



SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

# Fort Goff Creek Bridge R04 ABC Project


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AASHTO
The Voice of Transportation

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# Fort Goff Creek Bridge

**Lead Adopter**

**SHRP2 Solutions Innovative Bridge Designs for Rapid Renewal**

# Fort Goff Creek Bridge


**Fort Goff Creek Bridge Streambed Restoration Project**

- California law requires unimpaired passage for all anadromous fish at stream crossings
- Replace 60-year-old culvert with 60’ long single span bridge

# Fort Goff Bridge

## Multiple Funding Sources


Fisheries Restoration Grant Program (FRGP) [capital]

**Cal Department of Fish & Wildlife (CDFW)**

**National Oceanic & Atmospheric**

**Administration (NOAA) Fisheries**

**National Marine Fisheries Service (NMFS)**

Caltrans SHOPP (Minor fund) [support]

Office of Traffic Safety [capital]

SHRP2 (Strategic Highway Research Program #2) [support & capital]

**American Association of State Highway & Transportation Officials (AASHTO)**

**Federal Highway Administration (FHWA)**

United States Fish & Wildlife Service (USFWS) [support]

Pacificorp Coho Enhancement Fund (CEF) [capital]

# Fort Goff Creek Bridge

**Fort Goff Creek Bridge**


Challenges:

- Project in severe climate area
- Freeze-thaw cycles and heavy salting
- Nearest batch plant located 90 minutes away from site

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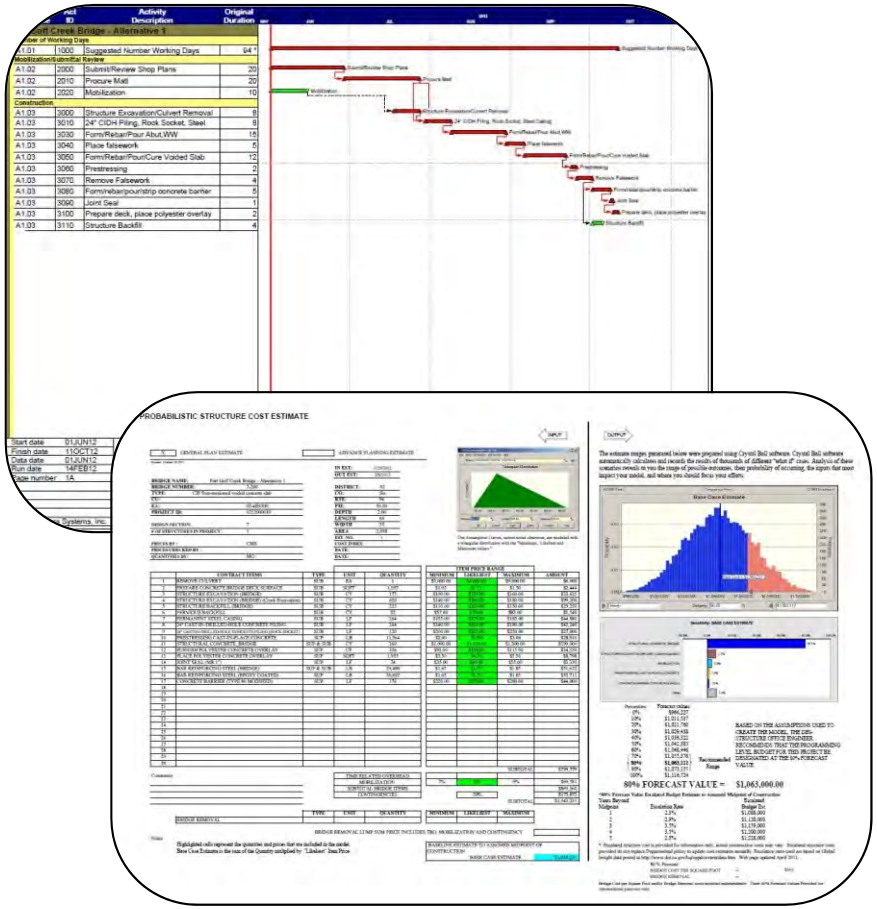
# Early Analysis for Structure Type



