

Highway Safety Improvement Program 2017 National Summary Report



FHWA Safety Program



U.S. Department of Transportation
Federal Highway Administration



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Table of Contents

Executive Summary.....	1
Background	3
HSIP Funding Approach.....	3
Data-Driven Safety Decision Making	5
State Safety Programs Administered Under HSIP.....	5
Methodology Types for Selected Programs Administered Under HSIP.....	6
HSIP Projects Overview	7
Project Cost.....	8
Functional Class and Ownership	8
Improvement Categories and Subcategories.....	12
SHSP Emphasis Areas	21
2013-2017 Comparison.....	22
Comparison to Previous Years	24
Benefit-Cost Analysis of the HSIP.....	25
Summary	27
References	28
Appendix A: Full Description of HSIP Improvement Categories and Sub Categories for 2013 HSIP Reporting Guidance	29
Appendix B. Detailed Tables of Project Costs Summaries	35

List of Tables

Table 1. Total number of projects and project cost breakdown, 2013-2017	22
Table 2. Number of projects and average total project cost for various project types, 2013-2017	24
Table 3. Total Number and Cost of Projects by Year	25
Table 4. Weighted BC Ratio for Segment and Intersection Based Projects (weight based on total project cost).....	26
Table 5: Number and Cost of 2017 Projects by Improvement Category	35
Table 6: Number and Cost of Projects by Subcategory for Intersection Geometry	36
Table 7: Number and Cost of Projects by Subcategory for Intersection Traffic Control	36
Table 8: Number and Cost of Projects by Subcategory for Pedestrians and Bicyclists.....	36
Table 9: Number and Cost of Projects by Subcategory for Roadway	37
Table 10: Number and Cost of Projects by Subcategory for Roadside	37

List of Figures

Figure 1: FAST Act Annual Program Apportionments FY17	4
Figure 2: Number of State Safety Programs (top 9).....	6
Figure 3: Number of State Safety Programs (bottom 9).....	6

Figure 4: Count of PIM selected for programs administered under HSIP	7
Figure 5: Number of Projects by Project Cost.....	8
Figure 6. Number of Projects by Functional Class	9
Figure 7. Average Total Cost of Projects by Functional Class	10
Figure 8. Number and Average Total Cost of Projects by Urban/Rural Designation.....	11
Figure 9. Number of Projects by Road Ownership.....	11
Figure 10. Average Total Cost of Projects by Road Ownership	12
Figure 11. Number of Projects by Improvement Category (Top 11)	13
Figure 12. Number of Projects by Improvement Category (Bottom 11)	14
Figure 13. Average Total Cost of Projects by Improvement Category (top 11).....	15
Figure 14. Average Total Cost of Projects by Improvement Category (bottom 8)	16
Figure 15: Number of Intersection Geometry Projects by Subcategory.....	17
Figure 16: Number of Traffic Control Projects by Subcategory	18
Figure 17: Number of Pedestrian and Bicyclist Projects by Subcategory	19
Figure 18: Number of Roadway Projects by Subcategory	20
Figure 19: Number of Roadside Projects by Subcategory	21
Figure 20: Number of Projects by SHSP Emphasis Area	22

Executive Summary

The Highway Safety Improvement Program (HSIP) is a core Federal-aid highway program with the purpose to achieve a significant reduction in fatalities and serious injuries on all public roads. Under the Fixing America's Transportation System (FAST) Act, Congress authorized up to \$2.4 billion per year for States to achieve this goal through the implementation of highway safety improvement projects. The States not only met this challenge, but far exceeded it obligating over \$4 billion for over 4,600 highway safety improvement projects in 2017.

These highway safety improvement projects come in all shapes and sizes. Some HSIP projects are much bigger in scope than others, while other projects include countermeasure installations across multiple sites. The 2017 HSIP National Summary Report provides an aggregate summary of the type and cost of projects across all States. Provided below are highlights of the States' 2017 HSIP implementation efforts.

- Many States have intersection (24 States) and roadway departure (27 States) programs.
- States continue to use crash frequency and crash rate to identify projects in a majority of their safety programs.
- A majority (roughly 64 percent) of HSIP projects cost less than \$500,000 each, with 33 percent of all projects costing less than \$100,000.
- About 18 percent of HSIP projects would be considered high cost, coming in at over \$1 million each. These projects often include widening shoulders, installing cable barrier, adding auxiliary lanes, or other miscellaneous intersection geometry and roadway projects.
- Projects associated with a functional class were most often categorized as rural major collector or rural minor arterial.
- Projects on rural principal arterial freeways and expressways had the highest average total cost per project of \$3.6 million, whereas projects on rural local roads or streets had the lowest average total cost per project of \$194,500.
- There are fewer urban projects than rural projects and the average total cost per project of the urban projects is greater than the average total cost per project of the rural projects.
- About 75 percent of highway safety improvement projects occur on roads owned by the State Highway Agency.
- Projects on roads owned by Town or Township Highway Agencies had the second highest average total cost per project of \$1.7 million, while City or Municipal Highway Agencies had the third highest average total cost per project of approximately \$1.1 million.
- A majority (73%) of highway safety improvement projects falls into the following categories: roadway, intersection traffic control, intersection geometry, roadside, and roadway signs and traffic control.
- On average, States obligated 40% percent of HSIP funds to address systemic safety improvements.
- Interchange design, alignment, and shoulder treatments have the highest average cost per project; whereas parking, speed management, and railroad grade crossing projects have the lowest average cost per project.
- States use HSIP funds to address the predominant infrastructure-related crash types – roadway departure, intersection, and pedestrian crashes.

While the spending patterns don't change much from year to year, the number and cost of HSIP projects has continued to increase. There were 1,684 projects with a total cost of \$1.61 billion in 2009, which rose to 4,616 projects with a total cost of \$4.3 billion in 2017. Over the past eight years, States obligated \$24.9 billion for more than 29,000 highway safety improvement projects. Based on a sample of 2017 HSIP projects, FHWA estimates that the benefits of the HSIP outweigh the costs on a scale ranging from 6.09 to 11.24.

Background

The Highway Safety Improvement Program (HSIP) is a core Federal-aid highway program with the purpose to achieve a significant reduction in traffic fatalities and serious injuries on all public roads through the implementation of highway safety improvement projects. The HSIP, like other Federal-aid highway programs, is a federally-funded, state administered program. The FHWA establishes the HSIP requirements via 23 CFR Part 924, and the States develop and administer a program to best meet their needs.

The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance¹. To obligate HSIP funds, each State shall:

- Develop, implement, and update a State strategic highway safety plan;
- Produce a program of projects or strategies to reduce identified safety problems; and
- Evaluate the SHSP on a regularly recurring basis. [23 U.S.C. 148(c)(1)]

States are also required to submit a report that describes the progress being made to implement highway safety improvement projects and the effectiveness of those improvements. [23 U.S.C. 148(h)] States prepared the 2017 reports using the [HSIP Reporting Guidance](#), dated December 29, 2016. The HSIP Reporting Guidance outlines the content and schedule for the annual HSIP report. The HSIP report should include, at a minimum, a discussion of each State's:

- Program Structure
- Progress in Implementing the HSIP projects
- Progress in Achieving Safety Outcomes and Performance Targets
- Effectiveness of Improvements
- Compliance Assessment

The HSIP 2017 National Summary Report compiles and summarizes aggregate information related to the States progress in implementing HSIP projects during the 2017 reporting cycle. Progress in implementing HSIP projects is described based on the amount of HSIP funds available and the number and general listing of projects obligated as documented in the [2017 HSIP reports](#). The HSIP 2017 National Summary Report is not intended to compare states; rather to illustrate how the states are collectively implementing the HSIP to reduce fatalities and serious injuries on all public roads across the nation. The HSIP 2017 National Summary Report also presents a national benefit cost ratio for the HSIP.

A summary of available funding and the number and general listing of projects from prior years is available in the [HSIP National Summary Baseline Report: 2009 -2012](#), [HSIP 2013 National Summary Report](#), [HSIP 2014 National Summary Report](#), [HSIP 2015 National Summary Report](#), and [HSIP 2016 National Summary Report](#).

HSIP Funding Approach

The FAST Act authorizes a single amount for each year for all the apportioned highway programs combined. That amount is apportioned among the States, and then each State's apportionment is divided among the individual apportioned programs.

¹ FHWA, Fast Act HSIP Fact Sheet, February 2016. <https://www.fhwa.dot.gov/fastact/factsheets/hsipfs.cfm>

The FAST Act (Section 1101) authorizes a total combined amount (\$39.7 billion in FY 2016, \$40.5 billion in FY 2017, \$41.4 billion in FY 2018, \$42.4 billion in FY 2019, and \$43.4 billion in FY 2020) in contract authority to fund six formula programs (including certain set-asides within the programs described below):

- National Highway Performance Program (NHPP);
- Surface Transportation Block Grant Program (STBG);
- **Highway Safety Improvement Program (HSIP);**
- Congestion Mitigation and Air Quality Improvement Program (CMAQ);
- Metropolitan Planning; and
- The new National Highway Freight Program (NHFP)².

Figure 1 illustrates the distribution of funds across programs under the FAST Act.

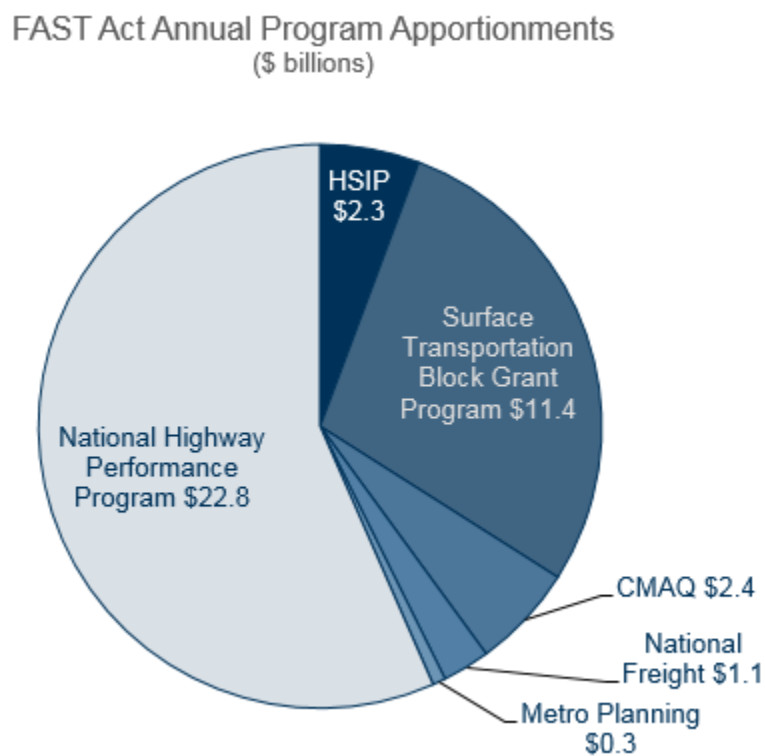


Figure 1: FAST Act Annual Program Apportionments FY17

HSIP receives 7% of the States apportionment remaining after allocations to NHPP, CMAQ and Metropolitan Planning, which amounts to approximately \$2.5 billion each year. The following sums are set-aside from the State's HSIP apportionment:

- Railway-highway crossings -- \$230 million [23 U.S.C. 130(e)]; and
- 2% for State Planning and Research (SPR). [23 U.S.C. 505(a)].

