HIGH FRICTION SURFACE TREATMENT (HFST)
I-57 and I-74 Interchange

101st IL Transportation and Highway Engineering (T.H.E.) Conference - February 24, 2015

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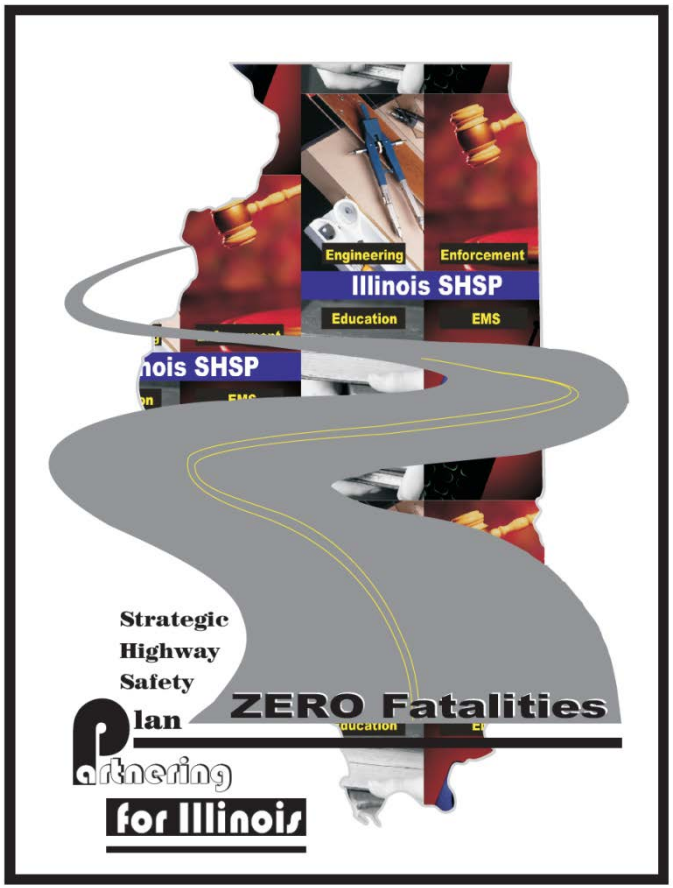
Bureau of Safety Engineering

Illinois SHSP

- Zero Fatality Goal
- All public roads
- Severe Crashes
- Substantive Safety
- 4E Partnership
- Continual Evaluation

