

HIR in Washington State

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Ontario, California

September 11 – September 13, 2012



Overview

- HIR Candidate Projects
- Recommendations for not using HIR
- Why HIR
- WSDOT HIR History
- SR 542



HIR Candidate Projects

- 2.5 to 3 inches of existing HMA
- Surface distress within the HMA layer only, no base or subgrade failure
- Weathered/oxidized pavements
- Sites with limited aggregate supplies
- Rutted roadways
- Roadways with generally uniform materials
- Traffic and geometrics
- Experienced contractor is beneficial



HIR Projects Recycling - Not Recommended

- High ADT – delay concerns
- Urban environments
- Structural problem in subgrade
- Excessively inconsistent pavement width
- Flushing or bleeding pavement
- Multiple pavement types
- Multiple physical obstructions



Why HIR?

- Driving Factors
 - Diminishing natural resources
 - Conserving energy, fuels and aggregates
 - Construction costs
 - Construction advantages
 - One operation – avoids the need to mill and fill as separate operations
- Standard practice for British Columbia, some states

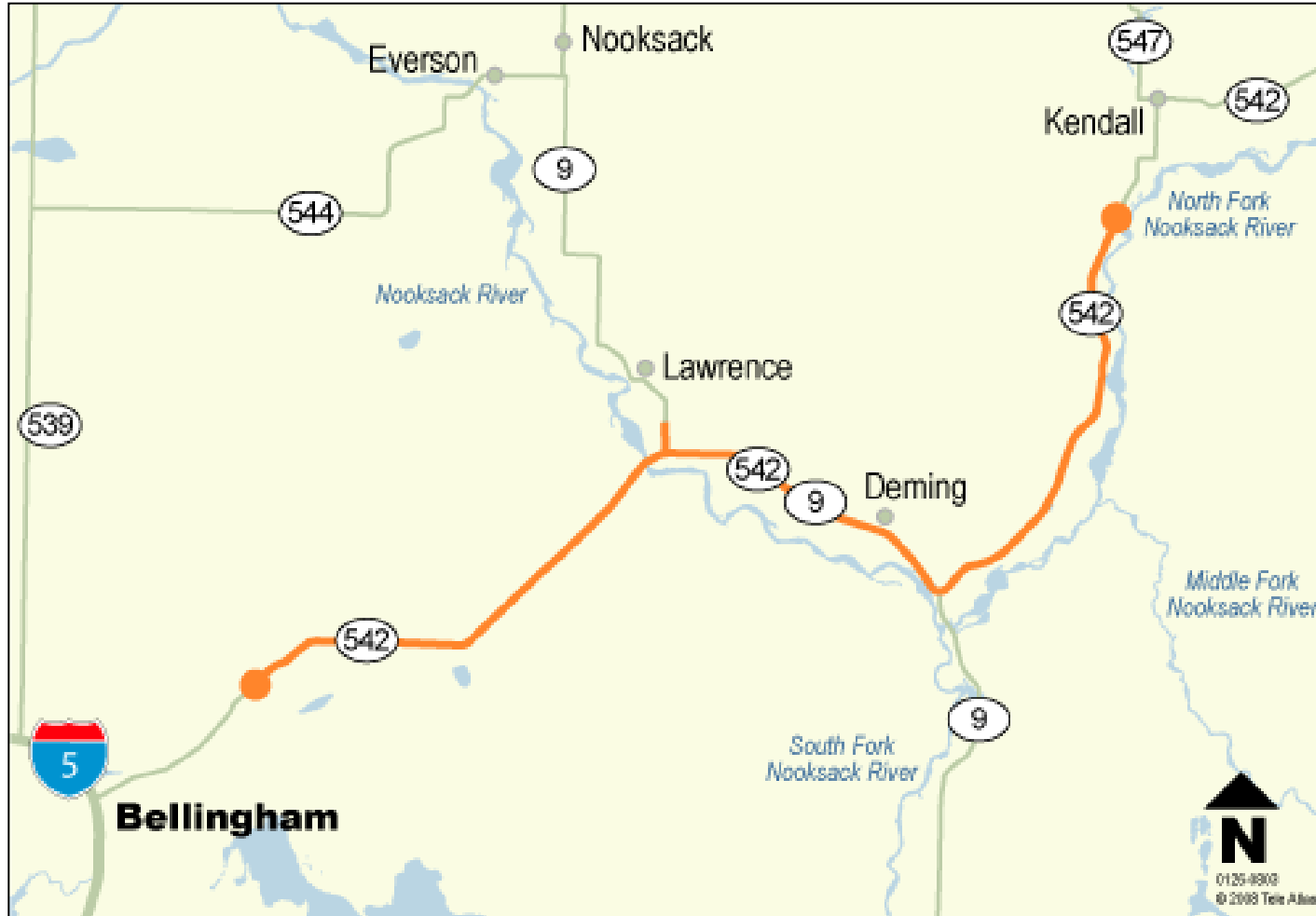


WSDOT HIR History

- 1995 HIR project
 - South Central Region (Yakima) overlaid with OGFC
- HIR has been considered for use by WSDOT in the past – “Things never worked out”
 - Existing fabric
 - High asphalt binder content
 - Traffic impacts
- SR 542 construction east of Bellingham (2009)



WSDOT HIR 2009



SR 542 Project

- Constructed August/September 2009
- Contractors
 - Granite Construction – Prime
 - GreenRoads Recycling – HIR Subcontractor
- 31 lane miles constructed
- ADT
 - 5,400 to 12,500
- Pavement Structure
 - 0.40' to 0.60' HMA over 0.50' PCCP or 0.60' to 1.25' Crushed Stone Base



SR 542 Project

- HIR Recycled 1.75 to 2 inches of surface distressed “only” pavement