² FHWA, Fast Act Apportionment Fact Sheet, February 2016.
<https://www.fhwa.dot.gov/fastact/factsheets/apportionmentfs.cfm>

In addition, if the High Risk Rural Roads Special rule applies to a State, then in the next fiscal year the State must obligate an amount at least equal to 200% of its FY 2009 HRRR set-aside for high risk rural roads. [23 U.S.C. 148(g)] Further, States that are subject to the 23 U.S.C. 154 and 164 penalties may also receive additional funding for HSIP projects.

HSIP funds, as defined for the remainder of this report, includes HSIP, HRRR and penalty transfer funds that are available to States for the advancement of highway safety improvement projects. Additionally, 'States' refer to all states (excluding California), the District of Columbia, and Puerto Rico. The state of California was excluded from the 2017 HSIP Projects Overview analysis, as many data elements needed to complete the analysis were not available. HSIP expenditures by Puerto Rico is a new addition to the 2017 HSIP report. This data was not available for HSIP reports in previous years.

Data-Driven Safety Decision Making

Beginning in 2016, the HSIP National Summary Report includes an evaluation of how states are using data-driven safety decision making to support their HSIP. This includes the States safety program administered under the HSIP and the methodologies states use to identify projects in each of these programs, as well as the amount of funds used for systemic improvements. On average, States obligated 40 percent of HSIP funds to address systemic improvements. The following sections and figures present information on State's safety programs and problem identification methodologies.

State Safety Programs Administered Under HSIP

States provide a brief overview of each program administered under the HSIP as part of their annual HSIP report. The HSIP Manual³ defines a program as a group of projects (not necessarily similar in type or location) implemented to achieve a common highway safety goal. For example, some States have one program that includes all projects resulting from the HSIP planning component. Other States have multiple "sub" programs. An example of a "sub" program may be a skid treatment program designed to reduce wet-weather-related crashes at different locations. Some States also refer to "sub" programs as initiatives.

Figure 2 and Figure 3 present the number of State safety programs for the 2017 reporting period. Most states have "Roadway Departure" (27 States) and "Intersection" (24 States) programs. Twenty-five states selected 48 programs in the "Other" category. Examples of programs in the "Other" category are: "pavement marking improvements", "longitudinal rumble strips", and "vulnerable road users".

³ FHWA, Highway Safety Improvement Program Manual, FHWA-SA-09-029, January 2010.
<https://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/>

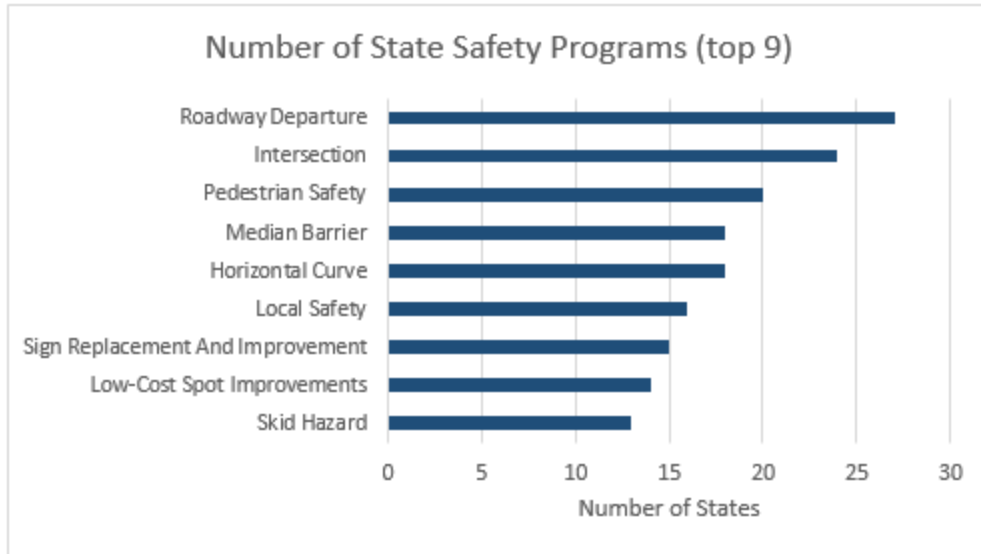


Figure 2: Number of State Safety Programs (top 9)

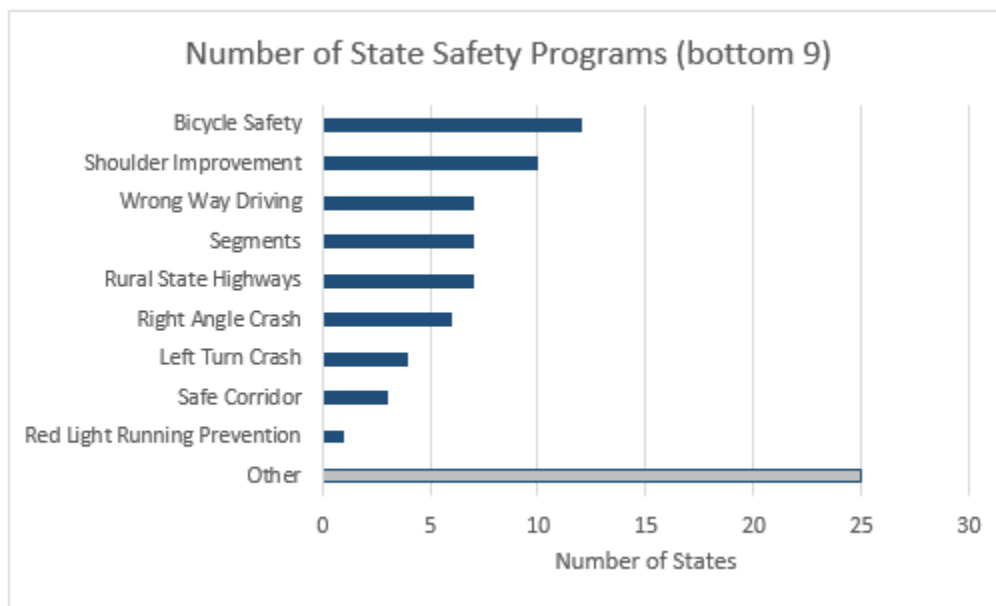


Figure 3: Number of State Safety Programs (bottom 9)

Methodology Types for Selected Programs Administered Under HSIP

For each State safety program administered under the HSIP, a State can also indicate what project identification methodology (PIM) was used for each program, consistent with the 13 PIMs or performance measures defined in the Highway Safety Manual⁴. Figure 4 presents the number of times a particular PIM was selected by the States. Please note that a State can select more than one PIM for each safety program. “Crash frequency” was selected 212 times while “Excess expected crash frequency using methods of moments” was only selected 1 time. Examples of methodologies in the “Other” category are: “Collaboration with county engineers” and “Hierarchical Bayesian Model”.

⁴ Highway Safety Manual, 1st edition, AASHTO, Washington, D.C., 2010.

PIMs selected for programs administered under HSIP

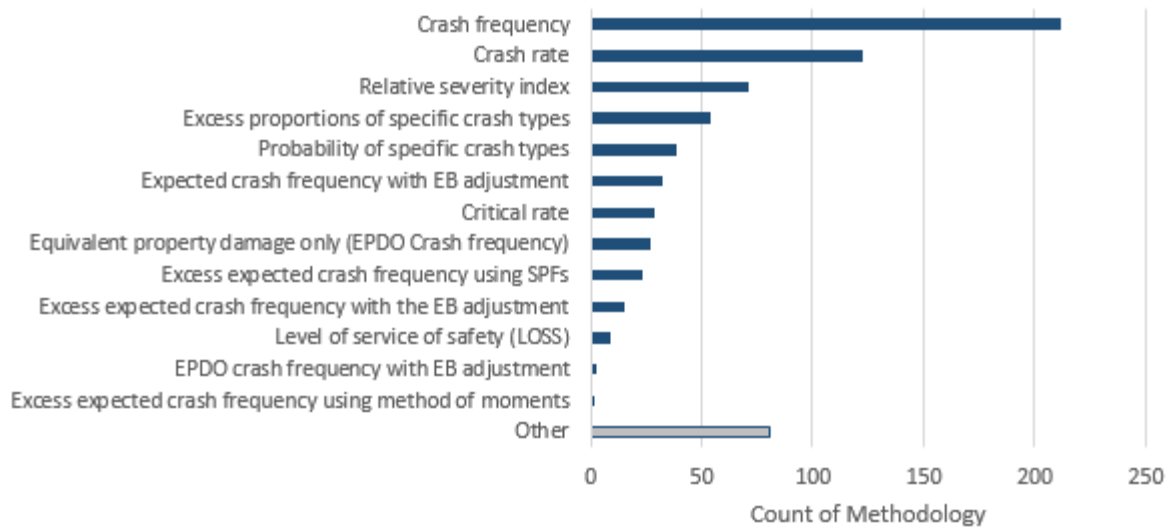


Figure 4: Count of PIM selected for programs administered under HSIP

HSIP Projects Overview

States provide project specific information for all projects obligated with HSIP funds during the reporting period in their annual HSIP reports. The reporting period is defined by the State and can be calendar year, state fiscal year or federal fiscal year. For 2017, the States obligated \$4.3B for 4,616 total projects. These obligations utilized funds apportioned during the 2017 fiscal year as well as HSIP funds available from previous years' apportionments.

As per the [HSIP Reporting Guidance](#), project specific information may include:

- Improvement Category and Sub Category (see Appendix A for complete descriptions)
- Project output (e.g., miles of rumble strips)
- Method for site selection
- Project cost
- Funding category
- Relationship to the State's strategic highway safety plan (SHSP) (i.e. emphasis area, strategy)
- Roadway characteristics

The following sections present various summaries of the nationwide HSIP project obligations for the 2017 reporting cycle. It should be noted that limited analysis of the project information can be done because not all states have included all of the above information for each project in their annual HSIP reports. Full use of the HSIP online reporting tool and the most recent HSIP reporting guidance will enable more complete and accurate reporting of national HSIP project data. In addition, HSIP projects come in all shapes and sizes. For example, some HSIP projects may be much bigger in scope than others, countermeasure installations across multiple sites, or non-infrastructure projects (i.e. transportation safety planning, data improvements). Nonetheless, the summaries in the following sections provide a broad scale analysis of HSIP spending for the 2017 reporting cycle by project cost, functional classification and ownership, improvement categories and subcategories, and SHSP emphasis areas.

Project Cost

In 2017, projects reporting \$0 costs or projects reporting deobligated funds were excluded from analysis. Costs ranged widely. Some projects were small in scope and cost, such as installing a pedestrian signal. Others were higher cost projects, such as resurfacing a highway or realigning a curve. Figure 5 shows the breakdown by project cost, grouped into general categories with breakpoints at \$100,000, \$500,000, and \$1,000,000.