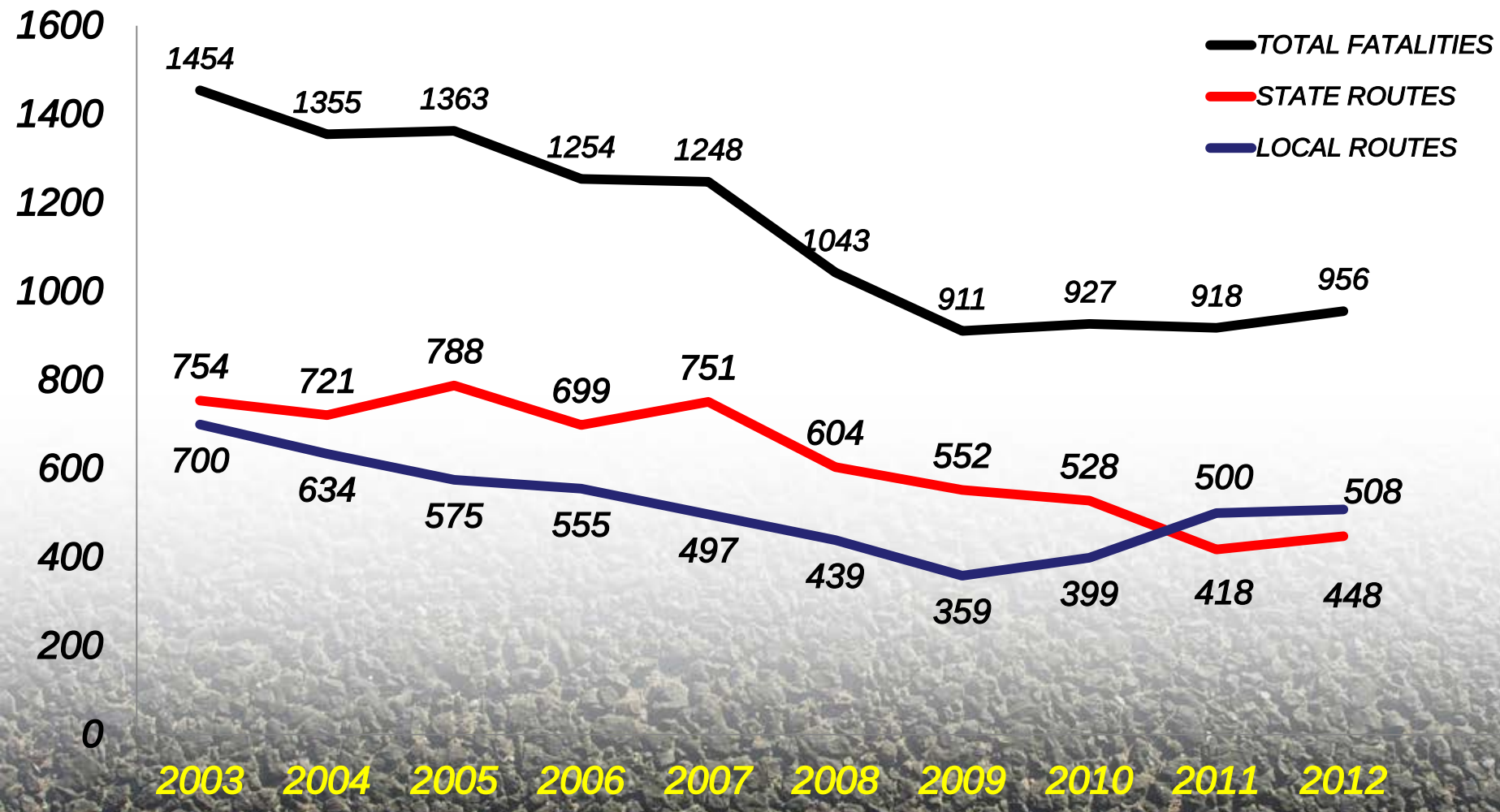


Driving Zero Fatalities to a Reality

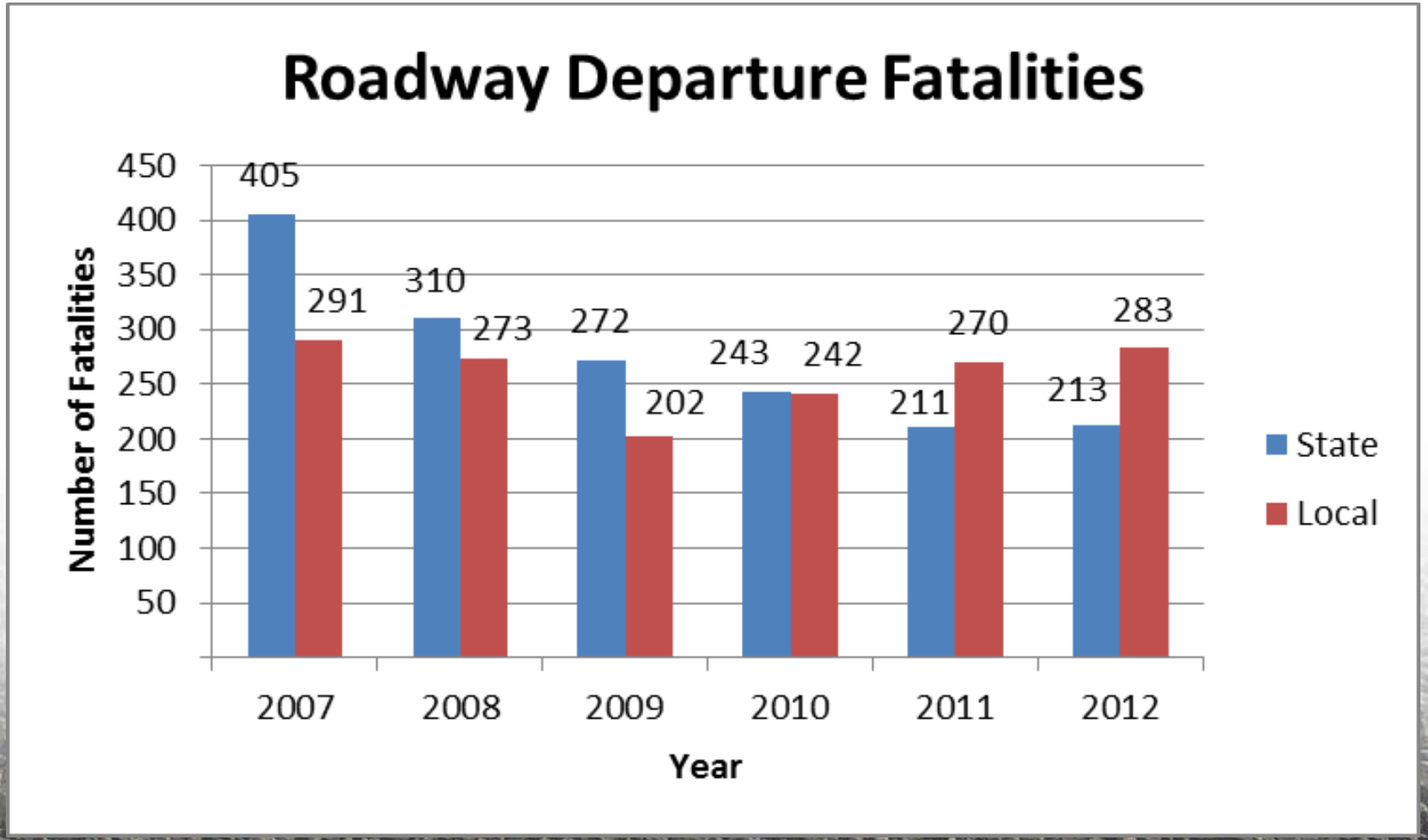
IL SHSP Emphasis Areas

- Alcohol / Impaired Driver
- Driver Behavior / Awareness
- Highway / Railroad Grade Crossing
- Information Systems
- Intersections
- Large Trucks
- **Roadway Departure**
- Safety Belts / Occupant Protection
- Vulnerable Users
- Work Zones

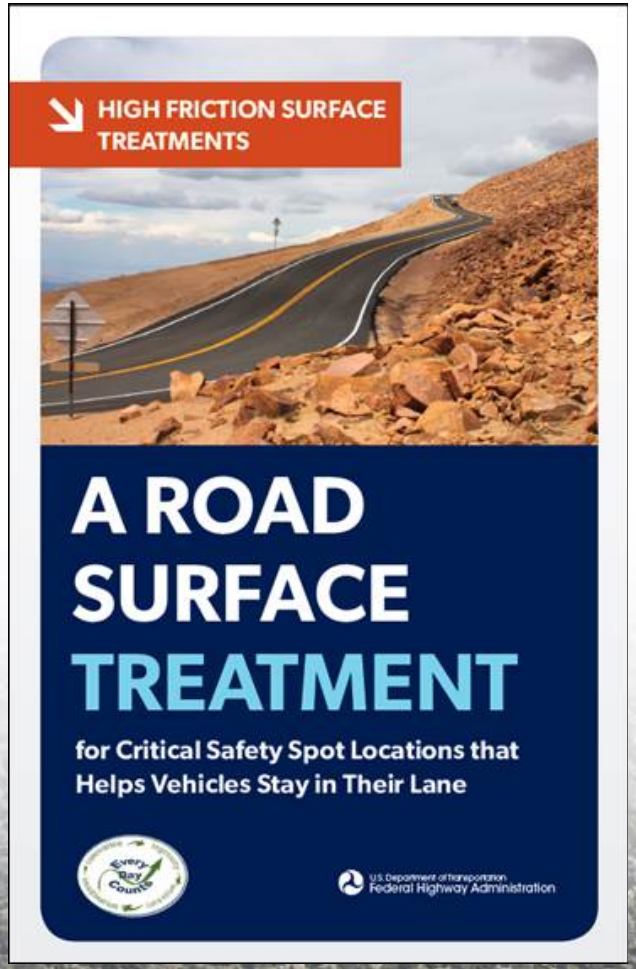
ILLINOIS FATALITIES



ROADWAY DEPARTURE



FHWA's Every Day Counts (EDC)

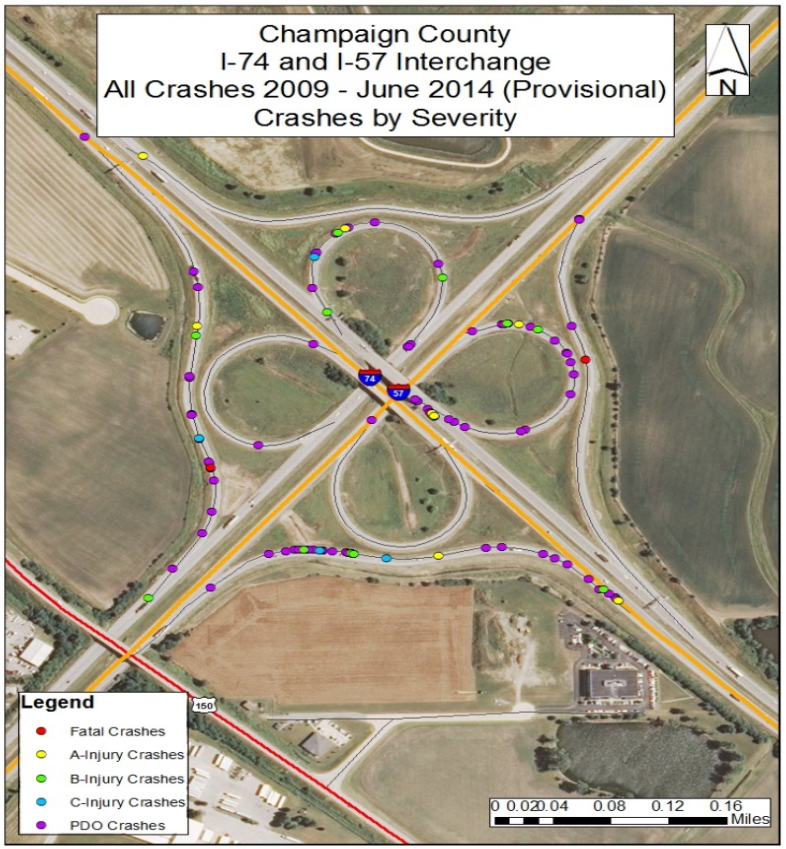


- *EDC-2 Includes HFST as 1 of 11 Different Innovations*

What is High Friction Surface Treatment?

- *HFST Increases Pavement Friction*
- *HFST Reduces Roadway Departure Type Crashes*

I-74 and I-57 Crash Data (2009 – June 2014)



Collision Type	Total	Fatal	A-Injuries	B-Injuries	C-Injuries	PDs
Fixed Object	79	2	3	3	3	71
Overturned	21	0	3	7	1	11
Angle	5	0	3	0	0	2
Sideswipe Same Direction	5	0	0	0	0	5
Rear End	3	0	0	2	0	1
Other Non-Collision	3	0	0	0	0	3
TOTAL:	**116**	**2**	**9**	**12**	**4**	**93**

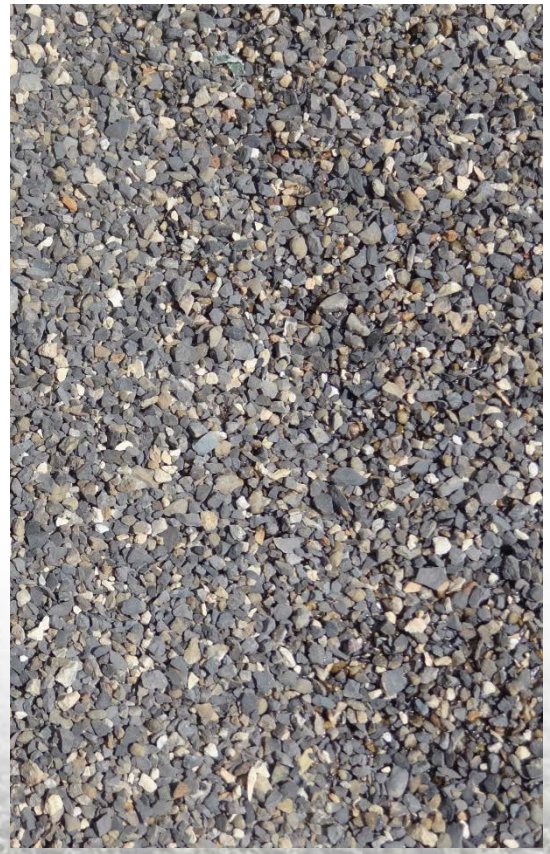
Roadway Departure Crash Totals	
Collision Type	**Total**
Fixed Object	79
Overturned	21
TOTAL:	**100**

