



EVALUATION OF A RUBBER-MODIFIED MIXTURE DESIGNED USING A BALANCED DESIGN IN COFFEE COUNTY, ALABAMA

Year 5 Evaluation Report

Submitted to

COFFEE COUNTY, AL

By

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Evaluation of a Rubber-Modified Mixture Designed Using a Balanced Design in Coffee County, Alabama

Year 5 Evaluation Report

Project Objective

This project evaluated the performance of a rubber-modified asphalt mixture designed using a Balanced Mix Design (BMD) approach, compared with an unmodified BMD mixture and a conventional unmodified Superpave mixture. To support this evaluation, Coffee County constructed three test sections on County Road 110 using the respective mixtures. The field performance of the test sections will be monitored over a six-year period to assess the long-term benefits of the rubber-modified BMD mixture relative to the comparison sections.

Year 5 Project Evaluation

A 5.9-mile segment of CR 110 in Coffee County, Alabama, was resurfaced in 2020 using three different asphalt mixtures: a ground tire rubber (GTR) modified mixture, a Balanced Mix Design (BMD) mixture, and a conventional volumetric Superpave mixture commonly used in Alabama (401 mix). Annual condition surveys of the test sections were conducted from 2021 through 2025 using NCAT's high-speed data collection vehicle, shown in Figure 1. The objective of these surveys was to evaluate and compare the field performance of the three mixtures in terms of International Roughness Index (IRI), rutting, surface texture, and cracking. Three data collection runs were performed in each travel lane during each survey. The project location is shown in Figure 2, and the test section layout is presented in Figure 3.



