

Observation of Recycling Partnership Test Sections

70th in Otsego and Albertville, Minnesota

5 June, 2020

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Background

Sixteen sections were constructed on August 20 – 22, 2019 as part of a partnership between City of Otsego MN, City of Albertville MN, NCAT, and MnROAD. Additional project details are available at <http://www.dot.state.mn.us/mnroad/ncat-partnership/pavement-preservation/index.html>.

Primary sources of local traffic:

- Residential developments along the north project boundary
- Commercial activity from the west edge project boundary
 - Ready mix concrete hauling
 - Semi-trailer supply

Prior to construction the existing pavement was in poor condition, and had approximately 4 in. of bituminous surface above granular base.

Figure 1 and Figure 2, photos of distress typical throughout the project, show closely spaced transverse cracking combined with fatigue and other longitudinal cracking.



Figure 1 70th St. August 2019. Eastbound (left), and westbound (right) lanes.



Figure 2 70th St. August 2019. Westbound (left) and eastbound (right) lanes.

The westbound lane contained more bituminous patching and leveling material than the eastbound. The difference can be seen in Figure 3.

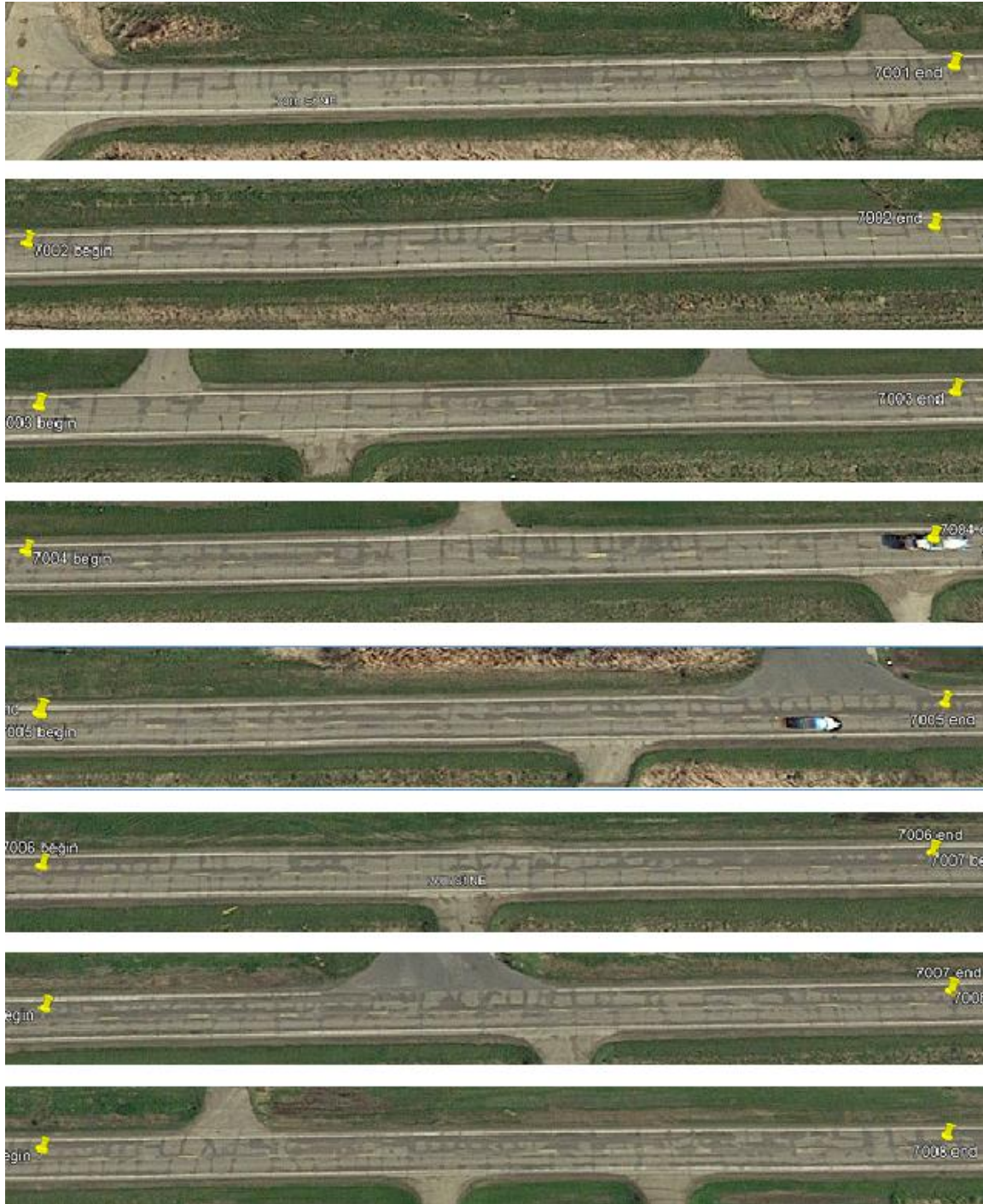


Figure 3 Preconstruction view of 70th St. sections 7001 (top) through 7008 (bottom). Google Earth date 5/14/2018.

The research layout (Figure 4) included sixteen 500-ft test sections separated by 50-ft transition zones. The sections can be grouped into four categories:

- Seven sections of 1-in. Thinlay above 4-in. Existing Pavement (Control)
- Two sections of 1-in. Thinlay above X-in. Mill-Overlay above Existing Pavement
