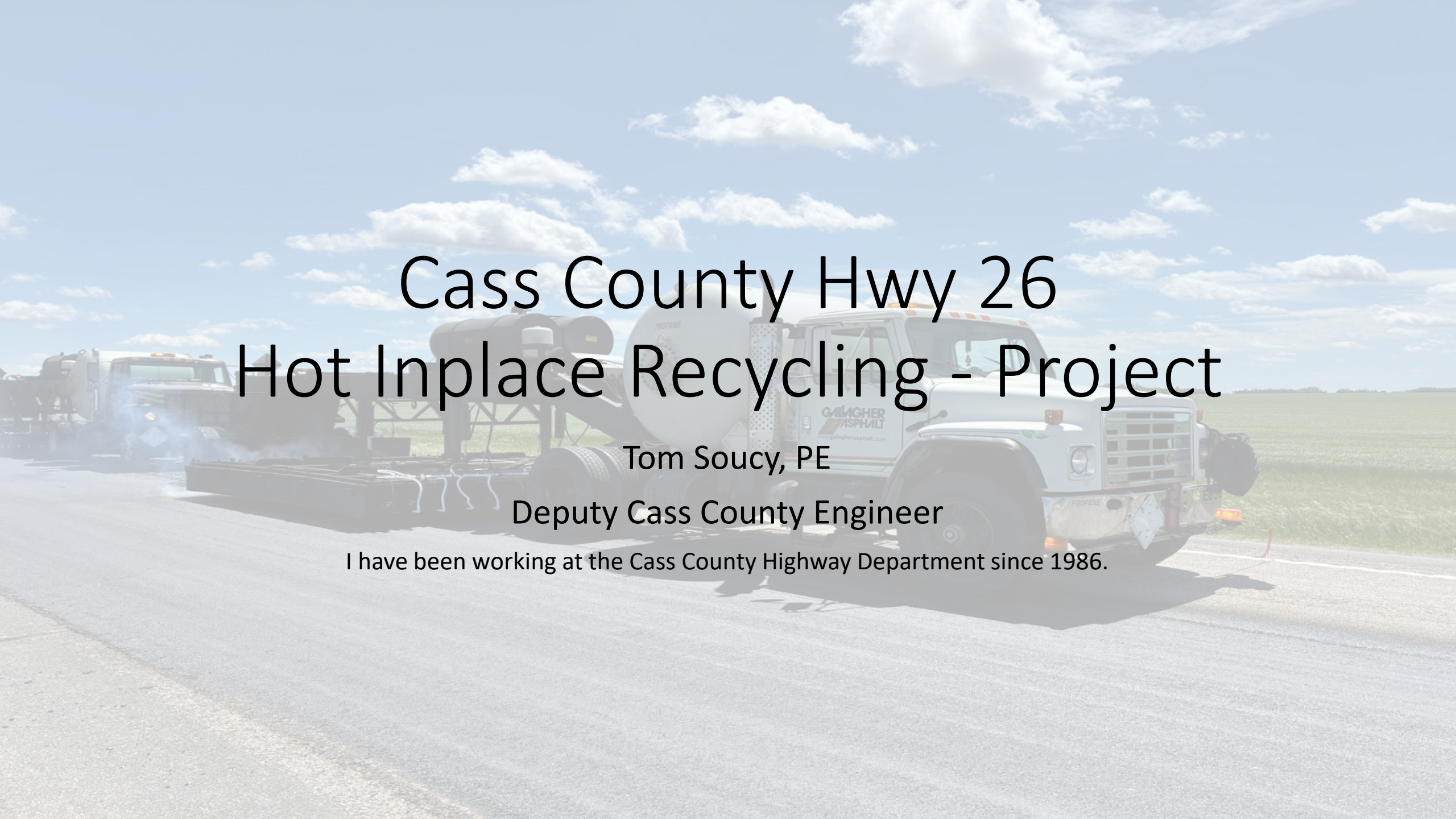




Cass County Hwy 26 Hot Inplace Recycling - Project

Tom Soucy, PE

Deputy Cass County Engineer

I have been working at the Cass County Highway Department since 1986.

Overview

- Infrastructure
- Ultimate Goal - Perpetual Pavement
- HIR Background Information
- HIR vs. Mill & Fill Comparison
- Design
- Construction
- Summary



Infrastructure

Roadway System

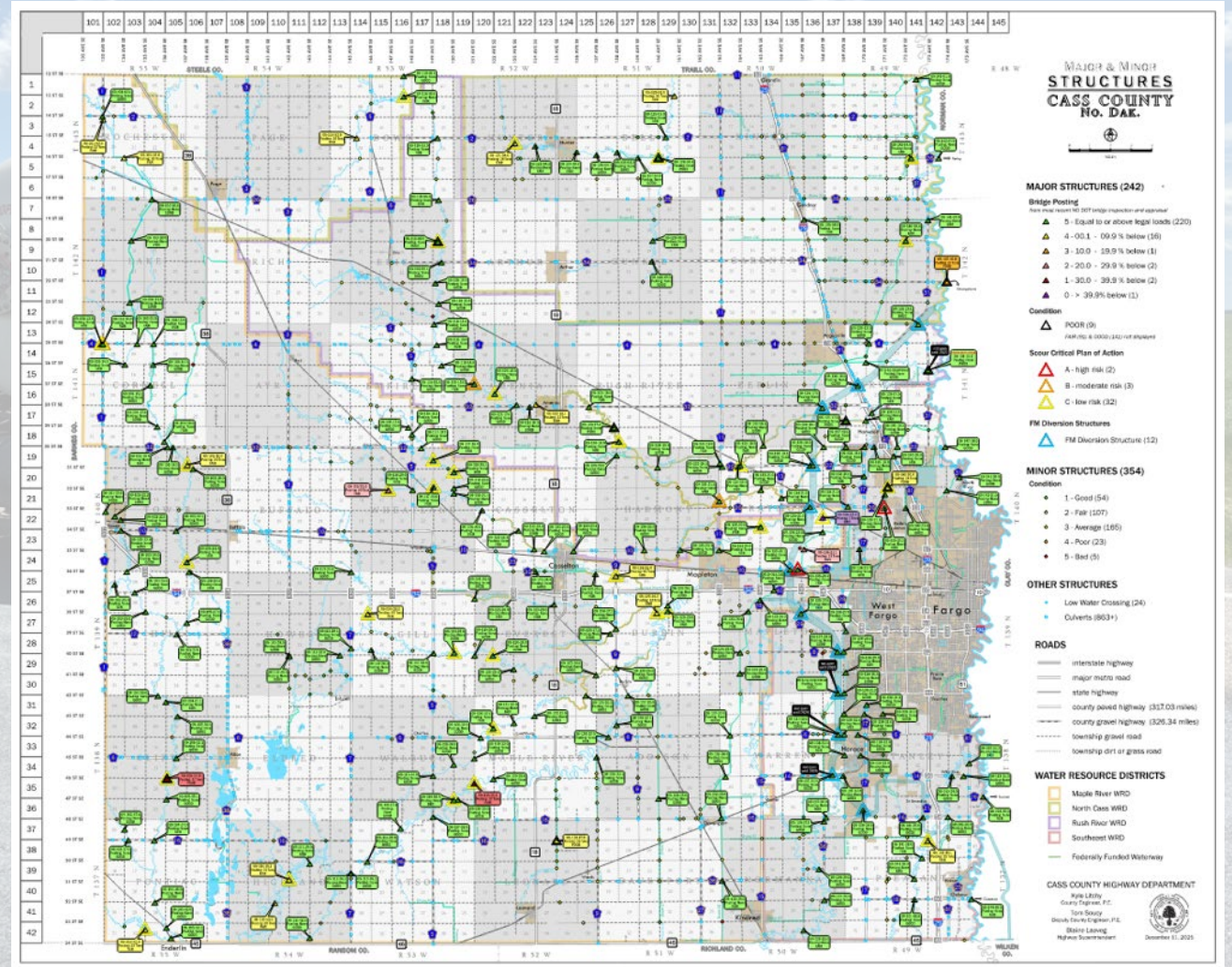
- 322 Miles Paved
- 321 Miles Gravel
- 643 Miles Total
- 1,768 Square Miles of County

