# MDOT Divisions and their Data to Assess Effectiveness Of Rumble Stripes on Highway Safety.

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**Abstract:** Although traffic deaths are caused by an array of factors, in the United States more than half of all roadway fatalities are caused by roadway departures [FHWA 2006]. In 2003, there were 25,562 roadway departure fatalities, accounting for 55 percent of all roadway fatalities in the United States. Roadway departure includes run-off-the-road (ROR) and head-on fatalities. In 2003, more than 16,700 people died in ROR crashes (39 percent of all roadway fatalities), and head-on crashes represented 12 percent of all fatal crashes [FHWA 2006]. On average, one roadway departure fatality crash occurred every 23 minutes. An average of one roadway departure injury crash occurred every 43 seconds [FHWA 2006]. In short, roadway departures are a significant and serious problem in the United States.

MDOT through the Traffic Engineering Division is commitment to improve Mississippi highway safety. MDOT has invested valuable resources to implement a series of safety improvement programs such as the "Rumble Stripes" program. Despite MDOT's high commitment and efforts to improve highway safety, MDOT does not know the impact of the "Rumble Strip" program in reducing crashes. In other words, MDOT lacks quantifiable evidence that demonstrates the effectiveness of this program.

This paper presents an overview of the agencies involved in collecting the data need tot assess the impact of the Rumble Stripes on Highway Safety. Furthermore, this paper provides a description of data collected and its structure. Finally, the results of the lessons learns are presented. They could serve as the foundation for similar studies and/or case students to facilitate students learning through meaningful real world scenarios.

*Keywords:* Rumble Stripes, Rumble Strips, State-of-the-Art

## Introduction

Although traffic deaths are caused by an array of factors, in the United States more than half of all roadway fatalities are caused by roadway departures [FHWA 2006]. In 2003, there were 25,562 roadway departure fatalities, accounting for 55 percent of all roadway fatalities in the United States. Roadway departure includes run-off-the-road (ROR) and head-on fatalities. In 2003, more than 16,700 people died in ROR crashes (39 percent of all roadway fatalities), and head-on crashes represented 12 percent of all fatal crashes [FHWA 2006]. On average, one roadway departure fatality crash occurred every 23 minutes. An average of one roadway

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departure injury crash occurred every 43 seconds [FHWA 2006]. In short, roadway departures are a significant and serious problem in the United States.

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This paper presents an overview of the agencies involved in collecting the data need to assess the impact of the Rumble Stripes on Highway Safety. Furthermore, this paper provides a description of data collected and its structure. Finally, the results of the lessons learns are presented. They could serve as the foundation for similar studies and/or case students to facilitate students learning through meaningful real world scenarios

## Overview Of Agencies Involved In Collecting Data

Collecting, processing, archiving and retrieving of data/information are a costly, demanding and necessary activity of all organizations. Each organization's division manages data/information in a different way for a variety of purposes to fulfill their primary responsibility. This primary responsibility is important to understand in requesting the appropriate data from the different divisions. Following is a brief description of the responsibilities of the MDOT Divisions involved in collecting data to be used to assess the effectiveness of rumble stripes on highway safety.

**Mississippi Department of Transportation.** The Mississippi Department of Transportation is responsible for providing a safe intermodal transportation network that is planned, designed, constructed and maintained in an effective, cost efficient, and environmentally sensitive manner. In order to provide the framework for accomplishing the Mississippi Department of Transportation's (MDOT) mission, a set of seven goals has been developed. These goals are multimodal, comprehensive in scope and interdependent. Table 1 shows the goals of MDOT. [MDOT, 2006]

Table 1. Mississippi Department of Transportation Goals
[MDOT, 2006]

Goal 1: Accessibility and Mobility: Improve Accessibility and Mobility for Mississippi's People, Commerce and Industry.

Goal 2: Safety: Ensure High Standards of Safety in the Transportation System.

Goal 3: Maintenance and Preservation: Maintain and Preserve Mississippi's Transportation System.

Goal 4: Environmental Stewardship: Ensure that Transportation System Development is Sensitive to Human and Natural Environment Concerns.

Goal 5: Economic Development: Provide a Transportation System that Encourages and Supports Mississippi's Economic Development.

Goal 6: Awareness, Education and Cooperative Processes: Create Effective Transportation Partnerships and Cooperative Processes that Enhance Awareness of the Needs and Benefits of an Intermodal System.

Goal 7: Finance: Provide a Sound Financial Basis for the Transportation System

Four offices within MDOT actively participated in this project: 1- District 6 Office, 2- District 5 Office, 3- Planning Division and 4- Traffic Engineering Division.

1 - District 6 Office: is responsible for coordinating, planning, design, construction and maintenance of the intermodal transportation network within fourteen counties. These counties include: Hancock, Harrison, Jackson, Pearl River, Stone, George, Lamar, Forrest, Perry, Greene, Jones, Wayne, Jasper, and Clarke. Figure 3-1 shows a map of the MDOT Districts. District 6 is located in the south east portion of the state

2 - District 5 Office: is responsible for coordinating, planning, design, construction and maintenance of the intermodal transportation network within ten counties. The counties include: Hinds, Madison, Rankin, Leake, Scott, Neshoba, Newton, Noxubee, Kemper, and Lauderdale. Figure 1 shows a map of the MDOT Districts. District 5 is located in the central portion of the state

