A Stronger Span:
Perspectives on Ohio's Longest County Route Semi-Integral Bridge

www.burgessniple.com/event/2018/otec

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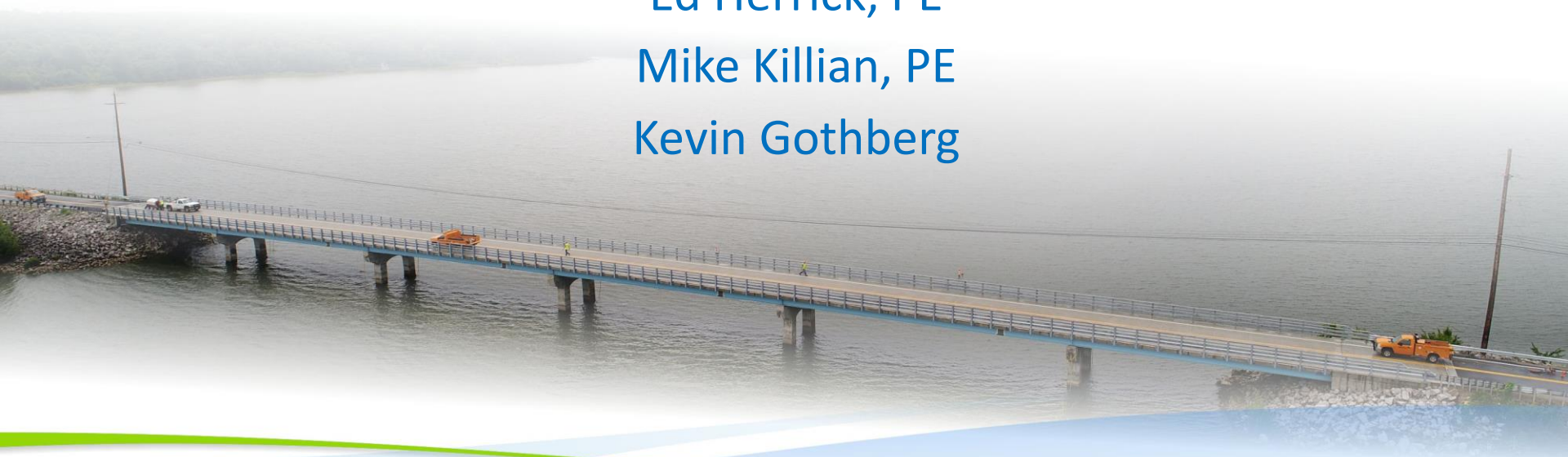
A Stronger Span: Perspectives on Ohio's Longest County Route Semi-Integral Bridge

