DEPARTMENT OF TRANSPORTATION

Major Highway Projects, Trunk Highway Fund Expenditures and Efficiencies Report

December 2017

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Legislative Request

This report was completed to comply with Minnesota Statute 174.56.

174.56 Report on Major Highway Projects, Trunk Highway Fund Expenditures, and Efficiencies.

Subdivision 1. Report required.

(a) The commissioner of transportation shall submit a report by December 15 of each year on (1) the status of major highway projects completed during the previous two years or under construction or planned during the year of the report and for the ensuing 15 years, and (2) trunk highway fund expenditures, and (3) beginning with the report due in 2016, efficiencies achieved during the previous two fiscal years.

(b) For purposes of this section, a "major highway project" is a highway project that has a total cost for all segments that the commissioner estimates at the time of the report to be at least (1) $15,000,000 in the metropolitan highway construction district, or (2) $5,000,000 in any nonmetropolitan highway construction district.

Subd. 2. Report contents; major highway projects.

For each major highway project the report must include:

(1) a description of the project sufficient to specify its scope and location;

(2) a history of the project, including, but not limited to, previous official actions by the department or the appropriate area transportation partnership, or both, the date on which the project was first included in the state transportation improvement plan, the cost of the project at that time, the planning estimate for the project, the engineer's estimate, the award price, the final cost as of six months after substantial completion, including any supplemental agreements and cost overruns or cost savings, the dates of environmental approval, the dates of municipal approval, the date of final geometric layout, and the date of establishment of any construction limits;

(3) the project's priority listing or rank within its construction district, if any, as well as the reasons for that listing or rank, the criteria used in prioritization or rank, any changes in that prioritization or rank since the project was first included in a department work plan, and the reasons for those changes;

(4) past and potential future reasons for delay in letting or completing the project, details of all project cost changes that exceed $500,000, and specific modifications to the overall program that are made as a result of delays and project cost changes;

(5) two representative trunk highway construction projects, one each from the department's metropolitan district and from greater Minnesota, and for each project report the cost of environmental mitigation and compliance; and

(6) the annual budget for products and services for each Department of Transportation district and office, with comparison to actual spending and including measures of productivity for the previous fiscal year.

Subd. 2a. Report contents; trunk highway fund expenditures.

The commissioner shall include in the report information on the total expenditures from the trunk highway fund during the previous fiscal year, for each Department of Transportation district, in the following categories: road construction; planning; design and engineering; labor; compliance with environmental regulations; administration; acquisition of right-of-way, including costs for attorney fees and other compensation for property owners; litigation costs, including payment of claims, settlements, and judgments; maintenance; and road operations.

Subd. 3. Department resources.

The commissioner shall prepare and submit the report with existing department staff and resources.

Report cost

The cost of preparing the report elements required by Minn. Stat. 174.56 is approximately $65,000.

The costs reported for the 2017 Major Highway Projects, Trunk Highway Expenditures, and Efficiencies report includes the costs to gather the data needed to report on the budget by products and services and productivity measures.

Purpose and Scope of the Report

Introduction

The first legislative report on Major Highway Projects was delivered by the Minnesota Department of Transportation to the legislature in January 2009.

The Major Highway Projects, Trunk Highway Fund Expenditures and Efficiencies report, or MHPR, provides a snapshot of MnDOT's programming and delivery for all large construction projects meeting the cost thresholds laid out in statute. The scope of the report and the information it contains are meant to inform the reader about MnDOT's business of planning, building, operation and maintenance of Minnesota's transportation system.

This is one of MnDOT's most comprehensive reports. The purpose of the report is to provide the reader with information about major projects, financial management, budgeting by products and services and efficiencies achieved. The report breaks down, in high-level detail, various parts of a major project. This is consistent with the agency's focus on delivering high quality projects on time and within budget.

Some of the details reported about major projects include:

- location and scope
- funding
- cost savings/overruns
- environmental costs
- delays
- project history
- cost estimates

Together, this information provides the 2017 picture of MnDOT's performance in planning, building, operating and maintaining a safe, accessible, efficient and reliable multimodal transportation system that connects people to destinations and markets throughout the state, regionally and around the world.

The report is organized into these sections:

- Trunk highway fund expenditures
- Environmental mitigation and compliance costs
- Products and services budget expenditures report
- Productivity measures
- Efficiencies
- Major highway project summary sheets

Summary of Report Contents

Major Highway Projects

This section of the report identifies major projects on the state trunk highway system, which includes the interstate and national highway systems. Per Minnesota Statutes 174.56, this report includes projects with cost estimates equal to or in excess of $15 million in the Twin Cities Metro District and with cost estimates equal to or in excess of $5 million in Greater Minnesota.

This report includes information on projects that meet the total project cost estimate criteria and are either under construction, programmed or planned within the next 15 years. For each project completed in the past two fiscal years (2016-2017) or identified for construction in the next four years (2018-2021), a project summary is included that provides detailed information on project location, purpose, scope, schedule and cost. Each project planned for construction in 2022-2032 is included in Appendix D and contains the basic information on project location, description, schedule and preliminary estimated cost.

All the projects are arranged by MnDOT districts. A district map highlighting the locations of the projects within the area and a list of projects precede the project summary pages for each district. The information provided in this report is current as of November 2017.

Environmental Mitigation and Compliance Costs

To comply with the legislative requirement in subdivision 2, clause (5), the cost of environmental mitigation and compliance was analyzed for two representative projects.

1. The Metro district project on Interstate 35E in Little Canada, Vadnais Heights, White Bear Lake and White Bear Lake Township was highlighted because it represents some of the types of mitigation that are commonly part of projects in Minnesota's largest metropolitan area.
2. The Highway 23 from Becks Road to Interstate 35 was chosen because it represents the types of environmental mitigation involved in an urban/rural combination corridor in Greater Minnesota.

Trunk Highway Fund Expenditures

Fiscal year 2017 expenditure information is provided for each of the categories specified in the statute.

Products and Services Budget

MnDOT developed a product and service framework that organizes and describes its products and services. The expenses and budgets provided in this report, by products and services, represent the department's annual budget for fiscal year 2017, as appropriated. It also includes expenses for services that may have been rendered in fiscal year 2016, but due to processing time would have been paid in fiscal year 2017.

Key concepts to remember when reviewing this section include:

- Timing differences between the two years of a biennium cause variances that would not be present if the report was prepared on a biennial basis. For example, carry-over from the first year of the biennium to the second year impacts the data for the second year.
- Some spending may not match budgets exactly because funds may have been encumbered in one year and expended in another.
- Uncommitted and carry-over budgets may seem to exhibit spending in excess of the total budget; however, this spending occurs within a biennium and is allowed by statute.
- The 2016 budget values were based on previous fiscal products and services analysis.

Productivity Measures

Productivity measures are an effort to identify, create, examine and document current levels of productivity within MnDOT. This project reports measures of MnDOT productivity for the most recent 10 years of data (where available).

Performance measures are not new at MnDOT. Traditional performance measures used by MnDOT are measures of product and service delivery effectiveness. Productivity measures help the department enhance financial effectiveness and are the next step to evaluate how efficiently MnDOT's products and services are delivered.

The report includes the following measures:

- Bridges:
  - Inspection cost per square foot of deck area
  - Maintenance cost per square foot of deck area
- Pavement: Cost per roadway mile-year added
- Snow and ice: Cost per plow mile driven
- Pavement markings: Cost per mile striped
- Transit: MnDOT administrative cost per transit passenger trip
- Freight: MnDOT cost per oversize/overweight permit issued
- Program Planning and Delivery to construction expenditure ratio

The background for each productivity measure is presented along with data through the previous 10 years where possible. Each measure includes a discussion about why the measure presented is an effective measure of productivity and lists major influencing factors.

Two of the eight productivity measures show the inflation-adjusted unit costs declining slightly. Specifically, pavement markings cost per mile striped and cost per oversize/overweight permit issued all show a slight decline in inflation-adjusted unit costs over the analysis period. Three of the eight measures show an overall flat trend. Specifically, the bridge maintenance cost per square foot of bridge deck area, cost per plow-mile driven, and MnDOT administrative cost per transit trip all remained relatively flat over the last ten years. The cost per additional roadway mile-year added shows a slight increase over the analysis period while the bridge inspection cost per square foot of deck area appears to have stabilized over the last nine years following a spike in 2008. A trend line was not applied to the program, planning and delivery to construction expenditure ratio measure as there are just four three-year rolling average data points available at this time.

Efficiencies

MnDOT consistently aims to be a good steward of public funds. Starting in 2015, the department decided to take a more targeted approach to identify and quantify these efficiencies, while looking for additional best practices and improvements. In FY 2017, MnDOT identified an estimated 83 million in savings from new and revised practices deployed across the organization. The majority of these efficiencies identified in FY 2017 came from construction program delivery and project development. Savings identified in the analysis led to program and project costs that were lower than if the efficient strategies had not been implemented.

Major Highway Projects Summary

This annual report identifies major projects constructed within the past two years, and all major projects programmed or planned for construction on the state trunk highway system over the next 15 years, including the interstate and national highway systems. As directed in Minnesota Statutes 174.56, this report includes projects with cost estimates equal to or in excess of $15 million in the Metro District and projects with cost estimates equal to or in excess of $5 million in Greater Minnesota. This report includes 559 projects that met the statutory cost threshold. The information provided in this report is current as of November 2017.

Table 1: Projects included in 2017 Major Highway Projects report

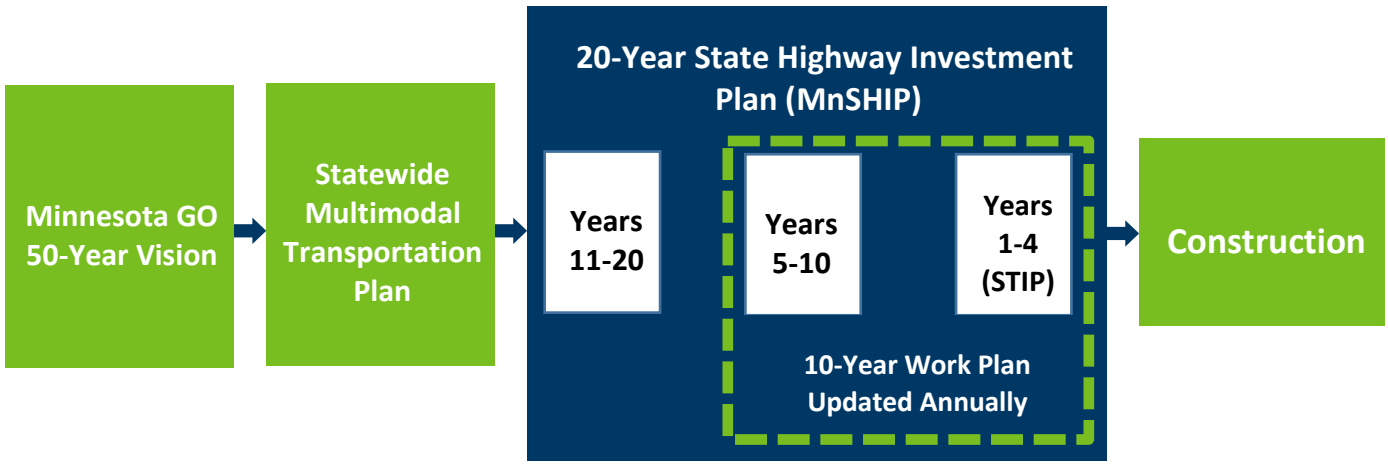
MnDOT District	Number of projects completed, under construction or listed in the STIP	Projects in years 2021-2032	Total Projects
1	38	37	75
2	24	31	55
3	33	48	81
4	31	27	58
6	44	47	91
7	49	35	84
8	15	20	35
Metro	35	45	80
TOTAL	269	290	559

Of the 559 projects reported this year, 80 are in the Twin Cities metro area and 479 are in Greater Minnesota. Projects vary in type, and include pavement preservation, bridge replacement and rehabilitation and mobility projects based on the priorities established in the MnDOT's 20-year State Highway Investment Plan, also known as MnSHIP.

State Highway Investment Planning Process

MnSHIP is an important link between the guiding principles in the Minnesota GO 50-Year Vision, the strategies in the Statewide Multimodal Transportation Plan and the actual capital improvements made to the state highway system. MnSHIP sets a "fiscally constrained" framework (that is, using only forecasted funding) for future capital improvements by identifying investment needs and priorities. This plan will serve as the framework for statewide investment on trunk highways for the next year before a new 20-year investment plan is produced. The investment levels identified in MnSHIP are being adhered to and MnDOT is on track to deliver on the fiscally constrained decisions from the plan.

Figure 1: Planning mechanisms and plans



MnSHIP covers three planning periods: years 1-4, years 5-10 and years 11-20. Projects identified for years 1-4 (FY 2018-21) are those listed in the 2018-2021 Statewide Transportation Improvement Program, also known as the STIP. MnDOT intends to deliver these projects during the next four years, although the programmed year of construction may be adjusted if actual revenues increase or decrease.

Investments identified for years 5-10 (FY 2022-27) include general funding levels for certain improvement categories (e.g., pavement preservation, traveler safety), and construction cost estimates for several specific projects within the improvement categories. These projects and their cost estimates should be considered preliminary, as revenue forecasts are uncertain.

Specific projects are not identified for years 11-20 (FY 2028-36); instead, MnSHIP has set broad investment priorities associated with funding allocations, which focus primarily on preserving the transportation assets MnDOT currently owns. Such elements include, but are not limited to:

- Pavement within MnDOT right of way
- Bridges
- Bike and pedestrian facilities
- Drainage structures
- Barriers, guardrails and fences
- Lighting and intelligent transportation system features
- Signs
- Noise walls

Investment priorities may change as a result of system performance conditions, legislative initiatives or federal funding requirements related to the MAP-21 and the FAST Act transportation programs.

MnDOT began the process by:

- Reviewing current investment priorities, asset conditions and other system needs
- Projecting the amount of federal and state funds that will be available for investment on the state highway system during the next 20 years
- Reviewing agency policy and federal and state transportation laws
- Identifying emerging significant risks that may affect investment priorities

Next, MnDOT established a range of potential investment levels for nine categories of highway investment priorities. These investment levels were combined into example investment scenarios to solicit feedback from the public. For investment direction for the 20-year plan, MnDOT considered stakeholder input, legislative direction, federal requirements and system-wide risks and outcomes to develop a final mix of investment priorities. This investment direction guided statewide and district investment goals. These goals are achieved by districts developing a schedule of projects that comprise their investment programs and are designed to make progress towards these goals.

Project Selection

MnDOT selects projects through different planning and programming processes all designed to address performance-based needs and achieve key objectives on the trunk highway system. These processes are the methods used by MnDOT to decide how to use authorized federal and state funds and revenue from the sale of trunk highway bonds. The primary framework for project selection is outlined below.

10-year Work Plan

The existing investment plan known as MnSHIP created two programs to guide project selection at a state and regional level for the next 10 years. They are the Statewide Performance Program and the regional District Risk Management Program. The purpose of establishing these two programs is to ensure the department efficiently and effectively works toward common statewide goals. These goals consist of meeting Governmental Accounting Standards Board thresholds for pavements and bridges, and meeting the performance requirements started in Moving Ahead for Progress in the 21st Century Act, or MAP-21, and continued in the more recent passage of the Fixing America's Surface Transportation Act, or FAST Act, while simultaneously maintaining regional flexibility to address unique risks and circumstances at the district level.

Statewide Performance Program

MAP-21, the previous federal transportation bill, placed greater emphasis on National Highway System performance and required MnDOT to make progress toward national performance goal areas, including those related to asset condition, safety and congestion. The greater emphasis on the NHS was continued in the FAST Act. If MnDOT fails to adequately progress towards the national goals, some federal funding flexibility is at risk. Further, an analysis highlighted the expectation that MnDOT maintain NHS routes in a state of good repair. In response, MnDOT developed the Statewide Performance Program to ensure that federal and state performance targets are met on the NHS and that the condition of these routes meets public and MnDOT expectations.

District Risk Management Program

The Statewide Performance Program focuses funding on addressing key performance targets on National Highway System routes, while the District Risk Management Plan, or DRMP, focuses funding on other non-NHS highway needs on all state highways. The majority of the program supports pavement and bridge rehabilitation or replacement projects. The DRMP project selection process is structured to give districts the flexibility to address their greatest regional and local risks. Districts are also able to make additional investments on the NHS system if the proposed project is in response to a high risk issue.

In the DRMP, each MnDOT district is responsible for selecting projects that mitigate its highest risks in the areas of asset management, traveler safety, critical connections and projects, which are a regional and community improvement priority. MnDOT distributes different levels of funding to the districts for this program based on a

revenue distribution method that accounts for various system factors. MnDOT districts collaborate with area transportation partnerships, metropolitan planning organizations and other key partners to select projects.

MnSHIP directs 45 percent of MnDOT's annual revenues toward DRMP projects or approximately $337 million per year, not including the cost of delivering those projects, such as right of way acquisition, consulting services, cost overruns and supplemental agreements. The DRMP's share of MnDOT's annual program may vary in the future depending on the outcomes of MnDOT's ongoing risk-based and performance-based planning efforts. The investment category mixes for each district vary depending on the system characteristics and conditions unique to that area of the state.

Impacts of Project Cost Changes

Changes to project costs and schedules affect the state trunk highway capital investment program. These effects are most directly seen through revisions to the STIP, which is a master listing of projects that MnDOT is planning to complete in the next four construction seasons. Seventy-five percent of the projects listed in the STIP are let and completed in their originally scheduled construction season. The completion date for other projects may be adjusted, and project scope and costs may increase or decrease after being listed in the STIP.

Project costs may change for a variety of reasons, including: changes in economic conditions, inflationary factors, scope changes, supplemental agreements, cost overruns and right of way acquisition. Costs may change prior to letting or after a contract is awarded. Changes in project costs prior to letting are handled through the STIP process. The STIP process allows projects to be added, revised or removed on an annual basis. Cost changes to a project post-letting are managed at the district level. If cost changes are higher than anticipated, set-asides are primarily used to handle the change. If project costs are lower than projected, other projects may be advanced to an earlier construction date, or funds may be directed to cover funding gaps and/or cost overruns on other projects. Project cost overruns and cost savings are managed on an aggregate program level.

If the statewide performance program has cumulative cost estimate changes resulting in a significant amount of uncommitted funds, a specific, one-time program may be implemented, such as the Better Roads for a Better Minnesota, which focused on achieving statewide performance objectives for overall pavement condition. To deliver the Better Roads program, projects that most effectively achieved these performance objectives and were at an appropriate stage in the project development process were accelerated so that they could be completed earlier than previously programmed.

Conversely, if cumulative project cost estimate changes increase by a significant enough level to necessitate revisions to the STIP, a number of projects may be delayed or removed, based on the fiscal ability to fully deliver each annual construction program. Projects that have not yet progressed through the project development process are more likely to be subject to schedule delays or cost revisions.

Project Prioritization

All projects identified within the 2018-21 STIP can be funded with current revenue projections and are high priority projects to local stakeholders, districts and Area Transportation Partnerships. Projects within the 2022-31 mid-range and long-range planning periods are a priority, but revenue forecasts, federal program requirements and funding sources are more uncertain and full funding may not have been identified. The 20-year Minnesota Highway Investment Plan details how investments at a program level are prioritized in this mid-range and long-range timeframe.

Project Summary Sheets

See Appendix C for one-page summaries, statewide maps, district maps and an indexed table of all major highway projects. An explanation of the information included for each project, common abbreviations and definitions are provided in Appendix B.