Road Surface		
Wet	78	67%
Dry	28	24%
Ice	7	6%
Snow or Slush	3	3%
Total:	**116**	

IL Special Provision for High Friction Surface Treatment (HFST)

- *BMPR and BSE Research & Author*
- *HFST as Experimental Feature*
- *Special Provision Elements –*
  - *Materials*
  - *Equipment*
  - *Construction Requirements*

Special Provision for HFST - Materials: Calcined Bauxite Aggregate and Polymeric Resin Binder



- *Bauxite Gradation @ 0 – 5% min. Pass #16 Sieve*
- *Extremely Hard Aggregate w/ Sharp Edges*
- *11 -15 lbs. of Bauxite / Sq. Yd.*
- *Resin Binder Temperature Sensitive*

Special Provision for HFST - Equipment: Fully Automated Truck Mounted Application

- *Fully Automated Truck Was Used*
- *Resin Applied Spray Bar (12 ft. Wide) Mounted on Truck, and Bauxite Dropped from Drop Box*
- *Resin Stored in Tanks on Truck; Applied @ 3.5 Sq. Yd. (max.) / Gallon Resin (15 Gallons / Minute)*

Special Provision for HFST – Pavement Preparation

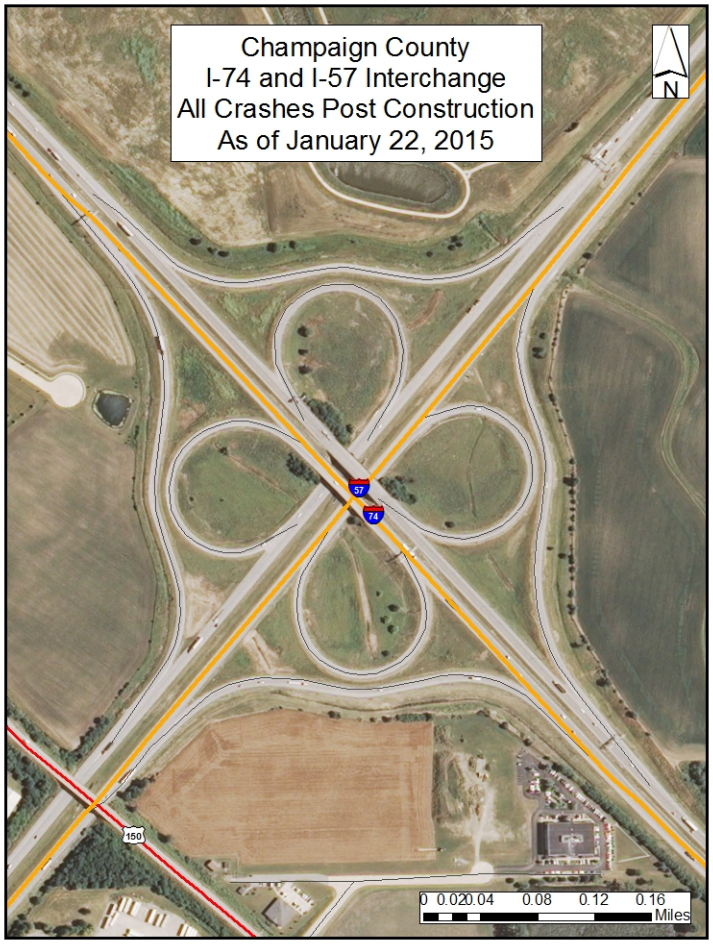
- *Must Have Structurally Sound, Moisture Free Pavement*
- *Full Depth Concrete Patch*
- *Clean and Seal ¼" – 1 ¾ " Wide Cracks*
- *Removal of Pavement Markings*

Special Provision for HFST - Equipment: Shot Blasting and Regenerative Air Sweeper (RAS)

- *Remove Curing Compound*
- *Crack Cleaning*

- *Pavement Cleaning Using RAS Power Broom - Initial, Second & Final Sweeping*

I-57 and I-74 Interchange Crash Totals – Crash Data Comparison of 08-13 thru 01-14 to 08-14 thru 01-15



- *Pre – HFST: 7 Total Crashes Reported (August 2013 – January 2014)*
- *Post – HFST: 0 Total Crashes Reported (August 2014 – January 2015)*

Other IDOT HFST Project Locations

US 30 in DeKalb County and US 34 in LaSalle County (D3)

IL 71 in LaSalle County (D3)

I-74 Mainline - 1.53 miles in Champaign County (D5)

Various Ramps in Madison and St. Clair County (D8)

Questions?

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Contract 70A52
HFST project
Ramps at I-74/I-57 interchange

Field Engineer-	Michael Carnahan
Resident-	Andrea Childers
Prime Contractor-	GM Sipes Construction, Inc.
Subcontractors for HFST-	Venture Construction
	Interstate Roadside Management (DBI/IRM)

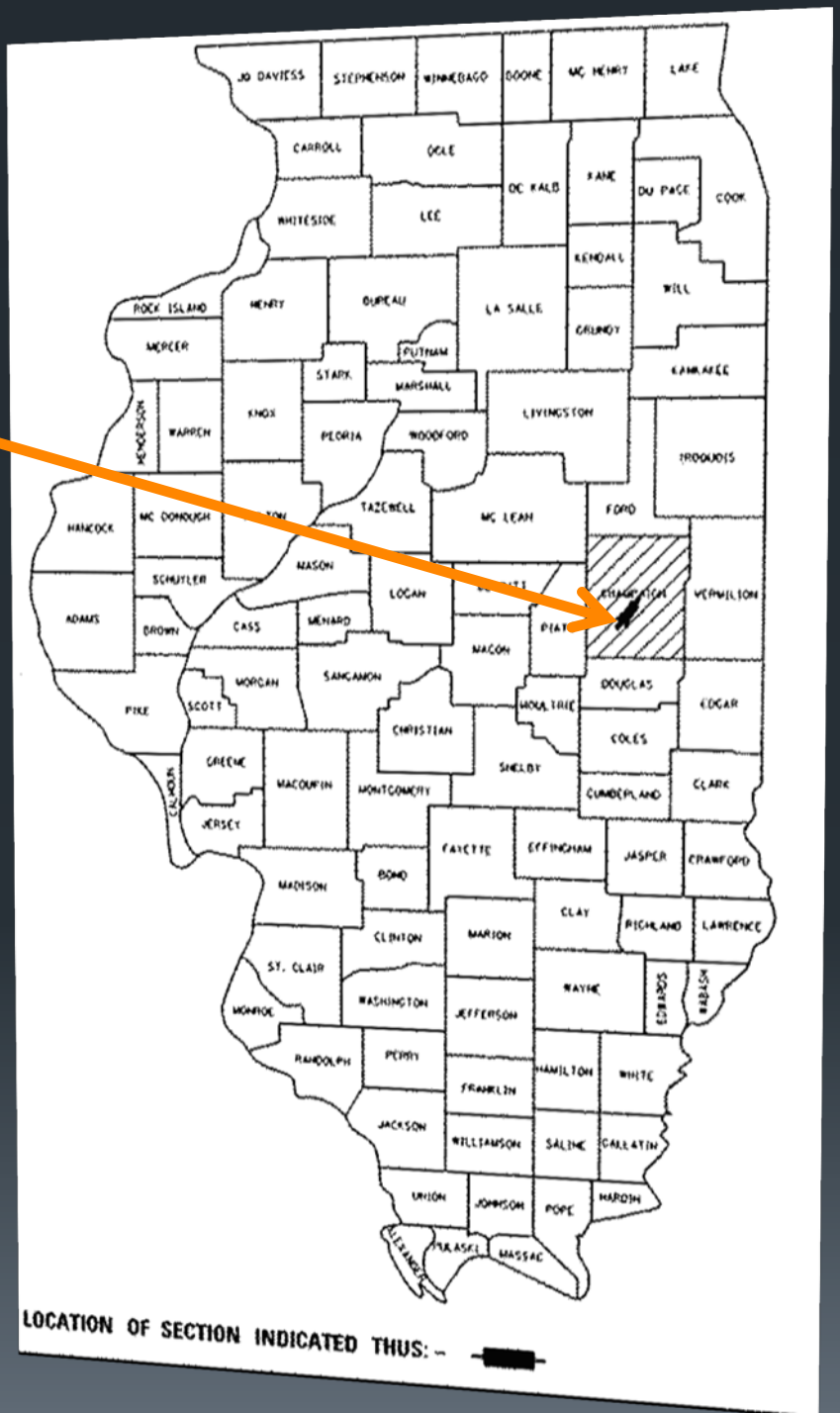
I-57/I-74 Interchange near Champaign-Urbana

