# Model Minimum Inventory of Roadway Elements—MMIRE

PUBLICATION NO. FHWA-HRT-07-046 AUGUST 2007

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296

## Foreword

Good safety and highway inventory data are crucial in today's processes to make sound safety improvement decisions. They will become even more important, if agencies are to take advantage of a new generation of safety analysis tools, such as the FHWA's Interactive Highway Safety Design Model (IHSDM) and *SafetyAnalyst*, AASHTO's Data and Analysis Guide, and the Highway Safety Manual. Development of a **Model Minimum Inventory of Roadway Elements**, referred to as **MMIRE**, is recommended so that State, local, and Federal agencies understand the importance of roadway inventory and traffic data for safety programs and know what critical roadway data variables are required to make more effective and efficient safety improvement decisions, as well as to take advantage of current and future cutting-edge analytical tools and resources.

The establishment and adoption of **MMIRE** has potential advantages beyond improved safety. State and local asset management systems also will benefit by collecting and monitoring of the **MMIRE**. Since a major portion of **MMIRE** will be comprised of an inventory of various roadway assets, asset managers can benefit from standardized definitions, consistent measurement accuracies, and geo-spatial location and performance levels of these assets. This joint effort between safety and asset management can result in shared data, improved interdepartmental cooperation, reductions in data discrepancy, and improved data collection and reliability. The initiative will improve both the overall safety and the asset management programs. Finally, collection of MMIRE in a current asset management system will allow safety practitioners to access that information from the database and reduce the burden on enforcement or investigators to collect the information at the crash scene.

Michael F. Trentacoste
Director, Office of Safety
Research and Development

## Notice



## Quality Assurance Statement

**Technical Report Documentation Page**

| | | |
|---|---|---|
| 1. Report No.<br>FHWA-HRT-07-046 | 2. Government Accession No. | 3. Recipient's Catalog No. |
| 4. Title and Subtitle<br>Model Minimum Inventory of Roadway Elements—MMIRE | | 5. Report Date<br>August 2007<br>6. Performing Organization Code:<br>N/A |
| 7. Author(s):<br>Forrest M. Council, David L. Harkey, Daniel L. Carter and Bryon White | | 8. Performing Organization Report No.<br>N/A |
| 9. Performing Organization Name and Address<br>VHB<br>8300 Boone Blvd., Suite 700<br>Vienna, VA 22182-2624<br><br>The University of North Carolina<br>Highway Safety Research Center<br>730 Martin Luther King, Jr. Blvd.<br>Chapel Hill, NC 27599-3430 | | 10. Work Unit No.<br>N/A<br>11. Contract or Grant No.<br>DTFH61-03-00105 |
| 12. Sponsoring Agency Name and Address<br>Federal Highway Administration<br>Office of Safety Research and Development<br>6300 Georgetown Pike<br>McLean, VA 22101-2296 | | 13. Type of Report and Period Covered<br>Final Report, September 2004—November 2006<br>14. Sponsoring Agency Code |
| 15. Supplementary Notes<br>Contracting Officer's Technical Representative (COTR): Carol Tan, HRDS-06 | | |

16. Abstract

Safety data provide the key to making sound decisions on the design and operation of roadways, but deficiencies in many States' safety databases do not allow for good decisionmaking. The Federal Highway Administration, American Association of State Highway and Transportation Officials, and the National Cooperative Highway Research Program sponsored a scanning study of how agencies in the Netherlands, Germany, and Australia develop and use traffic safety information systems. That scan produced a report that included recommendations for advancing safety themes in the areas of strategy, efficiency, and utility. A recently completed follow-on effort built on the scan team's final report and draft implementation plan by reviewing in detail the strategies suggested, providing action-related details to some of the critical strategies, and adding new strategies to help reach the team's goals.(1) As noted in that White Paper, while considerable attention and effort has been devoted to the improvement in crash data, one of the primary safety databases, much less effort has been devoted to improvements in the second primary safety database—roadway inventory and traffic data. One of the five critical strategies detailed there involved improving safety data by defining *good inventory data*, and specifically recommended the development of a Model Minimum Inventory of Roadway Element (MMIRE) that would define the critical inventory and traffic data elements needed by State and local jurisdictions to meet current safety analysis needs and data needs arising from a new generation of safety analysis tools. This current report presents a proposed MMIRE and documents the development process, which included review of the proposed MMIRE elements in a workshop of safety data experts. A listing of high-priority and supplemental inventory and traffic elements are presented, along with proposed coding for each element.

| | | | |
|---|---|---|---|
| 17. Key Words<br>safety data, traffic safety information systems, road inventory data, traffic data, data collection | 18. Distribution Statement<br>No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161. | | |
| 19. Security Classif. (of this report)<br>Unclassified | 20. Security Classif. (of this page)<br>Unclassified | 21. No. of Pages<br>81 | 22. Price |

**From DOT F 1700.7 (8-72)** **Reproduction of completed page authorized (art. 5/94)**

# SI* (MODERN METRIC) CONVERSION FACTORS

## APPROXIMATE CONVERSIONS TO SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| in | inches | 25.4 | millimeters | mm |
| ft | feet | 0.305 | meters | m |
| yd | yards | 0.914 | meters | m |
| mi | miles | 1.61 | kilometers | km |
| | | **AREA** | | |
| $in^2$ | square inches | 645.2 | square millimeters | $mm^2$ |
| $ft^2$ | square feet | 0.093 | square meters | $m^2$ |
| $yd^2$ | square yard | 0.836 | square meters | $m^2$ |
| ac | acres | 0.405 | hectares | ha |
| $mi^2$ | square miles | 2.59 | square kilometers | $km^2$ |
| | | **VOLUME** | | |
| fl oz | fluid ounces | 29.57 | milliliters | mL |
| gal | gallons | 3.785 | liters | L |
| $ft^3$ | cubic feet | 0.028 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.765 | cubic meters | $m^3$ |
| | | NOTE: volumes greater than 1000 L shall be shown in $m^3$ | | |
| | | **MASS** | | |
| oz | ounces | 28.35 | grams | g |
| lb | pounds | 0.454 | kilograms | kg |
| T | short tons (2000 lb) | 0.907 | megagrams (or "metric ton") | Mg (or "t") |
| | | **TEMPERATURE (exact degrees)** | | |
| $^oF$ | Fahrenheit | 5 (F-32)/9 or (F-32)/1.8 | Celsius | $^oC$ |
| | | **ILLUMINATION** | | |
| fc | foot-candles | 10.76 | lux | lx |
| fl | foot-Lamberts | 3.426 | candela/$m^2$ | cd/$m^2$ |
| | | **FORCE and PRESSURE or STRESS** | | |
| lbf | poundforce | 4.45 | newtons | N |
| lbf/$in^2$ | poundforce per square inch | 6.89 | kilopascals | kPa |

## APPROXIMATE CONVERSIONS FROM SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| mm | millimeters | 0.039 | inches | in |
| m | meters | 3.28 | feet | ft |
| m | meters | 1.09 | yards | yd |
| km | kilometers | 0.621 | miles | mi |
| | | **AREA** | | |
| $mm^2$ | square millimeters | 0.0016 | square inches | $in^2$ |
| $m^2$ | square meters | 10.764 | square feet | $ft^2$ |
| $m^2$ | square meters | 1.195 | square yards | $yd^2$ |
| ha | hectares | 2.47 | acres | ac |
| $km^2$ | square kilometers | 0.386 | square miles | $mi^2$ |
| | | **VOLUME** | | |
| mL | milliliters | 0.034 | fluid ounces | fl oz |
| L | liters | 0.264 | gallons | gal |
| $m^3$ | cubic meters | 35.314 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.307 | cubic yards | $yd^3$ |
| | | **MASS** | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.202 | pounds | lb |
| Mg (or "t") | megagrams (or "metric ton") | 1.103 | short tons (2000 lb) | T |
| | | **TEMPERATURE (exact degrees)** | | |
| $^oC$ | Celsius | 1.8C+32 | Fahrenheit | $^oF$ |
| | | **ILLUMINATION** | | |
| lx | lux | 0.0929 | foot-candles | fc |
| cd/$m^2$ | candela/$m^2$ | 0.2919 | foot-Lamberts | fl |
| | | **FORCE and PRESSURE or STRESS** | | |
| N | newtons | 0.225 | poundforce | lbf |
| kPa | kilopascals | 0.145 | poundforce per square inch | lbf/$in^2$ |

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

## TABLE OF CONTENTS

LIST OF TABLES

## ACRONYMS

| | |
|---|---|
| AADT | annual average daily traffic |
| AASHTO | American Association of State Highway and Transportation Officials |
| ADT | average daily traffic |
| AMF | accident modification factor |
| DOT | department of transportation |
| FHWA | Federal Highway Administration |
| FIPS | Federal Information Processing Standards |
| GLC | geographic locator code |
| GSA | General Services Administration |
| HPMS | Highway Performance Monitoring System |
| HSIS | Highway Safety Information System |
| HSM | *Highway Safety Manual* |
| IHSDM | Interactive Highway Safety Design Model |
| ITRF | International Traffic Records Forum |
| MMIRE | Model Minimum Inventory of Roadway Elements |
| MMUCC | Model Minimum Uniform Crash Criteria |
| NCHRP | National Cooperative Highway Research Program |
| NHTSA | National Highway Traffic Safety Administration |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users |
| TRB | Transportation Research Board |
| TSIMS | Transportation Safety Information Management System |
| USDOT | U.S. Department of Transportation |

# INTRODUCTION

Safety data are the key to sound decisions on the design and operation of roadways. Critical safety data include not only crash data, but also roadway inventory data, traffic data, driver history data, citation/adjudication information, and other files. The need for such data is increasing due to the development of a new generation of safety data analysis tools and methods. However, the quality of safety databases in many States and local agencies appears to be eroding. In 2003, the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Cooperative Highway Research Program (NCHRP) sponsored a scanning study of how agencies in the Netherlands, Germany, and Australia develop and use traffic safety information systems. The expert scan team's findings included a series of recommendations concerning needed improvements in this country.[(2)] In a follow-on effort funded by the FHWA, the recommendations from that scan team's report were reviewed and expanded in the *Traffic Safety Information Scan Strategy Implementation White Paper*.[(1)] Action-related details were added to some of the critical strategies, and new strategies were proposed to help reach the team's goals.

While strategies in the *White Paper* related to both crash data and other noncrash safety data such as roadway inventory and traffic volumes, more emphasis was placed on the noncrash (inventory and traffic) data. Traditionally, more emphasis has been given to improving crash data, resulting in both programs and organized user groups that do not exist for the noncrash data. Over the past decade efforts to develop a model and minimum set of good crash data elements has resulted in the Model Minimum Uniform Crash Criteria (MMUCC). The MMUCC has become the de-facto standard for crash data variables used by State and local jurisdictions when improving their crash data systems.

Indeed, a key strategy included in the *White Paper* concerned the need to better define *good safety inventory data*—those data that are important in today's safety decisions, and that will become even more important given the current development of a new generation of safety analysis tools. The concept of a minimum set of roadway elements was proposed. The recommended companion to the MMUCC has been termed the Model Minimum Inventory of Roadway Elements (MMIRE). In 2005, FHWA funded an effort to develop the initial version of MMIRE. This report documents that effort.

## DEFINITION OF AND RATIONALE FOR MMIRE

The concept of MMIRE includes a listing of roadway inventory and traffic elements critical to safety management and the proposed coding for each of these critical elements. No such listing now exists. These high-priority inventory and traffic variables are linked to and then used with crash data elements in making decisions concerning implementing safety treatments and in developing knowledge about the safety effects of treatments, roadway designs and traffic operations (e.g., signal phasing). While crash data alone can be used by a State or local roadway safety agency to answer some questions (e.g., the identification of locations for treatment), they are not sufficient in many cases. Without sound inventory and traffic data, the safety professional's ability to make critical programmatic decisions is greatly reduced. Examples where sound inventory and traffic data are needed include:

- **Identification of locations that would benefit most from safety treatments**. Safety treatment dollars are limited, and should be used on locations that will most benefit from treatments. While these problem-location-identification decisions can, and often are, made on the basis of crash frequency alone, such a process does not allow the safety engineer to identify those sites that are most likely to benefit from safety treatment. To meet these criteria, the site must not just have the highest frequency of crashes, but have an elevated crash risk when compared to similar sites. More specifically, the identification of high-priority intersections by crash frequency alone would lead to a listing including primarily (or only) intersections with high traffic volumes. To identify both those high and lower volume intersections that will benefit most from treatment, one needs to identify those that have higher crash frequencies or rates when compared to similar intersections based on intersection characteristics (e.g., entering volumes on all legs, number of approach lanes, signalized versus unsignalized, presence of left turn lanes and signal phases). Without an inventory file that includes both the locations of all intersections within a system and characteristics of each of these intersection legs, one cannot conduct such analyses since the needed group of similar intersections cannot be identified. Even if the safety engineer decided not to use such a robust problem-identification process, but did want to compare intersections on the basis of crash rates (i.e., crashes per entering vehicle) rather than just crash frequencies, they could not even complete this less-robust process without approach volumes from both crossing roadways—data that are not available in most State and local agencies. This is particularly true when the crossing roadway is not a State-system road (i.e., is a county or local road).

- **Development of knowledge about roadway treatment effects**. As has been documented in various publications, including the NCHRP "Series 500" Implementation Guides for the AASHTO Strategic Highway Safety Plan efforts[1], accurate estimates of the treatment effect (i.e., accident modification factors—AMFs) of many commonly used safety treatments are unknown or are based on poor data and research methods. The safety professional and the safety research community are continually trying to evaluate critical treatments. However, conducting a sound evaluation requires much more than just comparing the before and after

[1] See http://safety.transportation.org/guides.aspx.

crash experience on the treated site. Current state-of-the-practice methods require the use of a *reference group* of similar untreated sites. Even less than optimum evaluations require a comparison group of similar sites. Without a good inventory system, these groups cannot be defined.