Environmental Mitigation and Compliance Analysis

The two projects below were chosen to represent the types of environmental mitigation and compliance issues MnDOT faces. Both were completed in 2016-17.

This segment of Interstate 35E is located in Ramsey and Washington counties within MnDOT's Metro District. This project was highlighted because it represents some of the types of mitigation that are commonly part of projects in Minnesota's largest metropolitan area.

The Highway 23 and bridge culvert replacement project from Becks Road to Interstate 35, in St. Louis County, is located in MnDOT's District 1. This segment of Highway 23 was chosen because it is an example of the types of environmental mitigation involved in an urban/rural combination corridor in Greater Minnesota.

Metro District Project: Interstate 35E in Little Canada, Vadnais Heights, White Bear Lake and White Bear Lake Township

This MnDOT Metro District project took place on nine miles of Interstate 35E from north of Highway 36 to County Road J. MnPASS is a strategy for managing and reducing congestion on some of Minnesota's busiest highways. It does this by using managed lanes that are free for transit buses, motorcycles and High Occupant Vehicles, but single occupant vehicles are charged a fee during peak-travel times. This project extended the existing MnPASS lane in both directions from the previous terminus at Little Canada Road to CSAH 96 and only a northbound lane to County Road J. Other work consisted of storm sewer, stormwater ponds, restriping all lanes, and noise wall construction.

This project is a good example of MnDOT working proactively with landowners well ahead of the project to minimize changes to construction plans. They also designed with future projects in mind to avoid rework, including preliminary plans for additional stormwater capture and treatment required for the next phase of MnPASS.

Environmental mitigation and compliance costs (excluding noise walls) of $1,053,300 are detailed below and account for approximately 4.0 percent of project costs.

The total project cost (also detailed below) was $26.6 million. The construction cost of the project was $21.9 million, right of way costs were $280,000 and project engineering costs were $4.4 million.

Table 2: Environmental Mitigation Percentage for Interstate 35E in Ramsey and Washington Counties

Environmental Mitigation & Compliance Costs Breakdown: I-35E MnPASS Lane	
Environmental Documents: Costs NOT included in the mitigation cost total	
Preliminary Investigation (Environmental Assessment/Worksheet)	$68,100
TOTAL	$68,100
Environmental Investigation Costs	
Contamination/Regulated Materials Investigation	$25,600
Sub-Total	$25,600

Environmental Mitigation & Compliance Costs Breakdown: I-35E MnPASS Lane continued

Preconstruction Engineering Costs	
Stormwater Ponds	$43,700
Erosion Control and Stormwater Management	$59,000
Sub-Total	$102,700
Construction Engineering / Administration Costs	
Stormwater Ponds	$29,200
Erosion Control and Stormwater Management	$39,400
Sub-Total	$68,600
Construction Costs	
Stormwater Ponds	$364,500
Erosion Control and Stormwater Management	$491,900
Sub-Total	$856,400
Total Environmental Mitigation and Compliance Costs	
TOTAL	$1,053,300

Noise Only Mitigation & Compliance Costs Breakdown: Interstate 35E MnPASS Lane**	
Environmental Investigation Costs	
Air & Noise Investigation	$96,300
Sub-Total	$96,300
Preconstruction Engineering Costs	
Noise Walls	$839,600
Sub-Total	$839,000
Construction Engineering / Administration Costs	
Noise Walls	$559,700
Sub-Total	$559,700
Construction Costs	
Noise Walls	$6,996,700
Sub-Total	$6,996,700
Supplemental Agreements and Work Orders	
Noise Wall color match with existing	$14,300
Sub-Total	$14,300
Total Noise Only Environmental Mitigation and Compliance Costs	
TOTAL	$8,506,000

**Noise Analysis is mandated for major construction projects that are federally-funded and meet additional criteria. Noise walls are only constructed when analysis shows they are safe, feasible, a reasonable cost, provide adequate noise reduction, and those impacted vote to proceed.

Environmental Mitigation & Compliance Costs Breakdown: I-35E MnPASS Lane continued	
Project Delivery Costs (Engineering)	
Preconstruction Engineering	$2,629,00
Construction Engineering / Administration	$1,752,700
Sub-Total	$4,381,700
Right of Way Costs (land only)	
Total Project Right of Way Costs	$280,000
Sub-Total	$280,000
Construction Costs	
Total Project Construction Costs	$21,908,600
Sub-Total	$21,908,600
Total Project Costs	
Total Project Delivery Costs (Engineering)	$4,381,700
Total Right of Way Costs	$280,000
Total Project Construction Costs	$21,908,600
TOTAL	$26,570,300

Percentage of Project Costs for Environmental Mitigation & Compliance	
Total Environmental Mitigation Costs divided by Total Project Costs	
$1,053,300 divided by $26,570,300 =	4.0%

Greater Minnesota Project: Highway 23 from Becks Road to Interstate 35

This District 1 project on Highway 23 is an urban corridor from the junction of Becks Road to the junction of Interstate 35, which consisted of pavement resurfacing, new sidewalk and curb ramps, new and replaced signals, and bridge culvert (Munger Bridge) replacement at Kingsbury Creek. MnDOT's District Hydraulics and State Bridge Hydraulics groups worked with the Minnesota Department of Natural Resources to ensure details of the bridge culvert replacement were conducive with the DNR Fisheries stream channel restoration project already in progress.

Environmental mitigation and compliance costs of $1.0 million are detailed below and account for approximately 7.3 percent of project costs.

The total project cost (also detailed below) was $13.9 million. The construction cost of the project was just under $11 million, right of way costs were $715,100, and project engineering costs were $2.2 million.

Table 3: Environmental Mitigation Percentage for Highway 23 in St. Louis County

Environmental Mitigation & Compliance Costs Breakdown: Hwy 23 in St. Louis County	
Environmental Documents: Costs NOT included in the mitigation cost total	
Preliminary Investigation (Categorical Exclusion)	$14,500
TOTAL	$14,500
Environmental Investigation Costs	
Contaminated/Regulated Materials Investigation	$100,600
Sub-Total	$100,600
Preconstruction Engineering Costs	
Stormwater Ponds/Pretreatment Systems	$50,200
Erosion Control	$32,000
Sub-Total	$72,200
Construction Engineering / Administration Costs	
Stormwater Ponds/Pretreatment Systems	$33,500
Erosion Control	$21,400
Sub-Total	$54,900
Construction Costs	
Stormwater Ponds/Pretreatment Systems	$418,400
Erosion Control	$266,900
Contaminated/Regulated Materials Removal, Disposal & Construction Oversight	$102,800
Sub-Total	$788,100
Total Environmental Mitigation and Compliance Costs	
TOTAL	$1,015,800

Project Delivery Costs (Engineering)	
Preconstruction Engineering	$1,316,400
Construction Engineering / Administration	$877,600
Sub-Total	$2,194,000
Right of Way Costs (land only)	
Total Project Right of Way Costs	$715,100
Sub-Total	$715,100
Construction Costs	
Total Project Construction Costs	$10,969,900
Sub-Total	$10,969,900

Environmental Mitigation & Compliance Costs Breakdown: Hwy 23 continued

Total Project Costs	
Total Project Delivery Costs (Engineering)	$2,194,000
Total Right of Way Costs	$715,100
Total Project Construction Costs	$10,969,900
TOTAL	$13,879,000

Percentage of Project Costs for Environmental Mitigation & Compliance	
Total Environmental Mitigation Costs divided by Total Project Costs	
$1,015,800 divided by $13,879,000 =	7.3%

Trunk Highway Fund Expenditures

The following contains fiscal year 2017 cost information for each of the categories listed in the graph below. The graph lists the budgetary expenditures by category. A brief explanation follows, describing what is included in each cost category.

Table 4: Trunk highway fund and trunk highway bond fund expenditures by category (millions)

Number	Category Name	TH Fund Expenditures
1	Road construction	$1,104.30
2	Design and engineering	$216.60
3	Labor	$387.90
4	Acquisition of right of way	$46.10
5	Litigation	$5.80
6	Maintenance	$130.80
7	Road operations	$246.80
8	Planning	$17.70
9	Environmental compliance	$14.40
10	Administration	$119.9

Note: In $ millions

1. Road construction costs include all actual costs and encumbrances for road and bridge construction contracts. It includes both the design and engineering and construction cost portions of design/build contracts, and project related consultant costs.

2. Design and engineering costs include all costs and encumbrances for design, pre-design, construction and other engineering activities performed internally by MnDOT employees and by consultants.

3. Labor costs include all MnDOT expenditures to pay MnDOT employee wages including overtime and benefits for full-time, part-time and unclassified employees.

4. Right of way acquisition costs include all costs and encumbrances to acquire and manage land assets for the trunk highway system.

5. Litigation costs include the following: payments to the state Attorney General's Office for legal services, costs paid for expert witness fees, court reporters and transcribers, tort claims, and general and administrative costs related to legal services.

6. Maintenance costs include all costs and encumbrances to operate and maintain the trunk highway system, including bridges and structures inspection and maintenance and system roadways structure maintenance.

7. Road operations costs are all costs and encumbrances related to such activities as snow and ice removal, roadside and auxiliary infrastructure, and traffic devices operation and maintenance.

8. Planning costs are all costs for planning related to construction and maintenance of the trunk highway system, paid either to MnDOT employees or consultants.

9. Environmental compliance costs are derived from the completion of environmental review processes, documentation of review processes (e.g. Categorical Exclusions), environmental assessment worksheets, environmental impact statements, and environmental plans. Both internal employee and consultant costs are included.

10. Administration costs include all general and administrative costs related to the construction, maintenance and general support of the trunk highway system.

PLEASE NOTE:

- Debt service is not included in the road construction category.
- These 10 categories, required by the statute, do not represent all Trunk Highway Fund expenditures. Also, these 10 categories are not mutually exclusive; some expenditures are reported in more than one category, such as labor and administration.

Products and Services Budget and Spending

Since 2014, MnDOT implemented and refined reporting of expenditures by products and services as required by statute. The budget and spending information in this section is for fiscal year 2017 for all funds.

Methodology

The financial information presented includes spending by each MnDOT office and district. This shows how each office and district contributes to the products and services that MnDOT delivered. Budget and expenditure amounts include bond proceeds.

Notes about the data

- Budgets are estimated at the beginning of each year, and are not updated to reflect the various changes that occur throughout the year, including carryforward of funds from prior years, legislative actions, change in scope, etc.
- Timing differences between the two years of a biennium cause variances that would not be present if the report was prepared on a biennial basis. For example, carry-over from the first year of the biennium to the second year impacts the data for the second year.
- Some spending may not match budgets exactly because funds may have been encumbered in one year and expended in another.
- Uncommitted and carry-over budgets may seem to exhibit spending in excess of the total budget; however, this spending occurs within a biennium and is allowed by statute.
- Negative spending amounts exist when corrections from the prior period are made in the current period.

Agency Overhead

Agency overhead includes services provided throughout the department, such as:

- leave time
- fleet support
- buildings
- building services and maintenance
- finance and accounting
- human resources and workforce relations
- training
- supervision
- IT
- legal services
- government relations
- audit
- research
- communication
- citizen participation
- customer relations
- management and administration
- risk reserve
- workers' compensation
- insurance and unemployment

2017 Products and Services Summary

2017 Products and Services Framework

Table 5: Products and Services Framework

Program	
Budget Activity	**Product and Service**
Multimodal Systems	
Aeronautics	Airports Aviation Safety Operations and Regulation
Freight	Commercial Truck and Bus Safety Freight Rail Improvements Freight System Planning Port Improvements Rail Crossing Safety
Passenger Rail	Intercity Passenger Rail Improvement
Transit	Bicycle and Pedestrian Planning and Grants Light and Commuter Rail Transit Planning and Grants
State Roads	
Trunk Highway Program Planning and Delivery	Develop Highway Improvement Projects Highway Construction Management Oversight Plan Highway System Research and Development
Trunk Highway State Road Construction	Other Trunk Highway System Improvements Trunk Highway System Expansion Trunk Highway System Preservation
Trunk Highway Debt Service	Trunk Highway Debt Service
Trunk Highway Operations and Maintenance	Bridges and Structures Inspection and Maintenance Roadside and Auxiliary Infrastructure Snow and Ice System Roadway Structures Maintenance Traffic Devices Operation and Maintenance
Statewide Radio Communications	Radio Towers and Communications
Local Roads	
County State Aid Roads	County State Aid Highway
Municipal State Aid Roads	Municipal State Aid Highway

Note: External Partner Support can be used by any office and any budget activity.

Department Summary

			2016-17 Biennium			
Department Summary	2015 Totals		2016 Totals		2017 Totals	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Airports	108,502	50,028	85,339	57,270	108,916	54,864
Aviation Safety Operation and Regulation	13,644	17,601	19,677	21,951	17,792	15,607
Bicycle and Pedestrian Planning and Grants	66	13,081	4,860	27,124	435	1,051
Bridges and Structures Inspection, Maintenance	12,611	10,647	9,575	10,526	11,372	12,754
Commercial Truck and Bus Safety	3,134	3,641	4,230	3,514	4,458	4,000
County State Aid Highway	930,583	879,055	932,872	871,147	968,594	833,636
Develop Highway Improvement Projects	65,864	92,032	93,760	86,603	86,626	67,825
External Partner Support	191,558	83,474	93,641	84,860	232,137	60,453
Freight Rail Improvements	1,758	2,002	3,311	3,821	2,270	1,974
Freight System Planning	568	457	267	168	177	154
Highway Construction Management Oversight	42,694	45,857	53,179	49,959	48,688	46,702
Intercity Passenger Rail Improvement	2,740	7,365	8,094	5,971	4,316	4,092
Light and Commuter Rail	6,004	589	4,199	3,991	1,403	0
Municipal State Aid Highway	169,162	183,273	183,244	187,444	180,968	151,168
Plan Highway System	26,675	16,827	26,121	16,080	35,765	21,629
Port Improvements	32	1,047	5,899	4,030	1,582	771
Radio Towers and Communications	5,464	28,665	3,852	17,009	15,566	17,854
Rail Safety	9,563	5,127	14,064	10,027	9,589	9,251
Research and Development	17,458	8,992	9,186	7,779	16,166	7,186
Roadside and Auxiliary Infrastructure	18,877	20,366	15,584	17,899	22,460	22,172
Snow and Ice	81,602	80,153	74,351	66,322	76,005	81,847
State Road Construction	1,055,624	1,335,329	1,148,859	1,054,348	1,026,474	1,194,411
System Roadway Structures Maintenance	38,546	41,742	36,488	37,913	45,471	45,389
Traffic Operation and Maintenance	44,471	46,191	41,613	46,821	55,047	40,272
Transit Planning and Grants	140,436	80,179	132,051	114,760	131,814	149,717
Trunk Highway Debt Service	199,739	157,024	197,381	183,156	231,199	195,704
Direct	3,187,375	3,210,744	3,201,697	2,990,493	3,335,290	3,040,483
Agency Overhead	270,600	317,481	391,084	294,068	272,407	355,726
Grand Total	3,457,975	3,528,225	3,592,781	3,284,561	3,607,697	3,396,209

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding

Note: Upon continued products and services maturity, beginning in FY15 fleet and inventory costs were included in Direct Expenses. Fleet and inventory totaled $81million in FY17, $70million in FY16 and $94million in FY15.

Note: The Agency Overhead amounts above include items such as workers compensation, severance (medical portion), unemployment, and risk reserve. These specifics items totaled $12,857 in FY15, $13,415 in FY 16 and $13,837 in FY 17.

Division Summary

Division Summary	Chief Counsel Division		Chief of Staff Division		Commissioners Office Division	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Airports						
Aviation Safety Operation and Regulation						
Bicycle and Pedestrian Planning and Grants						
Bridges and Structures Inspection, Maintenance						
Commercial Truck and Bus Safety						
County State Aid Highway						
Develop Highway Improvement Projects	737	525				
External Partner Support						
Freight Rail Improvements						
Freight System Planning						
Highway Construction Management Oversight	742	763				
Intercity Passenger Rail Improvement						
Light and Commuter Rail						
Municipal State Aid Highway						
Plan Highway System	1,125	1,829				
Port Improvements						
Radio Towers and Communications						
Rail Safety						
Research and Development						
Roadside and Auxiliary Infrastructure						
Snow and Ice						
State Road Construction						
System Roadway Structures Maintenance						
Traffic Operation and Maintenance						
Transit Planning and Grants						
Trunk Highway Debt Service						
Direct	2,604	3,117				
Agency Overhead	8,929	10,129	2,875	3,211	4,912	4,411
Grand Total	11,533	13,246	2,875	3,211	4,912	4,411
Grand Total	3,457,975	3,528,225	3,592,781	3,284,561	3,607,697	3,396,209

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding.

Division Summary (continued)	Corporate Services Division		Engineering Services Division		Modal Planning & Program Management Division	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Airports					108,916	54,864
Aviation Safety Operation and Regulation					17,792	15,607
Bicycle and Pedestrian Planning and Grants					435	1,051
Bridges and Structures Inspection, Maintenance			1,087	2,405		
Commercial Truck and Bus Safety					4,458	4,000
County State Aid Highway						
Develop Highway Improvement Projects	802	787	18,991	21,496	219	250
External Partner Support	945	494	68,623	40,272	2,579	1,687
Freight Rail Improvements					2,270	1,974
Freight System Planning					177	154
Highway Construction Management Oversight	448	431	6,548	6,461	2	11
Intercity Passenger Rail Improvement					4,316	4,092
Light and Commuter Rail					1,403	0
Municipal State Aid Highway						
Plan Highway System	22	80	546	511	29,663	14,189
Port Improvements					1,582	771
Radio Towers and Communications						
Rail Safety					9,589	9,251
Research and Development	277	15	1,962	2,029	9,954	4,184
Roadside and Auxiliary Infrastructure			400	629		
Snow and Ice			22	17		
State Road Construction	0	193	1,479	695	292,786	32,524
System Roadway Structures Maintenance			836	1,080	0	40
Traffic Operation and Maintenance			18	175	140	140
Transit Planning and Grants					131,814	149,717
Trunk Highway Debt Service					231,199	195,704
Direct	2,494	2,000	100,512	75,770	849,294	490,210
Agency Overhead	34,165	57,833	21,438	39,594	18,840	19,631
Grand Total	36,659	59,833	121,950	115,364	868,134	509,841

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding.

Division Summary (continued)	Operations Division		State Aid for Local Transportation Division	
Products and Services	Budget	Spent	Budget	Spent
Airports				
Aviation Safety Operation and Regulation				
Bicycle and Pedestrian Planning and Grants				
Bridges and Structures Inspection, Maintenance	10,285	10,349		
Commercial Truck and Bus Safety				
County State Aid Highway			968,594	833,636
Develop Highway Improvement Projects	65,877	44,767		
External Partner Support	151,586	9,464	8,404	8,536
Freight Rail Improvements				
Freight System Planning				
Highway Construction Management Oversight	40,948	39,036		
Intercity Passenger Rail Improvement				
Light and Commuter Rail				
Municipal State Aid Highway			180,968	151,168
Plan Highway System	4,409	5,020		
Port Improvements				
Radio Towers and Communications			15,566	17,854
Rail Safety				
Research and Development	3,973	958		
Roadside and Auxiliary Infrastructure	22,060	21,543		
Snow and Ice	75,983	81,830		
State Road Construction	732,209	1,160,999		
System Roadway Structures Maintenance	44,635	44,269		
Traffic Operation and Maintenance	54,889	39,957		
Transit Planning and Grants				
Trunk Highway Debt Service				
Direct	1,206,854	1,458,192	1,173,532	1,011,194
Agency Overhead	174,707	203,093	4,052	3,987
Grand Total	1,381,561	1,661,285	1,177,584	1,015,181

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding.

