reported that optimizing these routes will help counties to plow highways more quickly and increase its understanding of where to locate salt storage facilities, which may save time and funds.

Recommendation

We recommend the Department of Transportation report to the Joint Legislative Audit Committee by June 30, 2017, on the results of its pilot program to optimize snowplow routes, including the estimated savings, its methodology for calculating those estimated savings, and whether it plans to expand the program.

County Reimbursement

Statutes generally require DOT to pay counties for the actual cost of maintenance work.

Unless DOT and a county agree upon alternate payment methods and terms, statutes require DOT to pay counties for the actual cost of maintenance work, including staff time, use of county machinery and materials, and overhead expenses, as detailed in the routine maintenance agreements. Statutes require each county to provide DOT with an itemized and verified list of costs no later than one month after the period in which the work was completed. Policies require the regions to review these invoices and approve reimbursement to the counties if the invoices are accurate.

We found that each county statewide submitted 12 invoices for work completed from January 2015 through December 2015. However, some counties consistently submitted invoices more than a month later than statutes require. Regions indicated that late-submittal occurs for a number of reasons, such as when a county experiences staff turnover or needs additional time to review an invoice before submittal.

DOT policies do not specify actions its regions should take when counties do not submit invoices in a timely manner.

DOT policies do not specify actions its regions should take when counties do not submit invoices in a timely manner. Four regions indicated that they contact counties that do not submit invoices in a timely manner, but one region indicated that it does not typically do so. Timely submittal of invoices allows regions to monitor the extent to which a county has spent its annual budget for routine maintenance work and verify in a timely manner that the work has been completed at an appropriate cost.

Recommendation

We recommend the Department of Transportation:

- *establish policies specifying actions that should be taken when a county does not submit an invoice for completed routine maintenance work in a timely manner; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

We reviewed the invoices each county submitted for routine maintenance work completed in December 2015 and found that 71 of 72 invoices included all information required by DOT. Most invoices included additional information describing the completed work. One invoice did not include all hourly rates for specific work tasks for which the county requested reimbursement, as required by DOT policies, but this invoice included the number of hours worked and the amounts spent on the tasks, from which the hourly rates could be calculated.

DOT has not established policies specifying how regions should review counties' invoices in order to ensure accuracy and completeness.

DOT has not established policies specifying how regions should review counties' invoices in order to ensure accuracy and completeness. DOT indicated that its most recent policies have not been in effect since February 2015 because the policies were outdated, but that it plans to establish new policies. We found that the regions reviewed invoices in different ways. For example, one region indicated that it reviewed all invoiced hourly rates, while two regions indicated that they did not review all invoiced hourly rates.

DOT should establish policies specifying how its staff are to review invoices submitted by counties for routine maintenance work. Doing so will help to ensure that staff verify the accuracy and completeness of invoices in a consistent manner. Counties may be unlikely to submit inaccurate invoices deliberately but may do so inadvertently.

☑ Recommendation

We recommend the Department of Transportation:

- *establish policies specifying how its regional office staff are to review invoices submitted by counties for routine maintenance work; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Targeted Routine Maintenance

In addition to executing calendar-year routine maintenance agreements, DOT executes discretionary maintenance agreements and performance-based maintenance contracts with counties that agree to complete targeted routine maintenance projects. Such projects include priorities identified by DOT, such as sealing cracks in highway surfaces or improving drop-offs on unpaved shoulders. All 44 county highway commissioners who responded to our survey question indicated that their counties completed projects in 2015 under at least one discretionary maintenance agreement, performance-based maintenance contract, or both.

Discretionary Maintenance Agreements

Unspent routine maintenance funds are reallocated for discretionary maintenance projects in the following calendar year.

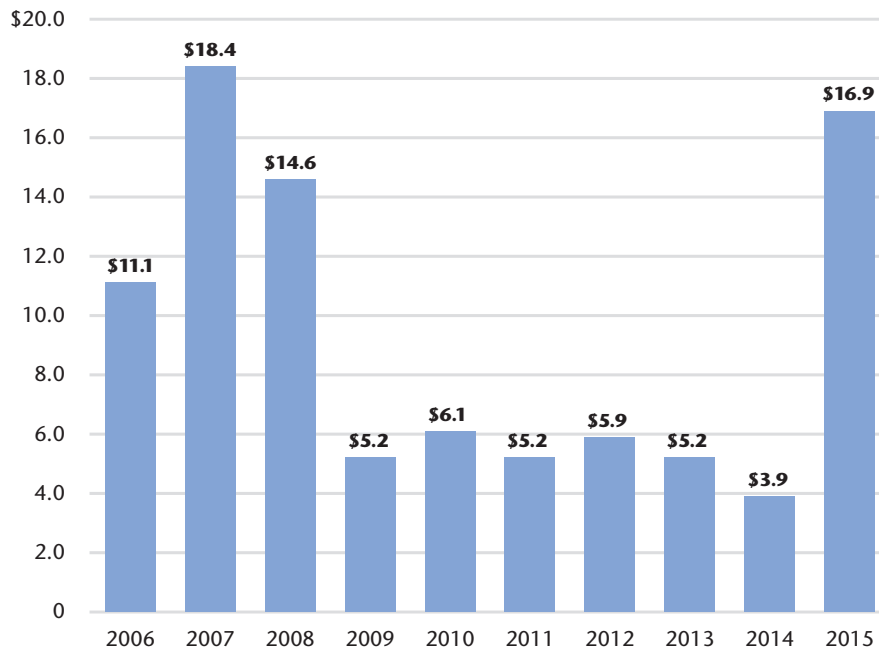
If routine maintenance funds are unspent in a given calendar year, DOT reallocates them for discretionary maintenance projects in the following calendar year. The central office determines the amount available to each region in the same manner as it determines routine maintenance funds. Regions determine how to allocate the funds among the counties and execute discretionary maintenance agreements for each project. Counties are reimbursed for their actual costs to complete a project.

DOT's regions indicated that they consult with counties to identify and plan discretionary projects. Three regions indicated that it can be challenging to plan projects because the funds become available only in late spring. County highway commissioners who responded to our survey question also indicated that they were sometimes given only short advance notice about the arrival of such funds. As a result, they indicated that making available the necessary county staff and equipment to complete work with these funds was challenging.

As shown in Figure 17, expenditures incurred under discretionary maintenance agreements totaled \$16.9 million in 2015. From 2009 through 2013, expenditures were considerably lower, in part, because reduced routine maintenance funds were available in those years, excluding additional amounts appropriated for winter-related work. In 2014, expenditures were lower, in part, because DOT used some of its routine maintenance funds to execute performance-based maintenance contracts. Appendix 13 shows expenditures incurred under discretionary maintenance agreements in each county in 2015.

Figure 17

Discretionary Maintenance Agreement Expenditures for State Highways (in millions)



Performance-based Maintenance

In its January 2013 report, the Transportation Finance and Policy Commission recommended that statutory provisions limiting DOT's ability to enter into performance-based maintenance contracts with individual counties be repealed, and that DOT work with county highway departments to create policies for such contracts. 2013 Wisconsin Act 20, the 2013-15 Biennial Budget Act, modified statutes to allow DOT and counties to enter into agreements specifying that DOT will pay for maintenance projects according to a contractually stipulated price, rather than the actual cost of the work.

In early 2014, DOT began a pilot program to complete maintenance projects through performance-based maintenance contracts that are intended to help control costs.

In early 2014, DOT began a pilot program to complete maintenance projects through performance-based maintenance contracts that are intended to help control costs. At the start of each year, DOT reserves a portion of routine maintenance funds for performance-based maintenance projects to be completed in each region. Regions work with counties to identify particular projects, and the county in which a given project will occur submits a quote to complete the project for a given amount, as opposed to its actual costs. If DOT accepts the quote, the county contractually agrees to complete the project for that amount and can retain any amount not spent to complete the project. If a county submits a quote that DOT determines is excessive, other counties are allowed to submit quotes for the project.

Counties are not required to submit detailed monthly invoices for project work but instead are contractually required to submit daily logs with such information as the amount of construction materials used. Regions review these daily logs and approve payment requests.