Advance Planning Study Alternatives

Cast-in-place

$1,043,000

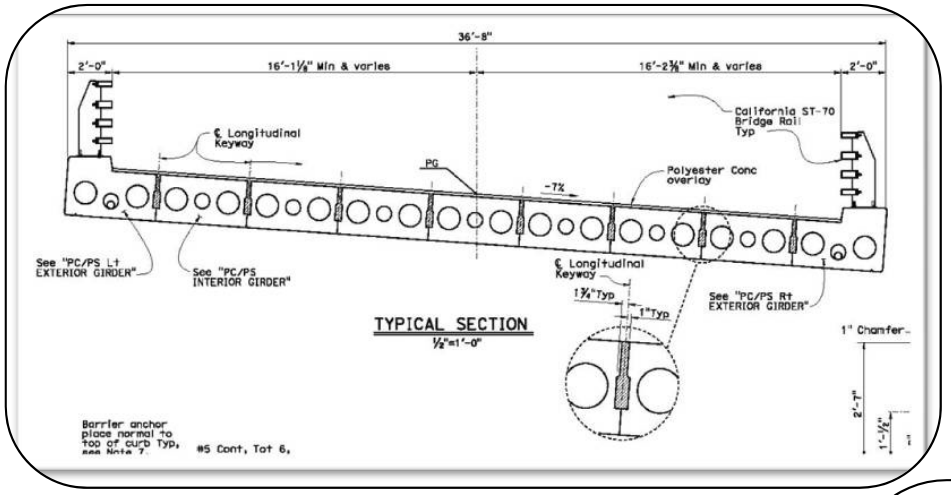
Precast Superstructure

$937,000

All Precast Elements

$928,000

# Type Selection

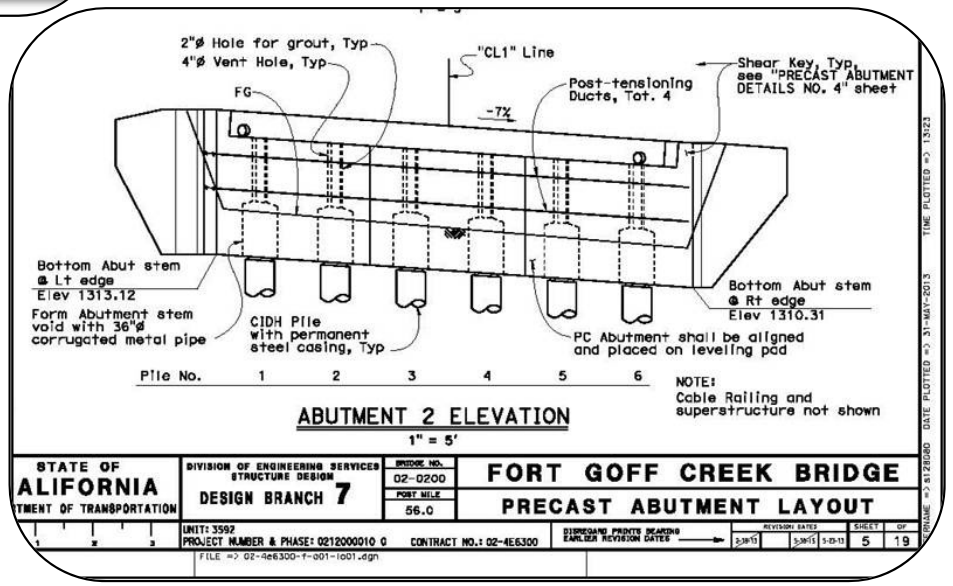



## Prefabricated Elements

- PC Voided Deck Slabs
- PC Abutment Elements
- PC Wingwalls
- Prefabricated Rail

## Type Selection Drivers

- Ensure concrete quality
- Reduce days of detour
- Reduce impact to stream bed
- Reduce risk of second season



# ABC Toolkit Implementation

- Single row of piles
- Repeatable elements
- Pick weight under 95K
- Pre-assemble substructure elements prior to shipping
- Fabrication tolerances in specifications


# Bid Process

Design-Bid-Build/Low Bidder

Structure estimate at time of bid: $978,572

Successful bid: $1,309,843

Final Cost: $1,400,303 ($660/sqft)