- **Use of the new generation of safety management tools.** For the past few years, FHWA and AASHTO have been developing a set of new cutting-edge analytical tools and resources to aid the roadway designer and the safety engineer in their design, operations, and treatment decisions. These include FHWA's Interactive Highway Safety Design Model (IHSDM)[2] and *SafetyAnalyst*[3], AASHTO's Series 500 *Data and Analysis Guide*[(3)], and the *Highway Safety Manual*[4]. IHSDM is a CAD-based system, comprised of multiple modules that allows the user to predict the expected safety performance of roadway design and redesign alternatives. Currently, only the rural two-lane version has been developed. However, similar tools are being developed for both suburban and urban arterials and rural multilane roadways. These tools will be included in the first edition of the *Highway Safety Manual*, a compilation of safety knowledge and safety analysis tools being developed by the Transportation Research Board with funding from AASHTO. FHWA's *SafetyAnalyst* is a package of safety management tools that will assist the user in efforts ranging from screening the roadway network to identify sites for improvement to analyzing the sites and choosing the most appropriate treatments, and evaluating the effects of the treatment. This set of tools will be completed and released in 2008. AASHTO's Series 500 Guides[5] are compilations of current knowledge about low-cost safety treatments aimed at reducing specific crash types (e.g., run-off-road crashes, unsignalized intersection crashes, crashes involving drinking drivers) The final Guide in this series, *A Guide for Addressing Safety Data and Analysis in Developing Emphasis Area Plans*, contains analytical techniques to assist the safety engineer and other safety professionals in planning how to reduce each of 22 crash types covered in the Series 500 Guides.[(3)] What is important to note is that ***all*** of these new tools require good inventory and traffic flow data for use. Without such data, the safety professional cannot take full advantage of the safety decision tools.

- **Development of knowledge about roadway elements and designs that increase or decrease crash risk.** While the study of changes in crash risk or crash injury risk due to changes in roadway elements is usually conducted by researchers rather than safety engineers, the knowledge gained from such analyses leads to improved design standards and operating procedures—outcomes that do affect how the engineers do their jobs. Such studies cannot be completed without detailed information on the roadway characteristics and traffic flows on roadway segments with and without crashes. At this point, very little is known about the true effects on crash risk of such elements as curvature or grade on multilane rural and suburban roads, driveway density, access control policies, and many others. The lack of this knowledge affects sound safety decisions, and this lack results from the fact that

---

[2] See http://www.tfhrc.gov/safety/ihsdm/ihsdm.htm.
[3] See http://www.tfhrc.gov/safety/pubs/06124/index.htm.
[4] See http://www.wsdot.wa.gov/partners/hsm/public/.
[5] See http://safety.transportation.org/guides.aspx.

complete inventory data that can be linked with crashes is unavailable in most States and local jurisdictions.

Almost all State highway agencies and some local transportation agencies currently have roadway inventory and traffic flow data in their files. These data were often the result of expanding data collection efforts required by FHWA's Highway Performance Monitoring System (HPMS)[6] for sample sections of roadways to the full State system of roadways. Although HPMS has been the driving force behind the collection of roadway inventory and traffic data by State departments of transportation (DOTs), it cannot be considered the model for safety inventory data because:

- It is based on the need for data on highway condition, performance, use, and operating characteristics of highways and is not driven by safety considerations.
- It requires complete inventory data of only basic (universe) variables, while other variables are captured only for certain sample sections of roadways (e.g., lane width, shoulder width).
- The format of certain variables, even those captured on only sample sections, is not conducive to safety use (e.g., horizontal curvature data specifies the total curve length within the sample for certain curve classes, but not the location of the individual curves within the section).

While the data elements in many States' current inventory systems are an expansion of the HPMS sample elements to all roads in the full State system and capture such variables as lane width, shoulder width and type, speed limit, and other cross sectional variables, very few State systems capture curvature or grade data, intersection inventory data, roadside inventory data, or other data elements critical to safety.

FHWA and AASHTO initiated efforts to develop a "Draft Model Highway Data Dictionary" for subsequent use in the development of the Transportation Safety Information Management System (TSIMS). The data dictionary is viewed as a starting point for developing a comprehensive, uniform set of roadway characteristic data attributes.[7] However, it cannot be considered a model for a sound safety inventory database due to some limitations in the explanatory descriptions of the items, missing critical safety elements (e.g., clear-zone width), and in the classification of the priority of the elements.

In summary, there is no current listing of critical safety-related inventory and traffic data elements—no MMIRE. In contrast, the U.S. Department of Transportation's (USDOT's) National Highway Traffic Safety Administration, working with the Governors' Highway Safety Association and safety data advocates across the Nation, have developed a listing of and definitions for critical crash data elements over the past decade—the Model Minimum Uniform Crash Criteria (MMUCC).[8] Although not an official national standard, this data element

---

[6] For more information on HPMS, refer to http://www.fhwa.dot.gov/policy/ohpi/hpms/.

[7] For more information, refer to http://tsims.aashtoware.org/ContentManagement/PageBody.asp?PAGE_ID=3&CONTENT_ID=23.

[8] For more information on MMUCC, refer to http://www.mmucc.us/.

guideline has become the de facto standard that is used by almost all State agencies when they reexamine and modify their crash report form. What is needed is a companion for MMUCC—thus the birth of MMIRE.

Three final background points are noted concerning what MMIRE is envisioned to be. First, since the development of the concept in the Council and Harkey *White Paper*,[1] it has been strongly recommended that like MMUCC (but unlike HPMS), the collection of MMIRE elements will be *voluntary* rather than mandatory. Like MMUCC, MMIRE is envisioned as a tool to be used by State and local agencies in their safety data improvement efforts. The only MMIRE-related requirement currently being discussed concerns States applying for Federal safety-data improvement grants under Section 2006(e)—"State Traffic Safety Information System Improvements" in the new Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) legislation. The language in that section indicates that the USDOT Secretary will define *model data elements* for use in safety analyses, and that States applying for the grants will need to certify that they have adopted the model elements or will use the grant funds to work toward adopting and using them. While not known at this time, it is anticipated that elements in MMIRE, like MMUCC, ultimately will be included in the listing of these model data elements.

Second, it also has been recommended strongly from inception that MMIRE efforts be continually reviewed by the data collectors and users—the State and local DOTs. The *White Paper*[1] suggested that the listing of proposed elements be vetted by review committees of State and local agency safety and inventory engineers and users. The vetting effort should include strong participation from appropriate individuals and committees in AASHTO, because their endorsement and support will be critical to gaining State agency acceptance. As described below, this vetting process has begun with the convening of State and local data experts in a MMIRE review workshop. It is anticipated that FHWA will continue that vetting process in further reviews.

Third, the choice of elements considered for MMIRE and the priority assigned are based on the need for that element in *safety* efforts. There are clearly other variables collected in HPMS and other files that are used for nonsafety analyses (e.g., pavement depth). These may well be key variables for other purposes, but were not included (or recommended) in MMIRE unless they were felt to be important for safety uses.

# DEVELOPMENT OF MMIRE

MMIRE has been developed through a multistage process involving identification of potential elements, review and comment by data collection and data use experts, modification of MMIRE element listing based on that review, and developing of proposed coding schemes for each element. The following narrative describes that process.

## IDENTIFICATION OF POTENTIAL MMIRE ELEMENTS

As noted above, the goal of MMIRE is to define *critical safety data inventory elements*—those elements needed by State and local agencies to conduct their internal analyses, and those elements required by existing safety analysis tools and resources. However, this effort was not limited to existing data element needs. Thought also was given to critical elements that will be needed for use in future analysis tools and program decisions. For example, pedestrian and bicycle safety are both high-priority areas for both State and local jurisdictions. As in program decisions and knowledge developed for other road users, both crash and exposure data are needed by the analyst. While pedestrian and bicycle exposure data currently are not collected, these counts may be possible by using digital-image-based methods now under development. Such critical, but nonexistent, elements are included in the proposed MMIRE structure.
The research team based their choice of proposed elements on five specific existing tools and resources:

- *HPMS—the Highway Performance Monitoring System*. As noted above, HPMS is very likely the reason why current inventory systems exist in State DOTs. Even given the fact that HPMS was not developed as a safety data base, it was a high-priority source of potential elements, with elements from both the "universe" and the "sample" datasets of HPMS being considered in terms of possible use in safety analyses. Conversations were held with HPMS staff to ensure that the proposed MMIRE would be compatible with current HPMS revision efforts, and HPMS staff provided inputs on elements before initial review by outside experts.

- *IHSDM—FHWA's Interactive Highway Safety Design Model*. This is a CAD-based system composed of multiple modules that allow the user to predict the expected safety performance of roadway design and redesign alternatives. Currently, only the rural two-lane version has been developed. However, similar tools are being developed for both suburban and urban arterials and rural multilane roadways. These tools will be included in the first edition of the *Highway Safety Manual*. Elements related to these road types have been added to the MMIRE matrix based on IHSDM user documents.(4)

- *SafetyAnalyst*. FHWA is currently developing this package of safety management tools that will assist the user in efforts ranging from screening the roadway network to identify sites for improvement, analyzing the sites and choosing the most appropriate treatments, and evaluating the effects of the treatment. Variables required by SafetyAnalyst as noted in the user documentation are considered to be very critical MMIRE elements. "Optional" or "recommended" SafetyAnalyst variables also were included and considered.(5)

- *TSIMS—AASHTO's Traffic Safety Information Management System*. The overall goal of the TSIMS project is to develop an enterprise safety data warehouse, software that will assist the State and local agency in the collection, storage and linkage of the many types of safety data. A component of the current TSIMS package is a "Data Dictionary" that includes listings of "minimum," "basic," and "extended" roadway inventory variables. Since this is very similar to what MMIRE is attempting to do, many of these elements were reviewed and included in the MMIRE matrix.

- *MMUCC—The Model Minimum Uniform Crash Criteria.* While MMUCC is a crash data element system, it contains reference to 18 roadway inventory variables that should exist in a roadway inventory file and thus be linked to for analyses. Based on inputs from MMUCC specialists at the review workshop, these variables were checked against the listing of draft MMIRE variables, and all were found to be included.

These four original inventory element listings were reviewed in detail by the project team staff, and potential MMIRE elements were identified. In addition to elements in these four listings, the project team also included additional elements that are felt to be critical MMIRE variables. These additions were based primarily on four other sources:

1. Project team knowledge of State inventory databases that arose from their work with the nine States and two local agencies that are or have participated in FHWA's *Highway Safety Information System (HSIS).*[9]

2. Project team knowledge of roadway safety research efforts, and the data needed to conduct that research (including data that are not available in most or all State and local data files).

3. Project team knowledge of efforts related to the development of the *Highway Safety Manual*, and the data elements needed in the research and tools supporting that effort.

4. Project team knowledge of data needed in other "nontraditional" safety data analyses—primarily those related to pedestrian, bicycle, and roundabout safety.

This element identification effort produced a listing of over 150 potential MMIRE elements. The listing was converted to a matrix for use in the review workshop described in the section below. For each data element, the project team provided a proposed priority—1st, 2nd, and not recommended. This priority was based on a combination of factors including the requirements of the four major data sources and tools noted above (i.e., MMUCC was added later) and the team's knowledge of current and expected future analysis and tool needs. In some cases, the difficulty of data collection was considered in this prioritization.

In addition to the draft priority, the matrix also provided information on the presence of or requirement for each data element in the four basic data sources and the "level of priority" provided by each source (e.g., HPMS has both Sample Section and Universe elements; *SafetyAnalyst* has "mandatory," "optional," and "supplemental" elements).

---

[9] For more information, refer to http://www.hsisinfo.org/.

Finally, the project team searched for each potential data element in inventory files for 20 States that were available to them—the eight current HSIS States and 12 other States. Each State file was examined to determine which of the MMIRE elements being considered were collected by that State. For example, information on "county" is captured in 18 of the 20 State systems examined (i.e., 90 percent). This information was also provided to the reviewers in the workshop to give them some sense of the current presence of each variable in the sample State data systems.

## THE MMIRE REVIEW WORKSHOP

A one-day MMIRE review workshop was held August 3, 2006, in conjunction with the International Traffic Records Forum (ITRF). As indicated above, the purpose of the workshop was to have State and local agency data collectors and data users review and provide feedback on the potential data elements in the draft MMIRE matrix described above. To ensure input from State and local DOT data collection managers, State and local data users, roadway safety researchers, and other roadway data experts, the workshop participants include both an invited group of attendees whose travel expenses were funded by FHWA and other ITRF attendees who signed up for the workshop. The workshop included 34 attendees—18 from State DOTs, 2 from local DOTs, 6 from the USDOT, 6 roadway safety researchers, one data-product vendor, and one representative from AASHTO. A full list of attendees is provided in Appendix A.

The above-described MMIRE draft matrix was presented to the attendees, who were asked to:

1. Provide feedback including their thoughts on the adequacy of the proposed MMIRE and the proposed priority of the elements.

2. Provide suggestions concerning additional/fewer elements and difficulties and solutions to collection of each element.

3. Provide suggestion on how best to proceed toward the development of a MMIRE implementation plan.

## MODIFICATION OF DRAFT MMIRE ELEMENT LISTING

Following the workshop, the project team incorporated the feedback from the workshop participants into the final proposed MMIRE elements. Changes incorporated included addition of a small number of new variables and deletion of a smaller number of proposed variables, minor variable name changes, and changes in the priorities for some variables. The most significant changes involved (1) reorganization of sections of the matrix, (2) changing what were originally "intersection" descriptors to include additional "junctions" such as mid-block pedestrian and bicycle crossings, and (3) a change in how the "priority" of each element is defined. With respect to the latter, while the draft priorities discussed at the workshop could be affected by the anticipated difficulty in data collection, the discussion there resulted in the final priority being only based on the importance of the element in safety analyses, and a new variable was added estimating the level of difficulty of data collection.

## DEVELOPMENT OF PROPOSED CODING SCHEME FOR EACH MMIRE ELEMENT

Following finalization of the proposed listing of MMIRE elements, the project team defined a proposed coding scheme for each element. For existing elements found in any of the five data sources noted above, the team reviewed the proposed coding from each. As would be expected, the coding for a given variable differed to some degree across the sources. The final decision was made based on the expected use in future analyses. Thus, additional weight was given to the schemes now used in both the IHSDM and SafetyAnalyst and anticipated for use in future tools. However, an attempt was made to ensure that the proposed scheme also was compatible with HPMS codes, on the assumption that States may have used that coding when developing their inventory files, thus reducing the amount of recoding that might be necessary in a conversion to the MMIRE formats.