Awarded through HSIP
$1,211,654.24

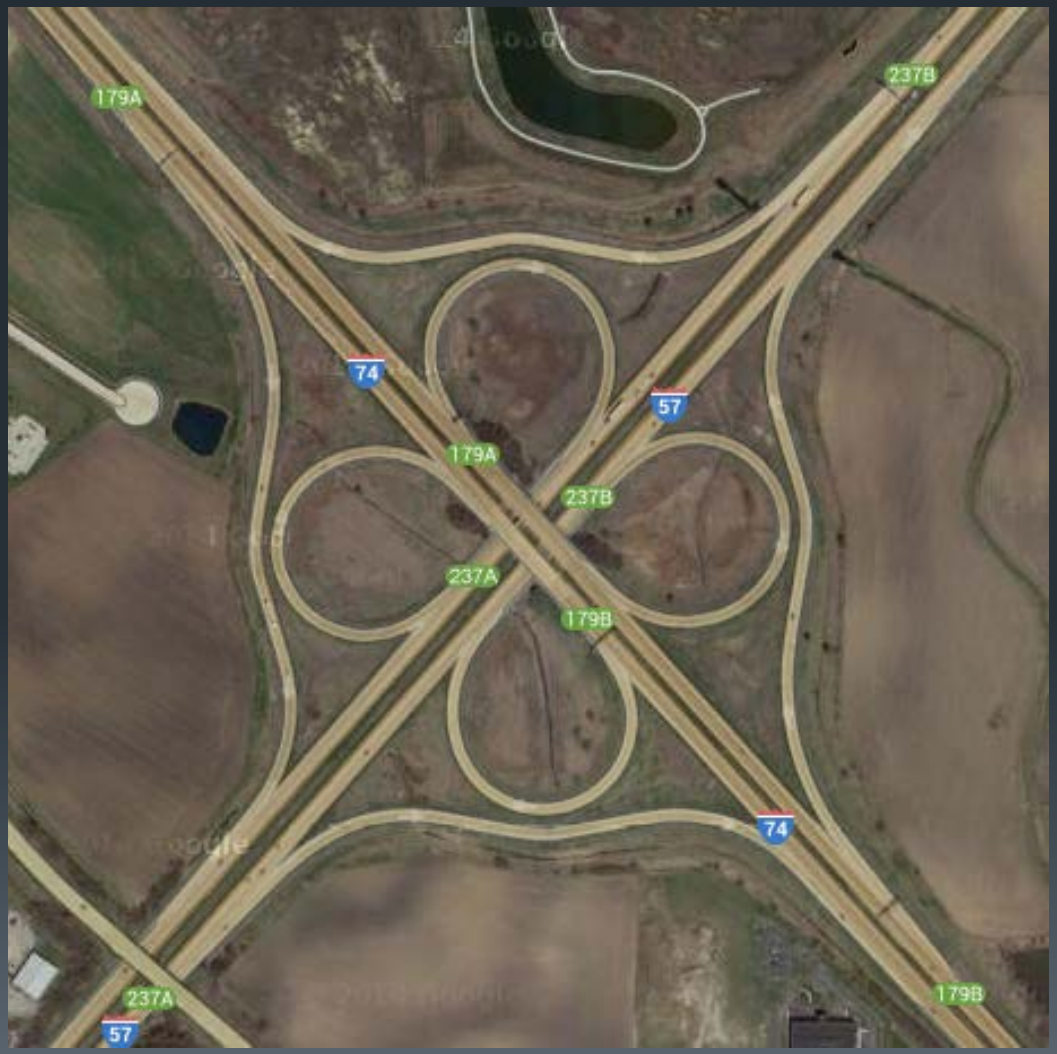
Net Cost of Section
$1,227,843.14

+1.34%

HFST $23.50 / SQ YD

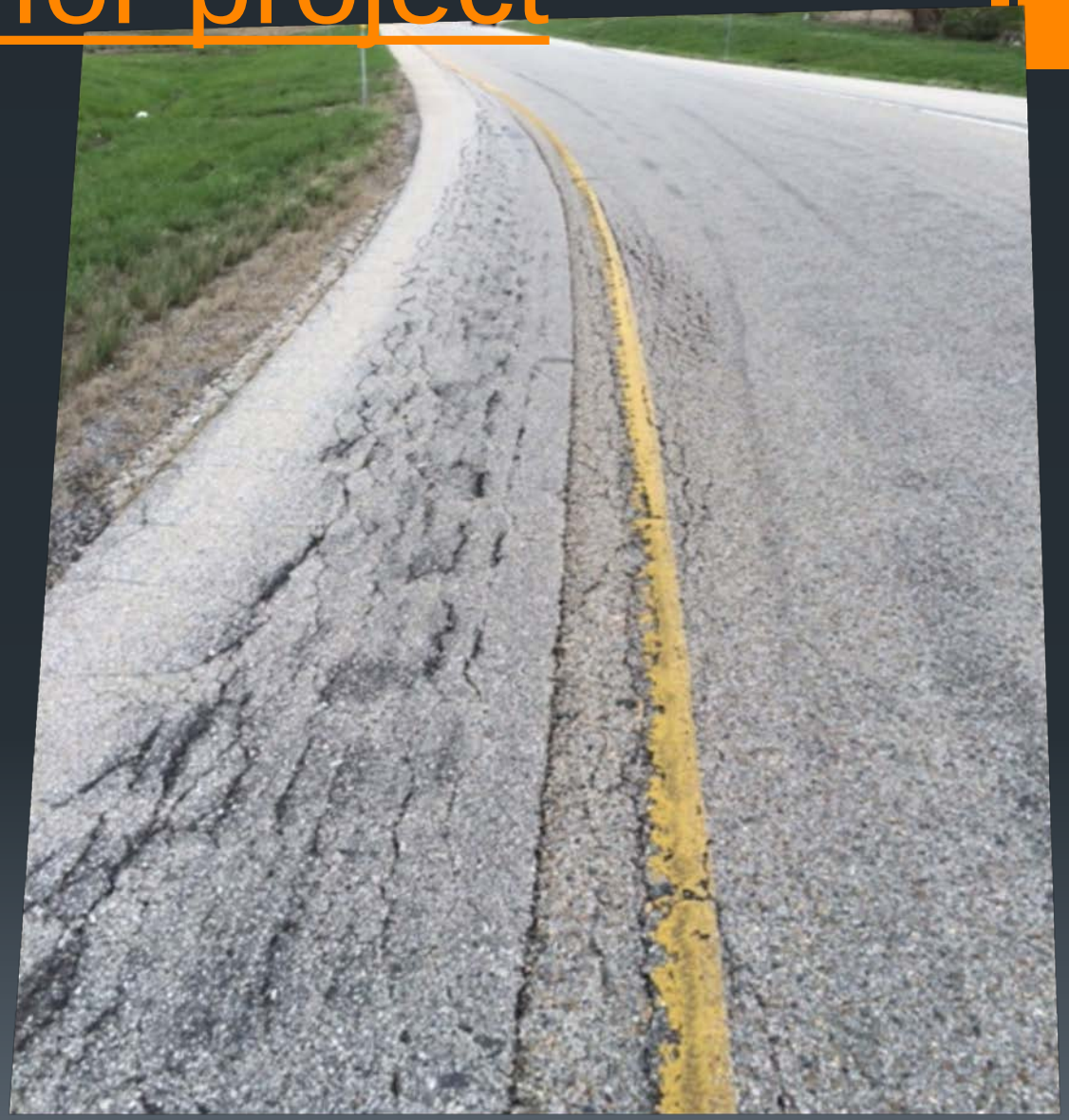


Cloverleaf interchange at I-74/I-57



Reasons for project

- Geometrics
- Speed transition
- Accident Rates
- Off tracking
- Deteriorated shoulders

