# FDR in Utah

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# Outline

- History
  - Success
  - Failures
- Present Times
  - FDR Program
  - Specification
  - Selecting Projects

# Recycling History

- 3 or 4 FDR projects (depending on definition)
  - SR 21: 23 Years ago
- 2% Portland Cement Slurry
  - Recipe/Expected 250 psi @ 7 days
- CIPR for 20+
- Several HIPR projects

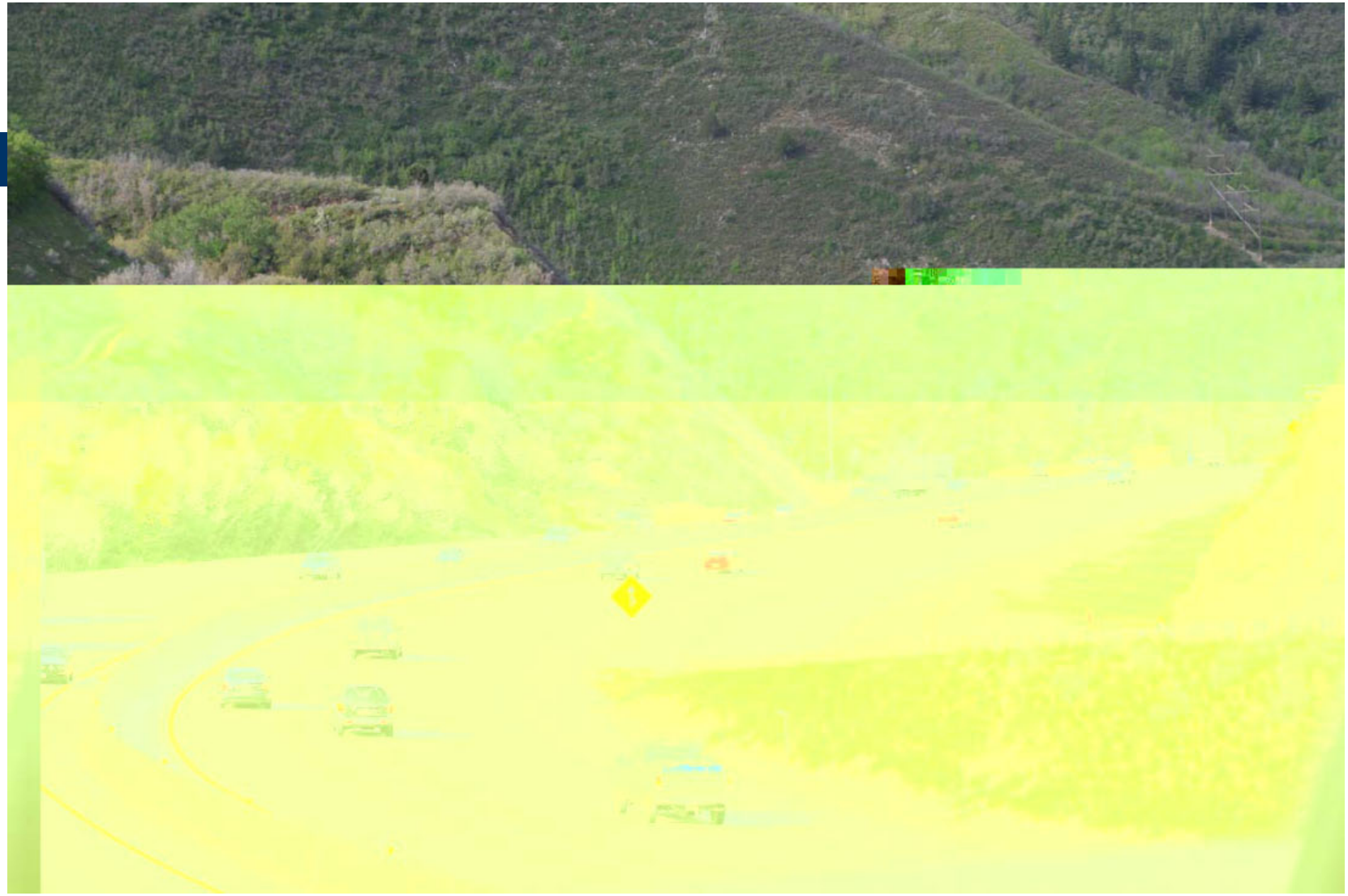
# Successful History

# Parley’s Canyon

- Flagship Project?
- Canyon Climb – 3000’ in 10 miles
- 2 degree curves
- I-80, Connecting Salt Lake City and Park City

