

Bentley

Alan Carter

Sr. Transportation Engineer,
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Illuminate
2025
Atlanta



Leveraging Data and Technology: I-70 Floyd Hill to Veterans Memorial Tunnels Project

Introduction



We are a world-leading design, engineering and project management organization. We connect people, data and technology to transform the world's infrastructure and energy systems.

Safety, Integrity, Innovation, Collaboration, and Excellence



Alan Carter, P.E.
Project Director

38k+ people **50+** Countries **130** nationalities

Buildings & Places	Defence	Industrial	Minerals & Metals	Nuclear	Power & Renewables	Transportation	Water

Consulting, Strategy & Advisory	Engineering & Design	Project & Program Management	Project Delivery	Operations & Maintenance	Capital	Decommissioning

Project Description

Owner: Colorado Department of Transportation (CDOT)

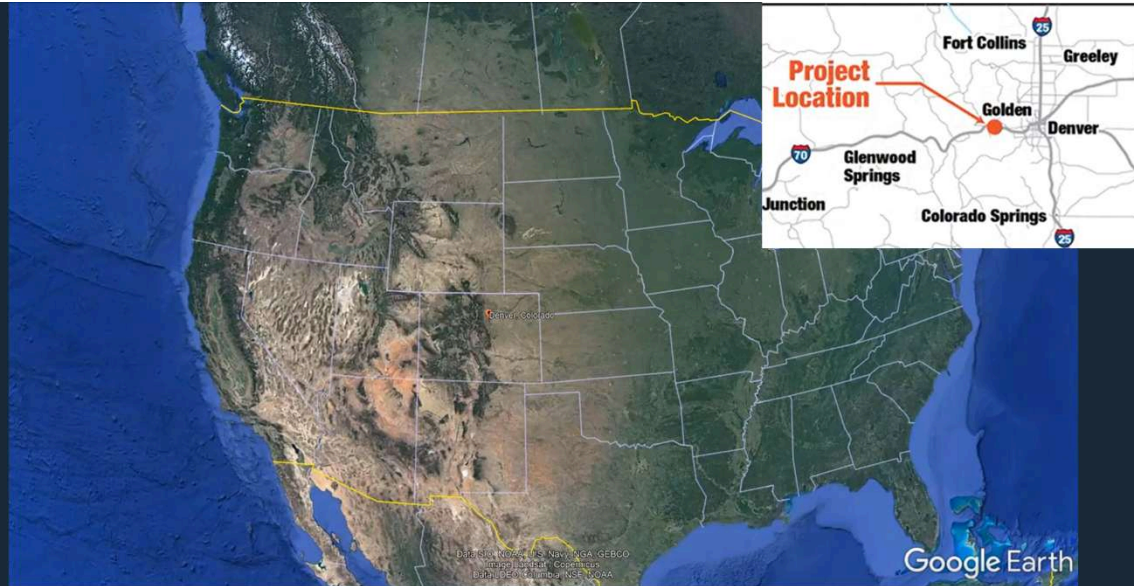
Project Location: Colorado – United States

- I-70 from Floyd Hill to Veterans Memorial Tunnels, 7 miles (11 km) in length

Project Purpose: Address traffic congestion, substandard geometry, and aging infrastructure

Project Goals:

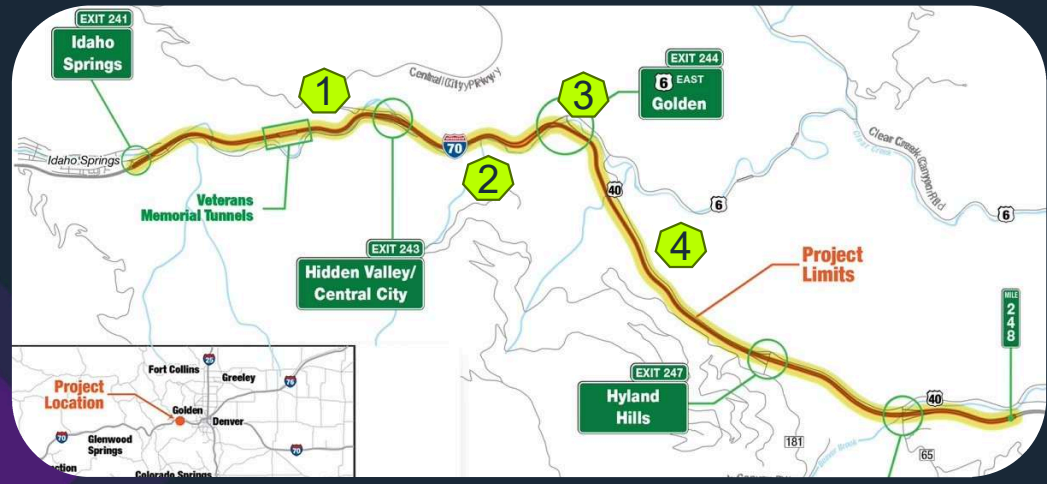
- Improve Safety, Mobility, Operations, & Maintenance
- Minimize Construction and Economic Impacts through Innovation
- Stakeholder Commitment and Partnership
- Enhance Environmental Stewardship