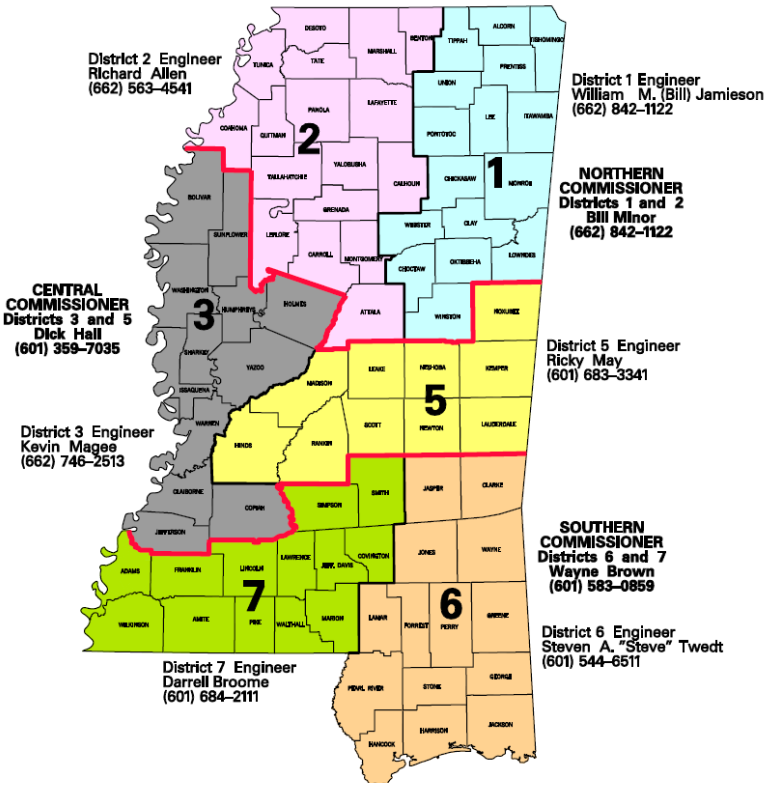


Figure 1. MDOT District Offices

3 - Planning Division: provides the Legislature, MDOT and the Federal Highway Administration with information to support program planning and decisions. Table 2 shows the planning division fundamental functions to provide support for planning and decisions [MDOT Planning Division, 2006]

Table 2. Planning Division Fundamental Functions [MDOT Planning Division, 2006]

| Function | Brief Description |
|---|---|
| The Long Range Statewide Transportation Plan (MLRTP) | Provides the framework for Mississippi's transportation program. This is a 20+ year outlook. |
| Statewide Transportation Improvement Program (STIP) | Provides a listing of the projects to be accomplished during the next three years. |
| Traffic Monitoring System for Highways (TMS/H) | Includes the collection and analysis of all traffic data including traffic counts, vehicle classification counts, truck weight surveys, turning movement counts, speed surveys, and occupancy surveys. |
| Roadway Inventory and Mapping | Provide statistics such as highway dimensions and mileage, structure information, and an extensive array of maps. |
| A Federal Functional Classification System | Used distinguish highways according to the character of service provided by the facility. |
| Special Programs and Studies | Administer programs including Urbanized Area support (places larger than 50,000), Federal Aid to all Urban areas (places above 5,000), Transit Planning grants, Transportation Enhancement program, Latin American Trade Study, Environmental Noise studies, Intermodal Connector Improvement Program, Great River Road Transportation Committee, etc. |
| Specialized Reports and Feasibility Studies | Prepare for decision makers include activities such as the Highway Performance Monitoring System (HPMS), Statistical reports on state, city and county highway finance, and analyses of interchanges and highway improvements. |

4 - Traffic Engineering Division: ensures that safe, efficient traffic control measures are standardized throughout the State Maintained Highway System. It is responsible for the development of programs to add, upgrade or revise existing traffic control devices. This task compels studies to determine and recommend appropriate speed zones as well as the development and distribution of policies for the application of traffic control devices in accordance with established guidelines. The Traffic Engineering Division also directs the

in-house manufacture and distribution of MDOT erected signs. Personnel travel statewide to install and maintain signs and signals on assigned sections of state maintained highways. [MDOT Traffic Engineering Division, 2006]

### Archived Data, Structure And Means Of Retrieval

Upon identifying the divisions their roles in collecting data pertinent to this research project, the MDOT project leader contacted the different divisions and provided a brief description of the project and the research team. The research team followed-up this initial contact by requesting a meeting with the representatives of the agencies to provide an overview of the project and initiate the consolidation of the data that had been collected. During, this initial contact an informal interview was conducted with the division representative to explicitly identify the data that the agency had already collected, the structure, and the media in which the data was stored as well as the retrieval means of the division. Upon agreeing with the division concerning the data to be retrieved, a mechanism to transfer the data was established. As expected and evidenced below, each agency used a different structure to archive the data. Following are some examples of the data that was obtained for the project.

**Planning Division - Mississippi Department of Transportation.** In order to fulfill its mission, the MDOT planning division has placed a number of traffic recording devices around the state. This office handled mainly pictorial and numerical information. The planning division archived the information both in hard copies and electronic media. Some of the information received by the research team was in hardcopy and some was received in electronic files. One of the first pieces of information received by the research team was a series of maps showing geographical information of gathered data. Figure 2 shows the map that was provided to the research team that illustrates the location of each the stations. From this map, recording devices in the studied area were selected to retrieve traffic volume counts that corresponded with the segments part of the study shown in Table 3.