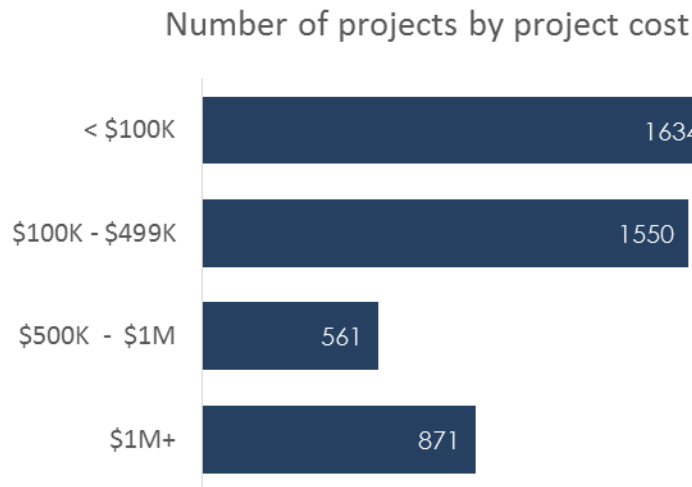


Figure 5: Number of Projects by Project Cost

Roughly 69 percent of the projects had costs less than \$500K. A small percentage (12 percent) fell into the \$500K - \$1M category. The remaining 19 percent were higher cost projects totaling \$1M or more. The top five sub categories selected for these higher cost projects are:

- Roadway – other (73 projects)
- Widen shoulder – paved or other (50 projects ranging from 0.11 to 25 miles treated)
- Rumble strips – edge or shoulder (38 projects)
- Barrier – cable (38 projects ranging from 0.1 to 103 miles treated)
- Intersection geometry – other (29 projects)

In 2016, the breakdowns were similar. Over two-thirds of the projects had costs less than \$500K, about 12 percent fell into the \$500K - \$1M category, and about 19 percent were more than \$1M.

Functional Class and Ownership

Figure 6 through Figure 10 illustrate the distribution of projects by road type.

Figure 6 shows number of projects by functional class, following the HPMS classification scheme. Figure 7 shows average total cost of projects by functional class. Figure 8 shows the number and average total cost of projects by urban/rural designation. Figure 9 shows projects by road ownership. Figure 10 shows average total cost of projects by road ownership. If the functional class or road ownership was not indicated, the project is counted under the “unknown” category. Examples of classifications in the “other” category include multiple functional classes, state or citywide implementation, or non-infrastructure projects.

Number of Projects by Functional Class

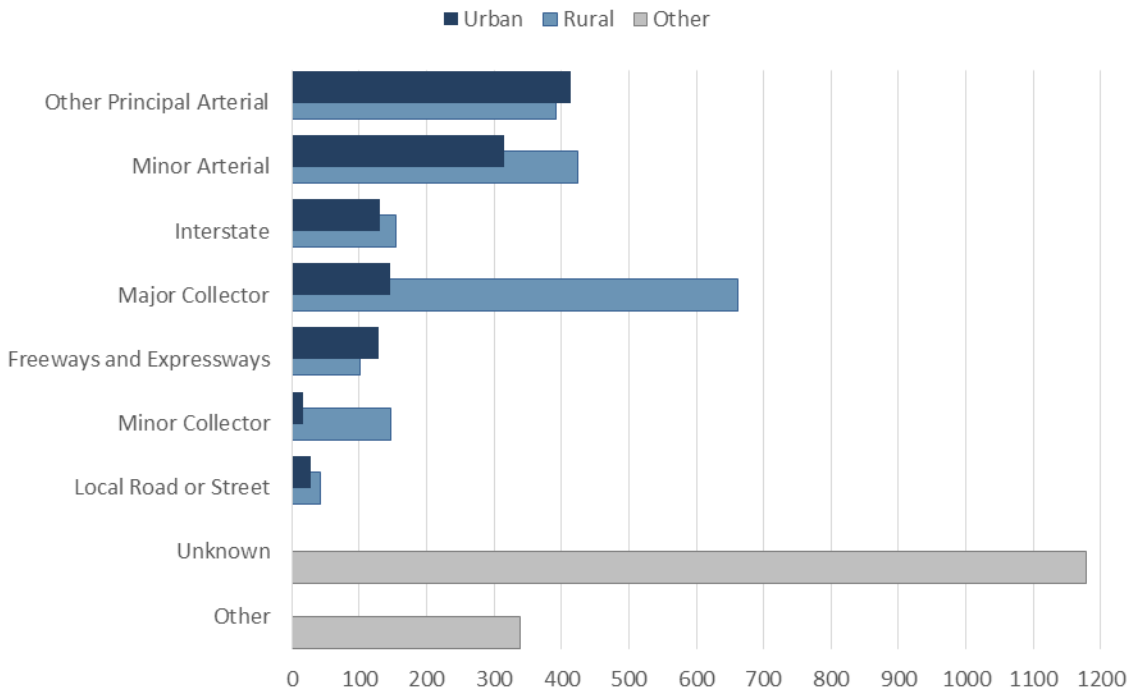


Figure 6. Number of Projects by Functional Class

As in 2016, projects that were associated with a functional class were most often categorized as “Rural Major Collector” or “Rural Minor Arterial” (Figure 6). There were 1179 projects categorized as “Unknown” indicating the State did not assign a functional classification to the project.

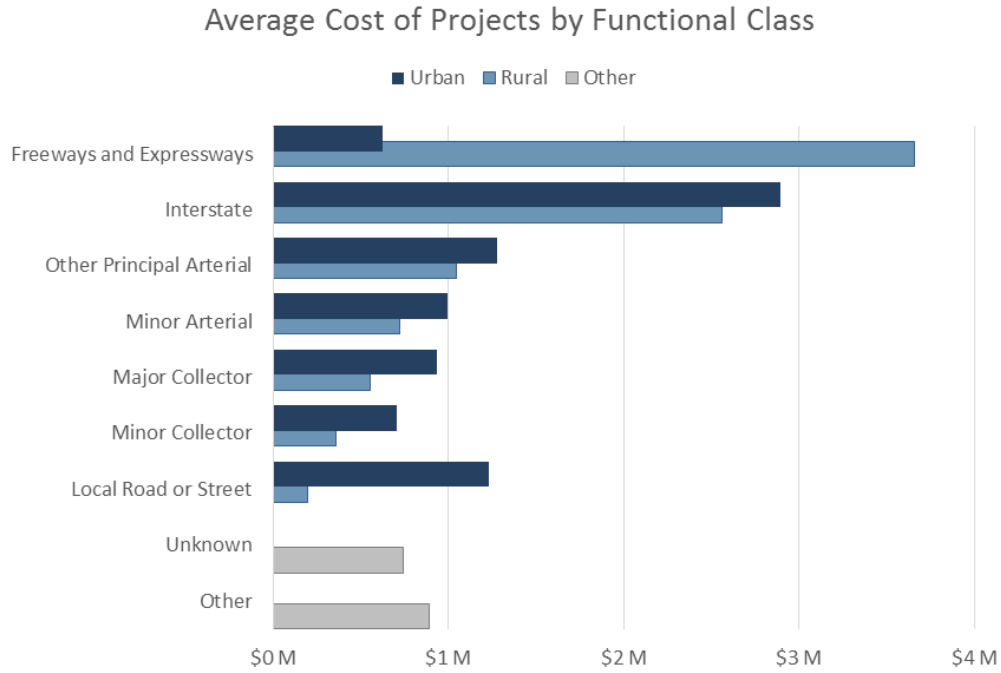


Figure 7. Average Total Cost of Projects by Functional Class

Figure 7 shows the average total cost of projects by functional class. It is important to note that not every project had an associated cost so the average is based on the number of projects which had cost information available. Projects categorized as “Rural Principal Arterial – Freeways and Expressways” had the highest average total cost per project of \$3.6 million and projects categorized as “Rural Local Road or Street” had the lowest average total cost per project of \$194,500.

Number and Average Total Cost of Projects by Urban/Rural Designation

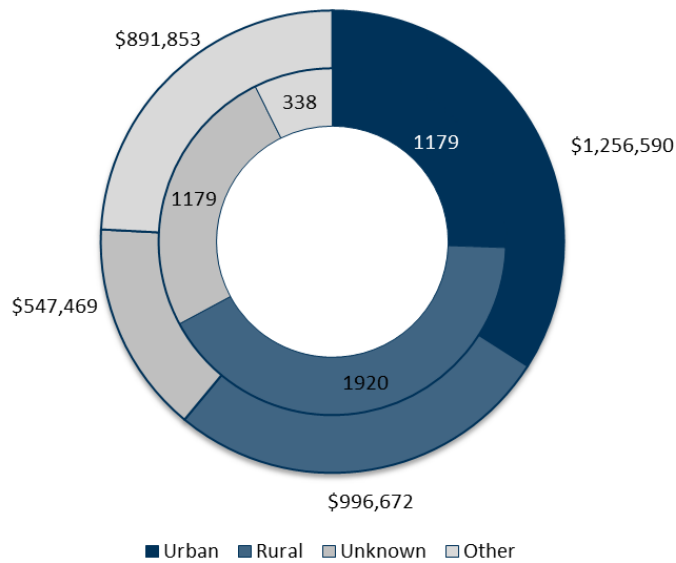


Figure 8. Number and Average Total Cost of Projects by Urban/Rural Designation

Figure 8 illustrates the number and average total cost of projects by urban/rural designation. As in 2016 and 2015, there are fewer total urban projects than rural projects but the average total cost of the urban projects is greater than the average total cost of the rural projects.

Number of Projects by Road Ownership

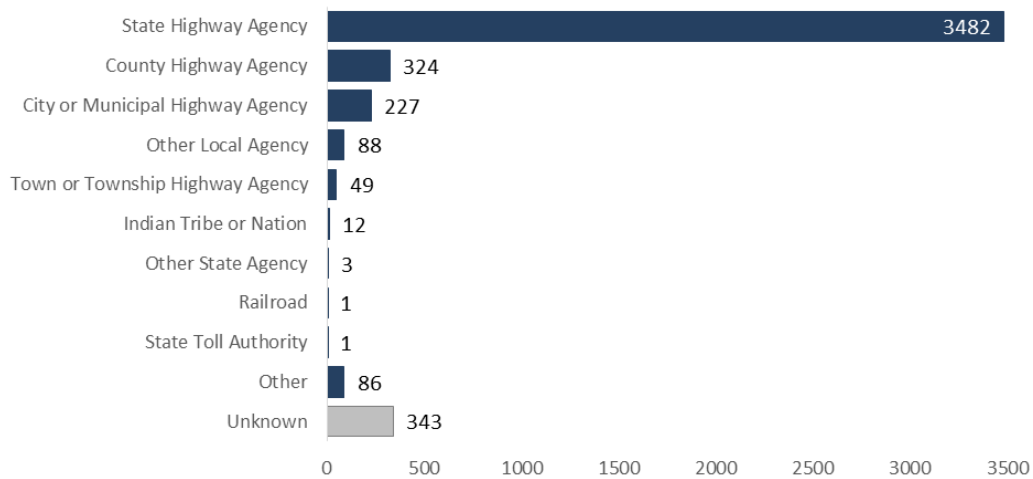


Figure 9. Number of Projects by Road Ownership

As in 2015 and 2016, States implement most projects on roads owned by a “State Highway Agency” (Figure 9). There were 343 projects categorized as “Unknown” (indicating that the State did not indicate road ownership for a particular project). There were 86 projects categorized as “Other”.

