

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

INTEROFFICE MEMORANDUM

August 10, 2011

TO: Scott E. Bennett, Assistant Chief Engineer - Planning

FROM: Alan Meadors, Planning and Research Engineer *Alan*

SUBJECT: Pavement Condition and Needs Study - Revised
Highway 150 from I-55 to Highway 137
Mississippi County

A study of Highway 150, Section 1 from the interchange at I-55 (Log Mile 1.52) to Highway 137 (Log Mile 10.46) in the Community of Huffman, Mississippi County, a distance of 8.94 miles, was conducted to determine if rehabilitation or reconstruction is needed for the route. See Figure 1 for area map.

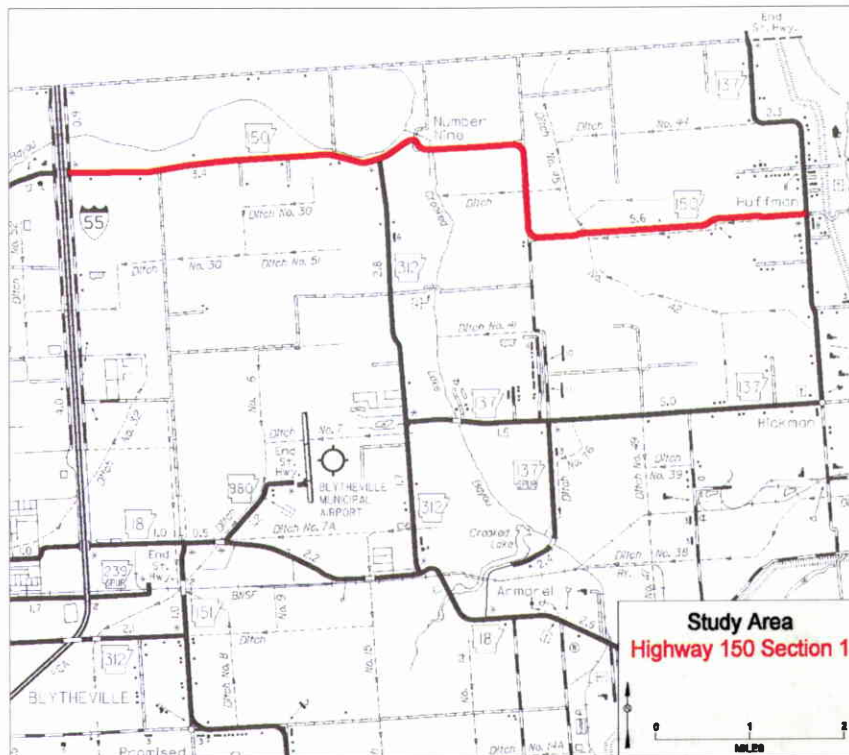


FIGURE 1. Study Area

The Community of Huffman is located approximately 15 miles northeast of Blytheville, at the junction of Highways 150 and 137 in Mississippi County. The population in Blytheville decreased nearly 14.5 percent from 2000 to 2010 while the population of Mississippi County decreased 10.5 percent, from 51,979 in 2000 to 46,480 in 2010. The statewide population growth for the same ten-year period was approximately 8.7 percent.

Land use in the region is primarily agriculture with various farming industries. In addition, the major industry in the region is Nucor Steel which operates three steel plants east of Blytheville.

Existing Conditions

Highway 150 is a primary east-west route connecting I-55 and the three steel plants. This route was originally a county road. It was added to the state highway system in 1932 and it is not on the Arkansas Primary Highway Network (APHN). The first bituminous chip seal was placed in 1953. This highway is functionally classified as a major rural collector and mainly consists of two 10-foot lanes and narrow or unpaved shoulders from I-55 to Highway 137 with a posted speed limit of 55 miles per hour (mph). Three bridges (Bridge No. 06587, 06588 and 06589) constructed in 1996 are located on the study segment with current sufficiency ratings of greater than 90. There are two 90-degree curves on this segment and the braking or deceleration area before these curves has been rehabilitated with the use of asphalt patching. The bridges and road geometry are shown in Figure 2.