 - Mill-Overlay depths were 2-in. and 3 in.

- Two sections of 1-in. Thinlay above 7-in. Stabilized Full Depth Recycled Base
 - Stabilization done with either Foam or Emulsion
- Five sections of 1-in. Thinlay above 3-in. Cold In-Place Recycle or Cold Central Plant Recycle above 1-in. Existing Pavement
 - Two CIR sections used Foam or Emulsion
 - Three CCPR sections, two used Foam and one used Emulsion

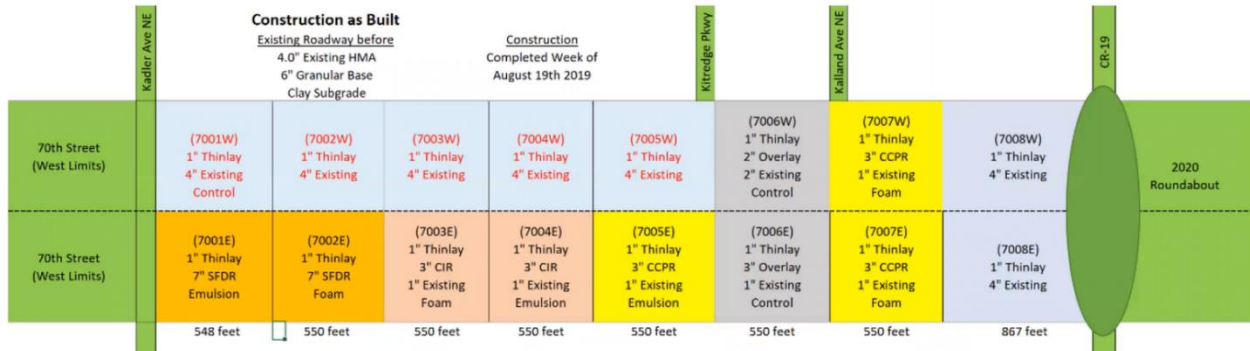


Figure 4 Test Section Layout

Observations¹

CRACKING

On 5/28/2020 a crack mapping survey was conducted from the shoulder without benefit of traffic control. The observation conditions (partly cloudy sky and dry road) were adequate for viewing of cracks. Crack position and longitudinal length was determined with a measuring wheel, and transverse length was estimated. A map was developed for each cell, and an electronic copy is on file in the project folder.

On 5/28/2020 five sections remained free of cracks: Thinlay over CCPR-emulsion, Thinlay over 3-in. overlay, Thinlay over 2-in. overlay, and two cases using Thinlay over CCPR-foam.

Information in Table 1, Figure 5, and Figure 6 shows an increase in longitudinal and transverse cracking occurred during the first five months of 2020. Severity level remained LOW with the exception of a single MED 12-ft transverse crack.

On 1/3/2020 no cracking was observed in sections built using CIR, CCPR, and Mill-Overlay techniques. Transverse Cracking was observed in the SFDR sections. Transverse and Longitudinal Cracking was observed in the Thinlay (Control) sections.

¹ These observations will defer to measurements conducted with Pathways survey equipment.