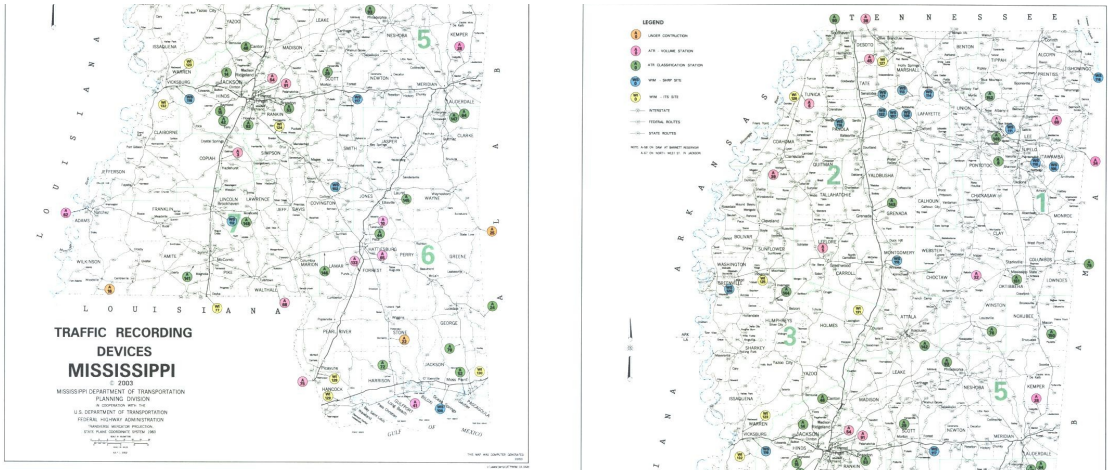


Figure 2. Traffic Recording Devices – Mississippi

Table 3. Road Segments Included in the Study

| ID | Project Name /District | Route | Starting Point (Mile Marker) | Ending Point (Mile marker) |
|---|---|---|---|---|
| 1 | US 98 in George County from the Greene County line to SR 63/Dist 6 | US 98 | Greene County line | SR 63 |
| 2 | US 98 in Greene County from east of SR 198 in McLain to the George County line/Dist 6 | US 98 | Greene County from east of SR 198 in McLain | George County line |
| 3 | US 98 in Perry County from the Forrest County line east 7.5 miles/Dist 6 | US 98 | Forrest County line | East 7.5 miles into Perry County |
| 4 | US 98 in Forrest County from Interstate 59 to the Perry County line/Dist 6 | US 98 | Forrest County from Interstate 59 | Perry County line |
| 5 | SR 589 in Lamar County from Haden Road north to US 98/Dist 6 | SR 589 | in Lamar County from US 98 north | to US 98 |
| 6 | SR 589 in Lamar County from US 98 north to the Covington County line/Dist 6 | SR 589 | in Lamar County from US 98 north | to the Covington County line |
| 7 | SR 43 in Hancock County from SR 603 to Dummyline Road/Dist 6 | SR 43 | in Hancock County from SR 603 | to Dummyline Road |
| 8 | SR 43 in Hancock County from Dummyline Road to Salem Road/Dist 6 | SR 43 | in Hancock County from Dummyline Road | to Salem Road |
| 9 | SR 43 in Pearl River County from Pinetucky Road to SR 26/Dist 6 | SR 43 | in Pearl River County from Pinetucky Road | to SR 26 |
| 10 | US 11 in Pearl River County from Minkler Road to Charwood Drive/Dist 6 | US 11 | in Pearl River County from Minkler Road | to Charwood Drive |
| 11 | 11 in Pearl River County from Charwood Drive to the north corporate limits of Poplarville/Dist 6 | US 11 | in Pearl River County from Charwood Drive | to the north corporate limits of Poplarville |
| 12 | Scooba-Noxubee County Line (7 ½ Miles of 4 lane) in Kemper County /Dist 5 | US45 | Scooba<br><br>0.644 North of | Noxubee County Line |
| 13 | Porterville-Scooba (9 ¾ Miles of 4 lane)/Dist 5 | US45 | Porterville | Scooba |
| 14 | Lauderdale to Porterville (10 Miles of 4 lane)/Dist 5 | US45 | Lauderdale | Porterville |

Although the Planning Division did not have a GIS system to link the traffic recoding devices (presented in the Figure 2) and the road segments included in the study (presented in Table 3), the Planning Division had extensive data regarding the recording devices in the studied area. Several computers files with data from the stations from several years were received by the research team. Figure 3 shows a sample of files that were received by the research team. Figure 4 shows a sample of the data contained in the data files.