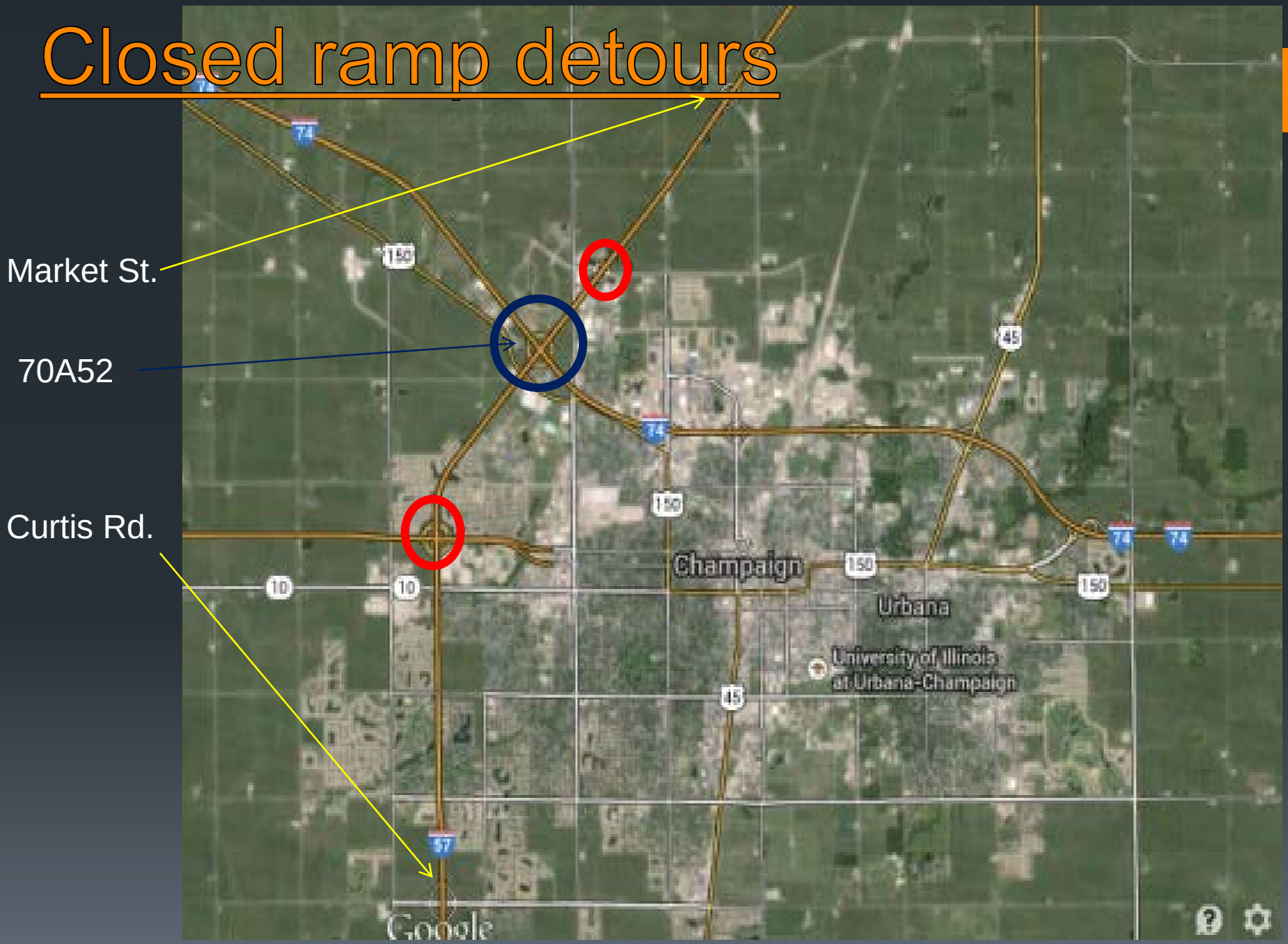


Before

After

Speed Indicator Signs

Closed ramp detours



Prior to HFST placement

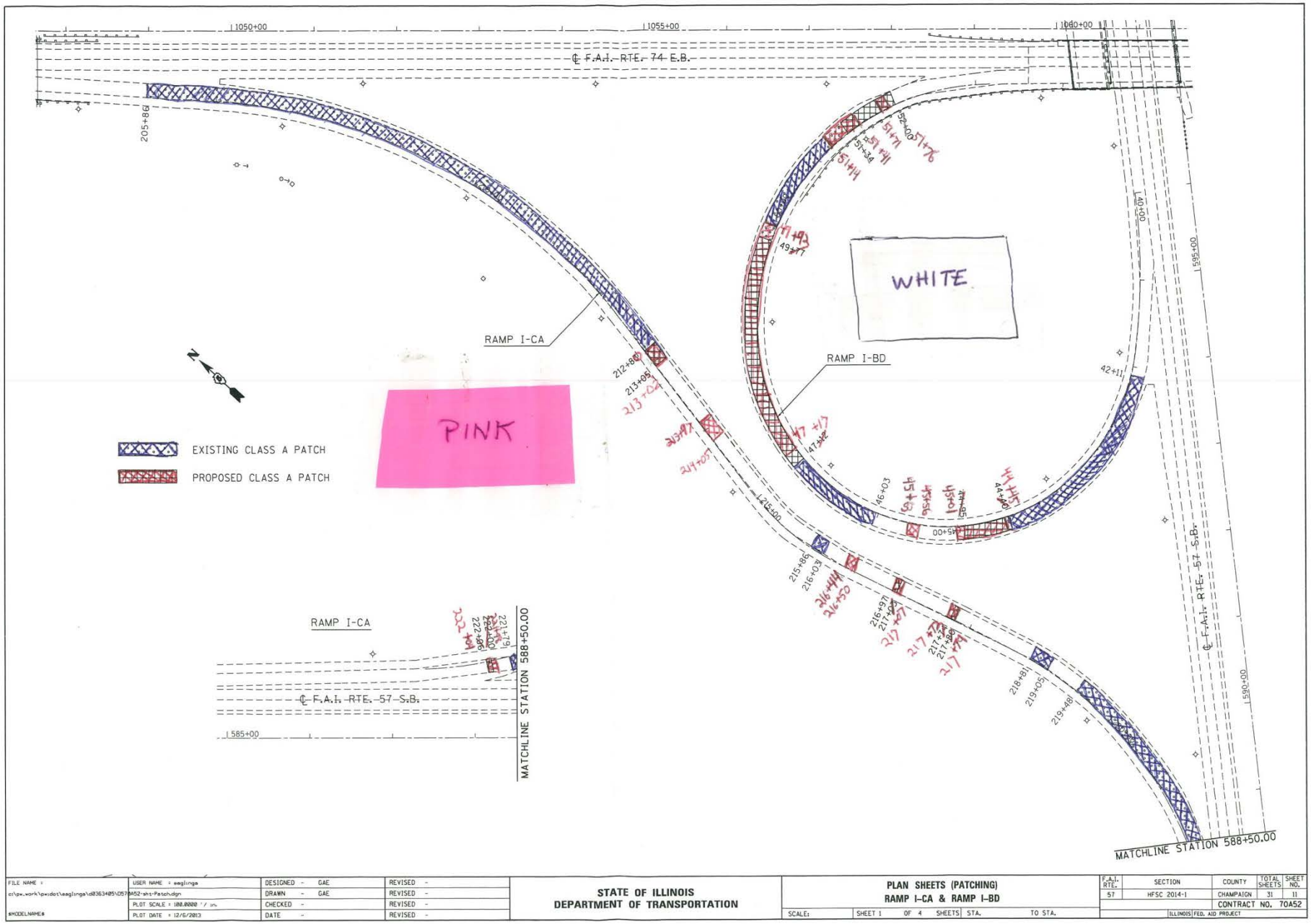
Existing Surface

-jointed concrete pavement with HMA overlay

-2yr old Class A patches

-new Class A patches

Contract required patching to be done 30days prior to HFST placement.