“Looking forward to improvements to reduce congestion for residents, improve quality of life, improve safety, and increase travel options”

Pete Buttigieg, US Transportation Secretary

Project Challenges



West Section



- Substandard geometry, narrow shoulders
- Proximity of rock face

Central Canyon



- Insufficient curve radii, limited SSD
- Proximity of clear creek

Bottom of Floyd Hill



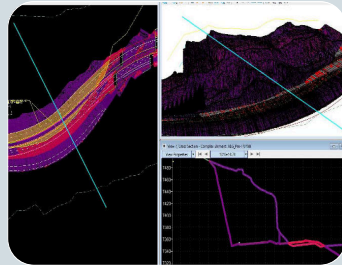
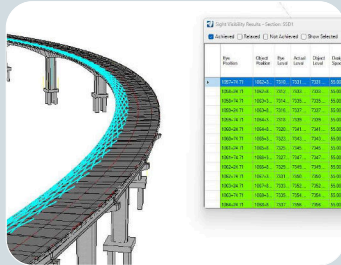
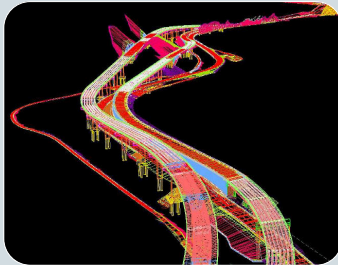
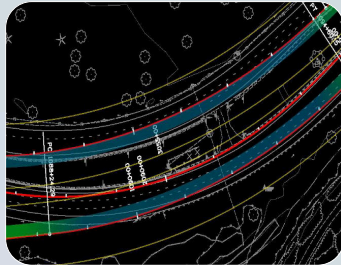
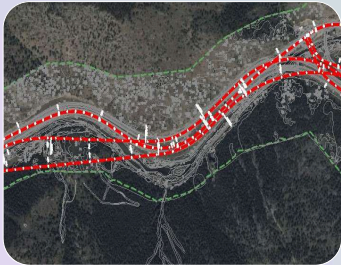
- Sharp curves, narrow shoulders at the bottom of steep downgrade

East Section



- Long, steep downgrades
- Existing rockfall issues

Alternatives Analysis – 3D Modeling



Horizontal and Vertical Alignments

- Quick layouts using Geometry tools
- Dynamic profile adjustments

Speed Tables / Superelevation Sections

- Automatic calculations
- Immediate feedback

3D Models

- ORD for roadways
- OBM for bridges
- Dynamic cross sections

Sight Distance Calculations

- Sight Visibility analysis tools
- Immediate checks for adequate shoulder widths

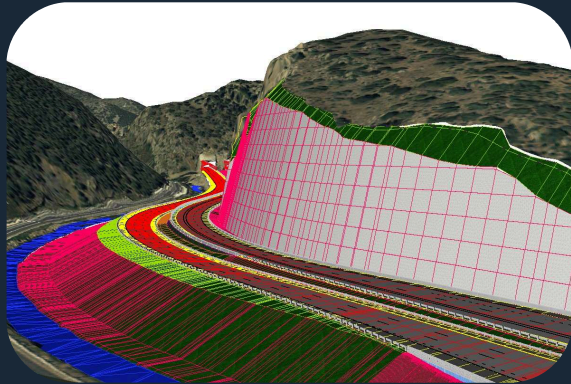
Earthwork Quantities

- Cut/Fill Volumes
- Quantities by Named Boundary for rock excavation areas

Alternatives Analysis - Visualization

- **I-70 Mountain Corridor Context Sensitive Solutions (CSS Process)**
 - Establishes community values such as aesthetics, sustainability, safety, and accessibility
 - Stakeholders include local municipalities, environmental agencies, recreational user groups, and more

- **LumenRT for Visualizations**
 - ORD and OBM 3D Models directly exported to LumenRT
 - LumenRT 360 for lightweight, shareable model distribution