Figure 1. Data Collection Vehicle

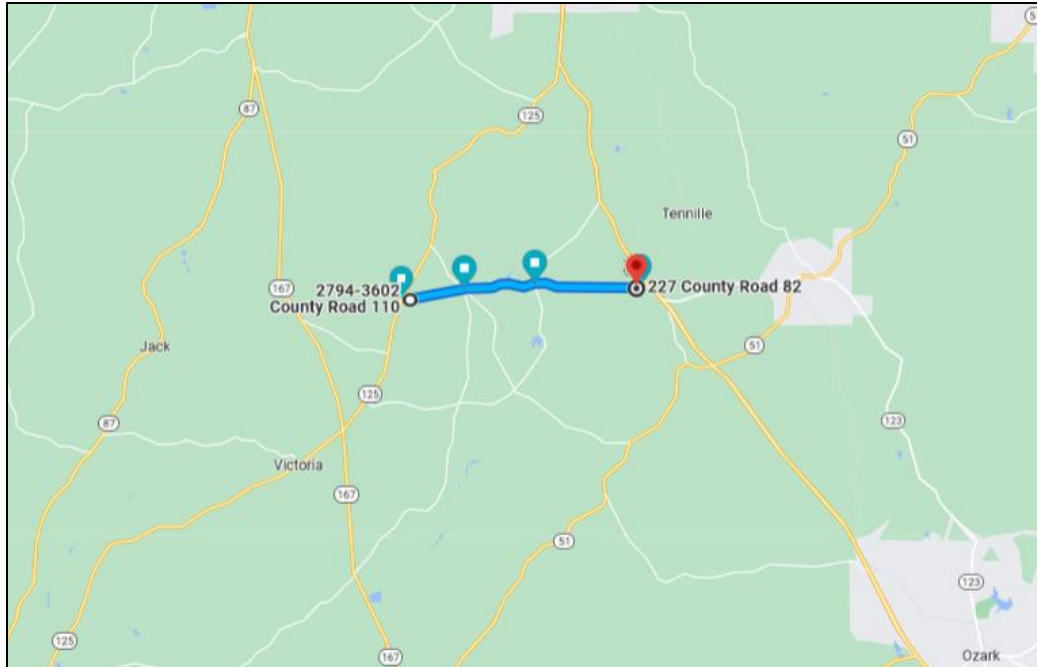


Figure 2. Survey Location

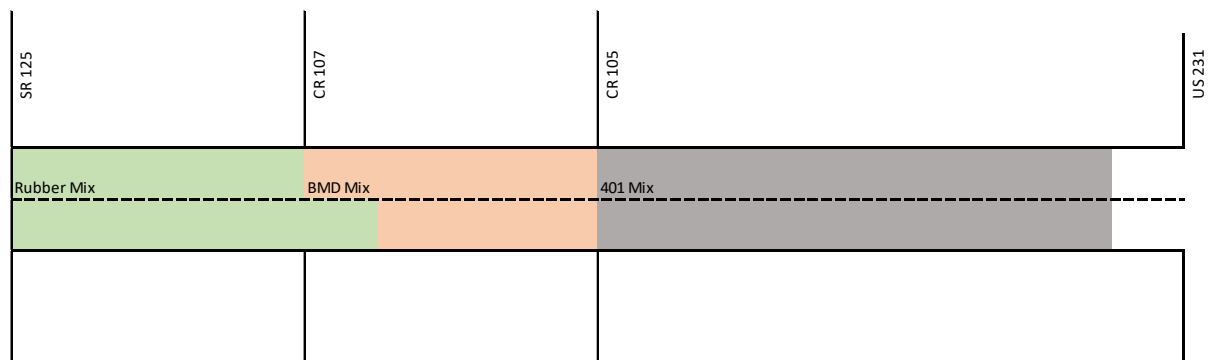


Figure 3. Test Section Layout

The most recent field performance evaluation was conducted on December 12, 2025, after approximately five years in service. Data were collected on all three test sections to assess pavement condition and compare the long-term performance of the mixtures. Data were collected on the three sections to document performance. The average performance data for IRI, rutting, and texture are shown in Figures 4 - 6. Overall, all three mixtures have performed well after five years of service, exhibiting low levels of roughness, rutting, and cracking. However, some differences in performance have begun to emerge among the mixtures, particularly with respect to ride quality and cracking resistance.

As shown in Figure 4, IRI values increased gradually for all sections throughout the monitoring period, which is expected as pavements age under traffic and environmental loading. The conventional 401 mix consistently exhibited the lowest IRI values, indicating the smoothest ride quality among the three mixtures. The GTR sections maintained intermediate IRI values, while the BMD section exhibited the highest IRI values throughout the evaluation period. Despite

these differences, all sections maintained relatively low IRI values after five years of service, indicating satisfactory ride quality and no significant deterioration affecting pavement smoothness.

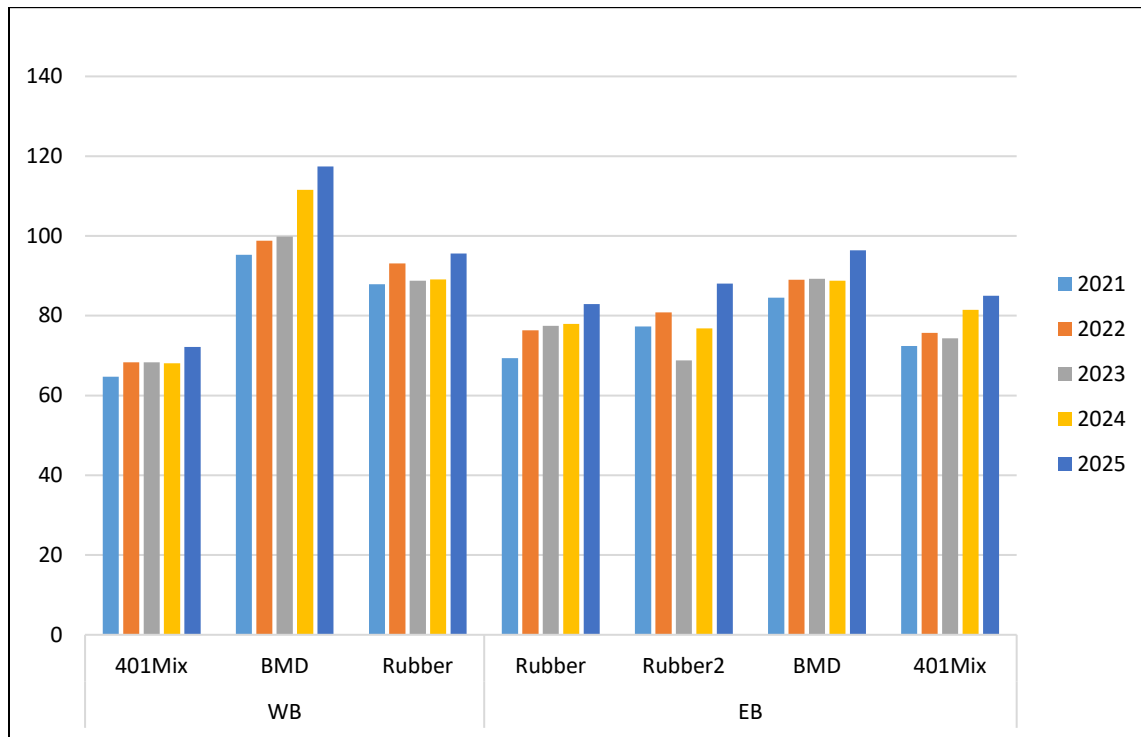


Figure 4. IRI Results

Rutting results shown in Figure 5 indicate excellent resistance to permanent deformation for all three mixture types. Although rut depth generally increased with time, the measured values remained very low throughout the study. The GTR sections consistently exhibited the lowest rut depths, suggesting slightly better resistance to permanent deformation than the BMD and 401 sections. The conventional 401 section generally exhibited the greatest rutting among the sections, although the differences were relatively small. The results indicate that incorporating GTR did not compromise rutting resistance and may have provided a modest improvement in resistance to deformation under traffic loading.