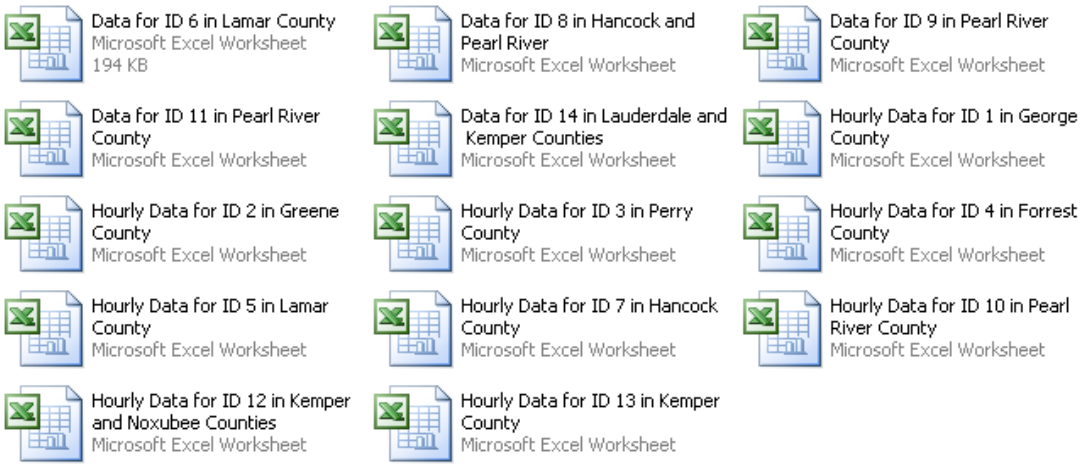


Figure 3. Sample Data Files from the Planning Division

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Summary of ID 6: SR 589 in Lamar County from US 98 to Covington CL | | | | | | |
| 2 | ID | Route | Location | Type of Count | 2000 AADT | 2004 AADT | 2006 AADT |
| 3 | 6 | SR 589 | From SR 98 to Epley Rd | Volume | 4300 | 5000 | 5100 |
| 4 | 6 | SR 589 | From Epley Rd to SR 42 | Volume | 4200 | 4300 | 4400 |
| 5 | 6 | SR 589 | From SR 42 to Covington CL | Volume | 1800 | 2200 | 2200 |

Summary | Volume-US 98 to Epley Rd | Volume-Epley Rd to SR 42 | Volume-SR 42 to (

Figure 4 Sample data contained in the data files

The information provided by the Planning Division represented a wide range of timeframe in different locations. Figure 5 shows the Annual Average Daily Traffic (AADT) data for a particular location including a map with the specific location of the count. Additional, for some locations the Planning Division was able to provide direction distribution of the traffic as shown in Figure 6.

| ID: | 6 | |
|---|---|---|
| Route: | SR 589 | |
| Location: | From US 98 to Epley Rd | |
| County: | Lamar | |
| | 2000 | 2004 AADT |
| | 4300 | 5000 |

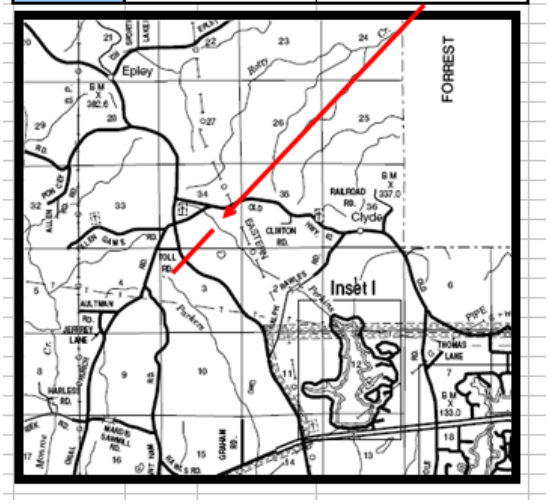


Figure 5 Sample Annual Average Daily Traffic (AADT) Information

| | Trk % | Dir. Dist. | 2006 AADT |
|---|---|---|---|
| | 29% | 50/50 | 8400 |

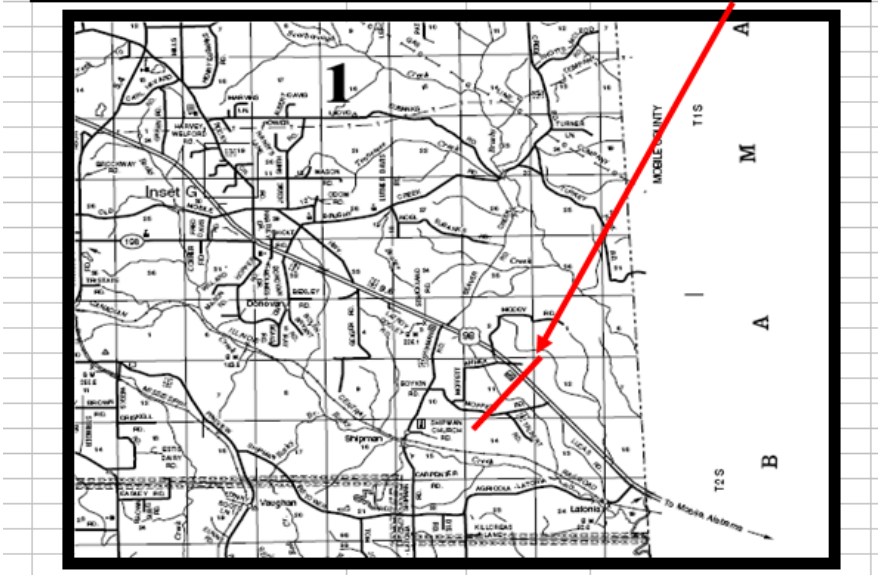


Figure 6 Sample Annual Average Daily Traffic (AADT) Distribution and Location

The Planning Division also provided hourly counts information for some locations. Figure 7 shows a sample hourly count information collected on Monday 1/30/06 and Wednesday 2/1/06 on a particular segment.