# PROPOSED MMIRE ELEMENTS AND CODES

## PROPOSED MMIRE ELEMENTS

The proposed listing of MMIRE elements is presented in the matrix in Appendix B. For clarity of presentation, the project team divided the listing into the following categories and subcategories. Individual elements/variables are then listed under each subheading.

**Table 1. Category and subcategory headings for MMIRE elements.**

.

- I. Roadway Segment Descriptors
  - I.a. Segment Location/Linkage Variables
  - I.b. Segment Roadway Classification
  - I.c. Segment Cross Section
    - I.c.1. Surface Descriptors
    - I.c.2. Lane Descriptors
    - I.c.3. Shoulder Descriptors
    - I.c.4. Median Descriptors
  - I.d. Roadside Descriptors
  - I.e. Other Segment Descriptors
  - I.f. Segment Traffic Flow Data
  - I.g. Segment Traffic Operations/Control Data
- II. Segment Alignment
  - II.a. Horizontal Curve Data
  - II.b. Vertical Grade Data
- III. Road Junctions
  - III.a. At-Grade Intersection/Junctions
    - III.a.1. At-Grade Intersection/Junction General Descriptors
    - III.a.2. At-Grade Intersection/Junction Descriptors (Each Approach)
  - III.b. Interchange and Ramp Descriptors
    - III.b.1. General Interchange Descriptors
    - III.b.2. Interchange Ramp Descriptors

As shown, the descriptors are categorized into three basic groups—roadway segment descriptors (e.g., begin and end route milepost, number of lanes, AADT), roadway segment alignment descriptors (e.g., degree of curve, percent grade), and road junction descriptors (e.g., type of junction, approach traffic volume, presence of protected left turn phasing). While most current inventory systems are divided into these three basic file types, relational databases would allow the data to be stored in alternative ways. Thus, the categorization is logic driven and used for explanation purposes rather than a prescription for file layouts.

The matrix in Appendix B includes the following information:

- *Column A—The MMIRE Data Elements*. The elements are organized into the subfiles indicated above.

- *Column B—Definitions of MMIRE Data Elements.*

- *Column C—Project Team's Recommended Priority*. For each data element, the project team has provided a proposed priority—$1^{st}$ or $2^{nd}$. This priority is based on a combination of factors including the requirements of the four major data sources and tools noted above and the team's knowledge of current and expected future analysis and tool needs. Note that other elements were considered both by the project team prior to the workshop and by the review team at the workshop, but are not included in the final proposed list of elements since no strong current or future association with safety analysis or management could be identified.

- *Column D—Ease of Data Collection*. For each data element, the project team has provided an estimate of the ease of data collection for that variable—easy, moderately difficult, difficult. This estimate is based a number of factors including whether a data item is likely to be already collected (e.g., is an HPMS-required universe variable) and the team's knowledge of State agencies' attempts to collect the data. An asterisk (*) indicates that a proposed new data collection system is currently being developed to assist in the compilation of these elements (e.g., the FHWA Digital Highway Measurement System[(6)]).

- *Columns E-I—Presence of Each Data Element in the Five Basic Data Sources*. Note that the level of requirement is coded for each column (e.g., for HPMS, whether the element is required in the Universe File or in the Sample File.)

## PROPOSED MMIRE ELEMENT CODING

Appendix C contains the proposed coding for each of the proposed MMIRE elements. The element name, definition, attributes (i.e., proposed coding), and source of coding is presented. When similar coding was found in the major sources, "All Sources" is noted. In many cases, "Project team" indicates coding for a new variable proposed by the project team. In other cases, it indicates that no coding was found for an element in the major sources, and the coding was based on the project team's knowledge of coding in existing State inventory files.

## ADDITIONAL SAFETY VARIABLES IN THE NATIONAL BRIDGE INDEX AND USDOT NATIONAL HIGHWAY-RAIL CROSSING INVENTORY

The MMIRE matrix in Appendix B includes reference to both the National Bride Index[10] and the USDOT National Highway-Rail Crossing Inventory[11]. Both these inventories contain multiple variables, some of which are related to safety and some related to nonsafety usage (e.g., bridge strength ratings). At the request of and with the input of a State DOT workshop participant, a listing of those elements in each file that are most related to safety analyses are included for information in Appendix D.

---

[10] For description of NBI, see http://www.ire.org/datalibrary/databases/viewdatabase.php?dbaseindex=16. To obtain NBI data see http://www.fhwa.dot.gov/bridge/britab.htm for contact information.

[11] See http://www.fra.dot.gov/us/content/801.

## PRIORITIZING DATA COLLECTION

The listing of proposed MMIRE variables included in this document is extensive. Adoption of MMIRE by a transportation agency will require adequate resources, since very few if any of the agencies now collect all the proposed variables. In some cases, depending on the nature of existing safety inventory files, significant resources will be required to complete the effort. However, the adoption of MMIRE can clearly be done in stages. The report presents the authors' rating of element-priority based on the needs of current and future safety analysis procedures and tools. State and local agencies may have their own safety analysis procedures that would modify these priorities, but clearly there is the opportunity to concentrate early-stage data collection on the highest priority variables. The authors have not attempted to provide "sub-priorities"—e.g., element-specific priorities for all elements within the priority "1" category. Based on their knowledge of safety analysis needs, the authors would note that perhaps the most important elements missing from at least most State DOT databases are those related to intersections and roadway curvature. As noted above, a sound safety management program for intersections demands at least a listing of (and locations of) all intersections within the system being managed, along with key descriptors of the intersections. In like fashion, curvature significantly affects crash risk, particularly on two-lane rural roads. Managing these locations again requires the location of and description of curves.

Collection of these "missing data" will not be easy. However, technology is being developed that will assist the agencies in this effort (e.g., FHWA's Digital Highway Measurement System). Agency personnel charged with MMIRE responsibilities are urged to monitor advancements with this and other similar systems. However, as noted in Action Item 3.2a of the earlier referenced *White Paper*(1), there are other commercially available systems that do not appear to provide data as accurate as that provided by the FHWA system. As recommended there, agencies should purchase only safety data collection equipment that has been validated for accuracy.

## CLOSURE

This report describes a proposed set of data elements for inclusion in MMIRE—the Model Minimum Inventory of Roadway Elements. As has been noted throughout the report, this listing is viewed as a first step in a process to establish MMIRE and to begin the voluntary adoption by State and local DOTs. It is expected that additional review of, and possible modification to, this initial listing will follow. As noted above, the adoption of MMIRE by a State or local agency will not be easy—it will require commitment, adequate resources, and a staging plan. However, the results of this effort will be the foundation for one of the most important tasks conducted by any transportation agency—the development and use of a safety management system that reduces the crashes, deaths, and injuries involving the agency's primary customer, the road user.

## APPENDIX A. MMIRE WORKSHOP ATTENDEES

Janet Allbee
Colorado State Patrol

Rory Austin
NHTSA

William Beans
New Jersey DOT

Toni Bianchi
AASHTO

Patrick Brady
Florida DOT

Tim Burks
Oregon DOT

Jim Ellison
Pierce County (WA)
Public Works

Mark Finch
Washington State DOT

Carl Gonder
Alaska DOT

Mike Griffith
FMCSA

Doug Harwood
Midwest Research Institute

Joe Hausman
Ohio DOT

Tim Heideman
Traffic Improvement
Assoc., Michigan

Matt Hiland
GeoDecisions, Inc.

Loren Hill
Minnesota DOT

Elizabeth Hilton
Texas DOT

Roger Horton
Washington State DOT

Peggy Knight
Iowa DOT

Matthew Koukol
Minnesota DOT

Kevin Lacy
North Carolina DOT

Dale Lighthizer
Michigan DOT

Donald McNamara
NHTSA

Bich-Hanh Nguyen
Univ. of New Mexico

Richard Paddock
TSASS, Inc.

Michael Pawlovich
Iowa DOT

Robert Pollack
FHWA

Robert Richie
Tennessee DOT

Bob Scopatz
Data Nexus, Inc.

L.C. Smith
North Carolina DOT

David Smith
FHWA

Reginald Souleyrette
Iowa State University

Mary Spicer
Vermont DOT

Ida van Schalkwyk
University of Arizona

Dennis Utter
NHTSA

Mark Wills
Oregon DOT

Jack Zogby
Transportation Safety
Management Systems

Workshop Leaders

Forrest Council
VHB

David Harkey
UNC Highway Safety
Research Center

Carol Tan
FHWA Safety R&D

# APPENDIX B. PROPOSED MMIRE ELEMENTS

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| **I. ROADWAY SEGMENT DESCRIPTORS** | | | | | | | | |
| **I.a. Segment Location/Linkage Variables** | | | | | | | | |
| 1. County[18] | County location of segment | 1 | E | | | M | B | |
| 2. City/Local Jurisdiction | City/local jurisdiction location of segment if applicable | 1 | E | U | | O | M | |
| 3. Route Number | Route number | 1 | E | U | Y | M | M | |
| 4. Street Name | Street name | 1 | E | | | | | |
| 5. Section End-Points Descriptors | Location information defining the location on a route of each endpoint of the section | 1 | E | U | Y | M | E | |
| 6. Section Identifier | Unique segment identifier, derived from other variables (e.g., combination of route number, county location and beginning and ending mileposts | 1 | E | U | | M | E | |
| 7. Section Length | Section length | 1 | E | U | Y | M | | |
| 8. Highway District | Highway district | 1 | E | | | O | | |
| 9. Governmental Ownership | Governmental owner of segment (including FIPS code) | 1 | E | U | | | | |
| 10. Type of Governmental Ownership | Type of governmental ownership | 1 | | | | | | |
| 11. Route Signing | Type of route signing on the segment | 1 | E | U | | M | M | |

12 1 = 1st Priority, 2 = 2nd Priority
13 E = Easy, M = Moderate, D = Difficult. Note that an asterisk (*) indicates an element for which data collection technology is being developed.
14 U = Universe File, S = Sample Section
15 Y = Yes, O = Optional
16 M=Mandatory, O=Optional, S=Supplemental
17 M=Minimum, B=Basic, E=Extended
18 Variable numbers are cross-referenced to variable coding in Appendix C.