West Rock Cut and Reality Mesh

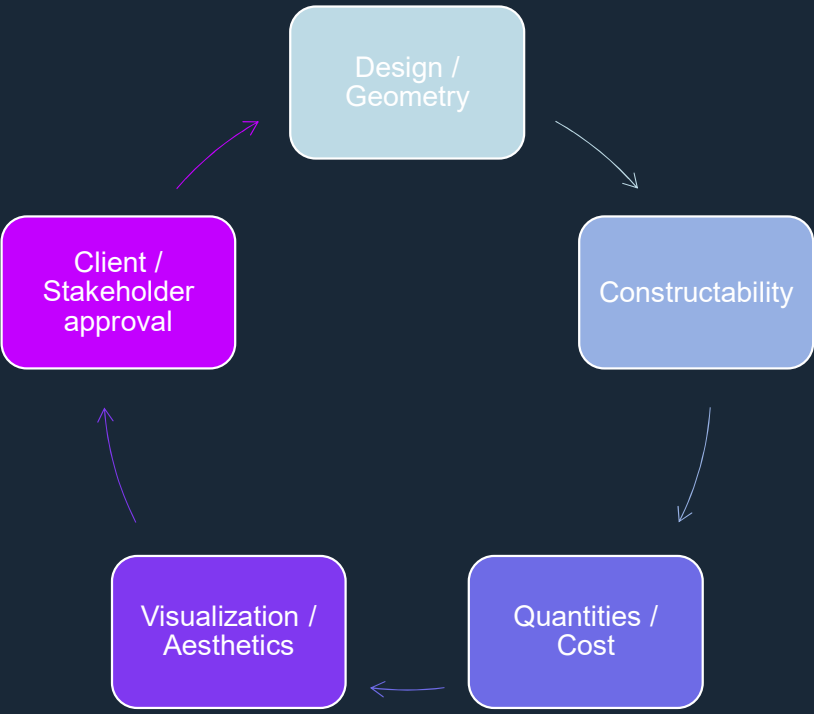
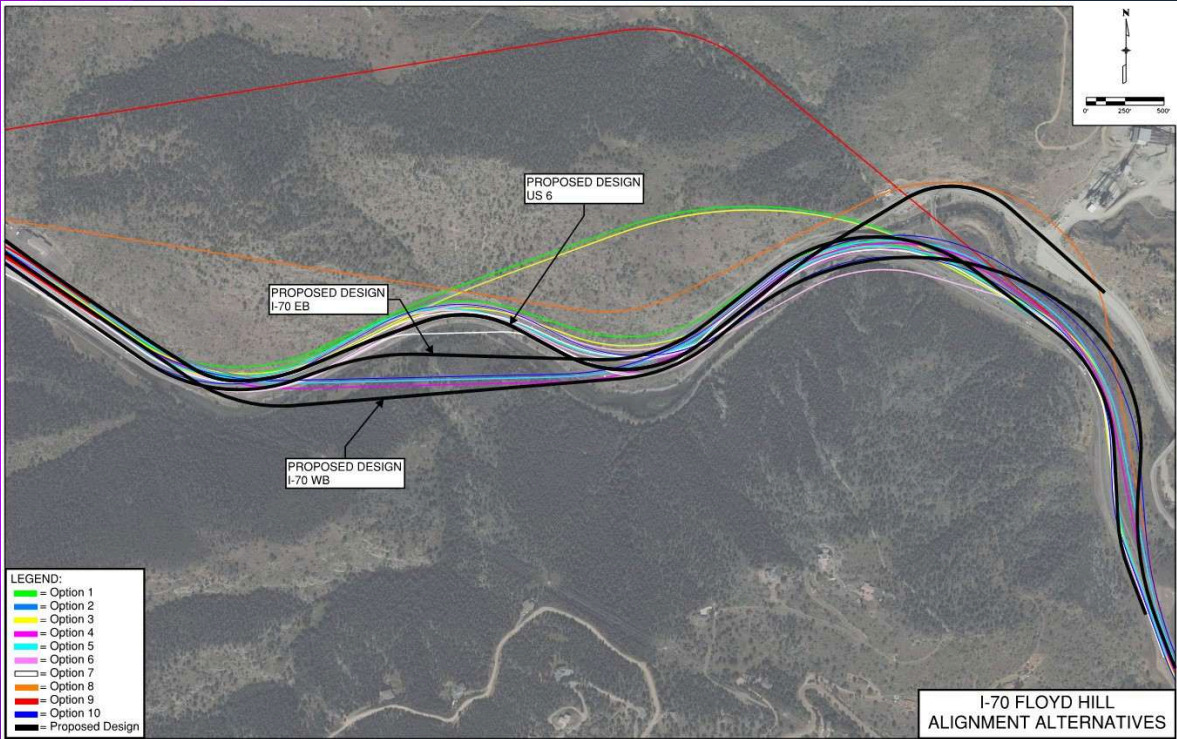