| ID: | 1 | | |
|---|---|---|---|
| Route: | US 98 | | |
| Location: | From AL State Line to SR 63 | | |
| County: | George | | |
| Dates of Count: | Monday 1/30/06 | | Wednesday 2/1/06 |
| Time | Westbound | Eastbound | Total |
| 0 | 44 | 30 | 74 |
| 100 | 41 | 25 | 66 |
| 200 | 33 | 23 | 56 |
| 300 | 53 | 24 | 77 |
| 400 | 84 | 68 | 152 |
| 500 | 123 | 83 | 206 |
| 600 | 138 | 142 | 279 |
| 700 | 177 | 212 | 388 |
| 800 | 195 | 232 | 427 |
| 900 | 207 | 263 | 470 |
| 1000 | 229 | 235 | 463 |
| AM Peak 1100 | 245 | 233 | 478 |
| 1200 | 240 | 244 | 484 |
| 1300 | 258 | 273 | 531 |
| 1400 | 281 | 278 | 558 |
| 1500 | 278 | 272 | 550 |
| PM Peak 1600 | 283 | 287 | 570 |
| 1700 | 252 | 271 | 523 |
| 1800 | 195 | 228 | 423 |
| 1900 | 153 | 153 | 306 |
| 2000 | 120 | 120 | 240 |
| 2100 | 105 | 95 | 200 |
| 2200 | 80 | 85 | 164 |
| 2300 | 62 | 50 | 112 |

2006- AL State line to SR 63 / 2003- AL State line to SR 63 / Volume only- SR 63 to C

Figure 7. Sample Hourly Count

It is important to highlight the fact that the Planning Division data was organized and structured in a way that was most suitable for the initial intent of the data. However, very little field standardization was found in the data and consolidation of the data was not a trivial task.

**District 6 Office - Mississippi Department of Transportation.** Due to the complexity and diversity of responsibilities of the District 6 Office, the information is collected, used and store using multiple formats. The District 6 Office archived the information both in hard copies and electronic media. Some of the information received by the research team was in hardcopy and some was received in electronic files. This office handled descriptive, pictorial and numerical information. Information ranged from specific in nature (either by location or day) to very broad. One of the first pieces of information received by the research team was a list of construction projects suitable to assess the effectiveness of the rumble stripes on highway safety. Figure 8 shows the list of project segments as chosen by District 6. This list was then used as the foundation to collect all relevant traffic flow and crash information relevant to the project.

| COMPLETION DATE | |
|---|---|
| 12-30-2005 | US 98 in George County from the Greene County line to SR 63 has rumble stripe. |
| 7-31-2004 | US 98 in Greene County from east of SR 198 in McLain to the George County line has a rumble strip. |
| 8-26-2004 | US 98 in Perry County from the Forrest County line east 7.5 miles has rumble stripe. |
| 6-14-2002 | US 98 in Forrest County from Interstate 59 to the Perry County line has no rumble strip or rumble stripe. |
| 7-5-2002 | SR 589 in Lamar County from Haden Road north to US 98 has rumble stripe. |
| 8-1-2002 | SR 589 in Lamar County from US 98 north to the Covington County line has no rumble strip or rumble stripe. |
| 8-26-2005 | SR 43 in Hancock County from SR 603 to Dummyline Road has rumble stripe. |
| 3-17-2004 | SR 43 in Hancock County from Dummyline Road to Salem Road has no rumble stripe. |
| 8-26-2004 | SR 43 in Pearl River County from Pinetucky Road to SR 26 has no rumble stripe. |
| 6-14-2002 | US 11 in Pearl River County from Minkler Road to Charwood Drive has no rumble stripe. |

Figure 8 Project List District 6

The district office also provided detailed information regarding the construction projects. Figure 9 shows examples of a construction drawing provided by the District 6 Office.

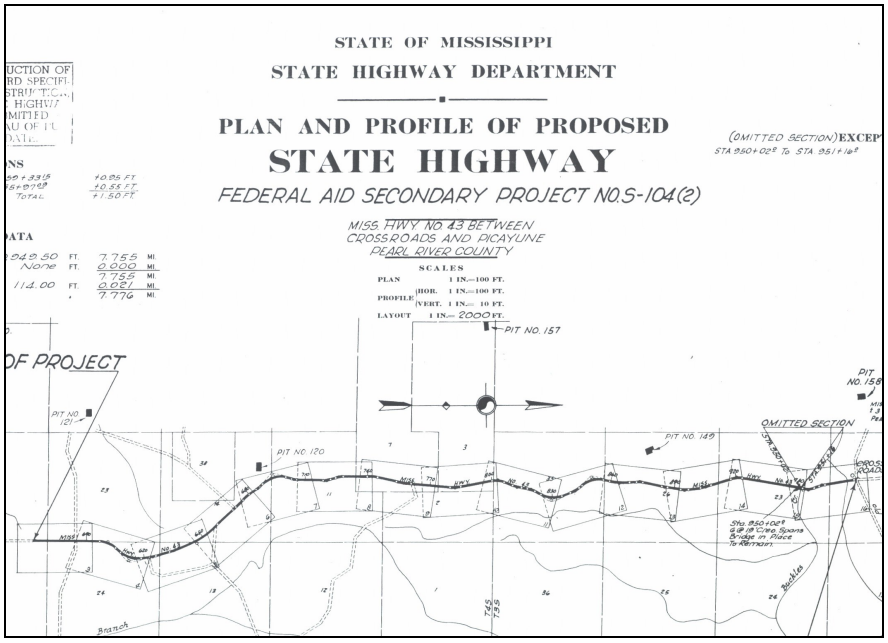


Figure 9 Sample Section Information

**District 5 Office - Mississippi Department of Transportation.** Similar to the District 6 Office, the District 5 Office has multiple responsibilities and therefore collected, used and stored information using multiple formats. It is interesting to note that although both District Offices are part of the same department of transportation (Mississippi) and both have similar responsibilities, the format used to collect, store and retrieve the information was different between the two districts.