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 12. Route Signing Qualifier | Whether the route is "business" or other qualifier | 1 | E | U | | | | |
| 13. Coinciding Route Indicator | Whether the route segment is a "primary" coinciding route (i.e., the route that crashes are referenced to) or a "minor" coinciding route | 1 | E | | | | | |
| 14. Coinciding-Route Primary Route Number | If a minor coinciding route segment, the route number for the major (primary) route | 1 | E | | | | | |
| 15. Direction of Inventory | Direction of inventory | 1 | E | | | | | |
| **I.b. Segment Roadway Classification** | | | | | | | | |
| 16. Functional Class | Functional class | 1 | E | U | | M | M | YES |
| 17. Rural/Urban Designation | Rural/urban designation | 1 | E | U | Y | M | B | |
| 18. Federal Aid/ Route Type | Federal aid/route type | 1 | E | U | | | E | |
| 19. Access Control | Access control | 1 | E | S | | O | M | YES |
| 20. Operational Class | Operational class of segment, if different from official functional class | 2 | D | | | | | |
| **I.c. Segment Cross Section** | | | | | | | | |
| **I.c.1. Surface Descriptors** | | | | | | | | |
| 21. Surface Type | Surface type (paved, unpaved or types of pavement) | 1 | E | S | Y | | | |
| 22. Surface Friction | Surface friction indicator | 1 | D | | | | | |
| 23. Surface Friction Date | Date surface friction measured | 1 | | | | | | |
| 24. Total Surface Width | Total paved surface width (could be derived if all other lane widths are captured) | 2 | M | | | | B | |
| 25. Pavement Roughness | Pavement roughness (roughness number) | 2 | D | U | | | E | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 26. Pavement Roughness Date | Date pavement roughness number assigned | 2 | | | | | | |
| 27. Pavement Condition | Pavement condition (descriptive scale) | 2 | D | S | | | M | |
| 28. Pavement Condition Date | Date pavement condition assigned | 2 | | | | | | |
| **I.c.2. Lane Descriptors** | | | | | | | | |
| 29. No. of Thru Lanes | Number of thru lanes, including HOV and reversible lanes | 1 | E | U | Y | M | M | YES |
| 30. Average Thru Lane Width | Average lane width used by traffic (i.e., not including wide curb lanes, parking area, bicycle lanes, etc.) | 1 | M | S | Y | O | M | YES |
| 31. Exclusive Left Turn Lane Presence | Exclusive left turn lane type | 1 | E | | | | | |
| 32. Exclusive Left Turn Lane Length | Exclusive left turn lane length | 1 | E | | | | | |
| 33. Exclusive Right Turn Lane Presence | Exclusive right turn lane type | 1 | E | | | | | |
| 34. Exclusive Right Turn Lane Length | Exclusive right turn lane length | 1 | E | | | | | |
| 35. Auxiliary Lane Presence/Type | Presence or type of auxiliary lane | 1 | E | | | | | |
| 36. Auxiliary Lane Length | Length of auxiliary lane | 1 | E | | | | | |
| 37. HOV Lanes | Presence of HOV lanes in segment | 1 | M | U | | M/O | | |
| 38. HOV Lane Types | HOV lane types | 2 | E | | | | | |
| 39. Reversible Lanes | Number of reversible lanes present on segment | 1 | | | | | | |
| 40. Presence/Type of Bicycle Facility | Presence or type of bicycle facility on segment | 1 | D | | | O | B | YES |
| 41. Width of Marked Bicycle Lane or Bike Path | Width of marked bicycle lane or bike path | 1 | D | | | | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 42. Width of Wide Curb Lane | Width of wide curb lane used by both vehicles and bicycles | 1 | M | | | | | |
| 43. Number of Peak Hour Lanes | Number of through lanes used in peak period in the peak direction | 2 | M | U | | | | |
| **I.c.3. Shoulder Descriptors** | | | | | | | | |
| 44. Right Shoulder Type | Shoulder type on right side of road in direction of inventory | 1 | E | S | Y | M | M | |
| 45. Right Shoulder Total Width | Total width of right shoulder, including paved and unpaved parts | 1 | M | | Y | O | B | YES |
| 46. Right Paved Shoulder Width | Width of paved portion of right shoulder | 1 | E | S | Y | O | B | YES |
| 47. Left Shoulder Type | Shoulder type on left side of roadway in direction of inventory. For undivided roads and divided roads with one direction of inventory, this will be the outside shoulder on the opposing side. NOTE that information on paved width of the inner (left) shoulder on divided roads is captured in the Median descriptors. | 1 | E | S | Y | M | M | |
| 48. Left Shoulder Total Width | Width of left (outside) shoulder, including paved and unpaved parts | 1 | M | | Y | O | B | YES |
| 49. Left Paved Shoulder Width | Width of paved portion of left shoulder | 1 | E | S | Y | O | B | YES |
| 50. Shoulder Rumble Strip Presence | Presence of shoulder rumble strip | 1 | M | | | S | | |
| 51. Rumble Strip Type | Rumble strip type if present | 2 | M | | | | | |
| 52. Sidewalk Presence | Presence of sidewalk in direction of inventory | 1 | D* | | | | B | |
| 53. Curb Presence | Presence of curb | 1 | M | | | | B | |
| 54. Curb Type | Curb type | 2 | D | | | | | |
| **I.c.4. Median Descriptors** | | | | | | | | |
| 55. Median Type | Median type (including two-way left turn lane) | 1 | E | S | | M | M | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 56. Median Width | Median width, including inside shoulders | 1 | E | S | | O | M | YES |
| 57. Median Barrier Type | Median barrier type | 1 | E | | | M | | |
| 58. Median (Inner) Paved Shoulder Width | Median (inner) paved shoulder width | 1 | E | | | | | |
| 59. Median Shoulder Rumble Strip Presence | Presence of median shoulder rumble strip | 1 | M | | | | | |
| 60. Median Rumble Strip Type | Rumble strip type if present | 2 | M | | | | | |
| 61. Median Left Turn Lane Type | Type of left turn lane in median. | 1 | E | | | | | |
| 62. Median Left Turn Lane Width | Width of median left turn lane | 1 | E | | | | | |
| **I.d. Segment Roadside Descriptors** | | | | | | | | |
| 63. Roadside Clearzone Width | Roadside clearzone width | 1 | D* | | | | | |
| 64. Sideslope | Sideslope | 1 | D* | | | | | |
| 65. Roadside Rating | A rating of the safety of the roadside from Appendix D, Publication No. FHWA-RD-99-207, Prediction of the Expected Safety Performance of Rural Two-Lane Highways. Only collect if clearzone width and sideslope are not collected. | 1(only if clearzone and sideslope variables are not collected) | D | | Y | | | |
| 66. Driveway Information | Driveway count by type | 1 | D* | | Y | | | |
| 67. Roadside Hardware Descriptors | Roadside hardware descriptors (including type, location, size, distance from lane edge). Examples include barrier (type and terminal type), signs (size, breakaway?), culverts, etc. | 2 (Linkage to Asset Management ?) | D* | | | | | |
| **I.e. Other Segment Descriptors** | | | | | | | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 68. Terrain Type (e.g., Mountainous, Level) | Basic terrain type around segment. This is a (poor) surrogate for detailed data on curvature and grade, and would be collected only in the absence of those variables. See “Alignment” variables below. | 1 | M | S | | O | B | |
| 69. Bridge Descriptors for Bridges in Segment | Bridge descriptors for bridges in segment | Linkage to Bridge File | E | | | | | |
| 70. RR Grade Crossing Descriptors for Crossings in Segment | RR grade crossing descriptors for crossings in segment | Linkage to RR File | E | | | | | |
| 71. Number of Signalized Intersections in Section | Number of signalized intersections in section | 1 (only if no intersection file) | M* | S | | | | |
| 72. Number of Stop-Controlled Intersections in Section | Number of stop-controlled intersections in section | 1 (only if no intersection file) | M* | S | | | | |
| 73. Number of Uncontrolled/Other Intersections | Number of uncontrolled/other intersections | 1 (only if no intersection file) | M* | S | | | | |
| **1.f. Segment Traffic Flow Data** | | | | | | | | |
| 74. Average Daily Traffic Volume | Average Annual Daily Traffic | 1 | E | U | Y | M | M | YES |
| 75. AADT Year | Year of AADT | 2 (if annual file) | E | | Y | | M | YES |
| 76. AADT Annual Escalation Percentage | AADT annual escalation percentage | 2 (if annual file) | M | | O | O | B | |
| 77. Percentage Truck or Truck AADT | Percentage truck or truck AADT (includes tractor-semis and trucks with 6+ wheels) | 1 | M | S | | O | E | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 78. Total Daily Two-Way Pedestrian Count/Exposure | Total daily pedestrian flow in both directions (unless directional segment). This is a (poor) surrogate for crossing pedestrian counts. | 2 (Collect only if crossing counts are unavailable for intersection/ junction approaches. see below) | D | | | | | |
| 79. Bicycle Count/Exposure | Total daily bicycle flow in both directions (unless directional segment) | 1 | D | | | S | | |
| 80. Motorcycle Count or Percentage | Motorcycle daily count or percentage of AADT | 1 | D | | | | | |
| 81. Hourly Traffic Volumes (or Peak and Off-Peak AADT) | Hourly traffic volumes (or peak and off-peak AADT) | 2 | D | | | O | | |
| 82. K-Factor | The K-factor is the 30th highest hourly volume (i.e., the design hour volume) for a year, as a percentage of the annual average daily traffic | 2 | D | S | | | B | |
| 83. Future AADT | Forecasted AADT | 2 | D | U | O | | B | |
| 84. Future AADT Year | Year of forecasted AADT | 2 | D | U | O | | B | |
| 85. Directional Factor | Proportion of peak hour traffic in the predominate direction of flow | 2 | D | S | | O | | |
| 86. Percent Combination Trucks - Daily Average | Percent combination trucks—daily average | 2 | M | S | | | E | |
| 87. Percent Single Unit Trucks - Daily Average | Percent single unit trucks—daily average | 2 | M | S | | | E | |
| **I.g. Segment Traffic Operations/Control Data** | | | | | | | | |
| 88. One/Two-Way Operations | Whether the segment operates as a one- or two-way roadway | 1 | E | U | | M | | |
| 89. Speed Limit | Speed limit | 1 | E | U | | O | M | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 90. School Zone Indicator | Whether segment contains a school zone | 1 | M | | | | | |
| 91. On-Street Parking Presence | Time-based parking restrictions | 1 | D | | | S | M | |
| 92. On-Street Parking Type | On-street parking type | 1 | D | S | | | | |
| 93. Roadway Lighting | Type of roadway lighting | 1 | M | | | S | B | YES |
| 94. Truck Route Designation | Truck route designation | 1 | E | U | | | | |
| 95. Toll Facility? | Toll facility indicator | 1 | E | U | | | | |
| 96. Edgeline Presence/Type | Edgeline presence/type | 1 | D* | | | | | |
| 97. Centerline Presence/Type | Centerline presence/type | 1 | D* | | | | | |
| 98. No Passing Zone Code / Passing Permissibility | No passing zone code/passing permissibility | 2 | D* | S | | | | |
| 99. 85th % Speed | Traffic speed exceeded by 15 percent of the vehicles in the flow | 2 | D | | | S | | |
| **II. Roadway Alignment Descriptors** | | | | | | | | |
| **II.a. Horizontal Curve Data (NOTE: Each data record will define an angle point or a single curve, even if the curve is a component of a compound or reverse curve. Spirals or other transitions are part of the curve.)** | | | | | | | | |
| 100. Curve Identifiers and Linkage Variables | All variables needed to define location of each curve record and all variables necessary to link with other safety files | 1 | D* | | Y | | | |
| 101. Curve Feature Type | Type of horizontal alignment feature being described in the data record | 1 | D* | | | | | |
| 102. Horizontal Curve Degree or Radius | Degree or radius of curve | 1 | D* | S | Y | S | | YES |
| 103. Horizontal Curve Length (Including Spiral) | Length of curve | 1 | D* | S | Y | S | E | YES |
| 104. Curve Superelevation or Superelevation Adequacy | Either measured superelevation rate or percent or adequacy of superelevation when compared to AASHTO design standards | 2 | D* | | Y | | | YES |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 105. Horizontal Transition/Spiral Curve Presence | Presence/type of transition from tangent to curve | 1 | D | | Y | | | |
| 106. Horizontal Curve Intersection/Deflection Angle | The angle between the two intersecting tangents in the direction of inventory (sometimes called the "deflection angle") | 2 | D | | | | | |
| 107. Horizontal Curve Direction | Direction of curve in direction of inventory | 1 | M* | | Y | S | | |
| **II.b. Vertical Grade Data**<br>**(NOTE: Each data record will define an individual grade or the angle point or vertical curve linking two grades.)** | | | | | | | | |
| 108. Grade Identifiers and Linkage Variables | All variables needed to define location of each vertical feature and all variables necessary to link with other safety files | 1 | E | | | | | |
| 109. Vertical Alignment Feature Type | Type of vertical alignment feature being described in the data record | 1 | E | | | | | |
| 110. Percent of Gradient | Percent of gradient | 1 | D* | | Y | S | E | YES |
| 111. Grade Length | Grade length | 1 | D* | S | Y | | | |
| 112. Vertical Curve Length | Vertical curve length | 1 | D | | | | | |
| **III. Roadway Junction Descriptors** | | | | | | | | |
| **III.a. At-Grade Intersection/Junctions**<br>**(NOTE: These junctions can include both normal "intersections" and also junctions of roadways with independent pedestrian crossings, bike trails, railroad grade crossings, etc. Thus, the category includes what has been considered "mid-block" crossings.)** | | | | | | | | |
| **III.a.1. General Descriptors** | | | | | | | | |
| 113. Unique Intersection Identifier | A numeric unique identifier for each intersection/junction | 1 | E | | | | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 114. Type of Intersection/Junction | Type of junction being described in the data record | 1 | E | | | | | |
| 115. Location Identifier for Road 1 Crossing Point | Location on the first intersecting route (e.g., route-milepost) | 1 | M | | Y | | B | |
| 116. Location Identifier for Road 2 Crossing Point | Location on the second intersecting route (e.g., route-milepost) | 1 | D (unless spatial data system) | | | | | |
| 117. Location Identifier for Road 3, 4, etc., Crossing Point (e.g., Route-Milepost), etc. | Location on the third and subsequent intersecting route (e.g., route-milepost) | 1 | D (unless spatial data system) | | Y | | | |
| 118. Intersection/Junction No. of Legs | Intersection/junction no. of legs | 1 | M | | Y | M | | |
| 119. Intersection/Junction Geometry | Intersection/junction geometry | 1 | E | | Y | M | | |
| 120. School Zone Indicator | Whether the intersection/junction is in a school zone | 1 | E | | | | | |
| 121. Railroad Crossing Number if a RR Grade Crossing | Railroad crossing number if a RR grade crossing (for linkage to National Highway-Rail Crossing Inventory) | 1 | M | | | | | |
| 122. Intersection Skew Angle | Angle from perpendicular of intersection of the roads | 1 | D | | Y | S | | |
| 123. Intersection/Junction Offset | Whether crossroad approach centerlines are directly opposed or offset by some distance | 1 | D | | | O | E | |
| 124. Intersection/Junction Offset Distance | Distance that approach centerlines are offset | 1 | D | | | O | M | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 125. Intersection/Junction Traffic Control | Traffic control present at intersection/junction | 1 | M | | Y | M | | YES |
| 126. Signalization Type (e.g., Actuated, Fixed, System) | Type of signalization at intersection/junction | 2 | M | | | S | | |
| 127. Number of Intersection/Junction Quadrants With Limited Sight Distance | Number of intersection/junction quadrants with limited sight distance | 1 | D | | Y | | B | |
| 128. Intersection/Junction Lighting | Type of lighting at intersection/junction | 1 | M | | | | | |
| 129. Roundabout - No. of Circulatory Lanes | No. of circulatory lanes in roundabout | 1 | E | | | | | |
| 130. Roundabout - Circulatory Width | Width of the roadway between the central island and outer edge of the circulatory lane | 1 | E | | | | | |
| 131. Roundabout—Inscribed Diameter | Distance between the outer edges of the circulatory roadway | 1 | M | | | | | |
| 132. Roundabout—Bicycle Facility | Type of bicycle facility at roundabout | 1 | E | | | | | |
| **III.a.2. At Grade Intersection/Junction Descriptors—Each Approach** | | | | | | | | |
| 133. Approach AADT | AADT on approach described | 1 | E (if system road), M (if nonsystem crossroad) | | | | | YES |
| 134. Approach Use Type | Usage of approach | 1 | E | | | | | |
| 135. Approach Is Two-Way, One-Way | One-way or two-way flow on approach | 1 | E | | | M | | |
| 136. No. of Thru Lanes | Total number of thru lanes on approach, both directions | 1 | E | | | | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 137. No. of Exclusive Left Turn Lanes | Number of exclusive left turn lanes on approach | 1 | M | | Y | M | M | |
| 138. No. of Exclusive Right Turn Lanes | Number of exclusive right turn lanes on approach | 1 | M | | Y | M | | |
| 139. Length of Exclusive Left Turn Lanes | Length of exclusive left turn lanes | 2 | M | | | | | |
| 140. Length of Exclusive Right Turn Lanes | Length of exclusive right turn lanes | 2 | M | | | | | |
| 141. Median Type at Intersection | Median type at intersection on approach | 1 | M | | | M | | |
| 142. Approach Traffic Control | Traffic control present on approach | 1 | M | | | | | |
| 143. Left Turn Protection | Presence and time of left turn protection | 1 | D | | | O | | |
| 144. Signal Progression | Signal progression on approach | 1 | D | | | S | E | |
| 145. Crosswalk Presence/Type | Type of crosswalk | 1 | D | | | | | |
| 146. Pedestrian Signalization Type | Type of pedestrian signalization on approach | 1 | M | | | | B | |
| 147. Pedestrian Signal Special Features | Special features for either pushbutton or recall pedestrian signals | 2 | M | | | | | |
| 148. Crossing Pedestrian Count/Exposure | Count or estimate of average daily pedestrian flow crossing this approach (Note: only applicable to approaches with vehicular traffic.) | 1 | D | | | S | | |
| 149. Left/Right Turn Prohibitions | Left or right turn prohibitions on this approach | 1 | D | | | O | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 150. Left Turn Counts/Percent | Count or estimate of average daily left turns, or percent of total approach traffic turning left (Note: This could also be captured for peak-periods only or by hour of day.) | 2 | D | | | O | | |
| 151. Right Turn Counts/Percent | Count or estimate of average daily right turns, or percent of total approach traffic turning right (Note: This could also be captured for peak-periods only or by hour of day.) | 2 | D | | | O | | |
| 152. Transverse Rumble Strip Presence | Presence of transverse rumble strip on approach | 2 | D | | | | | |
| 153. Roundabout—Entry Width | Full width of entry where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width. | 1 | E | | | | | |
| 154. Roundabout—Number of Entry Lanes | Number of entry lanes into roundabout on this approach | 1 | E | | | | | |
| 155. Roundabout—Entry Radius | Minimum radius of curvature of the curb on the right side of the entry | 2 | D | | | | | |
| 156. Roundabout—Exit Width | Full width of exit where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width. | 1 | E | | | | | |
| 157. Roundabout—Number of Exit Lanes | Number of exit lanes from roundabout on this approach leg | 1 | E | | | | | |
| 158. Roundabout—Exit Radius | Minimum radius of curvature of the curb on the right side of the exit | 2 | D | | | | | |
| 159. Roundabout—Pedestrian Facility | Type of pedestrian crossing facility on this approach to roundabout | 1 | E | | | | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 160. Roundabout—Crosswalk Location (Distance From Yield Line) | Location of marked pedestrian crosswalk relative to yield line | 1 | E | | | | | |
| 161. Roundabout—Splitter Island Width | Width of the splitter island separating entry and exit legs (measured at the inscribed circle) | 1 | E | | | | | |
| **III.b. Interchange and Ramp Descriptors** | | | | | | | | |
| **III.b.1. General Interchange Descriptors** | | | | | | | | |
| 162. Unique Interchange Identifier | A numeric unique identifier for each interchange | 1 | E | | | | | |
| 163. Location Identifier for Road 1 Crossing Point | Location on the first intersecting route (e.g., route-milepost) | 1 | M | | | | | |
| 164. Location Identifier for Road 2 Crossing Point | Location on the second intersecting route (e.g., route-milepost) | 1 | D (unless spatial data system) | | | | | |
| 165. Location Identifier for Road 3, 4, etc., Crossing Point, etc. | Location on the third and subsequent intersecting route (e.g., route-milepost) | 1 | D (unless spatial data system) | | | | | |
| 166. Interchange Type | Type of interchange | 1 | M | | | M | | |
| 167. Interchange Lighting | Type of interchange lighting | 1 | M | | | | | |
| **III.b.2. Interchange Ramp Descriptors** | | | | | | | | |
| 168. Unique Ramp Identifier | An identifier for each ramp that is part of a given interchange | 1 | E | | | | | |
| 169. Ramp Length | Length of ramp | 1 | M | | | O | M | |
| 170. Ramp No. of Lanes | Number of lanes on ramp | 1 | M | | | O | E | |
| 171. Ramp AADT | AADT on ramp | 1 | M | | | | | |
| 172. Ramp Posted Speed Limit | The posted (not advisory) speed limit on the ramp | | | | | | | |