Bridges

- 242 Bridges over 20 feet
- 354 Bridges under 20 feet
- 596 Bridges Total

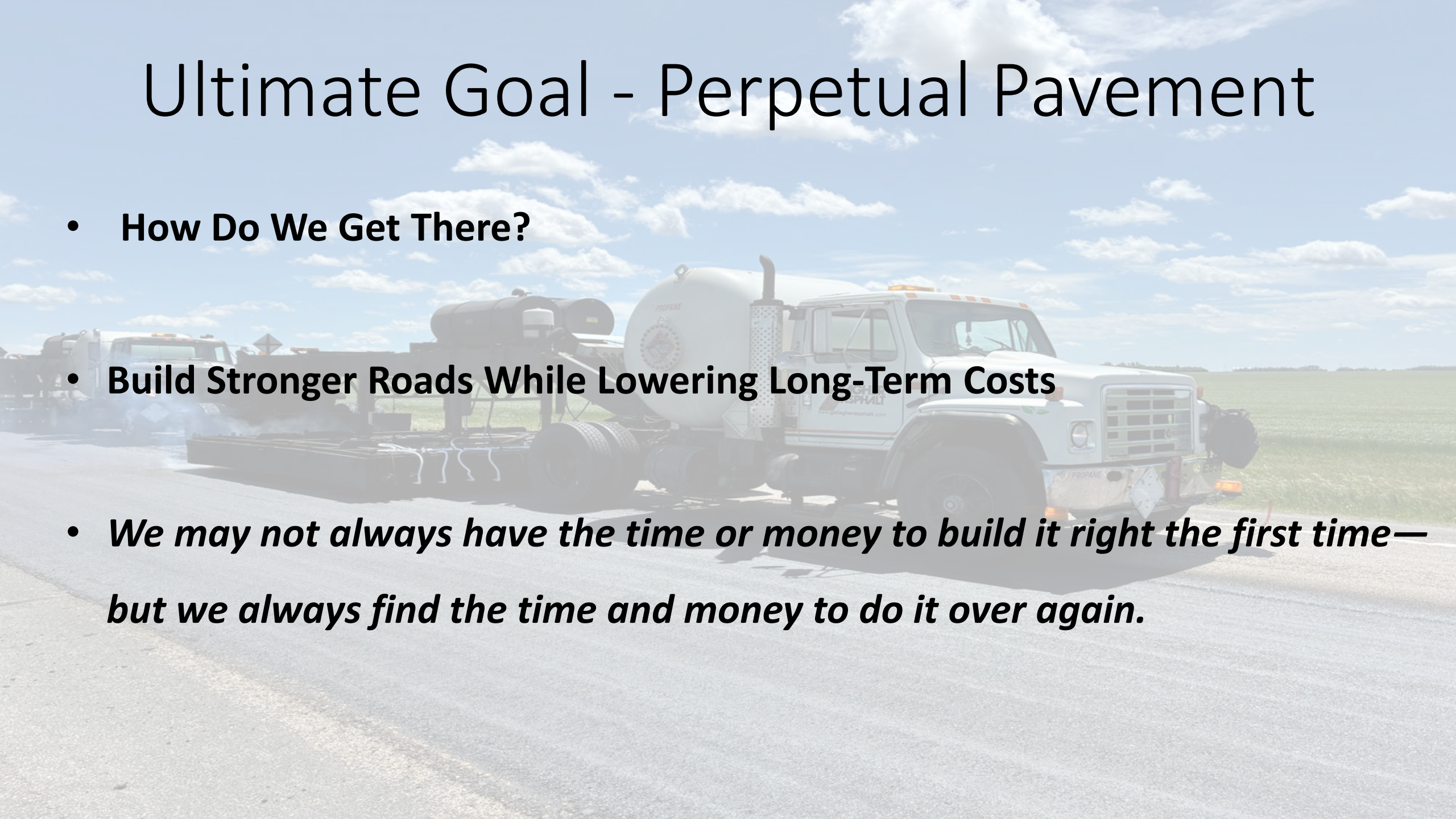
Annual Transportation Budget

- \$25 Million for Roads & Bridges



Ultimate Goal - Perpetual Pavement

- **How Do We Get There?**
- **Build Stronger Roads While Lowering Long-Term Costs**
- *We may not always have the time or money to build it right the first time—
but we always find the time and money to do it over again.*



Ultimate Goal - Perpetual Pavement

- Continue improving our infrastructure rather than simply building new roads the old way.
- **Goal:** Widen nearly all paved roads with some type of shoulder – Prefer a **36 foot top.**



Ultimate Goal - Perpetual Pavement

- With approximately **50+ years of future grading projects**, we may achieve this goal.
- **Can HIR help us achieve our goal?**