The first piece of information provided by this district was the list of construction projects most suitable for the assessment. Figure 10 shows the list of project segments as chosen by District 5.

In addition to the list of construction projects this district also provided detailed information on each project. Figure 11 shows sample project information files from the District 5. Figure 12 shows a file opened for a particular selected highway section. Figure 13 shows the scope of work for modifications to a segment of highway. It is word noting that this division provided all the information in digital form.

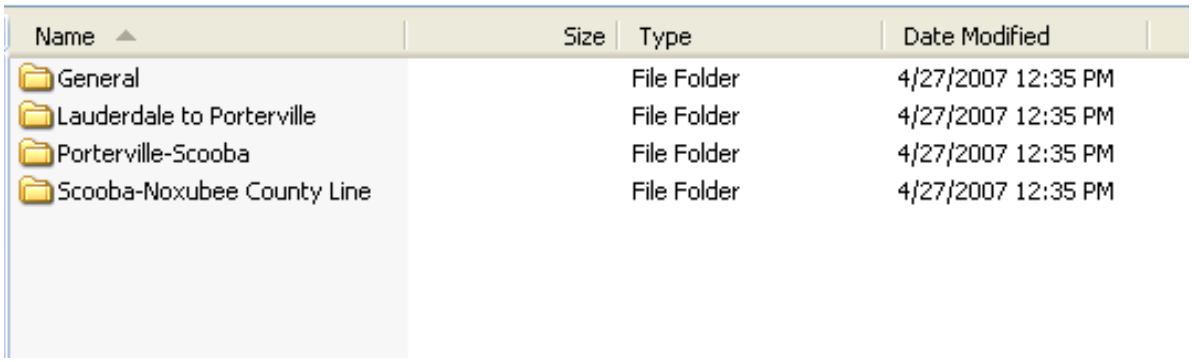


**Figure 10 Project List District 5**


**Figure 11 Sample Project Information**

Mississippi Department of Transportation

Transportation Management Information System

RDD680 Report

Date: 03/27/2007

Time: 12:20:48

Analysis Section ID: 1672

| | | | | | |
|---|---|---|---|---|---|
| County: Kemper [35] | | Begin Distance: 0.000 mi | | DDA: N | Federal Functional Class: 02 |
| Route: 45 N. Bound Lns | | End Distance: 0.582 mi | | District: 5 | National Highway System: Y |
| Pavement Type: | Overlay Flexible | Number of Lanes in Section: | 2 | | Plan Length: 0.582 mi |
| Structure Number: | 3.71 | Total Number of Lanes: | 4 | | Measured Length: 0.582 mi |
| Divided Highway: | Y | Total Lane Width: | 28.0 ft / 8.40 m | | Paved Shoulder: N |
| | | Left Shoulder Width: | 6.0 ft / 1.80 m | | |
| | | Right Shoulder Width: | 8.0 ft / 2.40 m | | |
| Begin Station No.: | 149+25 | Begin Latitude: | 32.577820 | | Begin Longitude: -88.502655 |
| End Station No.: | 180+00 | End Latitude: | 32.586693 | | End Longitude: -88.501762 |
| Begin Landmark: | Lauderdale Co. Line | | | | |
| End Landmark: | 0.582 Mi. N. Of Lauderdale Co. Line | | | | |
| Memo: | Overlay #1 Was Placed After Original Construction In Lieu Of Removingstriping | | | | |

Lanes

Landmarks

**Figure 12 Sample Section Information**

MISSISSIPPI DEPARTMENT OT TRANSPORTATION

SECTION 904- NOTICE TO BIDDERS NO. 69 CODE:

DATE: 06/0 4/2004

SUBJECT: Scope of Work

PROJECT: MP-5000-00(024) / 302669 - LAUDERDALE & KEMPER COS.

The contract documents do not include an official set of construction plans, but may, by reference, include some Standard Drawings when so specified in a Notice to Bidders entitled 'Standard Drawings'. All other references to plans in the contract documents and Standard Specifications for Road and Bridge Construction are to be disregarded.

Work on the project shall consist of the following:

Overlay approximately 10.5 miles of existing asphalt pavement on US Hwy. 45 from just north of Lauderdale at approximately station 26+44 northerly to Porterville at approximately

**Figure 13 Sample Scope of Work**

**Traffic Engineering Division - Mississippi Department of Transportation.** In order to fulfill its mission the MDOT Traffic Engineering Division continuously collects safety related information. All the information provided by this office to the research team was in electronic files. Several files were provided to the research team to analyze the safety conditions of the studied area. Although, all the data was electronically stored, there were very limited (if any) common fields between this information and information provided by the planning division and/or the districts office.

The main data provided by this division was crash information for each of the segments provided by the district offices. Figures 14 and 15 show the sample data files as provided by the Traffic Engineering Division. Figure 16, 17, and 18 provides sample crash information with components and their elements.

