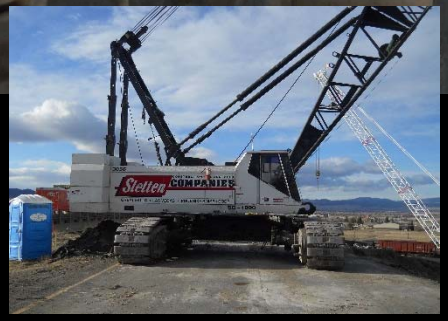
Western Bridge Engineer's Seminar - 2017

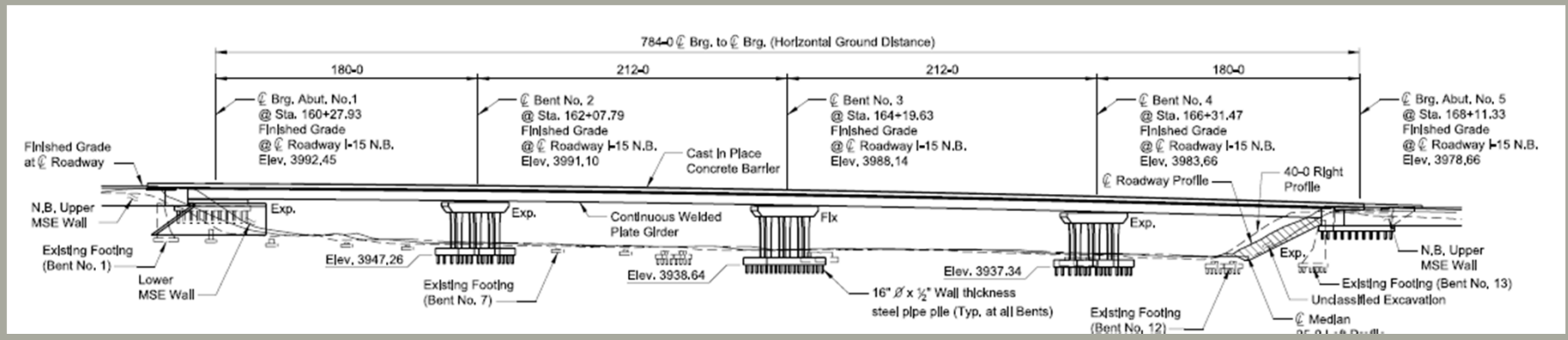
I-15 Capitol-Cedar Interchange Bridges – Helena

Stephanie Brandenberger, PE
MDT, Helena, MT

Dustin Hirose, PE
HDR Inc. Missoula, MT



Front-End Planning Mitigates Construction Risks



Capitol - Cedar Interchange

Helena, Montana

Acknowledgements

Montana Department of Transportation (MDT)

Federal Highway Administration (FHWA)

Montana Rail Link (MRL)

HDR

Tetra Tech

Sletten Construction

City of Helena

Project Overview

- EIS – Interstate 15 corridor, Helena area
- Location:
  - Helena urban, east side
  - 1 mile between Capitol & Cedar Interchanges
  - Crossing MRL railroad tracks and City street
- Conditions:
  - Functionally obsolete bridges
  - High crash rate
  - Vulnerable to collapse – seismic & impact
- Purpose:
  - Improve safety and operational efficiency
  - Provide auxiliary lanes in each direction
  - Replace functionally obsolete, seismically deficient bridges
  - Reduce noise impacts