Chief Counsel Division	Chief Counsel		Civil Rights		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Develop Highway Improvement Projects			737	525	737	525
Highway Construction Management Oversight			742	763	742	763
Plan Highway System			1,125	1,829	1,125	1,829
Direct	0	0	2,604	3,117	2,604	3,117
Agency Overhead	7,147	5,268	1,782	4,861	8,929	10,129
Grand Total	7,147	5,268	4,386	7,978	11,533	13,246

Chief of Staff Division	Chief of Staff		Communications		Equity & Diversity		Public Engagement & Constituent Services		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Agency Overhead	392	253	1,191	1,172	942	935	350	851	2,875	3,211
Grand Total	392	253	1,191	1,172	942	935	350	851	2,875	3,211

Note: The offices of Customer Relations and Public Engagement & Constituent Services were combined during 2016 and are therefore both combined under Public Engagement & Constituent Services

Commissioner's Office Division	Audit		Commissioner's Staff		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Agency Overhead	1,847	1,664	3,065	2,747	4,912	4,411
Grand Total	1,847	1,664	3,065	2,747	4,912	4,411

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 28

Corporate Services Division	Administration		Financial Management		Human Resources		Technology Investment Management		Corporate Services Division Administration		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Develop Highway Improvement Projects					802	787					802	787
External Partner Support	105	104	833	328	7	62					945	494
Highway Construction Management Oversight					448	431					448	431
Plan Highway System					22	80					22	80
Research and Development			250	0	27	15					277	15
State Road Construction								193			0	193
Direct	105	104	1,083	328	1,306	1,375	0	193	0	0	2,494	2,000
Agency Overhead	12,397	13,259	5,270	8,051	6,387	6,433	9,137	29,132	974	958	34,165	57,833
Grand Total	12,502	13,363	6,353	8,379	7,693	7,808	9,137	29,325	974	958	36,659	59,833

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 29

Engineering Services Division	Bridges		Construction & Innovative Contracting		Environmental Stewardship		Land Management		Materials & Road Research	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Bridges and Structures Inspection, Maintenance	1,086	1,764			1	0				
Develop Highway Improvement Projects	5,156	4,449	478	164	2,264	2,172	7,345	7,392	3,748	3,085
External Partner Support	55,225	28,732	115	86	189	160	11,394	6,398	1,535	2,582
Highway Construction Management Oversight	1,275	1,033	968	1,007	153	104	544	77	3,608	3,395
Plan Highway System	97	112			435	357			14	25
Research and Development	53	86			216	178			1,693	1,762
Roadside and Auxiliary Infrastructure	9	2			121	122	270	231		
Snow and Ice	0	2			22	15				
State Road Construction	353	54					0	161	1,126	479
System Roadway Structures Maintenance	22	5			20	25				
Traffic Operation and Maintenance	17	32			1	0				
Direct	63,293	36,271	1,561	1,257	3,422	3,133	19,553	14,259	11,724	11,328
Agency Overhead	4,781	4,824	2,529	2,379	3,665	3,134	5,335	4,663	5,128	7,011
Grand Total	68,074	41,095	4,090	3,636	7,087	6,267	24,888	18,922	16,852	18,339

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding.

Engineering Services Division (continued)	Project Management and Technical Support		Engineering Services Division Administration		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Bridges and Structures Inspection, Maintenance			0	641	1,087	2,405
Develop Highway Improvement Projects	0	4,234			18,991	21,496
External Partner Support	165	2,314			68,623	40,272
Highway Construction Management Oversight	0	845			6,548	6,461
Plan Highway System	0	17			546	511
Research and Development	0	3			1,962	2,029
Roadside and Auxiliary Infrastructure			0	274	400	629
Snow and Ice					22	17
State Road Construction	0	1			1,479	695
System Roadway Structures Maintenance			794	1,050	836	1,080
Traffic Operation and Maintenance			0	143	18	175
Direct	165	7,414	794	2,108	100,512	75,770
Agency Overhead	0	5,794	0	11,789	21,438	39,594
Grand Total	165	13,208	794	13,897	121,950	115,364

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 31

Modal Planning & Program Management Division	Aeronautics		Freight & Commercial Vehicle Operations		Passenger Rail		Transit	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Airports	108,916	54,864						
Aviation Safety Operation and Regulation	17,792	15,607						
Bicycle and Pedestrian Planning and Grants							435	1,051
Commercial Truck and Bus Safety			4,458	3,986				
Develop Highway Improvement Projects							58	51
External Partner Support	10	0	1,344	1,337	580	202	45	68
Freight Rail Improvements			2,270	1,974				
Freight System Planning			177	154				
Highway Construction Management Oversight								
Intercity Passenger Rail Improvement					4,316	4,092		
Light and Commuter Rail							1,403	0
Plan Highway System							0	201
Port Improvements			1,582	771				
Rail Safety			9,589	9,251				
Research and Development								
State Road Construction								
System Roadway Structures Maintenance								
Traffic Operation and Maintenance								
Transit Planning and Grants							131,814	149,717
Trunk Highway Debt Service								
Direct	126,718	70,471	19,420	17,473	4,896	4,294	133,755	151,088
Agency Overhead	2,734	2,901	3,466	3,701	114	92	1,206	1,203
Grand Total	129,452	73,372	22,886	21,174	5,010	4,386	134,961	152,291

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding.

Modal Planning & Program Management Division (continued)	Transportation System Management		Modal Planning & Program Management Division Administration		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
Airports					108,916	54,864
Aviation Safety Operation and Regulation					17,792	15,607
Bicycle and Pedestrian Planning and Grants					435	1,051
Commercial Truck and Bus Safety			0	14	4,458	4,000
Develop Highway Improvement Projects	161	199			219	250
External Partner Support	600	80			2,579	1,687
Freight Rail Improvements					2,270	1,974
Freight System Planning					177	154
Highway Construction Management Oversight	2	11			2	11
Intercity Passenger Rail Improvement					4,316	4,092
Light and Commuter Rail					1,403	0
Plan Highway System	29,663	13,988			29,663	14,189
Port Improvements					1,582	771
Rail Safety					9,589	9,251
Research and Development	9,954	4,184			9,954	4,184
State Road Construction	292,786	32,524			292,786	32,524
System Roadway Structures Maintenance			0	40	0	40
Traffic Operation and Maintenance	140	140			140	140
Transit Planning and Grants					131,814	149,717
Trunk Highway Debt Service	231,199	195,704			231,199	195,704
Direct	564,505	246,830	0	54	849,294	490,210
Agency Overhead	8,820	4,849	2,500	6,885	18,840	19,631
Grand Total	573,325	251,679	2,500	6,939	868,134	509,841

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 33

Operations Division	District 1		District 2		District 3		District 4	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Bridges and Structures Inspection, Maintenance	1,307	1,247	549	573	685	694	364	355
Develop Highway Improvement Projects	14,164	5,799	4,544	2,955	5,114	3,996	2,567	2,367
External Partner Support	934	1,036	119	269	374	597	1,384	358
Highway Construction Management Oversight	3,876	5,453	1,860	1,457	4,684	3,299	2,640	1,936
Plan Highway System	301	323	361	354	429	261	233	212
Research and Development			3	2	8	5	1	2
Roadside and Auxiliary Infrastructure	1,315	1,621	1,334	1,315	1,714	1,941	1,374	1,454
Snow and Ice	9,705	11,918	5,944	7,130	8,441	9,871	6,302	6,938
State Road Construction	98,281	163,984	26,814	52,033	58,949	94,750	30,874	87,991
System Roadway Structures Maintenance	5,496	5,066	2,991	3,211	5,435	5,366	3,651	3,882
Traffic Operation and Maintenance	1,493	1,772	915	1,082	2,589	2,561	1,572	1,546
Direct	136,872	198,219	45,434	70,381	88,422	123,341	50,962	107,041
Agency Overhead	16,150	14,741	9,900	9,529	15,475	15,433	10,669	10,545
Grand Total	153,022	212,960	55,334	79,910	103,897	138,774	61,631	117,586

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding.

Operations Division (continued)	District 6		District 7		District 8		Metro District	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Bridges and Structures Inspection, Maintenance	1,749	1,923	826	669	680	649	4,118	4,233
Develop Highway Improvement Projects	8,695	7,279	4,009	2,802	2,228	1,679	22,324	16,260
External Partner Support	43,286	1,451	129	265	94	164	103,792	5,113
Highway Construction Management Oversight	6,992	5,493	2,992	2,894	1,975	1,436	14,755	16,706
Plan Highway System	316	338	287	235	307	239	1,683	1,396
Research and Development	2	0	0	5	0	1	28	15
Roadside and Auxiliary Infrastructure	2,382	2,780	1,659	1,414	927	929	4,950	5,327
Snow and Ice	8,904	10,879	7,335	7,313	4,552	5,548	21,304	21,160
State Road Construction	71,481	177,892	82,849	155,209	28,539	58,120	311,466	361,979
System Roadway Structures Maintenance	4,093	5,053	5,263	4,625	2,332	2,301	15,388	14,766
Traffic Operation and Maintenance	2,495	2,454	1,081	1,108	753	865	24,631	18,921
Direct	150,395	215,542	106,430	176,539	42,387	71,931	524,439	465,876
Agency Overhead	17,720	16,107	12,814	12,065	9,650	9,157	52,027	51,622
Grand Total	168,115	231,649	119,244	188,604	52,037	81,088	576,466	517,498

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 35

Operations Division (continued)	Maintenance		Traffic, Safety & Technology		Operations Division Administration		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent	Budget	Spent
Bridges and Structures Inspection, Maintenance	6	1	1	5			10,285	10,349
Develop Highway Improvement Projects			2,232	1,630			65,877	44,767
External Partner Support	0	18	1,392	82	82	111	151,586	9,464
Highway Construction Management Oversight			1,174	362			40,948	39,036
Plan Highway System			492	1,662			4,409	5,020
Research and Development			3,931	928			3,973	958
Roadside and Auxiliary Infrastructure	6,405	4,762					22,060	21,543
Snow and Ice	3,496	1,073					75,983	81,830
State Road Construction			22,135	8,585	821	456	732,209	1,160,999
System Roadway Structures Maintenance	-14	-1					44,635	44,269
Traffic Operation and Maintenance	18,883	9,561	477	87			54,889	39,957
Direct	28,776	15,414	31,834	13,341	903	567	1,206,854	1,458,192
Agency Overhead	27,884	53,809	2,418	2,620	0	7,465	174,707	203,093
Grand Total	56,660	69,223	34,252	15,961	903	8,032	1,381,561	1,661,285

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 36

State Aid Division	State Aid for Local Transportation		Statewide Radio Communications		Total	
Products and Services	Budget	Spent	Budget	Spent	Budget	Spent
County State Aid Highway	968,594	833,636			968,594	833,636
External Partner Support	1,089	1,225	7,315	7,311	8,404	8,536
Municipal State Aid Highway	180,968	151,168			180,968	151,168
Radio Towers and Communications			15,566	17,854	15,566	17,854
Direct	1,150,651	986,029	22,881	25,165	1,173,532	1,011,194
Agency Overhead	807	686	3,245	3,301	4,052	3,987
Grand Total	1,151,458	986,715	26,126	28,466	1,177,584	1,015,181

Note: The dollar amounts listed in the tables are in thousands. Totals may not add up due to rounding. 37

Productivity Measures

Introduction

Traditional performance measures used by MnDOT are measures of product and service delivery effectiveness. Performance measures have been used at MnDOT since the 1990s. Productivity measures help to evaluate how efficiently MnDOT's products and services are delivered.

Background

The productivity measures are an effort to identify, create, examine and document current levels of productivity within MnDOT for MnDOT's core products and services. This project is aimed at complying with the requirement to annually report measures of MnDOT productivity for the previous fiscal year.

The report includes the following measures:

- Bridge inspection: cost per square foot of deck area
- Bridge maintenance: cost per square foot of deck area
- Pavement: cost per roadway mile-year added
- Snow and ice: cost per plow mile driven
- Pavement markings: cost per mile striped
- Transit: MnDOT administrative cost per transit passenger trip
- Freight: MnDOT administrative cost per oversize/overweight permit issued
- Program planning and delivery to construction expenditure ratio

These areas represent a subset of MnDOT's products and services.

Purpose and scope

The productivity measures contained in this report were identified and developed by each respective operational area. The data is repeatable, verifiable and auditable. Measures of productivity should be viewed in the context of MnDOT's mission to deliver a safe and reliable multi-modal transportation system for Minnesotans. While measures of effectiveness are not included in this report, they can be found within MnDOT's Annual Transportation Performance Report.

Costs are presented in both inflation adjusted and unadjusted terms. The base year for inflation adjusted data is 2017; therefore, the adjusted and unadjusted values for 2017 are identical. Inflation factors were selected for each measure based upon the nature of the work performed and the expenses incurred. For measures where the bulk of costs are labor related, a 2 percent inflation factor is used based on historic MnDOT labor inflation rates. For measures where the bulk of costs are maintenance related, a 3 percent inflation factor is used based on average inflation in MnDOT's maintenance and operations commodities and labor from 2008-2017.

For the pavement measure, actual values are used from MnDOT's pavement surfacing index. The surfacing index has been volatile, but increased an average of 2 percent per year from 2007-2017. For the program planning and delivery to construction expenditure ratio, two different inflation factors were applied. For the program planning and delivery side of the ratio, the 2 percent labor inflation factor is applied since those expenditures are primarily labor. For the construction expenditure side of the ratio, actual MnDOT construction cost index values are used. This index has been volatile, but increased an average of 2 percent per year from 2007-2017.

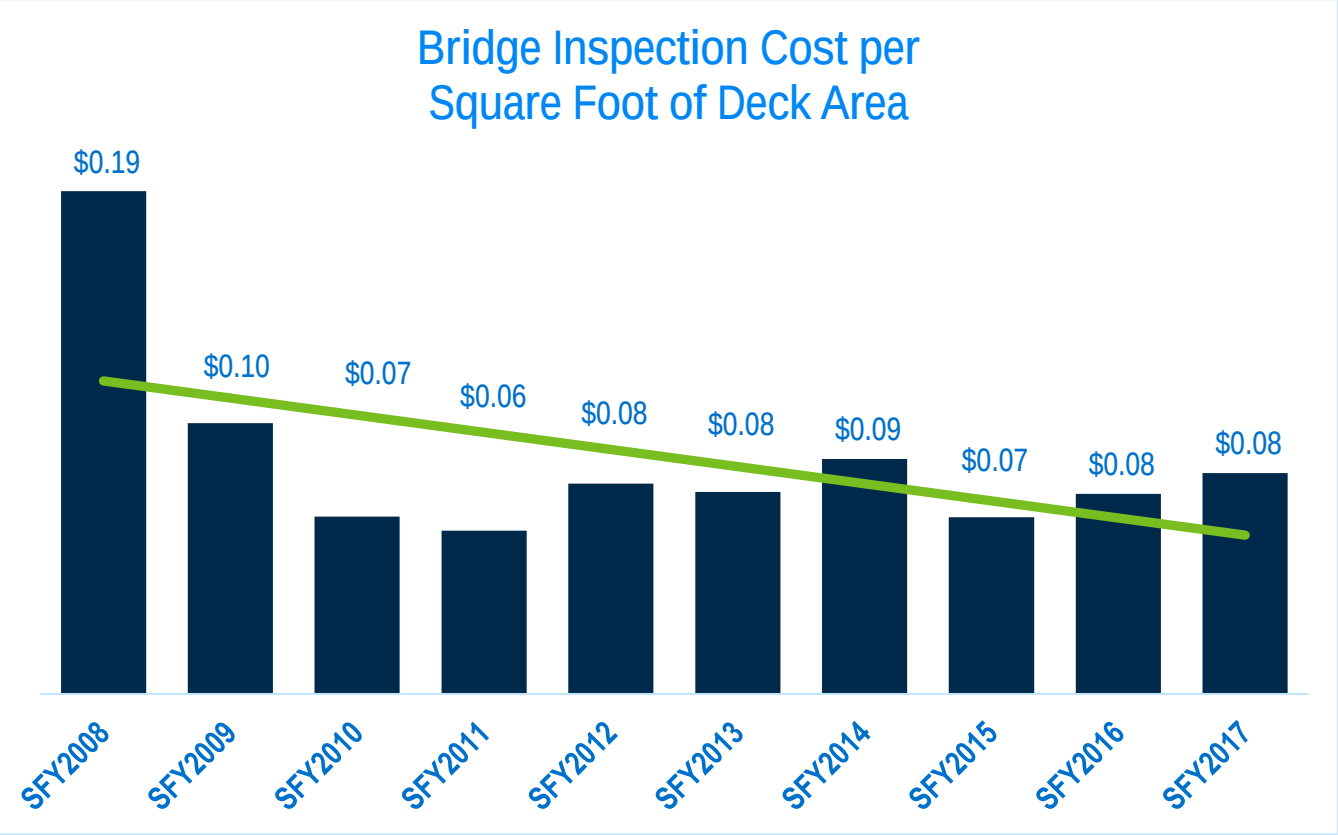
Bridges: Inspection Cost per Square Foot of Deck Area

Routine and fracture critical bridge safety inspections play key roles in maintaining a safe transportation system, ensuring the structural integrity of bridges and keeping MnDOT in compliance with state and federal laws. Bridge safety inspections also provide the condition assessment data that supports MnDOT investment decisions regarding bridge repair, rehabilitation and replacement.

Measure definition

The bridge inspection productivity measure tracks dollars spent on routine and fracture critical bridge inspections (labor and equipment costs) against the total deck area of bridges inspected to calculate the average inspection cost per square foot. Note that these average inspection costs are not necessarily directly proportional to the square footage of a particular bridge. Many factors affect inspection costs such as bridge design type complexity, access, traffic-control requirements, equipment requirements and the bridge's level of deterioration.

Figure 2: State Fiscal Year 2008-2017 Bridge Inspection Cost per Sq. Ft. of Deck Area



The square foot of deck area for 2008–2011 does not include all bridges inspected due to previous cost accounting practices and software limitations. Data from 2012 forward is accurate with regard to both cost and square foot of deck area inspected. Costs were adjusted to 2017 dollars using a 2 percent annual inflation factor based on historic MnDOT labor inflation.

Results and analysis

The cost per square foot for bridge inspections were fairly stable in the years following a spike in 2008 and 2009. Bridge inspection expenses and cost per square foot peaked in fiscal year 2008 when the governor mandated accelerated inspections for all bridges. Changes to the National Bridge Inspection Standards in 2016 intensified inspection and documentation requirements thereby increasing inspection costs.

Table 6: Inflation-adjusted bridge inspection cost per square foot of deck area

State Fiscal Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bridge inspection expenses ($1,000)	$7,607	$3,243	$2,153	$1,920	$2,038	$2,221	$2,206	$2,064	$2,270	$2,428
Sq. ft. of bridge deck inspected (1,000s)	40,191	31,804	32,243	31,236	25,752	29,220	24,934	31,044	30,107	29,182
Cost per sq. ft. of inspection	$0.19	$0.10	$0.07	$0.06	$0.08	$0.08	$0.09	$0.07	$0.08	$0.08

Costs were adjusted to 2017 dollars using a 2 percent annual inflation factor based on historic MnDOT labor inflation.