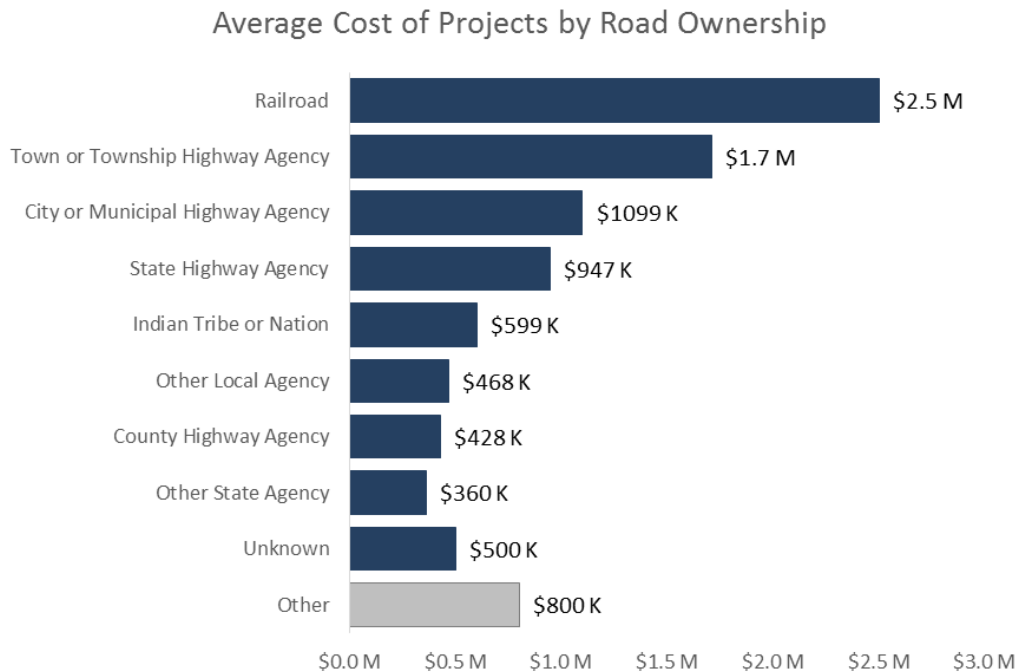


Figure 10. Average Total Cost of Projects by Road Ownership

Figure 10 shows the average total cost of projects by road ownership. It is important to note that not every project had an associated cost so the average is based on the number of projects which had cost information available (excluding de-obligated costs). One singular project comprised the State Toll Authority category and had the highest total cost of all categories at \$282 million. This is not included in the graph above so as not to detract from the relative average costs of the other projects.

Improvement Categories and Subcategories

Under the HSIP Reporting Guidance, each project should be assigned a general improvement category and a subcategory under that general category. While a single project may consist of multiple project types, FHWA suggests States assign each project to only one category. The category chosen should align with the primary purpose of the project. Figure 11 and Figure 12 show the distribution of the number of projects by general improvement category. Figure 13 and Figure 14 combined show the distribution of the average cost of projects by general improvement category. Projects categorized as “Unknown” indicate that there was no general improvement category assigned by the State. Figure 15 through Figure 19 show the breakdown of the number of projects by subcategory for five general improvement categories: Intersection geometry, Intersection traffic control, Pedestrians and bicyclists, Roadway, and Roadside. More detailed tables with the cost spent in each subcategory are available in Appendix B. For ease of reporting, similar subcategories were grouped together. For example, in Figure 15 below, “Auxiliary lanes – other” combines adding acceleration lanes, adding auxiliary through lanes, adding two way left turn lanes, and several other related subcategories.

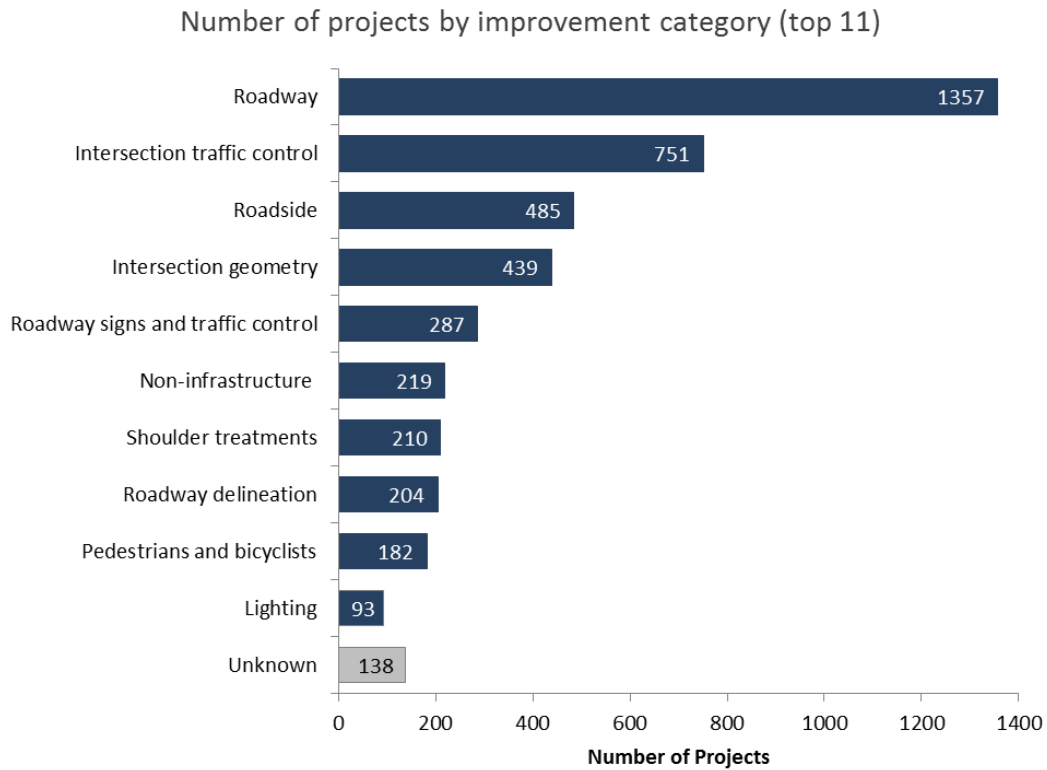


Figure 11. Number of Projects by Improvement Category (Top 11)

Figure 11 shows the number of projects by improvement category (top 11) as classified in the HSIP Reporting Guidance. Based on the project information reported by the States, the top five improvement categories are roadway, intersection traffic control, roadside, intersection geometry, and roadway signs and traffic control. In 2016, the top five improvement categories were the same. The number of projects classified in each category and the ranking of project categories were similar, also, compared to 2016.

Number of projects by improvement category (bottom 8)

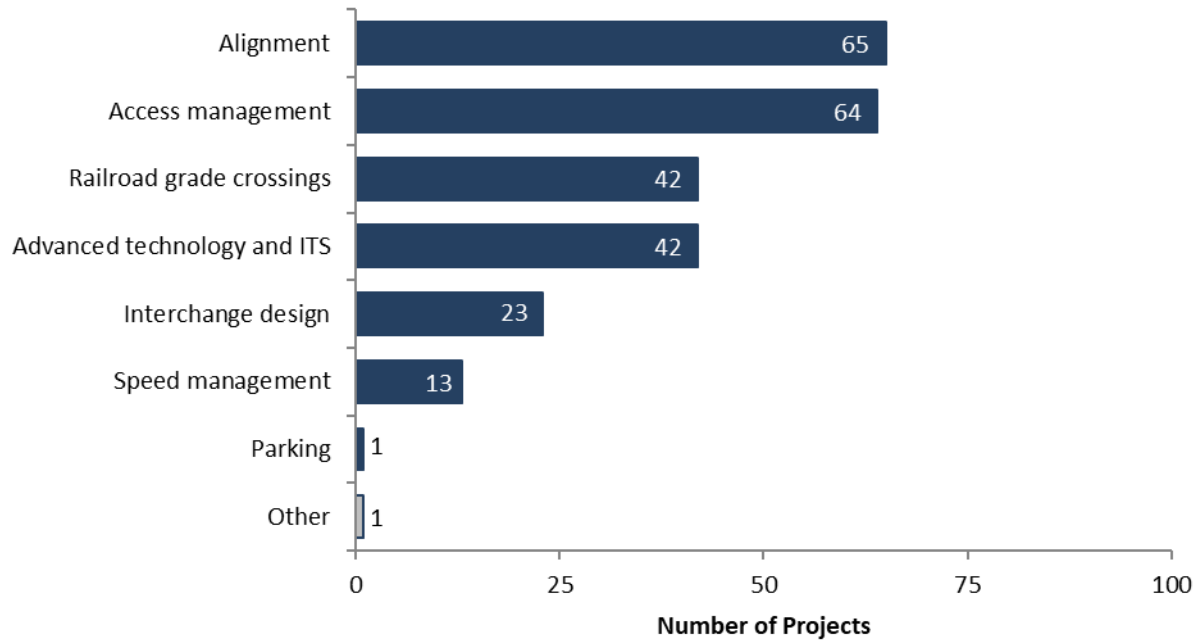


Figure 12. Number of Projects by Improvement Category (Bottom 8)

Figure 12 shows the number of projects by improvement category (bottom 8) as classified in the HSIP Reporting Guidance. Note that in 2017 there were no projects reported for work zone, multiple, or animal-related categories. The number of speed management and advanced technology and ITS projects nearly doubled, and there were half as many interchange design projects. The remaining bottom-ranking categories were similar to 2016.