Table 1 Cracking History by Section

Section	Treatment	Total Longitudinal				Total Transverse				Remarks
		1/3/2020		5/28/2020		1/3/2020		5/28/2020		
		Count	Length, Ft	Count	Length, Ft	Count	Length, Ft	Count	Length, Ft	
7001E	SFDR-Emulsion	0	0	1	68	9	86	34	211	
7002E	SFDR-Foam	0	0	0	0	16	110	29	220	
7003E	CIR-Foam	0	0	0	0	0	0	4	9	
7004E	CIR-Emulsion	0	0	0	0	0	0	3	9	Rutting outside of fog line. 70%
7005E	CCRP-Emulsion	0	0	0	0	0	0	0	0	Rutting outside of fog line. 100%
7006E	3" Mill/Overlay	0	0	0	0	0	0	0	0	
7007E	CCRP-Foam	0	0	0	0	0	0	0	0	Rutting outside of fog line. 5%
7008E	Control	3	17	3	11	34	95	54	192	
7001W	Control	6	98	17	270	30	156	70	403	
7002W	Control	9	42	12	109	17	100	48	269	Look for future block crack
7003W	Control	5	21	11	57	30	146	50	280	
7004W	Control	13	165	23	188	54	276	94	454	
7005W	Control	0	0	2	4	28	110	66	259	
7006W	2" Mill/Overlay	0	0	0	0	0	0	0	0	
7007W	CCRP-Foam	0	0	0	0	0	0	0	0	
7008W	Control	3	8	4	17	6	25	29	111	

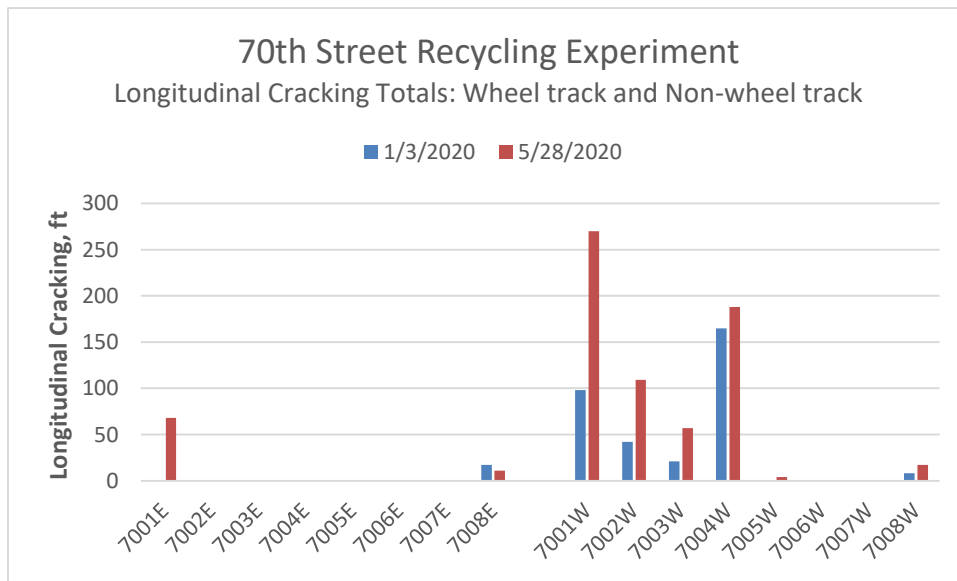


Figure 5 Longitudinal cracking history.