What is Hot In-Place Recycling

- Heat
- Scarify/Mill
- Rejuvenate/Mix
- Repave/Compact



Three Common HIR Approaches

- Surface Recycling
- Repaving
- Remixing



Type HIR Options – Available To Us

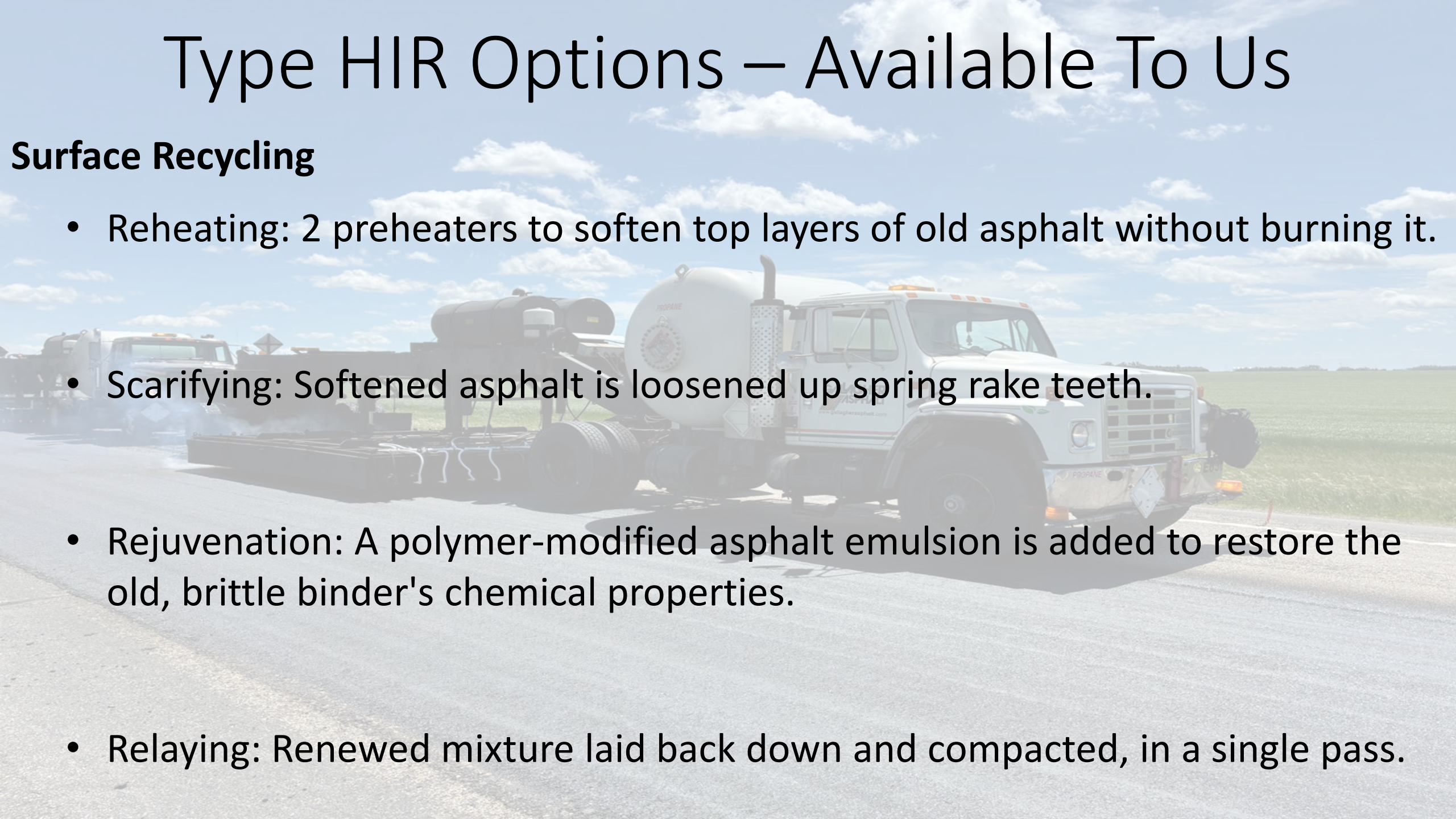
- Surface Recycling
 - **Reheating, Scarify, Rejuvenation, Relaying & Compact**
- Repaving
 - **Reheating, Mill In Layers, Windrow/Rejuvenation, Relaying & Compact**



Type HIR Options – Available To Us

Surface Recycling

- Reheating: 2 preheaters to soften top layers of old asphalt without burning it.
- Scarifying: Softened asphalt is loosened up spring rake teeth.
- Rejuvenation: A polymer-modified asphalt emulsion is added to restore the old, brittle binder's chemical properties.
- Relaying: Renewed mixture laid back down and compacted, in a single pass.



Type HIR Options – Available To Us

Surface Recycling



Type HIR Options – Available To Us

Surface Recycling



Type HIR Options – Available To Us

Repaving

- The process begins with two or more, propane-fueled preheaters
- Heat with Grade control Milling and Windrowing
- Heat next layer



Type HIR Options – Available To Us

Repaving

- Heat and Mill – Shift Windrow
- Heat - Mix Rejuvenating Oil – Windrow
- Paver Lay Windrow and Compact with Rollers



Type HIR Options – Available To Us

Repaving



Type HIR Options – Available To Us

Repaving

- Straight Projects are preferred
- Turnlanes and Curves are doable



Major Pros – Why Consider HIR?

Lower material demand

Much of the existing asphalt remains in the roadway, reducing the need for virgin aggregate and binder.

Less hauling

Less material is removed and replaced, which can reduce truck traffic, haul distance and associated disruption.

Preserves roadway geometry

Typically maintains elevations and overhead clearances better than deeper reconstruction.

Potentially faster

A recycling train can rehabilitate the surface continuously, reducing lane-closure duration.

Good surface correction

Can address raveling, aging binder, cracking, rutting and other surface-level distresses when the underlying structure is adequate.

Sustainability

Reuses existing pavement and can reduce energy use, emissions and waste compared with more material-intensive alternatives.

Major Pros – Why Consider HIR?

- Process can be repeated multiple times on the same roadway
- Some roads have successfully received their third HIR treatment



Major Cons – Where HIR Can Fall Short

Not a structural cure

HIR is primarily a surface rehabilitation method. Weak base/subgrade or deep structural failures require a different treatment.

Limited depth

Typical HIR depth is roughly $\frac{3}{4}$ –2 inches, 1.5 -2 inches most common.

Pavement must be suitable

The existing asphalt must have appropriate materials and condition for heating, scarification and remixing.

Temperature sensitive

Heating must be carefully controlled. Too much heat can damage binder; inadequate heating can make processing difficult.

Weather dependent

Cold temperatures, wind and moisture can affect heating, production and quality.

