Technical Presentation

SR 179 Oak Creek Bridge in Sedona
ADOT Structure No. 2850

Presented to the:
Western Bridge Engineers' Seminar

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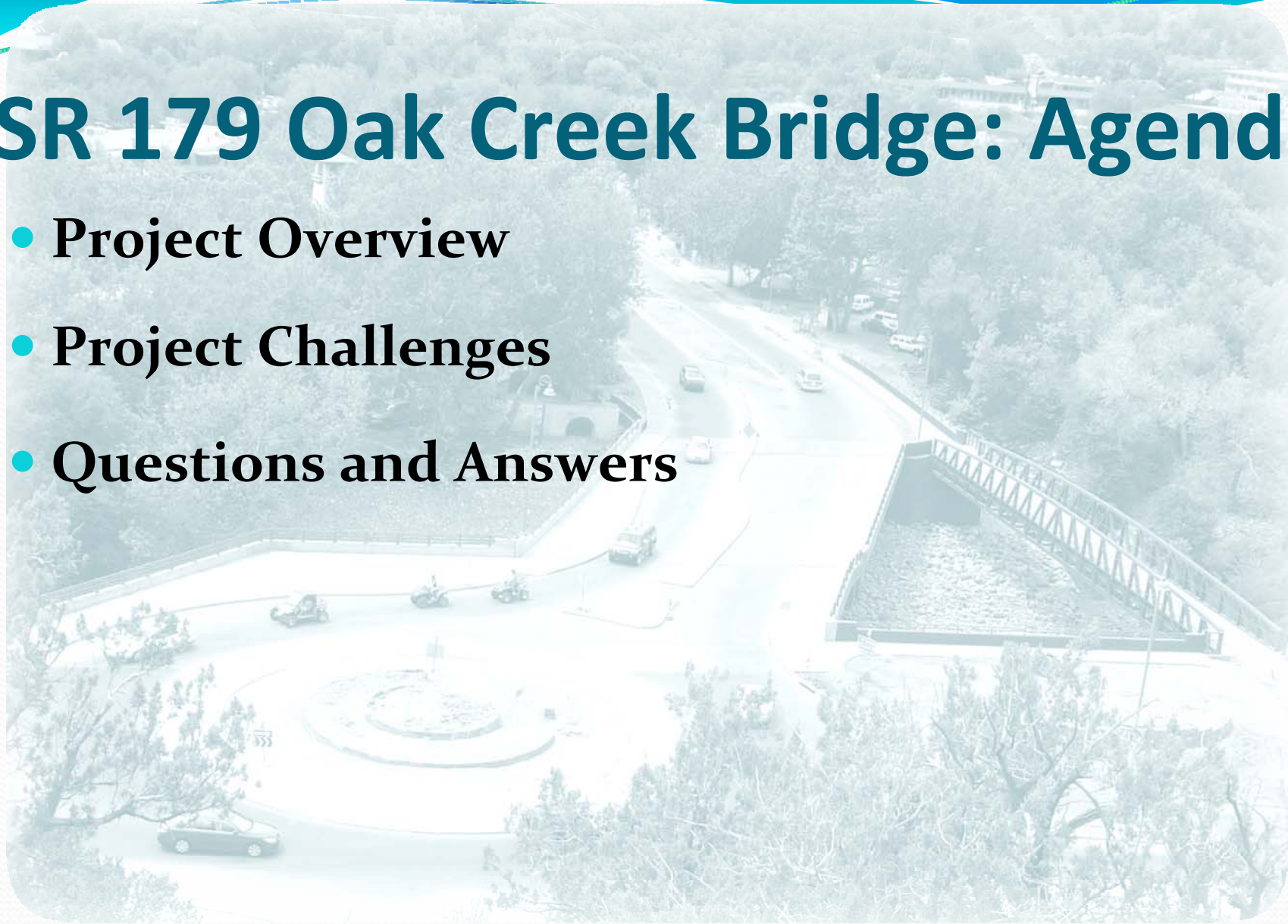
PREMIER
ENGINEERING CORPORATION

AECOM

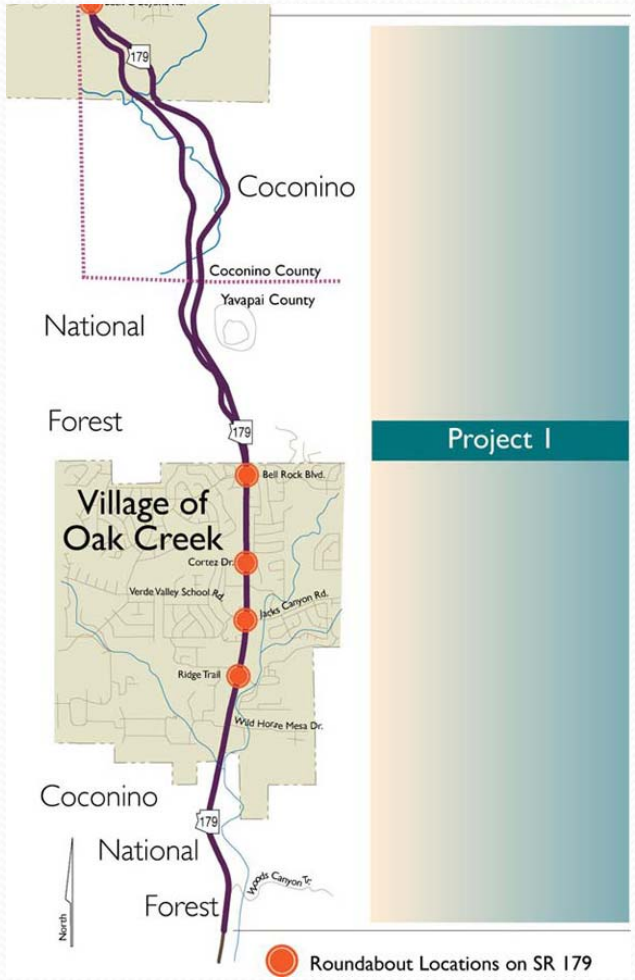
September 26, 2011

SR 179 Oak Creek Bridge: Agenda

- Project Overview
- Project Challenges
- Questions and Answers



Project Overview



Project Overview

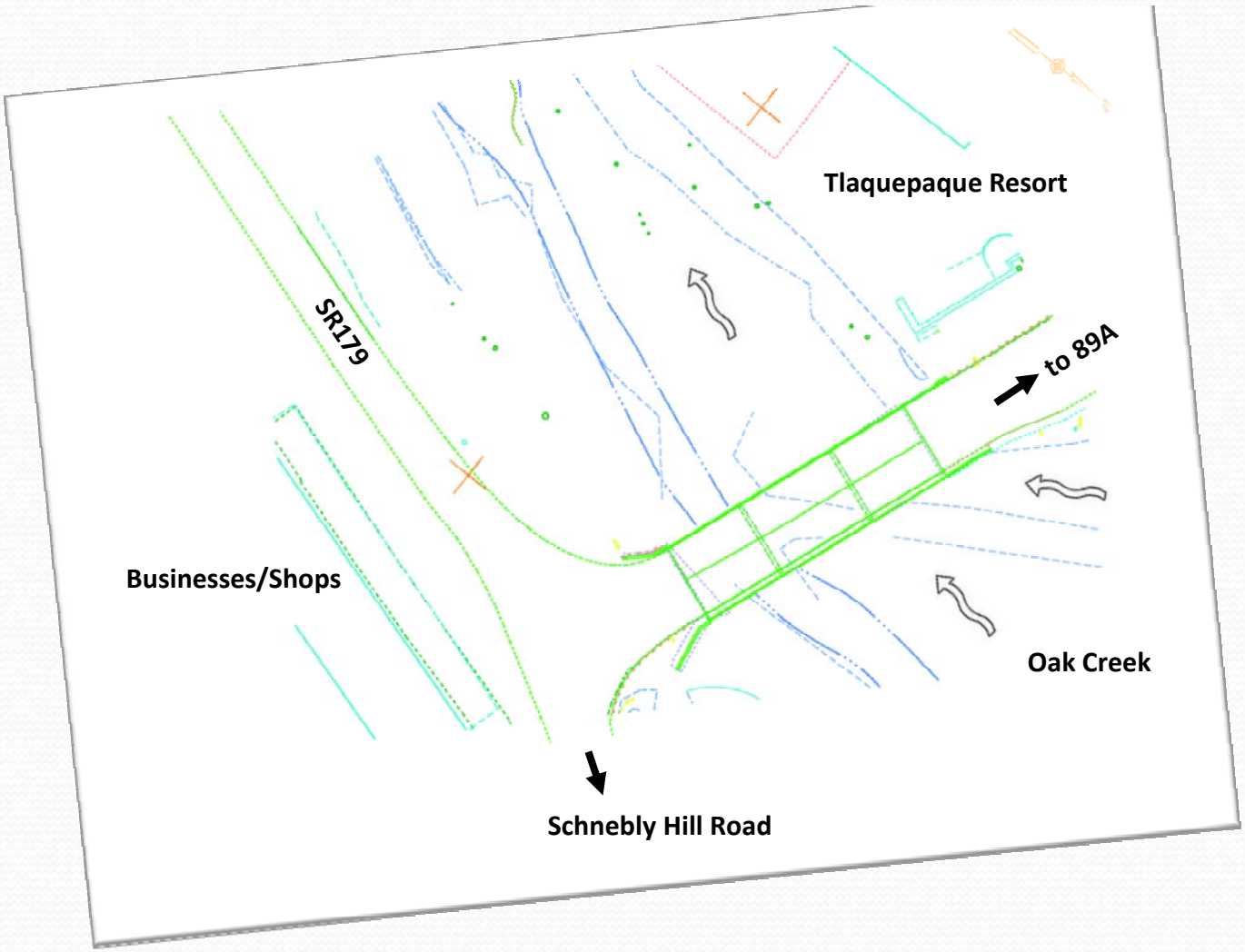
- Design (2004-2007) (Project 1 and 2)
- Overall Construction (2007-2010) (Project 1 and 2)
- Enhanced safety for travelers by improving traffic, pedestrian, and bicycle movements

SR179 Oak Creek Vehicular and Pedestrian/Utility Bridges

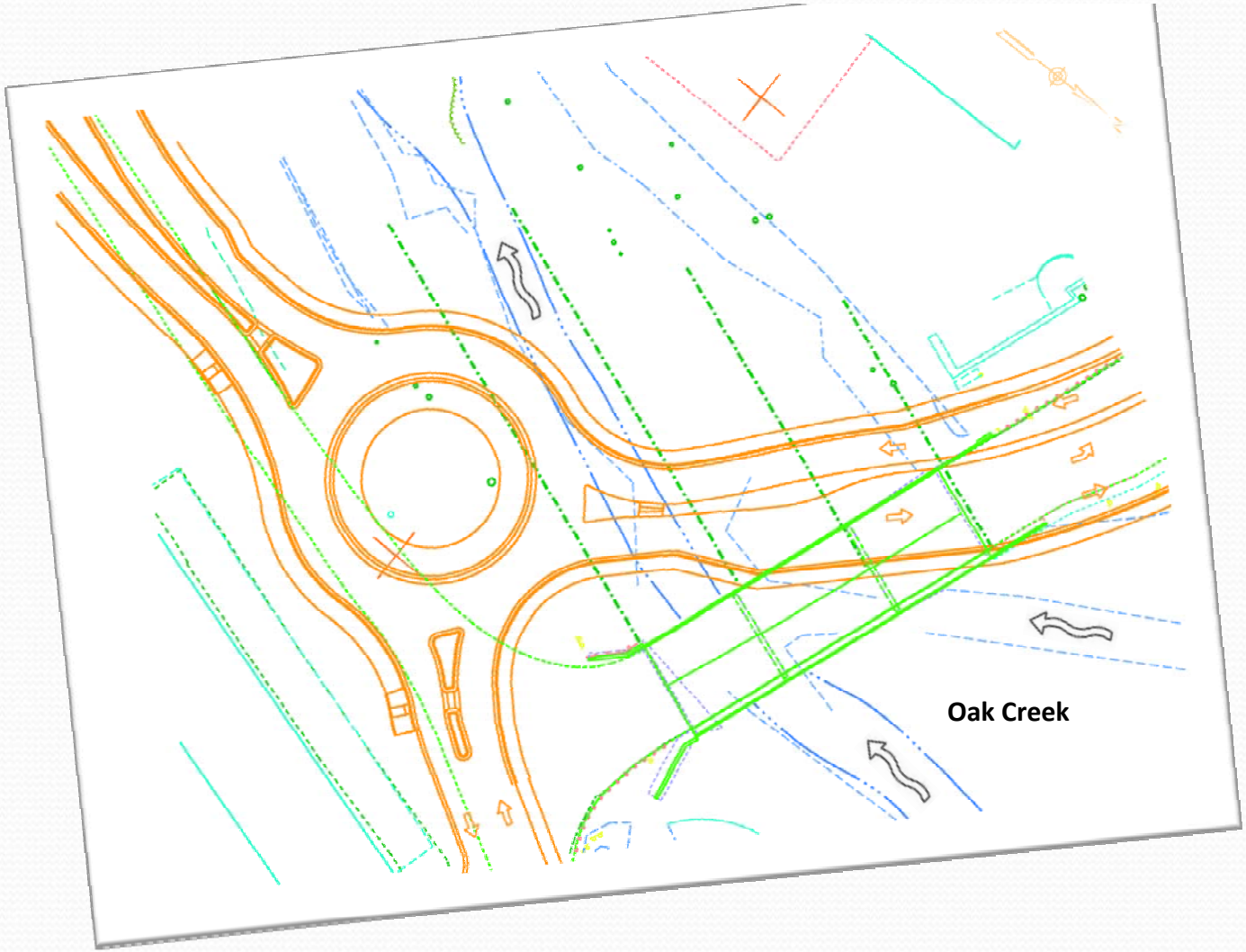
Design Challenges

- **Bridge Configuration and Bridge Selection**
- **Phased Construction**
- **Relocation of Existing Utilities Prior to Bridge Construction**
- **Bidwell Limitations**
- **Unusual Design of Girders and Pier Cap**