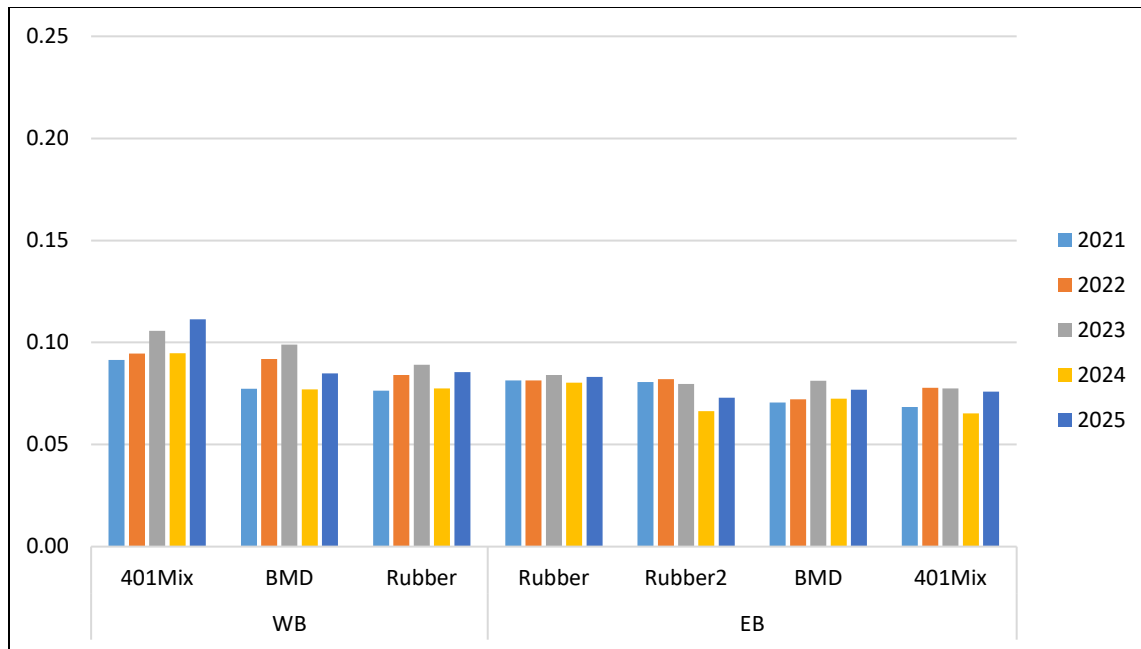


Figure 5. Rutting Results

Surface texture measurements, shown in Figure 6, increased over time for all sections. The conventional 401 mix generally exhibited the highest texture values, followed by the BMD and GTR sections. While differences among mixtures were observed, all sections maintained adequate texture characteristics throughout the monitoring period. The gradual increase in texture may be attributed to normal wear and exposure of aggregate particles under traffic, which can enhance pavement macrotexture. Overall, the results indicate that the GTR mixture provided texture characteristics comparable to those of the conventional and BMD mixtures while maintaining satisfactory surface properties after five years in service.