Table 7: Actual (unadjusted) bridge inspection cost per square foot of deck area

State Fiscal Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bridge inspection expenses ($1,000)	$6,365	$2,768	$1,874	$1,705	$1,846	$2,052	$2,079	$1,984	$2,225	$2,428
Sq. ft. of bridge deck inspected (1,000s)	40,191	31,804	32,243	31,236	25,752	29,220	24,934	31,044	30,107	29,182
Cost per sq. ft. of inspection	$0.16	$0.09	$0.06	$0.06	$0.07	$0.07	$0.08	$0.06	$0.07	$0.08

Numbers within the table are not adjusted for inflation.

Major influencing factors

Primary factors that influence this measure include changes to:

- Inspection intensity and documentation requirements – changes implemented in 2016 described above
- Fracture critical inspection frequency - changes to the fracture critical bridge inspection frequency from every 48 months to every 24 months in 2008. Fracture critical inspections take more time and are more expensive per square foot of bridge deck area than routine inspections.
- Age of infrastructure and condition of the structure, resulting in more deterioration to monitor and increased inspection times.
- Size and complexity of bridges - trends toward certain new and reconstructed bridges as complex bridges also add inspection time and create access issues.
- Increases in traffic control requirements and the cost of equipment and materials.

Also, since 2012, a possible factor influencing MnDOT time and effort on bridge inspections is the National Bridge Inspection Oversight Program established by FHWA in 2011. This program evaluates state bridge inspection programs for compliance annually using 23 metrics. These metrics were put in place to ensure consistency among states' programs and to ensure bridges are safe, reduce liability for bridge owners and increase public confidence. This program resulted in more administrative costs to the states, and has possibly impacted the amount of time

spent reporting bridge inspection information. Because of the numerous contributing factors, the cost per square foot for bridge inspections is not necessarily directly proportional to the bridge deck area.

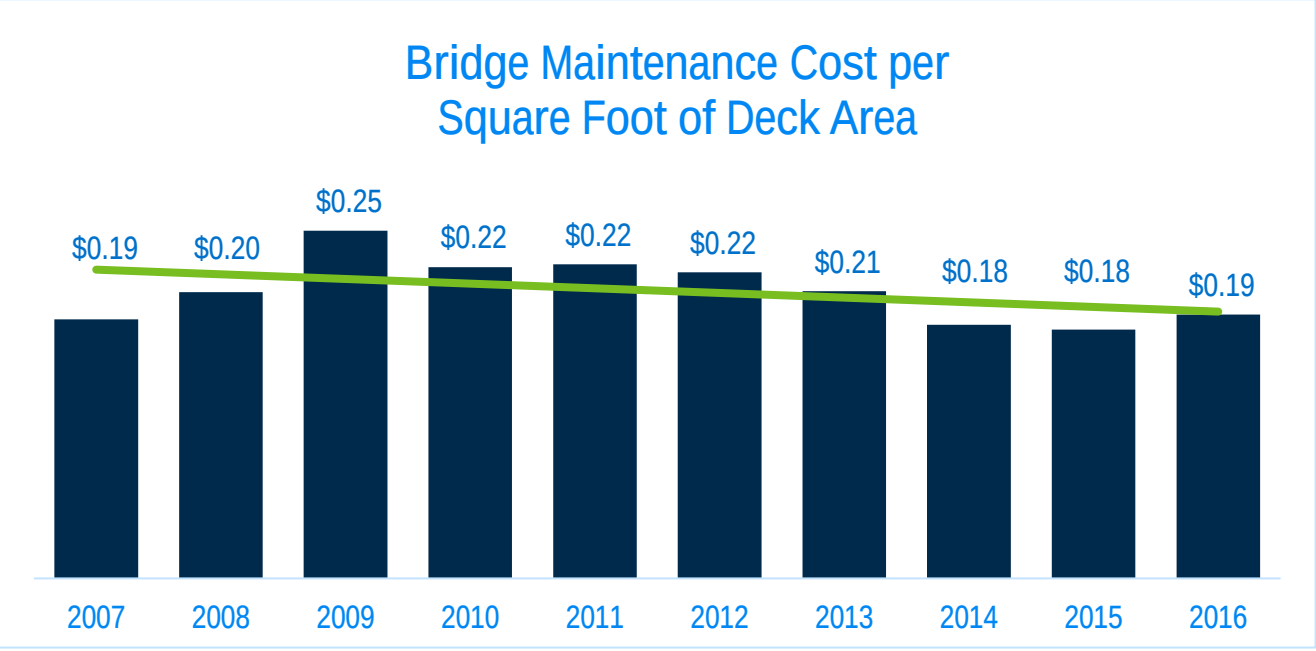
Bridges: Maintenance Cost per Square Foot of Deck Area

Bridge preservation keeps bridges in sound condition and slows their deterioration through preventive and reactive maintenance. Preventive maintenance includes routine maintenance activities performed on a cyclical basis and periodic minor repairs. Reactive maintenance includes those activities scheduled in response to an identified condition that may compromise ride, public safety or bridge structural function. Preventive maintenance on newer bridges is cost effective and will keep them in good condition longer. Reactive maintenance, when needed, will delay the need for extensive rehabilitation or replacement.

Measure definition

The bridge maintenance productivity measure compares dollars spent on preventive and reactive maintenance (labor, equipment and material costs) against the total deck area of Minnesota's trunk highway bridges to calculate the average cost per square foot of deck area maintained. Note that these average maintenance costs are not necessarily directly proportional to the square footage of a particular bridge. Many factors affect maintenance costs such as bridge design type and complexity, access, traffic-control requirements, scope of work, equipment requirements and the bridge's level of deterioration.

Figure 3: 2007-2016 Bridge Maintenance Cost per Sq. Ft. of Deck Area



Costs were adjusted to 2017 dollars using a 3 percent annual inflation factor based on historic MnDOT maintenance and operations commodity and labor inflation.

Results and analysis

Over the last decade, between $0.18 and $0.25 per square foot was spent on average to perform preventive and reactive maintenance adjusting for inflation. As a reference, it costs an average of $150 per square foot to construct a new bridge.

The overall trend is flat, although costs have trended downward over the last few years. MnDOT's ability to perform bridge preventive maintenance was enhanced from FY 2006-2009 (2007-2009 data reflected in this Report) due to a budget shift from State Road Construction to Operations and Maintenance. This may partially account for the temporary rise in maintenance costs per square foot.

With additional funding MnDOT can address medium and low priority reactive maintenance needs that might otherwise wait. Consequently, higher costs per square foot in one year help prevent more urgent and costly repairs in the future. As the bridge system ages, maintenance costs per square foot may trend upwards as the amount of reactive maintenance required is expected to increase.

Table 8: Inflation-adjusted bridge maintenance cost per square foot of deck area

Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Preventive Maintenance Expenditures ($1,000)	$4,571	$4,226	$4,465	$3,868	$4,408	$3,081	$2,788	$3,107	$3,187	$3,174
Reactive Maintenance Expenditures ($1,000)	$4,163	$5,513	$7,319	$6,719	$6,281	$7,334	$7,078	$5,968	$6,143	$5,783
Total Maintenance (3% inflation)	$8,734	$9,739	$11,785	$10,587	$10,689	$10,415	$9,866	$9,075	$9,330	$8,958
Total Bridge Deck sq. ft. (1,000)	47,124	47,576	47,373	47,531	47,543	47,567	48,034	50,003	52,417	47,456
Maintenance Cost per sq. ft.	$0.19	$0.20	$0.25	$0.22	$0.22	$0.22	$0.21	$0.18	$0.18	$0.19

Costs were adjusted to 2017 dollars using a 3 percent annual inflation factor based on historic MnDOT maintenance and operations commodity and labor inflation.

Table 9: Actual (unadjusted) bridge maintenance costs

Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Preventive Maintenance Expenditures ($1,000)	$3,401	$3,239	$3,525	$3,145	$3,692	$2,658	$2,477	$2,843	$3,004	$3,082
Reactive Maintenance Expenditures ($1,000)	$3,098	$4,225	$5,778	$5,463	$5,260	$6,326	$6,289	$5,462	$5,790	$5,615
Total Maintenance	$6,499	$7,464	$9,303	$8,608	$8,952	$8,984	$8,766	$8,305	$8,794	$8,697
Total Bridge Deck sq. ft. (1,000)	47,124	47,576	47,373	47,531	47,543	47,567	48,034	50,003	52,417	47,456
Maintenance Cost per sq. ft.	$0.14	$0.16	$0.20	$0.18	$0.19	$0.19	$0.18	$0.17	$0.17	$0.18

Costs are not adjusted for inflation

Major influencing factors

Budget allocations and the condition of Minnesota's overall bridge system are factors that influence this measure. As the condition of the bridge system trends toward good and satisfactory, preventive maintenance becomes the predominant treatment. As the condition of the bridge system trends toward fair and poor, reactive maintenance needs increase.

Other factors that influence this measure include bridge design type and complexity, traffic control requirements, access and equipment requirements. Because of the numerous contributing factors, the cost per square foot for bridge maintenance is not necessarily directly proportional to the bridge deck area. These costs are very high and are appropriate for monitoring the overall trend.

This report includes only the costs associated with MnDOT-performed preventive and reactive maintenance activities. MnDOT generally self-performs the majority of bridge preservation activities, but future reporting efforts may include contract maintenance work.

Pavement: Cost per roadway mile-year added

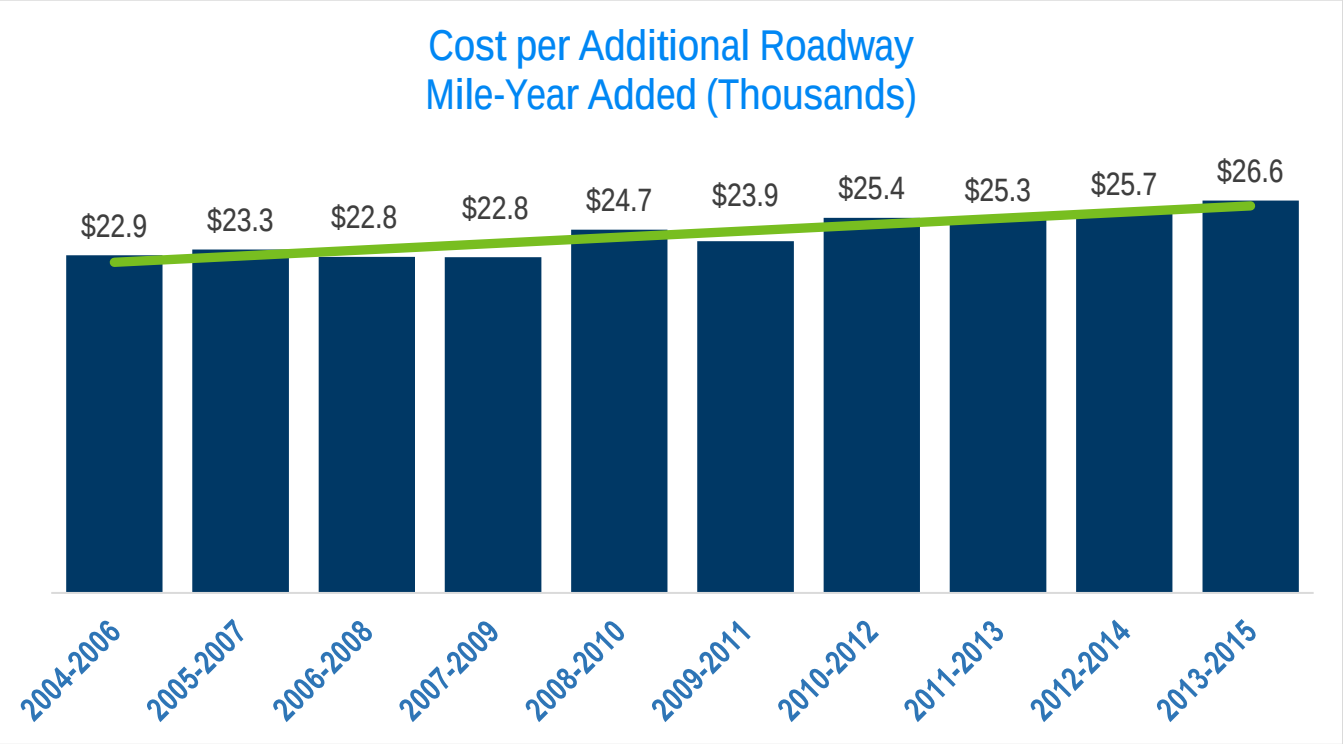
Preserving the functional and structural integrity of Minnesota's highways is a priority for MnDOT because timely repair and replacement reduces long-term costs and because highway smoothness greatly affects Minnesotans' satisfaction with overall state highway maintenance. MnDOT performs a variety of rehabilitation activities that extend the remaining service life of roadways. Remaining service life is the time in years until the roughness of a pavement section is predicted to reach the point where travelers feel the road is rough. A roadway with zero years of service life remaining can still be driven on, but it has reached the point when some sort of rehabilitation is warranted.

Measure definition

The pavement productivity measure compares MnDOT's estimated pavement preservation investments against the number of mile-years it adds to Minnesota's trunk highway system for MnDOT's contracted work. Mile-years are defined as the number of miles of roadway that receive treatment in a given year multiplied by the design life (in years) of that treatment. For example, one mile of roadway that receives a fix expected to last 10 years would be calculated as 10 mile-years.

The investment numbers represent MnDOT's contracted work for the following program categories: reconstruction, recondition, resurfacing and road repair. Work performed by MnDOT labor, such as patching pot holes, is not included. A three-year rolling average is used to smooth financial data that is in fiscal years and condition data that is in calendar years. Additionally, any improvement in condition is captured the year after the investment is made.

Figure 4: Three-year Rolling Average 2004-2015 of Cost per Roadway Mile-Year Added (Thousands)



Costs were adjusted to 2017 dollars using the actual annual Pavement Surfacing Index from the MnDOT Construction Cost Index that has been volatile but increased an average of 2 percent per year for the last 10 years.

Rehabilitation activities that extend service life will add a considerable number of years to the remaining service life of a pavement but are typically more costly. Less expensive short-term fixes may increase the pavement smoothness in the near term, but will not add many additional years of remaining service life. This measure provides a way of looking at the makeup of the pavement program. Long life fixes, while adding considerable life to a roadway, are very costly. Fixes with short lives, while fairly inexpensive, do not add much life to the system. A good balance of long and short term fixes is desired. When budgets are tight, the program will trend toward increased miles of low cost, short life fixes, to keep the system in serviceable condition. As funds increase, a greater number of the higher cost, long life fixes can be part of the program.

Results and analysis

The results through 2015 show the trend in cost per roadway mile-year added is slightly increasing over time. The increasing trend might be related to more items being included in pavement jobs than in previous decades such as culverts, ADA improvements, trails, and shoulder improvements for bicyclists. It should be noted that this measure only includes an analysis of the contracted work that was performed. It does not suggest whether the overall investment in the system is adequate. One must look at the condition of the system, and projected condition based on programmed investment, to see how the system condition is changing over time.

Table 10: Inflation-adjusted cost per roadway mile-year added

3-year averages	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015
Pavement Preservation spending (millions)	$285.3	$286.8	$244.5	$284.7	$328.4	$368.2	$394.5	$440.0	$435.0	$389.3
Mile-Years added (1,000s)	12.4	12.3	10.7	12.5	13.3	15.4	15.5	17.4	16.9	14.6
Cost per roadway mile year added (1,000s)	$22.9	$23.3	$22.8	$22.8	$24.7	$23.9	$25.4	$25.3	$25.3	$26.6

Costs were adjusted to 2017 dollars using the actual annual Pavement Surfacing Index from the MnDOT Construction Cost Index that has been volatile but increased an average of 2 percent per year for the last 10 years.

Table 11: Actual (unadjusted) cost per roadway mile-year added

3-year averages	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015
Pavement Preservation spending (millions)	$187.6	$210.9	$208.7	$258.3	$310.4	$350.8	$396.6	$462.8	$479.1	$439.4
Mile-Years added (1,000s)	12.4	12.3	10.7	12.5	13.3	15.4	15.5	17.4	16.9	14.6
Cost per roadway mile year added (1,000s)	$15.1	$17.2	$19.5	$20.7	$23.3	$22.7	$25.6	$26.7	$28.4	$30.1

Costs were not adjusted for inflation.

Major influencing factors

Inflation in construction costs is a major influencing factor for MnDOT's construction program. Pavement is especially impacted by inflation since asphalt and concrete prices have increased disproportionately compared to other construction activities and commodities in recent history.

In addition, many pavement projects are chosen due to reasons that are not primarily related to pavement condition. The need to improve safety and/or mobility along a route often is a primary reason the project is selected. Although the pavement is repaired or replaced as part of the project, the cost of the project is higher, in some cases much higher, due to the non-pavement related work, such as culvert or underground drainage structure repairs. This makes it difficult to derive a good relationship between the number of years of life added and the dollar spent on pavement repairs. Some years, MnDOT's program has more of these types of projects than others, making it difficult to analyze yearly trends. Finally, as new materials and construction techniques are developed, the lives of the various fixes will hopefully increase, when compared to MnDOT's current methods. If the added cost of the new method provides a substantial increase in pavement life, it will be reflected in this measure.

Snow and Ice: Cost per Plow-Mile Driven

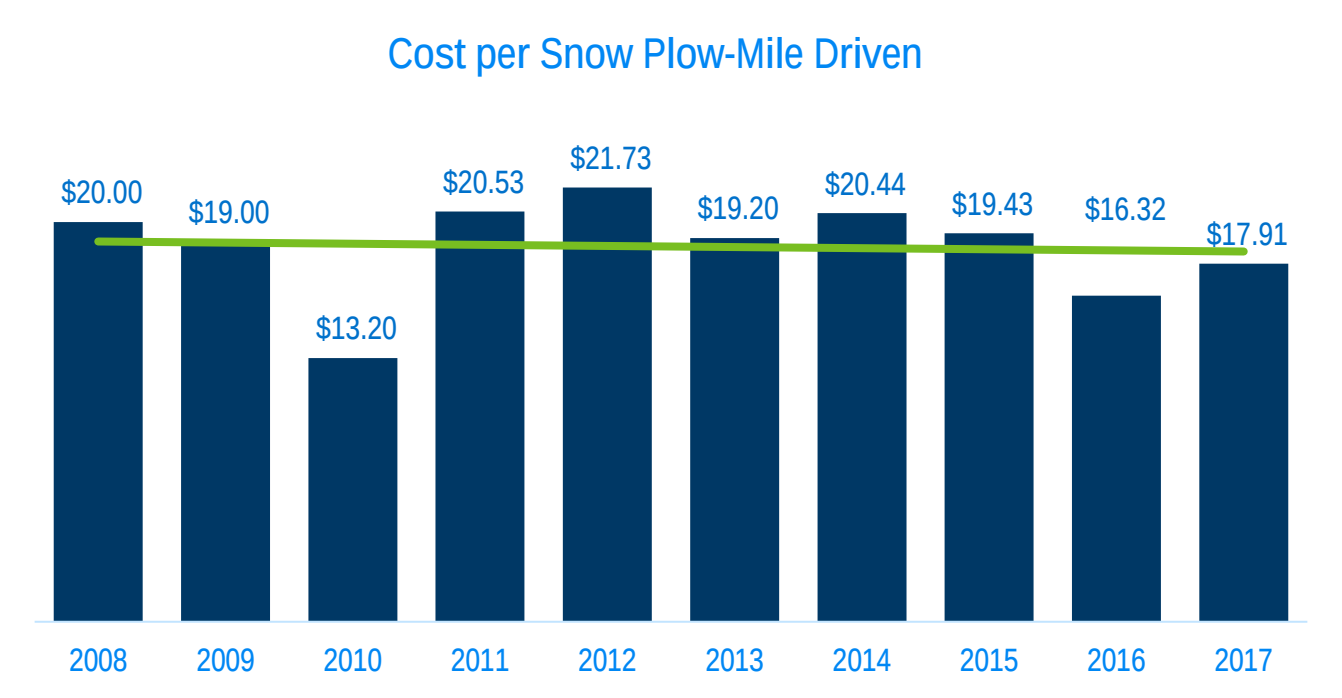
Fast and effective snow and ice control is critically important to Minnesotans' quality of life during the winter months. It preserves mobility, increases traveler safety, reduces damage to vehicles and limits the extent of weather-induced congestion.