Contractor/equipment availability

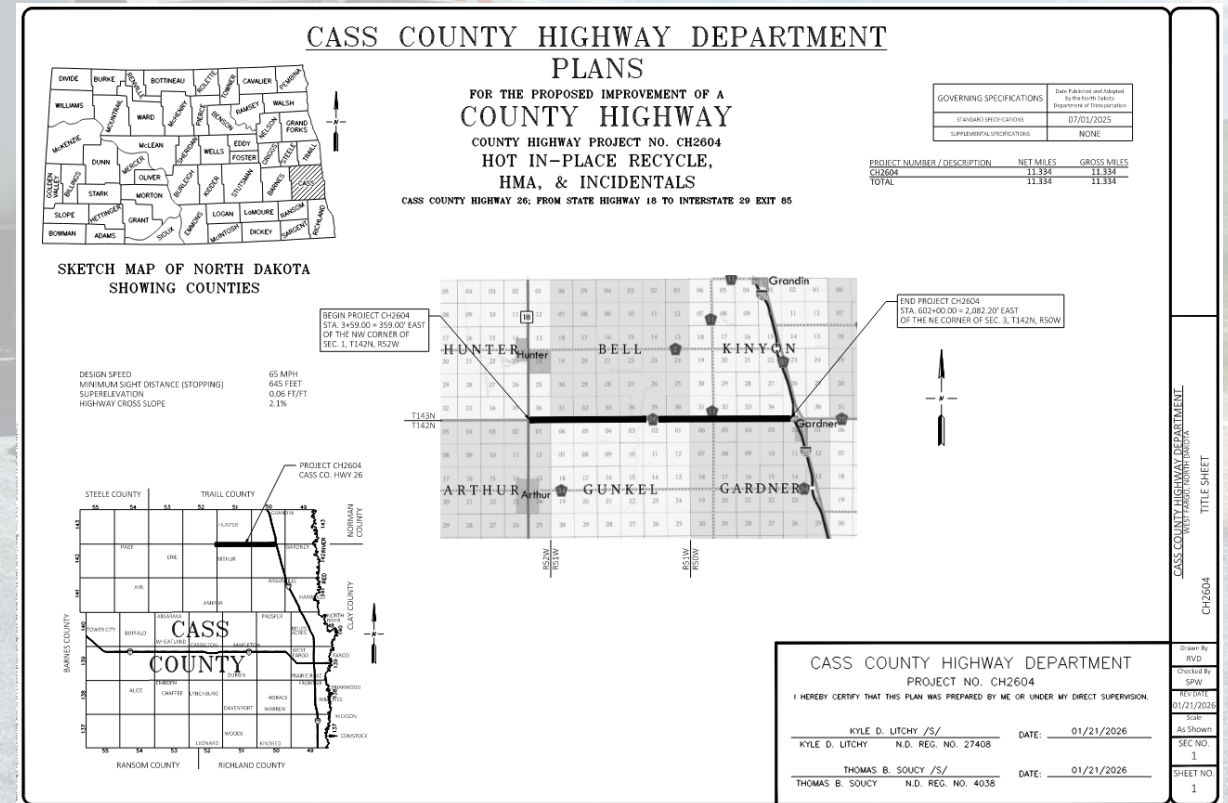
Specialized equipment and experienced crews may not be readily available in every market.

HIR vs. Conventional Mill & Overlay

Factor	Hot In-Place Recycling	Mill & Overlay
Existing asphalt	Reused in place	Milled and hauled away
New material	Generally, less	Generally, more
Hauling	Lower	Higher
Traffic control	Potentially less	Typically, more
Depth of treatment	Primarily shallow surface	Can remove deeper material
Structural repairs	Limited	Can address more depth, but still depends on design
Specialized equipment	High	Widely available
Best fit	Surface distress + sound structure	Broader range of rehabilitation needs

Design

- Plan Notes from MN County 2025 Projects
- Contractors Input
- Bid the project in February of 2026



Design

- We chose the 1.5" Overlay to Strengthen Surface, Shldrs. & Apprs.
- Cores were taken and a mix design was completed.
- Our Contractor's equipment utilized:
 - Heating, Raking/Mixing, Paving & Compaction Method
- Cores were taken afterwards to check the HIR depth and pavement density.