| Generic Variable Description | Definition | MMIRE Priority[12] | Ease of Data Collection[13] | HPMS[14] | IHSDM[15] | SafetyAnalyst[16] | TSIMS[17] | MMUCC |
|---|---|---|---|---|---|---|---|---|
| 173. Feature at Beginning Ramp Terminal | A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the beginning terminal. | 1 | E | | | | | |
| 174. Ramp Descriptor at Beginning Ramp Terminal | Description of the beginning terminal of the ramp | 1 | M | | | M | | |
| 175. Location Identifier For Roadway at Beginning Ramp Terminal | Location on the roadway at the beginning ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point. | 1 | E (if begin point is on a system roadway) | | | | | |
| 176. Roadway Traffic Flow Direction at Beginning Ramp Terminal | Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp. | 1 | E | | | | | |
| 177. Feature at Ending Ramp Terminal | A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the ending terminal. | 1 | E | | | | | |
| 178. Ramp Descriptor at Ending Ramp Terminal | Description of the ending terminal of the ramp | 1 | M | | | M | | |
| 179. Location Identifier for Roadway at Ending Ramp Terminal | Location on the roadway at the ending ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point | 1 | E (if end point is on a system roadway) | | | | | |
| 180. Roadway Traffic Flow Direction at Ending Ramp Terminal | Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp. | 1 | E | | | | | |

## APPENDIX C. PROPOSED MMIRE ELEMENT CODING

**The following describes the proposed MMIRE elements. In each case, the element name is in bold, followed by a brief *definition* of the element, the *attributes* (proposed coding), and the *source of coding*. The latter will be one or more of the four primary data sources or the project team. The elements are numbered for cross-referencing with the same element in the Appendix B matrix.**

## I. ROADWAY SEGMENT DESCRIPTORS

### I.A. SEGMENT LOCATION/LINKAGE VARIABLES

**(Note that whatever linear reference or spatial variables are used, they must be consistent across all safety data files.)**

#### 1. COUNTY

**Definition:** County location of segment

**Attributes:**

- Record the county name or equivalent entity. If codes are used instead of name, use the GSA Geographic Locator Codes (GLC) that can be found on the Internet at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8815&noc=T. If State-assigned codes are used, they should be convertible to the GSA/FIPS format.

**Source of Coding:** Project Team

#### 2. CITY/LOCAL JURISDICTION

**Definition:** City/local jurisdiction location of segment if applicable

**Attributes:**

- Record the city name or equivalent entity. If codes are used instead of name, use the GSA Geographic Locator Codes (GLC) that can be found on the Internet at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8815&noc=T. If State-assigned codes are used, they should be convertible to the GSA/FIPS format.

**Source of Coding:** Project Team

#### 3. ROUTE NUMBER

**Definition:** Route number

**Attributes:**

- 20-character alphanumeric value

**Source of Coding:** SafetyAnalyst

#### 4. STREET NAME

**Definition:** Street name

**Attributes:**

- Alpanumeric Street Name

**Source of Coding:** All sources

## 5. SECTION END-POINTS DESCRIPTORS

**Definition:** Location information defining the location on a route of each endpoint of the section

**Attributes:**

- Section end-point descriptors can be either related to a Linear Reference System (e.g., Route-beginning milepoint, Route-ending milepoint) or to a spatial data system (i.e., longitude/latitude for begin and end points). The descriptor-types used must be common across all MMIRE files and compatible with crash data location coding.

**Source of Coding:** All sources

## 6. SECTION IDENTIFIER

**Definition:** Unique segment identifier, derived from other variables (e.g., combination of route number, county location and beginning and ending mileposts)

**Attributes:**

- See definition

**Source of Coding:** All sources

## 7. SECTION LENGTH

**Definition:** Section length

**Attributes:**

- Section length in miles or kilometers

**Source of Coding:** All sources

## 8. HIGHWAY DISTRICT

**Definition:** Highway district

**Attributes:**

- Numeric district number
- Not applicable
- Unknown

**Source of Coding:** SafetyAnalyst

## 9. GOVERNMENTAL OWNERSHIP

**Definition:** Governmental owner of segment (including FIPS code)

**Attributes:**

- Record the city name or equivalent entity. If codes are used instead of name, use the GSA Geographic Locator Codes (GLC) that can be found on the Internet at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8815&noc=T. If State-assigned codes are used, they should be convertible to the GSA/FIPS format.

**Source of Coding:** Project Team

**10. TYPE OF GOVERNMENTAL OWNERSHIP**
**Definition:** Type of governmental ownership
**Attributes:**
- State
- County
- Town/township
- Municipal
- Other State agency
- Other local agency
- Federal agency
- Other

**Source of Coding:** HPMS

**11. ROUTE SIGNING**
**Definition:** Type of route signing on the segment
**Attributes:**
- Interstate
- U.S.
- State
- Off-interstate business marker
- County
- Township
- Municipal
- Parkway or forest route
- Other
- Not signed

**Source of Coding:** HPMS

**12. ROUTE SIGNING QUALIFIER**
**Definition:** Whether the route is "business" or other qualifier
**Attributes:**
- Unqualified
- Alternate
- Business route
- Bypass
- Spur
- Loop
- Proposed
- Temporary
- Truck route
- None of the above

**Source of Coding:** HPMS

**13. COINCIDING ROUTE INDICATOR**
**Definition:** Whether the route segment is a "primary" coinciding route (i.e., the route that crashes are referenced to) or a "minor" coinciding route
**Attributes:**

- Numeric code indicating "primary" (crash-linked) route or "minor" route

**Source of Coding:** Project Team

**14. COINCIDING-ROUTE PRIMARY ROUTE NUMBER**
**Definition:** If a minor conciding route segment, the route number for the major (primary) route
**Attributes:**

- 20-character alphanumeric value

**Source of Coding:** SafetyAnalyst

**15. DIRECTION OF INVENTORY**
**Definition:** Direction of Inventory
**Attributes:**

- Compass direction if divided roads are inventoried in each direction due to different characteristics on each roadway; "both" if inventory in only one direction

**Source of Coding:** Project Team

**I.B. SEGMENT ROADWAY CLASSIFICATION**

**16. FUNCTIONAL CLASS**
**Definition:** Functional class
**Attributes:**

- Principal arterial interstate
- Principal arterial other freeways and expressways
- Principal arterial other
- Minor arterial
- Major collector
- Minor collector
- Local

**Source of Coding:** HPMS, IHSDM

**17. RURAL/URBAN DESIGNATION**
**Definition:** Rural/urban designation
**Attributes:**

- Rural
- Urban
- Not applicable
- Unknown

**Source of Coding:** SafetyAnalyst

**18. FEDERAL AID/ ROUTE TYPE**
**Definition:** Federal aid/route type
**Attributes:**

- Route is on NHS
- Route is an NHS connector
- Route is unrelated to NHS

**Source of Coding:** HPMS

**19. ACCESS CONTROL**
**Definition:** Access control
**Attributes:**

- Full
- Partial
- None

**Source of Coding:** All sources

**20. OPERATIONAL CLASS**
**Definition:** Operational class of segment if different from offical functional class
**Attributes:**

- Principal arterial interstate
- Principal arterial other freeways and expressways
- Principal arterial other
- Minor arterial
- Major collector
- Minor collector
- Local

**Source of Coding:** HPMS, IHSDM

**I.C. SEGMENT CROSS SECTION**

**I.C.1. SURFACE DESCRIPTORS**

**21. SURFACE TYPE**
**Definition:** Surface type
**Attributes:**

- Concrete
- Asphalt
- Gravel
- Dirt

**Source of Coding:** SafetyAnalyst

**22. SURFACE FRICTION**
**Definition:** Surface friction indicator
**Attributes:**

- Measured skid number on the segment or general indication of wet-surface friction (e.g., high, medium, low)

**Source of Coding:** Project Team

**23. SURFACE FRICTION DATE**
**Definition:** Date surface friction was measured or assigned
**Attributes:**

- mm/dd/yyyy

**Source of Coding:** Project Team

**24. TOTAL SURFACE WIDTH**
**Definition:** Total paved surface width (could be derived if all other lane widths are captured)
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**25. PAVEMENT ROUGHNESS/CONDITION**
**Definition:** Pavement roughness (roughness number)
**Attributes:**

- International Roughness Index (IRI)

**Source of Coding:** HPMS

**26. PAVEMENT ROUGHNESS DATE**
**Definition:** Date pavement roughness was assigned
**Attributes:**

- mm/dd/yyyy

**Source of Coding:** Project Team

**27. PAVEMENT CONDITION**
**Definition:** Pavement condition (descriptive scale)
**Attributes:**

- Numeric rating 1.0–5.0 if IRI not provided

**Source of Coding:** HPMS

**28. PAVEMENT CONDITION DATE**
**Definition:** Date pavement condition was assigned
**Attributes:**

- mm/dd/yyyy

**Source of Coding:** Project Team

## I.C.2. LANE DESCRIPTORS

### 29. NO. OF THRU LANES
**Definition:** Number of thru lanes, including HOV and reversible lanes
**Attributes:**
- Numeric

**Source of Coding:** All sources

### 30. AVERAGE THRU LANE WIDTH
**Definition:** Average lane width used by traffic (i.e., not including wide curb lanes, parking area, bicycle lanes, etc.)
**Attributes:**
- Feet or meters

**Source of Coding:** All sources

### 31. EXCLUSIVE LEFT TURN LANE PRESENCE
**Definition:** Exclusive left turn lane presence and number for both divided and undivided roadways. Supplemental information on left turn lane type in medians of divided roadways (e.g., directional left turn lane) is captured under Median Descriptors
**Attributes:**
- None
- Single LT lane
- Multiple LT lane

**Source of Coding:** Project Team

### 32. EXCLUSIVE LEFT TURN LANE LENGTH
**Definition:** Exclusive left turn lane length
**Attributes:**
- Full segment length
- Length in feet or meters if not full segment length

**Source of Coding:** Project Team

### 33. EXCLUSIVE RIGHT TURN LANE PRESENCE
**Definition:** Exclusive right turn lane presence and number
**Attributes:**
- None
- Single RT lane
- Multiple RT lanes

**Source of Coding:** Project Team

### 34. EXCLUSIVE RIGHT TURN LANE LENGTH
**Definition:** Exclusive right turn lane length
**Attributes:**
- Full segment length, or length in feet or meters if not full segment length

**Source of Coding:** Project Team

**35. AUXILIARY LANE PRESENCE/TYPE**
**Definition:** Presence or type of auxiliary lane
**Attributes:**

- Climbing lane
- Passing lane
- Acceleration lane
- Deceleration lane
- Other

**Source of Coding:** Project Team

**36. AUXILIARY LANE LENGTH**
**Definition:**
**Attributes:**

- Full segment length, length in feet or meters if not full segment length

**Source of Coding:** Project Team

**37. HOV LANES**
**Definition:** Presence of HOV lanes in segment
**Attributes:**

- None
- Increasing direction
- Decreasing direction
- Both directions

**Source of Coding:** Project Team

**38. HOV LANE TYPES**
**Definition:** HOV lane types
**Attributes:**

- No HOV lanes
- Has exclusive HOV lanes
- Normal thru lanes used as HOV at specified times
- Shoulder/parking lanes used as HOV at specified times

**Source of Coding:** HPMS

**39. REVERSIBLE LANES**
**Definition:** Number of reversible lanes present on segment
**Attributes:**

- No reversible lanes
- One reversible lane
- Two reversible lanes
- More than two reversible lanes