The primary goal of MnDOT's snow and ice operations is the safety of Minnesota's traveling public. Citizens expect to be able to carry out normal activities through most weather events and to have transportation facilities that safely accommodate travel shortly after an event has passed. In addition, the snow and ice program works to prevent the accumulation of snow through snow fences and prevent the formation of ice through the application of anti-icing chemicals prior to a snow event.

Measure definition

The snow and ice productivity measure compares dollars spent on MnDOT's snow and ice program against the number of plow miles driven during the snow and ice season. The data includes miles driven to get to and from routes since those miles are required to deliver snow and ice operations.

Figure 5: State Fiscal Year 2007-2017 Cost per Snow Plow-Mile Driven



Costs were adjusted to 2017 dollars using a 3 percent annual inflation factor based on historic MnDOT maintenance and operations commodity and labor inflation.

Results and analysis

The chart above shows the cost per plow-mile driven was stable over nine of the last 10 years. The exceptionally low cost per plow-mile driven in SFY2010 is the result of an exceptionally mild winter.

Table 12: Inflation-adjusted cost per snow plow-mile driven

State Fiscal Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Costs ($millions)	$108.9	$116.1	$93.3	$128.0	$71.9	$126.4	$148.9	$93.3	$97.0	$97.0
Plow Miles Driven (1000s)	5,445	6,111	7,068	6,235	3,306	6,583	7,282	4,800	5,943	5,417
Cost per Mile	$20.0	$19.0	$13.2	$20.5	$21.7	$19.2	$20.4	$19.4	$16.3	$17.9

Costs were adjusted to 2017 dollars using a 3 percent annual inflation factor based on historic MnDOT maintenance and operations commodity and labor inflation.

Table 13: Actual (unadjusted) cost per snow plow-mile driven

State Fiscal Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Costs ($millions)	$83.5	$91.7	$75.9	$107.2	$62.0	$112.3	$136.2	$87.9	$94.2	$97.0
Plow Miles Driven (1000s)	5,445	6,111	7,068	6,235	3,306	6,583	7,282	4,800	5,943	5,417
Cost per Mile	$15.3	$15.0	$10.7	$17.2	$18.8	$17.1	$18.7	$18.3	$15.8	$17.9

Numbers within the table are not adjusted for inflation.

Major influencing factors

Major factors that influence expenses are winter severity (number of events, precipitation totals, wind, etc.) and event timing (rush hour and weekend events). To combat these factors MnDOT is increasing efficiency by implementing innovative technologies and practices including tow plows, anti-icing, pre-wetting, de-icing, comprehensive snowfighter training, snow fences and enhanced materials.

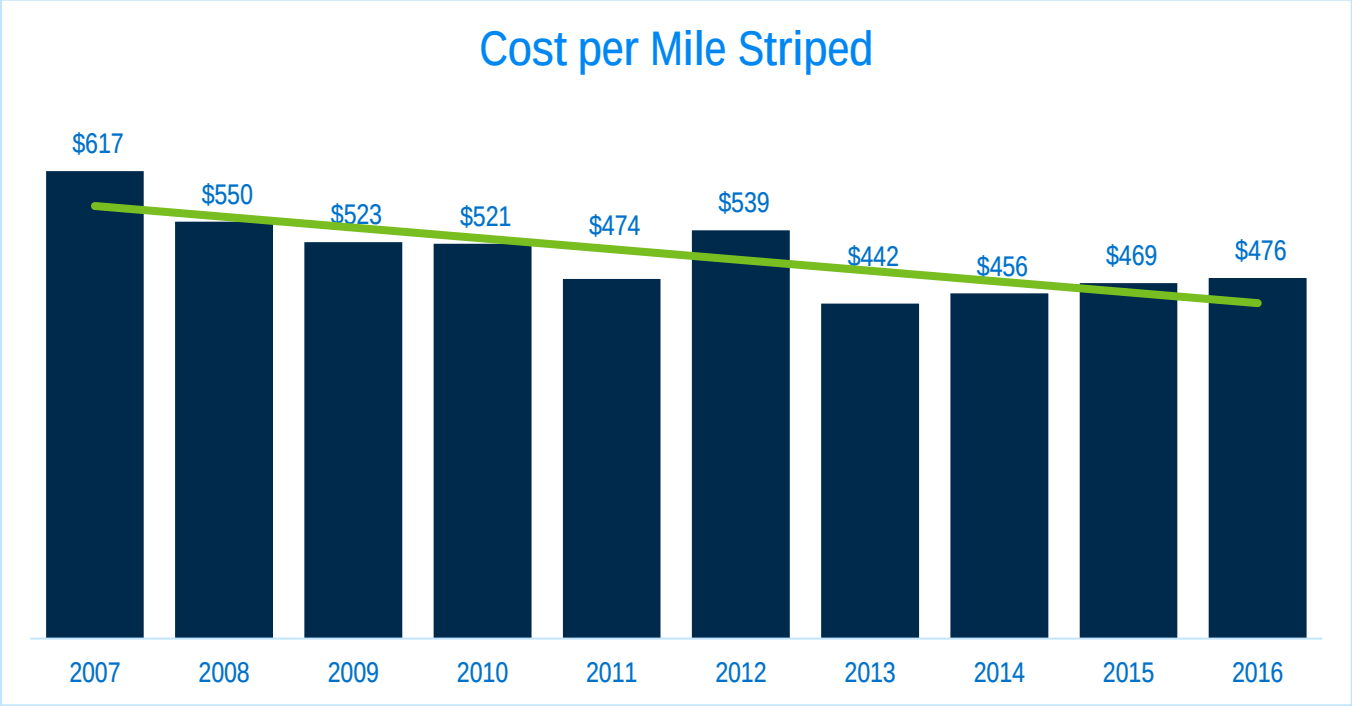
Pavement Markings: Cost per Mile Striped

Pavement markings perform an important function in managing, directing and controlling traffic. In some cases, they are used to supplement the regulations or warnings of other devices, such as traffic signs or signals. Sometimes, they are used alone and produce results that cannot be obtained by the use of any other device.

Measure definition

The pavement markings productivity measure compares dollars spent marking pavements on Minnesota's trunk highway system against the number of miles striped.

Figure 6: Calendar Year 2007-2016 Cost per Mile Striped



Costs were adjusted to 2017 dollars using a 3 percent annual inflation factor based on historic MnDOT maintenance and operations commodity and labor inflation.

Results and analysis

Striping cost per mile trends downward over the reporting period, although it does fluctuate from year-to-year due to the influencing factors listed below.

Table 14: Inflation-adjusted cost per mile striped

Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Striping Costs (1000s)	$9,996	$10,291	$9,416	$8,390	$7,117	$9,001	$6,368	$6,879	$6,895	$7,089
Miles Striped (1000s)	16.2	18.7	18	16.1	15	16.7	14.4	15.1	14.7	14.9
Cost per mile	$617	$550	$523	$521	$474	$539	$442	$456	$469	$476

Costs were adjusted to 2017 dollars using a 3 percent annual inflation factor based on historic MnDOT maintenance and operations commodity and labor inflation.

Table 15: Actual (unadjusted) cost per mile striped

Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Striping Costs (1000s)	$7,438	$7,887	$7,433	$6,822	$5,960	$7,764	$5,658	$6,295	$6,499	$6,883
Miles Striped (1000s)	16.2	18.7	18	16.1	15	16.7	14.4	15.1	14.7	14.9
Cost per mile	$460	$421	$414	$424	$396	$466	$392	$417	$442	$462

Costs were not adjusted for inflation.

Major influencing factors

Equipment, labor and material costs, along with organization, management, supervision, weather, planning and coordination all influence this measure. The materials used also vary greatly, ranging from less costly and less durable markings such as latex, to the midrange product epoxy, to polymer pre-formed tape, which has a long service life and is used for markings that will be exposed to high levels of roadway traffic.

Transit: MnDOT Administrative Cost per Transit Passenger Trip

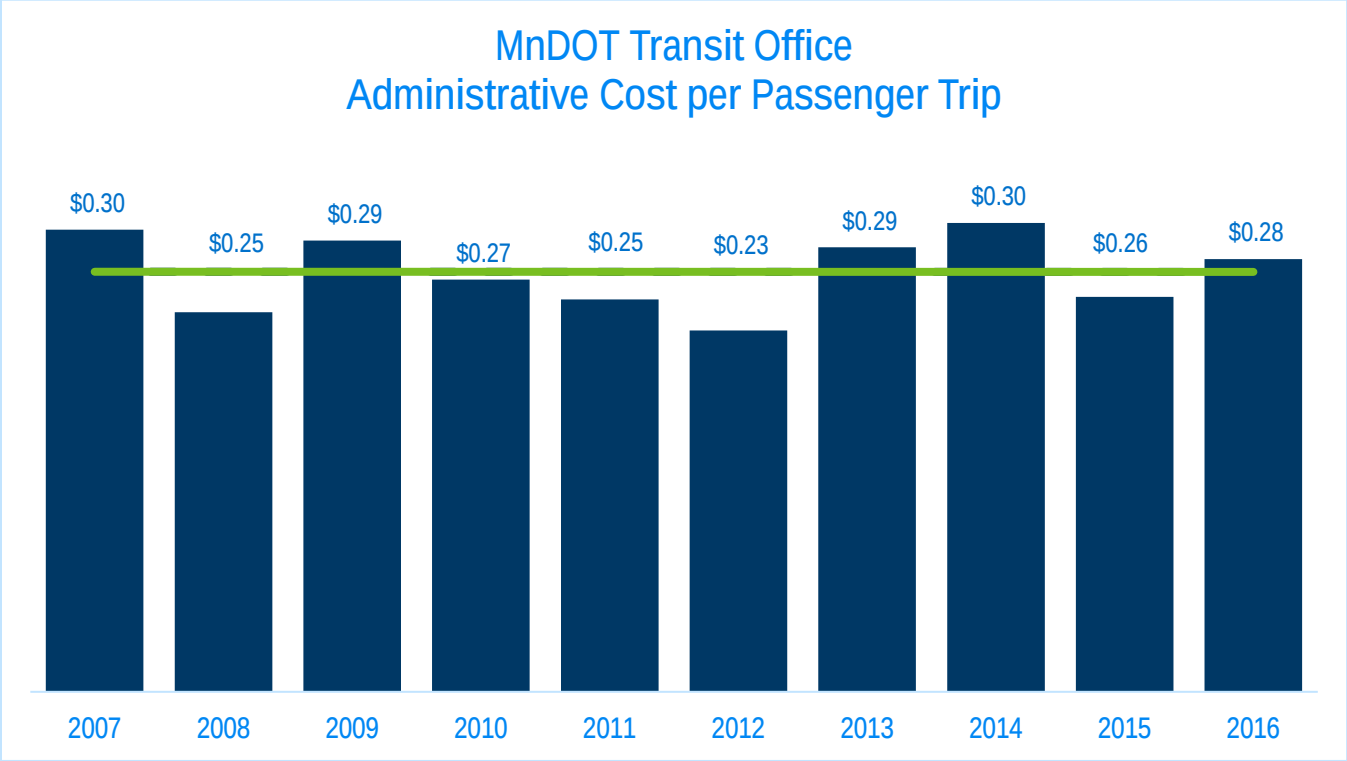
Transit connects people to jobs, family, schools, shopping, health care centers and sports and cultural events. These systems enhance the mobility of the elderly, low-income and persons with disabilities in communities across the state by providing a reliable transportation option. Transit can be an alternative to driving that can reduce congestion, fuel consumption and greenhouse gas emissions.

Greater Minnesota's 37 public transit systems are operated by local governments and non-profits. MnDOT supports these systems through planning, research, technical assistance, and the management of state and federal transit grants for funding programs that administer capital and operational funding. MnDOT's Transit Office also supports transportation for seniors and individuals with disabilities statewide, contributes a share to Northstar Commuter Rail, and administers federal dollars for transit in the rural parts of the seven-county metro area.

Measure definition

The Greater Minnesota transit productivity measure compares dollars spent by MnDOT's Transit Office providing grant agreements and overseeing transit fund recipients against the number of passenger trips provided by those grantees. This measure does not capture the total average cost per passenger trip as it does not include local, state and federal dollars granted directly to local transit providers nor does it include funding collected at the fare box.

Figure 7: Calendar Year 2007-2016 Transit Office Administrative Cost per Passenger Trip



Costs were adjusted to 2017 dollars using a 2 percent annual inflation factor based on historic MnDOT labor inflation.

Results and analysis

The MnDOT Transit Office administrative cost per passenger trip has remained relatively flat over the period of analysis, with moderate fluctuations due to factors listed below.

Table 16: Inflation-adjusted MnDOT administrative cost per transit passenger trip

Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Expenses ($1,000)	$3,275	$2,979	$3,568	$3,406	$3,348	$3,127	$3,978	$4,198	$3,556	$3,799
Greater MN Ridership (1,000's)	10,954	12,128	12,216	12,772	13,189	13,368	13,826	13,839	13,920	13,566
Cost per Ride	$0.30	$0.25	$0.29	$0.27	$0.25	$0.23	$0.29	$0.30	$0.26	$0.28

Costs were adjusted to 2017 dollars using a 2 percent annual inflation factor based on historic MnDOT labor inflation.

Table 17: Actual (unadjusted) MnDOT administrative cost per transit passenger trip

Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Expenses ($1,000)	$2,687	$2,493	$3,045	$2,965	$2,973	$2,832	$3,675	$3,956	$3,418	$3,725
Greater MN Ridership (1,000's)	10,954	12,128	12,216	12,772	13,189	13,368	13,826	13,839	13,920	13,566
Cost per Ride	$0.25	$0.21	$0.25	$0.23	$0.23	$0.21	$0.27	$0.29	$0.25	$0.27

Costs were not adjusted for inflation.

Major influencing factors

Factors that cause fluctuations in MnDOT's administrative cost per passenger trip include regulatory changes such as the introduction of new grant programs necessitating educational outreach and more intensive oversight, increases and decreases in available funding, and the 2011 state government shutdown. MnDOT's Transit Office is working to increase cooperation with local providers to improve service for the traveling public and to build transit providers' administrative capacity to comply with state and federal rules with minimal assistance from MnDOT transit staff.

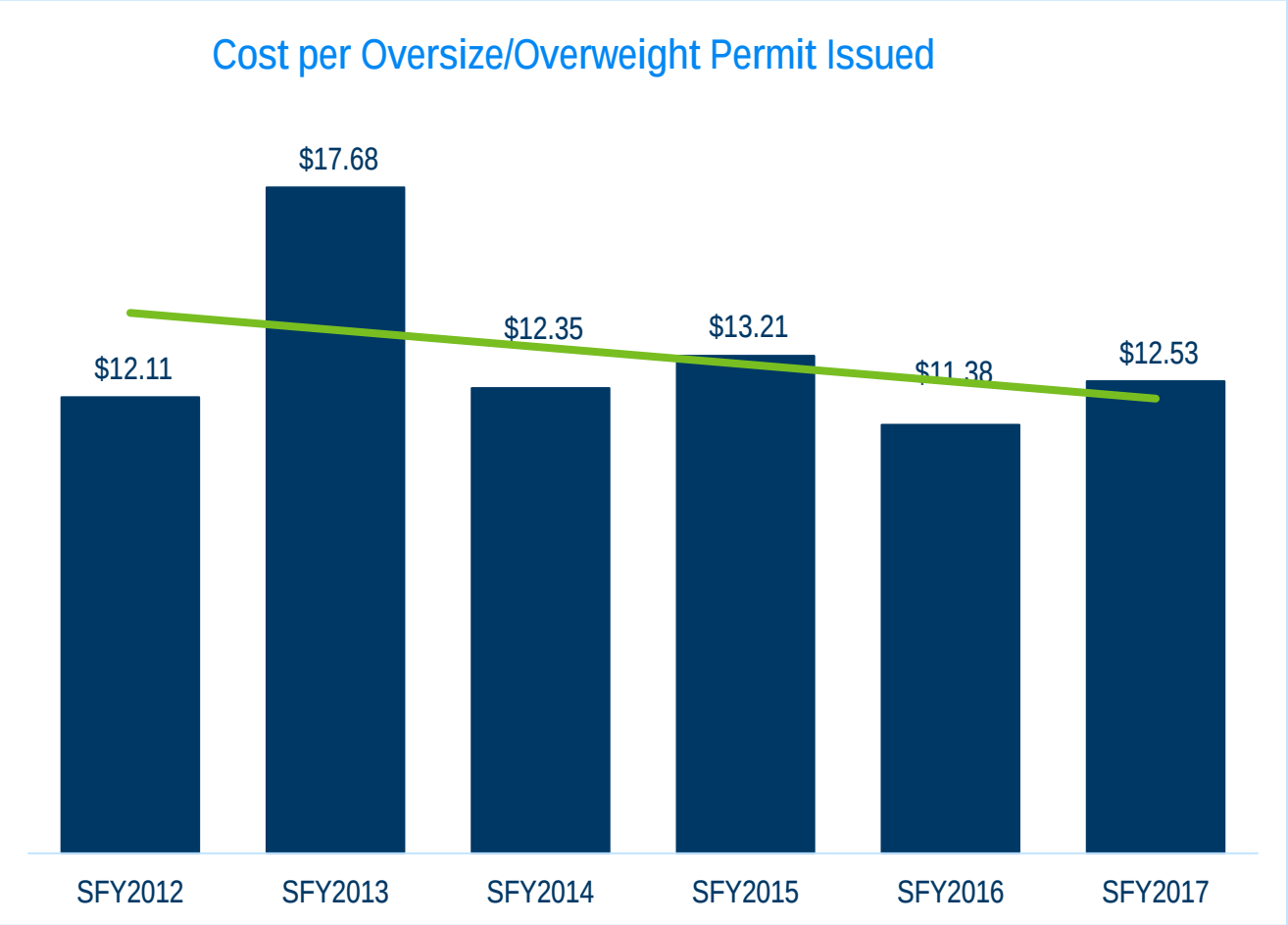
Freight: MnDOT Cost per Oversize/Overweight Permit Issued

Oversize/overweight permitting protects and preserves Minnesota's transportation infrastructure by directing oversized and/or overweight loads toward routes that can safely and efficiently accommodate them, minimizing damage to vulnerable infrastructure. The permitting process benefits freight haulers by helping them identify a compliant route before a truck departs. The permitting process also benefits the public by minimizing the costs of expensive repairs to infrastructure due to damage caused by bridge strikes or damage to pavement from overloading of a roadway or bridge. Applications are currently submitted online, in person, via e-mail or by U.S. mail. Simple applications are typically processed the same day with some online applications processed automatically. For applications requiring special handling due to especially large or heavy loads, the permitting unit conducts a more detailed review, coordinating with relevant engineering and district staff.

Measure definition

The oversize/overweight permit productivity measure tracks dollars spent processing permit requests and directly supporting that work against total permits issued each year. Note that the average cost per permit will differ significantly between simple permit and those that require special handling.