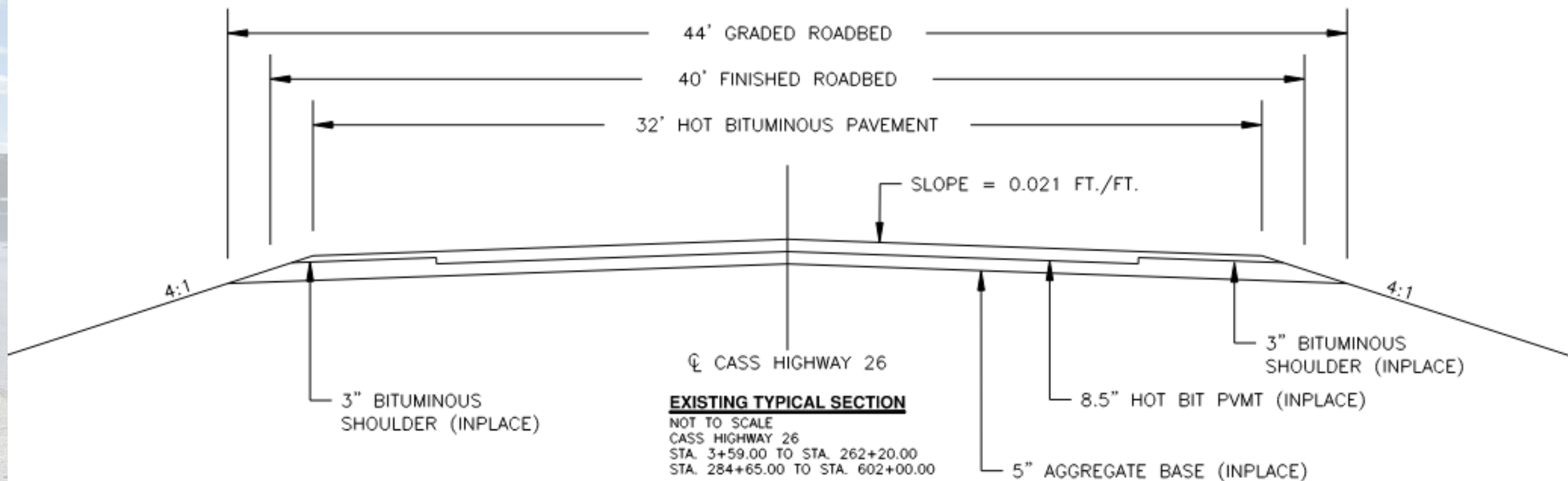


Design

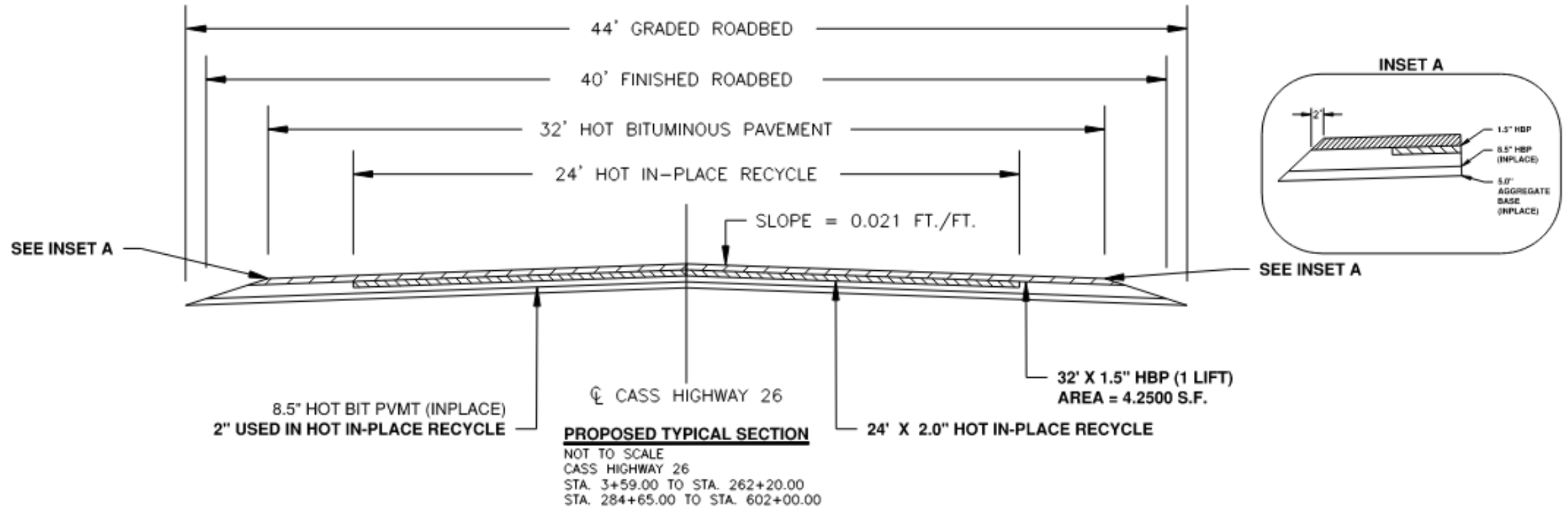
- 11.3 Mile Project
- 2" HIR – Center 24'
- 1.5" – 32' HMA Overlay
- Fogged Wear
- No RR Crossings
- School Turnlanes
- 1/2" Wheel Ruts existing
- Overlaid last in 2007, Crack Sealed twice and one Chipseal.



Design



Design



Design

1. Heating and Scarifying

- Heating Scarifying Unit; Use a self-propelled unit capable of heating and scarifying the asphalt pavement.
- Distributor-Paving Unit; Use a single unit that uniformly distributes the asphalt rejuvenating agent at the stipulated rate and mixes the material. This equipment levels and finishes the scarified material.

2. Heating and Milling

- Heating Milling Unit; Use a self-propelled unit capable of milling, heating and windrowing the asphalt pavement that is being processed.
- Tunnel Heater; Use a self-propelled unit capable of heating the underlying pavement or the previously milled material. The tunnel heater may be equipped with a milling unit.
- Milling-Mixing-Paving Unit; Add the asphalt rejuvenating agent uniformly across the width of the HIR material at the stipulated rate onto the material and mix. Screed and finish the milled material. Alternatively, a self-propelled independent pave complying with specifications may be used after the mixing operation.

Design

<i>Laboratory Results</i>		
	Existing Cores	Treated with Kendex MNE
Average Gmm	2.449	2.429
Average Gmb	2.217	N/A
Core Density	90.6	N/A
Penetration @ 77F	30	83
%Bit	6.1	6.3
3/4"	100	100
1/2"	96	96
3/8"	88	87
#4	66	68
#8	50	50
#16	34	35
#30	21	21
#50	12	11
#100	7	7
#200	5.1	4.9
HCV	0.793	N/A

Kendex MNE Rejuvenator at an approximate rate of 0.1 Gal/SY/1.5"

Design

	A	B	C	D	E	F	G	
1	PROJECT DETAILS							
2	LENGTH (FT)	59,841						
3	WIDTH (FT)	24						
4								
5								
6	HOT IN-PLACE RECYCLE							
7	DEPTH (IN)	SY/MILE	\$/SY	\$/MILE	TOTAL \$			
8	1.5	14,080	\$5.75	\$80,960.00	\$917,562.00			
9	2.0	14,080	\$6.25	\$88,000.00	\$997,350.00			
10	2.5	14,080	\$6.75	\$95,040.00	\$1,077,138.00			
11	3.0	14,080	\$7.25	\$102,080.00	\$1,156,926.00			
12								
13								
14								
15	MILL & OVERLAY							
16	DEPTH (IN)	SY/MILE	MILL \$/SY	HMA TONS/MILE	HMA \$/TON	\$/MILE	TOTAL \$	
17	1.5	14,080	\$2.25	1,173	\$75.10	\$119,772.30	\$1,357,442.08	
18	2.0	14,080	\$2.50	1,564	\$75.10	\$152,656.40	\$1,730,134.78	
19	2.5	14,080	\$2.75	1,956	\$75.10	\$185,615.60	\$2,103,678.62	
20	3.0	14,080	\$3.00	2,347	\$75.10	\$218,499.70	\$2,476,371.32	
21								
22								
23								
24	\$ DIFFERENCE							
25	DEPTH (IN)	\$/MILE	TOTAL \$					
26	1.5	\$38,812.30	\$439,880.08					
27	2.0	\$64,656.40	\$732,784.78					
28	2.5	\$90,575.60	\$1,026,540.62					
29	3.0	\$116,419.70	\$1,319,445.32					
30								

