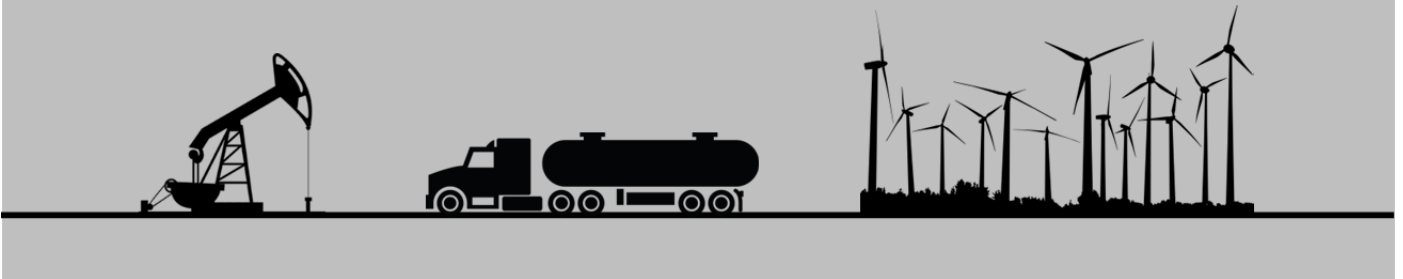


# Rehabilitation Recommendations for SH 87 in Gonzales County

## Technical Memorandum TM-14-07



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## **INTRODUCTION**

Roadways in the Eagle Ford Shale energy sector development area of Texas experienced severe distress during the early and mid-2010s. One of these roadways was US 87 in Gonzales County located in the Yoakum District of the Texas Department of Transportation (TxDOT). The Yoakum District asked the Texas A&M Transportation Institute (TTI) to perform an investigation and to recommend repair strategies for the section of US 87 from the Wilson to the Dewitt County Line.

This investigation was performed in cooperation with TxDOT's Maintenance Division and Yoakum District and Area Offices. The pavement investigation and analysis included gathering historical information on the project, collecting and analysis of ground penetrating radar (GPR) and falling weight deflectometer (FWD) data, and pavement borings.

TxDOT District personnel indicated that the existing surface on the roadway was placed about eight years prior to the investigation. Cracking of varying severity exists throughout the project.

## **RECOMMENDATIONS**

Table 1 summarizes the repair strategies for this section of highway. Based on the information gathered, the following observations and recommendation are provided:

- Multiple pavement sections in and near the City of Nixon and totaling about 1.1 miles exhibit distress. Several of these sections need pavement structure repair in the near future. The worst problems are occurring east of US 80 in the locations with thin (~3.5 in.) asphalt surfacing. Locations in the pavement with patches between 9 and 12 in. of HMA seem to be working reasonably well as repairs.
- This analysis focused on the longer sections of US 87 for rehabilitation planning purposes. Detailed information gathering and analysis was not performed on the Nixon pavement sections as they are relatively short as compared to other sections of the highway.
- Most of the cracking in the sections investigated is top down in the HMA layers.
- A significant change in subgrade support exists from TRM 757.250 to TRM 764. The deflections were also much higher in this section. Cracking exists throughout the entire HMA depth.


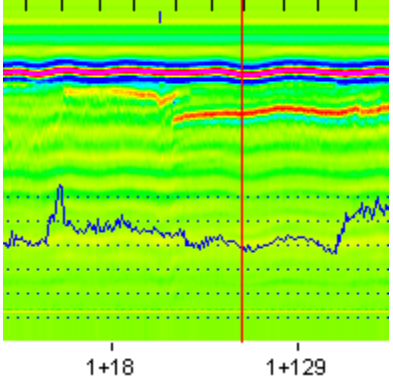

**Table 1. Recommendations for US 87, Gonzales County.**


<b>Begin</b>	<b>End</b>	<b>Typical Existing</b>	<b>Recommended Strategy</b>	<b>Length</b>	<b>Priority</b>
TRM 744	TRM 745.127	Multiple pavement sections in Nixon	Pavement structure repair for short term – increase HMA thickness. Detailed analysis and possible deep reconstruction may be required for long term solution.	1.127 mi	N/A – excluded from rehab planning analysis
TRM 745.127	TRM 757.250	4.5" HMA, 6" limestone CTB, on old roadbed	Mill 3" to remove top-down cracking, place new overlay(s) to meet FPS thickness designs	12.123 mi	2
TRM 757.250	TRM 764	5" HMA, 6" limestone CTB	Mill 2", perform FDR and place additional thickness of HMA required to meet FPS thickness designs	5.435	1