Figure 8: Inflation-adjusted MnDOT Administrative Cost per Oversize/Overweight Permit Issued



Costs were adjusted to 2017 dollars using a 2 percent annual inflation factor based on historic MnDOT labor inflation.

Results and analysis

The cost per oversize/overweight permit issued trended slightly downward over the last six state fiscal years. A notable exception to the downward trend was the spike in SFY2013 that was due to significant enhancements to the permitting software and changes to the payment service. Comparable data is not available for fiscal years prior to 2012 due to a change in accounting systems that year (from MAPS to SWIFT).

Table 18: Inflation-adjusted MnDOT administrative cost per oversize/overweight permit issued

State Fiscal Year	2012	2013	2014	2015	2016	2017
Expenses ($1,000)	$1,078	$1,597	$1,108	$1,149	$946	$980
Permits Issued	89,028	90,372	89,679	86,969	83,093	78,237
Cost per Permit	$12.11	$17.68	$12.35	$13.21	$11.38	$12.53

Costs were adjusted to 2017 dollars using a 2 percent annual inflation factor based on historic MnDOT labor inflation.

Table 19: Actual (unadjusted) MnDOT administrative cost per oversize/overweight permit issued

State Fiscal Year	2012	2013	2014	2015	2016	2017
Expenses ($1,000)	$977	$1,476	$1,044	$1,104	$927	$980
Permits Issued	89,028	90,372	89,679	86,969	83,093	78,237
Cost per Permit	$10.97	$16.33	$11.64	$12.70	$11.16	$12.53

Costs were not adjusted for inflation.

Major influencing factors

Factors that cause fluctuations in MnDOT's administrative cost per oversize/overweight permit issued include:

- total number of permit applications received
- volume of applications submitted by mail, fax, or telephone versus through an online application
- development or purchase of technology that improves the application or route analysis process
- the mix of simple permit applications versus those requiring special handling
- availability of routes for oversized or overweight vehicles on Minnesota's trunk highway network

For loads big or heavy enough to require special handling, incremental increases to a load's size or weight can substantially increase the complexity of a permit.

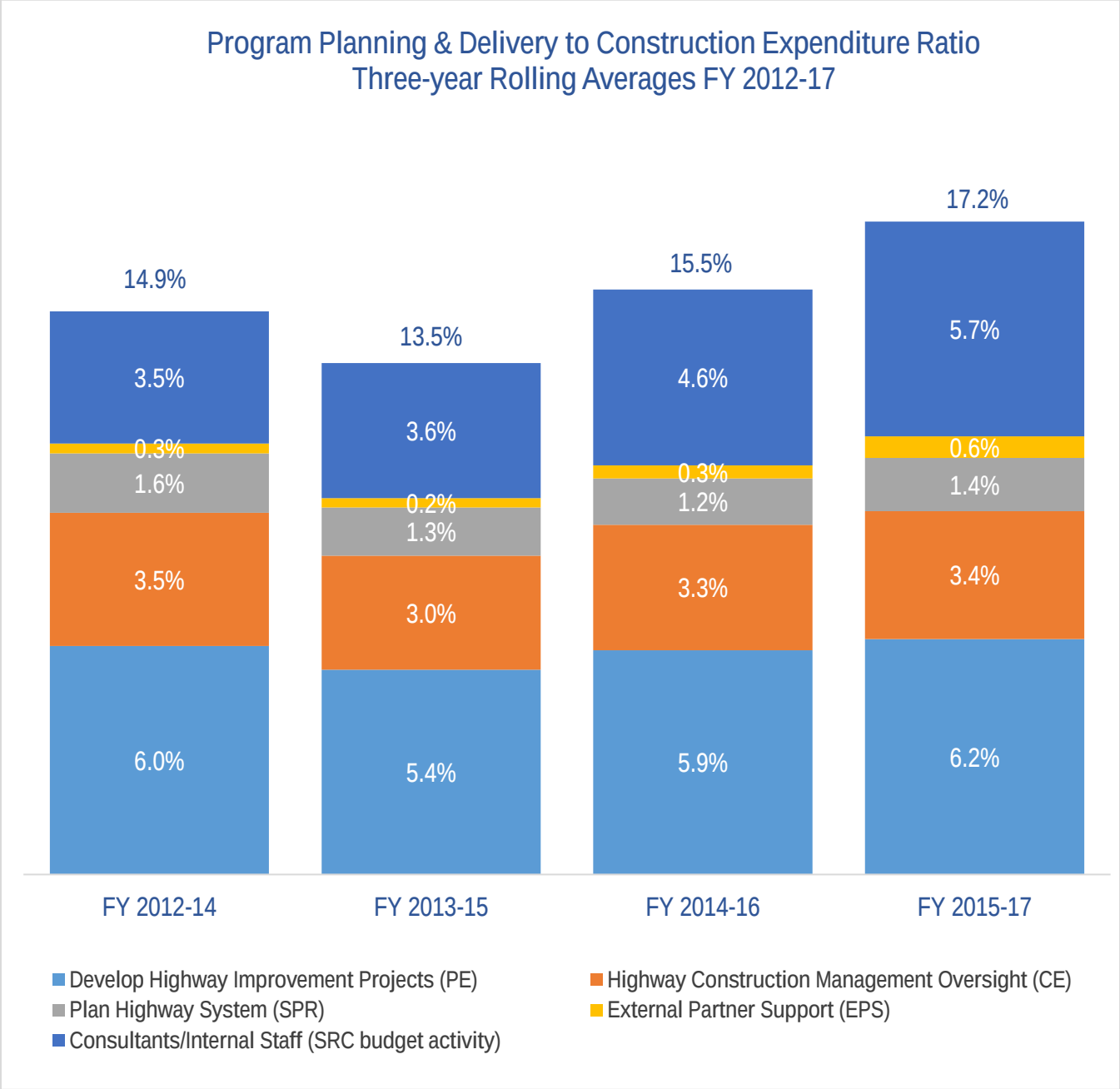
Program Planning and Delivery to Construction Expenditure Ratio

MnDOT manages and delivers the State Road Construction or SRC program. This includes planning at the state and district levels and developing and managing state highway projects from project initiation through completion of construction. MnDOT employees perform the majority of program planning and delivery activities, however consultants are regularly contracted to plan and lead projects. Program planning and delivery includes preliminary engineering, design, construction contract administration, and indirect costs associated with delivering MnDOT's construction program. Private contractors typically construct SRC projects. For this measure, consultant led program planning and delivery costs are subtracted from SRC expenditures and added into program planning and delivery expenditures.

Measure Definition

The program planning and delivery to construction expenditure ratio examines dollars spent on program planning and delivery and compares the amount to construction expenditures*(see note under chart). For this measure, consultant-led program planning and delivery costs are subtracted from SRC expenditures and added into program planning and delivery expenditures. Three-year rolling averages are calculated for this measure because projects typically require multi-year planning and construction expenditures.

Figure 9: Fiscal Year 2012-2017 Program Planning & Deliver to Construction Expenditure Ratio



* Throughout this measure, expenditures reflect budgetary commitments (expenditures and encumbrances) and include consultant-led program planning and delivery. Program delivery expenditure s were adjusted to 2017 dollars using a 2 percent annual inflation rate. Construction expenditures were adjusted to 2017 dollars using the actual annual MnDOT Construction Cost Index that has been volatile but increased an average of -2 percent per year for the last 10 years.

Table 20: Inflation-adjusted planning and delivery to construction expenditure ratio

FISCAL YEAR	2012-14	2013-15	2014-16	2015-17
Develop Highway Improvement Projects ($1,000)	$60,896	$68,415	$75,271	$78,484
Highway Construction Management Oversight ($1,000)	$35,449	$38,054	$42,138	$42,655
Plan Highway System ($1,000)	$15,828	$16,098	$15,558	$17,711
External Partner Support ($1,000)	$2,668	$3,150	$4,375	$7,209
Consultants (SRC budget activity) ($1,000)	$35,195	$45,123	$59,056	$71,546
Program Planning and Delivery Expenditures ($1,000)	$150,035	$170,840	$196,398	$217,604
State Road Construction Expenditures ($1,000)	$1,008,378	$1,264,161	$1,270,871	$1,261,666
Program Delivery Expenditure/Construction Expenditure Ratio	14.90%	13.50%	15.50%	17.20%

Expenditures reflect budgetary commitments (expenditures and encumbrances) of direct costs and include consultant-led program planning and delivery. Program delivery expenditures were adjusted to 2017 dollars using a 2 percent annual inflation rate. Construction expenditures were adjusted to 2017 dollars using the actual annual MnDOT Construction Cost Index that has been volatile but increased an average of 2 percent per year for the last 10 years.

Table 21: Unadjusted planning and delivery to construction expenditure and ratio

FISCAL YEAR	2012-14	2013-15	2014-16	2015-17
Develop Highway Improvement Projects ($1,000)	$66,088	$72,539	$78,185	$80,239
Highway Construction Management Oversight ($1,000)	$38,388	$40,397	$43,828	$43,528
Plan Highway System ($1,000)	$17,163	$17,116	$16,197	$18,036
External Partner Support ($1,000)	$2,862	$3,352	$4,545	$7,279
Consultants (SRC budget activity) ($1,000)	$38,014	$47,809	$61,278	$72,823
Program Planning and Delivery Expenditures ($1,000)	$162,514	$181,213	$204,033	$221,906
State Road Construction Expenditures ($1,000)	$999,526	$1,187,767	$1,161,055	$1,179,003
Program Delivery Expenditure/Construction Expenditure Ratio	16.30%	15.30%	17.60%	18.80%

Expenditures reflect budgetary commitments (expenditures and encumbrances) and include consultant-led program planning and delivery. Costs were not adjusted for inflation.

Results and analysis

The graph above shows the program planning and delivery to construction expenditures ratio in three-year averages from 2012-2017, broken out by products and services. Comparable data is not available for fiscal years prior to 2012 due to a change in accounting systems that year (from MAPS to SWIFT).

Adjusted for inflation, the three-year rolling average program planning and delivery to construction expenditure ratio is between 14.9 and 17.2 percent. In other words, to deliver the construction program, MnDOT spends $0.15 and $0.17 in program planning and delivery direct expenditures for every dollar of construction expenditure.

The direct expenditures refer to labor, equipment and materials that are specifically related to the program, planning and delivery activities, such as design and preliminary engineering. Indirect costs of delivering MnDOT's construction program, such as time charged to customer service, public outreach and feedback, governance and consultant management activities are not included. These costs are generally unique to a public agency.

Major influencing factors

Program delivery expenditures such as scoping, environmental review and design typically precede construction expenditures, frequently by several years. Therefore the program delivery expenditures do not exactly line up with the construction program delivered in the same year. The agency is using a three-year rolling average for this measure because projects typically require multi-year planning and construction expenditures. In addition, funding fluctuates. Construction funding increased with one-time programs such as Corridors of Commerce, the American Recovery and Reinvestment Act and the 2008 Chapter 152 bridge-bonding program. In the recent past, MnDOT increased its investment in program planning and delivery for the accelerated development of projects. The three-year rolling average reduces the influence of fluctuating appropriations on the delivery/construction ratio.

While inflation affects all measures, this one includes diverging costs. Labor costs are rising at lower rates than construction costs. If all else is equal, this adjustment would show increasing efficiency over time. There are other factors that could influence this ratio as well; for example, an increased level of effort due to added statutory or regulatory requirements such as endangered species and stormwater treatment.

Efficiencies

MnDOT aims to be a good steward of public funds. Starting in 2015, the department decided to take a more targeted approach to identify and quantify these efficiencies, while looking for additional best practices and improvements. In fiscal year 2017, MnDOT identified an estimated $83 million in savings from new and revised practices deployed across the organization. Including fiscal year 2015 savings, MnDOT achieved an estimated $154 million in saving from these practices over the previous two fiscal years. The majority of these efficiencies identified in FY 2017 came from construction program delivery and project development. Savings identified in the analysis led to program and project costs that were lower than if the efficient strategies were not implemented.

Background

Before embarking on the fiscal year 2015 analysis, MnDOT conducted research on efficiency measurement throughout the country looking at other state DOTs. There were, at the time, three state DOTs that report their overall department efficiencies to the public in a manner similar to the approach chosen for Minnesota: Florida, Utah and Missouri. Florida and Utah highlight illustrative examples of efficiency on a case by case basis. Missouri's efficiency and performance measurement tracker summarizes its savings by benchmarking its use of practical design', innovation and value engineering. Missouri also analyzes how savings from construction bids that come in lower than estimated are reallocated. MnDOT uses an approach similar to that of Missouri.

Compared to other states, MnDOT is conservative in its efficiency measurement by only tracking savings that are directly attributed to deliberate decisions in planning, project management and delivery that advance efficient outcomes. Although external market forces can have an impact on MnDOT's ability to stretch each dollar further, the agency is not counting savings that can be attributed to external market forces in this analysis.

Methodology

Overview

MnDOT analyzes and evaluates its performance in a number of different ways to measure overall organizational effectiveness. MnDOT evaluates the conditions and service levels being provided to the public through its traditional performance measures.

Although efficiency is always a consideration, there are other priorities MnDOT considers such as equitably providing transportation access regardless of geographic location. The ability to maximize efficiency is often limited by the more significant directive to equitably provide transportation services to all Minnesotans. This is a charge that is not easily measured using traditional performance measures.

To add to traditional performance measures, MnDOT is evaluating and identifying the efficiency with which it operates. Efficiency measurement looks at an organization's ability to maximize the output from a given set of input resources.[1] There are different ways to identify and evaluate levels of efficiency, each with its own strengths and weaknesses. Benchmarking best practices is a common tool for identifying best cases given certain constraints. It analyzes what has worked, why it has worked, in what conditions it has worked, and how it may

[1] Palmer, A. (1993). Performance Measurement in Local Government. *Public Money & Management*, 31-36.

work in the future.[2] The analysis looks to isolate key decisions and strategies that are maximizing outputs without compromising outcomes to the public.[3]

Internal efficiencies are essentially all the ways MnDOT maximizes the use of financial resources through deliberate decisions and business processes that allow the agency to directly save money, avoid costs or provide a higher quality outcome. Efficiencies that provide cost savings and cost avoidance are pursued as long as they do not compromise the organization's legal requirements or the quality of the final product delivered. The evaluation analyzes internal efficiencies and also looks to note decisions that affect the public, but that may limit the organization's options in saving money. Strategic choices that do not provide cost savings, but still enhance MnDOT's service to the public are noted as external impacts in the individual project reports.

Data Limitations

MnDOT is required to evaluate the efficiency of the organization each fiscal year and report on the efficiencies that occurred in the previous two fiscal years. Projects usually take years to be developed, so to identify efficient practices that have produced programmatic savings in the current fiscal year, the department analyzed practices and processes that were implemented in previous years after the initial scoping process was completed, which impacted the overall project cost. For example, projects under construction in fiscal year 2017 were in development for six to 10 years. Many of the decisions have already been made that would lead to significant project savings.

Approach

MnDOT used a best practice case-analysis approach to evaluate and measure efficiency. Best practice evaluation reviews dimensions of efficiency in quality, time and cost.[4] It analyzes what has worked, why it has worked, in what conditions it has worked, and how it may work in the future.[5] MnDOT analyzed each case for implementation of cost saving strategies, designs and processes. Efficiencies were determined by evaluation against the sample of cases across the state. Best cases were determined by comparison of the standard approaches being employed.

1. A comparative process
2. An action
3. A linkage between the action and an outcome or goal

Figure 10: Best practice evaluation components (Bretschneider, Marc-Aurele, & Wu, 2005)

MnDOT is a large organization serving a diverse mission for the state of Minnesota. Strategic decisions and changes to business processes made in one part of the organization often have effects on other parts of MnDOT. To account for this, efficiency measurement was separated into two key areas of the organization to ensure efficiencies are not quantified more than once.

- **State Road Construction**: development and delivery of construction projects that are funded through Minnesota's state road construction budget
- **Administration, Maintenance & Operations**: the administration of the organization including all daily maintenance, long term maintenance and operation of transportation systems

State Road Construction was analyzed for efficiency at the project level, while all other business lines were evaluated at a program level. This distinction reflects where critical decisions are being made and the financial

[2] Behn, R. D. (1993). Case-analysis research and managerial effectiviness. *Public management: The state of the art*, 40-54.
[3] Holzer, Ph.D., M., Fry, J., Charbonneau, E., Riccucci, Ph.D., N., Kwak, S., & Burnash, E. (2009). *Literature Review and Analysis Related to Measurement of Local Government Efficiency.*
[4] Bretschneider, S., Marc-Aurele, F. J., & Wu, J. (2005). "Best Practices" Research: A Methodological Guide for the Perplexed. *Journal of Public Administration Research and Theory*, 307-323.
[5] Behn, R. D. (1993). Case-analysis research and managerial effectiviness. *Public management: The state of the art*, 40-54.

magnitude of those decisions. Transportation construction projects cost millions of dollars with each one involving complex tradeoffs and design considerations that can affect a project's cost by hundreds of thousands of dollars.

Administration, Maintenance and Operations were analyzed for efficiency at the program level. Efficient strategies and business process improvements were evaluated against former approaches. To have a basis for comparison, only emerging strategies that began scaling after the Chapter 152 program in 2008 were used. The efficiencies were analyzed for cost savings by calculating the present value of the approach being taken inclusive of the upfront costs and ongoing cost savings.

Below are the best practice areas that were identified in the efficiency analysis:

State Road Construction

- Pavement Design Methodology
- Performance-based Practical Design
- Innovative Construction Staging
- Value Engineering
- Alternative Technical Concepts

Administration, Maintenance and Operation

- Automated Flagger Assistance Devices
- Dynamic Message Sign Defrosters
- LED Ramp Meters
- LED Roadway Lighting
- Maintenance Decision Support System
- MnPASS Contracting
- MnSTEP
- Portable Signals
- Tow Plows
- Printing Business Practices
- Georilla
- Living Snow Fences
- Connecting MnDOT Facilities by Fiber Optic Network
- Conversion of Fiber Optic Communication Standard
- Importing Sign Data into CAD
- Slurry Tanks
- Ag Tractor Rental Program
- Wood Post Cold Storage Building

State Road Construction

Efficiencies identified in fiscal year 2017 came throughout project development for each project worth more than $10 million and any regionally significant project let in FY 2017. Savings identified in the analysis led to project costs that were lower than if the efficient strategies were not implemented.

MnDOT employs a number of strategies to reduce the overall cost of the projects before delivery. The analysis looked at key business processes directly linked to more efficient project delivery. The projects were evaluated on how well the business process improvements were implemented. The five areas linked to more efficient outcomes are: improved Pavement Design Methodology, Performance-Based Practical Design, Innovative Construction Staging, Value Engineering, and Alternative Technical Concepts. A summary of the savings on major projects can be found below.