Construction

PROJECT NO. CH2604 HOT IN-PLACE RECYCLE, HMA, & INCIDENTALS CASS COUNTY HIGHWAY 26; FROM STATE HIGHWAY 18 TO INTERSTATE 29 EXIT 85					ENGINEER'S ESTIMATE		Border States Paving PO Box 2586 Fargo, ND 58108-2586	
ITEM	SPEC	DESCRIPTION	UNIT	APPROX. QTY	UNIT COST	TOTAL	UNIT COST	TOTAL
1	103	CONTRACT BOND	L SUM	1	\$25,000.00	\$25,000.00	\$10,300.00	\$10,300.00
2	216	WATER	M GAL	390	\$30.00	\$11,700.00	\$21.70	\$8,463.00
3	302	AGGREGATE SURFACE COURSE CL 13	TON	1,495	\$30.00	\$44,850.00	\$33.90	\$50,680.50
4	411	HOT IN-PLACE RECYCLING	SY	162,450	\$10.00	\$1,624,500.00	\$6.25	\$1,015,312.50
5	430	RAP - SUPERPAVE FAA 43	TON	22,429	\$90.00	\$2,018,610.00	\$75.10	\$1,684,417.90
6	430	HMA INTELLIGENT COMPACTION	L SUM	1	\$30,000.00	\$30,000.00	\$6,770.00	\$6,770.00
7	430	CORED SAMPLE	EA	180	\$50.00	\$9,000.00	\$46.00	\$8,280.00
8	702	MOBILIZATION	L SUM	1	\$200,000.00	\$200,000.00	\$13,400.00	\$13,400.00
9	704	TRAFFIC CONTROL SIGNS	UNIT	1,566	\$3.00	\$4,698.00	\$2.05	\$3,210.30
10	704	DELINEATOR DRUMS	EA	20	\$20.00	\$400.00	\$25.50	\$510.00
11	706	BITUMINOUS LABORATORY	EA	1	\$5,000.00	\$5,000.00	\$2,100.00	\$2,100.00
12	706	CONTRACTOR'S LABORATORY	EA	1	\$5,000.00	\$5,000.00	\$2,100.00	\$2,100.00
13	760	RUMBLE STRIPS - ASPHALT SHOULDER	MILE	19.05	\$1,000.00	\$19,050.00	\$883.00	\$16,821.15
14	762	PAVEMENT MK PAINTED MESSAGE	SF	50	\$15.00	\$750.00	\$15.30	\$765.00
15	762	PREFORMED PATTERNED PVMT MK - MESSAGE (GROOVED)	SF	64	\$40.00	\$2,560.00	\$46.00	\$2,944.00
16	762	SHORT TERM 4IN LINE - TYPE NR	LF	23,838	\$0.25	\$5,959.50	\$0.26	\$6,197.88
17	762	PVMT MK PAINTED 6IN LINE	LF	151,022	\$0.50	\$75,511.00	\$0.13	\$19,632.86
18	762	PVMT MK PAINTED 8IN LINE	LF	333	\$0.75	\$249.75	\$2.05	\$682.65
19	762	PVMT MK PAINTED 24IN LINE	LF	453	\$7.00	\$3,171.00	\$6.15	\$2,785.95
20	990	MATERIAL TESTING	L SUM	1	\$5,000.00	\$5,000.00	\$10,700.00	\$10,700.00
					TOTAL =	\$4,091,009.25	TOTAL =	\$2,866,073.69

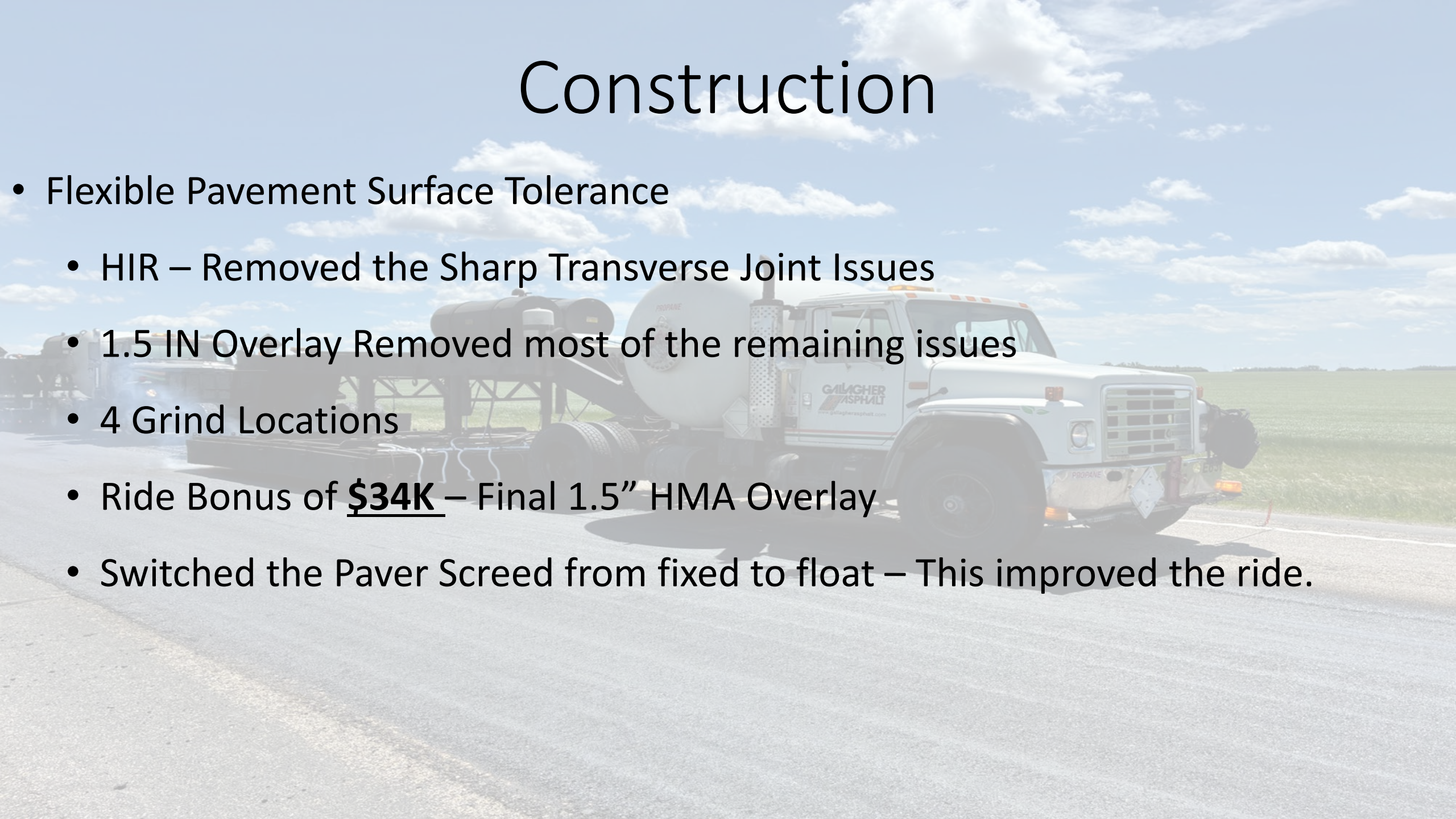
Construction

- Saved Approximately \$65,000 per mile
- \$735K Total Savings



Construction

- Flexible Pavement Surface Tolerance
 - HIR – Removed the Sharp Transverse Joint Issues
 - 1.5 IN Overlay Removed most of the remaining issues
 - 4 Grind Locations
 - Ride Bonus of **\$34K** – Final 1.5” HMA Overlay
 - Switched the Paver Screed from fixed to float – This improved the ride.



Construction

	Existing	HIR	Overlay
Average (Mean Roughness Index) MRI	109.3	113.7	41.6
Average # of Defects per Mile	32.7	3.6	0.7
Price Adjustment per Mile	N/A	Corrective Action	\$3,000.00

Defects were mostly observed at the abrupt changes in the Traverse Cracks.

Construction



Construction

- White Edgeline Centered on Rumble Strip
- Thicker paint flaked off and needed to be removed with a shovel
- Remove before HIR in the future?