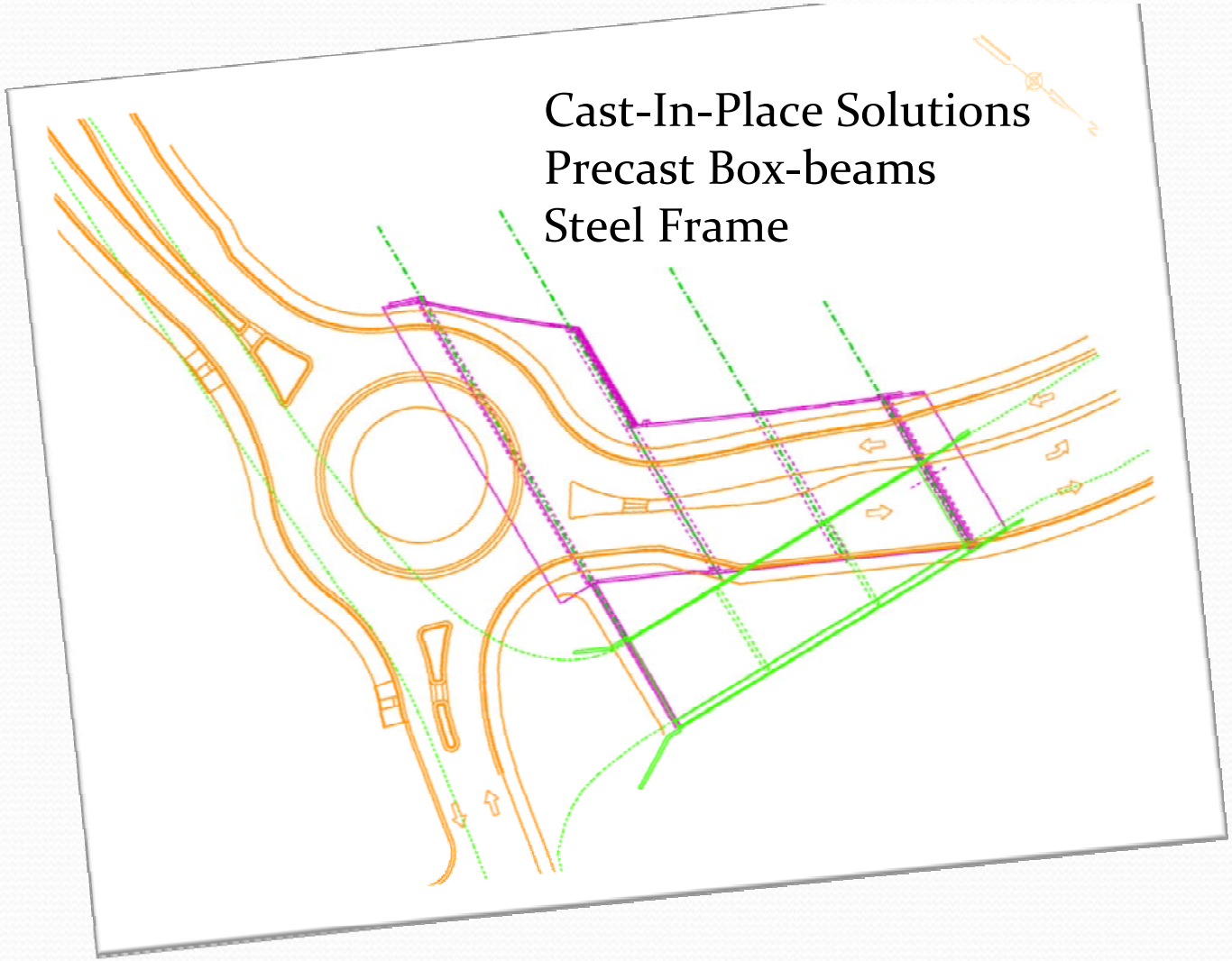
Bridge Selection



Bridge Selection

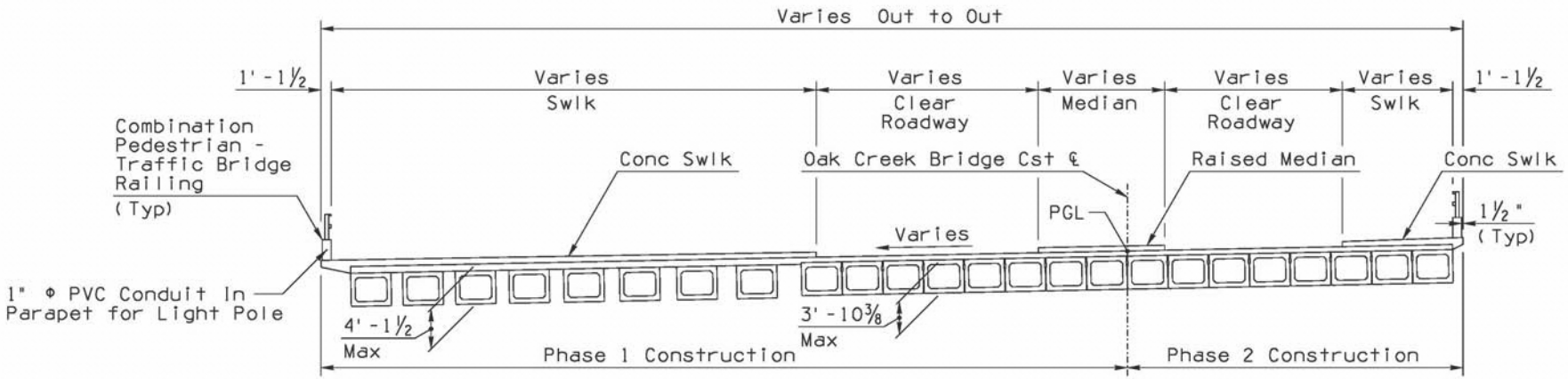


Bridge Selection



Bridge Selection

Span 1

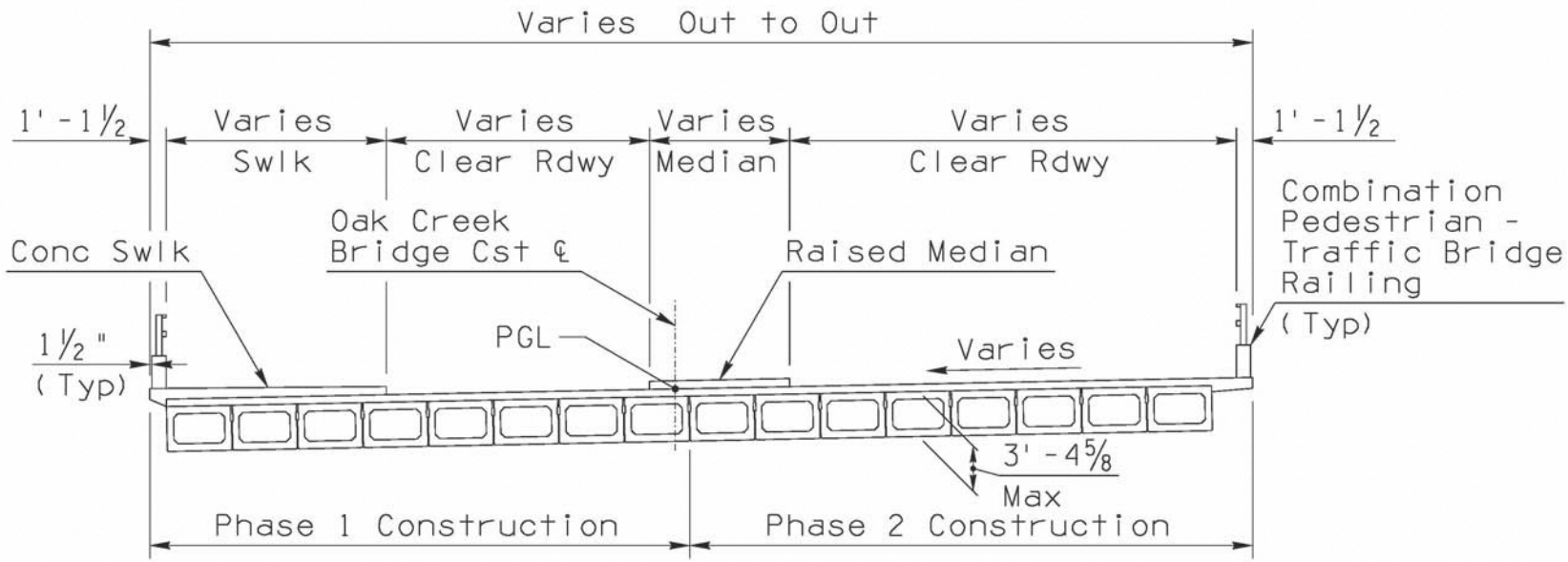


TYPICAL SECTION - SPAN 1

Scale: ⅛" = 1'-0

Span 1

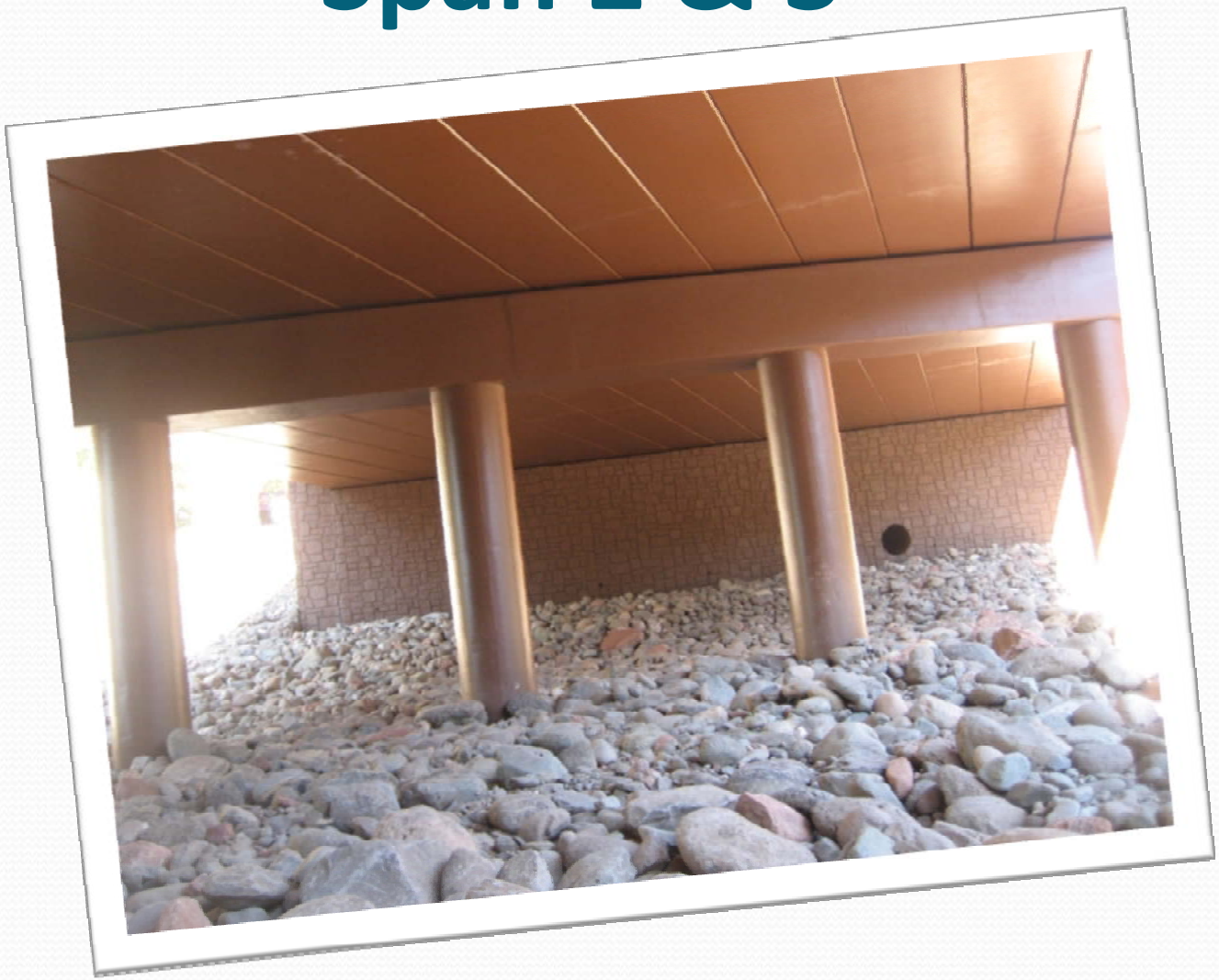
Span 2 & 3



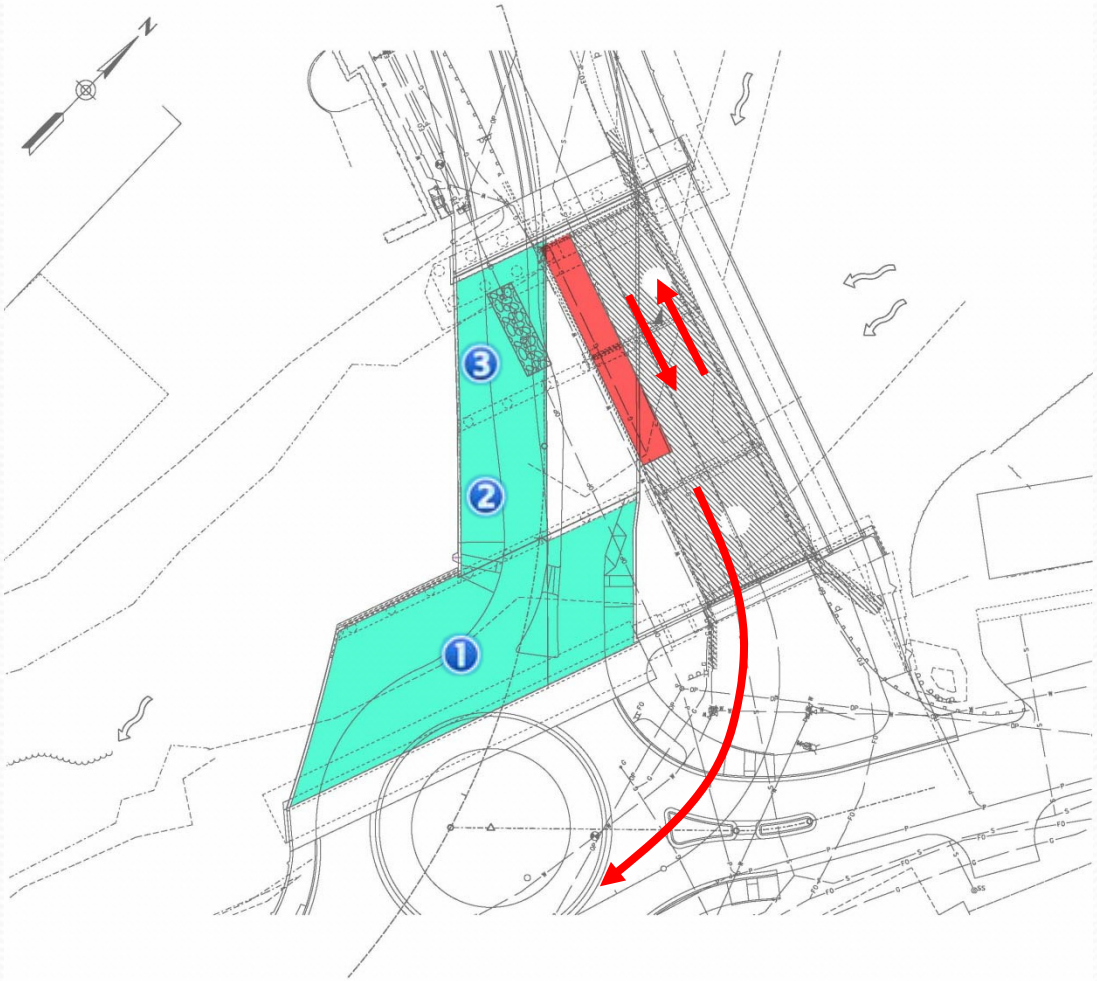
TYPICAL SECTION - SPANS 2 & 3

Scale: ⅛" = 1'-0

Span 2 & 3

