Montana Department of Transportation
Research Programs
June 2015

EXPERIMENTAL PROJECTS PROGRAM

EVALUATION OF VARIOUS BITUMINOUS CONCRETE PAVEMENT SURFACE TREATMENTS

Location:	Highways US 89 & 287 - Counties: Lewis & Clark, Teton, Pondera, and Glacier
Project Name:	Augustus North/SE of Dupuyer/US 89 N of Dupuyer
Project Numbers:	STPP-NHTSA 3-3(23)6/STPP 9-1(20)40/Maintenance Project
Type of Project:	Pavement Surface Treatments
Principal Investigator:	Craig Abernathy, Experimental Projects Manager (ExPM)
Technical Contact:	Justun Juelfs, MDT Maintenance Reviewer
Date of Installations:	Summer 2014
Date of Documentation:	September 2014-June 2015

Description

Compare the following three types of surface applications under similar environmental and traffic conditions over time to determine benefits of each treatment:

-Chip Seal (CS)
-Fog Seal over Chip Seal (FSCS)
-Micro-Surfacing (MS)

Section Locations

-**CS**: SE of Dupuyer SE/Route 89/Approximate reference point 65-71
-**FSCS**: North of Dupuyer/Route 89/Approximate reference point 89-101
-**MS**: Augustus North/Route 287/Approximate reference point 39-52

Evaluation Procedures

Research will conduct long-term documentation on the installations in an attempt to establish performance with the surface applications and to ascertain applicable comparisons between the three projects and any other measurable outcomes.

The measure of effectiveness (MOE) prevalent with this project will focus on:

- Long-term durability (e.g. chip embedment and retention, raveling, bleeding, etc.)
- Striping Durability (including retroreflectivity)
- Skid Retention

Construction Documentation: Research participation in the project analysis is after the installations were completed. This report will only detail performance.

Post Documentation: Research will visually inspect the sites biannually (late fall/early spring) for inclusion into the annual report.

All project sections will be generally inspected (and visual pavement documentation if required) throughout their entire lengths. There are sites selected (at mileposts within each project) for specific examinations added concurrently to the ongoing reporting.

Skid reporting will be the responsibility of the Materials Bureau, Pavement Management Section.

Maintenance personnel will provide pavement striping retroreflectivity information as made available to be included in this report.

This report and other information located at: *http://www.mdt.mt.gov/research/projects/ac-seal.shtml*

The purpose of an experimental projects report is to document the phases and events of any given experimental feature to provide the reader with an understanding of the specific activities required to install or incorporate the research element into an active construction or maintenance project.

This report also establishes a baseline for defining performance for any given feature under actual service conditions to determine its relative merits.

The information in this report reflects the overall general condition for the three treatments. All values in this report are approximate.

Analysis to Date: June 2015

All sections, based on visual inspections, are performing well. Pavement marking condition is good; all mats are tight in appearance evidence of good chip retention. No evidence of raveling observed except the anomaly documented on a short section of the micro-surfacing project.

-The **CS** south end section has been reduced (estimated) in length at 1.5 miles that now begins close to the county road 33 RD. NW, due to a reconstruct project in progress.

-The **FSCS** section, as documented in September 2014, had a layer of residual bitumen on the surface exposed aggregate (page 9); which most of that layer has now flaked or

oxidized most likely due to environmental exposure and traffic (page 11). Visually the aggregate has a tight compaction within the residual asphalt content (RAC). During the inspection, faint impressions depicting underlying transverse cracks were visible on the pavement surface (page 12).

-The **MS** section shows slight topical oxidation with the dense graded aggregate. Longitudinal and transverse cracking has appeared but rated as low-severity (page 17).

Located approximately 1200' north of mile point 47 was area with surface distress (assumed raveling) which required spot velocity patching (see page 18). The length of this area of repair was at 150'.

Skid Resistance Numbers

The following skid numbers (SN) were collected on September 2014:

- Reconstruct with Chip Seal – SE of Dupuyer SE/Route 89/Approximate reference point 65-71: Average on both lanes – **SN 64**

- ***** Fog Seal over Chip Seal – North of Dupuyer/Route 89/Approximate reference point 89-101: Average on both lanes – **SN 49**

- Micro Surfacing – Augustus North/Route 287/Approximate reference point 39-52: Average on both lanes – **SN 67**

When submitted, 2015 skid numbers will be added to this report.

*This SN may be initially low due to the emulsion coating on the aggregate. The SN may increase as this topical coating, worn off by traffic or environmental elements expose more surface area of the chips.

The following are representative images of each of the three project treatments and supplemental information.

Chip Seal Section– Route 89/Approximate Reference Point 65-71: September 2014

🡐 Beginning of chip seal: Reference point 64.6; view north.