**Source of Coding:** Project Team

**40. PRESENCE/TYPE OF BICYCLE FACILITY**
**Definition:** Presence or type of bicycle facility on segment
**Attributes:**

- None
- Wide curb lane
- Marked bike lane
- Separate parallel bike path
- Signed bike route only
- Other

**Source of Coding:** Project Team, SafetyAnalyst

**41. WIDTH OF MARKED BICYCLE LANE OR BIKE PATH**
**Definition:** Width of marked bicycle lane or bike path
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**42. WIDTH OF WIDE CURB LANE**
**Definition:** Width of wide curb lane used by both vehicles and bicycles
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**43. NUMBER OF PEAK HOUR LANES**
**Definition:** Number of through lanes used in peak period in the peak direction,  Include HOV lanes, reversible lanes, parking lanes, or shoulders that legally are used for through traffic during the peak period in the peak direction.
**Attributes:**

- Numeric

**Source of Coding:** HPMS

**I.C.3. SHOULDER DESCRIPTORS**

**44. RIGHT SHOULDER TYPE**
**Definition:** Shoulder type on right side of road in direction of inventory
**Attributes:**

- Paved
- Composite
- Gravel
- Turf
- Curb with no shoulder in front of it
- No shoulder
- Not applicable
- Unknown

**Source of Coding:** SafetyAnalyst

**45. RIGHT SHOULDER TOTAL WIDTH**
**Definition:** Total width of right shoulder including paved and unpaved parts
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**46. RIGHT PAVED SHOULDER WIDTH**
**Definition:** Width of paved portion of right shoulder
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**47. LEFT SHOULDER TYPE**
**Definition:** Shoulder type on left side of roadway in direction of inventory. For undivided roads and divided roads with one direction of inventory, this will be the outside shoulder on the opposing side. Note that information on paved width of the inner (left) shoulder is included under median descriptors.
**Attributes:**

- Paved
- Composite
- Gravel
- Turf
- Curb with no shoulder in front of it
- No shoulder
- Not applicable
- Unknown

**Source of Coding:** SafetyAnalyst

**48. LEFT SHOULDER TOTAL WIDTH**
**Definition:** Width of left (outside) shoulder, including paved and unpaved parts. See definition of "Left Shoudler Type" above.
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**49. LEFT PAVED SHOULDER WIDTH**
**Definition:** Width of paved portion of left shoulder. See definition of "Left Shoudler Type" above.
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**50. SHOULDER RUMBLE STRIP PRESENCE**
**Definition:** Presence of shoulder rumble strip
**Attributes:**

- On both shoulders of roadway segment
- Right shoulder only
- Left shoulder only
- No shoulder rumble strip

**Source of Coding:** Project Team

**51. RUMBLE STRIP TYPE**
**Definition:** Rumble strip type if present
**Attributes:**

- Milled
- Rolled
- Milled or rolled on edgeline
- Raised on edgeline

**Source of Coding:** Project Team

**52. SIDEWALK PRESENCE**
**Definition:** Presence of sidewalk in direction of inventory
**Attributes:**

- None
- Left side
- Right side
- Both sides

**Source of Coding:** Project Team

**53. CURB PRESENCE**
**Definition:** Presence of curb
**Attributes:**

- No curb
- Curb on left
- Curb on right
- Both curbs

**Source of Coding:** TSIMS

**54. CURB TYPE**
**Definition:** Curb type
**Attributes:**

- No curb
- Straight-face curb (i.e., "barrier curb")
- Slope-face curb

**Source of Coding:** Project Team

### I.C.4. MEDIAN DESCRIPTORS

**55. MEDIAN TYPE**
**Definition:** Median type
**Attributes:**
- Undivided
- Flush paved median [at least 4 ft in width]
- Raised median with curb
- Depressed median
- Two-way left turn lane
- Railroad or rapid transit
- Other divided

**Source of Coding:** Project Team

**56. MEDIAN WIDTH**
**Definition:** Median width, including inside shoulders
**Attributes:**
- Feet or meters

**Source of Coding:** HPMS

**57. MEDIAN BARRIER TYPE**
**Definition:** Median barrier type
**Attributes:**
- None
- Rigid barrier system (i.e., concrete)
- Semi-rigid barrier system (i.e., box beam, W-beam strong post, etc.)
- Flexible barrier system (i.e., cable, W-beam weak post, etc.),

**Source of Coding:** Based on SafetyAnalyst

**58. MEDIAN (INNER) PAVED SHOULDER WIDTH**
**Definition:** The width of the paved shoulder on the median (inner) side of the roadway on a divided roadway. Note that information on type, width and paved width of nonmedian shoulders is included in the Shoulder Descriptors. See definition of Left Shoulder Type..
**Attributes:**
- Feet or meters

**Source of Coding:** All sources

**59. MEDIAN SHOULDER RUMBLE STRIP PRESENCE**
**Definition:** Presence of median shoulder rumble strip
**Attributes:**
- Yes
- No

**Source of Coding:** Project Team

**60. MEDIAN RUMBLE STRIP TYPE**
**Definition:** Rumble strip type if present
**Attributes:**

- Milled
- Rolled
- Milled or rolled on edgeline
- Raised on edgeline

**Source of Coding:** Project Team

**61. MEDIAN LEFT TURN LANE TYPE**
**Definition:** Supplemental information on type of left turn lane in median. Note that basic information on number of median left turn lanes and the median turn-lane length should be captured under "Exclusive Left Turn Lane Presence" and "Exclusive Left Turn Lane Length" in the Lane Descriptors
**Attributes:**

- None
- Left-turn lane bays
- Directional left turn lane bays (to prevent crossing traffic from driveways)
- Offset left turn lanes (at intersection)

**Source of Coding:** Project Team

**62. LEFT TURN LANE WIDTH**
**Definition:** Width of median left turn lane
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**I.D. SEGMENT ROADSIDE DESCRIPTORS**

**63. ROADSIDE CLEARZONE WIDTH**
**Definition:** Roadside clearzone width
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**64. SIDESLOPE**
**Definition:** Sideslope
**Attributes:**

- Numeric percent

**Source of Coding:** IHSDM

**65. ROADSIDE RATING**
**Definition:** A rating of the safety of the roadside from Appendix D, Publication No. FHWA-RD-99-207, Prediction of the Expected Safety Performance of Rural Two-Lane Highways. Collect only if clearzone width and sideslope are not collected.
**Attributes:**

- Roadside hazard is ranked on a seven-point categorical scale from 1 (best) to 7 (worst), based on a comparison with pictures in the report.

**Source of Coding:** IHSDM

**66. DRIVEWAY INFORMATION**
**Definition:** Driveway count by type
**Attributes:**

- Numeric

**Source of Coding:** Based on SafetyAnalyst, IHSDM

**67. ROADSIDE HARDWARE DESCRIPTORS**
**Definition:** Roadside hardware descriptors (including type, location, size, distance from lane edge). Examples include barrier (type and terminal type), signs (size, breakaway?), culverts, etc.
**Attributes:**

- Jurisdiction selected. Note that some Asset Management Systems may collect this information. If so link to that data.

**Source of Coding:** To be defined on the basis of Asset Management Systems

**I.E. OTHER SEGMENT DESCRIPTORS**

**68. TERRAIN TYPE (E.G., MOUNTAINOUS, LEVEL)**
**Definition:** Basic terrain type around segment. This is a (poor) surrogate for detailed data on curvature and grade, and would be collected only in the absence of those variables. See Alighnment variables below.
**Attributes:**

- Mountainous
- Rolling
- Level

**Source of Coding:** All sources

**69. BRIDGE DESCRIPTORS FOR BRIDGES IN SEGMENT**
**Definition:** Bridge descriptors for bridges in segment
**Attributes:**

- Link to National Bridge Index. See Appendix D.

**Source of Coding:** National Bridge Index

**70. RR GRADE CROSSING DESCRIPTORS FOR CROSSINGS IN SEGMENT**
**Definition:** RR grade crossing descriptors for crossings in segment
**Attributes:**

- Link to USDOT Highway-Rail Crossing Inventory. See Appendix D.

**Source of Coding:** USDOT National Highway-Rail Crossing Inventory

**71. NUMBER OF SIGNALIZED INTERSECTIONS IN SECTION**
**Definition:** Number of signalized intersections in section
**Attributes:**

- Numeric

**Source of Coding:** HPMS

**72. NUMBER OF STOP-CONTROLLED INTERSECTIONS IN SECTION**
**Definition:** Number of stop-controlled intersections in section
**Attributes:**

- Numeric

**Source of Coding:** HPMS

**73. NUMBER OF UNCONTROLLED/OTHER INTERSECTIONS**
**Definition:** Number of uncontrolled/other intersections
**Attributes:**

- Numeric

**Source of Coding:** HPMS

**I.F. SEGMENT TRAFFIC FLOW DATA**

**74. AVERAGE DAILY TRAFFIC VOLUME**
**Definition:** AADT
**Attributes:**

- Vehicles per day

**Source of Coding:** All sources

**75. AADT YEAR**
**Definition:** Year of AADT
**Attributes:**

- Numeric

**Source of Coding:** All sources

**76. AADT ANNUAL ESCALATION PERCENTAGE**
**Definition:** Expected annual percent growth in AADT, with “AADT YEAR” as base year. This will allow calculation of current year’s AADT if “AADT YEAR” differs from current year.
**Attributes:**

- Percent

**Source of Coding:** IHSDM

**77. PERCENTAGE TRUCK OR TRUCK AADT**
**Definition:** Percentage truck or truck AADT (includes tractor-semis and trucks with 6+ wheels)
**Attributes:**

- Percent or numeric count

**Source of Coding:** SafetyAnalyst

**78. TOTAL DAILY TWO-WAY PEDESTRIAN COUNT/EXPOSURE**
**Definition:** Total daily pedestrian flow in both directions (unless directional segment). This is a (poor) surrogate for crossing pedestrian counts.
**Attributes:**

- Average daily count (numeric)

**Source of Coding:** Project Team

**79. BICYCLE COUNT/EXPOSURE**
**Definition:** Total daily bicycle flow in both directions (unless directional segment)
**Attributes:**

- Average daily count (numeric)

**Source of Coding:** Project Team

**80. MOTORCYCLE COUNT OR PERCENTAGE**
**Definition:** Motorcycle daily count or percentage of AADT
**Attributes:**

- Percent or numeric count

**Source of Coding:** Project Team

**81. HOURLY TRAFFIC VOLUMES (OR PEAK AND OFFPEAK AADT)**
**Definition:** Hourly traffic volumes (or peak and offpeak AADT)
**Attributes:**

- Numeric count

**Source of Coding:** SafetyAnalyst

**82. K-FACTOR**
**Definition:** The K-factor is the 30th highest hourly volume (i.e., the design hour volume) for a year, as a percentage of the annual average daily traffic.
**Attributes:**

- Percent

**Source of Coding:** HPMS

**83. FUTURE AADT**
**Definition:** Forecasted AADT
**Attributes:**

- Vehicles per day

**Source of Coding:** HPMS

**84. FUTURE AADT YEAR**
**Definition:** Year of forecasted AADT
**Attributes:**

- Vehicles per day

**Source of Coding:** HPMS

**85. DIRECTIONAL FACTOR**
**Definition:** Proportion of peak hour traffic in the predominate direction of flow
**Attributes:**

- Proportion (numeric)

**Source of Coding:** HPMS

**86. PERCENT COMBINATION TRUCKS - DAILY AVERAGE**
**Definition:** Percent combination trucks - daily average
**Attributes:**

- Percent

**Source of Coding:** All sources

**87. PERCENT SINGLE UNIT TRUCKS - DAILY AVERAGE**
**Definition:** Percent single unit trucks - daily average
**Attributes:**

- Percent

**Source of Coding:** All sources

## I.G. SEGMENT TRAFFIC OPERATIONS/CONTROL DATA

**88. ONE/TWO-WAY OPERATIONS**
**Definition:** Whether the segment operates as a one- or two-way roadway
**Attributes:**

- One-way
- Two-way
- One direction of travel for divided roadways

**Source of Coding:** SafetyAnalyst

**89. SPEED LIMIT**
**Definition:** Speed limit
**Attributes:**

- mph/kph

**Source of Coding:** All sources

**90. SCHOOL ZONE INDICATOR**
**Definition:** Whether segment contains a school zone
**Attributes:**

- Yes
- No

**Source of Coding:** Project Team

**91. ON-STREET PARKING PRESENCE**
**Definition:** Time-based parking restrictions
**Attributes:**

- Permitted 24 hrs/day
- Prohibited 24 hrs/day
- Permitted during specified times

**Source of Coding:** SafetyAnalyst, TSIMS

**92. ON-STREET PARKING TYPE**
**Definition:** On-street parking type
**Attributes:**

- No parking allowed
- Angle parking on one side
- Angle parking on both sides
- Parallel parking on one side
- Parallel parking on both sides

**Source of Coding:** HPMS and Project Team

**93. ROADWAY LIGHTING**
**Definition:** Type of roadway lighting
**Attributes:**

- None
- Spot on one-side
- Spot on both sides
- Continuous on one-side
- Continuous on both sides

**Source of Coding:** SafetyAnalyst

**94. TRUCK ROUTE DESIGNATION**
**Definition:** Truck route designation
**Attributes:**

- Designated truck route
- Not a designated truck route

**Source of Coding:** HPMS

**95. TOLL FACILITY?**
**Definition:** Whether the segment is a toll facility
**Attributes:**

- Toll segment
- Nontoll segment

**Source of Coding:** HPMS

**96. EDGELINE PRESENCE/TYPE**
**Definition:** Edgeline presence/type
**Attributes:**
- No marked edgeline
- Standard width edgeline
- Wide edgeline
- Other

**Source of Coding:** Project Team

**97. CENTERLINE PRESENCE/TYPE**
**Definition:** Centerline presence/type
**Attributes:**
- No marked centerline
- Standard centerline markings
- Centerline with centerline rumble strip

**Source of Coding:** Project Team

**98. NO PASSING ZONE CODE/PASSING PERMISSIBILITY**
**Definition: N**o passing zone code/passing permissibility
**Attributes:**
- Percent of section length striped for passing

**Source of Coding:** HPMS

**99. 85TH % SPEED**
**Definition:** Traffic speed exceeded by 15 percent of the vehicles in the flow
**Attributes:**
- mph/kph

**Source of Coding:** SafetyAnalyst

## II. ROADWAY ALIGNMENT DESCRIPTORS

**(Note that these variables are best captured in a separate file that is linkable to inventory, crash, and other files.)**

### II.A. HORIZONTAL CURVE DATA

**(Each data record will define an angle point or a single curve, even if the curve is a component of a compound or reverse curve. Spirals or other transitions are part of the curve.)**

#### 100. CURVE IDENTIFIERS AND LINKAGE VARIABLES

**Definition:** All variables needed to define location of each curve record and all variables necessary to link with other safety files.