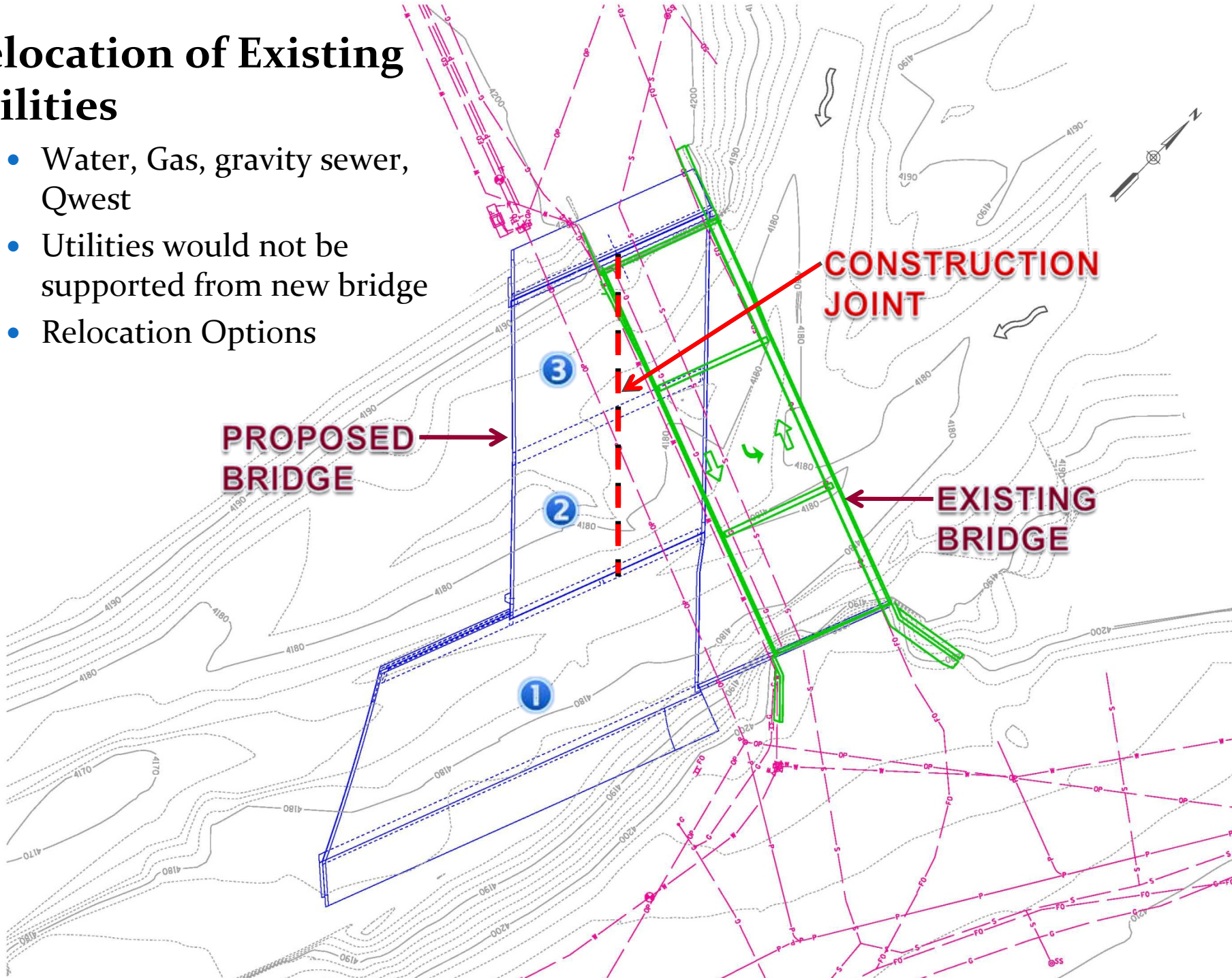


Phased Construction



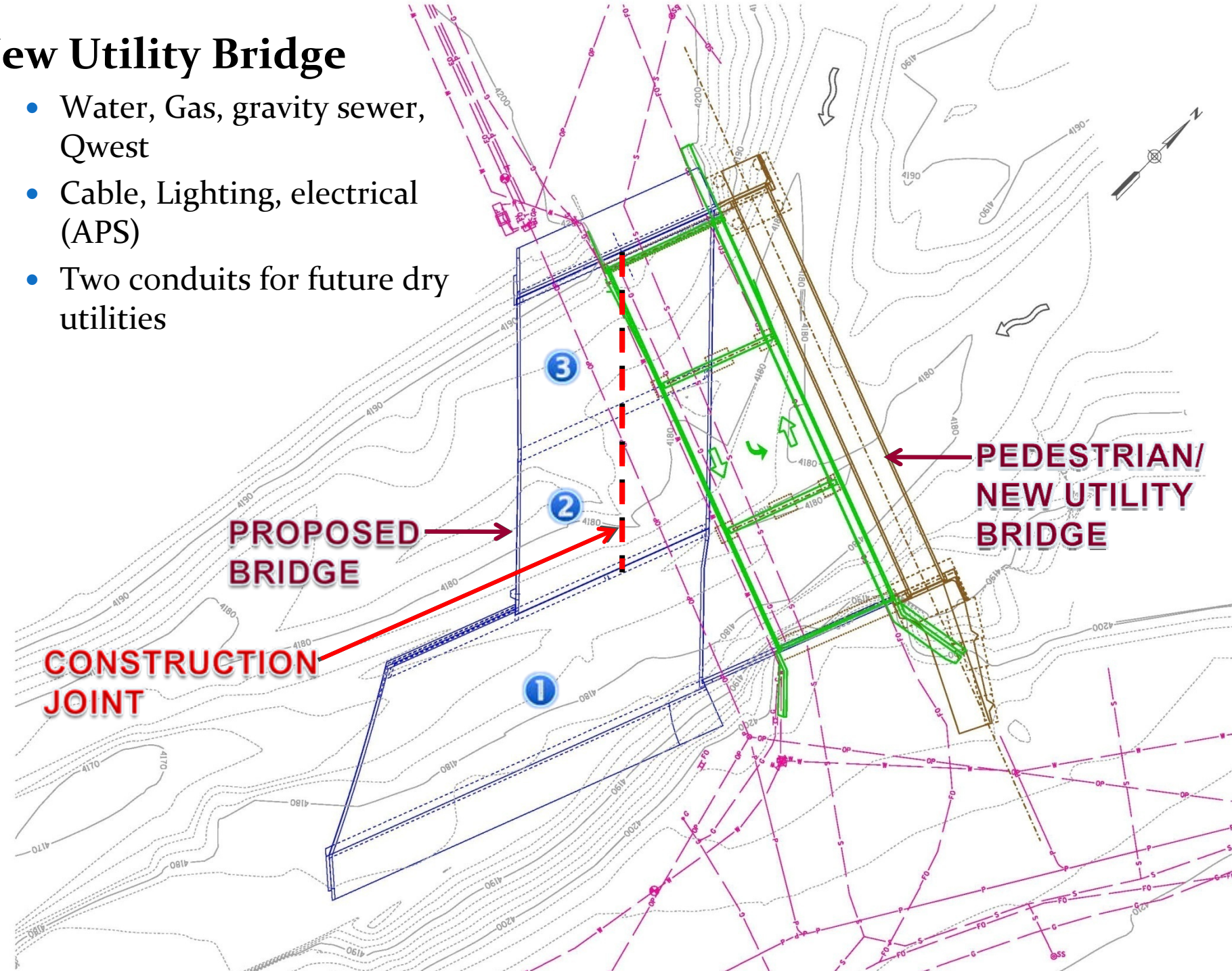
Relocation of Existing Utilities

- Water, Gas, gravity sewer, Qwest
- Utilities would not be supported from new bridge
- Relocation Options

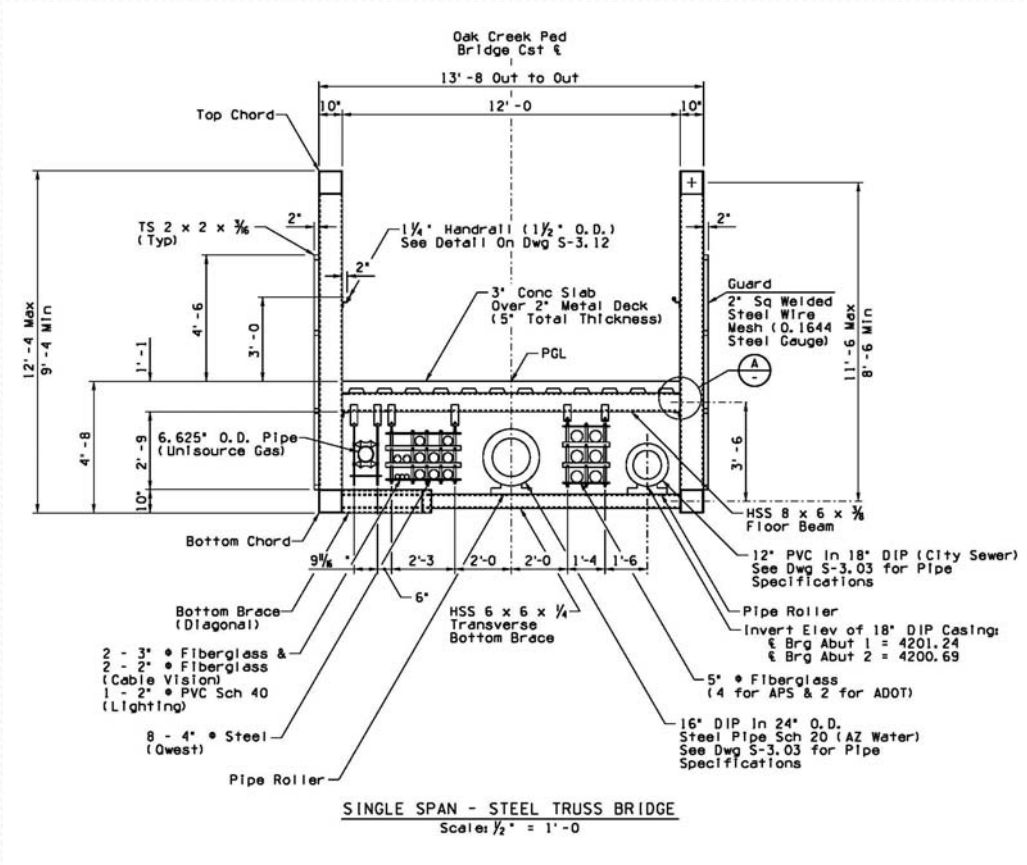


New Utility Bridge

- Water, Gas, gravity sewer, Qwest
- Cable, Lighting, electrical (APS)
- Two conduits for future dry utilities