🡐 End of chip seal: Mile point 71 – view south.

🡐 Example image of selected location marked on site for visual documentation (MP 67).

🡅 Sample surface image of general condition of chip seal.

🡇 Close-up of chip embedment.

Chip Seal Section – Route 89/Approximate Reference Point 65-71: June 2015

🡐 Beginning of chip seal: A reconstruct project has encroached on the south end of the CS and reduced the section to the intersection of 33 RD. NW; near estimated to be at RP 66.5; view north.

🡐 Representative image of general condition of the CS section – reference point 67.

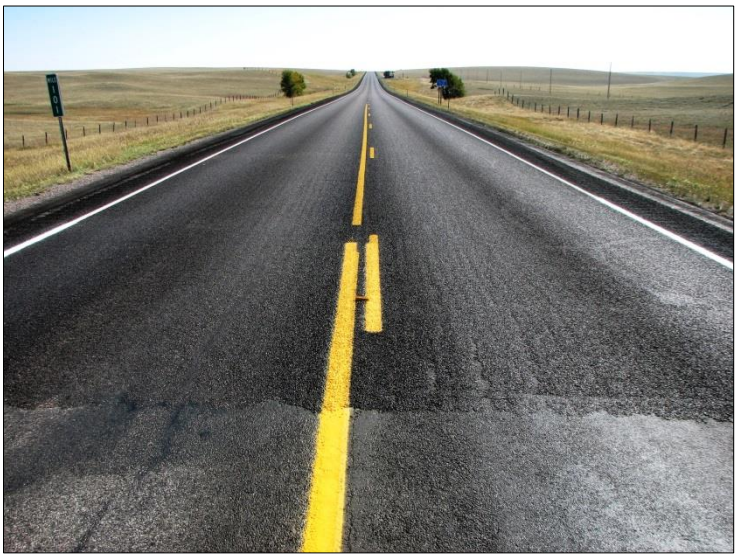
🡐North end of project; view south.

🡅 Sample image of general condition of chip seal surface.

🡇 Close-up of chip embedment.

Fog Seal over Chip Seal – Route 89/Mile Point 89-101: September 2014

🡐 Beginning of fog seal over chip seal (FSCS): Mile point 89 – view north.



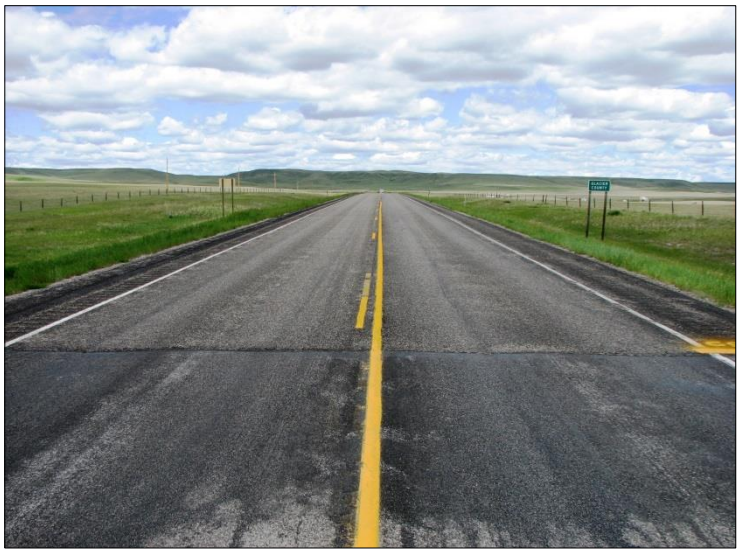
🡐 End of fog seal: Mile point 101 – view south.

🡐 Example image of selected location marked on site for visual documentation (reference point 95).

🡅 Sample image of general condition of fog seal surface.

🡇 Close-up of fog seal chip embedment.

Fog Seal over Chip Seal (FSCS) – Route 89/Mile Point 89-101: June 2015



🡸 Beginning of fog seal over chip seal (FSCS): Mile point 89; view north.

🡸 Representative image of general condition of the FSCS section – reference point 95.

🡅 Representative image of general condition of fog seal surface.

🡇 Close-up of fog seal chip embedment.

🡅 No active transverse cracking were observed, however indistinct impressions on the pavement suggest cracks have yet to appear to date.

Micro-Surfacing – Augustus North/Route 287/Mile Point 39-52 – September 2014

🡐 Beginning of micro-seal project: Reference point 39 – view north.

🡐 End of micro-surfacing: reference point 52 – view south.

🡐 Example image of selected location marked on site for visual documentation (RP 42).

🡅 Sample image of general condition of micro-seal surface.

🡇 Close-up of micro-seal chip embedment.