Smothers Road over Hoover Reservoir

Ed Herrick, PE

Mike Killian, PE

Kevin Gothberg



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Owner's Perspective

Ed Herrick, PE

Franklin County Engineer's Office

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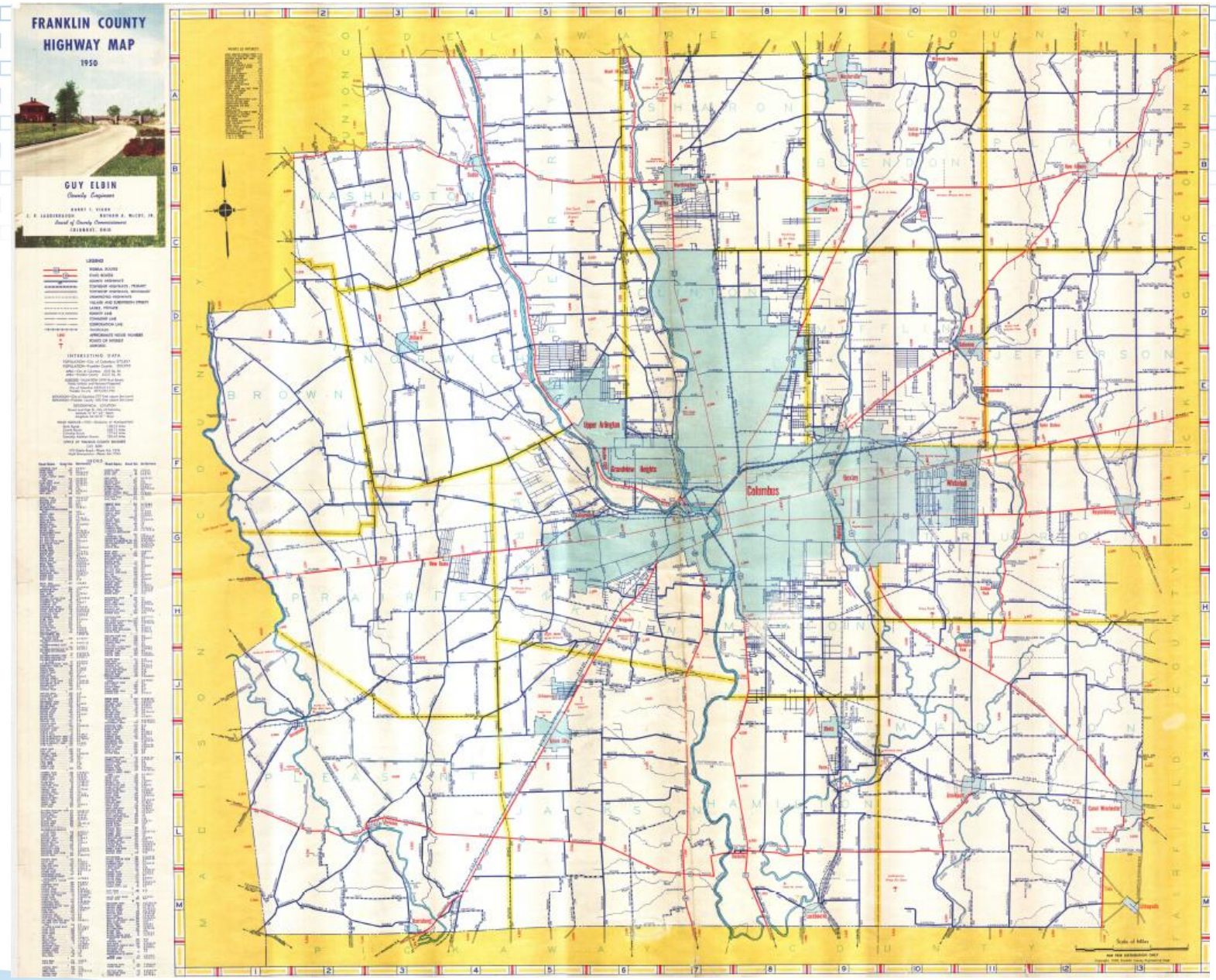