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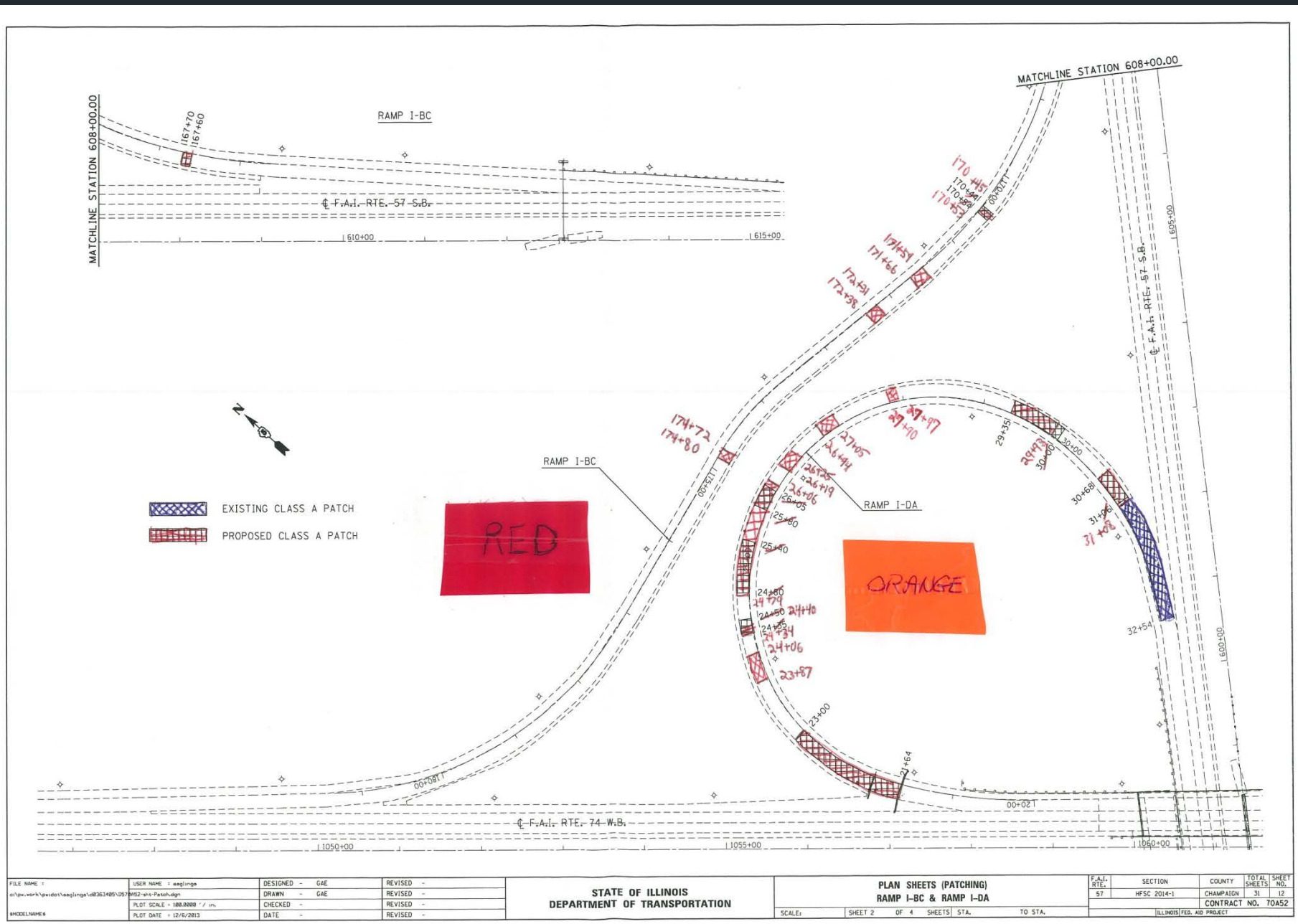

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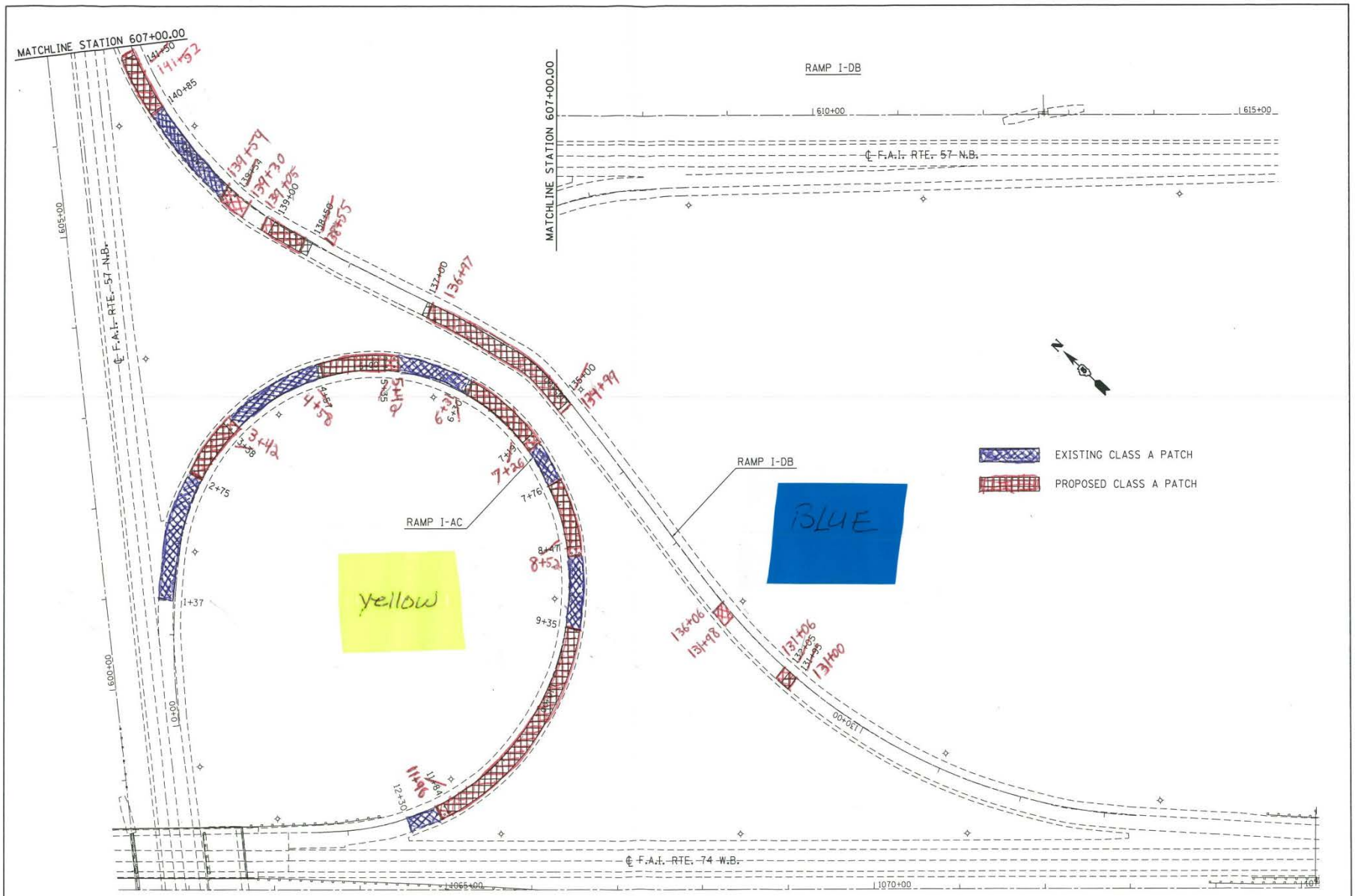