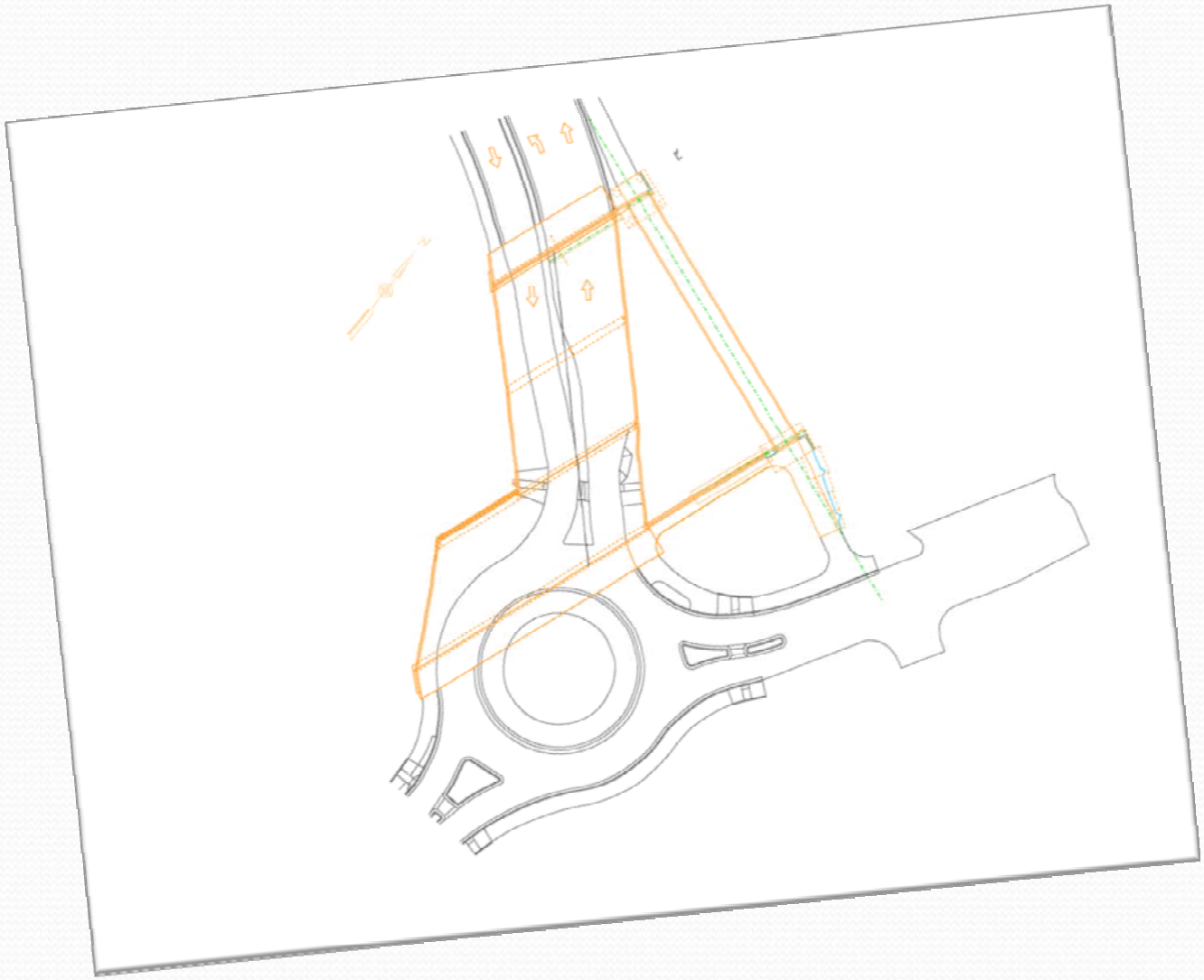
Pedestrian/Utility Bridge Cross Section



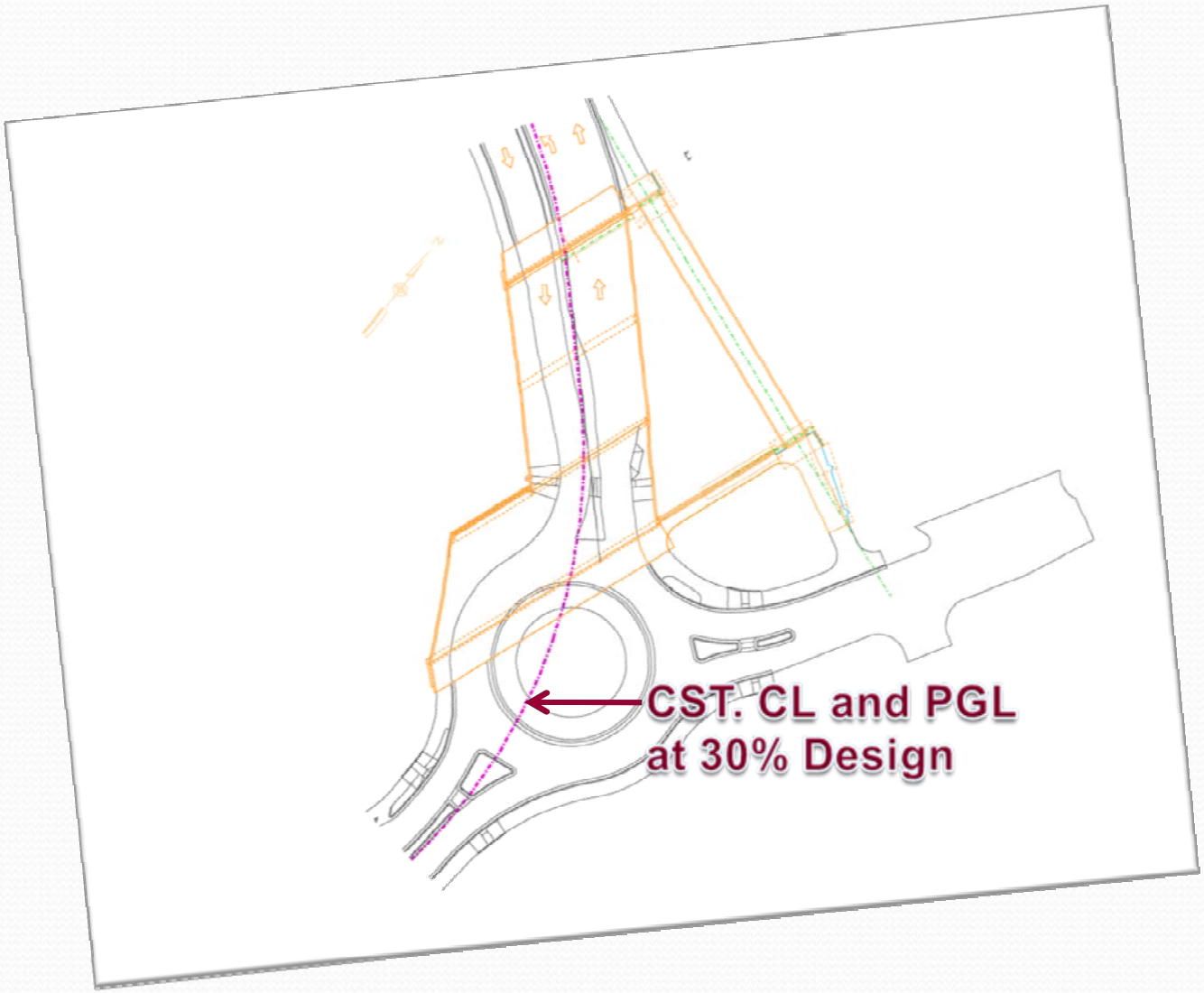
January 2009

SR179 Pedestrian/Utility Bridge

Bidwell Limitations

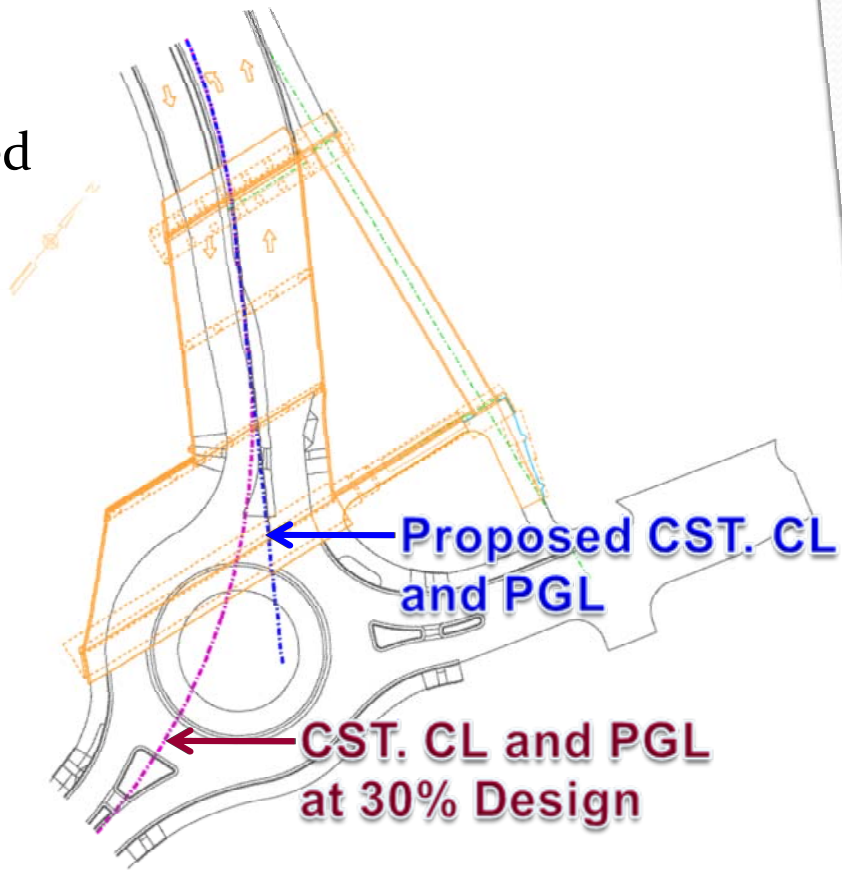


Bidwell Limitations



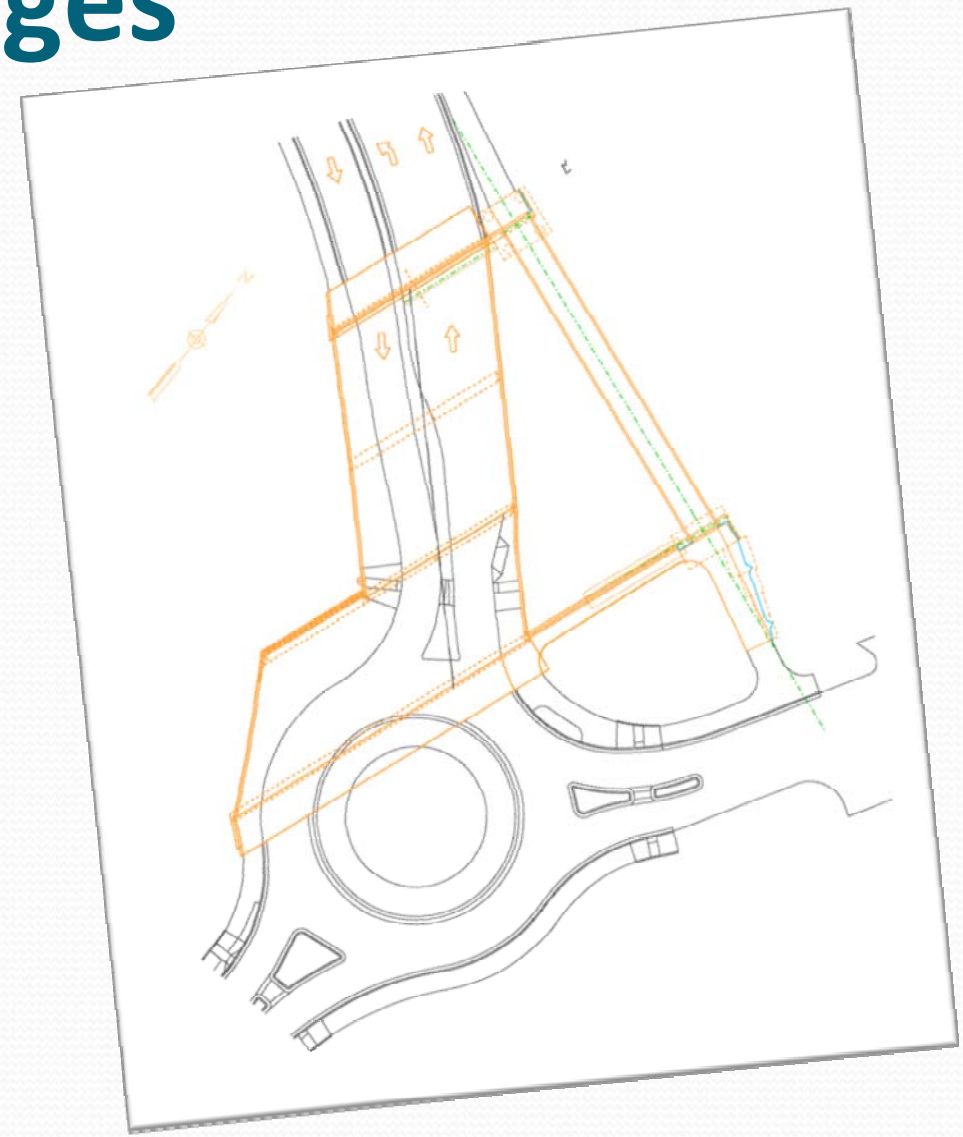
Bidwell Limitations

Bidwell recommended the use of an independent PGL for pouring the deck



Design Challenges

- **Unusual Design of Girders in Span 1 and Pier 1 Cap Design**
  - Expansion joint consideration – why pier 1?



Design Challenges

- **Unusual Design of Girders in Span 1 and Pier 1 Cap Design**
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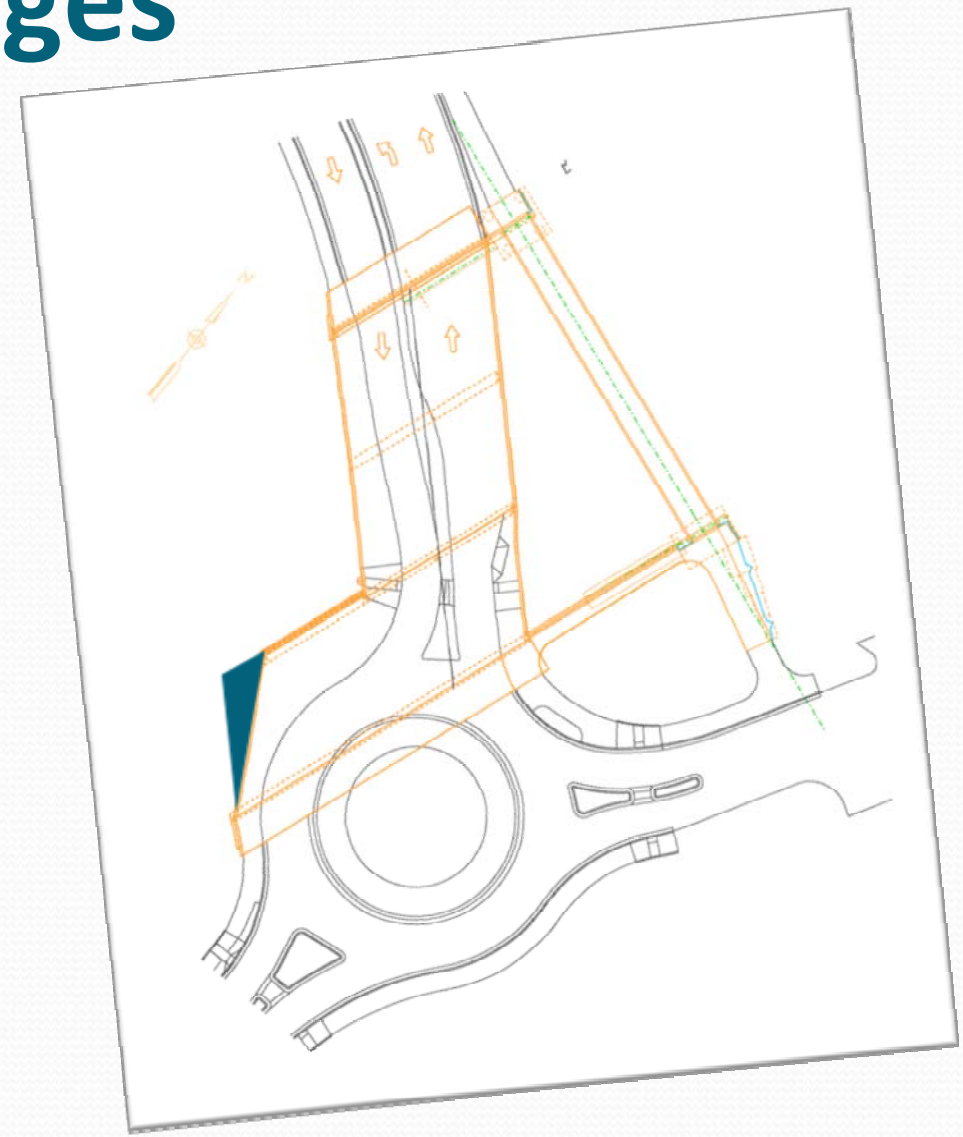
  - Why splayed girders?



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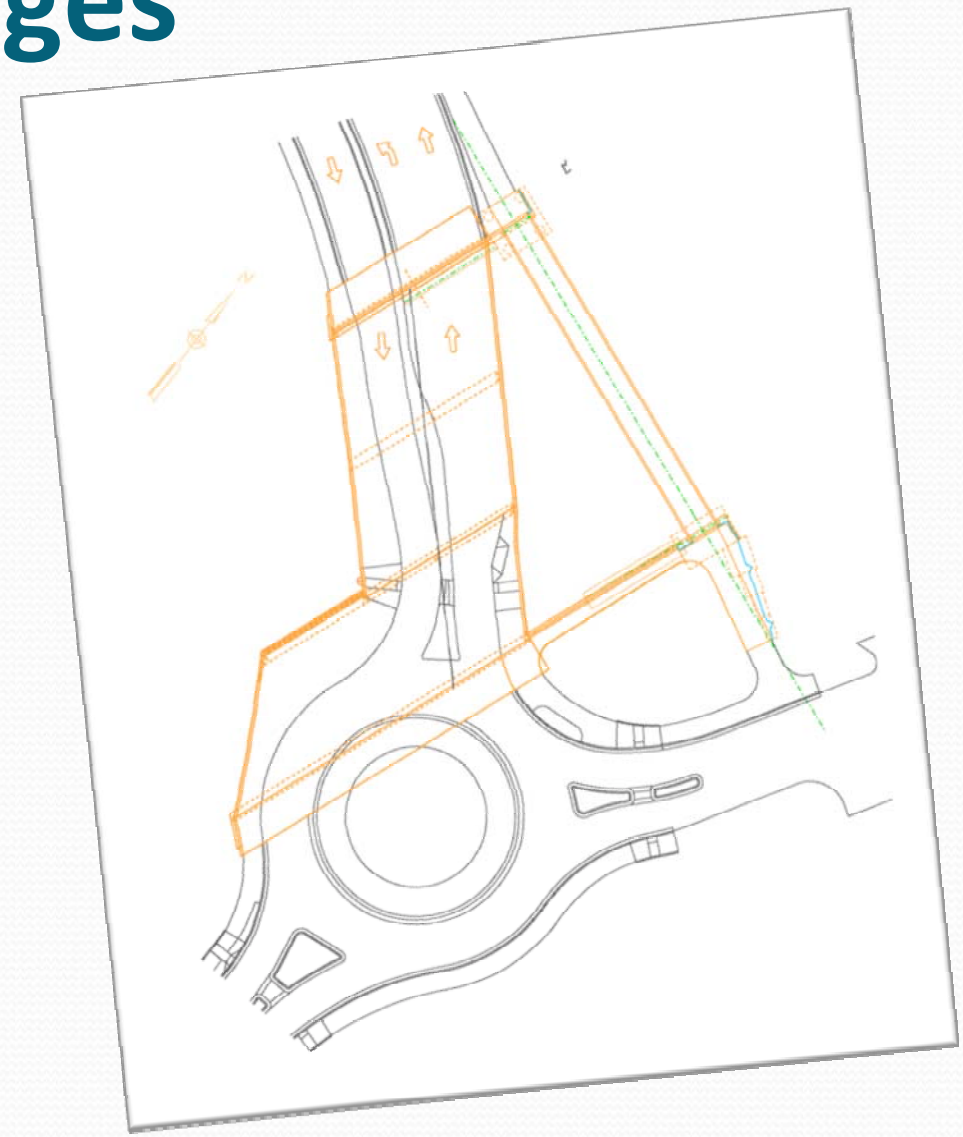
  - Why splayed girders?
  - Live load placement and modeling considerations – met with Tina Sisley at ADOT Bridge Group to develop a “tailored” live loading of the girders at different stages