Table 22: State Road Construction Efficiencies by Method for FY 2016 and FY 2017

SRC Savings Area	FY 2016	FY 2017
Pavement Design Methodology	$9,072,175	$6,410,000
Performance-Based Practical Design	$34,815,205	$39,200,000
Innovative Construction Staging	$4,340,000	$3,930,000
Value Engineering	$10,153,350	$17,885,000
Alternative Technical Concepts	$1,571,325	$3,490,000
Total Savings	$59,952,055	$70,915,000

Table 23: Total Detailed Efficiency Savings for the State Road Construction program for FY 2017

Project		Total Estimated Efficiency Savings
Hwy 1 - Reconstruction, Grade Surface and Passing Lane (5.7 Miles)		$5,510,000
Pavement Design Methodology	$385,000	
Performance-based Practical Design	$625,000	
Value Engineering	$4,500,000	
I-35 - Pavement Rehabilitation and Rest Area Improvements		$1,910,000
Pavement Design Methodology	$1,475,000	
Performance-based Practical Design	$435,000	
Hwy 2 - Bridge Rehabilitation (Red River, Grand Forks)		$3,750,000
Performance-based Practical Design	$3,000,000	
Value Engineering	$750,000	
Hwy 2 - Bemidji Bypass - Pavement Rehabilitation and Bridge Repair (21.5 miles)		$615,000
Performance-based Practical Design	$450,000	
Innovative Construction Staging	$165,000	
Hwy 10 - Bridge Replacement over Lake Orono, Roadway Reconstruction		$525,000
Performance-based Practical Design	$425,000	
Innovative Construction Staging	$100,000	

Project		Total Estimated Efficiency Savings
Hwy 25 - Pavement Rehabilitation, Drainage, and Safety Improvements (17.5 miles)		$260,000
Pavement Design Methodology	$175,000	
Innovative Construction Staging	$85,000	
Hwy 12 - Pavement Rehabilitation, Drainage, Safety Improvements and Snow Fencing (15 miles)		$725,000
Performance-based Practical Design	$725,000	
Hwy 59 - Pavement Rehabilitation, Drainage, Safety Improvements and Turn Lanes (36 miles)		$500,000
Performance-based Practical Design	$435,000	
Innovative Construction Staging	$65,000	
Hwy 52 - Pavement Overlay, Safety Improvements, Drainage and Turn Lanes (27 miles)		$390,000
Pavement Design Methodology	$275,000	
Innovative Construction Staging	$115,000	
Hwy 63 - Red Wing Bridge Replacement And Approach Roadways		$24,835,000
Performance-based Practical Design	$22,250,000	
Innovative Construction Staging	$2,500,000	
Value Engineering	$85,000	
Hwy 15 - Pavement Rehabilitation, ADA Improvements, Drainage and Signals		$175,000
Pavement Design Methodology	$125,000	
Performance-based Practical Design	$50,000	
Hwy 22 - Pavement Reconstruction, Drainage, Turn Lanes and Bridge Replacement (10.5 miles)		$1,387,000
Pavement Design Methodology	$625,000	
Performance-based Practical Design	$712,000	
Innovative Construction Staging	$50,000	
Hwy 60 - Roadway Reconstruction, Grading, Drainage 2-lane to 4-lane Conversion (8 miles)		$1,518,000
Pavement Design Methodology	$400,000	
Performance-based Practical Design	$968,000	
Innovative Construction Staging	$150,000	
Hwy 14 - Turnback - Pavement Reconstruction, Drainage, Utilities (3 miles)		$450,000
Pavement Design Methodology	$250,000	
Performance-based Practical Design	$200,000	
Hwy 22 - Pavement Rehabilitation (12 miles)		$1,350,000
Performance-based Practical Design	$1,350,000	
Hwy 169 - Pavement Rehabilitation, Grading, Drainage, Bridge Replacement - Design Build		$11,775,000
Innovative Construction Staging	$75,000	
Value Engineering	$9,800,000	
Alternative Technical Concepts	$1,900,000	
I-35 - Pavement Rehabilitation, Bridge Replacement, Drainage and DDI Interchange		$1,590,000
Alternative Technical Concepts	$1,590,000	
I-94 - Pavement Rehabilitation, Drainage, Safety Improvements, Tunnel Repairs		$3,800,000
Pavement Design Methodology	$300,000	
Performance-based Practical Design	$1,500,000	
Value Engineering	$2,000,000	

Project		Total Estimated Efficiency Savings
I-35W - Corridor Reconstruction, Bridge Replacement, Grading, Drainage, Transit and ITS		$9,850,000
Pavement Design Methodology	$2,400,000	
Performance-based Practical Design	$6,075,000	
Innovative Construction Staging	$625,000	
Value Engineering	$750,000	
	Grand Total	$70,915,000

Note: Two other projects were reviewed but no quantifiable efficiencies were identified.

Identified estimated savings reflect costs that were lower than if the efficient strategies were not implemented. The estimated savings identified in FY 2017 were the product of decisions made throughout project development – often over the course of many years. It was not feasible to retroactively calculate where each estimated dollar was repurposed. The agency is working to develop tracking software to better calculate the movement of funds during project development, but at this time it is not equipped to measure at that level of detail. Additionally, actions were evaluated once a project was selected for construction. Decisions being made before a project was selected to be built were deemed to be too abstract to determine causal relationships between actions and more efficient outcomes.

Pavement Design Methodology

In 2015, MnDOT began implementing a new pavement design strategy for its MnPAVE flexible pavement design. Based on findings from Minnesota's Cold Weather Pavement Testing facility, also known as MnROAD, concrete pavement depths were recalibrated to reduce concrete pavement thickness without sacrificing the life of the pavement. This new calibration allows MnDOT to resurface pavements with the thinnest layers possible while maintaining the service life and smooth ride expected. With the new Pavement Design Methodology, paving projects let in FY 2017 saved an estimated $6.4 million.

Performance-Based Practical Design

Performance-based design uses sophisticated analytical tools, flexible design criteria and a value-conscious approach to balance competing objectives, optimize return on investment, and increase local and system-level performance. It uses in-depth analysis and risk assessment to more closely scrutinize the use of funds and the effects on resources and communities. It focuses on building only what is needed while maintaining and improving safety. This is done by scoping projects to stay within the core purpose and need. By eliminating nonessential project design elements, the resulting project is lower cost and has improved return on investment. Through implementation of Performance-based Practical Design, projects let in FY 2017 saved an estimated $39.2 million.

Innovative Construction Staging

MnDOT is working to reduce the need to purchase permanent and temporary property. These acquisitions can be costly. Acquiring property can be so costly that project managers are increasingly using innovate staging strategies to help reduce and mitigate MnDOT's project costs, including the manner in which property is purchased. Through implementation of Innovative Construction Staging, projects let in FY 2017 saved an estimated $3.9 million.

Value Engineering

Value Engineering is a systematic process using a team of people from a variety of disciplines to improve the value of a project. Value can be increased by either improving the function or reducing the cost, while maintaining the safety, necessary quality and environmental attributes of the project. The VE process incorporates, to the extent possible, the values of design; construction; state, local, and federal approval agencies; other stakeholders; and the public. Cost savings, risk reduction, schedule improvements, improved design and quality are common outcomes of VE studies. Through implementation of Value Engineering practices, projects let in FY 2017 saved an estimated $17.9 million.

Alternative Technical Concepts

Alternative Technical Concepts allow for innovation and flexibility during the bidding process. The ATC process allows design-build firms to propose "equal or better" alternatives to the project requirements during the bidding process. The process is used to allow innovation and flexibility in the design and/or construction of a particular element of the project. Through implementation of ATC, projects let in FY 2017 saved an estimated $3.5 million.

Administration, Maintenance & Operations

Emerging strategies and business process improvements were evaluated at a program level. Specific actions were evaluated in comparison to the former approach. Only emerging strategies that were implemented after the adoption of the Chapter 152 program in 2008 were evaluated. An interdisciplinary team of engineers, planners and performance measurement staff evaluated these emerging strategies. They evaluated new approaches being taken, compared them to former processes, and determined if a link existed between the new approach and a more efficient outcome. Efficiencies were analyzed for cost savings by calculating the present value of the approach being taken inclusive of the upfront costs and ongoing cost savings. The costs and savings were then distributed over the life cycle of the new approach (10 years unless otherwise noted). Summaries of the areas reviewed are listed in the following table.

Table 24: Total Efficiency Savings for the Administration, Maintenance and Operations

Program	Total Estimated Efficiency Savings (in 2016 Dollars) FY 2016	Total Estimated Efficiency Savings (in 2017 Dollars) FY 2017
Automated Flagger Assistance Devices	$13,000	$13,000
Dynamic Message Sign Defrosters	$120,000	$120,000
LED Ramp Meters	$66,000	$66,000
LED Roadway Lighting	$2,600,000	$2,600,000
Maintenance Decision Support System	$5,800,000	$6,000,000
MnPASS Contracting	$200,000	$200,000
MnSTEP	$130,000	$140,000
Portable Signals	$100,000	$100,000
Tow Plows	$680,000	$780,000

Program	Total Estimated Efficiency Savings (in 2016 Dollars) FY 2016	Total Estimated Efficiency Savings (in 2017 Dollars) FY 2017
Printing Business Practices	$9,100	$20,000
Georilla	$180,000	$210,000
Blowing Snow Control	$670,000	$760,000
Slurry Tanks	$45,000	$55,000
Connecting MnDOT Facilities	$230,000	$240,000
RTMC Cost Savings (Sonet to IP)	$180,000	$180,000
Sign Placement Tool	$11,000	$20,000
Ag Tractor Rental Program		$450,000
Wood Post Cold Storage Building		$50,000
TOTAL	$11,034,100	$12,004,000

Efficiencies identified in FY 2017 led to administrative, maintenance and operations costs that were lower than if the efficient strategies were not implemented. Staff time savings were reallocated to administrative, maintenance and operational priorities. Capital savings such as snow plow purchases avoided through the use of tow plows allowed MnDOT to reinvest in needed capital priorities. All 2016 efficiencies carried forward in 2017 have a background inflation factor applied. Some have increased due to this inflation factor while others may appear unchanged due to rounding.

Automatic Flagger Assistance Devices

Automated Flagger Assistance Devices are portable traffic control devices with a stop sign and gate that require an operator. The devices are used by flagging personnel instead of traditional flagging equipment. The deployment of AFADs increases safety and efficiency of flagging operations. Efficiencies are realized through the reduction of personnel needed for flagging operations. For example, where a traditional flagging operation requires four people, a flagging operation using AFADs may require only one or two people. The reduction in personnel required for flagging allows for reassignment of people to other aspects of the scheduled work, resulting in quicker turn around and faster project completion. There were no significant changes to AFAD use in 2017. Including all associated costs to implement this program, MnDOT is saving an estimated $13,000 a year by using AFADs.

Dynamic Message Sign Defrosters

Dynamic Message Signs were originally designed with defrosters because of the potential for frost and condensation to cause problems with the electronics and reduce the readability of the displays. Metro freeway operations staff analyzed the cost of electricity for using the defrosters, contacted sign manufacturers for recommendations based on experience with deployments in similar climates and conducted tests on a limited number of the DMS. The results showed DMS operate well without any long term maintenance impacts without using the defrosters. There were no changes to the DMS efficiency in 2017. Including all associated costs to implement, MnDOT is saving an estimated $120,000 a year.

LED Ramp Meters

The installation of low-maintenance LED bulbs on Twin Cities ramp meters reduced electricity usage and freed staff to do other preventative maintenance work. MnDOT replaced all incandescent bulbs in its 430 ramp meter signal locations with longer service life and higher efficiency LED bulbs. Each ramp meter location has 12 individual

bulbs. There is an initial cost outlay for the LED installations, but the savings in electrical utility cost and elimination of the need to replace bulbs over the service life of the ramp metering infrastructure is greatly offset.

This efficiency continued in 2017 with no changes. For purposes of this analysis a 20-year life cycle is anticipated; so, including all associated costs to implement, MnDOT is saving an estimated $66,000 a year through the use of LEDs on ramp meters.

Conversion to LED Roadway Lighting

The statewide LED lighting conversion project involves converting more than 28,500 roadway lights from traditional high-pressure sodium to LED or light emitting diode technology. LED lights have an average life of about 18 years, whereas the life of a sodium bulb is only about four years. The conversion includes replacing both light fixtures and bulbs. Financial impacts will include a sizeable reduction in energy costs and the elimination of labor and equipment costs for the replacement of bulbs every four years. In 2017 MnDOT converted an additional 1,250 lights in Greater Minnesota, bringing totals to approximately 6,250 lights in Greater Minnesota and 18,500 lights in the Twin Cities Metro area. The entire conversion is anticipated to be complete by 2020. For purposes of this analysis a 17-year life cycle is anticipated. Average annual savings for MnDOT will be approximately $2.6 million.

MDSS

The Maintenance Decision Support System, Mobile Data Computers and Automated Vehicle Location are the three technologies that together provide critical information about real-time weather and pavement condition for the most efficient distribution of drivers and equipment for roadway maintenance. The most useful application of MDSS is during snow and ice clearance. The MDSS assists drivers with determining the correct amount of material to apply to the roadway surface, which is usually significantly less than most plow drivers would normally apply. In addition to minimizing environmental impacts of salt and chemical usage, the MDSS also presents significant financial savings for the department. MDSS was fully operational in 2016 on approximately 600 plow trucks. The number of trucks with MDSS capabilities grew to 642 in 2017. By 2020 MnDOT's entire snow plow fleet will be outfitted with MDSS. Including all associated costs to implement, MDSS is generating an estimated $6 million in annual savings.

MnPASS System

The MnPASS system was an innovative conversion of an existing High Occupancy Vehicle lane with a first of its kind dynamic pricing component. This system carefully regulates the number of paying single occupant vehicles within these lanes. For purposes of this analysis the benefit calculated is based on MnPASS's five-year contract life. Including all associated costs to implement, MnDOT is saving an estimated $200,000 a year compared to using an old system on this new business process. This efficiency remains unchanged in 2017.

MnSTEP–MnDOT Stretching Together Employee Program

An aging workforce, rising workers' compensation costs, and increasingly sedentary lifestyles among workers are just some of the challenges that Safety & Loss professionals face while trying to keep employees' safe and costs under control. In 2010 MnDOT's District 3 implemented an employee flexibility program in an effort to: achieve a safe and healthy workplace, reduce the risk of overexertion injuries, increase work performance and reduce workers' compensation costs. After implementation of the program, recordable injuries decreased by 44 percent, lost time injuries decreased by 45 percent, and overexertion injuries dropped by 62 percent. By reducing these types of injuries, average annual workers' compensation costs were down 47 percent and the number of claims were down 32 percent. For purposes of this analysis a five-year life cycle is anticipated. Including all associated costs to implement, MnDOT's District 3 is saving an estimated $140,000 a year by instituting MnSTEP.

Portable Signals

Portable Signal Systems are traffic control devices used instead of traditional flagging personnel and equipment. Once set up, portable signals work without an operator and can be left in place overnight. Efficiencies are realized through the elimination of personnel needed to flag traffic through a work area. The reduction in required personnel for flagging allows for reassignment of people to other projects, resulting in quicker turn around and faster project completion. Including all associated costs to implement, MnDOT is saving an estimated $100,000 annually by using portable signal systems. This efficiency remains unchanged in 2017.

Tow Plows

The operational gap of snow plow trucks needed to deliver snow and ice removal services versus the number of snow plow trucks available in the fleet is partially addressed by outfitting an existing tandem axle truck with an unmanned tow plow. A tow plow is a 26-foot plow that is mounted on a trailer pulled by a tandem axle snow plow truck. When the truck operator pulls a lever, the tow plow moves to the side of the truck. It has the capability to clear a path in excess of 24 feet wide. MnDOT bought and deployed two more tow plows in 2017, thus growing the efficiency by $100,000. Including all associated costs to implement, MnDOT is saving an estimated $780,000 a year by using tow plows.

Printing Business Practices

Printing materials and documents represent a large cost category within administrative areas of the organization. In 2015, central office printers were defaulted to duplex printing. In 2017 MnDOT realized nearly a 2.5 million sheet reduction. A majority of the sheet reduction can be attributed to the switch to automatic duplexing. Additional strategies such as signing and processing administrative documents electronically and transferring documents electronically are also being pursued. Implementation costs for the switch to duplex printing were negligible. MnDOT is saving an estimated $20,000 annually by switching to duplex printing. Calculation based on currently available data for a portion of MnDOT offices.

Georilla

Georilla is a web mapping interface MnDOT's Metro District began using in 2010. Since its inception, it has gained wide acceptance and is a department-wide resource. Currently, Georilla has over 600 users and gets 200 users daily. Georilla brings disparate data and tools together in one interface, allowing managers and employees to access the vast amounts of data across the agency. Georilla provides a map, but also allows employees to drill down into the depths of the data to find greater detail. The financial benefits of Georilla from 2016 forward were evaluated through an agency-wide survey conducted in July 2016 in which 57 employees reported a total of 5,416 hours in annual time savings from Georilla-enabled efficiencies. Compensation was determined by grouping staff, which were generally in either technical or engineering positions, in proportion to hour-weighted reported savings. In 2017 there were over 55,000 site visits to Georilla. Benefits from 2010-2015 were then prorated based on site visits for each year. Using this approach and including all associated costs to implement, MnDOT is saving an estimated $210,000 annually by using Georilla.

Blowing Snow Control Using Benefit Cost Analysis

MnDOT uses an array of blowing snow control measures such as living snow fences, structural snow fences, standing corn rows, strategically placed bales, native tall grass plantings and road design elements. All are intended to either increase snow storage in the road ditch or to prevent snow from blowing from the field onto the roadway. MnDOT now uses a web-based tool developed in 2013 in conjunction with the University of Minnesota Center for Transportation Studies to determine the benefit cost ratio of individual sites, selection

factors include land use, winter climate data and traffic volumes. Over 3,700 blowing and drifting snow problem sites covering approximately 1,200 miles of state highways are identified as potential sites. In 2016 the benefits and costs were determined at seven sites where standing corn rows or bales were used. The median benefit cost ratio of the selected sites was 5 to 1 and this ratio was applied to the statewide program extent of 27 miles, up from 16 miles in 2016. MnDOT paid farmers or landowners an average $5,376.55 per mile for standing corn rows/bales. Farmers are asked to leave five to six rows of standing corn approximately 200 feet from the centerline of the road. By 2026, the program is expected to grow to 50 miles of living snow fence. By applying the 5 to 1 benefit cost ratio to payments made and assuming an expanding program, the department expects to save approximately $760,000 annually over the next ten years.

Snow and Ice Control (Slurry Tanks)

Slurry Tanks are molded tanks saddle-mounted on the outside snowplow dump box. Each tank holds 400 gallons of liquid that is comprised of 70 percent granular salt and 30 percent salt brine solution. Saturating the salt before it is applied to the roadway reduces blow off and scatter and results in fewer snow plow runs to achieve bare pavement. Saturated salt also melts snow and ice more quickly. The financial benefits in this analysis result from reduced salt use. During the 2016-17 season, 23 trucks in the western portion of MnDOT District 6, near Owatonna, were using slurry tanks, this total is up from 19 used during the 2015-2016 season. Including all associated costs to implement, use of those 23 slurry tanks are saving the department an estimated $55,000 annually.

Connecting MnDOT Facilities by Fiber Optic Network

Connecting MnDOT facilities through a wide area network using the Regional Transportation Management Center fiber optic system provides significant cost savings, greater flexibility and more redundancy than historical connections. Capitalizing on the established fiber network also allows for enhanced capabilities like VOIP and facility monitoring. Starting in 2009, MnDOT began connecting its metro area facilities through its own fiber optic network, eliminating the need to pay monthly fees to service providers. Fees ranged from $4,000 per month for a large facility such as the Central Office, to $200 per month for a typical truck station. To date, MnDOT has connected 19 facilities. Including all associated costs to implement, connecting Metro area facilities via MnDOT-owned fiber optic network is saving the department an estimated $240,000 annually.

Conversion of Fiber Optic Communication Standard (SONET to IP)

The electronics communications industry continues to develop new products that combine lower cost with greater capabilities. These new products enabled MnDOT's Regional Transportation Management Center to change the fiber optic communications system backbone from the SONET industry standard to an IP based communication system. Both standards have an approximate lifespan of 10 years. However, the cost of a typical IP switch is $5,500 compared to $35,000 for a SONET switch. By applying the reduced switch cost to the RTMC's 60 switches, and including all associated costs to implement, MnDOT is saving an estimated $180,000 annually.