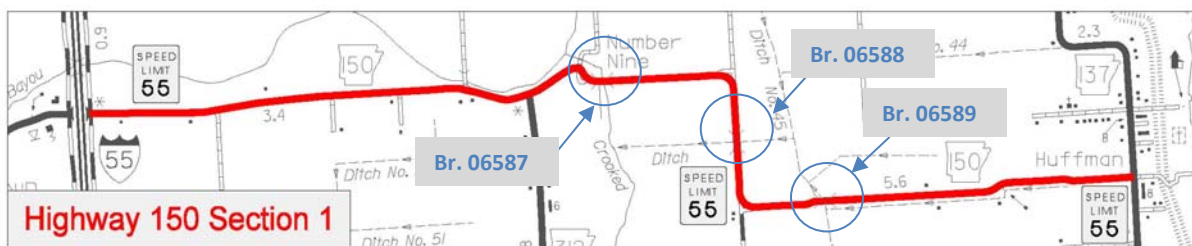


FIGURE 2. Highway 150 Section 1 from the interchange at I-55 to Highway 137

Traffic

Level of service (LOS) is a quality measure describing conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service, A through F, are defined and described in Appendix A.

For a highway such as Highway 150, LOS C is considered acceptable. The 2011 ADT for the study segment of Highway 150 ranges from 300 vehicles per day (vpd) to 1,700 vpd; the projected 2031 ADT ranges from 400 vpd to 2,300 vpd. Vehicle classification counts were also taken at the same locations showing a truck percentage of approximately 25. A traffic analysis conducted using the 2010 Highway Capacity Manual Software determined that traffic is currently operating at LOS A or B on the study segment. Traffic operation will remain at LOS A or B through the year 2031 unless traffic increases significantly over forecast. Because of the declining population in the area, it is believed that any increase in traffic would be attributed to the Steel plants or agricultural activities. See Figure 3 for existing and projected traffic volumes.

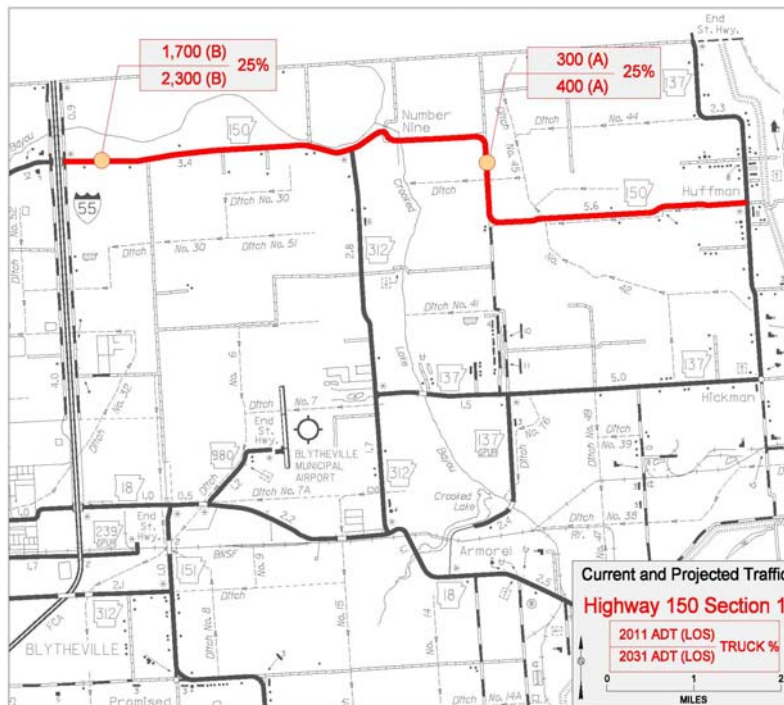


FIGURE 3. Current and Projected Traffic

In addition to truck traffic utilizing Highway 150 to access the steel Plants, the agricultural industry along this route contributes to the truck traffic along this segment on a sporadic basis.