**Attributes:**

- Route and location descriptors (e.g., route and beginning and ending milepoints or route and beginning and ending spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** All sources

#### 101. CURVE FEATURE TYPE

**Definition:** Type of horizontal alignment feature being described in the data record

**Attributes:**

- Horizontal angle point (i.e., joining of two tangents without a horizontal curve)
- Independent horizontal curve
- Component of compound curve (i.e., one curve in compound curve)
- Component of reverse curve (i.e., one curve in a reverse curve)

**Source of Coding:** Project Team

#### 102. HORIZONTAL CURVE DEGREE OR RADIUS

**Definition:** Degree or radius of curve

**Attributes:**

- Numeric, feet or meters if radius

**Source of Coding:** All sources

#### 103. HORIZONTAL CURVE LENGTH

**Definition:** Length of curve including spiral

**Attributes:**

- Feet or meters

**Source of Coding:** All sources

#### 104. CURVE SUPERELEVATION OR SUPERELEVATION ADEQUACY

**Definition:** Either measured superelevation rate or percent or adequacy of superelevation when compared to AASHTO design standards

**Attributes:**

- Rate/percent or yes/no

**Source of Coding:** Project Team

### 105. HORIZONTAL TRANSITION/SPIRAL CURVE PRESENCE

**Definition:** Presence/type of transition from tangent to curve and curve to tangent
**Attributes:**

- No transition
- Spiral transition
- Other transition

**Source of Coding:** Project Team

### 106. HORIZONTAL CURVE INTERSECTION/DEFLECTION ANGLE

**Definition:** The angle between the two intersecting tangents in the direction of inventory (sometimes called the “deflection angle”).
**Attributes:**

- Degrees. positive if angled right in the direction inventory and negative if angled left

**Source of Coding:** IHSDM

### 107. HORIZONTAL CURVE DIRECTION

**Definition:** Direction of curve in direction of inventory
**Attributes:**

- Right
- Left

**Source of Coding:** IHSDM

## II.B. VERTICAL GRADE DATA

**(Each data record will define an individual grade or the angle point or vertical curve linking two grades.)**

### 108. GRADE IDENTIFIERS AND LINKAGE VARIABLES

**Definition:** All variables needed to define location of each vertical feature and all variables necessary to link with other safety files.
**Attributes:**

- Route/linear reference system descriptors (e.g., route and beginning and ending milepoints or route and beginning and ending spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** All sources

### 109. VERTICAL ALIGNMENT FEATURE TYPE

**Definition:** Type of vertical alignment feature being described in the data record
**Attributes:**

- Vertical angle point (i.e., joining of two vertical gradients without a verticle curve)
- Vertical gradient
- Sag vertical curve (i.e., vertical curve that connects a segment of roadway with a segment of roadway that has a more positive grade)
- Crest vertical curve (i.e., vertical curve that connects a segment of roadway with a segment of roadway that has a more negative grade)

**Source of Coding:** Project Team

**110. PERCENT OF GRADIENT**
**Definition:** Percent of gradient
**Attributes:**

- Percent

**Source of Coding:** All sources

**111. GRADE LENGTH**
**Definition:** Grade length
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

**112. VERTICAL CURVE LENGTH**
**Definition:** Vertical curve length
**Attributes:**

- Feet or meters

**Source of Coding:** All sources

# III. ROADWAY JUNCTION DESCRIPTORS

## III.A. AT-GRADE INTERSECTION/JUNCTIONS

### III.A.1. GENERAL DESCRIPTORS

**113. UNIQUE INTERSECTION IDENIFIER**
**Definition:** A numeric unique indentifer for each intersection/junction
**Attributes:**

- Node number, LRS of primary route, etc.

**Source of Coding:** Project Team

**114. TYPE OF INTERSECTION/JUNCTION**
**Definition:** Type of Junction being described in the data record
**Attributes:**

- Roadway/roadway (not interchange related)
- Roadway/roadway (interchange ramp terminal)
- Roadway/pedestrian crossing (e.g., midblock crossing)
- Roadway/bicycle path or trail
- Roadway/railroad grade crossing
- Other

**Source of Coding:** Project Team

**115. LOCATION IDENTIFIER FOR ROAD 1 CROSSING POINT**
**Definition:** Location on the first intersecting route (e.g., route-milepost)
**Attributes:**

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** Project Team

**116. LOCATION IDENTIFIER FOR ROAD 2 CROSSING POINT**
**Definition:** Location on the second intersecting route (e.g., route-milepost)
**Attributes:**

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** Project Team

**117. LOCATION IDENTIFIER FOR ROAD 3, 4, ETC., CROSSING POINT (E.G., ROUTE-MILEPOST), ETC.**
**Definition:** Location on the third and subsequent intersecting route (e.g., route-milepost)
**Attributes:**

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** Project Team

**118. INTERSECTION/JUNCTION NO. OF LEGS**
**Definition:** Intersection/junction no. of legs
**Attributes:**

- Numeric

**Source of Coding:** SafetyAnalyst

**119. INTERSECTION/JUNCTION GEOMETRY**
**Definition:** Intersection/junction geometry
**Attributes:**

- T
- Wye
- Cross
- More than four legs
- Roundabout

**Source of Coding:** Project Team

**120. SCHOOL ZONE INDICATOR**
**Definition:** Whether the intersection/junction is in a school zone
**Attributes:**

- Yes
- No

**Source of Coding:** Project Team

**121. RAILROAD CROSSING NUMBER**
**Definition:** Railroad crossing number if a RR grade crossing (for linkage to National Highway-Rail Crossing Inventory)
**Attributes:**

- Numeric

**Source of Coding:** Project Team

**122. INTERSECTION SKEW ANGLE**
**Definition:** Angle from perpendicular of intersection of the roads
**Attributes:**

- Degrees

**Source of Coding:** SafetyAnalyst

**123. INTERSECTION/JUNCTION OFFSET**
**Definition:** Whether crossroad approach centerlines are directly opposed or offset by some distance
**Attributes:**

- Yes
- No

**Source of Coding:** SafetyAnalyst

**124. INTERSECTION/JUNCTION OFFSET DISTANCE**
**Definition:** Distance that approach centerlines are offset
**Attributes:**

- Numeric (zero if not offset)

**Source of Coding:** SafetyAnalyst

**125. INTERSECTION/JUNCTION TRAFFIC CONTROL**
**Definition:** Traffic control present at intersection/junction
**Attributes:**

- Uncontrolled
- Two-way stop
- Four-way stop
- Yield sign
- Signalized (with ped signal)
- Signalized (w/o ped signal)
- Other

**Source of Coding:** Project Team

**126. SIGNALIZATION TYPE (E.G., ACTUATED, FIXED, SYSTEM)**
**Definition:** Type of signalization at intersection/junction
**Attributes:**

- No signal
- Uncoordinated fixed time
- Traffic actuated
- Linear coordination
- System coordination
- Pushbutton- acuated
- Other

**Source of Coding:** SafetyAnalyst and Project Team

**127. NUMBER OF INTERSECTION/JUNCTION QUADRANTS WITH LIMITED SIGHT DISTANCE**
**Definition:** Number of intersection/junction quadrants with limited sight distance
**Attributes:**

- Number of quadrants

**Source of Coding:** IHSDM

**128. INTERSECTION/JUNCTION LIGHTING**
**Definition:** Type of lighting at intersection/junction
**Attributes:**

- None
- Spot lighting at intersection
- Continuous segment lighting

**Source of Coding:** Project Team

**129. ROUNDABOUT - NO. OF CIRCULATORY LANES**
**Definition:** No. of circulatory lanes in roundabout
**Attributes:**

- Numeric

**Source of Coding:** Project Team

**130. ROUNDABOUT—CIRCULATORY WIDTH**
**Definition:** Width of the roadway between the central island and outer edge of the circulatory lane
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**131. ROUNDABOUT - INSCRIBED DIAMETER**
**Definition:** Distance between the outer edges of the circulatory roadway
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**132. ROUNDABOUT—BICYCLE FACILITY**
**Definition:** Type of bicycle facililty at roundabout
**Attributes:**

- None
- Separate cycle path
- Circulatory bike lane
- Other

**Source of Coding:** Project Team

**III.A.2. AT-GRADE INTERSECTION/JUNCTION DESCRIPTORS (EACH APPROACH)**

**133. APPROACH AADT**
**Definition:** AADT on approach described
**Attributes:**

- Vehicles per day

**Source of Coding:** All sources

**134. APPROACH USE TYPE**
**Definition:** Usage of approach
**Attributes:**

- Shared Use (e.g., vehicles, peds, bikes)
- Pedestrians Only
- Bicycles Only
- Pedestrians and Bicycles
- Railroad
- Other

**Source of Coding:** Project Team

**135. APPROACH IS TWO-WAY, ONE-WAY**
**Definition:** One-way or two-way flow on approach
**Attributes:**

- One-way
- Two-way
- One direction of travel for divided roadways

**Source of Coding:** All sources

**136. NO. OF THRU LANES**
**Definition:** Total number of thru lanes on approach, both directions
**Attributes:**

- Numeric

**Source of Coding:** All sources

**137. NO. OF EXCLUSIVE LEFT TURN LANES**
**Definition:** Number of exclusive left turn lanes on approach
**Attributes:**

- Numeric

**Source of Coding:** All sources

**138. NO. OF EXCLUSIVE RIGHT TURN LANES**
**Definition:** Number of exclusive right turn lanes on approach
**Attributes:**

- Numeric

**Source of Coding:** All sources

**139. LENGTH OF EXCLUSIVE LEFT TURN LANES**
**Definition:** Length of exclusive left turn lanes
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**140. LENGTH OF EXCLUSIVE RIGHT TURN LANES**
**Definition:** Length of exclusive right turn lanes
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**141. MEDIAN TYPE AT INTERSECTION**
**Definition:** Median type at intersection on approach
**Attributes:**

- None
- Curbed
- Not curbed
- Barrier

**Source of Coding:** Project Team

**142. APPROACH TRAFFIC CONTROL**
**Definition:** Traffic control present on approach
**Attributes:**

- Uncontrolled
- Stop sign
- Yield sign
- Traffic signal with ped signal
- Pedestrian signal only
- Other

**Source of Coding:** Project Team

**143. LEFT-TURN PROTECTION**
**Definition:** Presence and time of left turn protection
**Attributes:**

- Unsignalized
- Signalized with no left turn projection
- All-day protection
- Peak hour protection only
- Other

**Source of Coding:** Project Team

**144. SIGNAL PROGRESSION**
**Definition:** Signal progression on approach
**Attributes:**

- No signal
- Uncoordinated fixed time
- Traffic actuated
- Linear coordination
- System coordination
- Other

**Source of Coding:** SafetyAnalyst and Project Team

**145. CROSSWALK PRESENCE/TYPE**
**Definition:** Type of crosswalk
**Attributes:**

- Marked crosswalk
- Unmarked crosswalk
- Marked with refuge island
- Marked with in-street yield sign
- Marked with in-pavement warning lights
- Other

**Source of Coding:** Project Team

**146. PEDESTRIAN SIGNALIZATION TYPE**
**Definition:** Type of pedestrian signalizaton on approach
**Attributes:**

- Pushbutton actuated
- Recall (activated by traffic signal)
- Other

**Source of Coding:** Project Team

**147. PEDESTRIAN SIGNAL SPECIAL FEATURES**
**Definition:** Special features for either pushbutton or recall pedestrian signals
**Attributes:**

- Accessible pedestrian signal (i.e., audible tones for low-vision pedestrians)
- Countdown pedestrian signal
- Both accessible and countdown features
- Other

**Source of Coding:** Project Team

**148. CROSSING PEDESTRIAN COUNT/EXPOSURE**
**Definition:** Count or estimate of average daily pedestrian flow crossing this approach (Note: only applicable to approaches with vehicular traffic.)
**Attributes:**

- Numeric

**Source of Coding:** Project Team and SafetyAnalyst

**149. LEFT/RIGHT TURN PROHIBITIONS**
**Definition:** Left- or right turn prohibitions on this approach
**Attributes:**

- No left turns permitted at any time
- No left turn permitted during certain portions of the day
- No right turns permitted at any time
- No right turns permitted during certain portions of the day
- No U-turns

**Source of Coding:** Based on SafetyAnalyst

**150. LEFT TURN COUNTS/PERCENT**
**Definition:** Count or estimate of average daily left turns, or percent of total approach traffic turning left. (Note: This could also be captured for peak-periods only or by hour of day.)
**Attributes:**

- Count or percent

**Source of Coding:** Project Team

**151. RIGHT TURN COUNTS/PERCENT**
**Definition:** Count or estimate of average daily righ-turns, or percent of total approach traffic turning right. (Note: This could also be captured for peak-periods only or by hour of day.)
**Attributes:**

- Count or percent

**Source of Coding:** Project Team

**152. TRANSVERSE RUMBLE STRIP PRESENCE**
**Definition:** Presence of transverse rumble strip on approach
**Attributes:**

- Yes
- No

**Source of Coding:** Project Team

**153. ROUNDABOUT—ENTRY WIDTH**
**Definition:** Full width of entry where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width.
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**154. ROUNDABOUT—NUMBER OF ENTRY LANES**
**Definition:** Number of entry lanes into roundabout on this approach
**Attributes:**

- Numeric

**Source of Coding:** Project Team

**155. ROUNDABOUT—ENTRY RADIUS**
**Definition:** Minimum radius of curvature of the curb on the right side of the entry.
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**156. ROUNDABOUT—EXIT WIDTH**
**Definition:** Full width of exit where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width.
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**157. ROUNDABOUT—NUMBER OF EXIT LANES**
**Definition:** Number of exit lanes from roundabout on this approach leg.
**Attributes:**

- Numeric

**Source of Coding:** Project Team

**158. ROUNDABOUT—EXIT RADIUS**
**Definition:** Minimum radius of curvature of the curb on the right side of the exit.
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**159. ROUNDABOUT—PEDESTRIAN FACILITY**
**Definition:** Type of pedestrian crossing facility on this approach to roundabout
**Attributes:**

- Marked crosswalk with raised splitter island
- Marked crosswalk with flush splitter island
- Unmarked crosswalk with raised splitter island
- Unmarked crosswalk with flush splitter island
- Other

**Source of Coding:** Project Team

**160. ROUNDABOUT—CROSSWALK LOCATION (DISTANCE FROM YIELD LINE)**
**Definition:** Location of marked pedestrian crosswalk relative to yield line
**Attributes:**

- Feet or meters

**Source of Coding:** Project Team

**161. ROUNDABOUT—SPLITTER ISLAND WIDTH**
**Definition:** Width of the splitter island separating entry and exit legs (measured at the inscribed circle).
**Attributes:**
- Feet or meters

**Source of Coding:** Project Team

## III.B. INTERCHANGE AND RAMP DESCRIPTORS

### III.B.1. GENERAL INTERCHANGE DESCRIPTORS

**162. UNIQUE INTERCHANGE IDENIFIER**
**Definition:** A numeric unique indentifer for each interchange
**Attributes:**
- Node number, LRS of primary route, etc.

