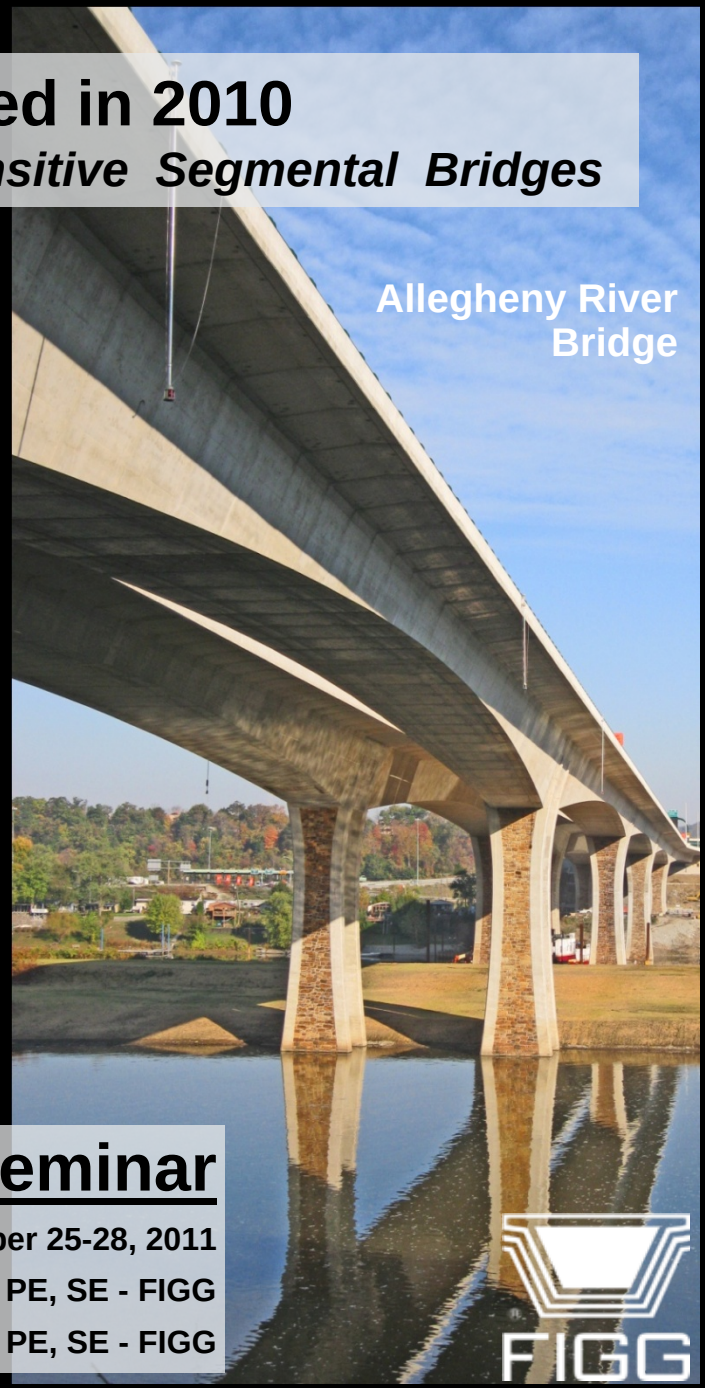
3 Record Spans Opened in 2010

Benefits of Long Span Environmentally Sensitive Segmental Bridges


US-191 Colorado River Bridge


Allegheny River Bridge


4th St. Bridge

Western Bridge Engineers' Seminar

Session 4D

September 25-28, 2011

Stephen E. Fultz, PE, SE - FIGG

Kevin A. McLaughlin, PE, SE - FIGG

FIGG

438’ Record Concrete Span for Utah

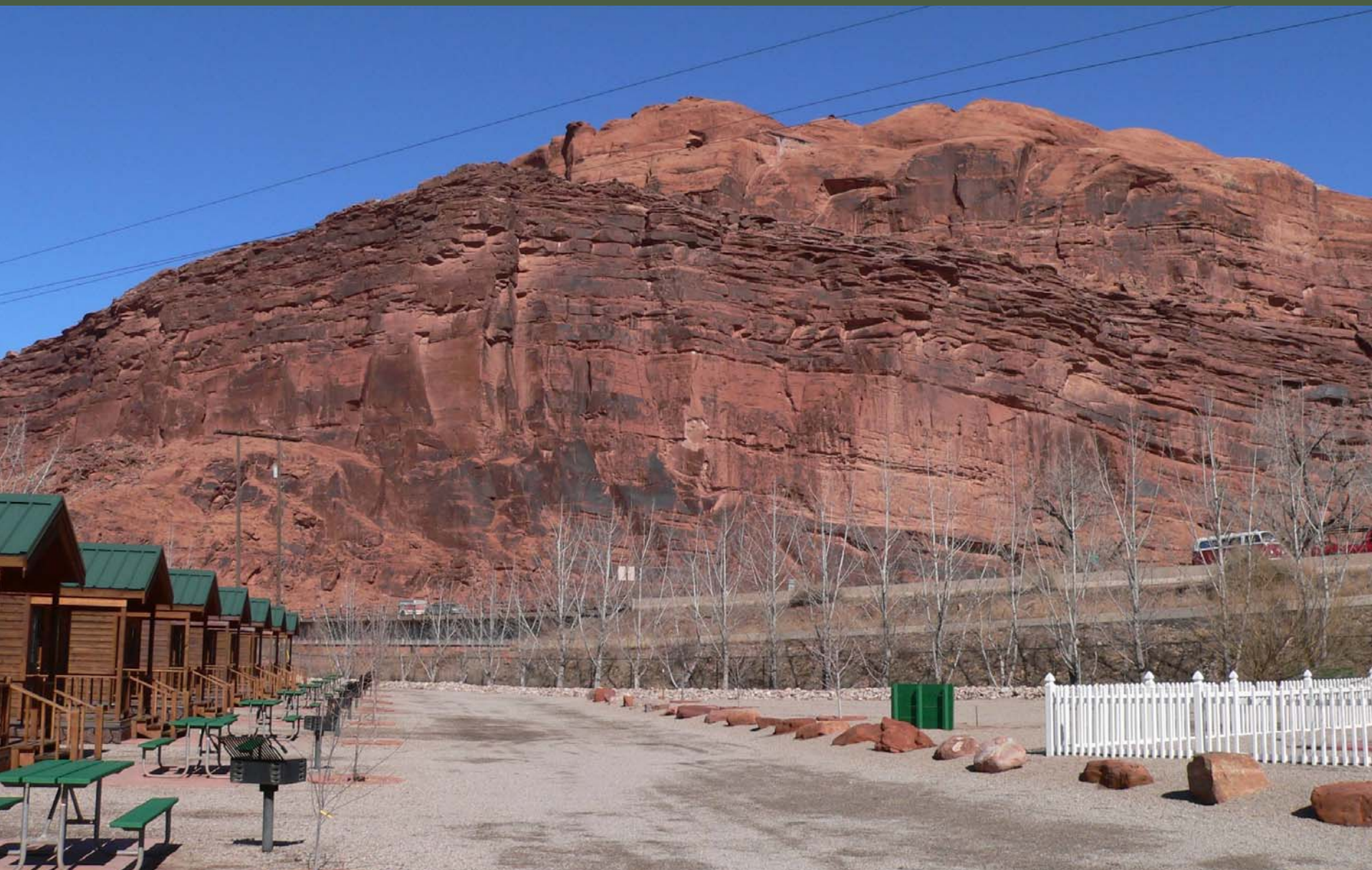
World-Renowned Moab, Utah

Location Map

North Bank

North Bank

South Bank



Goals & Objectives

Landmark, Signature Bridge in Harmony with the Environment

Aesthetics & Community Consensus

Improve Function and Capacity

Durable, Low Maintenance, 100+ Year Life

Focus on Constructibility to Minimize Impacts

Goals & Objectives

Long Spans to Protect the Environment Below

Accommodate River Hydraulics

Enhance/Expand Trail Network

Minimize ROW and MOT

Meet UDOT Schedule and Budget

Project Alignment

Concrete Segmental Solution

Colors and Textures to Blend the Structure into the Landscape

Natural Form Respects Arches/Canyonlands

Built From Above to Minimize Construction Impacts

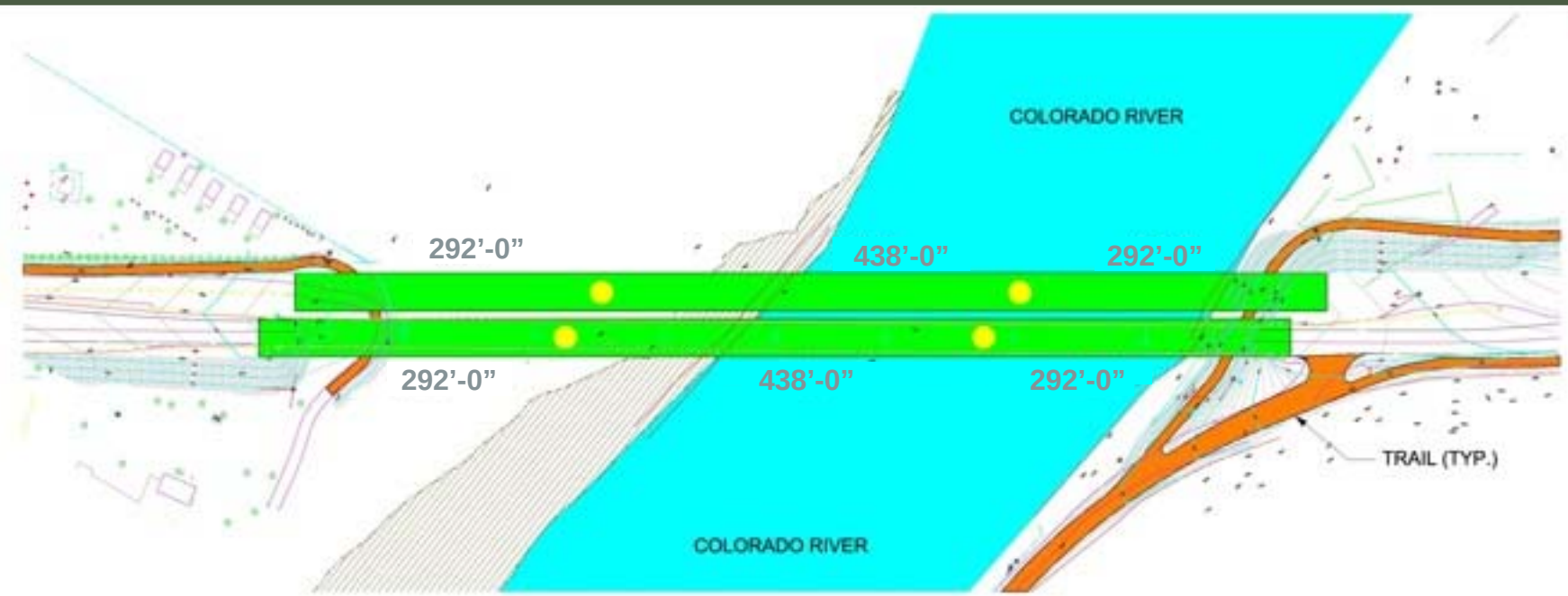
Efficient Long Span Design Minimizes Footprint