Difference due to

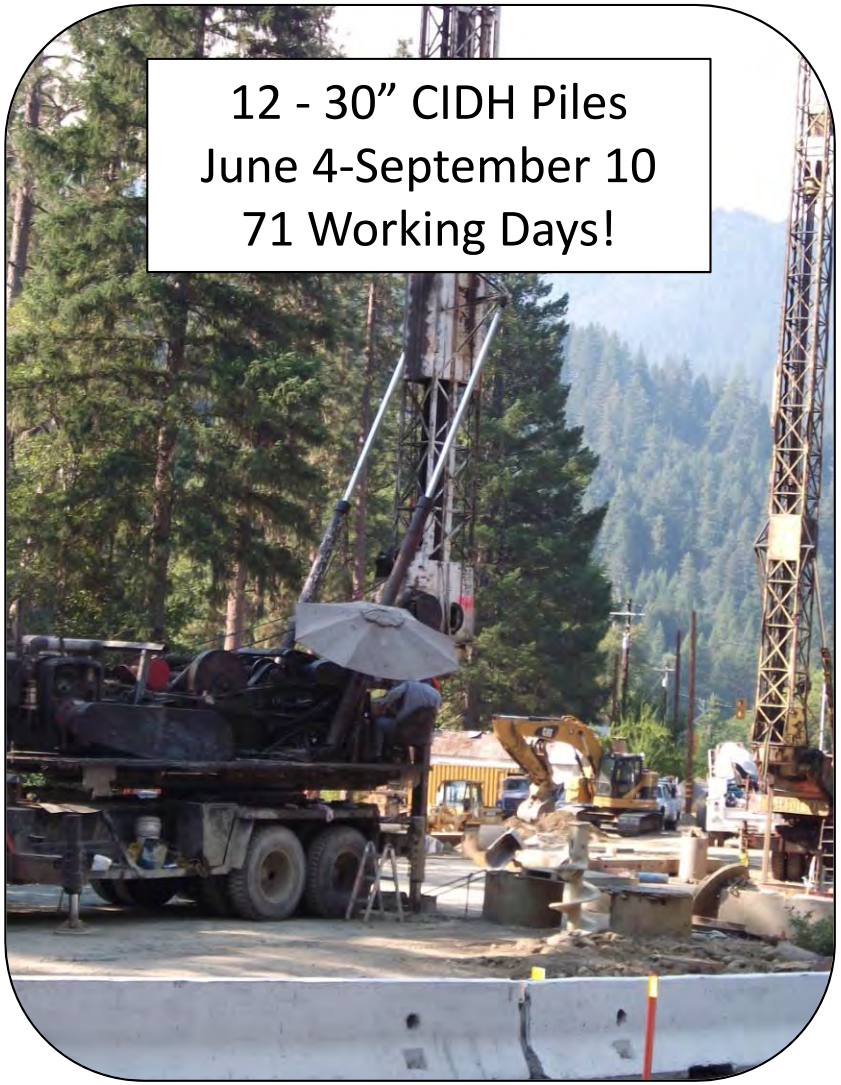
- Award to 3rd bidder
- 7 bidders but only 1 prefab subcontractor
- Remote location
- Perceived difficulties with aesthetics

# Construction: Detour

One way signalized traffic


Temporary culvert for detour


# Construction: Foundation




# Construction: Foundation


4 sac slurry for abutment bearing pad

# Construction: Abutments

- 6 precast abutment elements, 85kips each
- Voids formed with 36” diameter corrugated metal pipe

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# Construction: Abutments

Erect abutment segments and grout keyways - September 16 & 17

# Construction: Abutments

Stress and grout tie rods - September 18
Grout abutment stem voids - September 19
Cure stem grout over weekend - September 20-21