Safety

Crash data for the study segment on Highway 150 was analyzed for 2007, 2008, and 2009, which are the most recent years for which data is available (shown in Table 1). Crash rates were based on the number of crashes per million vehicle miles (mvm) traveled and they were found to be higher than the statewide averages for similar facilities during all three years. 90% of the reported crashes were single vehicle crashes. Of the 21 reported crashes, two were serious injury crashes; four moderate injury crashes; three possible injury crashes; and 12 property damage only crashes. It should be noted that a number of single vehicles were driven off the right side of the road. However, only two of the 21 crashes appeared to occur at either of the 90 degree curves. In addition, two crashes involved heavy trucks: one involved a tractor trailer crashing into an agriculture related vehicle that pulled out in front of it; the other was identified to be an opposite direction sideswipe between two tractor trailers.

TABLE 1. Crash Rates

Year	Number of Crashes	Crash Rate	Statewide Average Crash Rate*
2007	9	2.77	1.15
2008	7	1.76	1.12
2009	5	2.10	0.81

* Rural, two-lane, two-way undivided, no control of access highways

Pavement

Since its first bituminous chip seal in 1953, there have been a series of chip seals and overlays placed on this route. The soils in the region are generally classified by name as Sharkey soils that are dominant in the Mississippi Delta and also represent approximately 8% of the soils found in Arkansas. The engineering soil properties show that Sharkey soils are classified as an AASHTO soil type of A-7-5(43), with an

extremely high liquid limit. This type of soil is highly elastic, subject to considerable volume change and becomes extremely weak at high moisture levels. Based on the findings from *TRC-94 Resilient Properties of Arkansas Subgrades (1988)*, the subgrade soil along the route has a resilient modulus of approximately 6 ksi.

As with most low volume highways added to the state highway system from the county, the roadway sections are highly variable. A visual review of the route verifies this assumption. The field survey conducted in November 2010 found that there are many identifiable areas of minor rehabilitation. Approximately 58% of this route was found to have some type of minor rehabilitation (seal, patch or thin overlay). There were segments that exhibited longitudinal and block cracking, as well as significant rutting in others. This can be seen in Figures 4 and 5. Further details regarding the pavement conditions along this route are included in Appendix B.



FIGURE 4. Cracking and Minor Rehabilitation



FIGURE 5. Typical Rutting Found Within Log Mile 8.4-10.46

A Falling Weight Deflectometer (FWD) analysis was conducted in November 2010 to investigate the structural quality of the pavement along the study segment. The

analysis determined that most of the pavement on this segment has an average remaining life of over nine years. In order to extend the pavement life of the entire study segment 20 years, an asphalt overlay of approximately 3.5 inches on the existing pavement would be required. A closer inspection of the FWD analysis shows that the pavement is weaker from around log mile 8.4 to the end of the route at log mile 10.46. The FWD analysis results can be found in Appendix B.

Since 2007, approximately \$81,000 has been utilized to complete minor rehabilitation within this segment. Maintenance records and pavement patching locations are included in Appendix C. The summary of the minor rehabilitation performed on the segment can be found in Table 2.

TABLE 2. Minor Rehabilitation Performed on the Study Segment
(2007-2010)

Direction	Length (mile)	% Improved	Treatment
Eastbound	5.6	58	Patch/Minor Rehabilitation
Westbound	5.6	57	Patch/Minor Rehabilitation

Note: In addition, pavement crack sealing has been completed in both directions on selected sections.

Pavement condition data was collected in November 2010. The average International Roughness Index (IRI) for the segment is 128 inches per mile (in/mi), which is considered fair. The average rut depth of segment is 0.12 inches, which is considered good. There is an increase in the IRI and rutting within the last two miles of the segment (Log Mile 8.4 – Log Mile 10.46) where average IRI increases to 157 in/mi (fair) and the average rut depth increases to 0.20 inch (good). Selected sections show the rut depth significantly exceeding 0.25 inches in depth, which is considered fair.