As shown in Table 21, performance-based maintenance expenditures increased from \$7.5 million in 2014, when 63 counties completed 108 projects, to \$15.1 million in 2015, when 72 counties completed 161 projects. Appendix 14 shows performance-based maintenance expenditures in each county in 2014 and 2015.

Table 21

Performance-based Maintenance Expenditures for State Highways
(in millions)

DOT Region	2014	2015
Southwest	\$2.1	\$ 4.0
Northwest	1.7	3.2
Southeast	1.5	3.1
North Central	1.3	2.4
Northeast	1.0	2.4
Total	\$7.5	\$15.1

DOT collaborates with counties to identify best practices for completing performance-based maintenance projects in an efficient

and cost-effective manner. Some county highway commissioners who responded to our survey question indicated that performance-based maintenance contracts have allowed counties to share useful methods of completing projects more efficiently. In contrast, some staff in the regions and county highway commissioners indicated that counties do not want to incur costs not covered by their contracts and, therefore, submit quotes higher than the amounts DOT would have paid if the projects had been completed under routine or discretionary maintenance agreements.

In December 2016, DOT reported that its assessment of savings from performance-based maintenance contracts was ongoing. It indicated that the pilot program will operate through December 2017 and that it will then decide whether continuing to use performance-based maintenance contracts is cost-effective.

Recommendation

We recommend the Department of Transportation report to the Joint Legislative Audit Committee by March 30, 2018, on the results of its pilot program for performance-based maintenance contracts, including the estimated savings, its methodology for calculating those estimated savings, and whether it plans to continue the program.

Memorandum of Understanding

A memorandum of understanding indicates the types of maintenance work that should primarily be performed by counties and by contractors.

In August 2013, DOT, the Wisconsin County Highway Association, and the Wisconsin Transportation Builders Association signed a memorandum of understanding intended to clarify the responsibilities of DOT's maintenance program. The memorandum of understanding, which was renewed in September 2015, indicates the types of maintenance work that "should primarily be performed" by counties as routine maintenance, such as resurfacing work up to 500 feet in length, and the types of maintenance work that "should primarily be performed" by contractors under competitive bidding, such as resurfacing projects greater than 500 feet in length. The rehabilitation program funds contractors in such instances.

All five regions and several county highway commissioners indicated that the memorandum of understanding restricts work that can be completed under the maintenance program. Four regions indicated that some needed work has not been completed, such as on STH 25 in Dunn County, STH 68 in Dodge County, the STH 100 intersection with I-94 in Milwaukee County, STH 107 in Lincoln County, STH 122 in Iron County, STH 153 in Marathon and Shawano counties, and STH 155 in Vilas County. The four regions indicated that the

memorandum of understanding prevents them from using maintenance program funding to complete the work on these highways. They also indicated that rehabilitation program funding is typically used to complete projects on key state highways with higher traffic volumes, which do not include the highways they mentioned.

DOT's central office indicated to us that the memorandum of understanding is not intended to restrict maintenance work, and that routine maintenance funds can be used to complete resurfacing work longer than 500 feet in length. DOT should clarify in writing to the regions the intent of the memorandum of understanding, which will help the regions to understand the specific types of work that can be completed with maintenance program funds.

Recommendation

We recommend the Department of Transportation:

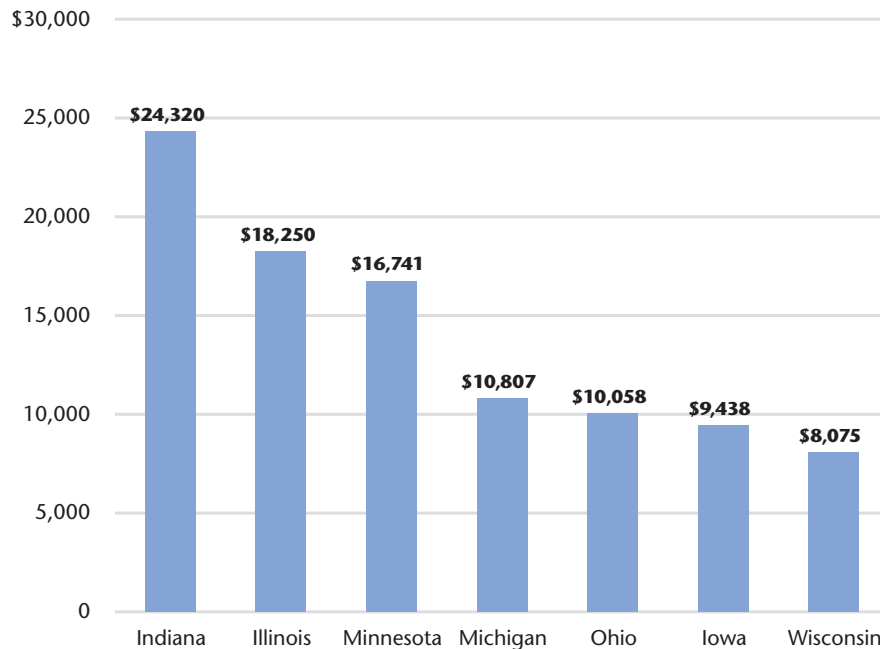
- *clarify in writing to its regions how the memorandum of understanding affects the completion of routine maintenance work; and*
- *report to the Joint Legislative Audit Committee by June 30, 2017, on the status of its efforts to address this recommendation.*

Comparison with Other States

In 2014, Wisconsin's maintenance expenditures per lane mile of state highways were lower than those of six other midwestern states.

FHWA requires each state to report its annual maintenance expenditures. As shown in Figure 18, Wisconsin's maintenance expenditures of \$8,075 per lane mile of state highways were lower than those of six other midwestern states in 2014, which was the most-recent year for which such information existed at the time of our audit. The information on which this comparison is based must be viewed with caution because states may not consistently define maintenance work. In report 97-4, we had found that Wisconsin's maintenance expenditures per lane mile of state highways were lower than five of these six other midwestern states.

Figure 18

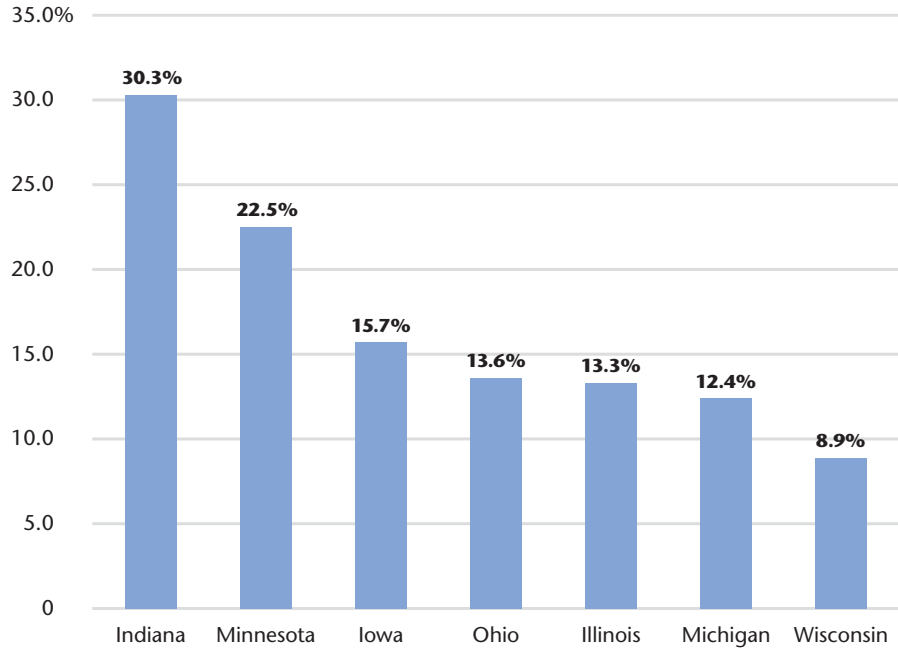
State Highway Maintenance Expenditures per Lane Mile, by Midwestern State¹
2014

¹ As reported by states to FHWA. The information on which this comparison is based must be viewed with caution because states may not consistently define maintenance work.