- Coordination Meetings
(WSDOT/Industry/Granite/GreenRoads)
 - August 11, 2008 (WSDOT/Industry Workshop)
 - January 12, 2009 (Project Awarded)
 - May 4, 2009 (HIPR Orientation)
 - June 5, 2009 (Test Plan Meeting)
 - July 17, 2009 and August 5, 2009 (Project Meeting)
 - November 5, 2009 (HIPR Recap Meeting)



SR 542 Project

- Recycled Mixture
 - Existing reclaimed asphalt pavement (RAP)
 - 5.8 percent asphalt binder, PG76-16
 - “Make-up” mixture
 - 20 percent with 4.5 percent asphalt binder
 - BC gradation (graded aggregate seal)
 - Recycling agent
 - 0.20 to 0.25 percent



SR 542 Project

- Construction
 - Two stage process with equipment manufactured by Pyrotech and modified by GreenRoads
 - Conventional compaction equipment/roller pattern
 - Constructed in 25 working days
 - Average 10 hour shift
 - 1.3 lane miles per shift



Mix Design/Calibration

Issues

- What Mix design?
- Not able to replicate HIR process
 - Used gyratory volumetrics to determine VA
- Trial blend process
 - Done by Contractor (Prime)
 - Core samples used with “admixture” gradation (empirical design)
- Final HIR Contractor (Sub) recommendations
 - HIR made “admixture” adjustments based on experience
- Samples were taken during production
- In-place density used to determine feasibility of use



Mix Design/Calibration (cont.)

What is working for emulsion based HIR

- Slight adjustments made for variability
- Adjustment recommendations by Contractor's staff
- Adjustments are monitored and documented



Challenges faced for using HIR

Issues

- Mix calibration is always a “discussion”
- Inspectors/decision makers feel very uncomfortable for a process in which they have little control
- One major failure will stunt future HIR work in Washington
- Contractor experience



Contractor Experience

- Have they properly constructed a HIR project?