The unpaved shoulder width of this segment is approximately four feet. Selected sections of the study segment exhibit significant pavement edge deterioration due to the large trucks encroaching on the shoulders (see Figure 6). The pavement edge deterioration is a potential safety concern since heavy trucks and other vehicles may be forced to travel closer to the centerline to avoid the shoulder deterioration.

Currently, there are no jobs included for this route in Arkansas' Statewide Transportation Improvement Program (STIP) for Fiscal Years 2010-2013.



FIGURE 6. Pavement Edge Deterioration

Findings

Based on a level of service analysis, the entire study segment of Highway 150 in Mississippi County is currently operating at an acceptable level of service and will remain at the same level of service through the year 2031 due to the low growth rate in this area. However, this segment of Highway 150 has been identified as having higher crash rates than the statewide average rates with 90% reported crashes being single vehicle crashes. The exposed vertical pavement edge and the deteriorated shoulders are considered to be two of the factors contributing to drivers losing control of the vehicle when attempting to recover from a roadway departure.

The current pavement condition is considered fair with the exception of the section from Log Mile 8.4 to Log Mile 10.46, which is considered to be in poor condition. The FWD analysis has shown that the existing pavement can support the truck volumes on this route with an average remaining life of approximately nine years. However the pavement is structurally weaker from log mile 8.4 to log mile 10.46. Therefore, the primary need on the study segment of Highway 150 in Mississippi County is to improve

the ride quality and safety for the entire route and structurally improve the weakest section of the route. Based on the FWD analysis and pavement condition assessment, improvements to the section from log mile 8.4 to log mile 10.46 may be considered a higher priority.

Safety Edge, an asphalt paving technique, has been used in the recently years around the country to protect motorists from run-off-the-road crashes, particularly on two-lane roads with unpaved shoulders. During the normal paving process, pavement edges are formed vertical or near vertical. Recent research has shown that almost all drivers and vehicles can recover if the edge is tapered to 30 degrees from the horizontal. Safety Edge provides the tapered edge and is easy to include in the paving process thus provides a safer roadway edge and a stronger interface between the pavement and the graded material.

Therefore, it is recommended that overlaying and restriping the existing roadway pavement from I-55 to Highway 137 and minor widening with Safety Edge is needed to improve the ride quality and safety. It is expected that the remaining life of the pavement can be extended significantly with a 2-inch overlay. It should be noted that a significantly thicker overlay would be required to provide a 20-year service life. The total estimated construction cost is \$2.2 million.

APPENDIX A

DESCRIPTIONS OF LEVEL OF SERVICE

Two-Lane Highway

LOS A - LOS A represents traffic flow where motorists are able to travel at their desired speed. Passing is rarely affected and drivers are delayed no more than 35% of the time by slower drivers.

LOS B - Traffic speeds in LOS B drop and drivers are delayed up to 50% of the time by other drivers.