Landscape Arch – Arches NP

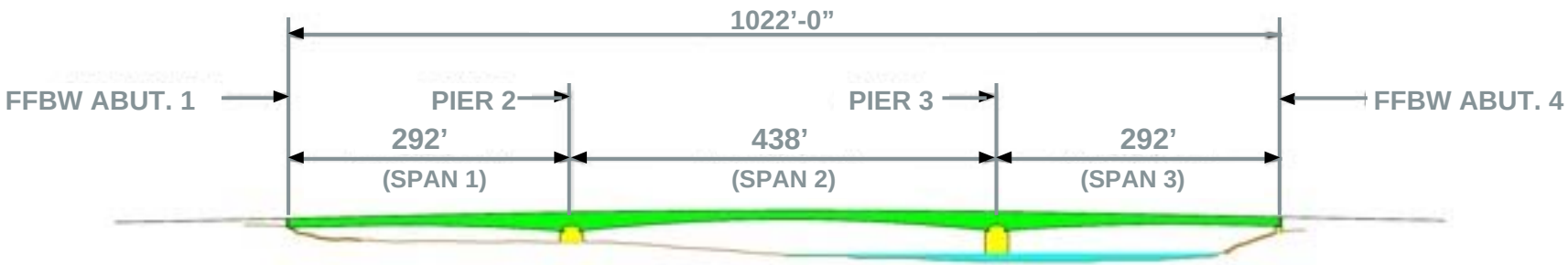
Concrete Segmental Solution

- 100+ Yr Life, Low Maintenance
  - Bi-directional Pre-compression - High Strength Steel Post Tensioning
  - High Strength Concrete Mix Design
  - Redundant Corrosion Protection Systems
  - Pre-compressed Integral Overlay
- Least Life Cycle Cost

Bridge Layout



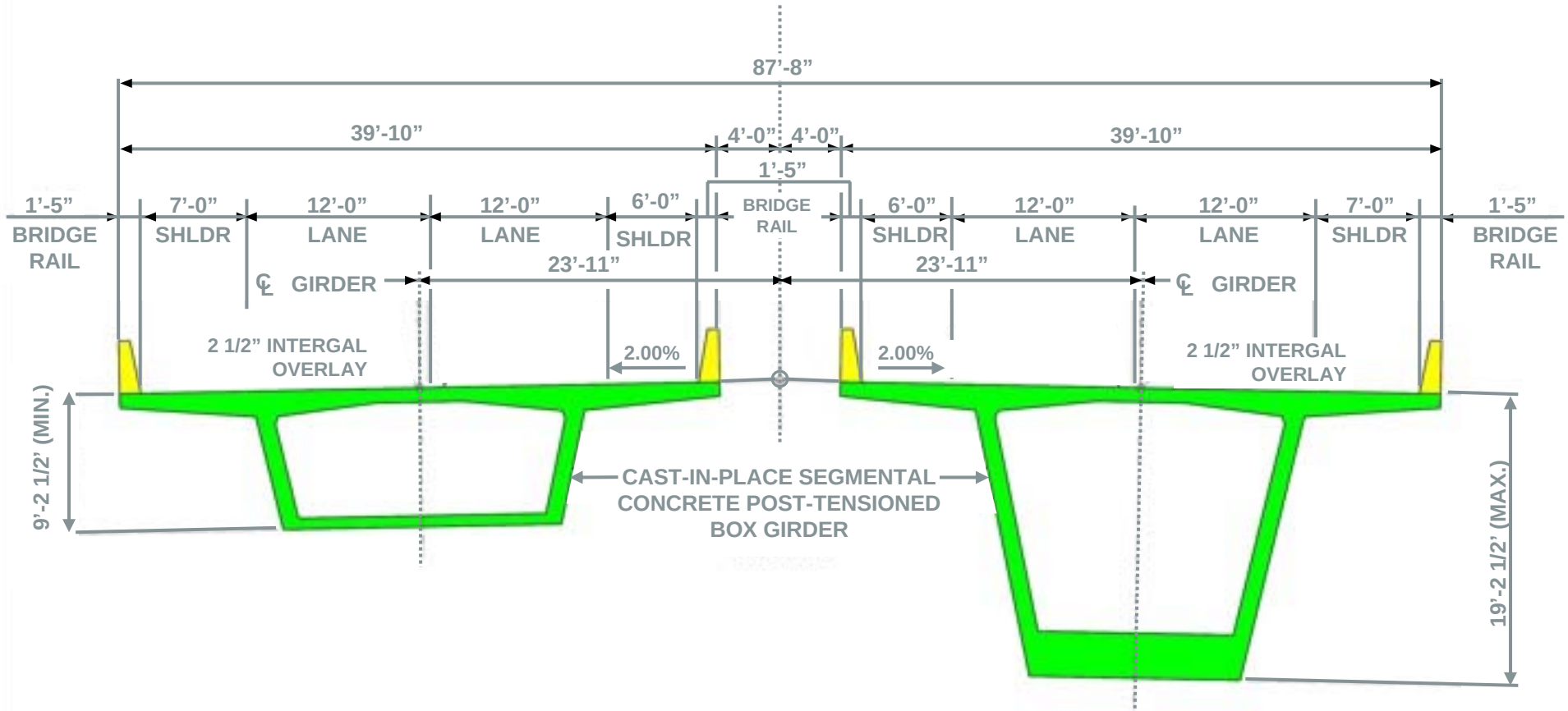
PLAN



ELEVATION

Piers reduced from 7 to 2 (Only 1 in the River)

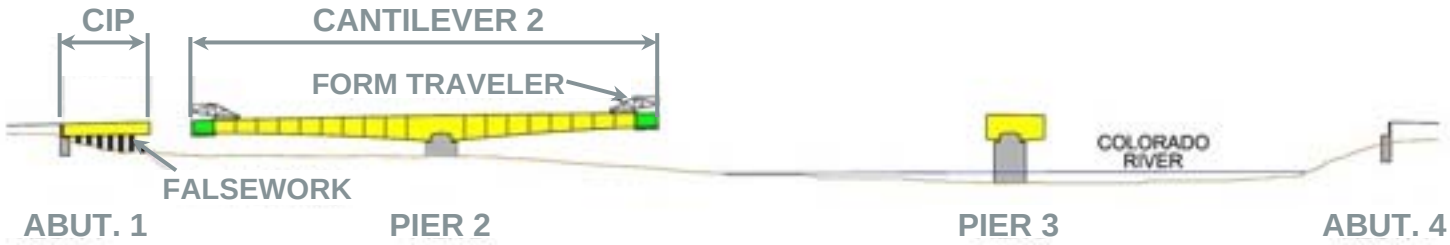
Superstructure Sections



MINIMUM DEPTH SECTION
CENTER SPAN & ENDS

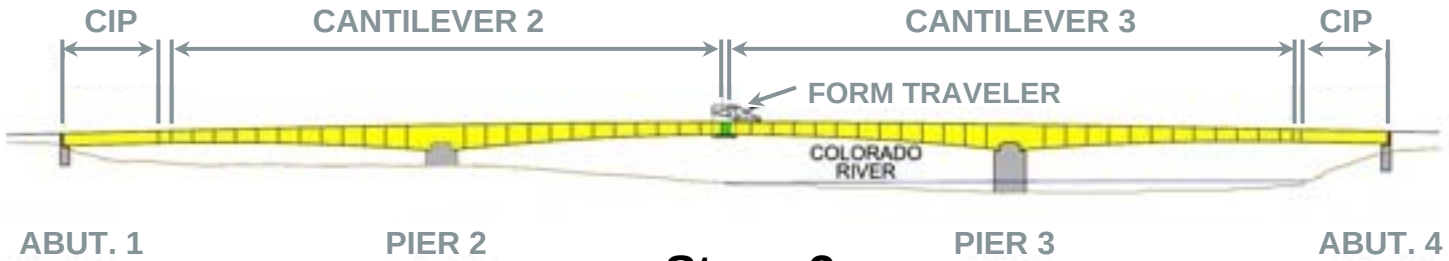
MAXIMUM DEPTH SECTION
PIERS

Construction Sequence – CIP BC



Stage 1

Stage 2



Stage 3

Stage 4

Community Involvement

UDOT Public Involvement

FIGG Bridge Design Charette™

- Unique Process for Creating a Signature Bridge
- Discuss and Gain Consensus
- Prioritize
- Set Design Direction

FIGG Bridge Design Charette™

March 13, 2008 - Moab, Utah

Theme: Moab - Arches National Park

A Bridge in Harmony with Nature

This remarkable national park and surrounding area hosts a breathtaking landscape rich in natural beauty. Visitors come to enjoy this unique picturesque setting.