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  - Why splayed girders?
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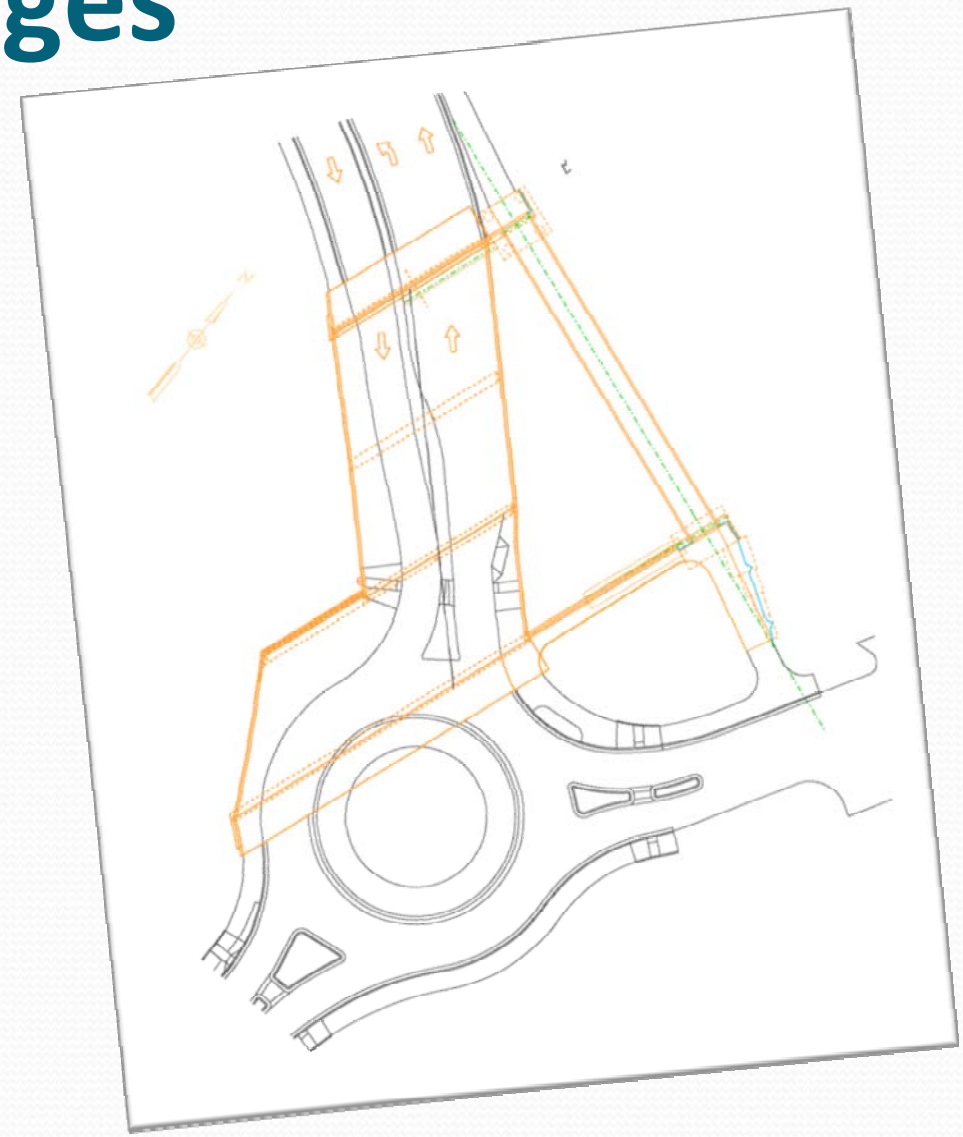
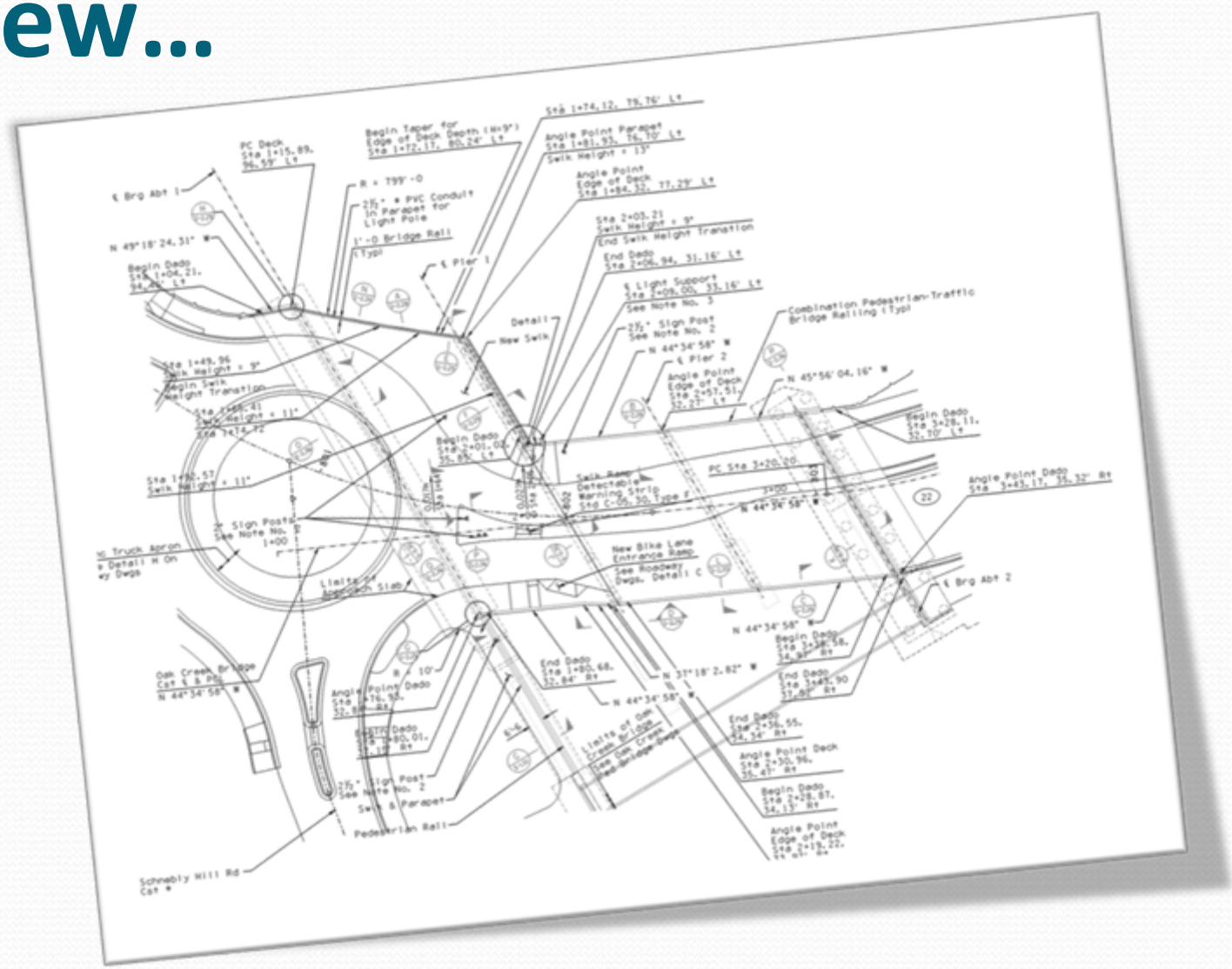
  - Special details required…