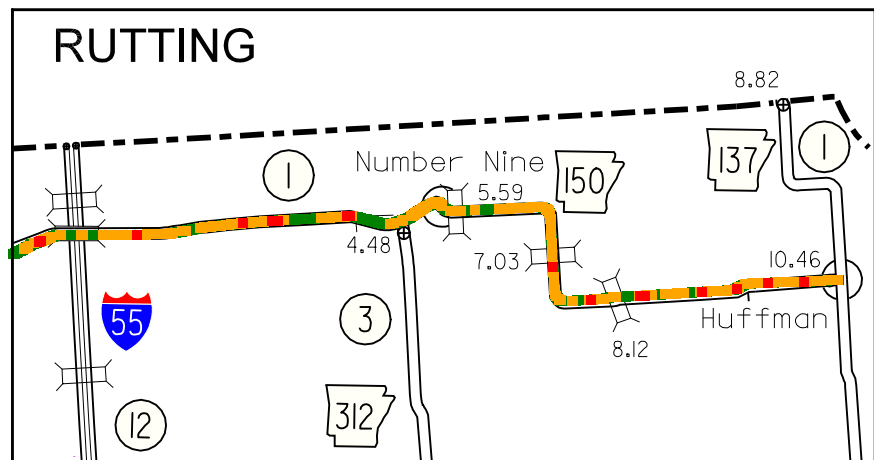
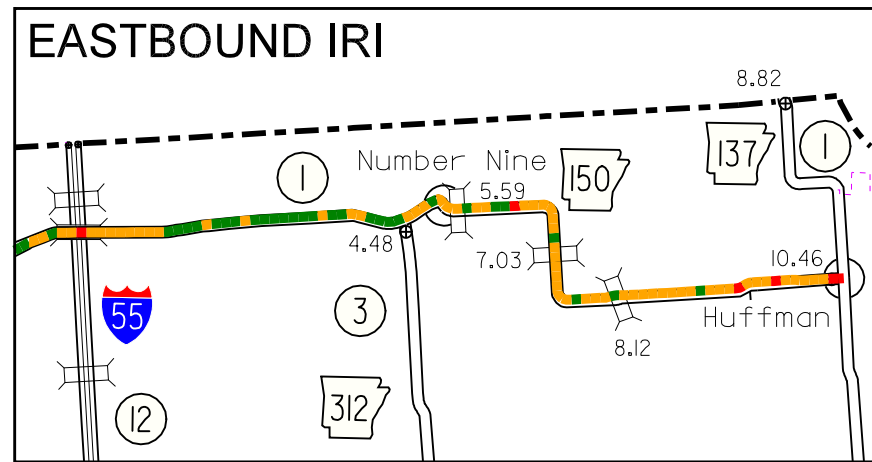
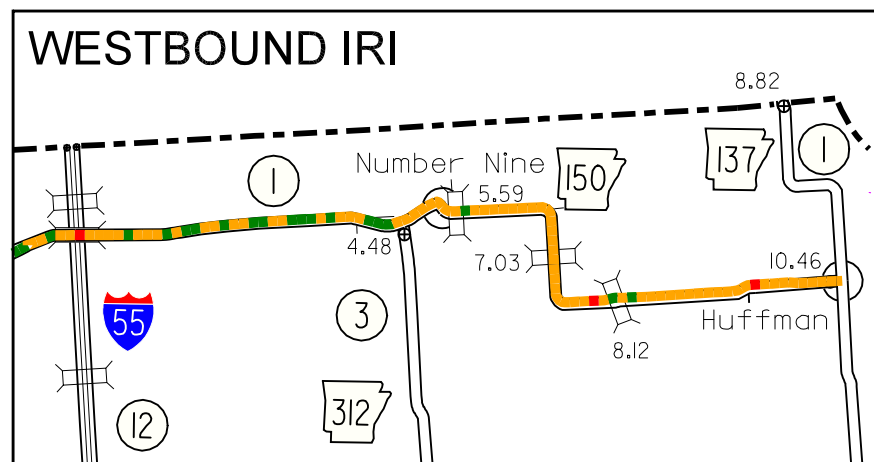
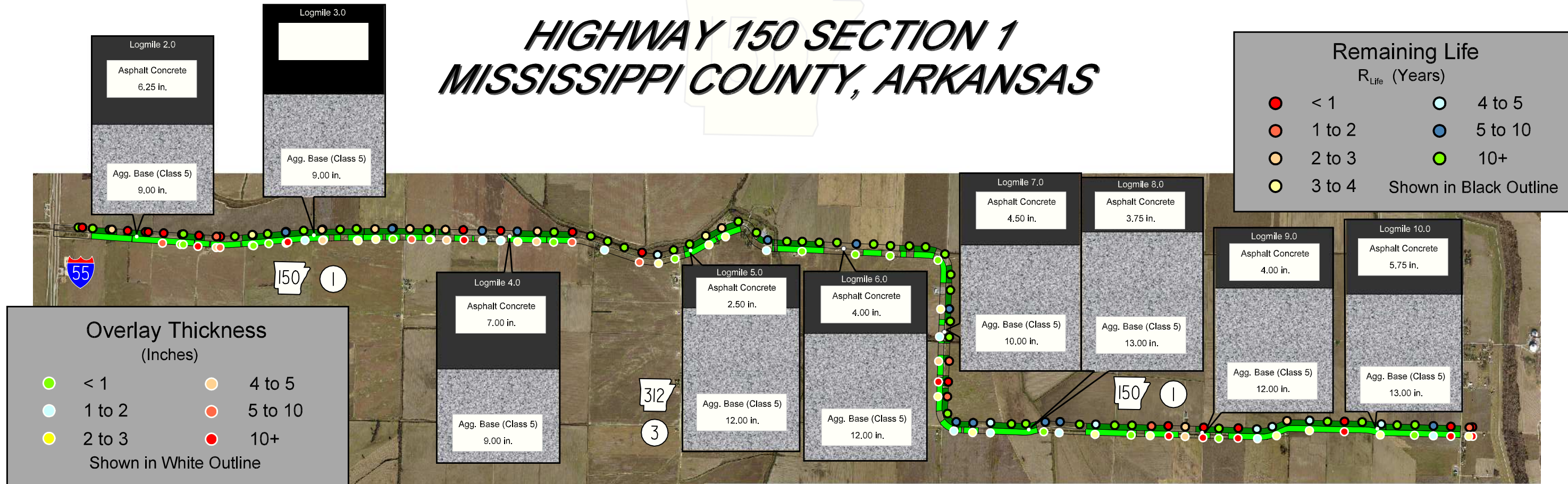
LOS C - At LOS C, speeds are slower than at LOS B. Although traffic flow is stable, it is susceptible to congestion due to turning traffic and slow-moving vehicles. Drivers may be delayed up to 65% of the time by slower drivers.