Another way to compare maintenance expenditures among states is to determine the proportion of state highway expenditures spent on maintenance. As shown in Figure 19, information reported to FHWA indicates that Wisconsin spent 8.9 percent of its total state highway expenditures in 2014 on maintenance activities, which is the smallest proportion of total expenditures of all midwestern states included in our analysis. The information on which this comparison is based must also be viewed with caution because states may not consistently define maintenance work.

Figure 19

Proportion of State Highway Expenditures Spent on Maintenance in 2014, by Midwestern State¹



¹ As reported by states to FHWA. The information on which this comparison is based must be viewed with caution because states may not consistently define maintenance work.



Appendices ■

Appendix 1

Organizations and Regional Planning Commissions that We Contacted

Organizations

1. 1000 Friends of Wisconsin
2. American Association of State Highway and Transportation Officials (AASHTO)
3. American Council of Engineering Companies of Wisconsin
4. American Society of Highway Engineers, Great Lakes Region
5. Association of Wisconsin Regional Planning Commissions
6. Sierra Club, Wisconsin John Muir Chapter
7. Wisconsin Asphalt Pavement Association
8. Wisconsin Association of Railroad Passengers
9. Wisconsin Association of Taxicab Owners
10. Wisconsin Concrete Pavement Association
11. Wisconsin County Highway Association
12. Wisconsin Public Interest Research Group (WISPIRG)
13. Wisconsin Transportation Builders Association
14. Wisconsin Transportation Development Association
15. Wisconsin Urban and Rural Transit Association

Regional Planning Commissions

1. Bay-Lake Regional Planning Commission
2. Capital Area Regional Planning Commission
3. East Central Wisconsin Regional Planning Commission
4. Mississippi River Regional Planning Commission
5. North Central Wisconsin Regional Planning Commission
6. Northwest Regional Planning Commission
7. Southeastern Wisconsin Regional Planning Commission
8. Southwestern Wisconsin Regional Planning Commission
9. West Central Wisconsin Regional Planning Commission

Appendix 2

State Highway Expenditures, by Revenue Source
(in millions)

	FY 1996-97	FY 1997-98	FY 1998-99	FY 1999-2000	FY 2000-01	FY 2001-02	FY 2002-03	FY 2003-04	FY 2004-05	FY 2005-06
State Funds	\$384.0	\$413.3	\$413.7	\$446.2	\$ 479.5	\$ 478.3	\$ 485.2	\$ 245.6	\$ 295.0	\$ 313.1
Federal Funds	246.0	245.7	307.1	376.4	395.4	442.8	447.3	406.4	441.4	490.2
General Obligation Bond Proceeds	-	-	-	-	-	-	-	252.4	288.3	317.6
Revenue Bond Proceeds	89.0	91.5	93.5	85.0	94.4	128.0	131.3	181.0	163.2	151.8
GPR	-	-	-	-	-	-	2.4	<0.1	0.2	40.6
Local Funds	20.6	24.0	22.1	23.2	32.3	39.1	36.3	37.1	44.5	36.5
Other	-	-	-	-	-	-	-	-	-	-
Total	\$739.7	\$774.5	\$836.4	\$930.8	\$1,001.5	\$1,088.3	\$1,102.5	\$1,122.5	\$1,232.5	\$1,349.9

	FY 2006-07	FY 2007-08	FY 2008-09	FY 2009-10	FY 2010-11	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16
State Funds	\$ 435.9	\$ 591.0	\$ 596.7	\$ 471.2	\$ 531.7	\$ 913.3	\$ 772.4	\$ 867.6	\$ 861.8	\$ 910.9
Federal Funds	494.6	545.0	658.9	771.5	742.9	635.2	612.9	554.3	680.5	616.9
General Obligation Bond Proceeds	170.2	17.3	87.7	210.4	300.6	33.8	242.1	321.1	354.5	299.8
Revenue Bond Proceeds	146.5	121.0	167.3	174.9	145.5	189.4	156.6	189.4	206.7	175.4
GPR	69.5	56.4	58.5	22.4	26.1	25.7	139.8	173.8	99.6	97.3
Local Funds	37.5	35.2	32.4	20.8	24.9	51.4	45.0	29.2	24.0	46.3
Other	-	-	-	<0.1	2.8	0.3	0.1	<0.1	<0.1	<0.1
Total	\$1,354.1	\$1,365.9	\$1,601.5	\$1,671.3	\$1,774.5	\$1,849.0	\$1,969.0	\$2,135.4	\$2,227.2	\$2,146.6

Appendix 3

State Highway Expenditures, by Program
(in millions)

Program	FY 1996-97	FY 1997-98	FY 1998-99	FY 1999-2000	FY 2000-01	FY 2001-02	FY 2002-03	FY 2003-04	FY 2004-05	FY 2005-06
Rehabilitation	\$390.8	\$456.0	\$496.8	\$567.8	\$ 625.2	\$ 682.2	\$ 521.7	\$ 552.2	\$ 584.7	\$ 575.3
Major Highway	175.8	147.3	166.5	185.5	173.2	210.6	294.2	297.0	302.0	280.1
Highway System Management and Operations	146.3	144.6	144.7	148.6	172.6	159.2	172.5	188.9	179.3	178.6
Southeast Wisconsin Freeway Megaprojects	-	-	-	-	-	-	-	-	-	-
General Obligation Bond Debt Service	6.4	6.2	6.0	5.6	5.1	5.0	4.4	6.5	44.2	45.0
High-Cost Bridge	-	-	-	-	-	-	-	-	-	-
Administration and Planning	20.4	20.4	22.4	23.3	25.4	23.1	21.9	22.5	15.9	18.0
Southeast Wisconsin Freeway Rehabilitation	-	-	-	-	-	8.1	87.7	55.3	106.4	252.8
Major Interstate Bridge	-	-	-	-	-	-	-	-	-	-
Total	\$739.7	\$774.5	\$836.4	\$930.8	\$1,001.5	\$1,088.3	\$1,102.5	\$1,122.5	\$1,232.5	\$1,349.9

Program	FY 2006-07	FY 2007-08	FY 2008-09	FY 2009-10	FY 2010-11	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16
Rehabilitation	\$ 574.9	\$ 603.2	\$ 777.5	\$ 773.9	\$ 774.8	\$ 803.6	\$ 866.1	\$ 825.3	\$ 905.2	\$ 864.3
Major Highway	245.5	235.5	298.2	321.8	363.4	487.9	345.2	365.2	373.0	407.9
Highway System Management and Operations	205.5	242.2	242.0	214.1	238.8	229.4	231.3	256.2	256.4	275.0
Southeast Wisconsin Freeway Megaprojects	-	-	-	-	-	238.5	292.4	295.8	316.2	234.7
General Obligation Bond Debt Service	82.1	76.5	79.6	36.6	43.8	72.0	198.4	252.2	193.8	211.8
High-Cost Bridge	-	-	-	-	-	-	-	45.5	112.0	64.6
Administration and Planning	18.0	20.3	19.0	19.0	18.6	16.2	17.2	17.0	16.8	16.5
Southeast Wisconsin Freeway Rehabilitation	228.2	188.2	185.2	303.4	334.1	1.3	0.5	0.4	<0.1	<0.1
Major Interstate Bridge	-	-	-	2.6	1.0	0.2	17.9	77.7	53.9	71.9
Total	\$1,354.1	\$1,365.9	\$1,601.5	\$1,671.3	\$1,774.5	\$1,849.0	\$1,969.0	\$2,135.4	\$2,227.2	\$2,146.6

Appendix 4

Annual Full-Time Equivalent Staff Positions in the State Highway Program¹

	1996	1997	1998	1999	2000	2001	2002
Filled	1,678.6	1,636.4	1,660.6	1,684.5	1,750.3	1,762.7	1,681.1
Vacant	64.0	71.0	64.0	46.0	64.0	121.0	74.0
Authorized	1,742.6	1,707.4	1,724.6	1,730.5	1,814.3	1,883.7	1,755.1

	2003	2004	2005	2006	2007	2008	2009
Filled	1,608.7	1,568.9	1,487.9	1,421.8	1,465.8	1,462.1	1,378.1
Vacant	174.9	47.0	158.4	37.0	96.0	78.8	145.4
Authorized	1,783.6	1,615.9	1,646.3	1,458.8	1,561.8	1,540.9	1,523.5

	2010	2011	2012	2013	2014	2015	2016
Filled	1,427.1	1,324.5	1,443.8	1,419.1	1,592.1	1,583.3	1,545.8
Vacant	180.1	292.1	66.1	91.2	78.5	80.8	101.3
Authorized	1,607.2	1,616.6	1,509.9	1,510.2	1,670.6	1,664.1	1,647.1

¹ As of December 31 for 1996 through 1999, and as of July 1 for 2000 through 2016.