The concept for the new bridge, crossing the Colorado River, is to blend into the natural setting as if born of the earth. Design attention and focus remains strongly on nature in this beautiful landscape

Blending of Color to Match the Surrounding Earth

Texture

Option 1- Smooth

Option 2- Rock

Option 3- CCC Stone

Construction Bid

January 22, 2009

Wadsworth Brothers Construction

$26 M

(9 Bidders -10.5% Under Engineers Estimate)

Pier Tables

Cantilever Construction

Mineral Stain

Mineral Stain

North Bank View

View from North Bank Trail

US-191 Colorado River Bridge


Pueblo
Colorado
4th STREET BRIDGE
Record 379’ Highway Span for Colorado
DOT
DEPARTMENT OF TRANSPORTATION
FIGG

Gateway to Historic Downtown

Contemporary Shape / Historic Color

Function and Aesthetics

Community Aesthetics

FIGG Bridge Design Charette™

Community Consensus

Spanning the Yard & River

Goals

Improve Safety

Increase Capacity

Minimize Railroad Impacts for a Successful Crossing

Signature Bridge
- Aesthetics
- Community Involvement

Segmental Solution Benefits

Best Satisfies All Project Criteria
- Yard Impacts (Temp. & Permanent)
- River Impacts
- Cost
- Constructibility
- Durability
- Aesthetics

Built from Above
- Minimizes RR Impacts
- Allows for Uninterrupted Yard Operations
- Eliminates Ground Based Erection
- Minimizes Environmental Impacts

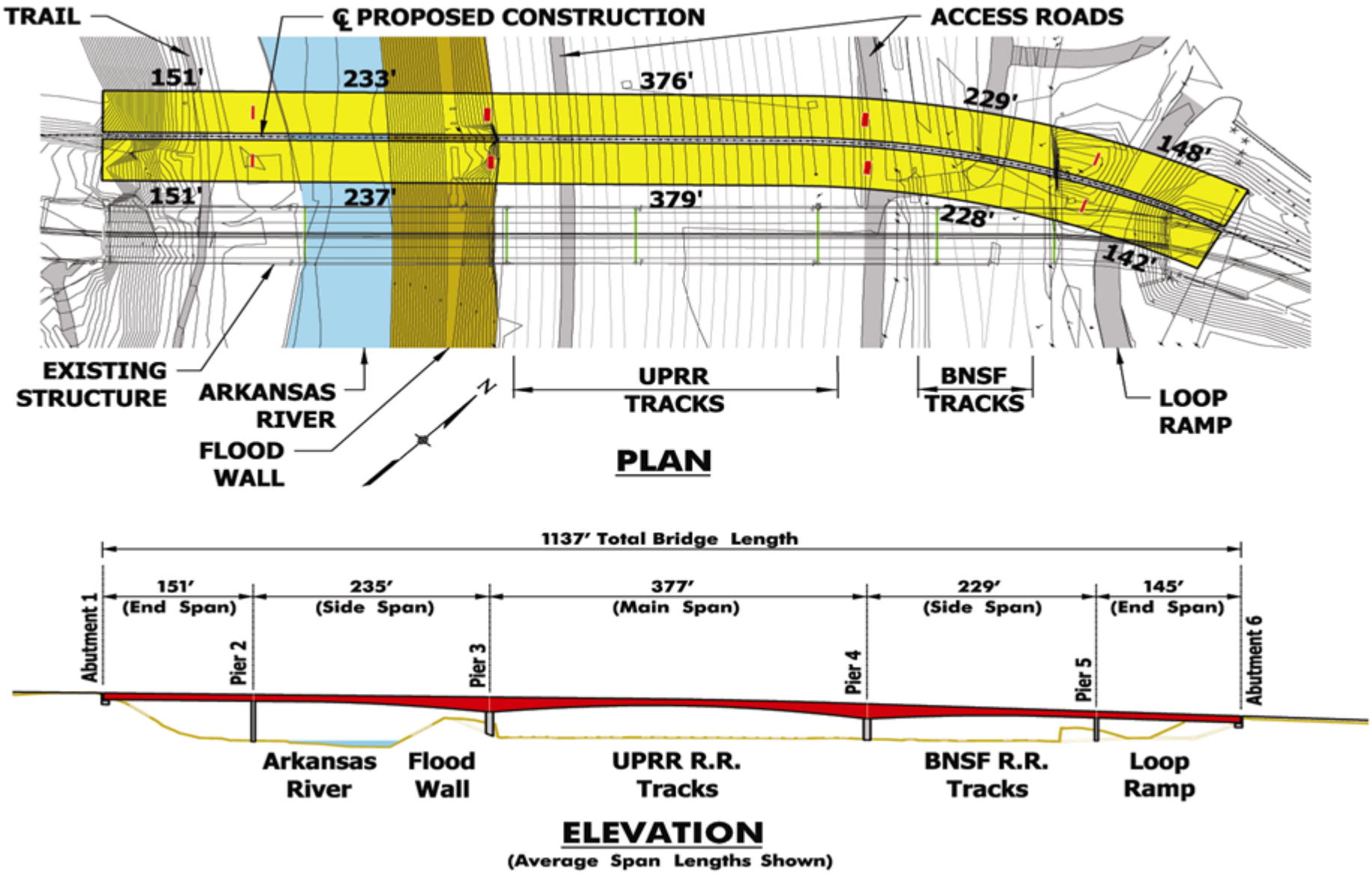
Uninterrupted Train Operations

Segmental Solution Benefits

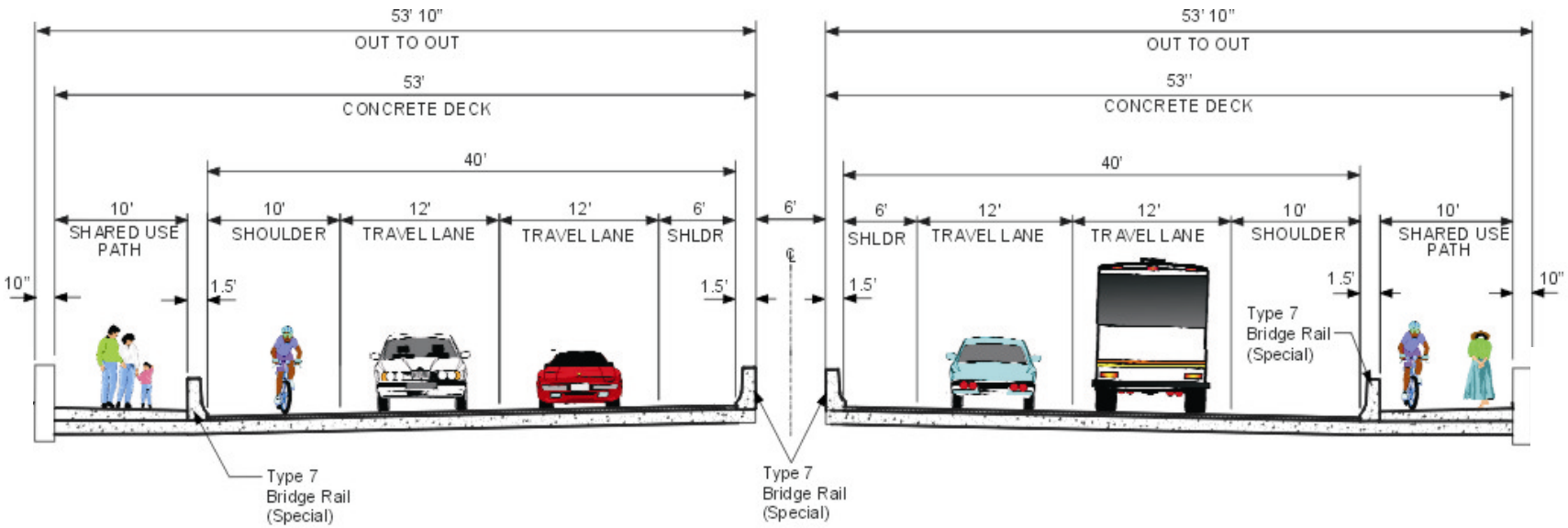
Efficient & Cost Effective Longer Spans
- Minimal Yard Impact

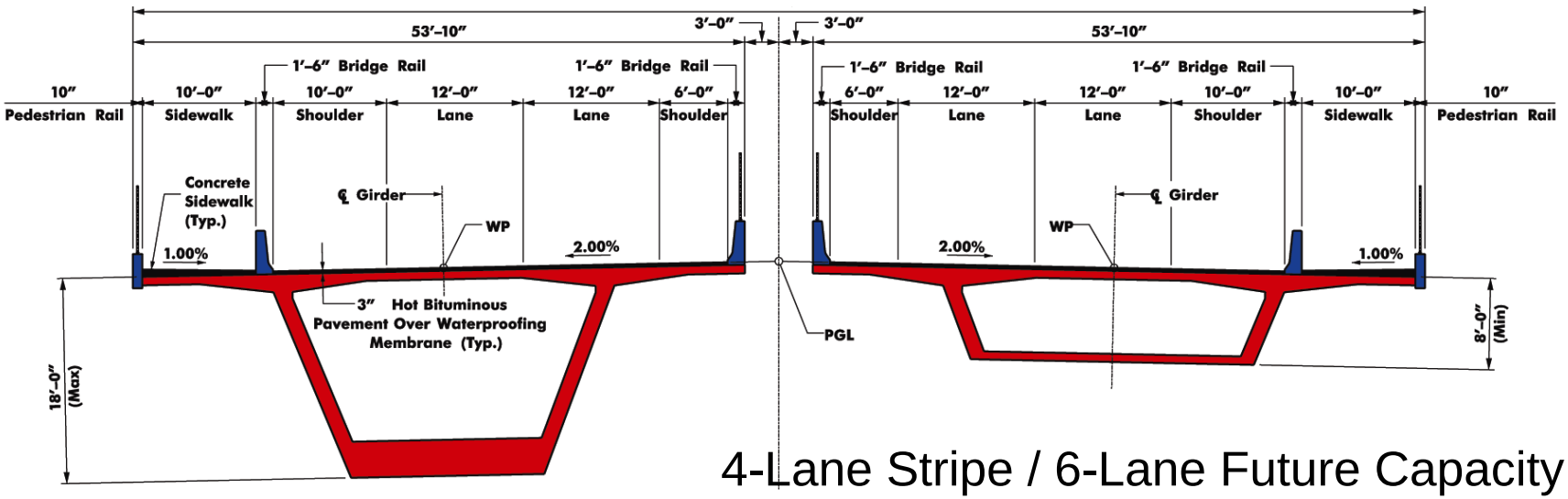
Superior Durability
- Materials
- Bi-Directional PT
- Interior Protection of Utilities and Inspection
- Sustainable