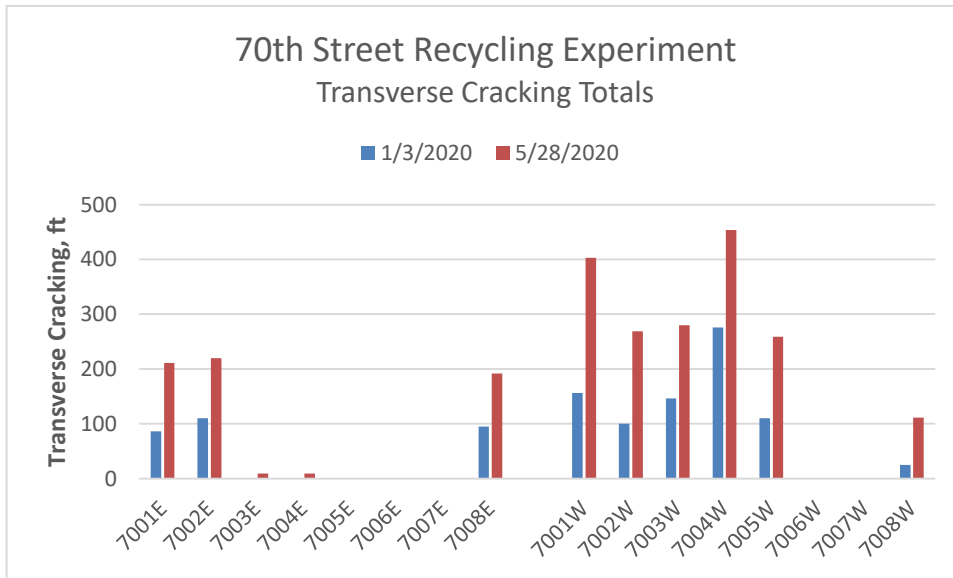


Figure 6 Transverse cracking history.

RUTTING

During the 5/28/2020 crack mapping inspection it was found that rutting had developed in the eastbound lane at an area from the right wheel track to a point outside the edge stripe, ending about 1-ft from the edge of the bituminous surface. Sections affected were #7004, 7005, and 7007; sections that otherwise have been relatively distress-free. This was the most serious rutting found on the test sections.

Measurements were subsequently performed on 6/5/2020 without traffic control. Measurements were obtained in each wheel path using a 6-ft straight-edge and a digital measuring gauge. The results are given in Table 2, and current performance is given in Figure 7 and Figure 8.

On 1/3/2020 random spot-checks indicated that some rutting occurred in the right wheel path of nearly all test sections. Rutting was less frequent in the left wheel path.

Table 2 Rutting History by Section

Section	Treatment	Rutting, in. 1/3/2020			Rutting, in. 6/5/2020			
		Cell Station	LWP	RWP	Cell Station	LWP	RWP	SHLDR
7001E	SFDR-Emulsion	*	0	<0.125	100	0.06	0.04	0.08
					300	0	0	0.15
7002E	SFDR-Foam	*	<0.125	0	100	0	0	0.09
					300	0	0.02	0.17
7003E	CIR-Foam	*	0	<0.125	100	0.04	0.05	0.07
					300	0.02	0.04	0.14
7004E	CIR-Emulsion	*	0	<0.125	100	0.07	0.09	0.32
					300	0.09	0.05	0.24
7005E	CCRP-Emulsion	*	0	<0.125	100	0.08	0.05	0.17
					300	0.1	0.11	0.24
7006E	3" Mill/Overlay	*	0	0	100	0.06	0.09	0.09
					300	0.11	0.07	0.07
7007E	CCRP-Foam	*	0	0	100	0.07	0.08	0.14
					300	0.05	0.04	0.11
7008E	Control	*	0	<0.125	100	0.14	0.13	0.05
					300	0.13	0.13	0.01
7001W	Control	*	0	0	100	0.06	0.11	#
					300	0.04	0.17	#
7002W	Control	*	0	<0.125	100	0.03	0.13	#
					300	0.06	0.1	#
7003W	Control	*	0	<0.125	100	0.07	0.06	#
					300	0.02	0.07	#
7004W	Control	*	<0.125	0	100	0.06	0.08	#
					300	0	0.09	#
7005W	Control	*	<0.125	0	100	0.13	0.11	#
					300	0.04	0.13	#
7006W	2" Mill/Overlay	*	0	0	100	0.07	0.1	#
					300	0.07	0.11	#
7007W	CCRP-Foam	*	0	0	100	0.07	0.12	#
					300	0.05	0.08	#
7008W	Control	*	0	<0.125	100	0.06	0.12	#
					300	0.08	0.19	#
(*) Random measurement located in the middle third of test cell.								
(#) No measurement, normal cross section.								