Appendix 5

**Proportion of State Highways Rated in Each Category of the
Pavement Condition Index in 2015, by County¹**

County	Good	Satisfactory	Fair	Poor	Very Poor	Serious	Failed	Unknown	Total Miles
Adams	61.2%	26.0%	11.5%	1.3%	0.0%	0.0%	0.0%	0.0%	95.3
Ashland	42.1	14.5	15.9	15.5	7.9	3.7	0.0	0.3	123.6
Barron	44.8	22.1	19.6	8.8	4.7	0.0	0.0	0.0	177.7
Bayfield	43.1	13.4	23.5	17.4	2.7	0.0	0.0	0.0	157.1
Brown	44.6	33.3	12.8	4.9	2.2	0.0	0.0	2.3	290.3
Buffalo	14.0	34.3	20.2	9.8	10.3	8.2	3.2	0.0	148.2
Burnett	27.8	44.5	19.0	5.9	1.9	1.0	0.0	0.0	106.7
Calumet	45.0	32.6	16.0	6.1	0.0	0.0	0.0	0.4	102.9
Chippewa	43.5	20.6	22.9	11.6	1.4	0.0	0.0	0.0	284.8
Clark	40.2	24.3	18.8	13.1	3.3	0.0	0.0	0.3	188.9
Columbia	20.2	13.2	20.3	16.4	15.7	7.9	0.6	5.6	321.8
Crawford	20.6	10.1	15.5	14.0	23.1	15.4	1.1	0.1	185.5
Dane	49.1	23.5	10.9	6.8	6.8	2.8	0.0	0.1	582.0
Dodge	44.3	21.9	20.9	8.4	2.8	1.7	0.0	0.0	284.9
Door	51.3	31.9	11.0	5.1	0.8	0.0	0.0	0.0	124.0
Douglas	36.9	36.8	16.3	4.5	4.1	0.0	0.0	1.3	219.2
Dunn	55.1	20.4	11.7	12.1	0.5	0.0	0.0	0.1	240.9
Eau Claire	52.8	20.1	20.1	5.2	1.8	0.0	0.0	0.0	214.6
Florence	13.7	25.0	39.4	16.6	5.2	0.0	0.0	0.0	67.3
Fond du Lac	62.0	23.6	5.3	5.2	1.4	1.3	0.0	1.3	256.2
Forest	22.9	27.0	40.5	8.8	0.7	0.0	0.0	0.0	153.5
Grant	37.1	20.8	12.1	14.8	11.1	3.9	0.0	0.2	282.4
Green	11.4	33.1	26.8	12.8	3.1	12.7	0.0	0.0	132.9
Green Lake	36.1	40.3	21.2	2.3	0.0	0.0	0.0	0.0	70.3
Iowa	39.4	25.4	11.8	11.7	9.4	1.6	0.7	0.0	200.6
Iron	34.0	28.4	12.6	11.5	8.0	5.1	0.0	0.3	115.5
Jackson	42.0	17.3	12.6	14.6	9.3	4.2	0.0	0.0	230.8
Jefferson	39.3	25.4	14.6	11.1	6.4	3.2	0.0	0.0	235.6
Juneau	26.4	29.1	14.8	17.9	11.4	0.4	0.0	0.0	227.1
Kenosha	47.6	36.8	9.5	3.9	1.4	0.0	0.0	0.8	174.8
Kewaunee	46.0	37.7	14.7	1.6	0.0	0.0	0.0	0.0	65.5
La Crosse	31.7	27.9	8.0	8.9	13.2	8.2	1.7	0.4	207.0
Lafayette	40.5	14.0	13.9	21.0	7.4	3.1	0.0	0.0	138.1
Langlade	39.6	26.0	14.8	8.1	10.8	0.6	0.0	0.0	148.6
Lincoln	40.7	36.2	14.3	7.1	1.4	0.0	0.0	0.3	188.6

	Good	Satisfactory	Fair	Poor	Very Poor	Serious	Failed	Unknown	Total Miles
Manitowoc	31.8%	56.7%	9.4%	1.4%	0.0%	0.0%	0.0%	0.8%	204.8
Marathon	50.2	22.3	10.2	9.8	5.3	1.6	0.0	0.6	377.7
Marinette	57.5	12.5	16.7	11.2	2.1	0.0	0.0	0.0	177.7
Marquette	32.2	26.5	27.6	11.9	0.9	0.0	0.0	0.8	112.6
Menominee	26.1	46.3	2.4	25.2	0.0	0.0	0.0	0.0	40.9
Milwaukee	43.9	27.9	14.9	6.3	3.5	0.7	0.2	2.6	442.8
Monroe	44.2	24.5	13.6	14.6	3.2	0.0	0.0	0.0	292.2
Oconto	68.9	18.9	7.6	4.6	0.0	0.0	0.0	0.0	187.4
Oneida	41.1	30.6	23.5	4.2	0.5	0.0	0.0	0.2	176.5
Outagamie	44.7	37.0	10.4	3.9	2.3	1.3	0.5	0.0	229.9
Ozaukee	65.0	28.0	3.1	2.3	1.5	0.0	0.0	0.0	130.4
Pepin	15.5	10.6	14.1	42.4	14.7	2.6	0.0	0.0	48.0
Pierce	32.5	14.5	19.3	20.9	9.4	3.4	0.0	0.0	165.1
Polk	28.1	33.0	22.4	12.5	2.2	1.8	0.0	0.0	165.8
Portage	56.7	24.3	13.6	4.5	0.0	0.0	0.0	0.9	233.0
Price	23.9	32.5	20.0	18.9	4.7	0.0	0.0	0.0	156.8
Racine	43.8	16.5	25.5	5.7	5.8	2.5	0.0	0.2	209.3
Richland	17.8	12.8	20.3	23.0	12.2	13.4	0.6	0.0	156.1
Rock	33.1	32.1	13.8	8.1	6.8	5.6	0.3	0.2	319.8
Rusk	10.0	24.9	27.7	7.6	26.7	3.0	0.0	0.0	105.6
St. Croix	61.7	15.7	8.7	8.8	4.9	0.0	0.0	0.2	259.9
Sauk	15.4	35.1	15.0	15.4	9.4	8.4	1.0	0.4	256.9
Sawyer	29.5	33.0	29.2	5.0	3.3	0.0	0.0	0.0	161.9
Shawano	39.1	27.7	16.7	11.4	2.7	1.7	0.0	0.8	243.0
Sheboygan	59.5	25.7	7.1	4.2	1.9	0.6	0.0	0.9	230.5
Taylor	35.7	42.7	20.7	0.9	0.0	0.0	0.0	0.0	111.7
Trempealeau	18.8	24.3	22.0	12.2	16.8	5.3	0.6	0.0	182.2
Vernon	21.8	6.4	14.5	22.9	25.6	8.8	0.0	0.0	218.5
Vilas	52.6	24.7	13.8	6.7	2.2	0.0	0.0	0.0	139.7
Walworth	35.0	37.0	11.0	8.7	5.1	2.7	0.0	0.5	287.0
Washburn	38.8	33.4	16.3	9.7	1.7	0.0	0.0	0.0	175.5
Washington	50.6	31.8	8.7	2.1	5.0	1.5	0.0	0.3	252.0
Waukesha	50.1	31.7	13.4	3.2	1.2	0.1	0.0	0.3	357.3
Waupaca	42.6	19.1	12.6	13.4	9.2	1.9	0.0	1.2	231.3
Waushara	46.7	28.1	15.9	9.3	0.0	0.0	0.0	0.0	154.6
Winnebago	69.1	23.4	5.0	1.0	0.4	0.0	0.0	1.0	242.5
Wood	56.0	14.3	17.6	8.6	3.4	0.0	0.0	0.1	229.1

¹ The pavement condition index measures the present condition of pavement.