Micro Surfacing – Augustus North/Route 287/Mile Point 39-52 – June 2015

🡸 Beginning of micro-seal project: Reference point 39 – view north.

🡸 Representative image of general condition of the MS section; reference point 50.

🡸 End of MS section: reference point 52 – view south.

🡅 Sample image of general condition of micro-seal surface.

🡇 Close-up of micro-seal chip embedment.

🡸🡻 Longitudinal cracking was documented during this inspection; the frequency is minor and at low severity.

Transverse cracking is also rated at low severity with an average frequency of 80 cracks per mile.

🡅🡇 Location: Approximately 1200' north of mile point 47.

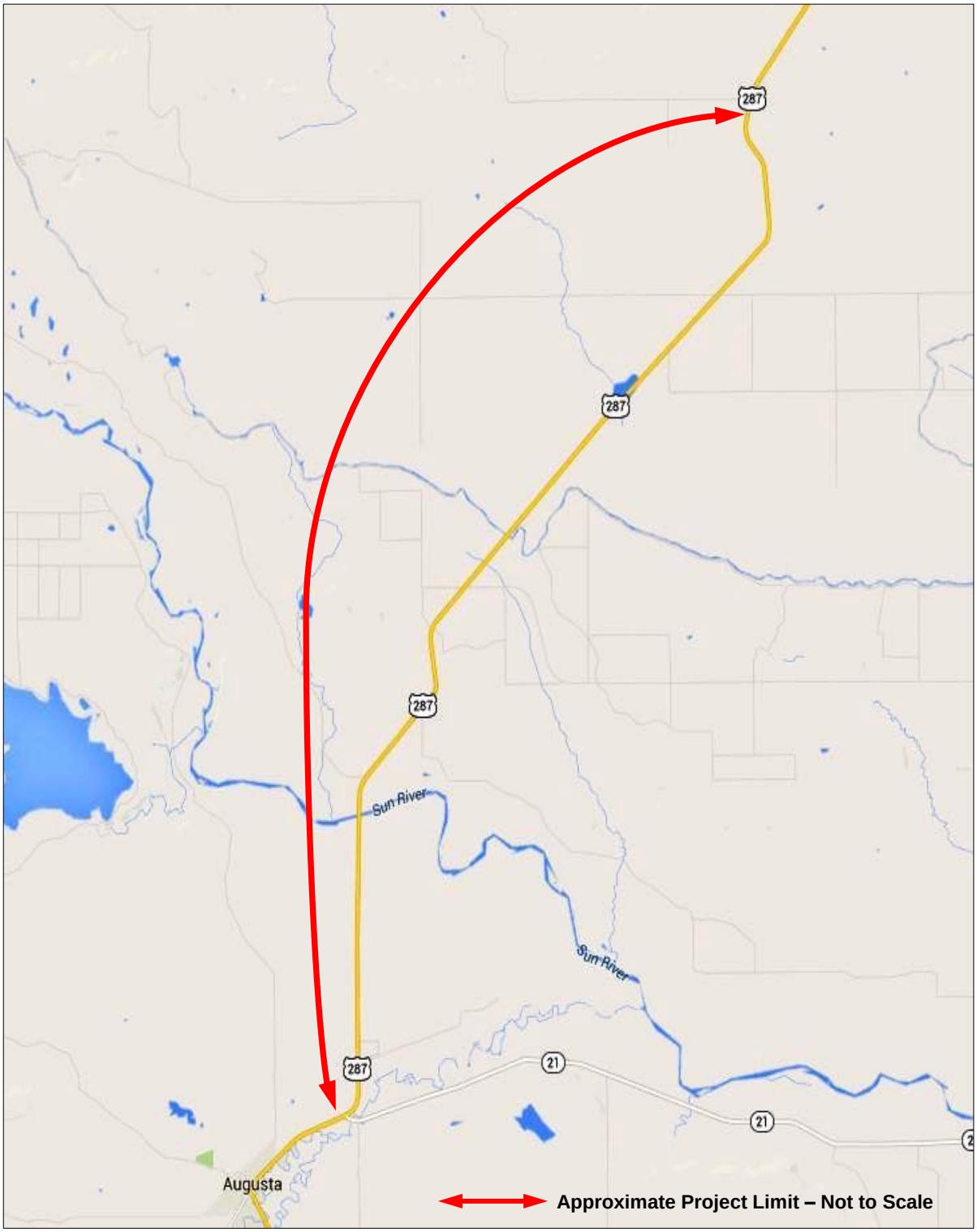
Section of pavement where presumed velocity patching was applied to correct the effects of either raveling or debonding; estimated length of random patching at 150'. No other areas of this type distress observed on the project.

Supplemental: Project Field Delineations

🡸🡻 Sections as marked at beginning and end of each project: Micro surfacing, chip seal, and fog seal respectively.