Historic Construction

Same Challenges

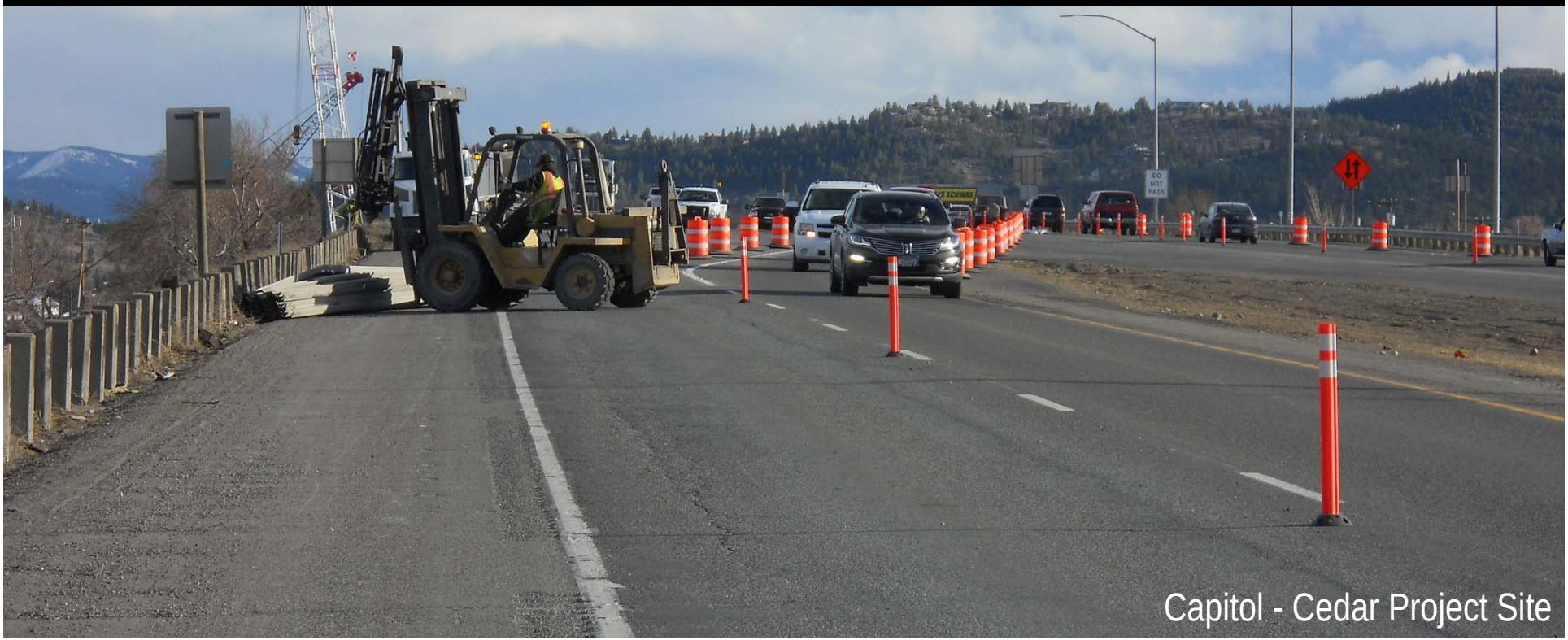
Challenges

- Railroad proximity

Capitol - Cedar Project Site

Challenges

- Railroad Proximity
- Maintain traffic & interchange operations



Capitol - Cedar Project Site

Challenges

- Proximity to railroad
- Maintain traffic & interchange operations
- Winter shutdown

Challenges

- Railroad Proximity
- Maintain Traffic & Interchange Operations
- Winter Shutdown
- Right of Way / Noise Barrier Wall
- Storm Water
- Utilities
- FAA Review and Permitting
- City Coordination
- Work Zone Safety
- Oversized Loads
- Contaminated Soils

Solutions and Opportunities

- Identify Risks Early
- Investment in Mitigation Strategies
  - Pile Test Program
  - Constructability and Scheduling Analysis
  - Railroad Coordination
  - Alternative Technical Concepts
  - Traffic Analysis
- State of the Art Anti-Icing System

Bridge TSL Study

- Identify & Mitigate Risks
- Comprehensive study
- Coordination with stakeholders and other disciplines to develop best overall alternative
- Bridge TSL was a two Phase Process:
  - Phase 1: Initial screening to look at all possibilities (23 alternates)
  - Phase 2: Evaluate probable options in more detail (6 alternates)
- Two concepts advanced into final design:
  - Spliced PS/PT Concrete Girder
  - Welded Steel Plate Girder

New Bridge

- Steel alternate prevailed
- Four spans (180-212-212-180) = 784’
- Two separate bridges providing 4 lanes in each direction
- Weathering Steel

Railroad Coordination

- MRL key stakeholder
- Develop a partnership with the railroad
- Engage the railroad throughout project development

Railroad Coordination

- Understand rail yard operations
- Geometric requirements - Clearances
- Identify track work windows
- Site Access, staging areas, and temporary track crossings

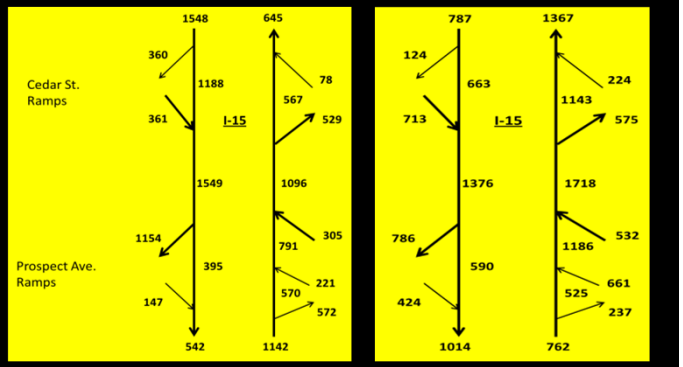
Railroad Coordination

→Key results of the coordination:

- Obtain buy-in from MRL
- Develop a cost effective design
- Reduce construction risk

Construction Sequencing

- Staged construction required
- Traffic analysis to develop the TMP
- Emergency detour plan required
- Need to build one bridge in a single season



Construction Sequencing

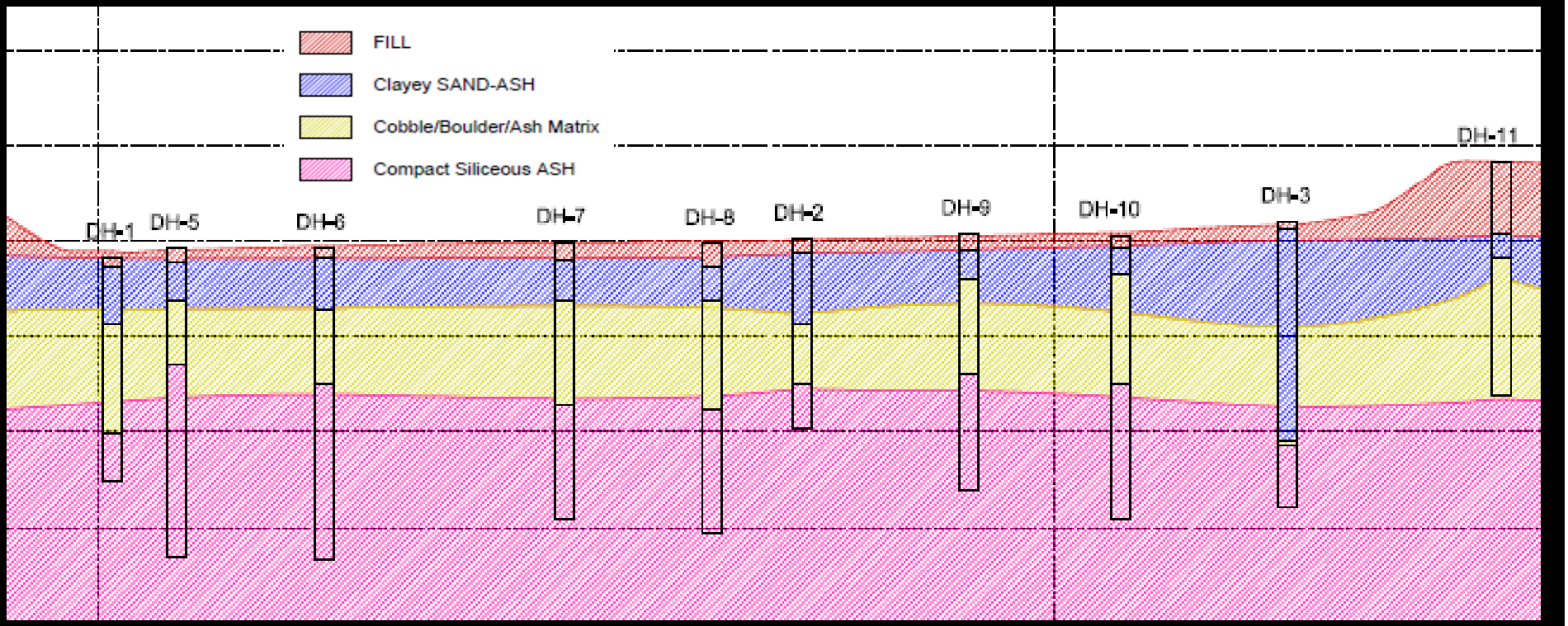
- Develop cost and schedule from a contractor's perspective
- Constructability review and detailed analysis of sequencing
- Build one bridge per season conventionally or utilized ABC?
- Estimate bid prices considering:
  - Materials (permanent and expendable)
  - Workforce: Labor Categories, Additional Crews
  - Risk: Where to include profit/contingency
- Better define project cost

Foundation Testing

- Foundation construction – critical element
  - Limited room to construct
  - Disruption to rail operations
  - Schedule implications
  - High cost
- Obtain early geotechnical recommendations

Foundation Testing

- Drilled shafts
  - Geotechnical capacity – OK
  - Structural capacity – OK
- Piles
  - Cons: May refuse early on shallow cobble/boulder layer and require a large footprint
  - Pros: Faster installation, lower cost, more redundancy
  - Pile test program warranted



Foundation Testing

- Conducted Pile Test Program early in the design phase
- Verified capacity & reduced pile footprint
- Program cost = $200,000
- Estimated Cost Savings = $3M
- Estimated Schedule Savings – 20 days

Conclusions

- Total project cost: $32M
- Steel bid ~ $1.10 per pound
- Construction ahead of schedule

→ Front end planning reduces risk

Questions?

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