Appendix 6

**Proportion of Concrete and Asphalt Local Roads Rated in
Each Category in 2015, by County¹**

County	Excellent	Very Good	Good	Fair	Poor	Very Poor	Failed	Total Miles
Adams	1.6%	19.7%	41.9%	25.3%	8.7%	2.4%	0.3%	927.6
Ashland	1.4	19.9	40.9	24.2	8.0	4.1	1.5	348.6
Barron	5.8	25.2	41.3	19.5	5.2	2.9	0.1	1,502.5
Bayfield	5.6	18.7	31.3	29.3	8.0	5.5	1.6	651.0
Brown	6.4	25.0	37.8	23.0	6.2	1.3	0.3	1,978.7
Buffalo	7.8	32.8	38.5	15.0	3.3	2.2	0.3	707.9
Burnett	11.8	30.5	33.4	16.5	4.4	1.9	1.5	930.1
Calumet	4.8	19.8	40.4	27.4	4.2	2.6	0.8	704.5
Chippewa	6.6	20.0	46.7	21.1	3.1	2.0	0.5	1,573.3
Clark	6.2	21.2	43.2	22.8	5.1	1.3	0.2	500.9
Columbia	2.7	16.5	46.3	22.1	7.7	3.7	1.0	1,429.0
Crawford	10.5	25.5	33.4	16.8	8.5	3.9	1.4	355.6
Dane	4.1	22.5	47.2	20.6	3.0	1.1	1.5	2,449.3
Dodge	5.7	22.1	35.1	22.5	11.5	3.0	0.1	1,478.5
Door	10.6	30.4	39.0	17.7	1.9	0.3	0.1	1,064.4
Douglas	5.3	22.4	23.8	24.4	18.6	4.7	0.9	788.2
Dunn	3.6	15.7	33.5	28.5	13.0	5.5	0.2	1,352.7
Eau Claire	3.4	29.0	26.9	15.6	6.2	14.2	4.8	807.0
Florence	8.3	29.1	39.5	15.2	3.9	3.6	0.3	192.5
Fond du Lac	3.8	15.9	35.6	33.2	7.3	3.3	0.9	1,355.5
Forest	3.8	27.2	34.1	23.7	7.5	3.3	0.4	412.6
Grant	5.9	27.6	40.7	19.1	4.4	2.1	0.3	696.9
Green	0.3	18.5	40.5	35.9	3.2	1.0	0.6	1,020.1
Green Lake	6.3	23.2	30.0	24.1	9.1	5.4	2.0	582.3
Iowa	1.5	26.7	35.3	25.4	6.8	2.7	1.7	672.0
Iron	2.8	25.7	40.6	18.5	5.2	4.7	2.5	213.8
Jackson	5.7	18.8	31.5	29.0	11.6	2.7	0.6	699.7
Jefferson	5.3	24.1	38.6	20.8	8.1	2.6	0.5	1,012.4
Juneau	5.1	20.2	37.9	29.1	6.4	1.2	0.3	676.5
Kenosha	4.3	18.2	32.8	33.2	7.9	2.8	0.9	829.4
Kewaunee	5.5	28.1	45.8	16.2	3.6	0.8	0.0	599.5
La Crosse	6.0	26.0	34.2	22.1	8.6	2.9	0.2	988.7
Lafayette	2.5	24.4	45.7	20.4	5.0	1.5	0.5	715.9
Langlade	1.5	13.5	52.9	27.8	3.1	1.0	0.3	727.3
Lincoln	3.5	31.8	46.9	13.7	3.3	0.8	0.1	648.7

County	Excellent	Very Good	Good	Fair	Poor	Very Poor	Failed	Total Miles
Manitowoc	3.9%	27.5%	37.1%	26.2%	4.3%	0.9%	0.0%	1,206.6
Marathon	4.4	30.0	38.7	22.3	2.6	1.7	0.2	1,728.7
Marinette	9.0	26.1	32.6	23.1	6.0	2.2	0.9	1,412.1
Marquette	3.1	11.6	61.4	22.9	0.6	0.2	0.0	755.4
Menominee	1.2	11.0	44.4	38.5	3.2	1.3	0.3	81.7
Milwaukee	5.2	25.8	42.8	19.6	5.0	1.3	0.2	1,340.8
Monroe	2.5	14.3	39.4	18.5	5.6	16.2	3.4	904.4
Oconto	8.6	29.9	35.0	18.9	4.5	2.7	0.3	1,471.0
Oneida	8.2	15.2	39.7	25.5	7.5	3.1	0.8	943.2
Outagamie	9.8	22.0	35.2	21.8	8.0	2.7	0.5	1,745.0
Ozaukee	4.6	37.2	29.6	21.4	6.2	1.0	0.1	819.1
Pepin	2.8	13.6	45.6	35.3	2.6	0.1	0.0	305.9
Pierce	3.2	20.6	37.2	28.3	8.4	1.9	0.4	819.5
Polk	7.9	27.0	45.7	16.0	2.4	0.7	0.2	1,427.4
Portage	3.5	22.8	39.8	24.5	4.7	3.9	0.8	1,326.8
Price	2.4	16.1	30.2	30.7	15.5	2.8	2.3	523.5
Racine	5.7	23.1	39.3	25.5	5.0	1.3	0.1	954.3
Richland	3.3	23.2	29.4	40.7	2.7	0.8	0.0	508.5
Rock	4.0	18.8	35.1	31.3	7.2	3.1	0.5	1,499.5
Rusk	4.6	25.1	39.9	23.6	5.6	1.1	0.2	598.8
St. Croix	1.2	25.0	48.8	19.8	4.5	0.6	0.0	1,374.0
Sauk	8.5	27.8	40.3	17.2	3.4	2.2	0.6	1,290.1
Sawyer	5.3	28.5	46.5	12.7	4.9	1.5	0.5	755.2
Shawano	6.4	20.8	46.4	22.2	3.5	0.6	0.1	1,287.7
Sheboygan	7.8	23.1	35.7	25.1	6.3	1.6	0.4	1,270.8
Taylor	3.7	22.4	45.9	20.9	5.3	1.8	0.0	514.5
Trempealeau	4.6	24.2	32.2	30.2	5.8	2.0	1.0	843.1
Vernon	2.8	17.1	42.6	29.2	4.7	3.4	0.3	483.8
Vilas	6.4	22.9	44.1	16.5	6.2	3.0	0.9	833.6
Walworth	2.6	29.1	49.0	14.8	2.8	1.6	0.1	1,246.8
Washburn	8.2	23.9	35.9	18.6	7.9	4.7	0.9	708.2
Washington	4.5	23.6	40.1	23.0	6.3	2.4	0.2	1,324.7
Waukesha	6.2	22.1	44.2	20.1	5.7	1.6	0.1	1,929.1
Waupaca	2.8	19.9	41.2	28.0	5.7	2.3	0.2	1,283.1
Waushara	3.0	12.9	64.6	16.6	1.7	1.2	0.1	1,089.8
Winnebago	6.6	22.6	36.8	27.7	4.5	1.4	0.4	1,306.2
Wood	4.0	20.8	42.3	27.1	4.3	1.4	0.0	1,265.7

¹ Statutes require each county and municipality to assess biennially the condition of roads under its jurisdiction, using a pavement rating system approved by DOT. DOT indicated that most counties and municipalities use rating systems other than the pavement condition index.

Appendix 7

Information on DOT's Performance Measures Related to Safety

DOT collects information from law enforcement agencies on the annual number of traffic crashes and personal injuries and has an annual goal of reducing the number of traffic crashes and the number of traffic injuries by 5.0 percent from the annual average over the prior five years. From 2011 through 2015:

- traffic crashes increased from 112,516 to 121,613, or by 8.1 percent, and DOT met its goal in one year (2012); and
- traffic injuries increased from 40,144 to 41,653, or by 3.8 percent, and DOT met its goal in two years (2011 and 2012).