Bridge Layout



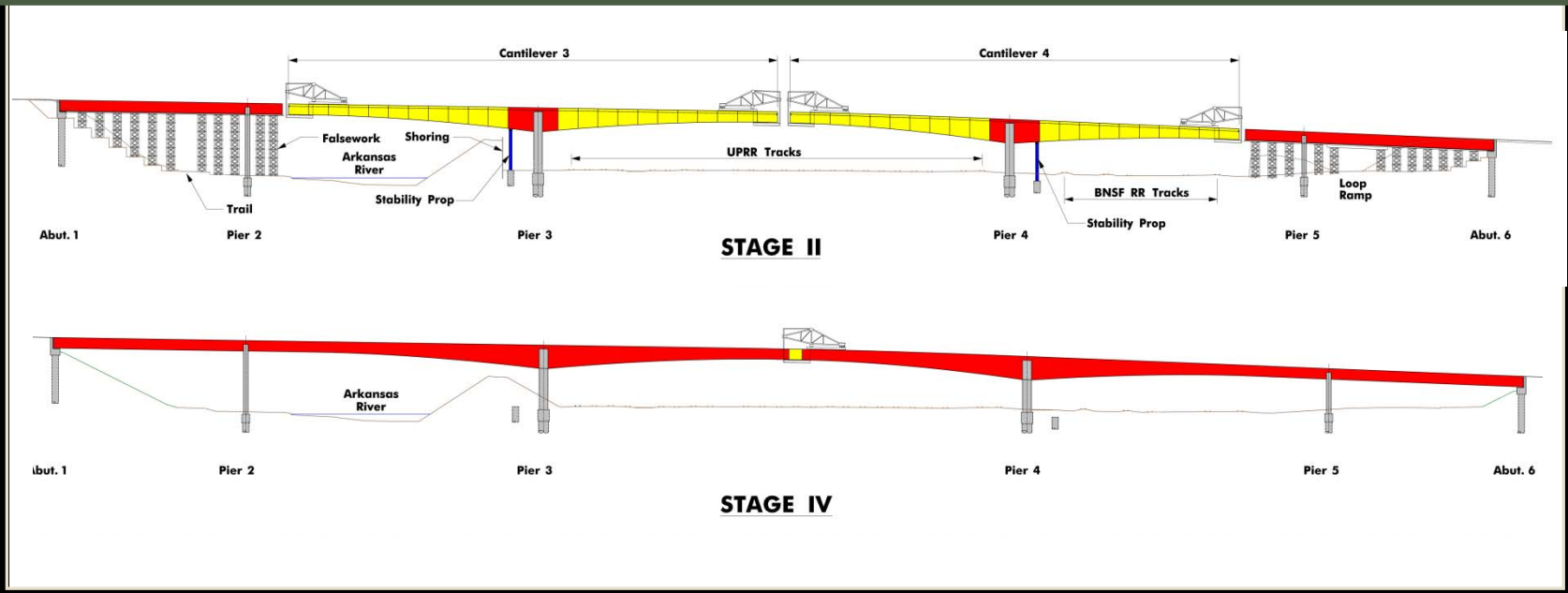
Typical Section





4-Lane Stripe / 6-Lane Future Capacity

CIP Balanced Cantilever



Temporary Prop

Phasing

Minimal Footprint

Piers

Cantilever Construction

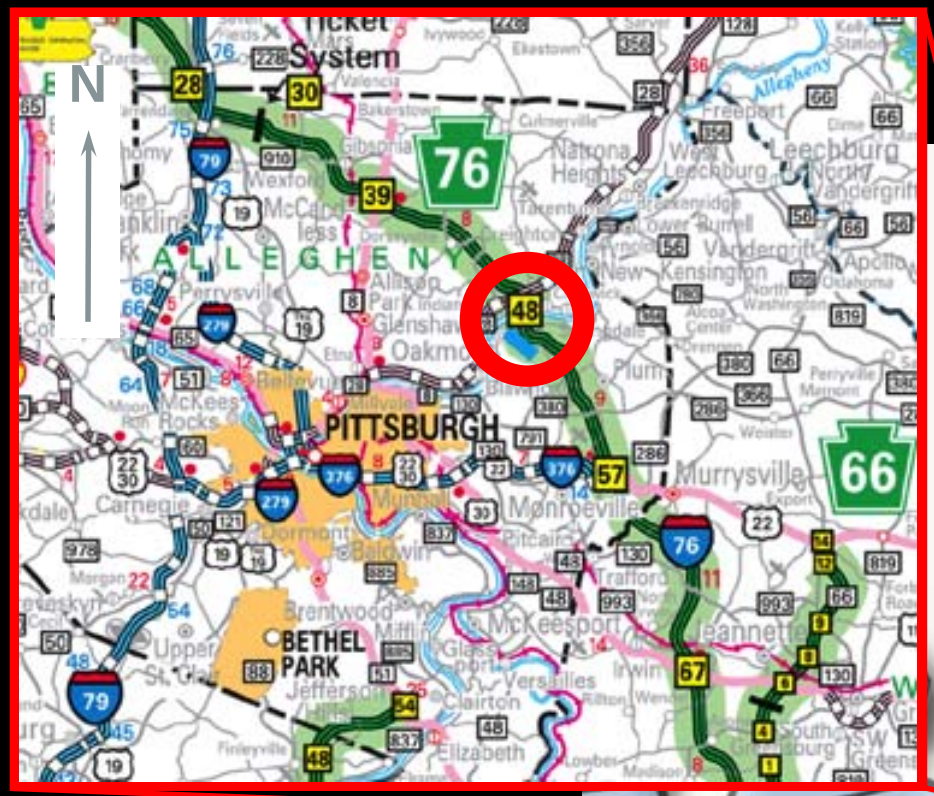
Concrete from Cantilever Tip

Final Closure

4th Street Bridge - Pueblo

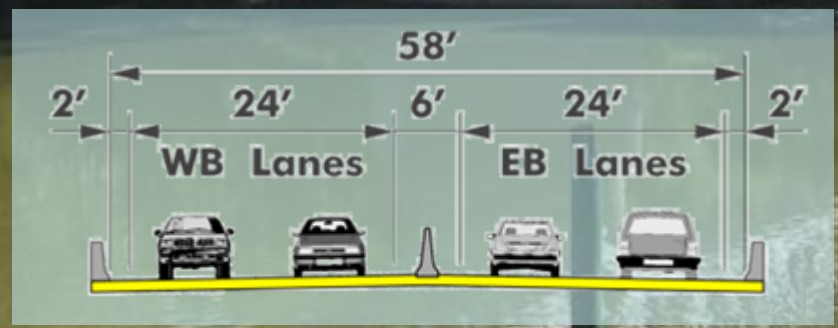

ALLEGHENY RIVER BRIDGE
Pennsylvania’s Record Concrete
Segmental Span – 532 ft.
FIGG
PENNA
TURN-
PIKE

Project Location

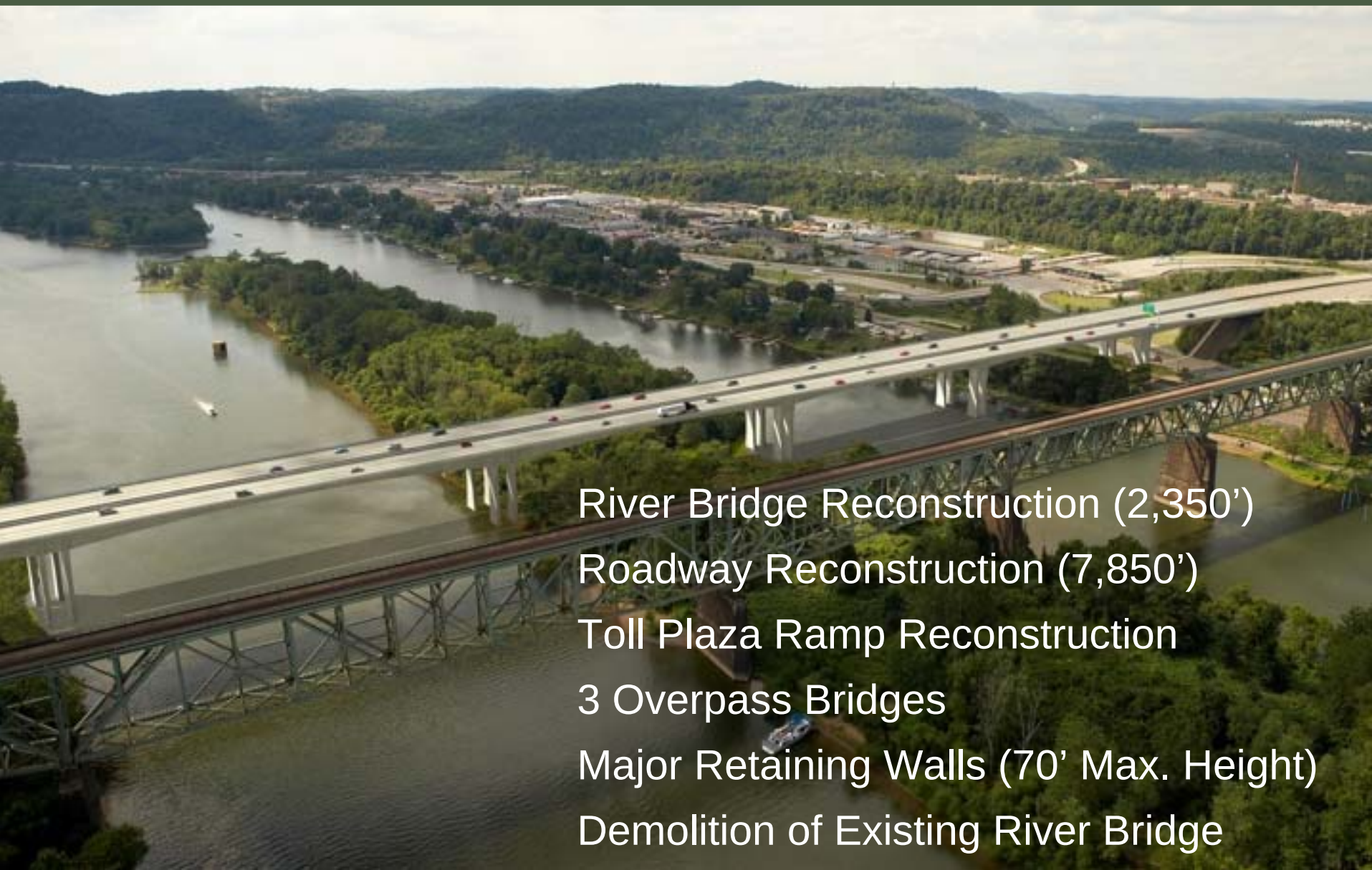


Regional Map

Old Bridge



Project Components



River Bridge Reconstruction (2,350’)