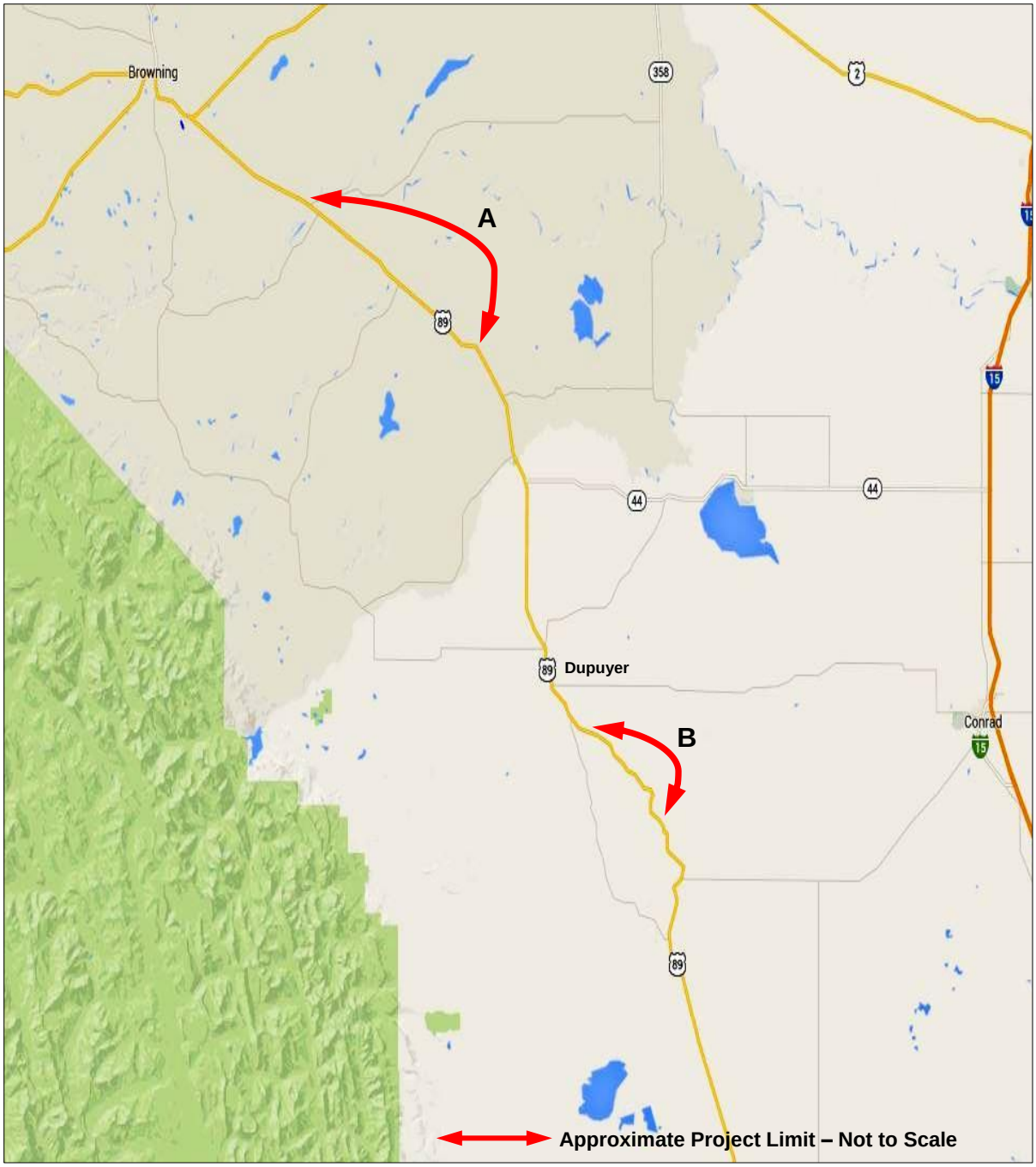
Project: **Augustus North** – Micro-Surfacing

Located on State Primary Highway 9/US 287 (C000009), beginning north of Augusta city limits at reference point (R.P.) 39.4 (junction of Montana Highway 21), extends north for 12.8 miles to R.P. 52.2: Lewis & Clark and Teton Counties.



Project: **North of Dupuyer** (Reference A):– Maintenance Fog Seal over Chip Seal

Located on State Primary 3/US 89 (C000003), R.P. 89.2-101.4: 12.2 miles: Glacier County.

Project: **SE of Dupuyer SE** (Reference B):– Reconstruct with Chip Seal

Located on State Primary 3/US 89 (C000003), R.P. 64.6-70.5: 5.5 miles: Teton and Pondera Counties.