DOT collects information from the federal government on the annual number of traffic fatalities and has an annual goal of reducing traffic fatalities by 5.0 percent from the annual average over the prior five years. From 2011 through 2015, traffic fatalities decreased from 565 to 555, or by 1.8 percent, and DOT met its goal in three years (2011, 2013, and 2014).

Reasons that Cost Estimates Increased after Enumeration for Five Ongoing Major Highway Projects

We reviewed the reasons for cost increases other than inflation on five ongoing projects for which DOT expects final costs to be considerably higher than the estimates provided at enumeration.

I-39/90 (Madison to Illinois) Project

Enumerated in 2011, this project's estimated cost increased from \$715.0 million at enumeration to \$1.2 billion in August 2016, or by \$485.9 million. DOT indicated that the cost estimate increased for a number of reasons other than inflation, including:

- DOT completed additional design engineering and construction work and purchased additional real estate. This increased the cost estimate by \$113.6 million.
- FHWA required DOT to increase the scope of the interchange with I-43. This increased the cost estimate by \$50.0 million.
- DOT modified its policies to include in the cost estimate the cost of design engineering and construction engineering completed by DOT staff. This increased the cost estimate by \$39.3 million.
- DOT upgraded alternate routes and increased shoulder width to minimize traffic delays and accidents. This increased the cost estimate by \$38.5 million.
- When forecasting future traffic levels as part of the project planning process in 2008, DOT used traffic counts that were six years old. When DOT updated its forecast in 2012, using traffic counts from that year, it concluded that the project required an increased pavement thickness and eight lanes, instead of six, to accommodate the higher forecast of future traffic levels near Janesville. These changes increased the cost estimate by \$35.0 million.
- DOT identified additional utilities costs, such as for relocating electrical wires. This increased the cost estimate by \$17.5 million.

USH 18/151 (Verona Road) Project

Enumerated in 2011, this project's estimated cost increased from \$150.0 million at enumeration to \$279.7 million in August 2016, or by \$129.7 million. DOT indicated that the cost estimate increased for a number of reasons other than inflation, including:

- DOT policies required additional types of costs, such as design engineering and construction engineering, to be included in the estimated cost when this project was transferred from the rehabilitation program to the major highway program. This increased the cost estimate by \$56.8 million.
- When forecasting future traffic levels as part of the project planning process in 2011, DOT used traffic counts that were five years old. When DOT updated its forecast of future traffic levels in 2012, using traffic counts from that year, it determined that it needed to construct additional highway lanes and a more-expensive interchange. This increased the cost estimate by \$28.4 million.
- DOT purchased additional real estate and underestimated the cost of real estate acquisition. This increased the cost estimate by \$10.1 million.

I-39/USH 51 (Wausau Beltline) Project

Enumerated in 2001, this project's estimated cost increased from \$120.5 million at enumeration to \$290.7 million in August 2016, or by \$170.2 million. DOT indicated that the cost estimate increased for a number of reasons other than inflation, including:

- Federal legislation provided additional funds to improve nearby local roads, and for project-tracking purposes, DOT considered these expenditures to be project-related. This increased the cost estimate by \$41.0 million.
- Changes to the project scope required the purchase of additional real estate. This increased the cost estimate by \$36.6 million.
- DOT modified the design for the USH 51/STH 29 interchange to increase the traffic speeds from 45 to 60 miles per hour and to improve access to the highway from traffic on an intersection local road. This increased the cost estimate by \$27.0 million.
- DOT did not include the costs of design engineering in the cost estimate. Including these costs increased the cost estimate by \$23.5 million.

I-41 (Neenah to Oshkosh and Suamico to De Pere) Project

Enumerated in 2003, this project's estimated cost increased from \$430.0 million at enumeration to \$1.4 billion in August 2016, or by \$970.0 million. DOT indicated that the cost estimate increased for a number of reasons other than inflation, including:

- DOT did not include in the cost estimate the costs of design engineering and construction engineering. This increased the cost estimate by \$256.7 million.
- After enumeration, federal legislation designated USH 41 as an interstate. This change required design changes that increased the cost estimate by \$299.9 million.
- Poor soil conditions at the project location and other unexpected work that was not identified at enumeration increased the cost estimate by \$137.3 million.
- Updated FHWA requirements required DOT to keep more lanes open to daytime traffic during construction. This change necessitated more work to be completed at night and increased the cost estimate by \$70.9 million.
- DOT decided to construct the highway with asphalt under concrete, rather than gravel under concrete, in order to increase the highway's lifespan. This increased the cost estimate by \$33.4 million.

STH 11 (Burlington Bypass) Project

Enumerated in 1997, this project's estimated cost increased from \$71.7 million at enumeration to \$123.3 million in February 2014, or by \$51.6 million. DOT indicated that the cost estimate increased for a number of reasons other than inflation, including:

- DOT decided to incorporate various design changes, such as upgrading five intersections to interchanges and adding a bridge as the result of the input of elected officials. DOT also decided to relocate approximately 4,000 feet of county trunk highway to improve safety. These design changes increased the cost estimate by \$20.2 million.
- DOT did not include in the estimate at enumeration the cost of design engineering. This change increased the cost estimate by \$9.0 million.
- DOT did not include the cost of work on adjoining highways in the cost estimate. Including these costs increased the cost estimate by \$6.3 million.

Appendix 9

**Estimated Design Engineering and
Construction Engineering Expenditures**
(in millions)

Design Engineering Expenditures

Fiscal Year	DOT Staff		Consultants		Total
	Amount	Percentage of Total	Amount	Percentage of Total	
2006-07	\$ 53.9	46.4%	\$ 62.4	53.6%	\$116.3
2007-08	58.5	42.1	80.6	57.9	139.1
2008-09	59.7	36.2	105.0	63.8	164.6
2009-10	55.0	30.7	124.0	69.3	179.1
2010-11	61.5	34.6	116.0	65.4	177.6
2011-12	59.5	28.8	146.9	71.2	206.3
2012-13	61.3	24.3	191.3	75.7	252.6
2013-14	68.3	30.1	158.6	69.9	226.9
2014-15	70.9	33.4	141.3	66.6	212.2

Construction Engineering Expenditures

Fiscal Year	DOT Staff		Consultants		Total
	Amount	Percentage of Total	Amount	Percentage of Total	
2006-07	\$29.7	37.6%	\$49.3	62.4%	\$ 79.0
2007-08	31.6	41.5	44.5	58.5	76.0
2008-09	29.8	36.3	52.3	63.7	82.0
2009-10	29.1	33.1	58.6	66.9	87.7
2010-11	32.7	32.1	69.2	67.9	101.9
2011-12	30.0	28.0	77.2	72.0	107.2
2012-13	28.5	25.6	82.8	74.4	111.3
2013-14	33.4	29.3	80.5	70.7	114.0
2014-15	40.8	32.4	85.0	67.6	125.8

Appendix 10

Completed Design Engineering and Construction Engineering Contracts, by Calendar Year of Execution

Design Engineering Contracts

Year	Number	Amount (in millions)			Percentage Change
		Contract	Actual	Change	
2006	233	\$ 37.1	\$ 51.9	\$14.7	39.6%
2007	223	54.2	67.4	13.2	24.4
2008	246	76.0	95.3	19.4	25.5
2009	252	68.0	77.8	9.8	14.4
2010	210	41.9	48.1	6.2	14.7
2011	217	81.0	83.5	2.5	3.1
2012	201	41.6	44.9	3.3	7.9
2013	143	16.7	16.8	0.1	0.6
2014	98	7.4	7.1	(0.3)	(4.6)
2015	18	0.7	0.7	<(0.1)	(3.7)
Total	1,841	\$424.6	\$493.5	\$68.8	16.2