Roadway Reconstruction (7,850’)

Toll Plaza Ramp Reconstruction

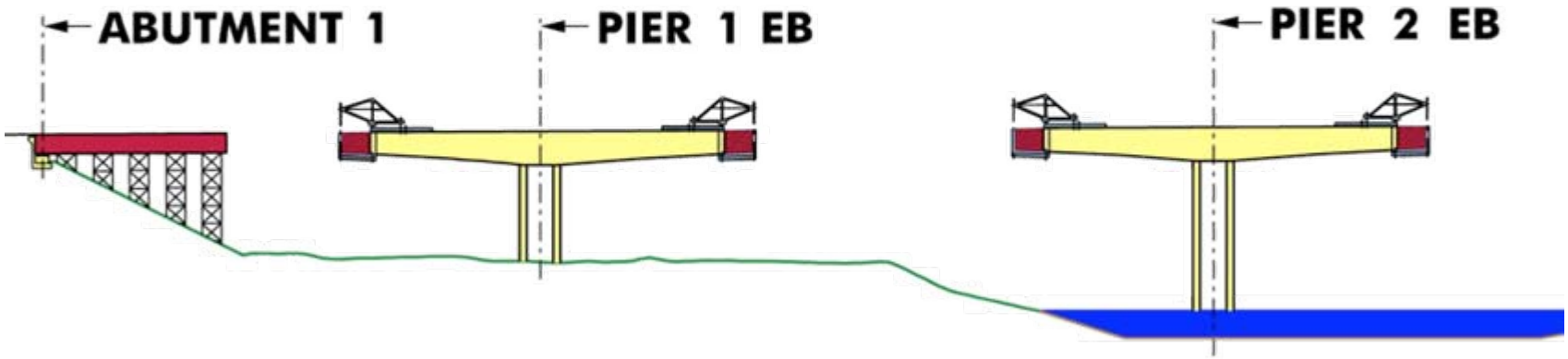
3 Overpass Bridges

Major Retaining Walls (70’ Max. Height)