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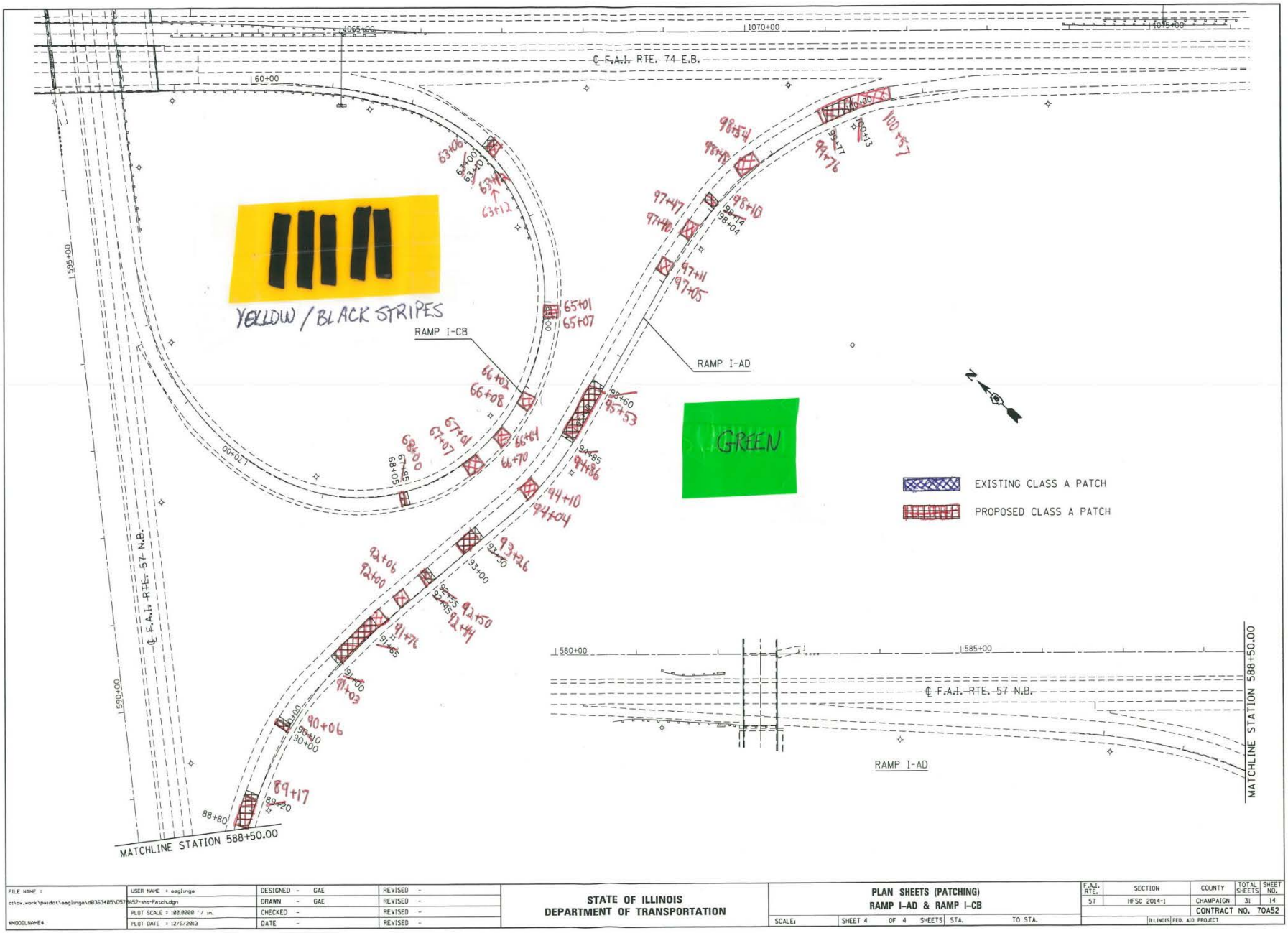

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		DATE -	REVISED -		SCALE: SHEET 4 OF 4 SHEETS STA. TO STA.			ILLINOIS FED. AID PROJECT		

Preparation for HSFT
Shot Blasting

- All Concrete
- Test HMA section
- Areas of stains and roadway buildup

Preparation for HSFT Regenerative Air Sweeper (RAS)

The RAS must be capable of being used **without** water for dust suppression to ensure a dry surface will be maintained."

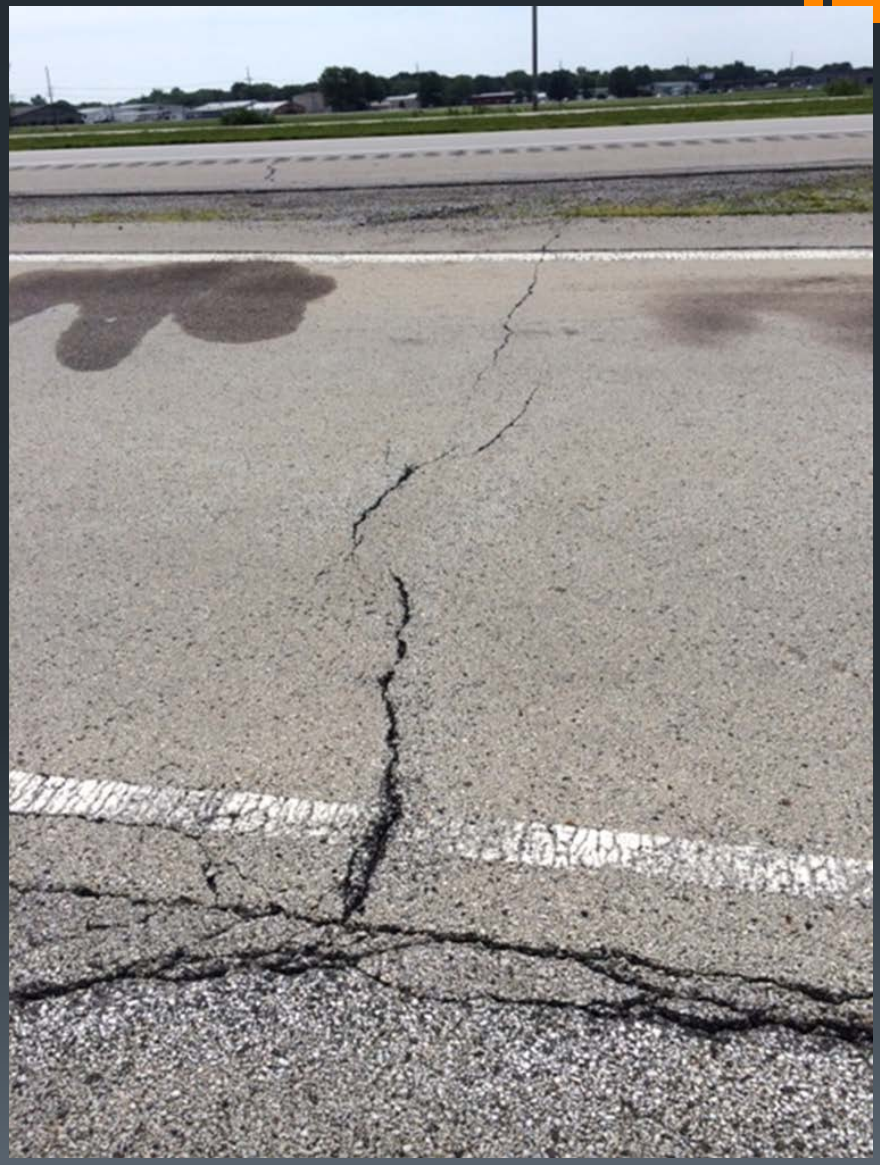
Here was the first big problem.

- The RAS needs the water to pick up the light concrete and HMA debris and paint flecks left from striping removal.
- Most of the shot was able to be picked up.
- There was still a considerable amount of dust.
- After a while, we realized in order to get the surface free of dust and lighter particulates, an air compressor was needed to blow the remaining small particles off the roadway. (This was not something our contractor had planned.)