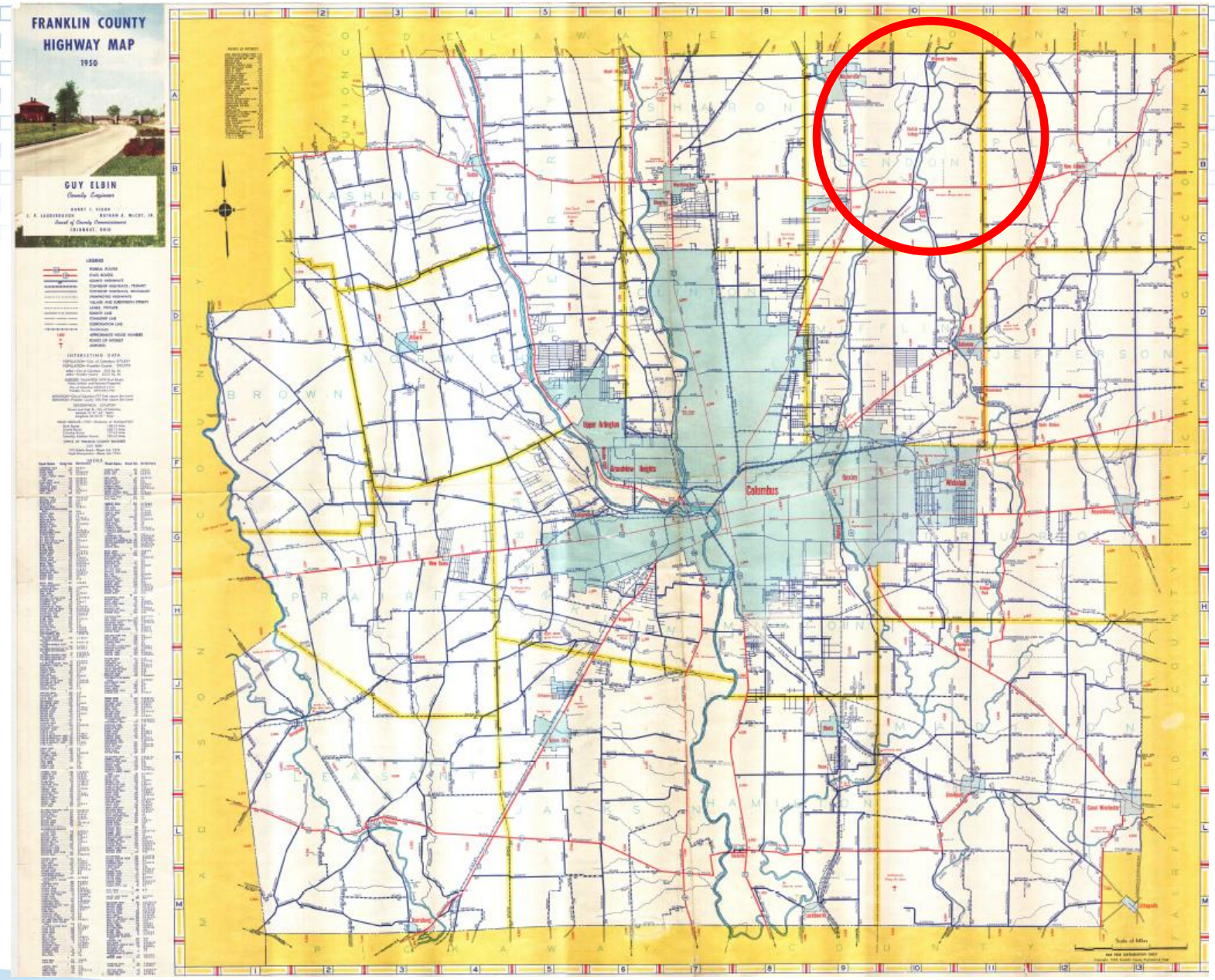

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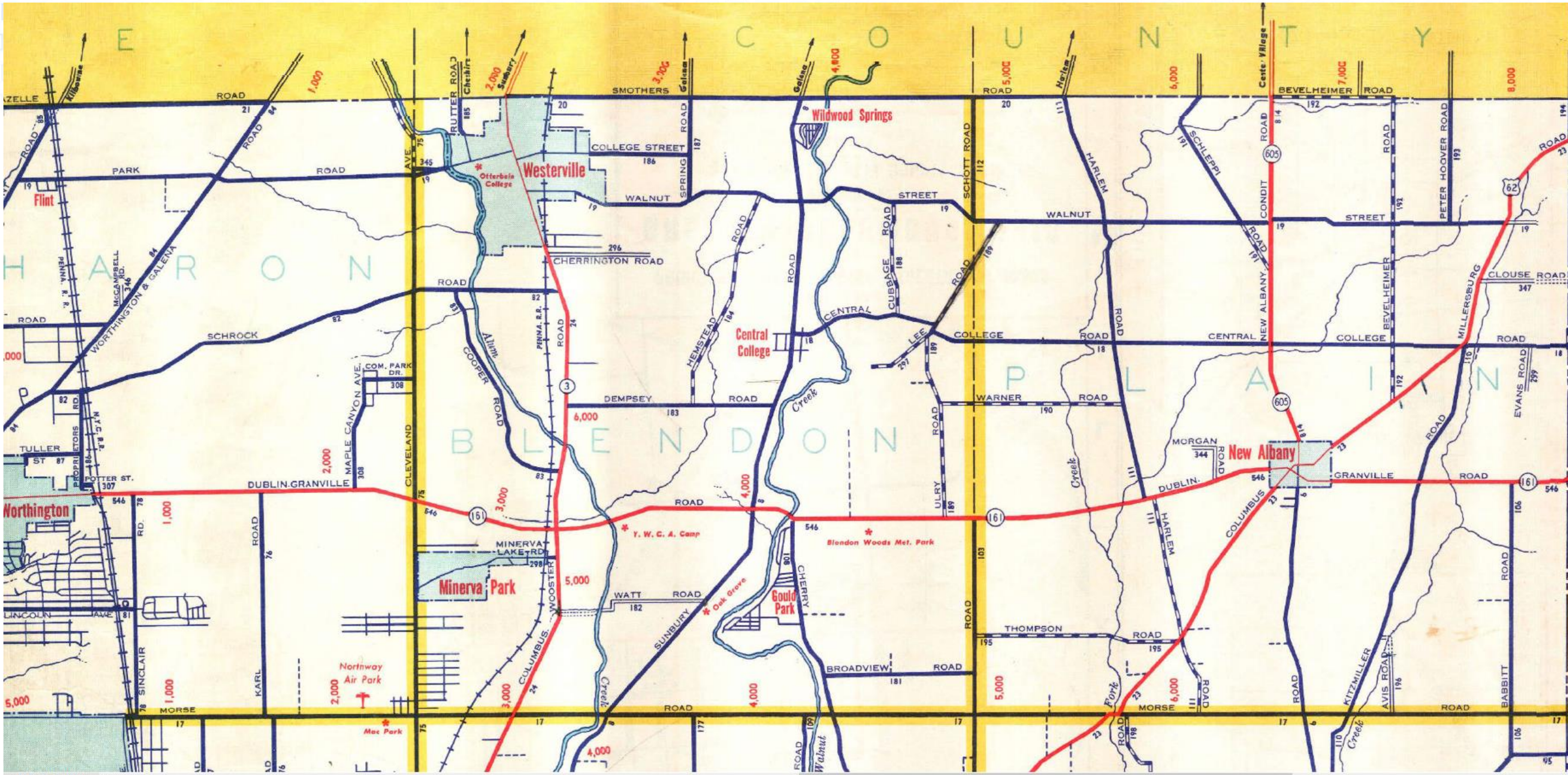
Westerville
Otterbein College
Wildwood Springs
Central College
New Albany
Worthington
Flint
Minerva Park
Gould Park
Y. W. C. A. Camp
Blendon Woods Met. Park
Oak Grove
Northway Air Park
Mac Park
SMOTHERS ROAD