# Construction: Precast Erection

Crane set up September 22, Girders and Wingwalls erected  September 23

# Construction: Precast Erection

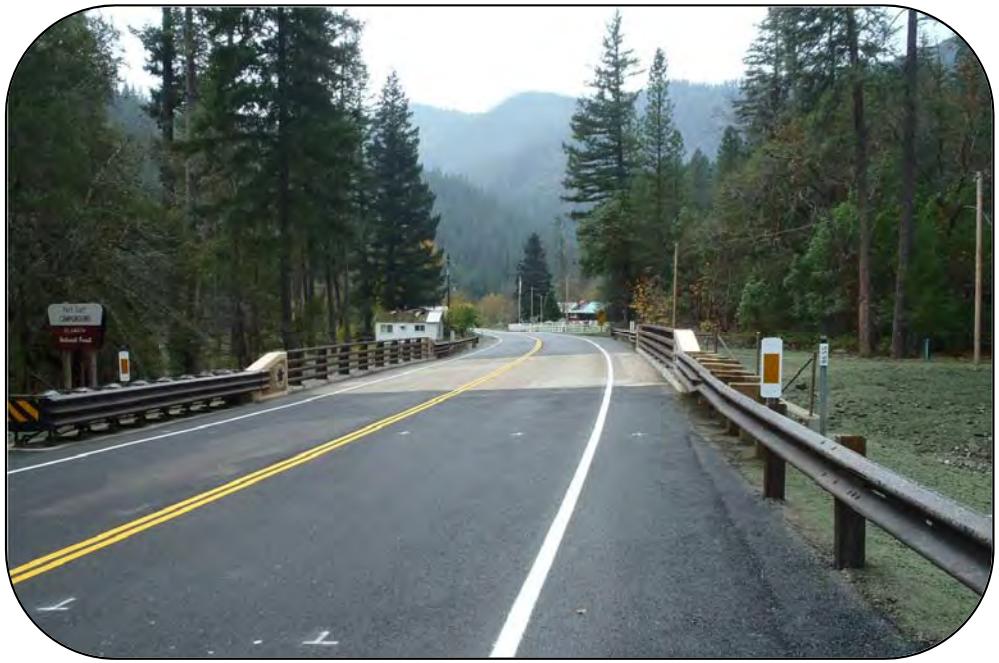

# Construction: Connections


# Construction: Rail & Aesthetics

California ST-70 Bridge Rail installed in 6 hours

Architectural treatment achieved by the use of form liners and on-site staining.

# Completed Project



Foundation
71 days

Structure
23 days

Road
21 days

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# Lessons Learned: CIDH Piling

1. Take foundation risk into account when developing schedule
2. Consider drilling system submittal to ensure drilling contractor shows up with the right equipment for the job.
3. Use spread footing or driven piles when possible to control schedule.

# Lesson Learned: PC Abutments

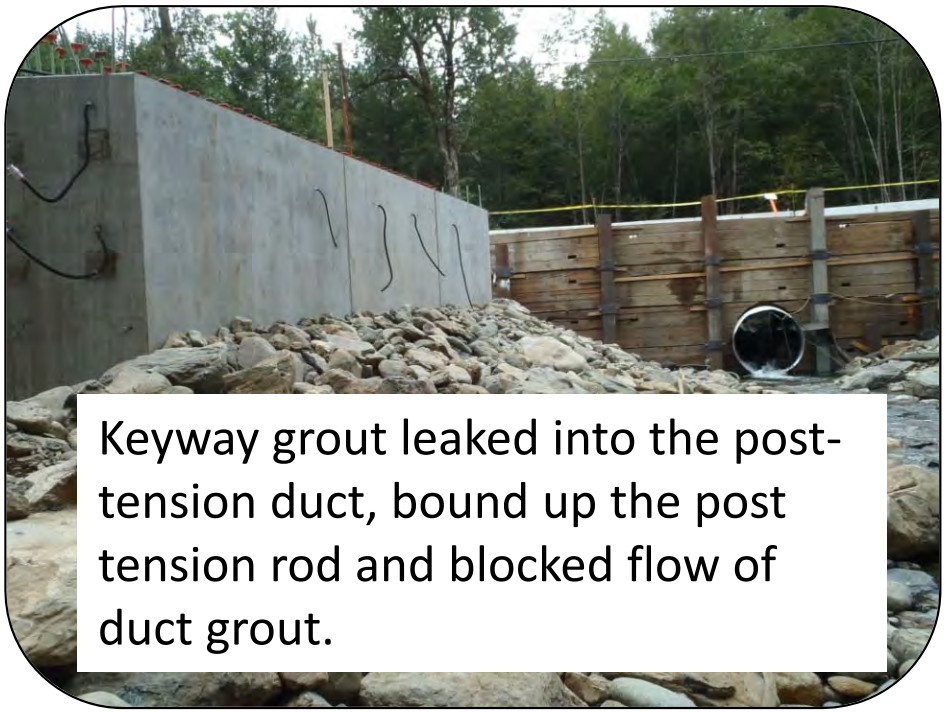
Impact of abutment segment connection method on working days

Craig Creek Bridge
Closure Pour Method
5 days from setting abutments to setting girders

Fort Goff
Post tension method
8 days from setting abutments to setting girders

# Lessons Learned: PC Abutments

Grouting keyways and post tensioning ducts proved challenging. Enlarge keyways to allow taping of duct connections.