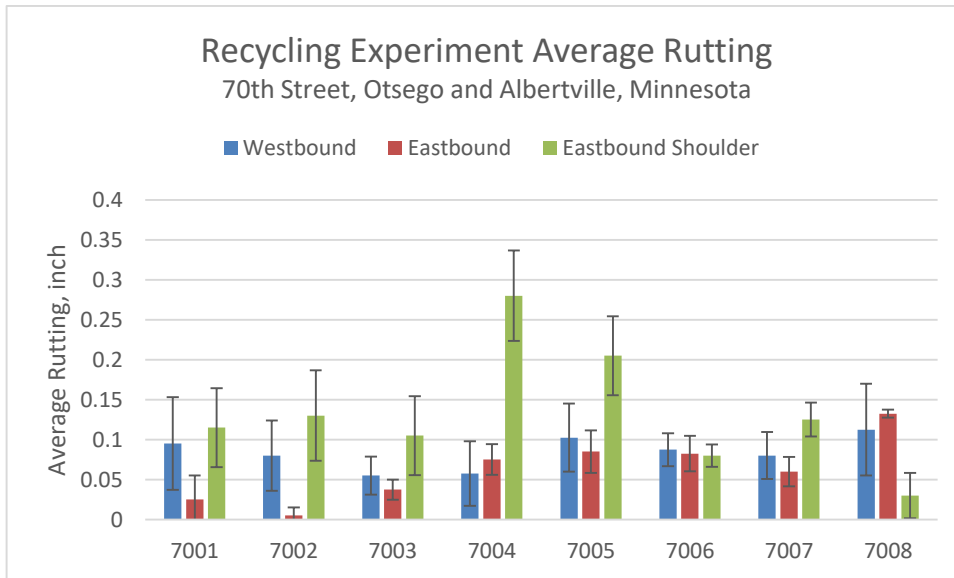


Figure 7 Average Rutting on 6/5/2020.

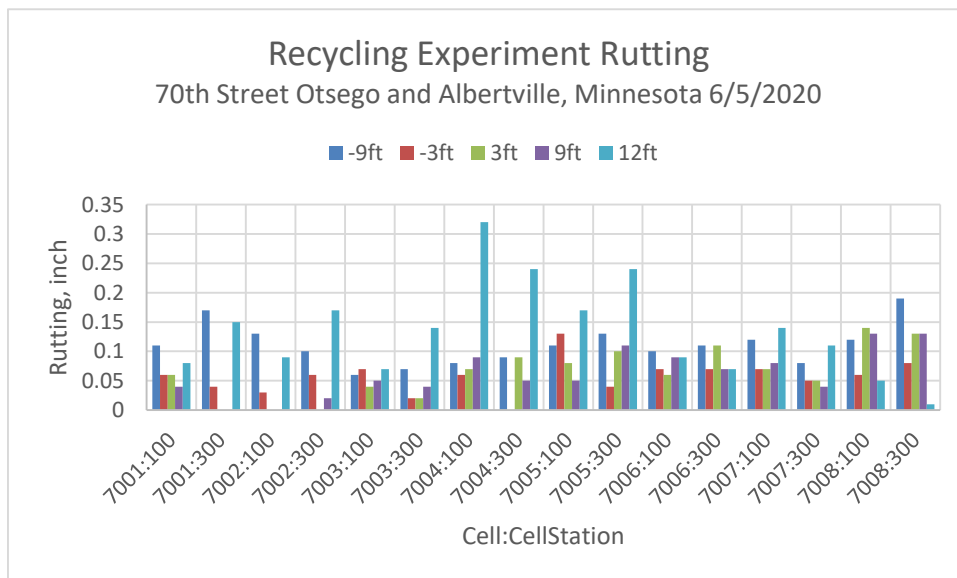


Figure 8 Rutting by station, 6/5/2020.

Current Condition and Ride Quality

Figure 9 and Figure 10 are examples of the typical condition of the test sections in June, 2020. The image shows some cracking in the westbound lane of 7001.

Ride quality will be monitored with high-speed laser profiling equipment, and reported using the International Roughness Index. Installation of the sections resulted in much improved ride quality.

- In October 2018 a profile measurement was collected on Section 7001 through 7005.
 - Eastbound average IRI was 365.5 in/mi.

- Westbound average IRI was 304.5 in/mi.
- On September 27, 2019 a post-construction measurement was collected on all sections (7001 through 7008). The IRI's of all the individual sections were below 90 in/mi.
 - Eastbound average IRI was 78.0 in/mi.
 - Westbound average IRI was 74.5 in/mi.



Figure 9 View eastbound into sections 7001E and 7001W, June 2020.



Figure 10 View eastbound into sections 7006E and 7006W, June 2020.