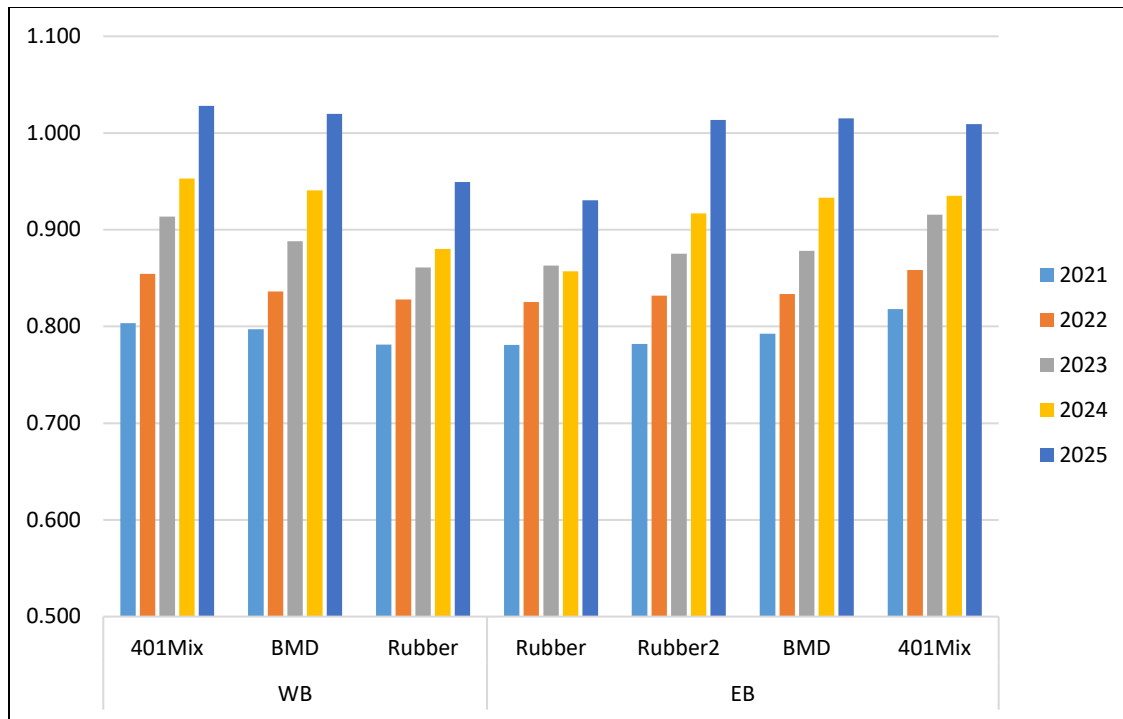


Figure 6. Texture Results

Cracking was detected and classified using Pathway Service’s software AutoCrack and AutoClass which classifies cracking by type. Figure 7 shows an example of the output from the Pathway software. The cracking identified by the AutoClass software was manually inspected for quality, and any obvious errors made by the software were then corrected.

Figure 8 presents the total cracked area as a percentage of lane area for each mixture type. Although the differences among sections were relatively small during the early years of monitoring, the GTR section has consistently exhibited the lowest amount of cracking as the pavements have aged. The reduced crack development observed in the GTR section suggests improved resistance to crack initiation and propagation compared with both the conventional 401 mix and the BMD section.

The BMD and 401 sections have also performed satisfactorily and continue to exhibit relatively low crack percentages. However, the higher cracking levels observed in these sections indicate a somewhat faster rate of distress development compared with the GTR section. While the current differences are not large enough to affect pavement serviceability, they may become more significant as the sections continue to age and accumulate traffic.

Overall, the cracking results suggest that the GTR mixture is providing better long-term resistance to crack development while maintaining rutting, ride quality, and surface texture performance comparable to the other mixtures. Continued monitoring through the final year of the project will help determine whether the observed advantage of the GTR section is sustained and whether the performance gap among the mixtures widens over time.