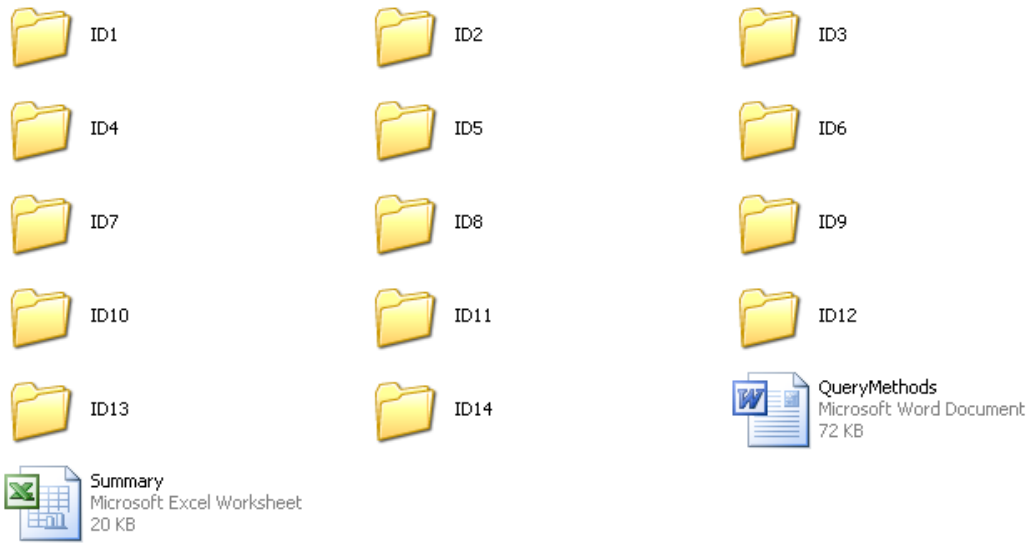


Figure 14 Sample Data Files from the Traffic Engineering

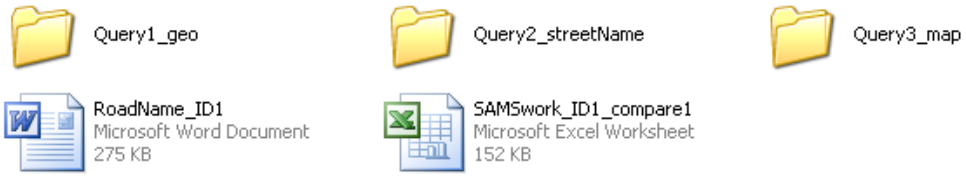


Figure 15 Sample Data Files from the Traffic Engineering

| | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|
| 1 | ROUTE I | SAMS ROUTE NAM | STREET NAME | INTERSECTING ROUTE | INTERSECTING STREET NAME | SAMS INT ROUTE N | COUNTYNAN | SAMS CITYNA |
| 4 | 198 | MS 198 | LONDON ST | 198 | RATLIFF ST | MS 198 | George [20] | LUCEDALE |
| 5 | 063 | | SOUTH | | | | George [20] | |
| 6 | | | WEST CAMELLIA ROAD | | TWIN CREEK ROAD | | George [20] | |
| 7 | 26 | MS 26 | WINTER ST. | 63 | COWART STREET | MS 63 | George [20] | LUCEDALE |
| 8 | | | 026 WEST | | HENERY COCHRAN | | George [20] | |
| 9 | | | 063 | | VENTURA DR. | | George [20] | |
| 10 | | | 063 SOUTH | | WALMART PL. | | George [20] | |
| 11 | | | 063 WALMART | | 063 | MS 63 | George [20] | |
| 12 | | | 063 WINTER ST. | | AUTO ZONE | | George [20] | |
| 13 | | | 08 SUNSET DR | | FAIRGROUNDS | | George [20] | |
| 14 | | | 098 | | HWY 63 | | George [20] | |
| 15 | | | 1205 MILL ST EAST | | FOUNTAIN LAKE RD | | George [20] | |
| 16 | | | 13185 HWY 613 | | HWY 613 | MS 613 | George [20] | |
| 17 | | | 132 NATHANS LANE | | TUT RD | | George [20] | |
| 18 | | | 13TH ST | | GRAND AVE | | George [20] | |
| 19 | 163 | | 163 | 163 | WALMART PARKING LOT | | George [20] | LUCEDALE |
| 20 | | | 163 SOUTH | | WALMART PARKING LOT | | George [20] | LUCEDALE |
| 21 | 163 | | 163 SOUTH | 26 | WINTER ST | MS 26 | George [20] | LUCEDALE |

Figure 16 Sample Crash Information with Components and their Elements

| | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | COUNTYNAN | SAMS CITYNA | INTERSECTION DIS | INTERSECTION DIST UC | INTERSECTION DIST DI | REPORTED DA | REPORTED TI | SAMS CRASH I | VEHICLE COU | SAMS INJURY |
| 4 | George [20] | LUCEDALE | 0.15 | F | W | 02/21/2006 | 12:05 | 1876478 | 2 | |
| 5 | George [20] | | 0 | | | 09/03/2002 | 12:31 | 3970484 | 3 | |
| 6 | George [20] | | | | | 09/08/2005 | 05:40 | 1812614 | 1 | |
| 7 | George [20] | LUCEDALE | 200 | F | S | 10/08/2006 | 15:10 | 3470592 | 2 | |
| 8 | George [20] | | 0 | | | 11/16/2002 | 12:41 | 4011012 | 2 | |
| 9 | George [20] | | 0 | | | 09/10/2002 | 17:32 | 4027514 | 2 | |
| 10 | George [20] | | 0 | | | 12/30/2003 | 13:04 | 4108442 | 2 | |
| 11 | George [20] | | 0 | | | 03/04/2003 | 13:25 | 4032498 | 2 | |
| 12 | George [20] | | 0 | | | 10/21/2002 | 11:48 | 3998293 | 3 | |
| 13 | George [20] | | 500 | F | | 01/13/2003 | 08:49 | 4013364 | 1 | |
| 14 | George [20] | | 0 | | | 12/26/2002 | 03:45 | 4058866 | 1 | |
| 15 | George [20] | | 0.08 | M | S | 10/27/2002 | 18:05 | 4021189 | 2 | |
| 16 | George [20] | | 0.5 | F | W | 05/06/2005 | 14:20 | 3446778 | 2 | |
| 17 | George [20] | | 300 | F | N | 10/06/2005 | 16:07 | 1812613 | 2 | |
| 18 | George [20] | | | | | 06/27/2005 | 19:17 | 3444162 | 2 | |
| 19 | George [20] | LUCEDALE | | | | 05/04/2004 | 14:57 | 1768515 | 2 | |
| 20 | George [20] | LUCEDALE | | | | 11/15/2004 | 11:25 | 1819635 | 2 | |
| 21 | George [20] | LUCEDALE | | | | 08/22/2005 | 17:15 | 1819487 | 2 | |