Demolition of Existing River Bridge

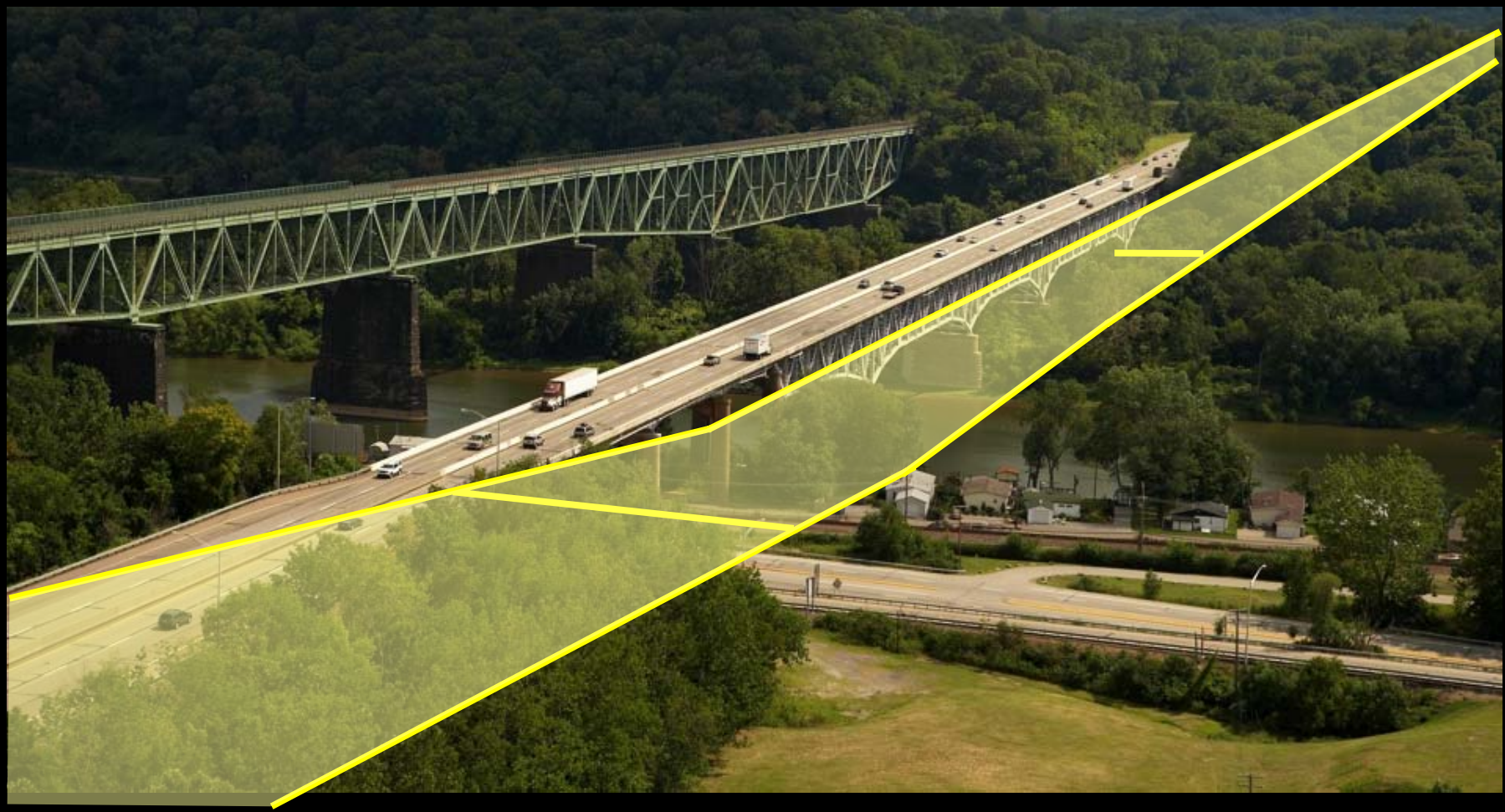
Site Details

Segmental Balanced Cantilever

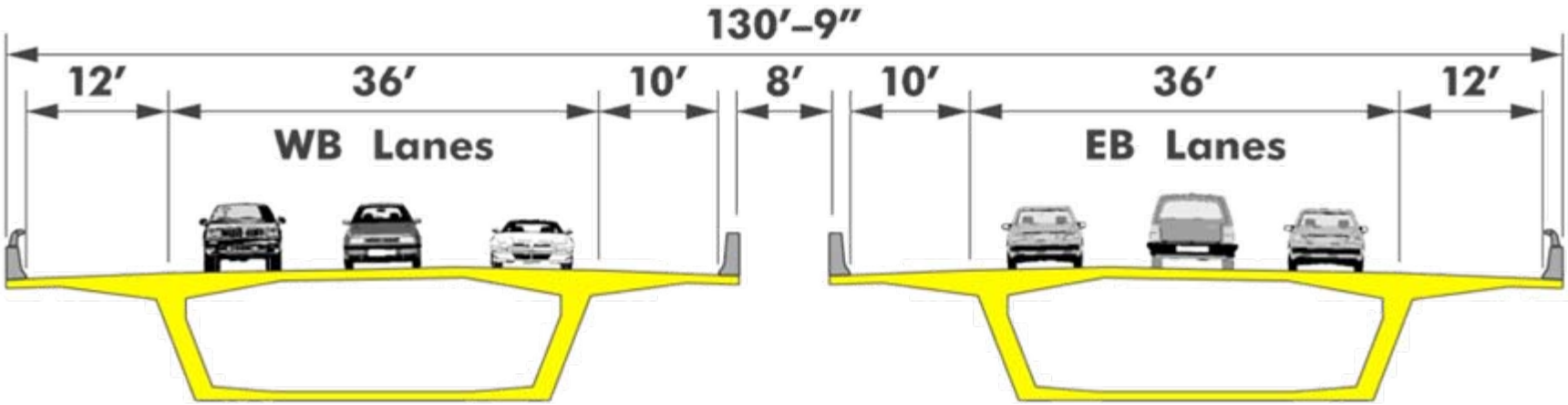


Build From Above to Maintain Traffic and Protect the Environment Below

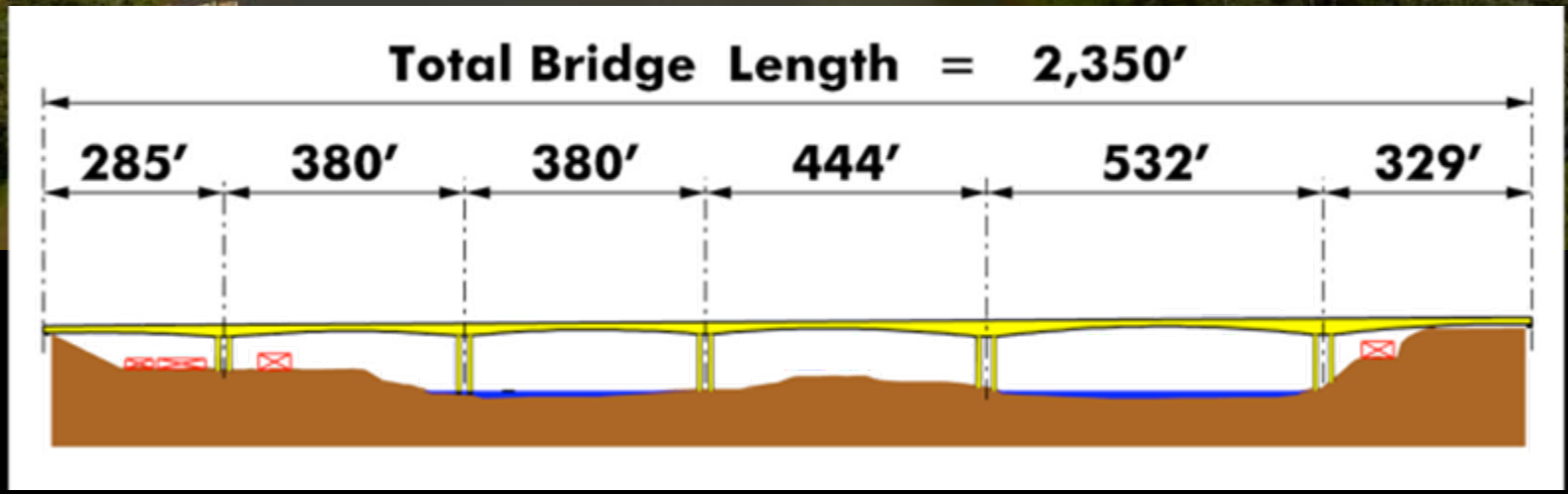
New Alignment



Roadway Section



Bridge Layout



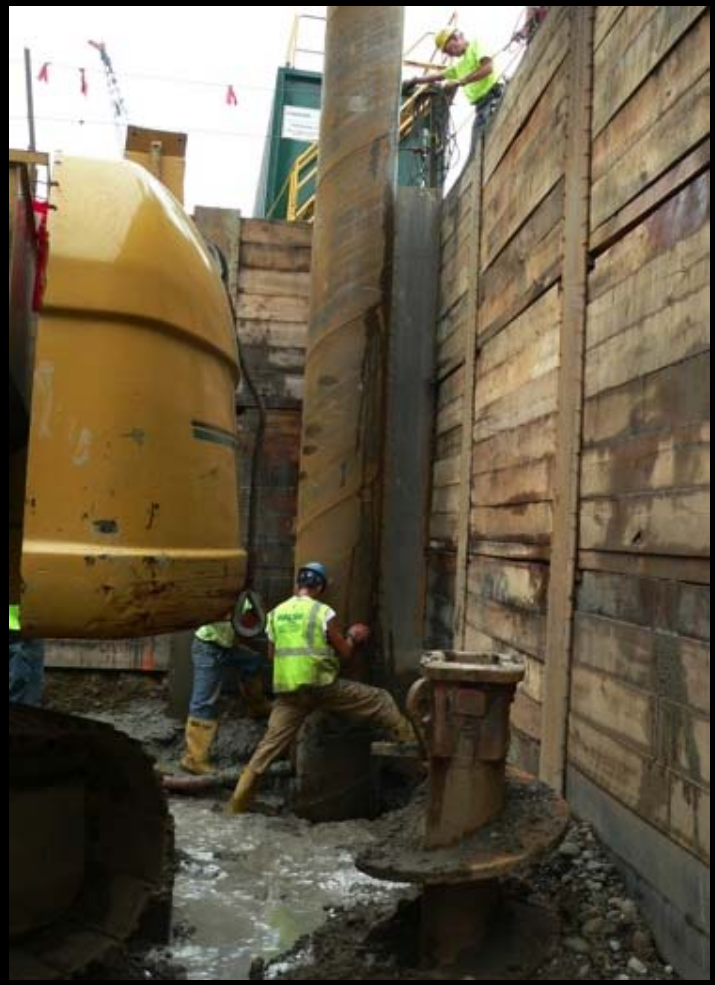
Schedule and Cost

Concrete Segmental Saved $42M over Steel Alternate

Advertisement	**January 2007**
Bid Opening	**April 2007**
Notice to Proceed **Walsh Construction - $189 M for total project including: roadway, retaining walls, minor structures and demolition**	**May 2007**
Existing Bridge Demolition	**July 2010**
Complete New Construction	**Sept 2010**

Foundations

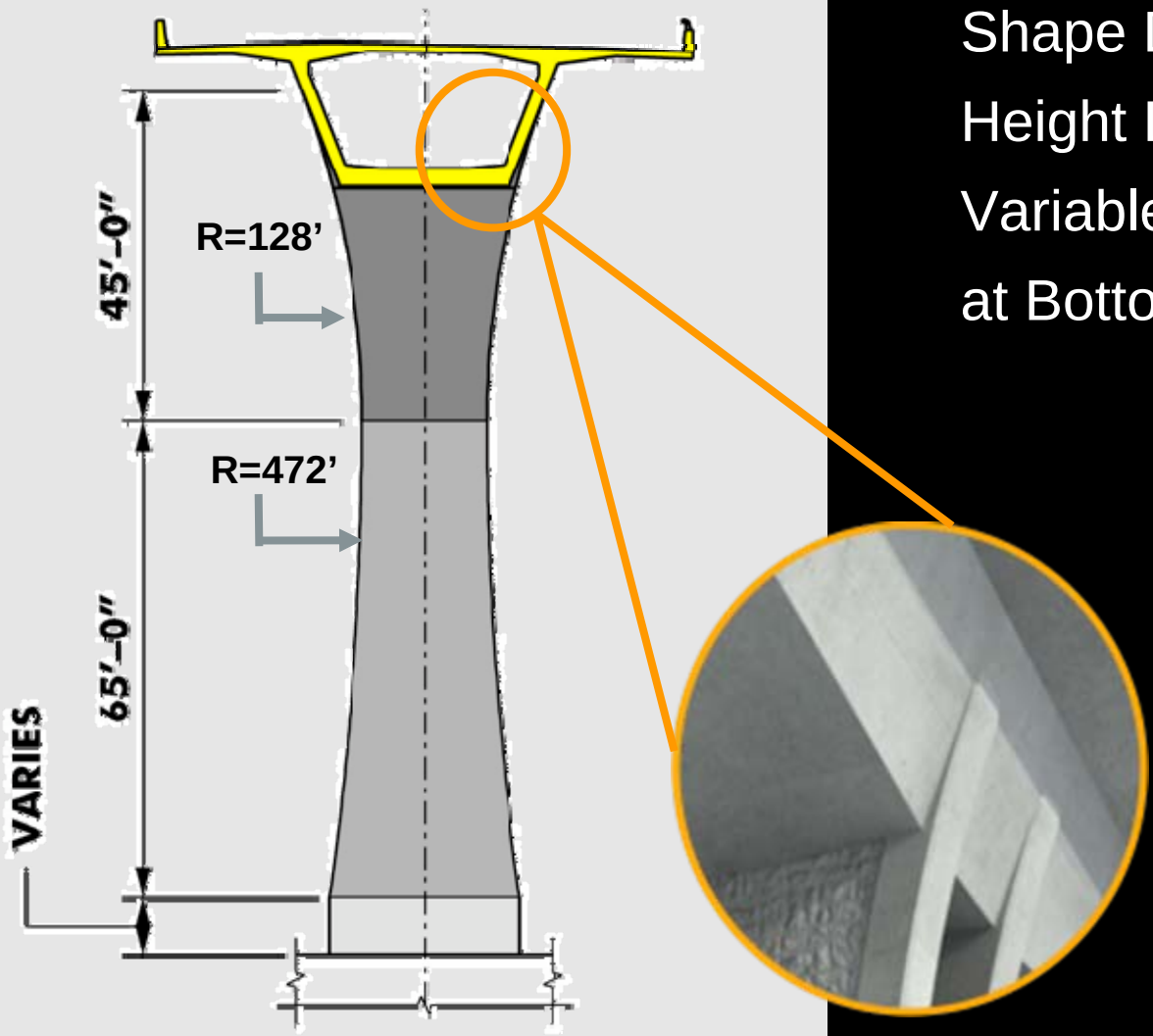
Pipe Piles & Drilled Shafts



Twin Wall Piers

Pier Shape

Natural - Organic

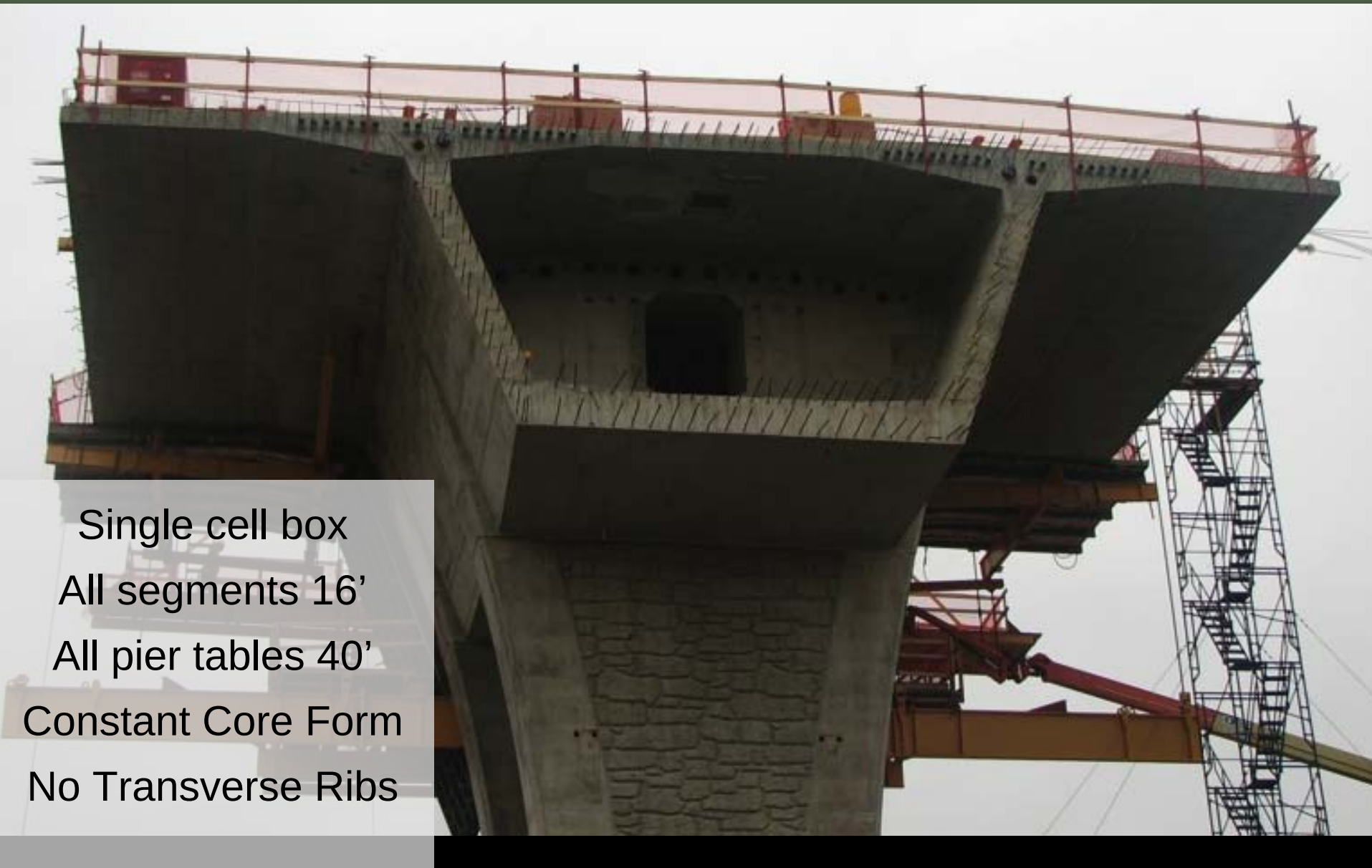


Shape Defined by 2 Radii

Height Defined from Top

Variable Rectangular Section at Bottom

Segmental Superstructure



Single cell box

All segments 16’