LOS D - LOS D describes unstable flow and passing becomes extremely difficult. Motorists are delayed nearly 80% of the time by slower drivers.

LOS E - At LOS E passing becomes nearly impossible and speeds can drop dramatically.

LOS F - LOS F represents heavily congested flow where traffic demand exceeds capacity and speeds are highly variable.

HIGHWAY 150 SECTION 1 MISSISSIPPI COUNTY, ARKANSAS



IRI		RUTTING
< 95	GOOD	< 0.25 inches
95 to 219	FAIR	0.25 to 0.5 inches
> 219	POOR	> 0.5 inches

Highway 150, Section 1 Logmile 1.52 to 10.46

R_{Life} Average _____ 9.7 Years _____

Overlay 80th Percentile _____ 3.7 Inches _____

IRI Average _____ 128 in/mile _____

Rutting Average _____ 0.12 in _____

Patching
(Based on 2010 MMHIS Imagery & 2009 Aerial Photography)

Westbound

Eastbound

This analysis was performed using a 20 year design life, with 42,554 ESALS, on FWD data collected November 2010. The Remaining Life is an average. Overlay is shown for the 80th percentile. The pavement condition data was collected November 2010. The IRI and Rutting are shown as averages.

Map Printed: June 2011
Data Collected: November 2010



**HIGHWAY 150 SECTION 1
MISSISSIPPI COUNTY, ARKANSAS**

**ROADWAY PROPERTIES FOR
CURRENT VEHICLE TRAFFIC**

	Length of Patches	% of Patched Road
Westbound	5.627 mi	57%
Eastbound	5.641 mi	58%

MAINTENANCE RECORD

Year	Cost
2007	\$11,540.80
2008	\$16,193.96
2009	\$53,547.00
Total From 2007 - 2009	\$81,281.76