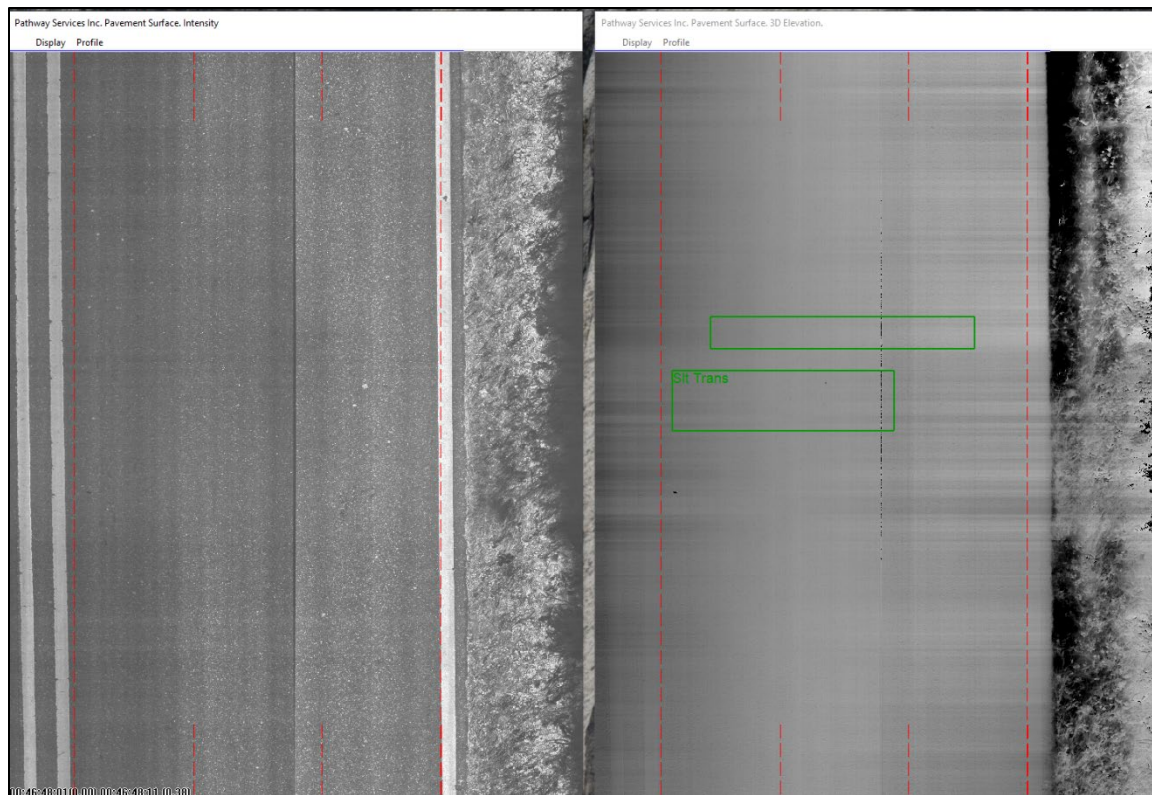


Figure 7. Example of Cracking Identified by Pathway System

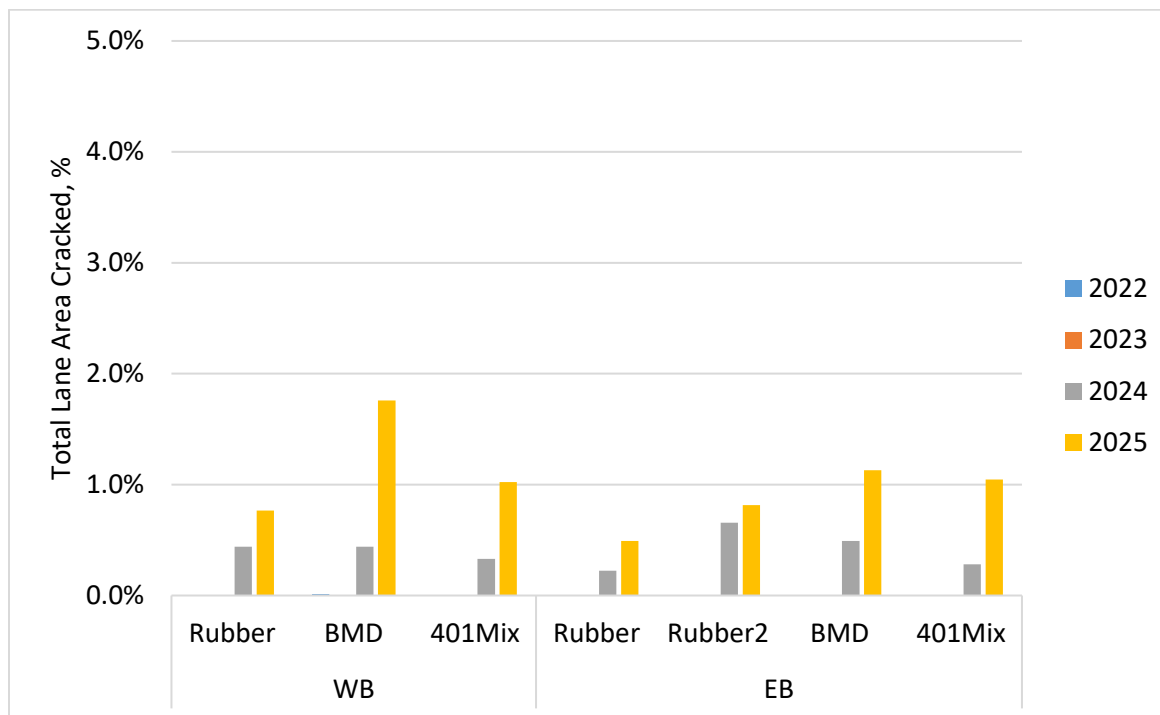


Figure 8. Total Lane Area Cracked (%) for the Sections over Time

Figures 9 – 11 show examples of each mix type at the time of the 2025 visit.



Figure 9. WB 401-Mix Section in 2025



Figure 10. WB BMD Mix Section in 2025



Figure 11. GTR Section in 2025