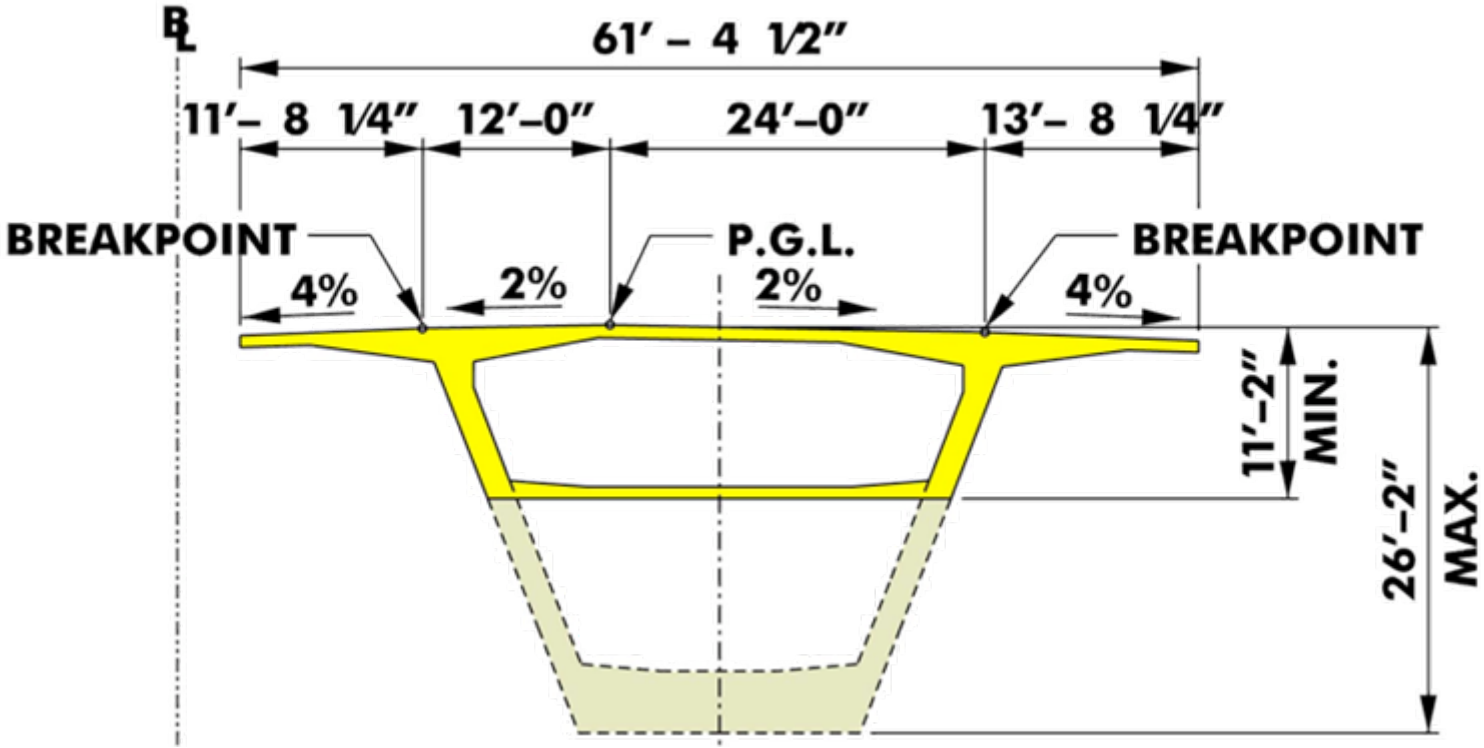
All pier tables 40’