Construction Engineering Contracts

Year	Number	Amount (in millions)			Percentage Change
		Contract	Actual	Change	
2006	227	\$ 33.9	\$ 34.0	\$ 0.1	0.4%
2007	173	23.1	21.1	(1.9)	(8.3)
2008	205	41.3	40.3	(1.1)	(2.6)
2009	237	52.9	47.5	(5.5)	(10.3)
2010	214	61.2	60.9	(0.3)	(0.5)
2011	207	59.3	56.5	(2.8)	(4.7)
2012	171	47.2	47.5	0.2	0.4
2013	173	47.7	44.1	(3.6)	(7.6)
2014	97	11.7	12.1	0.4	3.1
2015	19	2.5	1.4	(1.1)	(42.6)
Total	1,723	\$380.9	\$365.3	\$(15.5)	(4.1)

Appendix 11

Routine Maintenance Expenditures in 2015, by County¹

County	Amount	County	Amount
Adams	\$ 696,000	Marathon	\$2,935,000
Ashland	952,000	Marinette	1,183,000
Barron	1,369,000	Marquette	828,000
Bayfield	1,122,000	Menominee	282,000
Brown	2,966,000	Milwaukee	12,967,000
Buffalo	901,000	Monroe	2,069,000
Burnett	676,000	Oconto	1,490,000
Calumet	597,000	Oneida	1,304,000
Chippewa	2,621,000	Outagamie	1,797,000
Clark	1,325,000	Ozaukee	1,345,000
Columbia	3,838,000	Pepin	452,000
Crawford	1,425,000	Pierce	1,521,000
Dane	5,901,000	Polk	1,320,000
Dodge	1,812,000	Portage	1,871,000
Door	1,435,000	Price	986,000
Douglas	1,596,000	Racine	3,147,000
Dunn	1,916,000	Richland	1,152,000
Eau Claire	2,171,000	Rock	2,573,000
Florence	459,000	Rusk	560,000
Fond du Lac	1,675,000	St. Croix	2,668,000
Forest	987,000	Sauk	1,946,000
Grant	1,843,000	Sawyer	1,203,000
Green	970,000	Shawano	1,502,000
Green Lake	550,000	Sheboygan	1,311,000
Iowa	1,606,000	Taylor	776,000
Iron	885,000	Trempealeau	1,624,000
Jackson	1,757,000	Vernon	1,417,000
Jefferson	1,607,000	Vilas	1,027,000
Juneau	1,529,000	Walworth	2,681,000
Kenosha	3,448,000	Washburn	1,471,000
Kewaunee	304,000	Washington	2,625,000
La Crosse	2,010,000	Waukesha	5,221,000
Lafayette	953,000	Waupaca	1,902,000
Langlade	830,000	Waushara	1,082,000
Lincoln	1,358,000	Winnebago	2,720,000
Manitowoc	1,524,000	Wood	1,170,000

¹ Routine maintenance is intended to preserve state highways and includes removing snow and applying salt in the winter, applying protective coatings and sealing cracks, filling potholes, and repairing damaged guardrails.

Appendix 12

Winter Salt Expenditures in FY 2014-15, by County

County	Amount	County	Amount
Adams	\$ 137,000	Marathon	\$ 861,000
Ashland	153,000	Marinette	396,000
Barron	268,000	Marquette	157,000
Bayfield	288,000	Menominee	77,000
Brown	437,000	Milwaukee	2,000,000
Buffalo	119,000	Monroe	557,000
Burnett	109,000	Oconto	201,000
Calumet	51,000	Oneida	465,000
Chippewa	497,000	Outagamie	205,000
Clark	293,000	Ozaukee	299,000
Columbia	902,000	Pepin	41,000
Crawford	207,000	Pierce	198,000
Dane	2,147,000	Polk	321,000
Dodge	591,000	Portage	412,000
Door	131,000	Price	302,000
Douglas	276,000	Racine	478,000
Dunn	480,000	Richland	167,000
Eau Claire	593,000	Rock	450,000
Florence	179,000	Rusk	156,000
Fond du Lac	229,000	St. Croix	487,000
Forest	329,000	Sauk	493,000
Grant	351,000	Sawyer	267,000
Green	114,000	Shawano	339,000
Green Lake	51,000	Sheboygan	219,000
Iowa	284,000	Taylor	198,000
Iron	268,000	Trempealeau	370,000
Jackson	484,000	Vernon	281,000
Jefferson	445,000	Vilas	564,000
Juneau	375,000	Walworth	531,000
Kenosha	461,000	Washburn	255,000
Kewaunee	44,000	Washington	522,000
La Crosse	286,000	Waukesha	959,000
Lafayette	111,000	Waupaca	320,000
Langlade	245,000	Waushara	187,000
Lincoln	337,000	Winnebago	357,000
Manitowoc	193,000	Wood	299,000

Appendix 13

Discretionary Maintenance Expenditures in 2015, by County¹

County	Amount	County	Amount
Adams	\$460,000	Marathon	\$ 362,000
Ashland	147,000	Marinette	147,000
Barron	50,000	Marquette	84,000
Bayfield	86,000	Menominee	58,000
Brown	459,000	Milwaukee	1,678,000
Buffalo	108,000	Monroe	109,000
Burnett	150,000	Oconto	223,000
Calumet	177,000	Oneida	208,000
Chippewa	200,000	Outagamie	202,000
Clark	100,000	Ozaukee	155,000
Columbia	63,000	Pepin	55,000
Crawford	89,000	Pierce	98,000
Dane	458,000	Polk	164,000
Dodge	473,000	Portage	507,000
Door	70,000	Price	81,000
Douglas	42,000	Racine	619,000
Dunn	195,000	Richland	114,000
Eau Claire	291,000	Rock	247,000
Florence	18,000	Rusk	19,000
Fond du Lac	455,000	St. Croix	239,000
Forest	95,000	Sauk	429,000
Grant	126,000	Sawyer	76,000
Green	282,000	Shawano	170,000
Green Lake	3,000	Sheboygan	747,000
Iowa	577,000	Taylor	686,000
Iron	27,000	Trempealeau	761,000
Jackson	139,000	Vernon	374,000
Jefferson	25,000	Vilas	80,000
Juneau	122,000	Walworth	214,000
Kenosha	151,000	Washburn	76,000
Kewaunee	235,000	Washington	308,000
La Crosse	85,000	Waukesha	70,000
Lafayette	128,000	Waupaca	79,000
Langlade	471,000	Waushara	163,000
Lincoln	131,000	Winnebago	320,000
Manitowoc	182,000	Wood	138,000

¹ If routine maintenance funds are unspent in a given calendar year, DOT reallocates them for discretionary maintenance projects in the following calendar year. Such projects include priorities identified by DOT, such as sealing cracks in highway surfaces.

Appendix 14

Performance-based Maintenance Expenditures in 2014 and 2015, by County¹

2014

County	Amount	County	Amount
Adams	\$138,000	Marathon	\$207,000
Ashland	98,000	Marinette	91,000
Barron	86,000	Marquette	68,000
Bayfield	105,000	Menominee	0
Brown	0	Milwaukee	190,000
Buffalo	113,000	Monroe	106,000
Burnett	58,000	Oconto	46,000
Calumet	95,000	Oneida	112,000
Chippewa	169,000	Outagamie	76,000
Clark	103,000	Ozaukee	84,000
Columbia	152,000	Pepin	40,000
Crawford	265,000	Pierce	67,000
Dane	103,000	Polk	75,000
Dodge	69,000	Portage	33,000
Door	97,000	Price	0
Douglas	0	Racine	188,000
Dunn	133,000	Richland	39,000
Eau Claire	0	Rock	85,000
Florence	0	Rusk	72,000
Fond du Lac	137,000	St. Croix	204,000
Forest	75,000	Sauk	165,000
Grant	137,000	Sawyer	0
Green	172,000	Shawano	161,000
Green Lake	36,000	Sheboygan	151,000
Iowa	122,000	Taylor	69,000
Iron	30,000	Trempealeau	95,000
Jackson	101,000	Vernon	61,000
Jefferson	92,000	Vilas	71,000
Juneau	171,000	Walworth	344,000
Kenosha	0	Washburn	66,000
Kewaunee	0	Washington	123,000
La Crosse	100,000	Waukesha	548,000
Lafayette	256,000	Waupaca	149,000
Langlade	34,000	Waushara	40,000
Lincoln	76,000	Winnebago	225,000
Manitowoc	80,000	Wood	86,000