**SUMMARY OF COLLECTED INFORMATION**



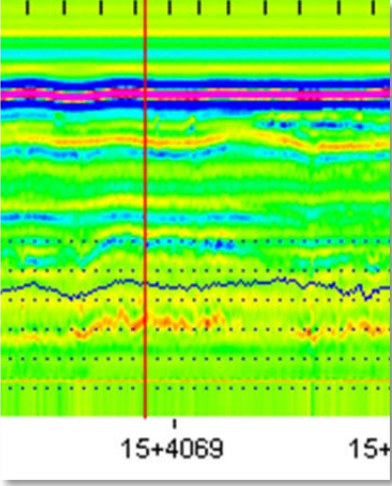
The remainder of this technical memorandum presents a summary of each of the sections on US 87. Supporting information follows the section summaries. The supporting information includes:

- The layer moduli backcalculated from the FWD data.
- Pavement boring results.
- Soils maps from the Natural Resource Conservation Service showing the soil ratings for:
  - Roads and streets.
  - Plasticity index.
  - Sulfate content.
  - Organic content.

<b>US 87 in Nixon</b>	<b>County: Gonzales</b>	<b>TRM 744 – 745.127</b>
Pavement Structure: Varies Base: Total HMA: 3.5 to 12 in.		Last Treatment: unknown
Current Condition:		
		
Distress: Extensive fatigue and reflection cracking. Numerous patches exist as shown in the above GPR excerpt.		
Cause of Problem:		
From GPR profiles, numerous sections exist as follows:		
<ul style="list-style-type: none"> <li>• TRM 744 to 744.132: 6 in. HMA over flexible.</li> <li>• TRM 744.132 to 744.303: 3.5 to 5 in. HMA over flexible.</li> <li>• TRM 744.303 to 744.659: 6 in. HMA over 7 in. JCP.</li> <li>• TRM 744.659 to 744.802: 9 to 12 in. HMA over flexible.</li> <li>• TRM 744.802 to 745.127: 3.5 to 6 in. HMA over flexible.</li> </ul>		
High counts of slow moving heavy truck traffic, combined with poor soils and oftentimes thin HMA all are contributing to the pavement distress. Reflection cracks from the JCP also exist where the HMA is placed over a concrete pavement.		
Recommended Approach:		
Localized pavement structure repair is needed now. For this repair, removing the distressed materials and increasing the asphalt mixture thickness to between 9 and 12 in. appears to be working reasonably well as repairs. For the long term, a detailed evaluation of the existing materials may be required and possible deep reconstruction may be necessary.		
Priority: Several locations need pavement structure repair now		

<b>US 87 Section 1</b>	<b>County: Gonzales</b>	<b>TRM 745.127 – 757.250</b>
Pavement Structure: Base: 6 in. CTB over old roadbed Total HMA: 4.5 in.		Last Treatment: ~2005 Type: asphalt mixture overlay
Current Condition:		
		
Distress: Longitudinal cracking in wheel paths, some transverse cracking, and some random cracking.		
Cause of Problem: Some of the cracking is reflective cracking from the CTB. The primary distress of longitudinal cracking is top-down cracking in the HMA. The FWD shows the base modulus averaging 485 ksi, and the subgrade modulus 18 ksi.		
Recommended Rehabilitation Approach: Mill 3 in. to remove top down cracking, place new overlay(s) to meet FPS requirements.		
Priority: 2		



<b>US 87 Section 2</b>	<b>County: Gonzales</b>	<b>TRM 757.250 – 764</b>
Pavement Structure: Base: 6 in. CTB Total HMA: 5 in.		Last Treatment: ~2005 Type: Asphalt mixture overlay
Current Condition:		
		
Distress: Longitudinal wheelpath cracking with some transverse cracking and random cracking.		
Cause of Problem: In this section, the cracking is through the entire thickness of HMA, suggesting a traditional fatigue failure. Additionally, FWD deflections are significantly higher, and the base and subgrade modulus values much lower in this section. FWD data show the average base modulus to be 258 ksi and the average subgrade modulus as 8 ksi. However, in many instances the FWD backcalculations hit their lower limits, suggesting the stabilized base may be deteriorating into the range of a flexible base course.		
Recommended Rehabilitation Approach: Mill 2 in.; perform FDR and additional thickness as required to meet FPS. In the FDR process, consider a flexible base overlay on top of the stabilized layer, as this cross section has provided good performance elsewhere in the District.		
Priority: 1		