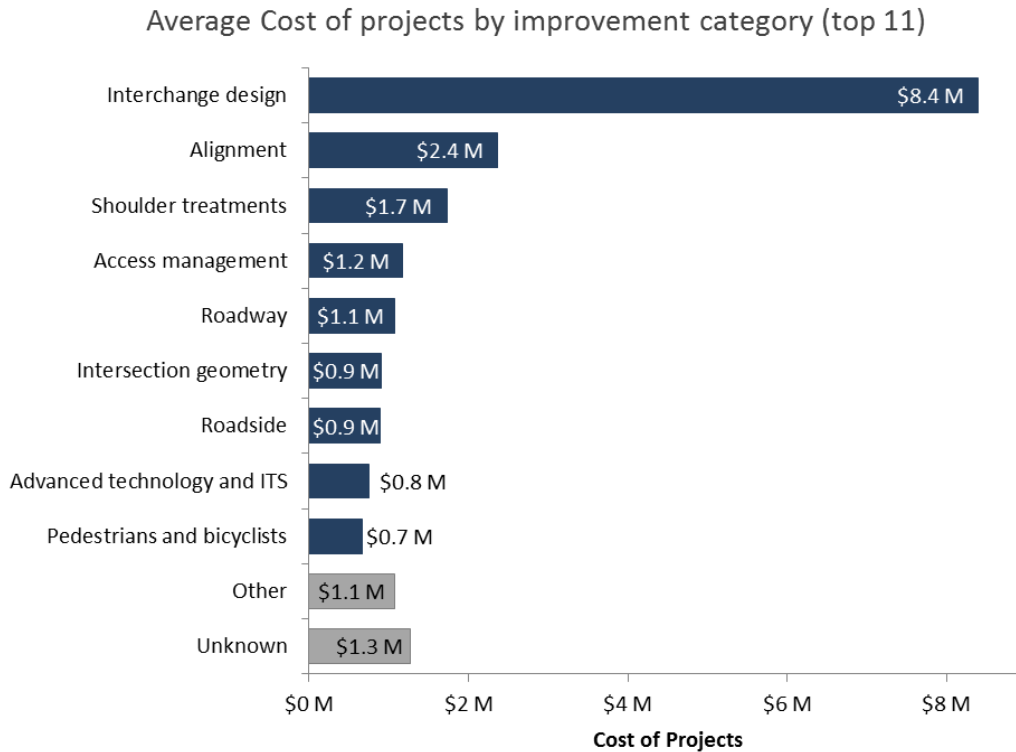


Figure 13. Average Total Cost of Projects by Improvement Category (top 11)

Figure 13 shows the average total cost of projects by improvement category (top 11). It is important to note that, unlike 2016, the average is based only on the number of projects with costs available (projects with deobligated costs and those reporting \$0 cost were excluded). This makes comparisons across years difficult, however, the notable differences in average project costs are below.

- Interchange design – several high-cost projects in 2017 shifted this average up from 2016 (decreased from \$1.2M in 2016 to \$8.4 in 2017).
- Advanced technology and ITS – remained in the top 11 in 2017, but moved down from the top ranking in 2016 (decreased from \$7M in 2016 to \$.8M in 2017)
- Access management – moved from the bottom 11 in 2016 to the top 11 in 2017 (increased from \$618K in 2016 to \$1.2M in 2017)
- Pedestrian and cyclists – moved from the bottom 11 in 2016 to the top 11 in 2017 (however, average cost for this category in 2016 was actually higher, at \$866K, compared to an average cost of \$666,727 in 2017).

Average Cost of projects by improvement category (bottom 8)

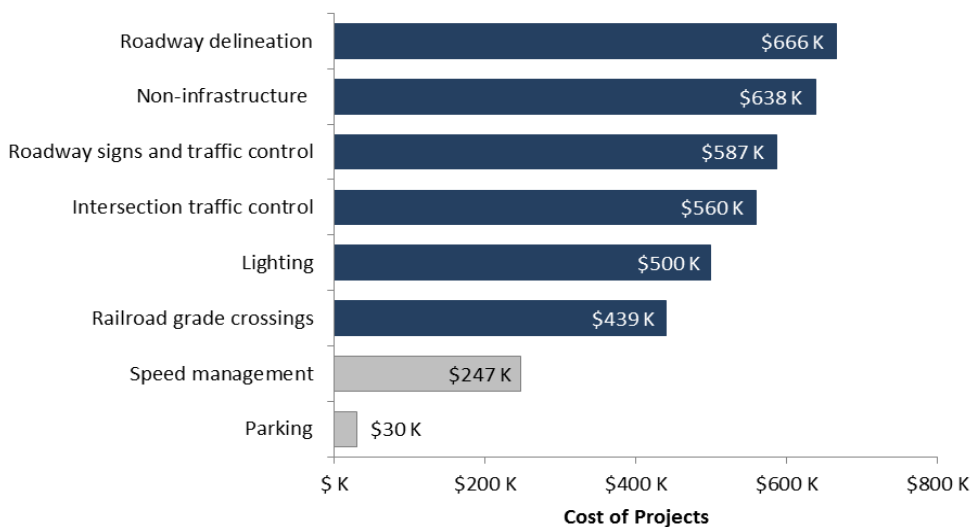


Figure 14. Average Total Cost of Projects by Improvement Category (bottom 8)

Based on project information reported by the States (Figure 14), the lowest average HSIP cost projects are in the following categories:

- Intersection traffic control; 751 projects with cost information
- Lighting; 93 projects with cost information
- Railroad grade crossings; 42 projects with cost information
- Speed management; 13 projects with cost information
- Parking; 1 project with cost information

Intersection Geometry Project Subcategories

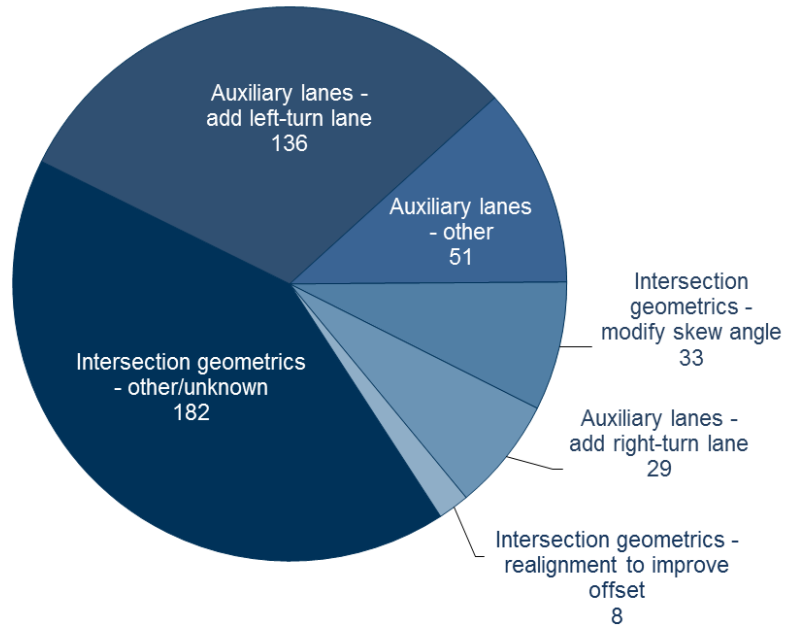


Figure 15: Number of Intersection Geometry Projects by Subcategory

The report highlights further evaluation of the intersection geometry and intersection traffic control categories because in 2017 (as in previous years) they ranked in the top five in terms of number of projects categorized (Figure 15). FHWA has also identified intersections as one of three focus areas for the Focused Approach to Safety effort.

For the Intersection geometry category, most projects are sub categorized as “Intersection geometrics – other/unknown” (41 percent; 182 of 439 projects) or “Auxiliary lanes – add left-turn lane” (31 percent; 136 of 439 projects). Examples of projects in the “Intersection geometrics – other/unknown” subcategory include modify intersection corner radius and general intersection safety improvement projects. The “Intersection geometrics – other/unknown” subcategory is predominately used without any project description, therefore, no other information is available for these projects.

Intersection Traffic Control Project Subcategories

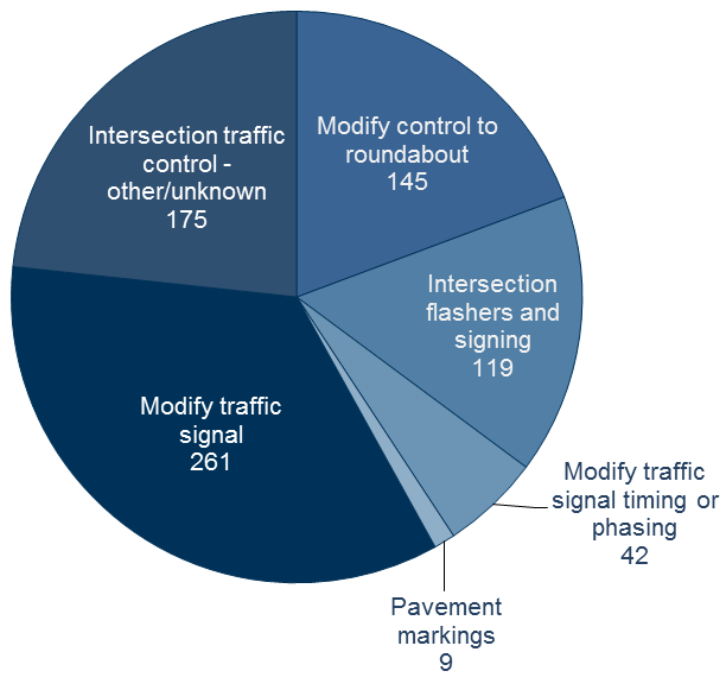


Figure 16: Number of Traffic Control Projects by Subcategory

For the Intersection traffic control category in Figure 16, most projects are subcategorized as “Modify traffic signal” (35 percent; 261 of 751 projects), “Intersection traffic control – other/unknown” (23 percent; 175 of 751 projects), and “Modify control to roundabout” (19 percent; 145 of 751 projects). Examples of projects in the “Intersection traffic control – other/unknown” category include projects described as signal and stop controlled systemic improvements and general intersection traffic control improvement projects. Examples of projects in the “Modify traffic signal” category include modernization/replacement of traffic signal and adding flashing yellow arrow signals. The “Intersection traffic control – other/unknown” subcategory is predominately used without any project description, therefore, no other information is available for these projects.

Pedestrian and Bicycle Project Subcategories

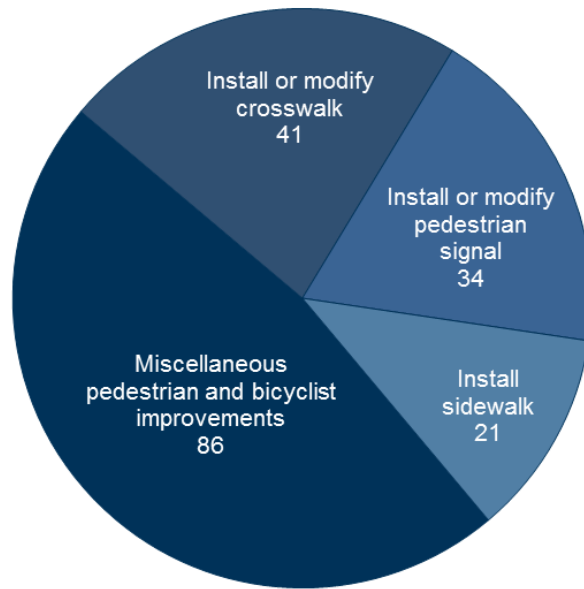


Figure 17: Number of Pedestrian and Bicyclist Projects by Subcategory

The report highlights further evaluation of the pedestrian and bicycle category because infrastructure improvements in this category are of significant interest to various stakeholders (Figure 17). FHWA has also identified pedestrians and bicyclists as one of three focus areas under the Focused Approach to Safety effort.