Constant Core Form

No Transverse Ribs

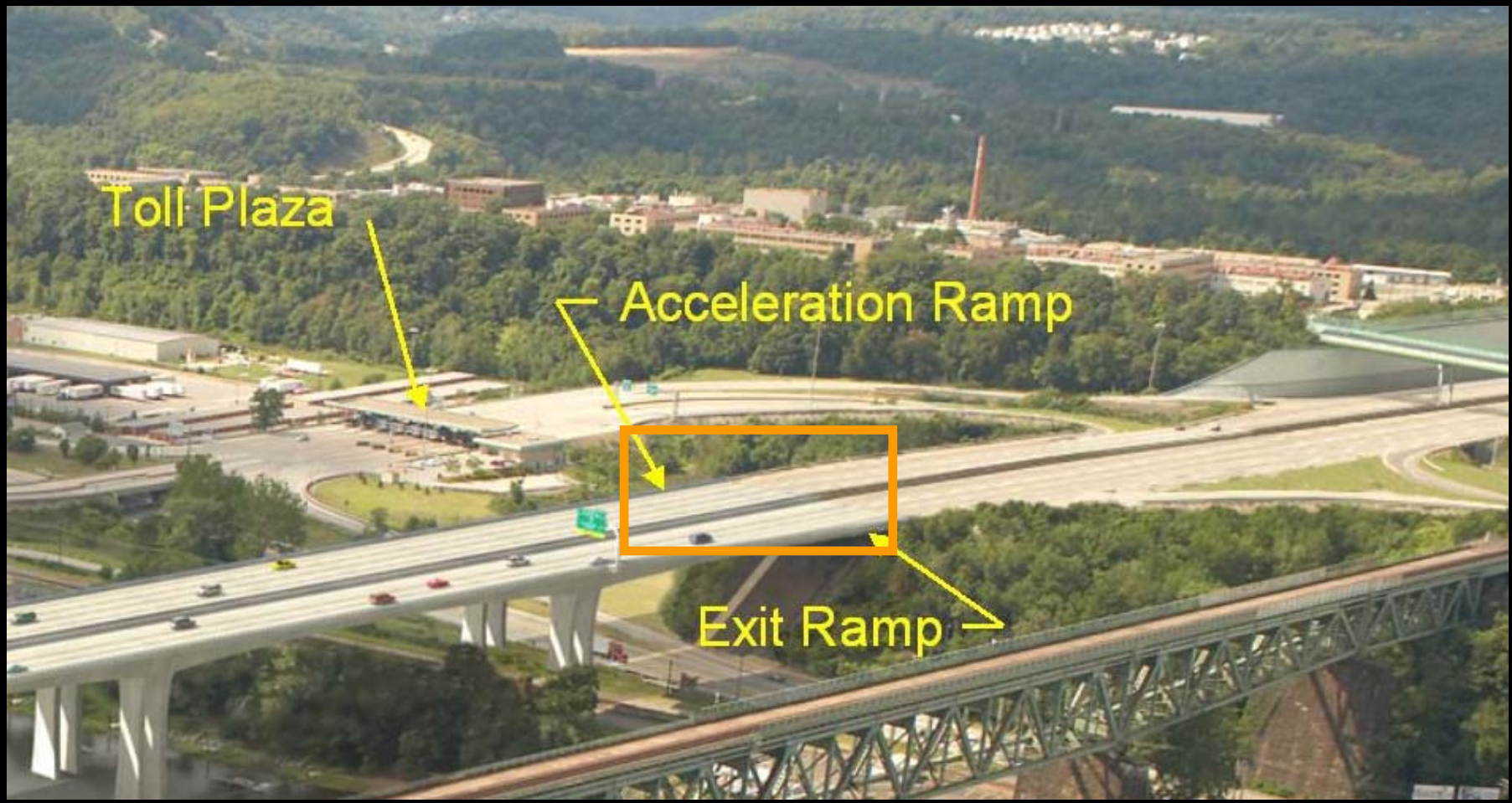
Segmental Superstructure

Variable Depth



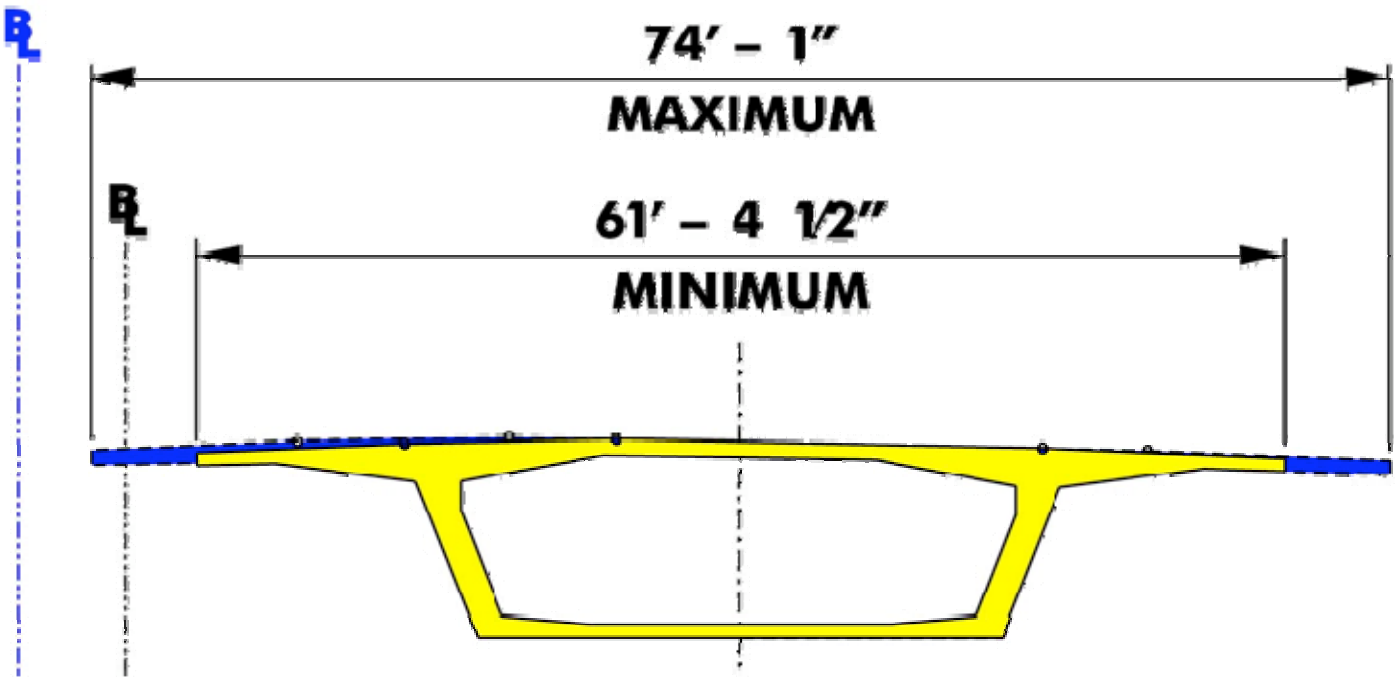
Variable Width

Widening at Interchange



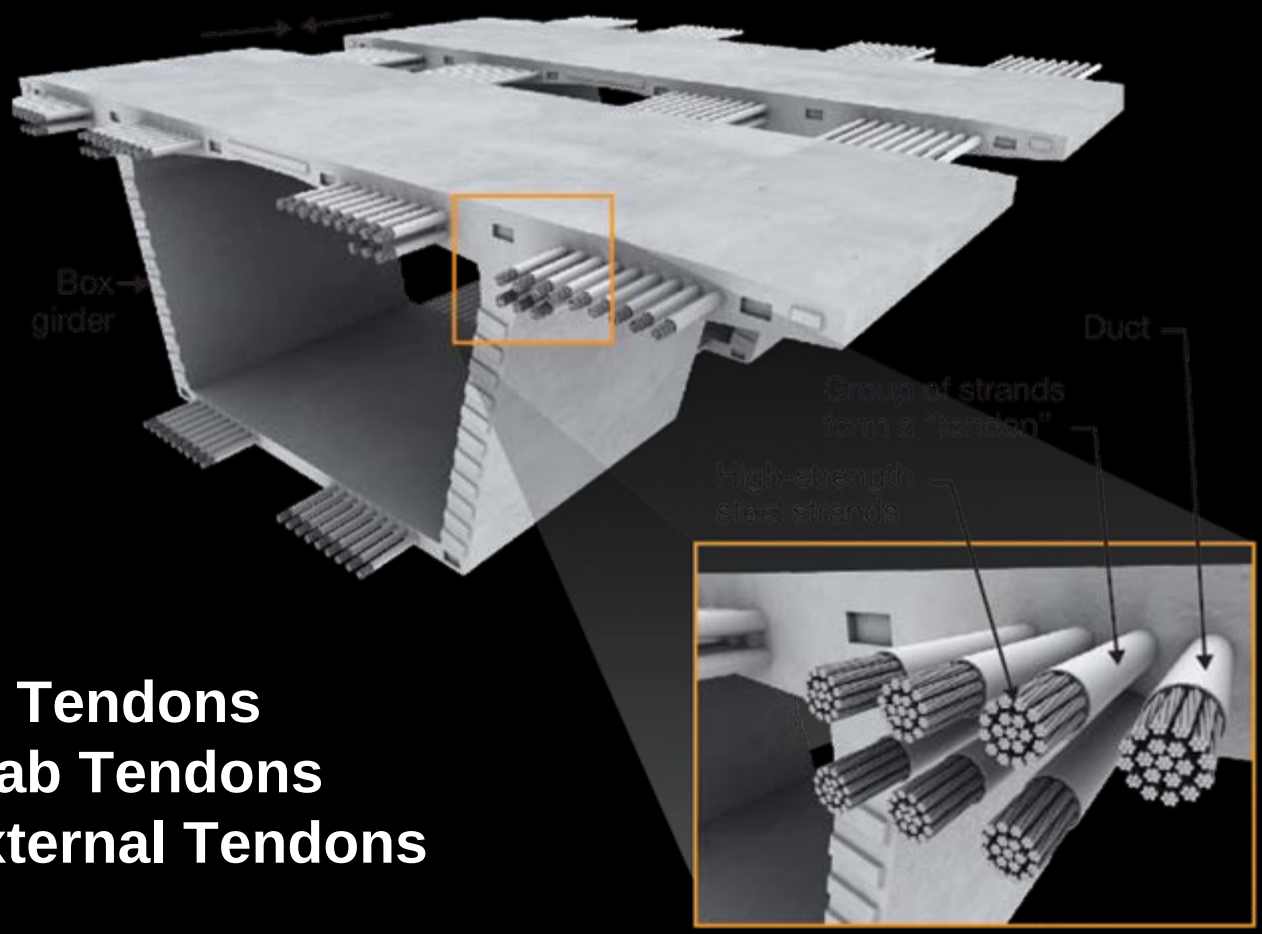
Accommodating Width Variation

Variable Width



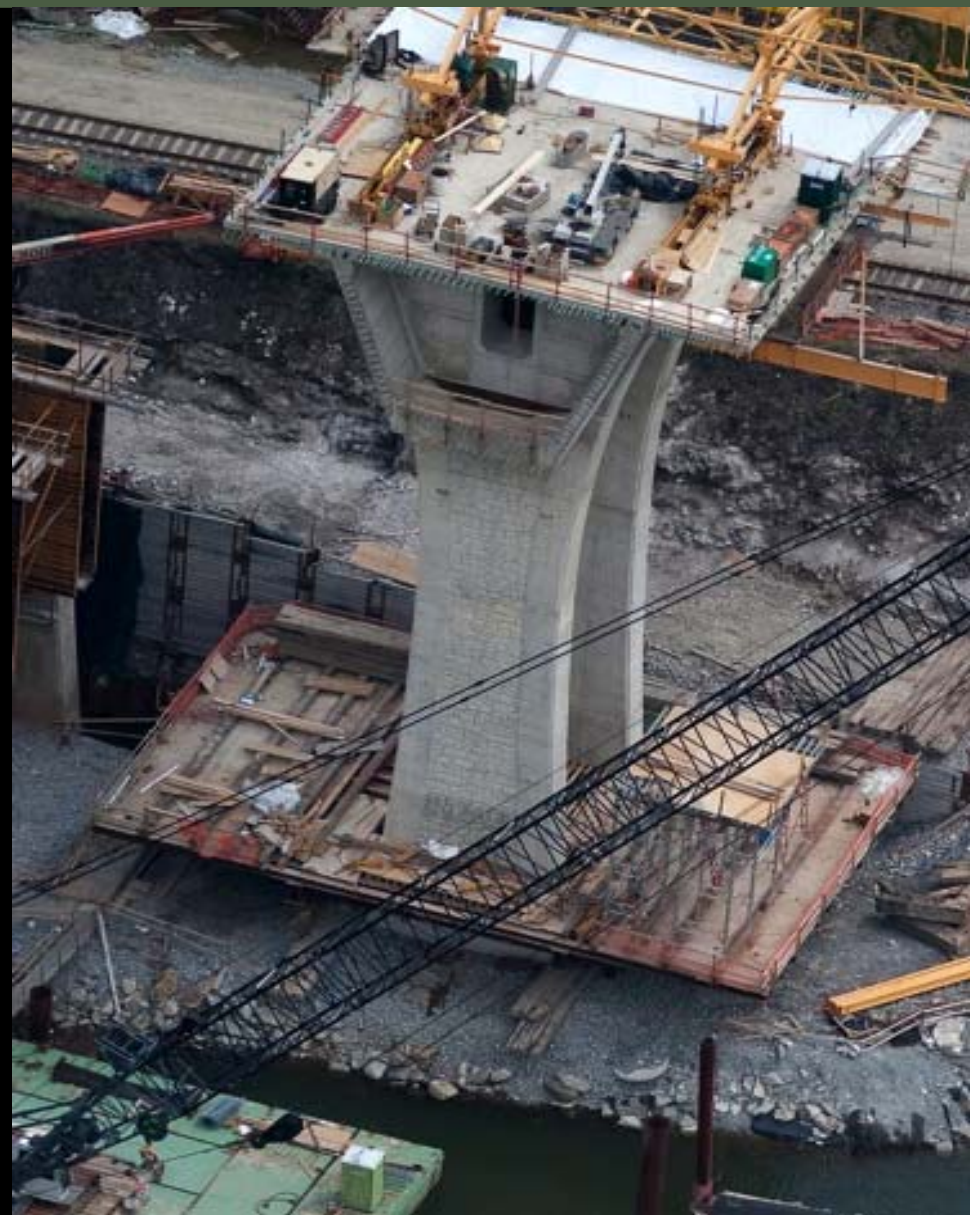
Widening Accommodated in Wings

Post-Tensioning System



Cantilever Tendons
Bottom Slab Tendons
Draped External Tendons

Pier Tables



Form Traveler

Cantilever Construction

Cantilever Construction

Cantilever Construction

Spans 1 and 2

Built over Active Traffic


Freeport Road

Norfolk Southern

Built over Active Traffic

Historic Oakmont CC

US Open (PGA/LPGA)

Texture

Nearby Stone Work

Golfer/Spectator Experience

Wall Treatments

Pier Treatment

Mineral Stain Application


FedEx
ALLEGHENY RIVER BRIDGE

Segmental Bridge Sustainable Benefits

Modular/fabricated system

Versatile/Enduring Aesthetics

Multiple operations concurrently

Best land use / Least ROW

Construction from Above to Maintain Traffic and Protect Environment Below

Segmental Bridge Sustainable Benefits

Creates Quite Usable Spaces Below

Respects the Environment with Small Footprint, Long Spans, Minimal Construction Disturbance

Saves Cost

Accelerated Schedule

Segmental Bridge Sustainable Benefits

Uses Local Labor and Materials

Spurs Local Economies

High Durability for Low Life Cycle Cost


US-191 Colorado River Bridge


Allegheny River Bridge


4th St. Bridge