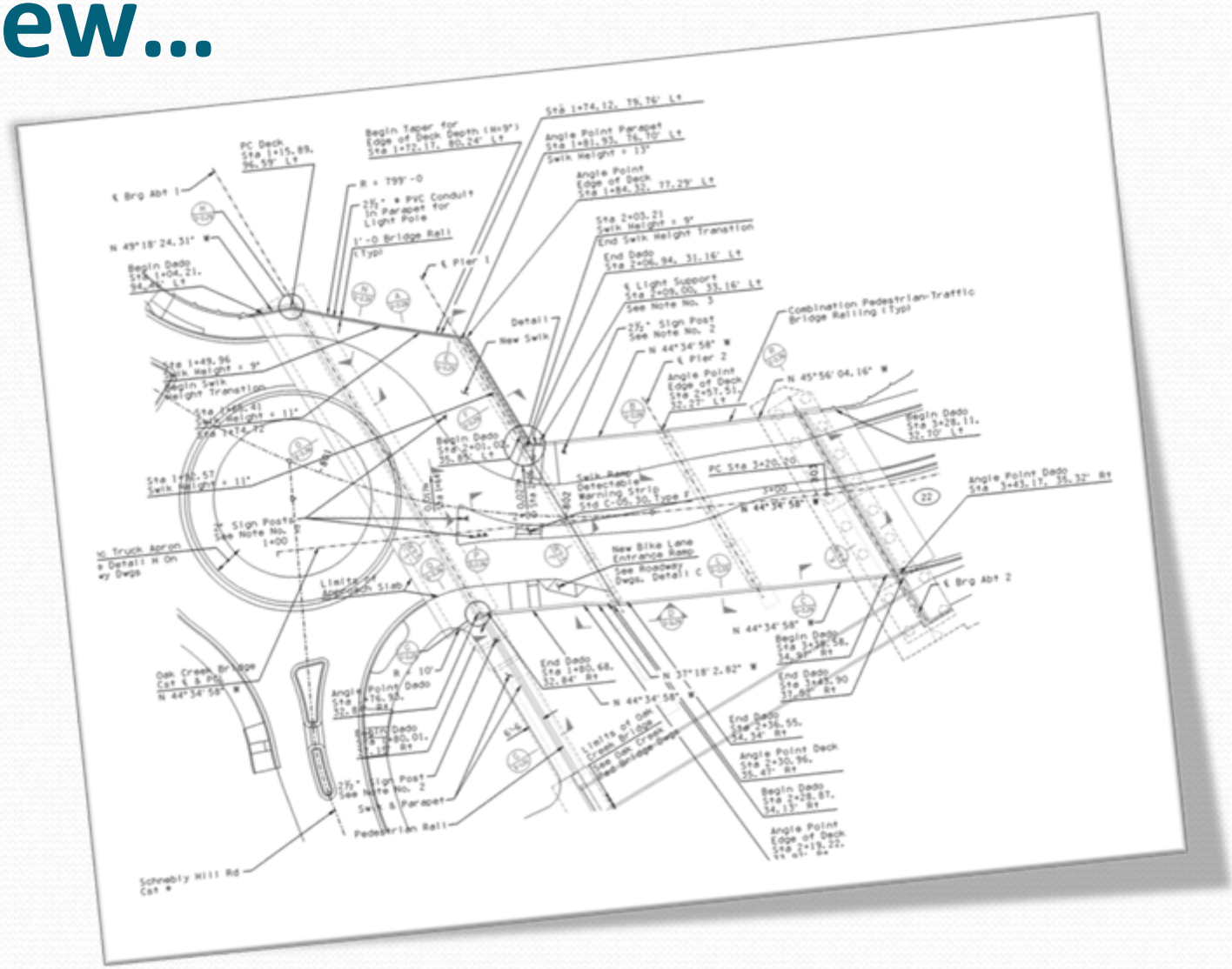


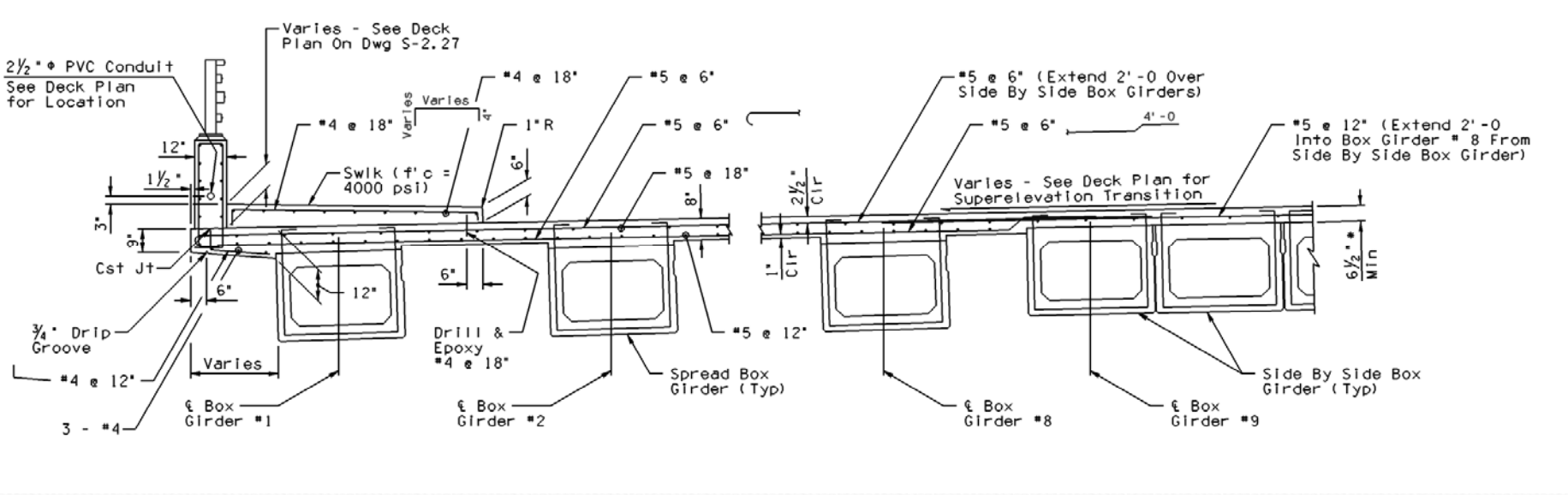
Just a few…

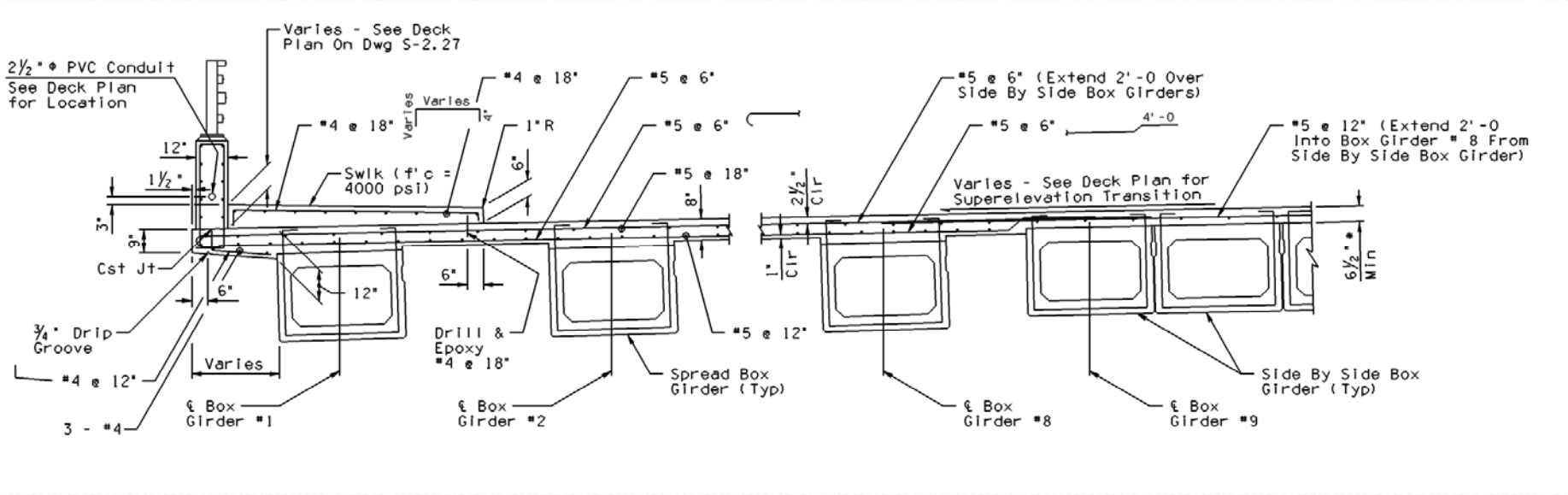

℄ Brg Abt 1
N 49°18'24.31" W
Begin Dado
Sta 1+04.21,
34.76' Lt
PC Deck
Sta 1+15.89,
36.59' Lt
Begin Taper for
Edge of Deck Depth (H=9")
Sta 1+72.17, 30.24' Lt
R = 799'-0
2½" ø PVC Conduit
in Parapet for
Light Pole
1'-0 Bridge Rail
(Typ)
℄ Pier 1
Sta 1+74.12, 73.76' Lt
Angle Point Parapet
Sta 1+81.93, 76.70' Lt
Walk Height = 13"
Angle Point
Edge of Deck
Sta 1+84.32, 77.29' Lt
Sta 2+03.21
Walk Height = 9"
End Walk Height Transition
End Dado
Sta 2+06.94, 31.16' Lt
℄ Light Support
Sta 2+09.00, 33.16' Lt
See Note No. 3
2½" Sign Post
See Note No. 2
N 44°34'58" W
℄ Pier 2
Angle Point
Edge of Deck
Sta 2+57.51,
32.27' Lt
Combination Pedestrian-Traffic
Bridge Railing (Typ)
N 45°56'04.16" W
Begin Dado
Sta 3+28.11,
32.10' Lt
Sta 1+49.96
Walk Height = 9"
Begin Walk
Height Transition
Sta 1+66.41
Walk Height = 11"
End 3474.92
Begin Dado
Sta 2+01.04,
35.84' Lt
Detail
New Walk
Walk Ramp
Detectable
Warning Strip
Std C-06.30, Type F
PC Sta 3+20.20
Angle Point Dado
Sta 3+43.17, 35.32' Rt
N 44°34'58" W
Sta 1+80.57
Walk Height = 11"
2½" Sign Posts
See Note No. 2
1400
New Bike Lane
Entrance Ramp
See Roadway
Dwgs. Detail C
℄ Brg Abt 2
Begin Dado
Sta 3+38.58,
34.92' Rt
End Dado
Sta 3+45.90
33.86' Rt
End Dado
Sta 1+80.68,
32.84' Rt
N 37°18'2.82" W
N 44°34'58" W
R = 10'
Angle Point Dado
Sta 1+76.93,
32.84' Rt
End Dado
Sta 1+80.01,
32.84' Rt
2½" Sign Post
See Note No. 2
Sta 6 Parapet
Pedestrian Rail
End Dado
Sta 2+56.55,
34.54' Rt
Angle Point Deck
Sta 2+30.96,
35.41' Rt
Begin Dado
Sta 2+28.87,
34.13' Rt
Angle Point
Edge of Deck
Sta 2+13.22,
34.41' Rt
Schnebly Hill Rd
Cat ℄

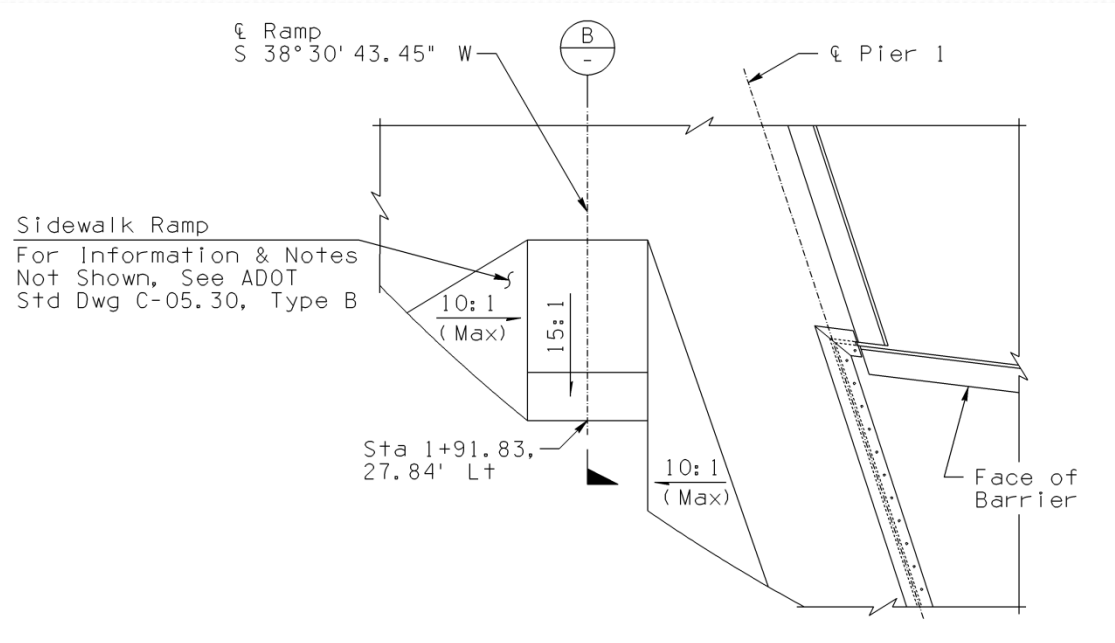
Just a few…

- 47 plan sheets were required for a 169’ long bridge

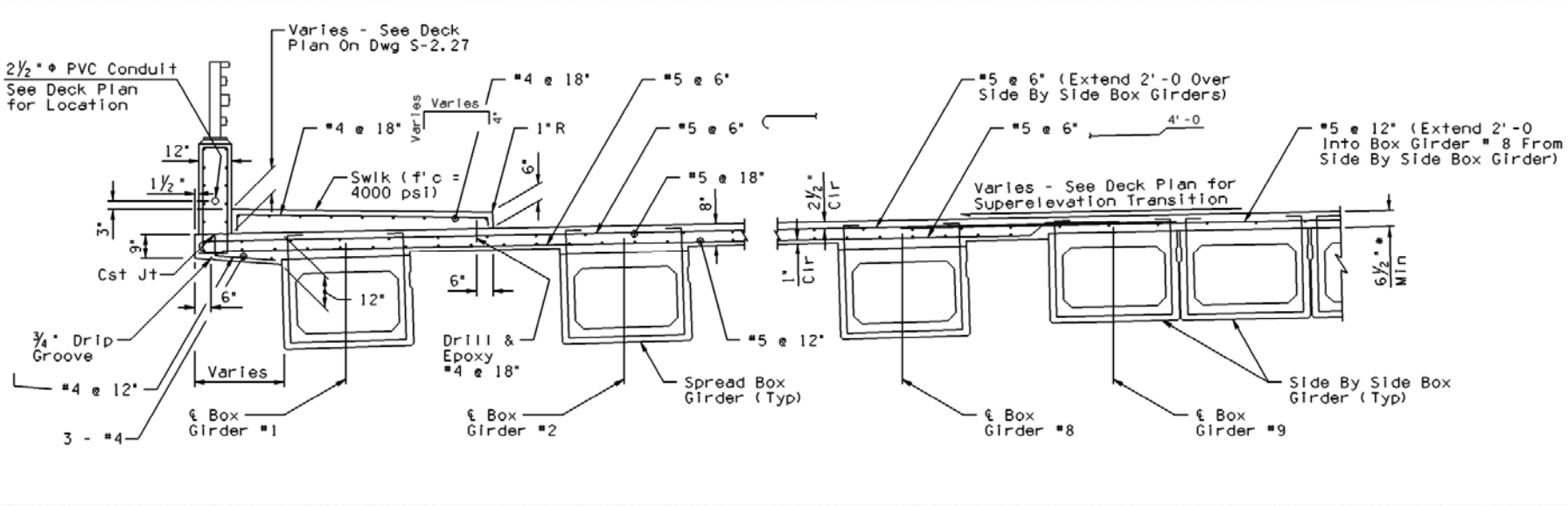


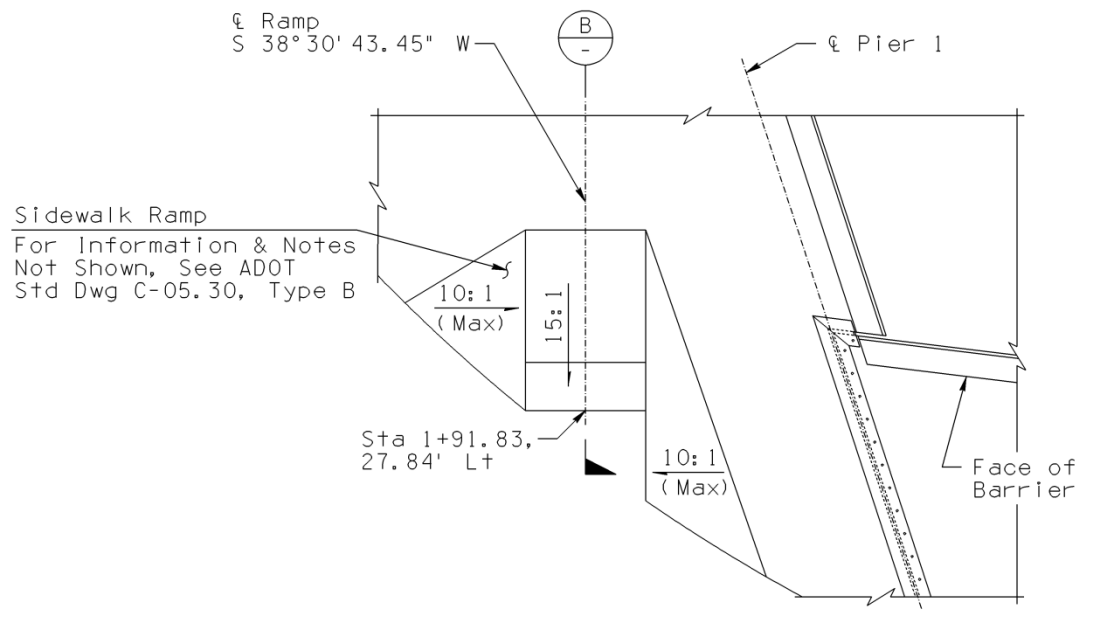

2½" ϕ PVC Conduit
See Deck Plan
for Location
Varies - See Deck
Plan On Dwg S-2.27
12"
1½"
3"
9"
Cst Jt
6"
¾" Drip
Groove
#4 @ 12"
3 - #4
Varies
℄ Box
Girder #1
#4 @ 18"
Varies
Varies
4"
1"R
Swlk (f'c =
4000 psi)
6"
12"
6"
Drill &
Epoxy
#4 @ 18"
#5 @ 6"
#5 @ 6"
#5 @ 18"
8"
#5 @ 12"
Spread Box
Girder (Typ)
℄ Box
Girder #2
#5 @ 6" (Extend 2'-0 Over
Side By Side Box Girders)
#5 @ 6"
4'-0
#5 @ 12" (Extend 2'-0
Into Box Girder # 8 From
Side By Side Box Girder)
Varies - See Deck Plan for
Superelevation Transition
2½"
Clr
1"
Clr
6½" *
Min
℄ Box
Girder #8
℄ Box
Girder #9
Side By Side Box
Girder (Typ)