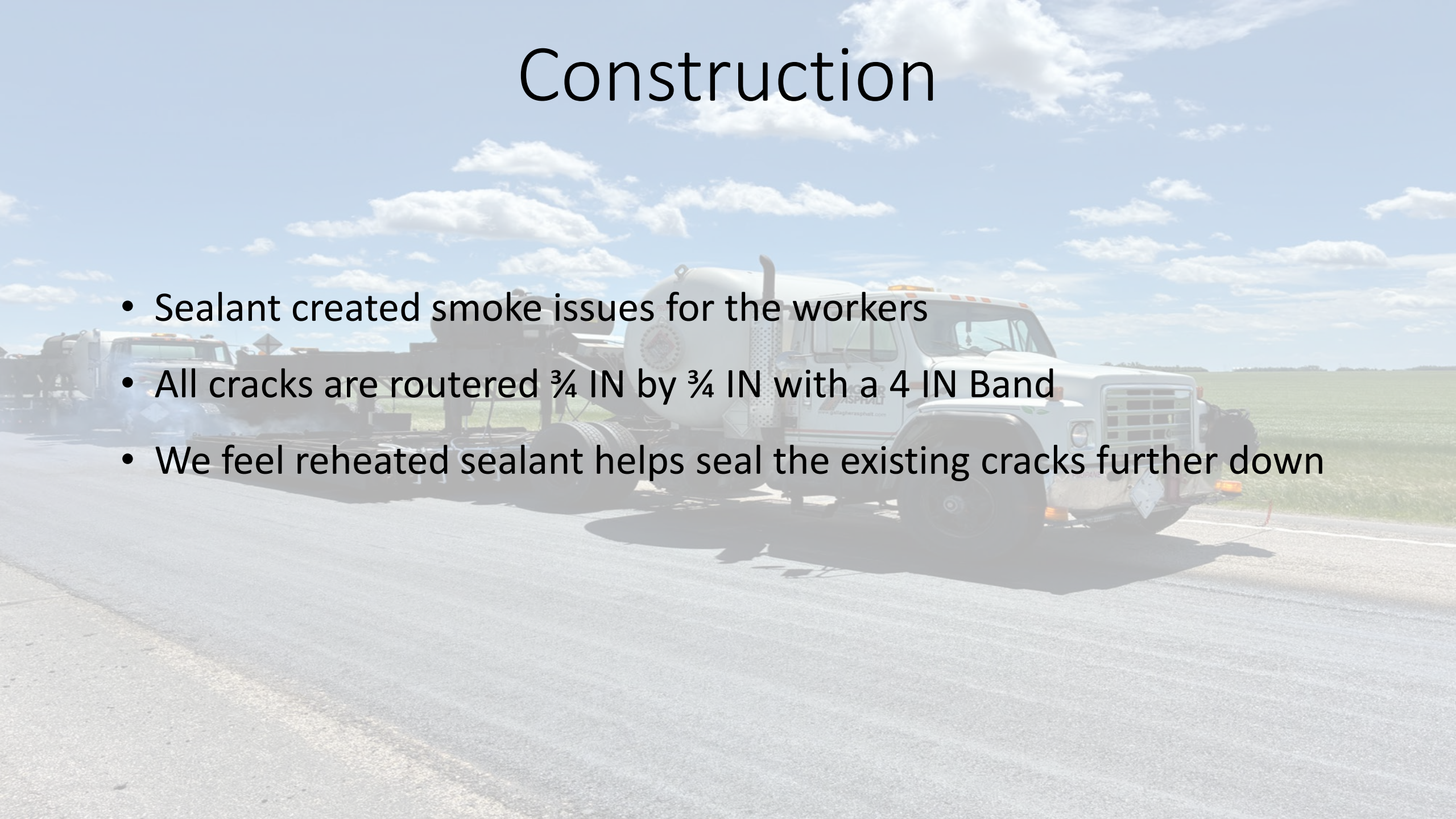


Construction



Construction

- Sealant created smoke issues for the workers
- All cracks are routed $\frac{3}{4}$ IN by $\frac{3}{4}$ IN with a 4 IN Band
- We feel reheated sealant helps seal the existing cracks further down



Construction

Side by Side of HIR



Construction

With 1.5" Overlay



Construction

— *Welcome* —
**GALLAGHER
ASPHALT**

..... **TO**
CASS COUNTY
— HIGHWAY DEPARTMENT —

HOT IN PLACE RECYCLING
★ **DEMO DAY** ★



10:30AM-12:00PM

DEMO PRESENTATION

Learn about hot in place
recycling technology,
process, and benefits.



LUNCH

Provided for all attendees.



SITE VISIT

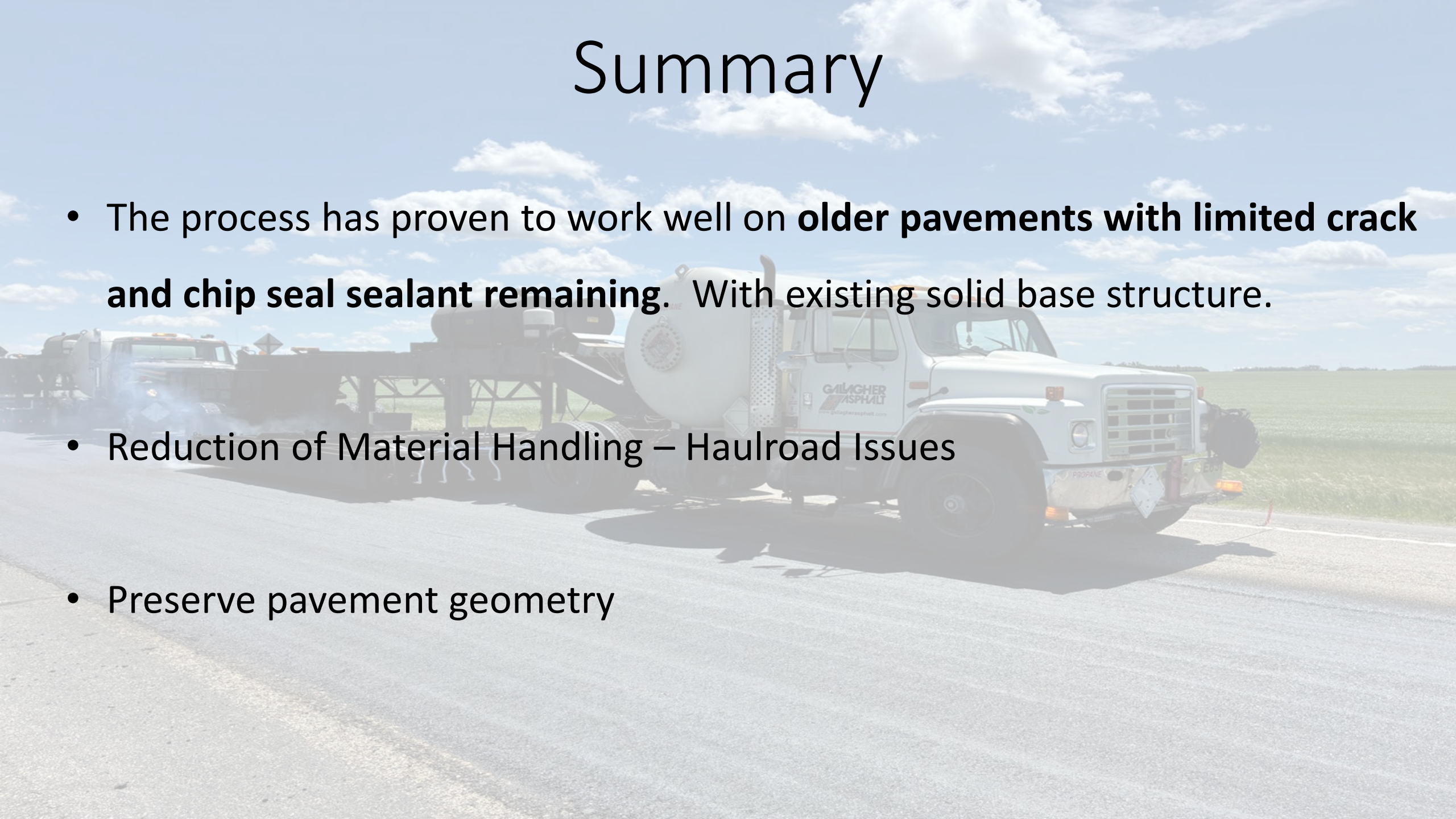
Visit a local construction
site to see Hot in Place
Recycling in action.