**Source of Coding:** Project Team

**163. LOCATION IDENTIFIER FOR ROAD 1 CROSSING POINT**
**Definition:** Location on the first intersecting route (e.g., route-milepost)
**Attributes:**
- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** Project Team

**164. LOCATION IDENTIFIER FOR ROAD 2 CROSSING POINT**
**Definition:** Location on the second intersecting route (e.g., route-milepost)
**Attributes:**
- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** Project Team

**165. LOCATION IDENTIFIER FOR ROAD 3, 4, ETC., CROSSING POINT**
**Definition:** Location on the third and subsequent intersecting route (e.g., route-milepost)
**Attributes:**
- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates). Must be consistent with other MMIRE files for linkage.

**Source of Coding:** Project Team

**166. INTERCHANGE TYPE (DIAMOND, CLOVER, ETC.)**
**Definition:** Type of interchange
**Attributes:**
- Diamond
- Full cloverleaf
- Partial cloverleaf
- SPUI
- Other

**Source of Coding:** Project Team

**167. INTERCHANGE LIGHTING**
**Definition:** Type of interchange lighting
**Attributes:**

- None
- Full interchange-area lighting
- Partial interchange lighting
- Continuous lighting on one or more approach roads
- Other

**Source of Coding:** Project Team

**III.B.2. INTERCHANGE RAMP DESCRIPTORS**
(NOTE that each ramp in an interchange is described by the following variables. Thus, each ramp record includes a full description of an individual ramp. If a ramp splits into two ramps, a new record is generated for the second and all subsequent ramps.)

**168. UNIQUE RAMP IDENTIFIER**
**Definition:** An identifier for each ramp that is part of a given interchange. This defines which ramp the following variables are describing.
**Attributes:**

- Alpa or Numeric—each set of interchange ramps could begin with "1" or "A"

**Source of Coding:** Project Team

**169. RAMP LENGTH**
**Definition:** Length of ramp
**Attributes:**

- Miles, feet or meters

**Source of Coding:** SafetyAnalyst

**170. RAMP NO. OF LANES**
**Definition:** Number of lanes on ramp
**Attributes:**

- Numeric

**Source of Coding:** SafetyAnalyst

**171. RAMP AADT**
**Definition:** AADT on ramp
**Attributes:**

- Numeric

**Source of Coding:** All sources

**172. RAMP POSTED SPEED LIMIT**
**Definition:** The posted (not advisory) speed limit on the ramp
**Attributes:**

- Numeric
- No posted limit (i.e., limit will be the same as on the connecting roadways)

**Source of Coding:** Project Team

**173. FEATURE AT BEGINNING RAMP TERMINAL**
**Definition:** A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the beginning terminal.
**Attributes:**

- Freeway
- Nonfreeway (surface street)
- Other ramp
- Frontage road
- Other

**Source of Coding:** Project Team

**174. RAMP DESCRIPTOR AT BEGINNING RAMP TERMINAL**
**Definition:** Description of the beginning terminal of the ramp
**Attributes:**

- Acceleration Lane
- Deceleration Lane
- Weaving lane (e.g., the weaving area joining two ramps under an overpass in a cloverleaf interchange)
- Intersection with roadway—ramp stop/yield controlled
- Intersection with roadway—ramp signal controlled
- Another ramp
- Other

**Source of Coding:** Project Team

**175. LOCATION IDENTIFIER FOR ROADWAY AT BEGINNING RAMP TERMINAL**
Definition: Location on the roadway at the beginning ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point.
Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates) for the roadway intersected at the beginning ramp terminal. Must be consistent with other MMIRE files for linkage.
- NA (Not applicable) if beginning terminal is not at a roadway (e.g., another ramp)

**Source of Coding:** Project Team

**176. ROADWAY TRAFFIC FLOW DIRECTION AT BEGINNING RAMP TERMINAL**
Definition: Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp.
Attributes:

- Increasing direction of flow (with respect to roadway inventory direction)
- Decreasing direction of flow (with respect to roadway inventory direction)
- NOTE—Alternative coding could be compass direction of flow

**Source of Coding:** Project Team

**177. FEATURE AT ENDING RAMP TERMINAL**
**Definition:** A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the ending terminal.
**Attributes:**

- Freeway
- Nonfreeway (surface street)
- Other Ramp
- Frontage road
- Other

**Source of Coding:** Project Team

**178. RAMP DESCRIPTOR AT ENDING RAMP TERMINAL**
**Definition:** Description of the ending terminal of the ramp
**Attributes:**

- Acceleration Lane
- Deceleration Lane
- Weaving lane (e.g., the weaving area joining two ramps under an overpass in a cloverleaf interchange)
- Intersection with roadway—ramp stop/yield controlled
- Intersection with roadway—ramp signal controlled
- Another ramp
- Other

**Source of Coding:** Project Team

**179. LOCATION IDENTIFIER FOR ROADWAY AT ENDING RAMP TERMINAL**
Definition: Location on the roadway at the beginning ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point.
Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates) for the roadway intersected at the ending ramp terminal. Must be consistent with other MMIRE files for linkage.
- NA (Not applicable) if ending terminal is not at a roadway (e.g., another ramp)

Source of Coding: Project Team

**180. ROADWAY TRAFFIC FLOW DIRECTION AT ENDING RAMP TERMINAL**
Definition: Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp.
Attributes:

- Increasing direction of flow (with respect to roadway inventory direction)
- Decreasing direction of flow (with respect to roadway inventory direction)
- NOTE—Alternative coding could be compass direction of flow

Source of Coding: Project Team

## APPENDIX D. PRIORITY SAFETY VARIABLES IN THE NATIONAL BRIDGE INDEX AND THE USDOT NATIONAL HIGHWAY-RAIL CROSSING INVENTORY

**Table 2. High priority safety variables in the National Bridge Inventory.**

| FIELD_NAME | DESCRIPTION |
|---|---|
| STATE | State Code |
| STRUCNUM | Structure Number |
| RTSIGPRF | Route Signing Prefix |
| RTNUM | Route Number |
| DIRSUFF | Directional Suffix |
| HWYAGNCY | Highway Agency District |
| CNTY | County (Parish) Code |
| PLACE | Place Code |
| FEATURE | Features Intersected |
| STRCTURE | Facility Carried by Structure |
| LOCATION | Location |
| INVRTE | Inventory Rte, Min Vert Clearance |
| MILEPT | Mile point |
| KMPT | Numeric Kilometerpoint |
| BASEHWY | Base Highway Network |
| LRSNVRTE | LRS Inventory Route |
| SUBRTNUM | Subroute Number |
| LATITUDE | Latitude |
| LONGTUDE | Longitude |
| FUNCLASS | Functional Class of Inventory Rte. |
| LANESON | Lanes on Structure |
| LANESUN | Lanes Under Structure |
| AVGDAY | Average Daily Traffic |
| AVDAYNO | Num. Field—Avg. Daily Traf. |
| YRAVG | Year of Average Daily Traffic |
| APPROW | Approach Roadway Width |
| APPRDNO | Num. Field for APPROW |
| BRIMED | Bridge Median |
| SKEW | Skew |
| RAIL | Bridge Railings |
| TRANSIT | Transitions |
| APPGUARD | Approach Guardrail |
| GUARDEND | Approach Guardrail Ends |
| STRCSTAT | Structure Open/Posted/Closed |
| ONSERVE | Type of Service on Bridge |
| UNDSERVE | Type of Service Under Bridge |
| TOTHORCL | Inventory Rte Total Horz Clearance |
| TOTHORNO | Numeric Conversion for TOTHORCL |
| STRLENGT | Structure Length |
| STRLNGNO | Numeric Conversion for STRLENGT |
| LEFTWALK | Left Curb/Sidewalk Width |
| LFTWLKNO | Numeric conversion for LEFTWALK |
| RITEWALK | Right Curb/Sidewalk Width |
| RTWALKNO | Numeric Conversion for RITEWALK |
| ROADWID | Bridge Roadway Width Curb-to-Curb |
| RDWIDNO | Numeric Conversion for ROADWID |
| MINVERTO | Min Vert Clear Over Bridge Roadway |
| MVCONO | Numeric Conversion for MINVERTO |
| MINVERTU | Minimum Vertical Underclearance |
| MVCUNO | Numeric Conversion for MINVERTU |
| MINLATU | Minimum Lateral Underclearance |
| MLCURNO | Numeric Conversion for MINLATU |
| MINLATL | Min Lateral Underclear on Left |

**Table 3. High priority safety variables in the National Bridge Inventory (continued).**

| FIELD_NAME | DESCRIPTION |
|---|---|
| MLCULNO | Numeric Conversion for MINLATL |
| RDALIGN | Approach Roadway Alignment |
| STRAHWY | STRAHNET Highway Designation |
| DIRTRAF | Direction of Traffic |
| HIGHINV | Highway System of Inventory Route |
| FEDLNDHY | Federal Lands Highways |
| AVTRAFF | Average Daily Truck Traffic |
| AVTRAFNO | Numeric Conversion for AVTRAFNO |
| DESNET | Designated National Network |
| PIERPRO | Pier/Abutment Protection |
| NBISLENG | NBIS Bridge Length |

**Table 4. High-priority safety variables in the USDOT National Highway Rail Crossing Inventory.**

| **Crossing Identification** |
|---|
| Crossing Number |
| Effective Date |
| **Part I: Location and Classification Information** |
| State |
| County |
| City (In or Near) |
| Street or Road Name |
| Highway Type & Number |
| Crossing Type |
| Crossing Position |
| Latitude (Decimal) |
| Longitude (Decimal) |
| **Part II: Railroad Information** |
| Typical Total No. of Daily Trains |
| Total Switching Trains |
| Total Daylight Thru Trains (6 AM to 6 PM) |
| Check if Less Than One Movement Per Day |
| Typical Speed Range of Trains Over Crossing |
| Type and Number Tracks |
| **Part III: Traffic Control Device Information** |
| No Signs or Signals |
| Type of Warning Device at Crossing - Signs |
| Crossbucks |
| Highway Stop Signs (R1-1) |
| RR Advance Warning Signs (W10-1) |
| Hump Crossing Sign (W10-5) |
| Pavement Markings |
| Other Signs |
| Gates |

| |
|---|
| Four-quadrant (or Full Barrier) Gates |
| Cantilevered (or Bridged) Flashing Lights |
| Mast Mounted Flashing Lights |
| Number of Flashing Light |
| Other Flashing Lights |
| Highway Traffic Signals |
| Wigwags |
| Bells |
| Other Train Activated Warning Devices |
| Specify Special Warning Device NOT Train Activated |
| Channelization Devices With Gates |
| Traffic Light Interconnection/Preemption |
| **Part IV: Physical Characteristics** |
| Smallest Crossing Angle |
| Number of Traffic Lanes Crossing Railroad |
| Are Truck Pullout Lanes Present? |
| Is Highway Paved? |
| Crossing Surface (on Main Line) |
| Does Track Run Down a Street? |
| Nearby Intersecting Highway? |
| Is It Signalized? |
| Is Crossing Illuminated? |
| **Part V: Highway Information** |
| Highway System |
| Is Crossing on State Highway System? |
| Functional Classification of Road at Crossing |
| Posted Highway Speed |
| Annual Average Daily Traffic (AADT) |
| Estimated Percent Trucks |
| Average Number of School Buses Over Crossing per School Day |

## REFERENCES


1. Council, F.M., and Harkey, D.L. (2006). *Traffic Safety Information Systems International Scan: Strategy Implementation White Paper* (Report No. FHWA-HRT-06-099). Washington, DC: Federal Highway Administration.

2. Crow, M., Halladay, M.L., Martinovich, S., Delucia, B.H., Harkey, D.L., McNamara, D.J., Ellison, J.W., Lacy, K., Serian, B.L., Griffith, M.S., and MacGregor, S. (2004). *Traffic Safety Information Systems in Europe and Australia* (Report No. FHWA-PL-04-010). Washington, DC: Federal Highway Administration.

3. Council, F.M., Harwood, D.W., Potts, I.B., Torbic, D.J., Graham, J.L., Hutton, J.M., Delucia, B.H., and Peck, R.C. (2007). *Guidance for Implementation of the AASHTO Strategic Highway Safety Plan: A Guide for Addressing Safety Data and Analysis in Developing Emphasis Area Plans* (NCHRP Report 500, Volume 21). Washington, DC: National Cooperative Highway Research Program.

4. Federal Highway Administration. "Basic Services Engineer's Manual, Section 3.2 Data Elements," *IHSDM Documentation* at http://www.ihsdm.org/ihsdm_public/html/user/docs/docs_all.html.

5. Federal Highway Administration. "Appendix A—Roadway Segment Inventory Data," *Functional Specification for Master SafetyAnalyst Program* (September 2004).

6. Federal Highway Administration. (2006). *Draft Executive Summary. Repeatability and Accuracy of Geometry Measured by the Digital Highway Measurement Vehicle*.