For the Pedestrians and bicyclists category, most projects are subcategorized as “Miscellaneous pedestrian and bicyclist improvements” (47 percent; 86 of 182 projects) and “Install or modify crosswalk” (23 percent; 41 of 182 projects). Many of the projects in the “Miscellaneous pedestrian and bicyclist improvements” subcategory do not have any project description; therefore, no other information is available for these projects.

Roadway Project Subcategories

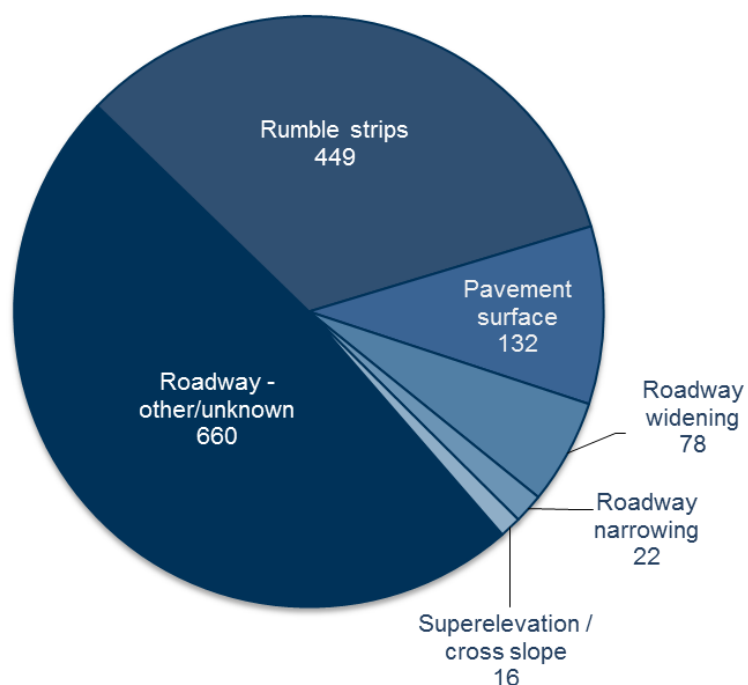


Figure 18: Number of Roadway Projects by Subcategory

The report highlights further evaluation of the roadway category because in 2017 (as in previous years) it ranked as the number one category in terms of number of projects categorized (Figure 18). FHWA has also identified roadway departure as one of three focus areas for the Focused Approach to Safety effort.

For the Roadway category, most projects were subcategorized as “Roadway – other/unknown” (49 percent; 660 of 1357 projects) and “Rumble strips” (33 percent; 449 of 1357 projects). Examples of projects in the “Roadway – other/unknown” subcategory were projects such as “restripe to revise separation between opposing lanes and/or shoulder widths”.

Roadside Project Subcategories

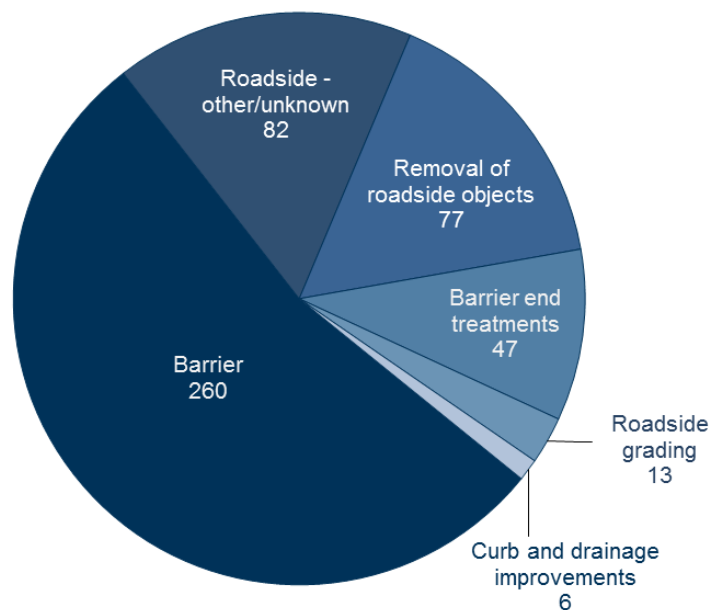


Figure 19: Number of Roadside Projects by Subcategory

The report highlights further evaluation of the roadside category was selected for further evaluation because in 2017 (as in previous years) it ranked in the top five in terms of number of projects categorized and is of recent national interest (Figure 19). For the Roadside category, most projects were subcategorized as “Barrier” (54 percent; 260 of 485 projects), “Roadside – other/unknown” (17 percent; 82 of 485 projects), and “Removal of roadside objects” (16 percent; 77 of 485 projects). Examples of two projects in the “Roadside – other/unknown” subcategory were “Barrier - removal” and “Fencing”.

SHSP Emphasis Areas

Based on a review of State SHSPs, FHWA identified the eight SHSP emphasis areas common across most States. These emphasis areas are used in the HSIP online reporting tool for categorizing HSIP projects. Figure 20 presents the number of HSIP projects categorized by SHSP emphasis area. For consistency and national reporting purposes, state-defined SHSP emphasis areas were assigned to these emphasis areas, where possible.

About 39 percent of the projects were categorized as “Roadway Departure” (42 percent in 2015 and 40 percent in 2016), 31 percent were categorized as “Intersections” (31 percent in 2015 and 29 percent in 2016), and 10 percent categorized as “Unknown/Other” (14 percent in 2015 and 13 percent in 2016). Examples of other categories used by the States include: “Highway infrastructure”, “Railroad”, and “Lighting”.

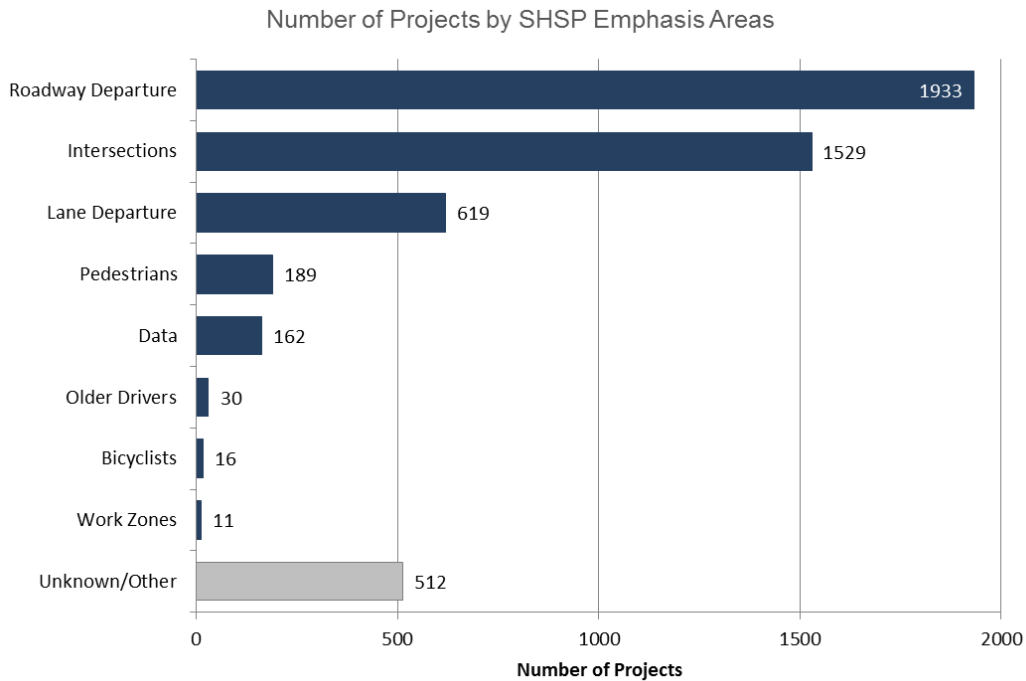


Figure 20: Number of Projects by SHSP Emphasis Area

2013-2017 Comparison

The number and cost of HSIP projects continues to increase each year. As shown in Table 1 below, the total number of projects and cost of projects did not change much from 2013 to 2014 but between 2015 and 2016, there were roughly 1000 more projects reported. This increasing trend continued in 2017, with an increase of about 500 projects over 2016. However, the breakdown in project costs for various breakpoints was similar across years.

Table 1. Total number of projects and project cost breakdown, 2013-2017

Year	2013	%	2014	%	2015	%	2016	%	2017	%
Number of projects	3292		3348		4188		4468		4943	
Number of projects (with cost info.)*	3171		3272		3830		3726		4616	
Cost of projects*	\$3.09B		\$3.10B		\$3.90B		\$4.03B		\$4.3B	
Average cost per project	\$981K		\$952K		\$1.02M		\$1.08M		\$879K	
Number of projects <\$100K	1154	35%	1011	30%	1374	33%	1106	25%	1634	33%

Year	2013	%	2014	%	2015	%	2016	%	2017	%
Number of projects \$100K - \$499K	985	30%	1054	31%	1131	27%	1246	28%	1550	31%
Number of projects \$500K-\$1M	401	12%	450	13%	445	11%	478	11%	561	11%
Number of projects \$1M+	631	19%	757	23%	880	21%	896	20%	871	18%
Number of projects with deobligated funds	60	2%	28	1%	146	3%	256	6%	285	6%
Number of projects with \$0 or blank	61	2%	48	1%	212	5%	486	11%	42	1%

* For 2017, number of projects with cost info and cost of projects do not include projects with deobligated funds or where the value entered was \$0, nor do they include projects in California. Also, for the first time 2017 data includes PR HSIP projects. Therefore, comparisons with previous years should be made with caution.

Table 2 shows the 2013 through 2017 comparison of the number of projects and average total cost of projects for various project types highlighted in this report (does not include projects with deobligated funds or projects where no value was reported or the value entered was \$0). For most project types, the number and cost of projects has increased over the four year period.

Table 2. Number of projects and average total project cost for various project types, 2013-2017

Project Type	Num Projects 2013	Avg Cost 2013	Num Projects 2014	Avg Cost 2014	Num Projects 2015	Avg Cost 2015	Num Projects 2016	Avg Cost 2016	Num Projects 2017	Avg Cost 2017
Urban projects	826	\$1.4M	954	\$1.3M	1236	\$1.2M	1277	\$1.7M	1179	\$1.2M
Rural projects	1244	\$930K	1361	\$890K	1847	\$1.1M	1683	\$956K	1920	\$998K
Roadway projects	854	\$639K	722	\$955K	1195	\$671K	1244	\$1.1M	1357	\$1.1M
Intersection traffic control projects	420	\$682K	505	\$702K	615	\$798K	608	\$704K	751	\$560K
Intersection geometry projects	376	\$1.3M	379	\$983K	559	\$1.0M	458	\$1.1M	439	\$910K
Ped/bike projects	103	\$534K	118	\$507K	122	\$965K	180	\$866K	182	\$667K
Roadside projects	225	\$951K	303	\$810K	422	\$893K	444	\$1.2M	485	\$896K

Note: For 2017, number of projects and average cost do not include projects with deobligated funds or where the value entered was \$0, nor do they include projects in California. Also, for the first time 2017 data includes PR HSIP projects. Therefore, comparisons with previous years should be made with caution.