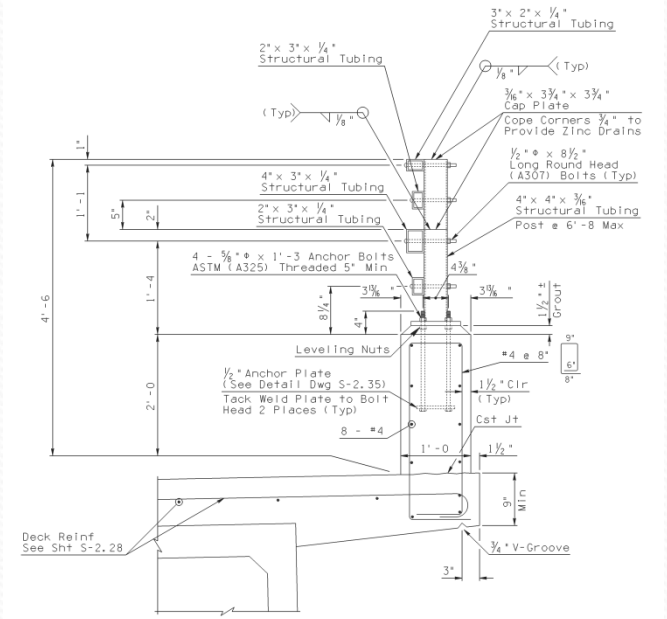


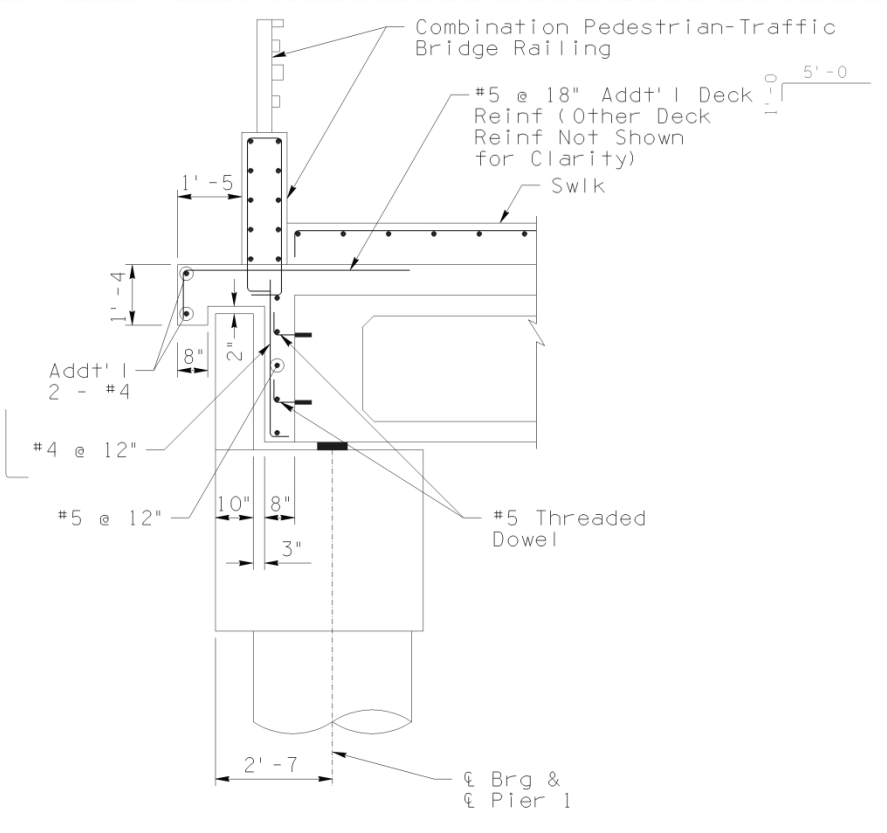


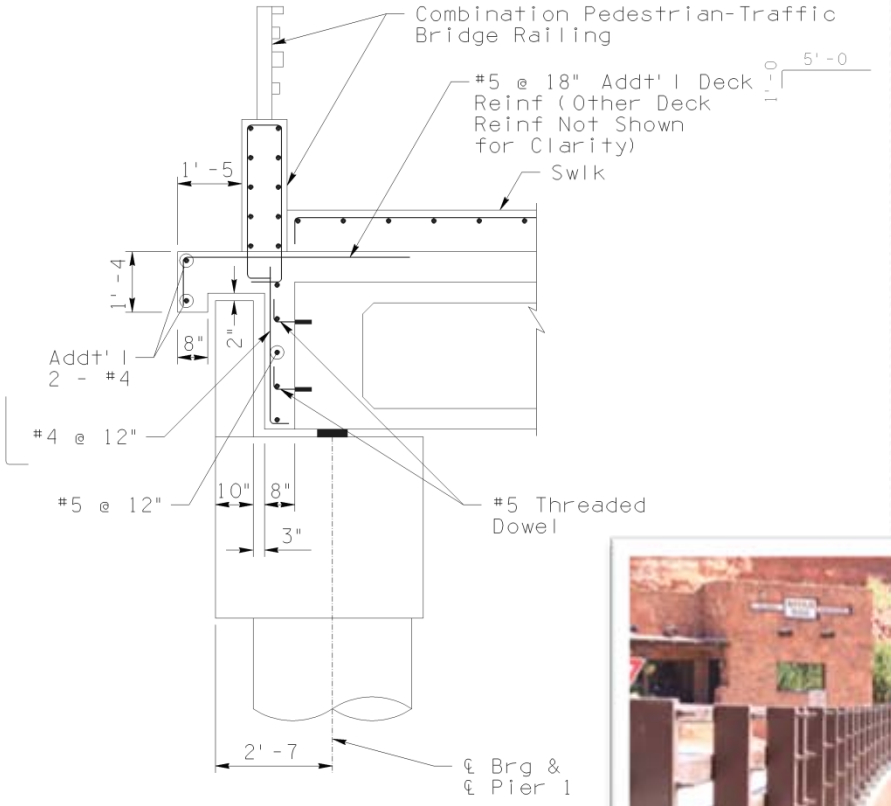
- **Handicap access detail**


2½" ϕ PVC Conduit
See Deck Plan
for Location
Varies - See Deck
Plan On Dwg S-2.27
#4 @ 18"
#5 @ 6"
#5 @ 6" (Extend 2'-0 Over
Side By Side Box Girders)
#4 @ 18"
Varies
Varies
4"
1"R
#5 @ 6"
#5 @ 6"
4'-0
#5 @ 12" (Extend 2'-0
Into Box Girder # 8 From
Side By Side Box Girder)
12"
1½"
Swlk (f'c =
4000 psi)
6"
#5 @ 18"
8"
2½"
Clr
Varies - See Deck Plan for
Superelevation Transition
3"
9"
Cst Jt
6"
12"
6"
1"
Clr
6½"ϕ
Min
¾" Drip
Groove
#4 @ 12"
Varies
Drill &
Epoxy
#4 @ 18"
#5 @ 12"
3 - #4
℄ Box
Girder #1
℄ Box
Girder #2
Spread Box
Girder (Typ)
℄ Box
Girder #8
℄ Box
Girder #9
Side By Side Box
Girder (Typ)


℄ Ramp
S 38°30'43.45" W
B
-
℄ Pier 1
Sidewalk Ramp
For Information & Notes
Not Shown, See ADOT
Std Dwg C-05.30, Type B
10:1
(Max)
15:1
Sta 1+91.83,
27.84' Lt
10:1
(Max)
Face of
Barrier

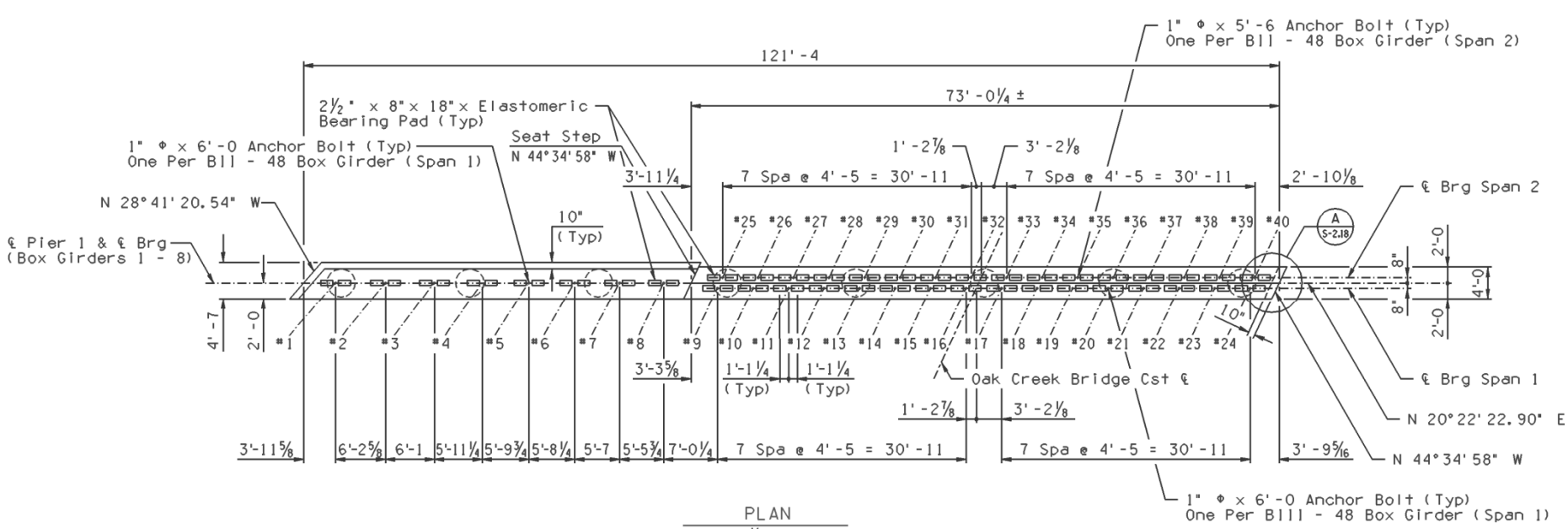

3"x 2"x ¼"
Structural Tubing
2"x 3"x ¼"
Structural Tubing
(Typ)
⅛"
(Typ)
⅛"
3/16"x 3¾"x 3¾"
Cap Plate
Cope Corners ¾" to
Provide Zinc Drains
½"ϕ x 8½"
Long Round Head
(A307) Bolts (Typ)
4"x 3"x ¼"
Structural Tubing
4"x 4"x 5/16"
Structural Tubing
Post @ 6'-8 Max
2"x 3"x ¼"
Structural Tubing
4 - ⅝"ϕ x 1'-3 Anchor Bolts
ASTM (A325) Threaded 5" Min
4⅜"
3⅜"
3⅜"
1½"±
Grout
8¼"
4"
Leveling Nuts
#4 @ 8"
½"Anchor Plate
(See Detail Dwg S-2.35)
Tack Weld Plate to Bolt
Head 2 Places (Typ)
1½"Clr
(Typ)
Cst Jt
8 - #4
1'-0
1½"
9"
Min
Deck Reinf
See Sht S-2.28
¾"V-Groove
3"


Combination Pedestrian-Traffic
Bridge Railing
#5 @ 18" Addt'l Deck
Reinf (Other Deck
Reinf Not Shown
for Clarity)
5'-0
1'-0
Swlk
1'-5
1'-4
2"
8"
Addt'l
2 - #4
#4 @ 12"
#5 @ 12"
10"
8"
3"
#5 Threaded
Dowel
2'-7
℄ Brg &
℄ Pier 1


Combination Pedestrian-Traffic Bridge Railing
#5 @ 18" Addt'l Deck Reinf (Other Deck Reinf Not Shown for Clarity)
5'-0
1'-10
Swlk
1'-5
1'-4
8"
2"
Addt'l 2 - #4
#4 @ 12"
#5 @ 12"
10"
8"
3"
#5 Threaded Dowel
2'-7
℄ Brg & ℄ Pier 1

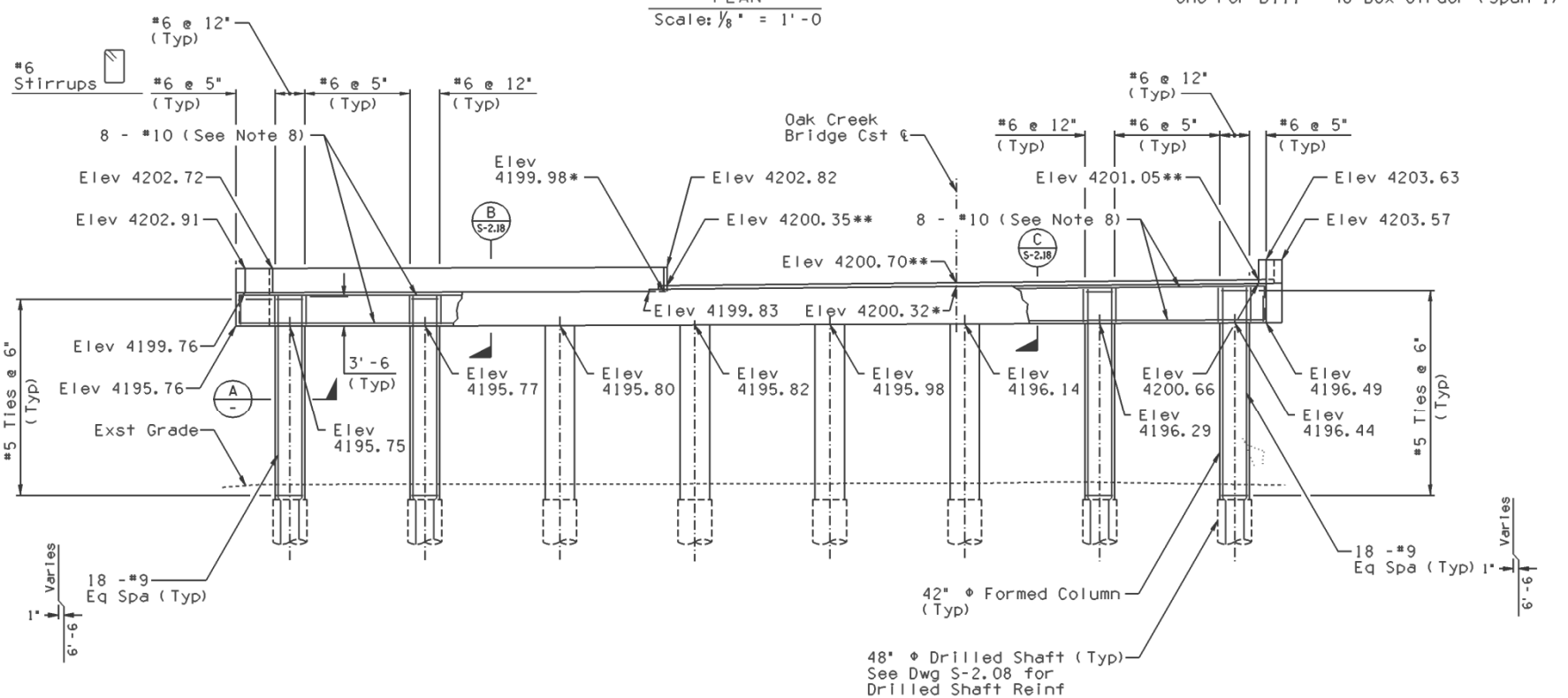
Design Challenges

- **Pier Cap #1**
  - Splayed girders vs. side-by-side girders
  - Thermal load considerations



PLAN

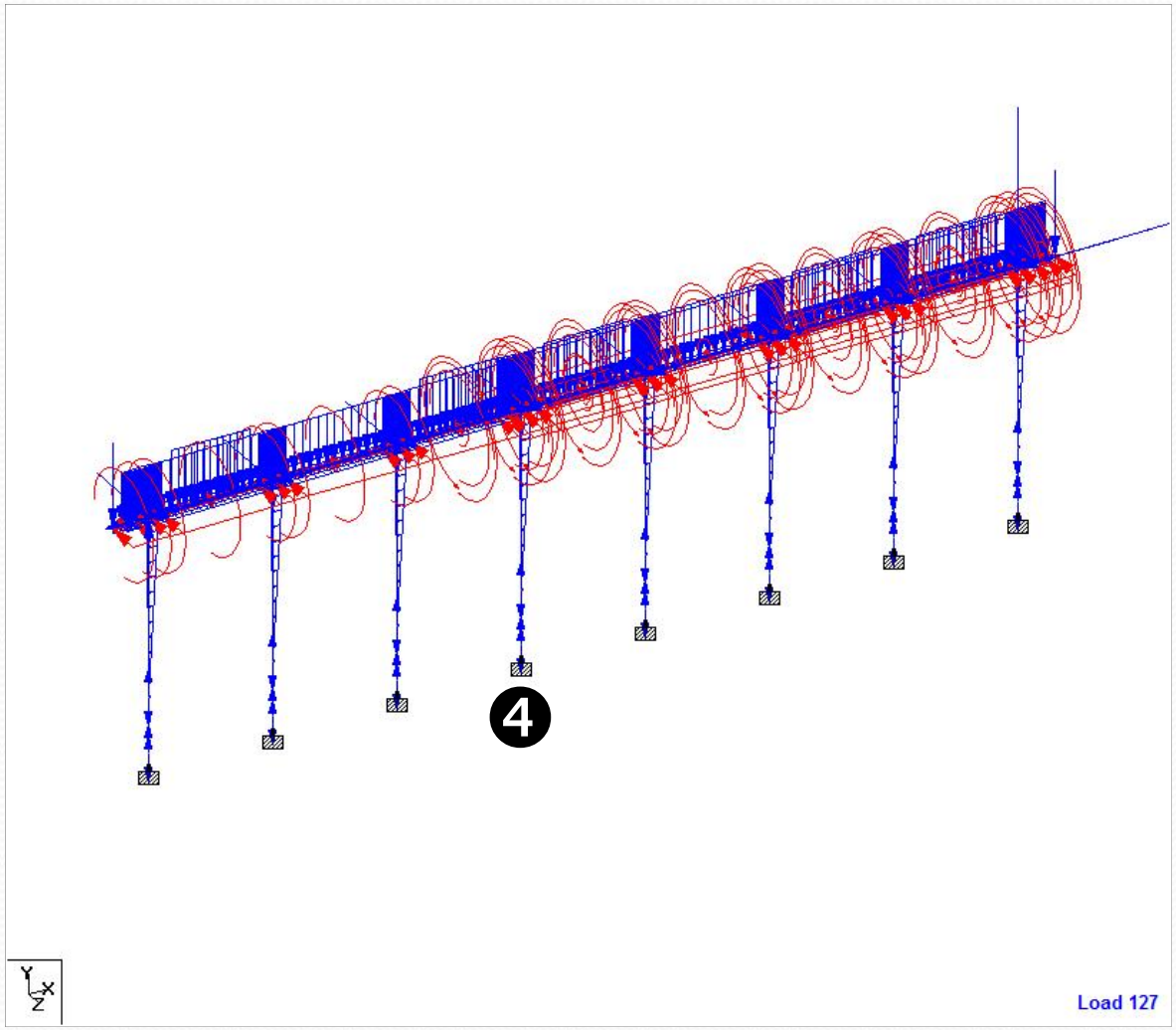
Scale: ⅛" = 1'-0

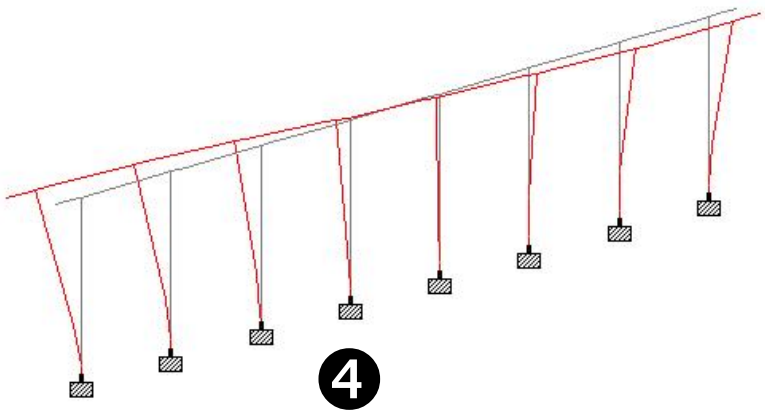


Design Challenges

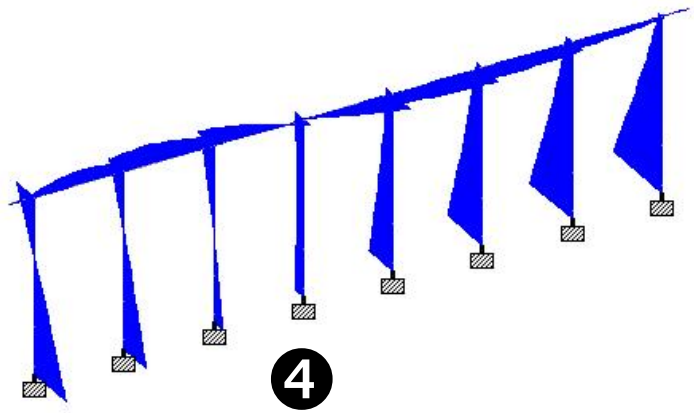
- **Pier Cap #1**
  - Thermal load was significant in Group VI – controlled for torsion and side moments in pier cap
  - Torsion also induced to a lesser degree in column/shaft