# Parley's Canyon

# Parley’s Canyon



# Parley’s Canyon

# Pavement Condition

- Much of Superelevation either gone or in reverse
- Significant structural failures in truck lanes
- Lots of asphalt surfacing
- Minimal base, in poor condition

# Design Parameters

- 20 year design period
- Replace Asphalt Surface
  - (Marshall to SuperPave)
  - PG 70-28
- Design Traffic
  - 50,000 AADT
  - 8+% Trucks (slow moving)

# Solution
**(from notes and memory)**

- Profile Milling (wire guide)
- 8” (+1”) of 2% Portland Cement treated material (varied from 0% to 100%) existing base, rest was existing HMA
- Capped with 7” of SuperPave
- 1” OGSC

# Project Notes

- Cement Treated Layer done in two steps
  - Original pulverization and grading
  - Addition of Portland Cement and compaction
- Had 30 minutes to get treated materials to grade
  - Original pulverization had to be within 1” of final grade before adding cement
- 1” fluff in materials after final compaction

# Concept Comments

- Happened because of Industry involvement
- Was cost effective
  - $500k out of $8M
- Had little trouble, even with grades and super-elevations.

# Not so Successful History

# I-80 HIPR

- I-80 MP 20 to 30
- 2” HIPR in 1992
- Microsurfacing over the top in 1993
- HIPR layer stripped severly, leading to significant ruts

# SR-36, North of Tooele

- 8 mile stretch of 5 lane arterial
- New construction on A-6/A-7 materials
- Intent, with encouragement from industry, was to treat the existing subgrade and base and pave over
- NO SUBCONTRACTORS BID ON PROJECT
- $1,000,000 change order for fabric and base

# Why did we stop?

- Normal cautiousness
- Constant change in Pavement Design Engineers
  - Learning curve
- No real Industry push
- Base aggregates were cheap

# Present Times

# UDOT FDR Program

- Costs for materials increasing
- Trend towards recycling
- Good success on CIPR projects
- **Industry involvement (SEM Materials)**

# Recent Projects
**(not ours)**

- Two LG Projects in St. George
  - 8” of FDR plus 2” HMA cap
- Monticello Airport (wet grade)

# Design Process/Thoughts

- Little or no base present
- Varying depths and layer of surfacing
- Typical savings in the areas of $500k in $3 to $5 M (10+%)
- Intended to last the life of the road
  - Could be perpetual
- $a_i$ = 0.16 to 0.28
  - Mr = 120 ksi to 150 ksi

# Specification

General Outline:

- Pulverize the existing in-place material
- Moisture condition pulverized material
- Mix with emulsion
- Place to line, grade and compact

# Specification

Acceptance Criteria:

- Gradation (2” minus on pulverized material)
- Quality of emulsion
- Compaction (97% of daily curve)
- No mix verification yet
  - Working on Resilient Modulus Testing
  - SEM’s business based on success

# Specification

Mix Design:

- Performed by Contractor/Supplier

| | *Coarse* | *Fine* |
|---|---|---|
| Short-term strength test, 1 hour | 80 min. | 75 min. |
| Indirect tensile strength (ITS) | 40 min. | 35 min. |
| Conditioned ITS | 25 min. | 20 min. |
| Resilient modulus | 150 min. | 120 min. |
| Thermal cracking (IDT) | See note in appendix | |

# Specification

Contractor QC:

- Pre-Construction Meeting
- Moisture Content of Pulverized Material
- Emulsion Content
- Depth Control
- Contour and Profile
- Moisture Content before Surfacing

# This Summer and Next

- Two Projects in R4
  - SR 491: 8” FDR + HMA/SMA
  - SR 10: 12” FDR + HMA/SMA
- Four Projects in R2
  - SR 68, SR 171, SR 48, SR 71
  - All are 6” FDR + HMA/OGSC

# Selecting Projects

(Still working out this one)

- Varying or multiple layers of HMA
- Low priority for Rehabilitation funding
- Minimal existing base
- Profile can be raised
- Distance from good materials sources
- Comparable to a remove and replace with 8” to 16” of new base course

# Dangling Participles

- Solventless Emulsion perceived as Proprietary
- Need verification of strength and durability
  - BYU Research Project
- Concerns about permeability
- Need to get to Resilient Modulus Testing
- Varying Depths of application
- Contractor's business is based on a successful project

# Summary

- FDR has a foothold in Utah
  - Reduces cost
  - Recycles materials
  - Speeds up construction
- A few things to work on
  - Validation of design criteria
  - Get past some bad tastes
- Industry involvement was a key!!

# Questions?