Comparison to Previous Years

The HSIP National Summary Baseline Report 2009-2012 reported project and cost information for HSIP reports submitted by the States for years 2009-2012. The information from the baseline report is summarized below with the purpose of comparing basic cost and project information to the 2013 through 2017 reports. Table 3 below shows that States obligated \$24.9B for more than 29,000 projects over the eight-year period. These obligations include not only HSIP funds apportioned during the reporting period (2009-2017), but also HSIP funds available from previous years' apportionments.

Table 3. Total Number and Cost of Projects by Year

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Num Projects	1,684	2,386	2,523	2,429	3,292	3,348	4,188	4,468	4,943	29,261
Num Projects (with cost info.)*	1,568	2,320	2,397	2,311	3,171	3,272	3,830	3,726	4,616	27,211
Cost of projects*	\$1.61B	\$1.46B	\$1.78B	\$1.65B	\$3.09B	\$3.10B	\$3.90B	\$4.03B	\$4.3B	\$24.9B
Avg. Cost Per Project*	\$1.0M	\$629K	\$743K	\$722K	\$981K	\$952K	\$1.0M	\$1.1M	\$940K	\$896K

* For 2017, number of projects with cost info and cost of projects do not include projects with deobligated funds or where the value entered was \$0, nor do they include projects in California. Also, for the first time 2017 data includes PR HSIP projects. Therefore, comparisons with previous years should be made with caution.

Benefit-Cost Analysis of the HSIP

FHWA also conducted a national evaluation of the HSIP to estimate expected program results using the project information from the 2017 HSIP reports. The purpose of the evaluation was to estimate a national benefit cost ratio for the HSIP. The HSIP national benefit cost ratio provides an indication of the programs national impact and the benefits the public can expect from investments in the HSIP.

The evaluation methodology makes use of the full project listing information from 49 States plus the District of Columbia (2017 HSIP Project Database) and associated crash modification factors (CMFs) from the CMF Clearinghouse, the Fatality Analysis Reporting System (FARS), the Highway Performance Monitoring System (HPMS), the Highway Safety Information System (HSIS), FHWA, and various reports. California was excluded from the analysis, as many elements needed for the analysis were not available. Puerto Rico was also excluded, given that road improvement project needs and costs deviate from those in the continental U.S. The following steps indicate how to apply the selected methodology for projects in the 2017 HSIP Project Database with complete data:

1. Calculate the estimated crash reduction for each project group
 - a. Estimate a “before” crash rate using data from FARS, HPMS, and HSIS.
 - b. Identify appropriate CMFs from the CMF Clearinghouse.
2. Calculate the monetary benefit for each project category by converting crash savings to dollar amounts.
 - a. The crash cost values in the 2017 analysis are based on the crash severity values recommended by Harmon et al. in a recent FHWA resource entitled “Crash Costs for Highway Safety Analysis”.⁵ The values for each combination of crash severities (e.g., K,

⁵ Harmon, Tim, Geni Bahar, and Frank Gross. Crash Costs for Highway Safety Analysis, Federal Highway Administration, Report FHWA-SA-17-071, January 2018.

KA, KAB, etc.) were calculated using information from Council et al⁶ and the methodology reported in a memo written by Bhagwant Persaud⁷ to FHWA.

3. Divide annual monetary benefit by the annualized project cost to calculate the benefit-cost ratio.
 - a. Assume a service life per treatment type using information from the Service Life and Crash Cost User Guide available on the CMF Clearinghouse.
4. Calculate a program wide benefit-cost ratio by averaging the ratios from all project groups.
 - a. Weight the average based on HSIP funds spent for a project to account for project groups which were more prevalent in the data.

For this reporting cycle, it was possible to calculate the expected project level benefit cost ratios for 1,194 segment and intersection-based projects, which is approximately 24 percent of the projects listed in the 2017 HSIP Project Database. Table 4 presents the weighted results (based on amount of HSIP funds that were spent for that project). Many projects had a range of years for the assumed service life, so the table presents the BC ratio according to the minimum and maximum service lives.

The values in the bottom row of Table 4 (ranging from 6.09 to 11.24) represent the range of BC ratios for the HSIP program for segment and intersection-based improvement projects, depending on the minimum or maximum service life of the treatment and discount rate. Comparatively, the range for the 2016 HSIP project listing was 4.36 to 6.51.

Table 4. Weighted BC Ratio for Segment and Intersection Based Projects (weight based on total project cost)

	Weighted BC Ratio (min Service Life, 3% discount rate)	Weighted BC Ratio (max Service Life, 3% discount rate)	Weighted BC Ratio (min Service Life, 7% discount rate)	Weighted BC Ratio (max Service Life, 7% discount rate)
<i>869 Segment Based HSIP Projects (weighted on segment project cost)</i>	7.86	11.98	6.28	8.57
<i>325 Intersection Based HSIP Projects (weighted on intersection project cost)</i>	6.73	7.60	5.00	5.47
<i>1,194 Segment & Intersection Based HSIP Projects (weighted on segment & intersection project cost)</i>	7.71	11.24	6.09	8.04

Many projects could not be included in analysis because they were either missing key data elements (e.g., number of miles or intersections treated, CMF, project cost, etc.) or were non-infrastructure

⁶ Council, F., E. Zaloshnja, T. Miller, and B. Persaud. "Crash Cost Estimates by Maximum Police-Reported Injury Severity Within Selected Crash Geometries", FHWA-HRT-05-051, FHWA Office of Safety R&D, October 2005.

⁷ Persaud, B. "How to convert value of a statistical life to cost per crash by severity, crash type and speed limit", FHWA Draft Memo for DCMF Evaluations (unpublished), November 2014.

projects. The calculated benefit-cost ratio for each of the 1,194 projects relied heavily on assumptions for each project regarding the applicable CMF, service life, crash rate, and injury severity cost.

Summary

The HSIP is a performance-driven program that uses data and analysis to target safety resources. This HSIP 2017 National Summary Report shows that in 2017, States directed HSIP funds to address the predominant infrastructure-related crash types: roadway departure, intersection and pedestrian crashes, similar to previous years. On average, States obligated 40 percent of HSIP funds to address systemic improvements. While the basic characteristics (rural and urban, improvement categories, and SHSP emphasis areas) of HSIP spending remains fairly consistent from year to year, the number and cost of HSIP projects has continued to increase over the seven-year period from 1,684 projects with a total cost of \$1.61 billion in 2009 to 4,616 projects with a total cost of \$4.3 billion in 2017. Based on a sample of 2017 HSIP projects, FHWA estimates that the benefits of the HSIP outweigh the costs on a scale ranging from 7.7 to 11.2.

References

FHWA, FAST Act Apportionment Fact Sheet

<https://www.fhwa.dot.gov/fastact/factsheets/apportionmentfs.cfm>

FHWA, HSIP Apportionment Notices

<http://www.fhwa.dot.gov/legsregs/directives/notices/>

FHWA, HSIP FAST Act Fact Sheet

<https://www.fhwa.dot.gov/fastact/factsheets/hsipfs.cfm>

FHWA, HSIP Reporting Guidance, February 13, 2013

https://safety.fhwa.dot.gov/legislationandpolicy/fast/hsip_reporting_guidance.cfm

FHWA, HSIP Online Reporting Tool

<http://safety.fhwa.dot.gov/hsip/resources/onrpttool/>

FHWA, HSIP National Summary Baseline Report 2009-2012

http://safety.fhwa.dot.gov/hsip/reports/nsbrpt_2009_2012.cfm

FHWA, HSIP 2013 National Summary Report

<http://safety.fhwa.dot.gov/hsip/reports/nsbrpt2013.cfm>

FHWA, HSIP 2014 National Summary Report

http://safety.fhwa.dot.gov/hsip/reports/pdf/2014/hsip_natl2014.pdf

FHWA, HSIP 2015 National Summary Report

http://safety.fhwa.dot.gov/hsip/reports/pdf/2015/hsip_natl2015.pdf

FHWA, HSIP 2016 National Summary Report

http://safety.fhwa.dot.gov/hsip/reports/pdf/2016/hsip_natl2016.pdf

2017 State HSIP Reports

<http://safety.fhwa.dot.gov/hsip/reports/>

Appendix A: Full Description of HSIP Improvement Categories and Sub Categories for 2013 HSIP Reporting Guidance

Category	Sub-category
Access management	Access management - other
	Change in access – close or restrict existing access
	Change in access – miscellaneous/unspecified
	Grassed median - extend existing
	Median crossover - close crossover
	Median crossover - directional crossover
	Median crossover - relocate existing
	Median crossover - unspecified
	Raised island - install new
	Raised island - modify existing
	Raised island - remove existing
	Raised island – unspecified
	Advanced technology and ITS
Congestion detection / traffic monitoring system	
Dynamic message signs	
Over height vehicle detection	
Alignment	Alignment - other
	Horizontal curve realignment
	Horizontal and vertical alignment
	Vertical alignment or elevation change
Animal-related	Animal related
Interchange design	Acceleration / deceleration / merge lane
	Convert at-grade intersection to interchange
	Extend existing lane on ramp
	Improve intersection radius at ramp terminus
	Installation of new lane on ramp
	Interchange design - other
	Ramp closure
	Ramp metering
Intersection geometry	Auxiliary lanes – add acceleration lane
	Auxiliary lanes – add auxiliary through lane
	Auxiliary lanes – add left-turn lane
	Auxiliary lanes – add right-turn lane
	Auxiliary lanes – add right-turn lane (free-flow)
	Auxiliary lanes – add slip lane
	Auxiliary lanes – add two-way left-turn lane
	Auxiliary lanes – extend acceleration/deceleration lane
	Auxiliary lanes – extend existing left-turn lane
	Auxiliary lanes – extend existing right-turn lane
	Auxiliary lanes – miscellaneous/other/unspecified

	Auxiliary lanes – modify acceleration lane
	Auxiliary lanes – modify auxiliary through lane
	Auxiliary lanes – modify free-flow turn lane
	Auxiliary lanes – modify left-turn lane offset
	Auxiliary lanes – modify right-turn lane offset
	Auxiliary lanes – modify turn lane storage
	Auxiliary lanes – modify turn lane taper
	Auxiliary lanes – modify two-way left-turn lane
	Intersection geometrics – miscellaneous/other/unspecified
	Intersection geometrics – modify intersection corner radius
	Intersection geometrics – modify skew angle
	Intersection geometrics – realignment to align offset cross streets
	Intersection geometrics – realignment to increase cross street offset
	Intersection geometrics – re-assign existing lane use
	Intersection geometry - other
	Splitter island – install on one or more approaches
	Splitter island – remove from one or more approaches
	Splitter island – unspecified
	Through lanes – add additional through lane
Intersection traffic control	Intersection flashers – add “when flashing” warning sign-mounted
	Intersection flashers – add advance emergency vehicle warning sign-mounted
	Intersection flashers – add advance heavy vehicle warning sign-mounted
	Intersection flashers – add advance intersection warning sign-mounted
	Intersection flashers – add miscellaneous/other/unspecified
	Intersection flashers – add overhead (actuated)
	Intersection flashers – add overhead (continuous)
	Intersection flashers – add stop sign-mounted
	Intersection flashers – modify existing
	Intersection flashers – remove existing
	Intersection signing – add basic advance warning
	Intersection signing – add enhanced advance warning (double-up and/or oversize)
	Intersection signing – add enhanced regulatory sign (double-up and/or oversize)
	Intersection signing – miscellaneous/other/unspecified
	Intersection signing – relocate existing regulatory sign
	Intersection traffic control - other
	Modify control – all-way stop to roundabout
	Modify control – modifications to roundabout
	Modify control – no control to roundabout
	Modify control – no control to two-way stop
	Modify control – remove right-turn yield