For secondary and final sweepings, water could be used and the heavier bauxite easily picked up for reclamation.

Preparation for HSFT Crack Filling…

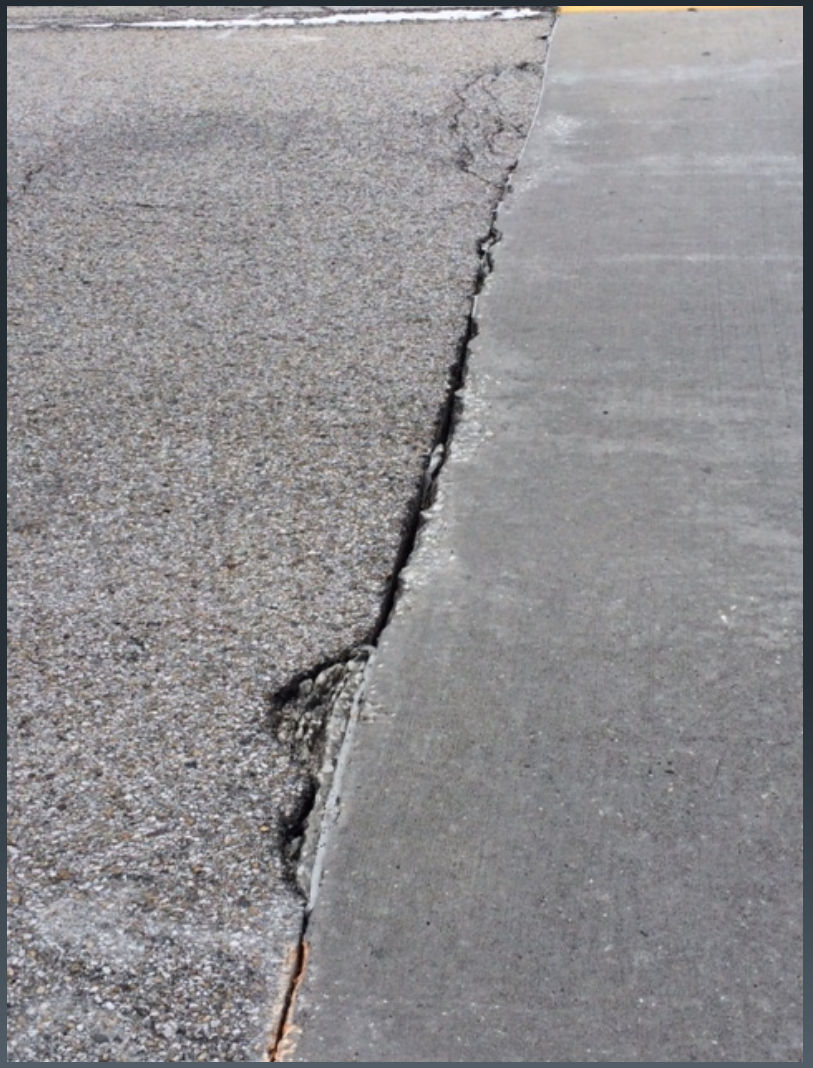
- To do or not to do?
- With what?



Cracks

Typical cracks we had on most ramps.

The worst of them all.



HFST

Truck Mounted Application Machine

Required to place

Resin at a minimum rate of **15 gal/min**

Aggregate at a minimum rate of **13lb/sq yd**

varying widths of **up to 12ft**.

HFST

FHWA has preference for the truck method for consistency and safety.

What we saw…

Workers are still needed present on pavement.

HFST

- 12ft spreader bar
- Roller to prevent air bubbles
- Blower to lay material back for 2nd pass


1760
8

Curing and Clean Up

- Allow the treatment to cure in accordance with polymeric resin manufacturer recommendations. (Manufacturer's rep.)
- Perform three separate clean up processes by removing the excess aggregate with a RAS on the treated area and adjacent areas.
- Perform initial clean up before opening to traffic. Excess aggregate can be reused on the following day's installation provided the reclaimed aggregate is clean, uncontaminated and dry.
- Perform secondary clean up 3 to 5 days after construction.
- Perform final clean up 3 to 5 weeks after construction.

Initial Sweeping

Things to watch and be aware of…

- Allow HFST to cure until it can barely be pushed by hand. It should be hard or impossible to push.
- After initial sweeping, contractor* needs to walk the HFST to check for spots that are bare and make repairs as necessary.
- After as much material as possible can be reclaimed, ramp may be opened to traffic.
- We did not use temporary striping. The HFST does a good job of delineating the lane from the shoulders. May need to consider during mainline application. Though not sure about Short Term Tape adherence to HFST.
- May be helpful to keep RRPM and cover or place around.
- Not removing the stripe and placing immediately inside of the stripe would save some of the problems with not having striping. (We were told it can be done.)

Secondary Sweeping

What did we see???

Field Acceptance Testing

- Ensure that the coverage rate of the retained aggregate is 11-15 lb/sq yd (6-8 kg/sq m).
- Remove and re-apply HFST where any patches of exposed polymeric resin exist, at no additional cost to the Department.
- The HFST treated area will be tested by the Department within 60 days after construction in accordance with the requirements in Table 3.
- Remove and replace deficient locations as directed.

Revised 2/11/14

Application Time and Rates

Date	Ramp	SqYds	Epoxy A (gallons)	Epoxy B (gallons)	Bauxite (Pounds)	Weather
7/15/2014	CB	1770.61	334	348		7:00a sunny, 57F, 8mph avg wind, moisture test 5a-7a showed pavement dry 10:00 sunny, 66F, 3.2mph avg wind, 51%humidity
7/16-7/18/14	DB	2715.2	405.2	416.5		10:00am=68F, 3.6avg wing, 52%humidity, mostly sunny
7/21/2014	CA	2737.02	409	405		81.8F, 52%humidity, 1.5mph avg wind, mostly sunny
7/22/2014	AC	1831.42	297	302	256000	83F, 72%humidity, 8.5mph wind, sunny
7/23/2014	AD	2489.5	400	408		72.6F, 49%, 8.8mph, mostly sunny
7/23/2014	BD	1896.87	334	346		64F, 61%, 10mph, overcast
7/24/2014	BC	2469.53	384	387		76.8F, 43%humidity, 1.8mph avg wind
7/25/2014	DA	1781.6	262	273		62F, cloudy, 78%humidity
Totals		17691.75	2825.2	2885.5	256000	
Application rate placed			3.10		14.47	
required by Special Prov.			3.50		11-15	
			sq yd/gallon		pounds/sq yd	

Equipment	
Blastrac	BT-483
RAS	A7000 Scharze Vactor Truck (International4200 VT365)
HFST truck	Autocar Xpeditor HFST Application Truck

Department Testing for Acceptance

Friction Data for I-57/74 Interchange Ramps - Contract 70A52

Ramp	Pre-HFST						Post-HFST						Increase			
	Treaded			Smooth			Treaded			Smooth			Treaded		Smooth	
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	FN_{AVG}	%	FN_{AVG}	%
I 57 SB on-ramp from I 74 WB	32	49	38	24	38	29	71	73	72	70	73	71	43	89.5	42	144.8
I 74 WB on-ramp from I 57 NB	33	50	41	31	22	43	75	80	77	75	76	76	34	87.8	33	76.7
I 57 NB on-ramp from I 74 EB	44	60	54	42	65	50	76	80	78	76	78	77	28	44.4	27	54.0
I 74 EB on-ramp from I 57 SB	38	58	45	31	42	36	79	80	80	79	80	80	44	77.8	44	122.2
I 74 WB on-ramp from I 57 SB	48	60	56	42	54	48	83	88	85	75	84	71	37	51.8	23	47.9
I 57 NB on-ramp from I 74 WB	38	57	48	27	49	37	77	85	81	79	85	83	44	68.8	46	124.3
I 74 EB on-ramp from I 57 NB	33	46	40	27	43	34	74	80	78	78	81	79	44	95.0	45	132.4
I 57 SB on-ramp from I 74 EB	30	55	44	21	42	30	77	85	81	75	77	76	51	84.1	46	153.3

Questions?
Comments.

Thank you for your time!