Sign Placement Tool (Importing Sign Data using MicroStation)

The Sign Placement Tool was developed in MnDOT's Metro District after completing an accurate Geographic Information System sign inventory. The GIS based inventory was essential for furthering asset management within the organization. Development of the SPT then created efficiencies when generating maps, layouts and other resources for work orders and construction plans. The tool is initiated within MicroStation by entering the specific project roadway and associated reference points. The SPT and designer basically create an in-place signing plan at their desk with limited time in the field. This process is not only more efficient than the previous field logging technique but it's also safer and eliminates the need for "boots on the ground" field time. Each year, Metro District staff complete and average of seven sign replacement projects. Prior to development of the tool, each project

required three weeks of field work for one staff person. By using the tool, staff time is reduced to one week of combined field and MicroStation time. Including all associated costs to implement, MnDOT is saving an estimated $20,000 a year using the Sign Placement Tool.

Agricultural Tractor Rental Program

Modeled after a South Dakota program, district fleet staff implemented an agricultural tractor rental program in 2009. Working with manufacturers and implement dealers, MnDOT negotiates reduced rental rates for tractors used primarily for mowing roadsides. In turn, manufacturers and dealers get the benefit of having their product showcased to thousands of drivers and potential customers daily. Tractors are rented for up to 250 hours then returned to dealers where they are then sold, with a full warranty, at reduced prices. In 2017 MnDOT rented a total of 97 tractors using this program and realized savings of approximately $450,000.

Wood Post Cold Storage Buildings

Historically, chemicals used to treat wood foundation posts for buildings have had a tendency to leech contaminants into the soil. Being cognizant of this fact, MnDOT moved to constructing steel post buildings for cold storage purposes. Recent industry advances in wood treatments that reduce soil contamination, have enabled MnDOT, in conjunction with the Office of Environmental Stewardship and the Department of Labor and Industry to use wood posts to construct cold storage facilities. These wood post buildings are generally less expensive to construct. In 2017 MnDOT let one building, to be constructed in 2018 using advanced wood post technology. Estimated costs for constructing a similar building using steel post construction would have additional construction costs of approximately $50,000.

Additional Efficiency Activity

Throughout the department, MnDOT is pursuing other efficiencies. Many are smaller efforts like a minor change to snow plow blades that an operator determines will save time or perform better. Others are larger efforts that are not yet mature, such as using drones or robots for remote inspection of bridges or culverts. As these efforts mature or their deployment grows they will be considered for inclusion in future efficiencies reports.

Appendix A: Products and Services Summary List and Descriptions

2017 Products and Services Framework

Table 25: Products and Services Framework

Program	
Budget Activity	**Product and Service**
Multimodal Systems	
Aeronautics	Airports Aviation Safety Operations and Regulation
Freight	Commercial Truck and Bus Safety Freight Rail Improvements Freight System Planning Port Improvements Rail Crossing Safety
Passenger Rail	Intercity Passenger Rail Improvement
Transit	Bicycle and Pedestrian Planning and Grants Light and Commuter Rail Transit Planning and Grants
State Roads	
Trunk Highway Program Planning and Delivery	Develop Highway Improvement Projects Highway Construction Management Oversight Plan Highway System Research and Development
Trunk Highway State Road Construction	Other Trunk Highway System Improvements Trunk Highway System Expansion Trunk Highway System Preservation
Trunk Highway Debt Service	Trunk Highway Debt Service
Trunk Highway Operations and Maintenance	Bridges and Structures Inspection and Maintenance Roadside and Auxiliary Infrastructure Snow and Ice System Roadway Structures Maintenance Traffic Devices Operation and Maintenance
Statewide Radio Communications	Radio Towers and Communications
Local Roads	
County State Aid Roads	County State Aid Highway
Municipal State Aid Roads	Municipal State Aid Highway

Note: External Partner Support can be used by any office and any budget activity.

Products and Services Descriptions

Aeronautics

Airports: Funding and administering airport grants, assisting local units of government and installing and operating navigational aids.

Aviation Safety Operations and Regulation: Protecting aviation users, promoting aeronautics safety and developing aviation policies and regulations in Minnesota.

Freight

Commercial Truck and Bus Safety: Issuing appropriate registrations, certificates and permits; conducting audits, reviews and safety inspections; and providing information, education and technical assistance related to commercial motor carriers.

Freight Rail Improvements: Funding provided to regional railroad authorities, railroads and shippers to improve rail facilities through the Minnesota Rail Service Improvement program. This includes developing related agreements and administering related grants and loans from other funding sources.

Freight System Planning: Developing plans and information to support an integrated system of freight transportation in Minnesota, including statewide plans related to freight, rail and ports and waterways.

Port Improvements: Funding provided to public port authorities through the Port Development Assistance Program. This includes developing related agreements and administering related grants and loans.

Rail Crossing Safety: Identifying and developing safety improvements at railroad grade crossings: coordinating rail crossing safety and rail regulatory activities and monitoring functions of railroad track and structures.

Passenger Rail

Intercity Passenger Rail Improvement: Activities and grants related to high speed and intercity rail. Includes system planning; project scoping; environmental documents; public hearings; preliminary engineering; final design; rolling stock procurement; acquisitions (including right of way); construction; field inspections; negotiating with the railroads; developing financial, project management and operating plans; value engineering; entering into cost sharing agreements with other public and private entities; carrying out the provisions of the High Speed Rail Compact on behalf of the state; and other technical activities.

Transit

Light and Commuter Rail: All work and grants related to light rail transit, including planning, project scoping, environmental documents, public hearings, preliminary engineering, value engineering, final design, acquisitions (including right of way), construction, field inspection and other technical activities.

Bicycle and Pedestrian Planning and Grants: Developing and implementing the Statewide Bicycle System Plan, Pedestrian System Plan, State Bikeway Route development, State Bicycle Map, bicycle and pedestrian design guidance and program administration. Administering Safe Routes to School grant programs and managing the ABC Ramps.

Transit Planning and Grants: Developing and implementing the Greater Minnesota Transit Investment Plan and other planning activities. This includes programming and administering grants funded by the Federal Transit Administration and state appropriations.

Trunk Highway Program Planning & Delivery

Highway Construction Management Oversight: Managing or monitoring the overall progress of a state highway project through completion of construction and final project documentation. Includes early project coordination to address project specific or procurement method requirements and constraints. Work primarily includes field inspections, oversight, quality management, testing, project scheduling and monitoring for compliance with the schedule and specifications. Work also involves managing and advising appropriate implementation of State Road Construction and federal funding allocations including fiscal management, financial tracking and regulatory conformity.

Develop Highway Improvement Projects: Managing or monitoring the overall progress of a state highway project from project initiation through completion of the project delivery package for procurement and letting. This includes ongoing project coordination as needed to address project specifics and procurement method requirements and constraints; activity coordination to ensure delivery of projects using appropriate scheduling and monitoring tools to ensure efficient delivery on time and within budget; managing and advising appropriate implementation of State Road Construction and federal funding allocations including fiscal management, financial tracking and regulatory conformity. This encompasses all direct and supporting activities necessary for preparing the contract documents and supporting documentation for construction contract procurement and as needed to support the procurement process. The time frame usually begins once a project is identified and ends prior to letting, but can extend into the construction time frame.

Research and Development: Administering and monitoring MnDOT's research program. Guiding policy decisions by developing, refining and testing methods for best practices and by using appropriate economic, demographic and labor market analysis. Providing strategic direction and establishing outcomes and performance measures for MnDOT's research program. Fostering the exchange of technical information and providing access to results of external and internal research.

Plan Highway System: Managing and integrating current data and best practices for multi-modal policy formation and investment packaging: coordinating transportation system plans and policies with other government entities; preparing updates of the statewide plan; applying long-range statewide transportation policies and performance measures at the district level to guide district transportation project/investment decisions both within the district and in regional and inter-regional corridors, which may cross district lines; using mobility performance targets to monitor corridor performance, identify problem areas, and assess where additional management and/or investments are needed to improve under-performing areas. This includes the technical assistance provided to districts and local partners by MnDOT's Central Office.

Trunk Highway State Road Construction

Trunk Highway System Expansion: Hard construction dollars used for expansion on roads and bridges shoulder to shoulder.

Other Trunk Highway System Improvements: Hard construction dollars used for stand-alone projects outside of the highway shoulder, including intelligent transportation systems.

Trunk Highway System Preservation: Hard construction dollars used for preservation of roads and bridges shoulder to shoulder.

Trunk Highway Debt Service

Trunk Highway Debt Service: Repayment of bond debt.

Trunk Highway Operations and Maintenance

Bridges and Structures Inspection and Maintenance: Inspecting, maintaining and operating bridges and structures (bridges, box culverts and overhead sign structures). Conducting bridge inspections, providing inspection training, monitoring and certification; maintaining and repairing bridges; inspecting, maintaining and repairing non-bridge structures such as earth retaining systems (retaining walls), noise walls, tower lighting, roadway lighting and traffic signal systems.

Roadside and Auxiliary Infrastructure: Maintaining rest areas, fixed scale sites, roadside erosion, vegetation, mowing, and regulatory functions such as land management permits, encroachments, noxious weed control, MS4, etc.

Snow and Ice: All work related to keeping the roads clear of snow and ice. Major activities include winter stockpiling, setup and transfer of de-icing materials, plowing and sanding, preparing, inspecting and cleaning equipment, installing snow fences and post storm cleanup.

Traffic Devices Operation and Maintenance: Inspecting, maintaining, operating and managing the highway traffic safety system through signal timing, freeway management/operations, speed zoning, signals, signing, lighting, guardrail, cable median barrier, crash attenuators, pavement markings, traffic management systems (i.e. ramp meters, cameras) and other activities and devices.

System Roadway Structures Maintenance: Inspecting, maintaining and operating the state highway system roadway structures, including pavement, shoulders and drainage.

Statewide Radio Communications

Radio Towers and Communications: Making major wireless or electronic systems upgrades or improvements; providing a shared public safety radio system among state agencies; deploying electronic and wireless communications systems at regional Transportation Operations Communications Centers, maintaining wireless two-way radio communications systems, towers and electronic equipment.

County State Aid Roads

County State Aid Highway: Distributing and administering construction and maintenance funds to counties for eligible roads and bridges.

Municipal State Aid Roads

Municipal State Aid Highway: Distributing and administering construction and maintenance funds to cities with a population greater than 5,000 for eligible roads and bridges.

External Partner Support

External Partner Support (can occur in any of the products and services): Used for dedicated appropriations, including agreements and partnerships. These services are for outside partners, such as cities, counties, other agencies, states, countries or other governmental entities. This can be used by any program or budget activity.

Appendix B: Glossary of Terms

The glossary of terms provides definitions of specific terms used in this report.

Area Transportation Partnership: An ATP is a group of traditional and non-traditional transportation partners including representatives from MnDOT, Metropolitan Planning Organizations, Regional Development Commissions, counties, cities, tribal governments, special interests and the public that have the responsibility of developing a regional transportation improvement program for their area of the state.

The ATP process was introduced in the early 1990s to ensure stakeholder participation in the investment of federal transportation funding. The ATP process provides for early and continuous involvement in the development of the State Transportation Improvement Plan a four-year list of projects that are expected to be done within that time frame.

Change Order: see supplemental agreement

Construction cost index: The Minnesota construction cost index is an indicator of price trends for highway construction. It is composed of six indicator items: roadway excavation, to indicate the price trends for all roadway excavation; concrete pavement and plant-mixed bituminous, to indicate the price trend for all surfacing types; and reinforcing steel, structural steel, and structural concrete, to indicate the price trend for structures.

Cost - Indirect: Indirect costs are those costs that cannot be directly tied to a specific output, e.g. depreciation, routine building maintenance and other administrative and support costs. Indirect costs are frequently referred to as "the cost to keep the lights on."

Cost - Direct: Direct costs occur when expenditures are tied directly to a project number that can be tracked to a customer deliverable. That is, direct cost dollars buy products and/or services delivered directly to the traveling public.

District Risk Management Program: Focuses funding on all non-National Highway System highway needs on all state highways. The majority of the program supports pavement and bridge rehabilitation or replacement projects. The DRMP project selection process is structured to give districts the flexibility to address their greatest regional and local risks. Districts are also able to make additional investments on the NHS system if the proposed project is in response to a high risk issue.

Effectiveness: Performance measure focused on achieving the end goal and takes into consideration any variables that may change in the future. Effectiveness encourages innovation as it demands innovation to meet desired goal(s).

Efficiency: Efficiency is often confused with effectiveness as the output to input ratio and focuses on getting the maximum output with minimum resources and still meet effectiveness measures. Efficiency focuses on doing things right and demands documentation and repetition. An efficiency is a deliberate decision or business process improvement that provides cost savings without compromising the quality of outcomes to the state of Minnesota.

Inflation factor: For unit cost growth across all operations and maintenance activities, MnDOT is using a 3 percent inflation factor based on historical data. It incorporates labor compensation rates and pricing for major commodity materials and services, such as fuel, asphalt, utilities, and salt. A 2 percent inflation factor is used when the bulk of the costs are labor, based on historical MnDOT labor costs.

Internal Efficiency Savings: Internal efficiencies are essentially all the ways MnDOT maximizes the use of financial resources, such as deliberate decisions and business processes that allow MnDOT to directly save money, avoid costs or provide a higher quality outcome. Efficiencies that provide cost savings and cost avoidance are pursued as long as they do not compromise the organization's legal requirements or the quality of the final product delivered.

Metropolitan Planning Organization: A metropolitan planning organization is a federally mandated and federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities.

MPOs, representing local governments and working in coordination with state departments of transportation and major providers of transportation services, have responsibility for the regional transportation planning processes in urbanized areas. A core function of MPOs is to establish and manage a fair and impartial setting for effective transportation decision making in an urbanized area.[6]

Minnesota GO: The Minnesota Department of Transportation's 50-year vision to better align the transportation system with what Minnesotans expect for their quality of life, economy and natural environment. The vision focuses on an understanding that transportation is a means to other ends, not an end in itself. It also recognizes that infrastructure is only one of many elements necessary to achieving a high quality of life, a competitive economy and a healthy environment.

This 50-year vision for transportation requires consistency and collaboration across jurisdictions and sectors. Although MnDOT initiated the effort to develop the vision, this is a vision for all forms of transportation and ownership of the vision is a shared responsibility.

Minnesota's multimodal transportation system maximizes the health of people, the environment and our economy. The system:

- Connects Minnesota's primary assets—the people, natural resources and businesses within the state—to each other and to markets and resources outside the state and country
- Provides safe, convenient, efficient and effective movement of people and goods
- Is flexible and nimble enough to adapt to changes in society, technology, the environment and the economy

Quality of Life	Environmental Health	Economic Competitiveness
Recognizes and respects the importance, significance and context of place – not just as destinations, but also where people live, work, learn, play, and access services Is accessible regardless of socio-economic status or individual ability.	Is designed in such a way that it enhances the community around it and is compatible with natural systems. Minimizes resource use and pollution.	Enhances and supports Minnesota's role in a globally competitive economy and the international significance and connections of Minnesota's trade centers Attracts human and financial capital to the state.

[6] {United States Government Accountability Office (GAO) Report-GAO-09-868, entitled, "Metropolitan Planning Organizations: Options Exist to Enhance Transportation Planning Capacity and Federal Oversight". September 2009. Pages 3-4.}

Minnesota State Highway Investment Plan: The 20-Year Minnesota State Highway Investment Plan 2014-2033 supports the guiding principles from the Minnesota GO vision and links the policies and strategies laid out in the Statewide Multimodal Transportation Plan to improvements on the state highway system.

National Highway System: The National Highway System consists of roadways important to the nation's economy, defense and mobility, and was developed by the Department of Transportation in cooperation with the states, local officials, and metropolitan planning organizations. The NHS includes the following subsystems of roadways (a specific highway route may be on more than one subsystem):

- **Interstate -** The Eisenhower Interstate System of highways retains its separate identity within the NHS.
- **Other Principal Arterials -** These are highways in rural and urban areas that provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- **Strategic Highway Network -** This is a network of highways that are important to the United States' strategic defense policy and that provide defense access, continuity and emergency capabilities for defense purposes.
- **Major Strategic Highway Network Connectors -** These are highways that provide access between major military installations and highways that are part of the Strategic Highway Network.
- **Intermodal Connectors -** These highways provide access between major intermodal facilities and the other four subsystems making up the National Highway System.

Performance measures: Quantifiable indicators used to assess how well, or how effectively, an organization is achieving its desired objectives. Much of the time results are compared against established targets to determine if improvement is needed.

Productivity: The measure of production or output per unit, not necessarily measure in monetary terms.

Project full cost: Actual transaction amounts plus applied overhead cost rates established by MnDOT based on the previous year's activity.

Regional Community Improvement Priority: Regional Community Improvement Priorities are investments that respond to regional concerns and collaboration opportunities, beyond system performance needs, to support economic competitiveness and quality of life in Minnesota. While these investments may improve highway performance, they do not constitute an improvement necessary to meet MnDOT's system-wide performance targets.

Statewide Multimodal Transportation Plan: This document is reflective of Minnesotans' voices, as expressed throughout an intensive engagement and review process. The content is strategically organized into chapters that address the most pertinent questions facing Minnesota's transportation system. The result is a transportation policy framework for all Minnesota partners and transportation modes for the next 20 years. The plan will focus on multimodal solutions that ensure a high return-on-investment while considering the context of place and how land use and transportation systems should be better integrated.

State Transportation Improvement Program: The State Transportation Improvement Program is Minnesota's four-year transportation improvement program. The STIP identifies the schedule and funding of transportation projects by state fiscal year (July 1 through June 30). It includes all state and local transportation projects with federal highway and/or federal transit funding along with 100 percent state funded transportation projects. Rail, port and aeronautic projects are included for information purposes. The STIP is developed/updated on an annual basis.

Statewide Performance Program: The statewide planning process establishes a cooperative, continuous and comprehensive framework for making transportation investment decisions throughout the state. Oversight of the process is a joint responsibility of the Federal Highway Administration and the Federal Transit Administration.

Performance-Based Planning

- The statewide planning process will establish and use a performance-based approach to transportation decision-making to support the national goals (MAP-21 23 USC §150; MAP-21 Fact Sheet on Performance Management, National performance goals; and FAST Act Fact Sheet on Performance Management).
- Each state will establish performance targets that address the performance measures, where applicable, to use in tracking progress toward attainment of critical outcomes for the state.
- The state will select performance targets in coordination with the relevant Metropolitan Planning Organizations to ensure consistency, to the maximum extent practicable.
- In urbanized areas not represented by a MPO, the state will select performance targets in coordination with the providers of public transportation, to the maximum extent practicable, to ensure consistency with sections 5326(c) and 5329(d) of title 49.
- States will integrate into the statewide transportation planning process other performance-based plans and processes

Supplemental Agreement (Change Order): According to the Minnesota Department of Transportation, *Standard Specifications for Construction, 2018 Edition*, a change order (synonymous with supplemental agreement) is a written agreement between the Department and the Contractor, executed on the prescribed form and approved as required by law, covering the performance of extra work or other alterations or adjustments to the Contract.[7]

Trend analysis: The practice of collecting information and developing a pattern or trend in the information. In project management, trend analysis technique uses historical results to predict future outcome.

[7] Minnesota Department of Transportation Standard Specifications for Construction, 2018 Edition; p. 6, 12.

Appendix C: Major Highway Project Summary Pages