	Modify control – reverse priority of stop condition
	Modify control – traffic signal to roundabout
	Modify control – two-way stop to all-way stop
	Modify control – two-way stop to roundabout
	Modify control – two-way yield to two-way stop
	Pavement Markings – add advance signal ahead
	Pavement markings – add advance stop ahead
	Pavement markings – add dashed edge line along mainline
	Pavement markings – add lane use symbols
	Pavement markings – add stop line
	Pavement markings – add yield line
	Pavement markings – miscellaneous/other/unspecified
	Pavement markings – refresh existing pavement markings
	Modify traffic signal – add additional signal heads
	Modify traffic signal – add backplates
	Modify traffic signal – add backplates with retroreflective borders
	Modify traffic signal – add closed loop system
	Modify traffic signal – add emergency vehicle preemption
	Modify traffic signal – add flashing yellow arrow
	Modify traffic signal – add long vehicle detection
	Modify traffic signal – add railroad preemption
	Modify traffic signal – add wireless system
	Modify traffic signal – miscellaneous/other/unspecified
	Modify traffic signal – modernization/replacement
	Modify traffic signal – modify signal mounting (spanwire to mast arm)
	Modify traffic signal – remove existing signal
	Modify traffic signal – replace existing indications (incandescent-to-LED and/or 8-to-12 inch dia.)
	Modify traffic signal timing – left-turn phasing (permissive to protected/permissive)
	Modify traffic signal timing – left-turn phasing (permissive to protected-only)
	Modify traffic signal timing – adjust clearance interval (yellow change and/or all-red)
	Modify traffic signal timing – general retiming
	Modify traffic signal timing – signal coordination
	Systemic improvements – signal-controlled
	Systemic improvements – stop-controlled
Lighting	Continuous roadway lighting
	Intersection lighting
	Lighting - other
	Site lighting – horizontal curve
	Site lighting – intersection
	Site lighting – interchange

	Site lighting – pedestrian crosswalk
Miscellaneous	Miscellaneous
Non-infrastructure	Educational efforts
	Enforcement
	Data/traffic records
	Non-infrastructure - other
	Outreach
	Road safety audits
	Training and workforce development
	Transportation safety planning
Parking	Modify parking
	Parking - other
	Remove parking
	Restrict parking
	Truck parking facilities
Pedestrians and bicyclists	Crosswalk
	Install new "smart" crosswalk
	Install new crosswalk
	Install sidewalk
	Medians and pedestrian refuge areas
	Miscellaneous pedestrians and bicyclists
	Modify existing crosswalk
	Pedestrian beacons
	Pedestrian bridge
	Pedestrian signal
	Pedestrian signal - audible device
	Pedestrian signal – Pedestrian Hybrid Beacon
	Pedestrian signal - install new at intersection
	Pedestrian signal - install new at non-intersection location
	Pedestrian signal - modify existing
	Pedestrian signal - remove existing
	Pedestrian warning signs - add/modify flashers
	Pedestrian warning signs – overhead
Railroad grade crossings	Grade separation
	Model enforcement activity
	Protective devices
	Railroad grade crossing gates
	Railroad grade crossing signing
	Railroad grade crossings - other
	Surface treatment
	Upgrade railroad crossing signal
Widen crossing for additional lane	
Roadside	Barrier end treatments (crash cushions, terminals)
	Barrier transitions

	Barrier - cable
	Barrier - concrete
	Barrier- metal
	Barrier - other
	Barrier - removal
	Curb or curb and gutter
	Drainage improvements
	Fencing
	Removal of roadside objects (trees, poles, etc.)
	Roadside grading
	Roadside - other
Roadway	Install / remove / modify passing zone
	Pavement surface – high friction surface
	Pavement surface - miscellaneous
	Roadway narrowing (road diet, roadway reconfiguration)
	Roadway - other
	Roadway - restripe to revise separation between opposing lanes and/or shoulder widths
	Roadway widening - add lane(s) along segment
	Roadway widening - curve
	Roadway widening - travel lanes
	Rumble strips - center
	Rumble strips – edge or shoulder
	Rumble strips - transverse
	Rumble strips – unspecified or other
	Superelevation / cross slope
Roadway delineation	Improve retroreflectivity
	Longitudinal pavement markings - new
	Longitudinal pavement markings - remarking
	Delineators post-mounted or on barrier
	Raised pavement markers
	Roadway delineation - other
Roadway signs and traffic control	Curve-related warning signs and flashers
	Sign sheeting – upgrade or replacement
	Roadway signs and traffic control - other
	Roadway signs (including post) – new or updated
Shoulder treatments	Widen shoulder – paved or other
	Pave existing shoulders
	Shoulder grading
	Shoulder treatments - other
Speed management	Modify speed limit
	Radar speed signs
	Speed detection system / truck warning
	Speed management - other

	Traffic calming feature
Work Zone	Work zone

Appendix B. Detailed Tables of Project Costs Summaries

Table 5: Number and Cost of 2017 Projects by Improvement Category

Improvement Category	Number of Projects	Total Cost of Projects*	Average Total Cost*	Total HSIP Cost of Projects*	Average HSIP Cost*
Access management	64	\$74,760,421.63	\$1,168,131.59	\$65,609,668.99	\$1,025,151.08
Advanced technology and ITS	42	\$31,848,611.38	\$758,300.27	\$22,544,587.59	\$536,775.90
Alignment	65	\$153,626,691.05	\$2,363,487.55	\$63,073,225.32	\$970,357.31
Interchange design	23	\$193,051,802.75	\$8,393,556.64	\$36,388,116.75	\$1,582,092.03
Intersection geometry	439	\$398,585,860.99	\$907,940.46	\$276,314,575.08	\$620,931.63
Intersection traffic control	751	\$442,846,841.12	\$560,125.18	\$358,243,478.45	\$472,616.73
Lighting	93	\$46,458,619.35	\$499,555.05	\$40,646,142.63	\$432,405.77
Non-infrastructure	219	\$139,807,086.04	\$638,388.52	\$118,596,054.09	\$527,093.57
Parking	1	\$29,851.00	\$29,851.00	\$29,851.00	\$29,851.00
Pedestrians and bicyclists	182	\$121,344,341.05	\$666,727.15	\$84,651,228.67	\$465,116.64
Railroad grade crossings	42	\$18,450,793.38	\$439,304.60	\$16,761,825.71	\$399,091.09
Roadside	485	\$476,249,772.09	\$896,312.91	\$402,171,182.34	\$809,197.55
Roadway	1357	\$1,058,049,971.39	\$1,076,475.86	\$617,723,044.93	\$385,354.36
Roadway delineation	204	\$184,194,677.28	\$666,475.86	\$157,313,050.64	\$731,688.61
Roadway signs and traffic control	287	\$192,659,872.09	\$587,258.09	\$101,935,209.02	\$346,718.40
Shoulder treatments	210	\$363,212,864.01	\$1,729,585.07	\$254,852,620.76	\$1,219,390.53
Speed management	13	\$3,209,230.00	\$246,863.85	\$3,018,830.00	\$232,217.69
Unknown	139	\$176,924,514.00	\$1,272,838.23	\$49,584,016.00	\$1,502,545.94
Total	4616	\$4,341,957,584.51	\$940,632.06	\$2,518,276,630.07	\$553,747.87

* Not all states provided cost data for all projects in a given improvement category. Projects that reported \$0 costs or deobligated funds were excluded.

Table 6: Number and Cost of Projects by Subcategory for Intersection Geometry

Subcategory	Number of Projects	Total Cost
Auxiliary lanes - add left-turn lane	136	\$101,550,943.86
Auxiliary lanes - add right-turn lane	29	\$11,465,462.42
Auxiliary lanes - other	51	\$51,788,843.41
Intersection geometrics - modify skew angle	33	\$15,960,270.87
Intersection geometrics - other/unknown	182	\$193,383,140.56
Intersection geometrics - realignment to improve offset	8	\$24,437,199.87
Total	439	\$398,585,861.00

* Not all states provided cost data for all projects in a given improvement category. Projects that reported \$0 costs or deobligated funds were excluded.

Table 7: Number and Cost of Projects by Subcategory for Intersection Traffic Control

Subcategory	Number of Projects	Total Cost
Intersection flashers and signing	119	\$7,707,507.13
Intersection traffic control - other/unknown	175	\$113,560,531.44
Modify control to roundabout	145	\$130,600,666.73
Modify traffic signal	261	\$132,689,328.79
Modify traffic signal timing or phasing	42	\$31,895,554.75
Pavement markings	9	\$4,200,421.27
Total	751	\$420,654,010.11

* Not all states provided cost data for all projects in a given improvement category. Projects that reported \$0 costs or deobligated funds were excluded.

Table 8: Number and Cost of Projects by Subcategory for Pedestrians and Bicyclists

Subcategory	Number of Projects	Total Cost
Install or modify crosswalk	41	\$14,170,648.98
Install or modify pedestrian signal	34	\$25,140,421.27
Install sidewalk	21	\$13,158,657.49
Miscellaneous pedestrian and bicyclist improvements	86	\$68,874,613.31
Total	182	\$121,344,341.05

* Not all states provided cost data for all projects in a given improvement category. Projects that reported \$0 costs or deobligated funds were excluded.

Table 9: Number and Cost of Projects by Subcategory for Roadway

Subcategory	Number of Projects	Total Cost
Pavement surface	132	\$111,864,938.43
Roadway - other/unknown	660	\$835,554,866.68
Roadway narrowing (road diet, roadway reconfiguration)	22	\$62,955,317.75
Roadway widening	78	\$267,095,319.86
Rumble strips	449	\$178,430,020.86
Superelevation / cross slope	16	\$4,876,516.00
Total	1357	\$1,460,776,979.58

* Not all states provided cost data for all projects in a given improvement category. Projects that reported \$0 costs or deobligated funds were excluded.

Table 10: Number and Cost of Projects by Subcategory for Roadside

Subcategory	Number of Projects	Total Cost
Barrier	260	\$256,418,193.73
Barrier end treatments	47	\$47,130,180.55
Curb and drainage improvements	6	\$3,412,586.85
Removal of roadside objects	77	\$46,889,479.08
Roadside grading	13	\$14,131,963.89
Roadside – other/unknown	82	\$66,729,356.56
Total	485	\$434,711,760.66

* Not all states provided cost data for all projects in a given improvement category. Projects that reported \$0 costs or deobligated funds were excluded.

For More Information:

Visit <http://safety.fhwa.dot.gov/hsip>

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