Keyway grout leaked into the post-tension duct, bound up the post tension rod and blocked flow of duct grout.

# Lessons Learned: Review & Inspection

- Increased lead time for shop plan review
- Allocate adequate resources for source inspections
- Develop guidance for shop plan review
- Abutment seat grades require close review on shop plans
- Precast QC/QA needs to be closely monitored and enforced
- Review all shop plans concurrently to avoid conflict (precast, post-tension, and prefab rail)

# Lesson Learned: Rebar Congestion

Pay close attention to steel congestion, particularly in skewed elements.

# Lessons Learned: Deck Overlay

Differential girder elevations are smoothed over with deck overlay

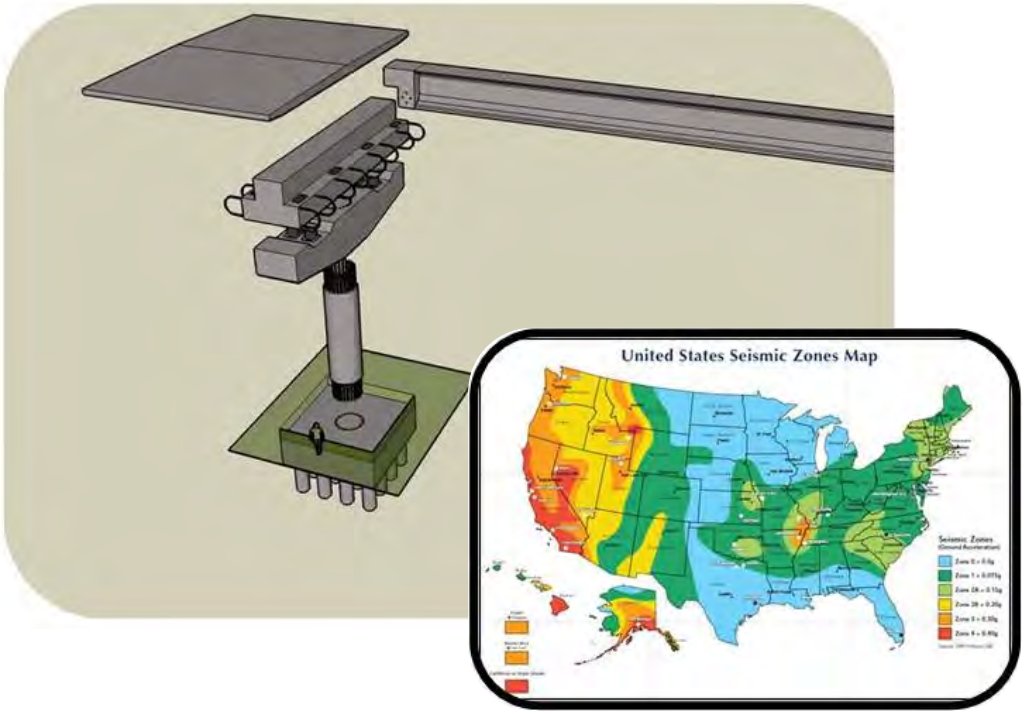
# In Review

- Successfully implemented SHRP2 ABC Toolkit
- Gathered Lessons Learned to further develop ABC Toolkit
- CT Construction and Program Managers have already targeted multiple projects for similar ABC approach
- Feedback from contractor positive. Project constructible within skill and equipment capability of average contractor.
- We need to work with the precast industry in California for smoother process
- Caltrans will continue to pursue ABC on a larger scale

# ABC multi-span pilot project program

Caltrans has been slower than other states to adopt multi-span ABC while investigating seismic performance of prefabricated structures.

The results are in …




The next step is to mainstream ABC in California is a multi-span ABC Pilot Project Program.

# Thank you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