2015

County	Amount	County	Amount
Adams	\$181,000	Marathon	\$297,000
Ashland	113,000	Marinette	454,000
Barron	176,000	Marquette	53,000
Bayfield	121,000	Menominee	48,000
Brown	116,000	Milwaukee	729,000
Buffalo	155,000	Monroe	307,000
Burnett	49,000	Oconto	232,000
Calumet	45,000	Oneida	91,000
Chippewa	194,000	Outagamie	203,000
Clark	150,000	Ozaukee	224,000
Columbia	221,000	Pepin	75,000
Crawford	103,000	Pierce	335,000
Dane	500,000	Polk	166,000
Dodge	365,000	Portage	334,000
Door	150,000	Price	186,000
Douglas	134,000	Racine	334,000
Dunn	202,000	Richland	41,000
Eau Claire	321,000	Rock	172,000
Florence	64,000	Rusk	139,000
Fond du Lac	305,000	St. Croix	162,000
Forest	105,000	Sauk	302,000
Grant	196,000	Sawyer	185,000
Green	149,000	Shawano	133,000
Green Lake	99,000	Sheboygan	406,000
Iowa	217,000	Taylor	106,000
Iron	49,000	Trempealeau	223,000
Jackson	101,000	Vernon	184,000
Jefferson	247,000	Vilas	78,000
Juneau	370,000	Walworth	607,000
Kenosha	206,000	Washburn	118,000
Kewaunee	206,000	Washington	289,000
La Crosse	231,000	Waukesha	746,000
Lafayette	364,000	Waupaca	105,000
Langlade	27,000	Waushara	200,000
Lincoln	302,000	Winnebago	149,000
Manitowoc	143,000	Wood	50,000

¹ Performance-based maintenance projects are specific types of targeted routine maintenance work. Such projects include priorities identified by DOT, such as sealing cracks in highway surfaces.

Response ■



Wisconsin Department of Transportation

www.wisconsin.gov

Scott Walker
Governor

Dave Ross
Secretary

Office of the Secretary
4802 Sheboygan Avenue, Room 120B
P O Box 7910
Madison, WI 53707-7910

January 23, 2017

Joe Chrisman
State Auditor
Legislative Audit Bureau
22 East Mifflin Street Suite 500
Madison, Wisconsin 53703

Telephone: 608-266-1113
FAX: 608-266-9912
E-mail: sec.exec@dot.wi.gov

Dear Mr. Chrisman:

Thank you for the opportunity to comment on the Legislative Audit Bureau's comprehensive evaluation of the Wisconsin Department of Transportation's (WisDOT's) management of the state highway program. As I begin my job as secretary, I appreciate the significant and thorough work performed by the audit team, and I am grateful for the recommendations that will help us at WisDOT with our ongoing efforts to deliver the best value to taxpayers.

Our mission at WisDOT is to provide leadership in the development and operation of a safe and efficient transportation system with a goal of making the best use of our budget resources. The audit confirms that there are steps we can take to improve the efficiency and effectiveness of our programs. The audit reaffirms that the department has taken steps over the past six years to improve highway management, and we appreciate that the report supports our efforts to make data-driven, performance-based decisions. We are dedicated to continuous improvement, and the audit findings make us better-informed in that pursuit.

WisDOT will comply with all the recommendations contained in the audit. Implementing these changes will allow the department to improve transparency, revise outdated policies and allow us to be better stewards of tax dollars. In reviewing the audit with department staff, there are specific clarifications I would like to offer in regard to several issues.

Project Cost Estimate Accuracy

Reliable project estimates are vital for the department, the legislature and the public. Over the last six years the department has implemented a number of improvements to cost estimating processes with the goal of increasing transparency without being too speculative. For instance, more recently enumerated Major Highway program projects are subject to the agency's risk-based cost estimating procedures, which include estimates of all costs associated with construction adjusted to current year dollars. The comprehensive LAB analysis of Major Highway project cost increases combines the experiences of projects enumerated as far back as the 1980s. The experiences of these older projects are not reflective of today's department practices.

The department is continuing to make refinements to our revised cost-estimating protocol, which now includes more rigorous and regular cost-estimate reviews involving the project team, subject matter experts and Federal Highway Administration staff. These steps reflect national best practices and are applied to all significant transportation investment projects.

Even when utilizing best practices, cost estimating always has inherent risks. These risks are greater in the Major Highway program because statutory requirements limit the amount of design WisDOT can complete prior to enumeration to that which is needed to complete an environmental document – typically less than 30 percent of design cost. Developing a cost estimate with limited design entails a higher degree of risk and speculation on future costs.

The report recommends that WisDOT report on future Major Highway project construction cost estimates assuming construction-related inflation rates, likely to be higher than the Consumer Price Index. The department's long-standing practice has been to report project cost estimates to the Transportation Projects Commission (TPC) using previous estimates inflated to current-year dollars. We will use the audit recommendations as we strive to make improvements. We understand the need to better communicate how inflation impacts future costs to the TPC, the legislature, and to the public.

Semi Annual Reporting to the TPC

WisDOT is committed to transparency. The report describes how TPC reports provide construction cost estimates but not previously incurred costs from each project study phase. Currently the semi-annual reports provide cost information for study projects and those projects in active construction. The intent of the department had been to provide a clear distinction between projects recommended for study and those not yet enumerated for construction. Based on recommendations in the report, the department will comply with the recommendations while continuing to draw a distinction between the types of projects to ensure transparency.

Public Notification and Public Involvement

The audit identifies areas where the department does not comply with existing administrative rules and policies regarding public notification about future projects. The department has a robust public involvement process and is in full compliance with a variety of state and federal public involvement requirements. In fact, the department held more than 200 meetings with public and stakeholder groups during the planning and design phase for the Verona Road project. We are proud of our outreach efforts and in our focus on continuing improvement, we'll expand those efforts and will update administrative code as necessary.

WisDOT will develop a plan to comply with the recommendations set forth in the report and take the opportunity to incorporate, where possible, the new means by which the public obtains project information, including digital and social media opportunities.

Depiction of Performance Targets

The audit describes many of WisDOT's efforts to establish a performance-based management approach for the highway program. The department is encouraging prudent project management and budgeting to ensure we are good stewards of tax dollars. Now more than ever, we emphasize building the right project at the right time at the lowest cost. WisDOT's on-budget construction goal of 103% of budget compares favorably to our industry counterparts. Minnesota experienced project costs compared to budget of 106% over a recent three-year period and a Purdue University study shows several other states averaging between 105% and 106% of their budgeted costs. The department will continue its efforts to improve in this area.

Pavement Condition

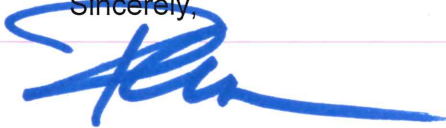
The audit covers pavement condition and how those conditions have changed over time. The report demonstrates how the department has prioritized investments on essential projects.

Backbone highways represent 13.5% of centerline highway miles, but carries half of the traffic, and 85% of truck-born freight. Since 2010, the percentage of backbone highway pavement rated as poor or worse has decreased to only 1.1%. Federal law will soon require that no more than 5% of the Interstate system should be in poor condition and failure to meet that goal will result in penalties or program restrictions. The department's approach of prioritizing backbone highway routes has positioned the state to meet those requirements while ensuring safe travel for businesses and the travelling public.

I would like to thank the LAB again for the thorough report and comprehensive recommendations. This outside assessment is incredibly valuable as we at the department strive to be as efficient as possible with taxpayer dollars. WisDOT is committed to implementing the recommendations and will continue to find ways to reduce program costs, while delivering a safe, high-quality transportation system.

I know that the department appreciated the thoughtful, cooperative approach the audit team took as they conducted their work. On a personal level, I can say that I am lucky to have this invaluable resource as I begin my time with the department. We look forward to reporting our progress to the Joint Committee on Audit.

Sincerely,



Dave Ross
Secretary