Load Case 127 – Group VI Loading

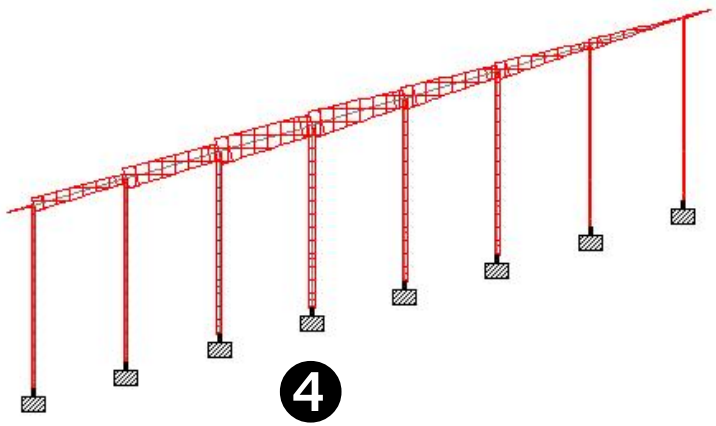




Load 127 : Displacement



Load 127 : Bending Y



Load 127 : Torsion

Construction Challenges

- **Narrow Corridor and Postage Stamp Bridge Site**
  - No room for laydown yard
  - Saved more Trees than planned - (Good)

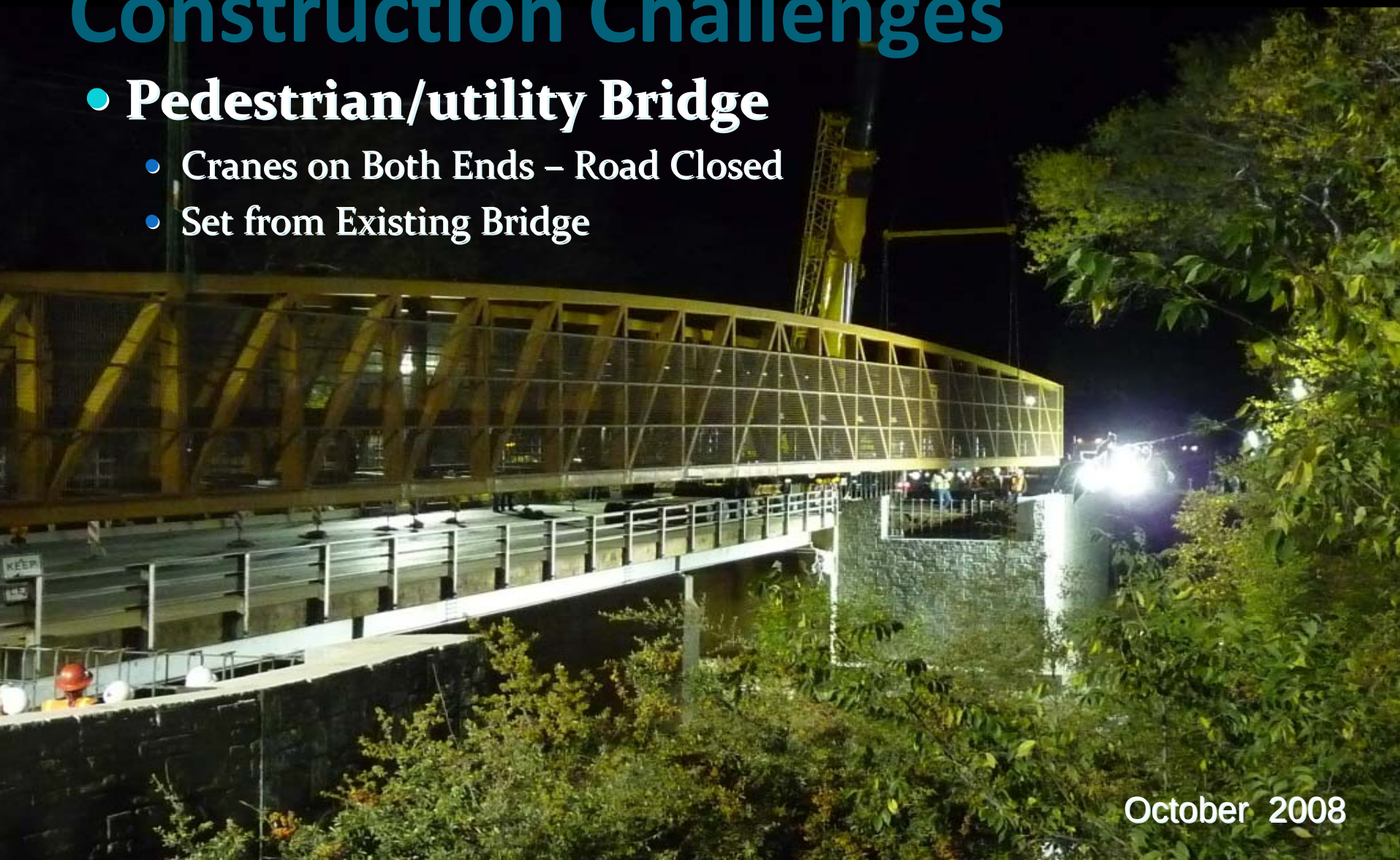
Construction Challenges

- **Pedestrian/utility Bridge**
  - Navigating Brewer Roundabout

October 2008

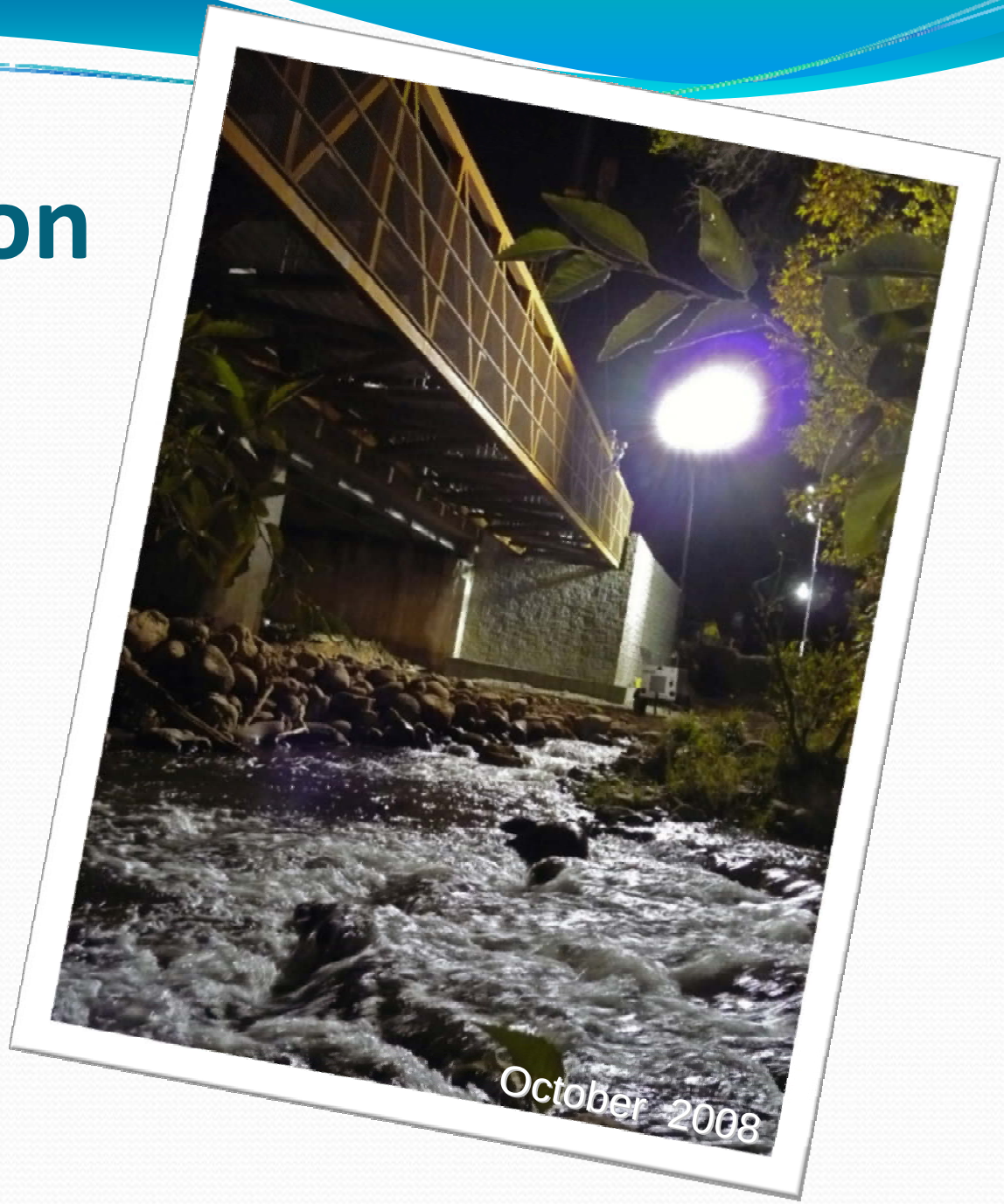
Construction Challenges

- **Pedestrian/utility Bridge**
  - Cranes on Both Ends – Road Closed
  - Set from Existing Bridge



Construction Challenges

- **Pedestrian Bridge Set**

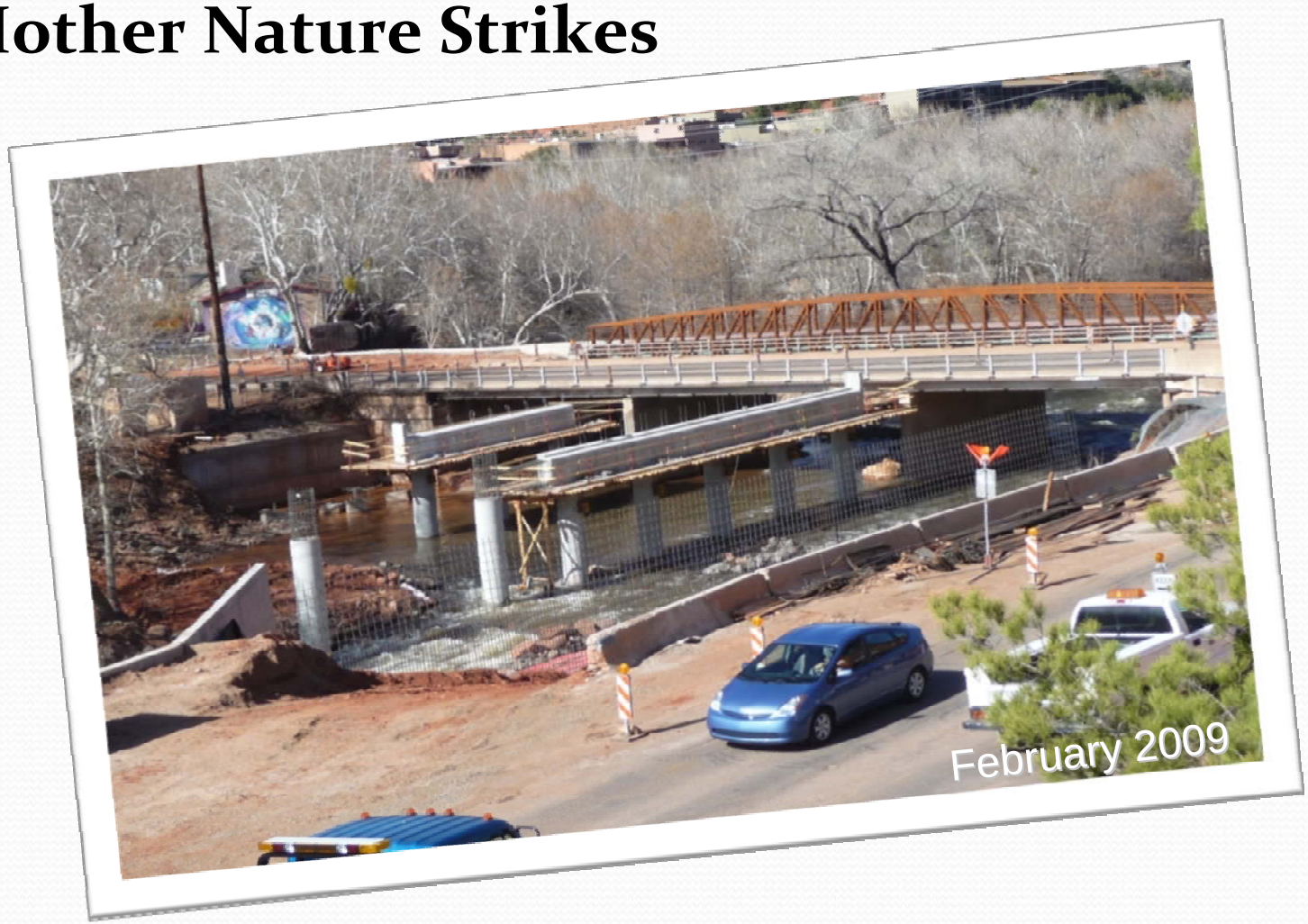


Construction Challenges

- **Temporary Pipes under Existing Bridge**

Construction Challenges

- **Mother Nature Strikes**



Construction Challenges

- **Mother Nature - Again**

Project Success

- **Bridge Work Complete – 2 Years and 3 Months after starting construction**

Before

After

Questions?