WB Viaduct and Reality Mesh

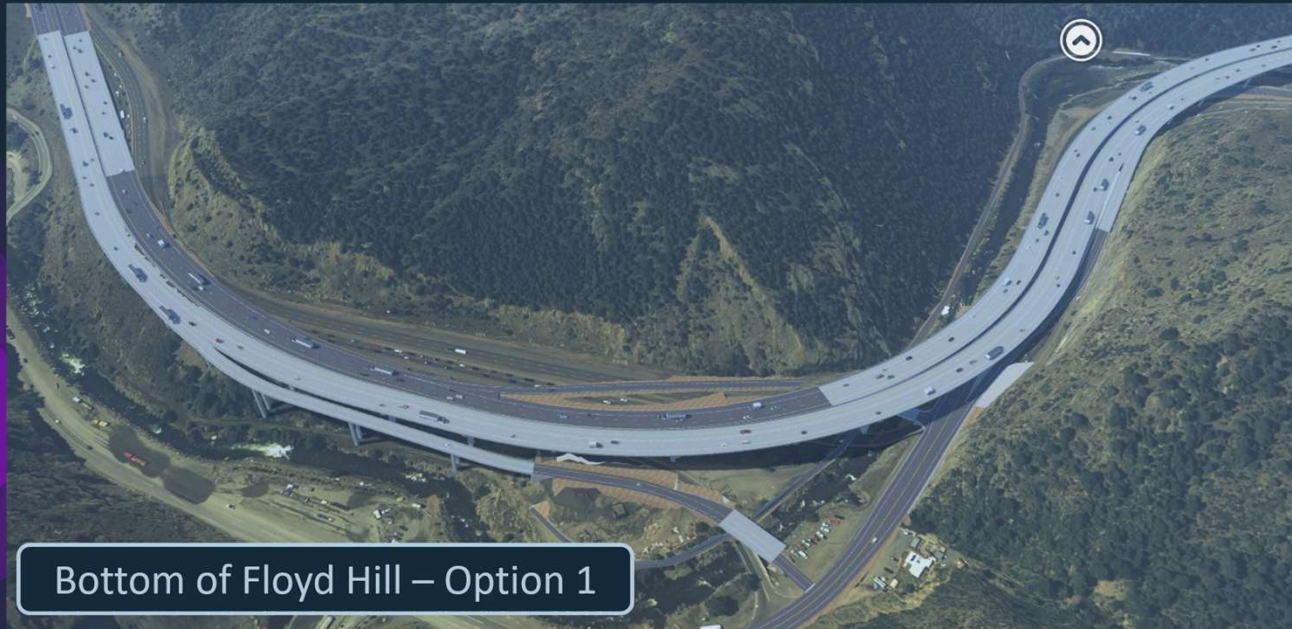


LumenRT 360 of Preferred Alternative

Alternatives Analysis - Process



Alternatives Analysis - Process



Bottom of Floyd Hill – Option 1

Optioneering of Alternatives

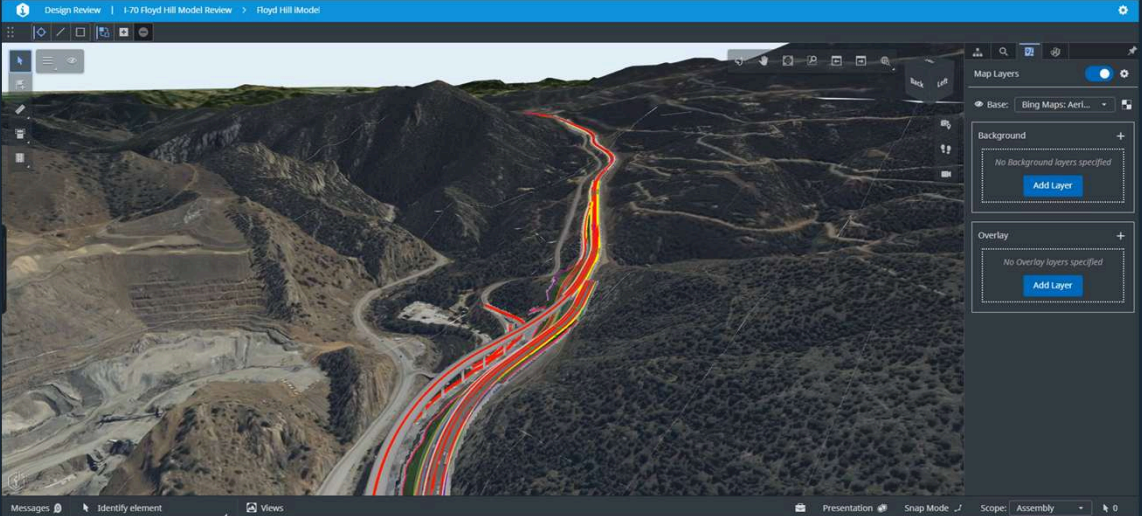
By utilizing *OpenRoads Designer* and LumenRT to quickly evaluate and visualize construction impacts, quantities, cost, and constructability, a preferred alternative that best met the project goals was selected out of dozens of alternatives

Preferred Alternative



Project Execution – Final Design

- Bentley Software Playbook
 - Projectwise – CDE
 - iTwin – Digital Twin facilitated real-time review of design progress
- Project Team: 190 users from 10 offices throughout US
- Project deliverables: 3,200+ page planset plus cross sections



iTwin for enhanced collaboration

Project Execution - Construction

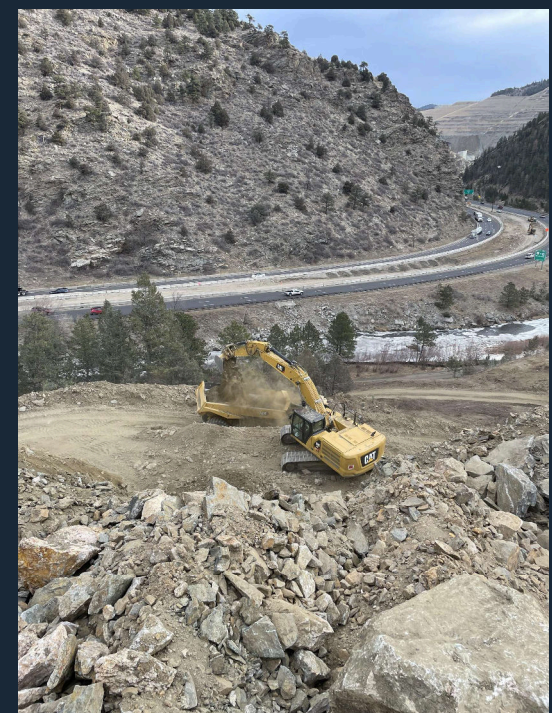
- Contractor: Kraemer North America
- Estimated project cost: \$905 million
- Construction began in July 2023
 - East Section - July 2023
 - West Section – March 2024
 - Central Section – May 2025
- Construction expected to be completed in 2029



East Section soil nail walls



West Section rock blast



Central Section excavation

Project Execution - Construction



LumenRT rendering of Central Canyon



Aerial photo of Central Canyon construction (3/28/25)

Project Achievements