Figure 17 Sample Crash Information with Components and their Elements

| | Q | R | S | T | U | V | W | X |
|---|---|---|---|---|---|---|---|---|
| 1 | SAMS INJURY C | SAMS FATAL C | SAMS STAT INJURY SEVER | SAMS STAT DUI I | LIGHT CONDITION DES | ROAD CONDITION DESC | SAMS CRASH TYPE DESC | SAMS INTR |
| 4 | | | 5 | | Daylight | Dry | Parked vehicle | |
| 5 | 0 | 0 | 5 | | Daylight | Dry | Angle | |
| 6 | 1 | | 4 | | Dark-Unlit | Dry | Fixed Object | |
| 7 | | | 5 | 0 | Daylight | Dry | Hit and Run | |
| 8 | 0 | 0 | 5 | | Dawn | Dry | Rear end slow or stop | |
| 9 | 0 | 0 | 5 | | Daylight | Dry | Rear end slow or stop | |
| 10 | 0 | 0 | 5 | | Daylight | Dry | Angle | |
| 11 | 0 | 0 | 5 | | Daylight | Dry | Parked vehicle | |
| 12 | 0 | 0 | 5 | | Daylight | Dry | Rear end slow or stop | |
| 13 | 0 | 0 | | | Daylight | Dry | Parked vehicle | |
| 14 | 0 | 0 | 5 | | Dark-Unlit | Dry | Run off Road - Straight | |
| 15 | 1 | 0 | 4 | | Dark-Unlit | Dry | Parked vehicle | |
| 16 | | | 5 | 0 | Daylight | Dry | Parked vehicle | |
| 17 | | | 5 | | Daylight | Dry | Parked vehicle | |
| 18 | | | 5 | 0 | Daylight | Dry | Angle | |
| 19 | | | 5 | | Daylight | Dry | Left turn same roadway | |
| 20 | | | 5 | | Daylight | Dry | Rear end slow or stop | |
| 21 | | | 5 | | Daylight | Dry | Rear end slow or stop | |

Figure 18 Sample Crash Information with Components and their Elements

## LESSONS LEARNED

The use of rumble stripes to improve the safety of drivers is of paramount importance for all the Mississippi Department of Transportation Divisions and Districts that graciously share their information with the research team. All the Divisions and Districts were very willing to

collaborate in the data consolidation process. However, collecting, archiving and retrieving information was not a main priority for any of the Divisions and Districts. Additionally, no general guidelines for data structuring was communicated among the Divisions and Districts. Therefore, it is evident that input into the data gathering process before the data is collected rather than after the fact, could greatly improve the process of accessing the impact of other safety programs currently implemented by the Department. By defining the data to be collected, the method for collecting the data, the formatting of the data, the timeframes for collecting the data (before, during and after construction) all the participating divisions and districts would be able to share information and to demonstrate the impact of their performance the stakeholders.

Additionally, this collection effort demonstrated that the data was available and the divisions and districts were willing to provide the data to the research team. The research team was able to combine, reform, integrate and analyze the data to produce quantifiable results.

Finally, although each division and district participating in this project had a different mission and collected different data, it is possible to create a data structure that allow these divisions and districts to share common data for common purposes and reduce the cost of the data collection efforts.

## SUMMARY

Maintenance and construction programs are arguably one of the most important functions of States DOT (as represented by the percentage of the budget invested). MDOT through the Traffic Engineering Division is commitment to improve Mississippi highway safety. MDOT has invested valuable resources to implement a series of safety improvement programs such as the "Rumble Stripes" program. Despite MDOT's high commitment and efforts to improve highway safety, MDOT does not know the impact of the "Rumble Strip" program in reducing crashes. In other words, MDOT lacks quantifiable evidence that demonstrates the effectiveness of this program. This paper focused on the agencies involved in collecting and storing the data as well as the data used to measure the effectiveness of the "Rumble Stripes" program. The content of this paper was them used as the foundation for the statistical analysis.

This work followed a descriptive research methodology to systematically collect data from the several agencies involved in construction projects. The first step in the data collection was for MDOT to contact the divisions and districts and provide brief information about the project and research. Then the research met with the each division and district to discuss the overall purpose of the project and request the required data. Then the divisions and districts were responsible for assembling the collected data and sending it to the researchers.

The results presented in this paper demonstrate the importance of inter-division and district collaboration. Furthermore, this paper provide an example of data collected, archiving mechanism and retrieval procedures of each agency involved in this project. Therefore, the results could be used as lessons learned and serve as the foundation for similar studies.

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