Contractor Experience

- The operation is “like” a paving operation



Contractor Equipment

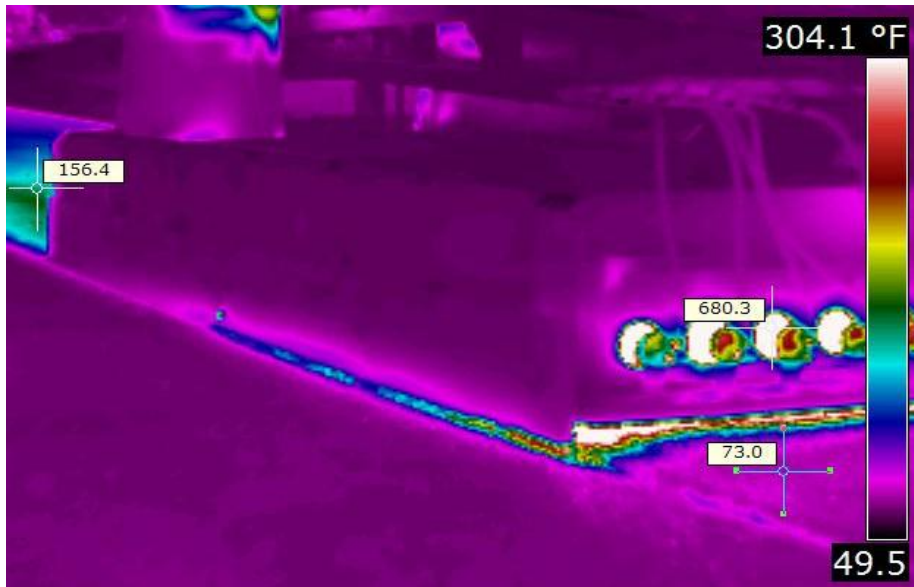




green roads
recycling

GVW33 000lbs

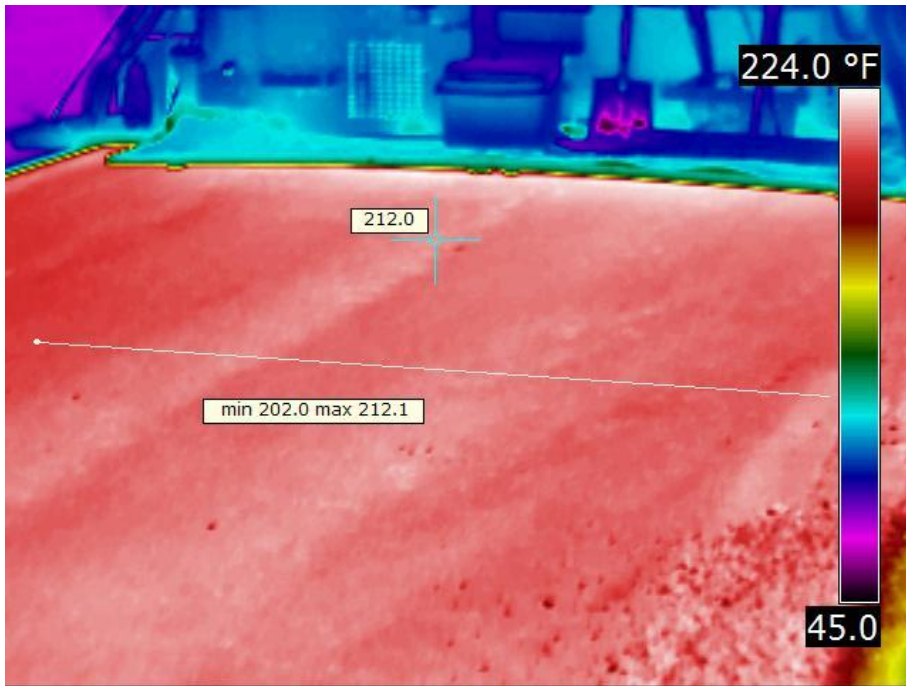
Contractor Equipment





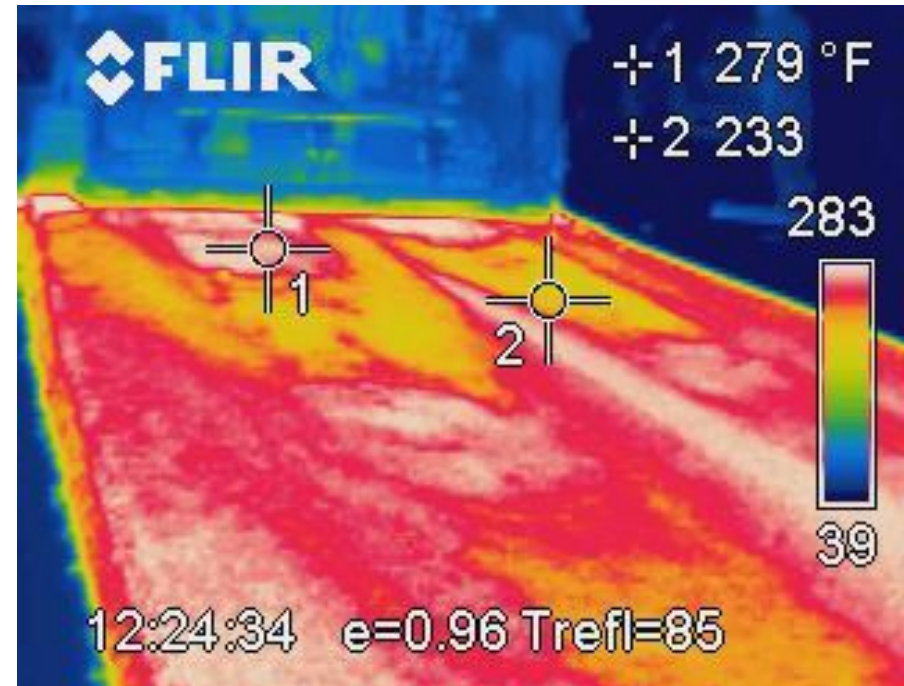
SR 542 Results

Hot In-Place



220 -230 F Typical compaction temperature

End Dumped HMA



Material Conservation, Energy and Emissions

Operation	Width	Project Value			
		Energy, BTU	CO _{2eq} (lb)	Asphalt (ton)	Aggregate (ton)
2 inch HMA Inlay	Shoulder to shoulder	19,735,400,000	3,265,000	1,533	27,950
2 inch HMA Inlay	Lanes only	16,916,060,000	2,789,000	1,314	23,957
2 inch HMA Overlay	Shoulder to Shoulder	18,150,370,000	3,007,000	1,533	27,950
2 inch HMA w/ 20 percent RAP Inlay	Lanes only	15,843,750,000	2,624,000	1,112	19,105
2 inch HIR - remixing	Lanes only	13,022,140,000	1,960,000	159	3,836

Source: Granite Construction 2009



HIR Performance

Project	Original HIR Construction		2010	
	Year	Depth	PSC	PRC
SR 97	1999	1.48	52	69
SR 542	2009	0.90 - 1.39	97	72 - 91



Current Performance



Current Performance



Current Performance



Current Performance



Current Performance



Current Performance



WSDOT HIR Results

- Less construction noise
- No abrupt lane edge during construction
- Reduced traffic disruptions
- Limited by geometrics – turn lanes
- Night joints need to be sealed
- Total HIR cost \$165,000 lane/mile vs. \$200,000 lane/mile for traditional HMA mill and fill
- The SR 542 project shows there is potential for HIR in Washington State
- Life cycle break even cost is 12 years (based on typical 16 year HMA life in Western Washington)



Thank You

www.wsdot.wa.gov/research/reports/fullreports/738.1.pdf