THANK YOU FOR
JOINING US AS WE
BUILD BETTER ROADS
THROUGH INNOVATION
AND PARTNERSHIP.

Summary

- The process has proven to work well on **older pavements with limited crack and chip seal sealant remaining**. With existing solid base structure.
- Reduction of Material Handling – Haulroad Issues
- Preserve pavement geometry



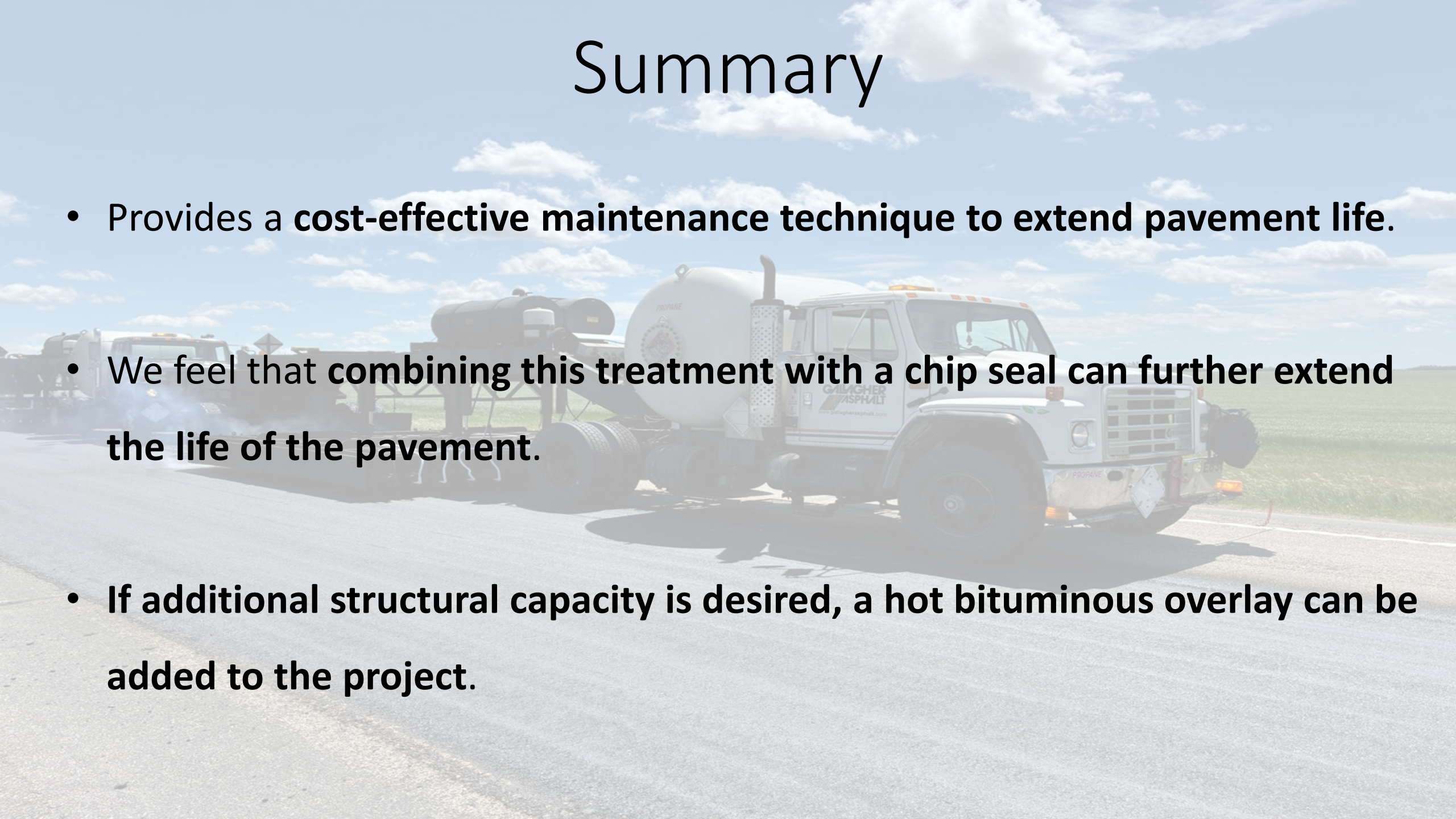
Summary

- It effectively improved the top 1.5 inches of pavement ride and thermal penetration of 3 inches plus.
- Project Size of at least 75,000 SY for competitive pricing.



Summary

- Provides a **cost-effective maintenance technique to extend pavement life.**
- We feel that **combining this treatment with a chip seal can further extend the life of the pavement.**
- If additional structural capacity is desired, a hot bituminous overlay can be added to the project.



A white propane delivery truck is parked on a paved road. The truck has a large white cylindrical tank with 'PROPANE' written on it. It is pulling a flatbed trailer. In the background, another similar truck is visible. The sky is blue with scattered white clouds. The word 'Questions?' is written in a large, black, sans-serif font across the middle of the image.

Questions?