- **Goal:** Improve Safety, Mobility, Operations, and Maintenance
 - **Achievement:** Selected an alternative meeting higher design speeds and added capacity while improving connectivity. Enables safer, more consistent travel through corridor
- **Goal:** Minimize Construction and Economic Impacts through Innovation
 - **Achievement:** Reduction of rock cuts, bridge lengths, and impacts to the creek and canyon
- **Goal:** Stakeholder Commitment and Partnership
 - **Achievement:** Interactive visualizations allowed input and consensus from stakeholders throughout design process.
- **Goal:** Enhance Environmental Stewardship
 - **Achievement:** Eliminate impacts and improve access to the creek while enhancing riparian areas. Reduce noise by relocating I-70.



“The Floyd Hill project will upgrade an essential tract of I-70, boosting our mountain economies and easing congestion so Coloradans can access the great outdoors”

John Hickenlooper, US Senator

Conclusion

- Collaborative Design Transparency
 - Bentley tools facilitated real-time review of alternatives resulting in rapid design progression
 - Realistic visualizations contributed to stakeholder and public endorsement of solutions to meet project goals
 - Bentley technology solutions bridged the gap between engineers, proposed designs, and public.



Government Officials and CDOT Executives at Groundbreaking



Rendered view of Proposed I-70



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