BEVELHEIMER ROAD
COLLEGE STREET
WALNUT STREET
CHERRINGTON ROAD
SCHROCK ROAD
PARK ROAD
CENTRAL COLLEGE ROAD
DEMPSEY ROAD
WARNER ROAD
DUBLIN-GRANVILLE ROAD
GRANVILLE ROAD
MINERVA LAKE RD
WATT ROAD
THOMPSON ROAD
BROADVIEW ROAD
MORSE ROAD
CLEVELAND AVE
SCHOTT ROAD
HARLEM ROAD
NEW ALBANY ROAD
KITZMILLER
CLOUSE ROAD
MILLERSBURG
SUNBURY
COLUMBUS
TULLER ST
POTTER ST.
WORTHINGTON & GALENA
MAPLE CANYON AVE.
SINCLAIR RD.
KARL ROAD
CHERRY
LEE
ULRY ROAD
MORGAN ROAD
EVANS ROAD
BABBITT
AVIS ROAD
PETER HOOVER ROAD
SCHLEPPI
HEMSTEAD ROAD
CUBBAGE ROAD
COOPER ROAD
Alum Creek
Walnut
Fork Creek
S H A R O N
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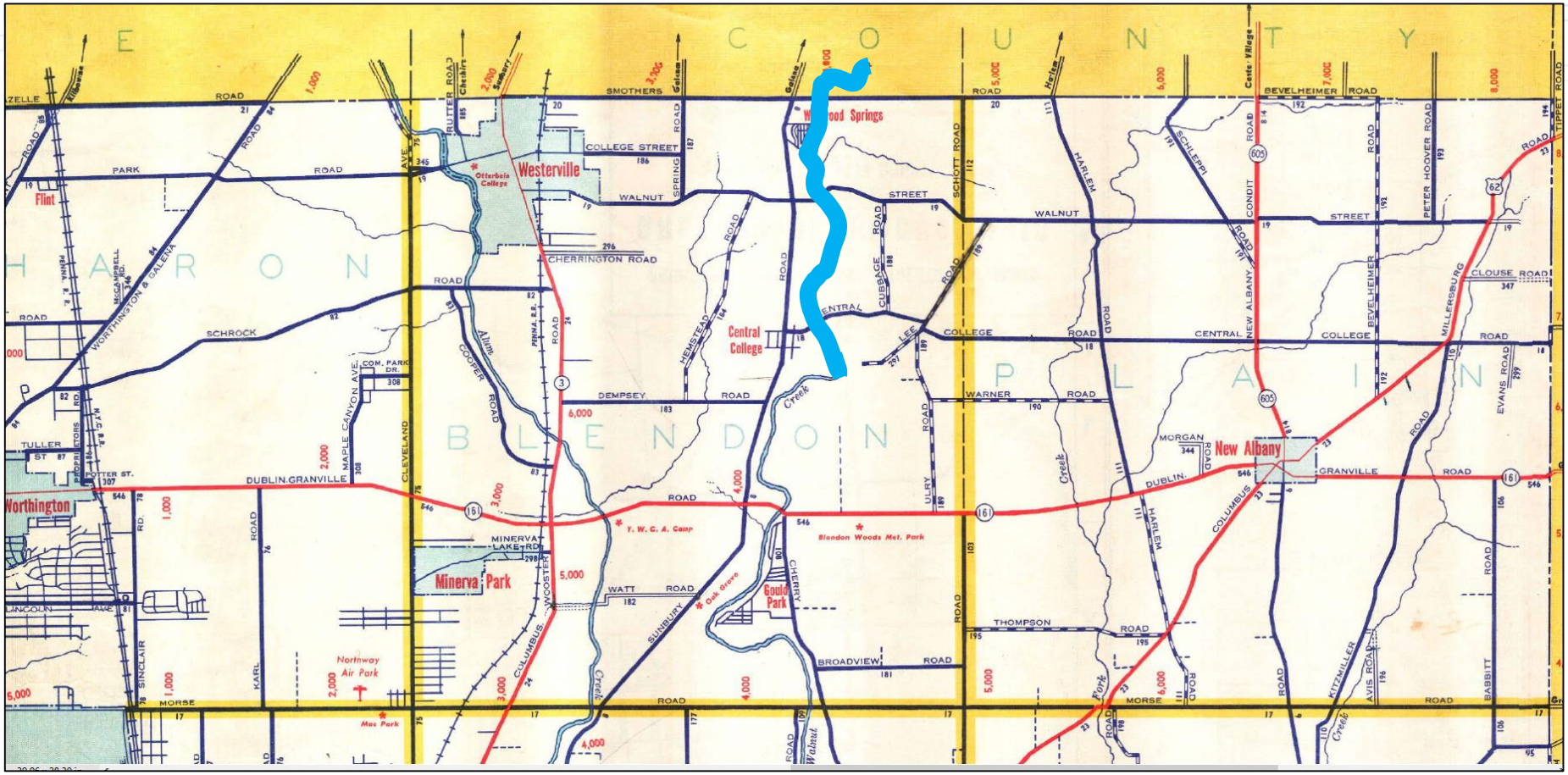

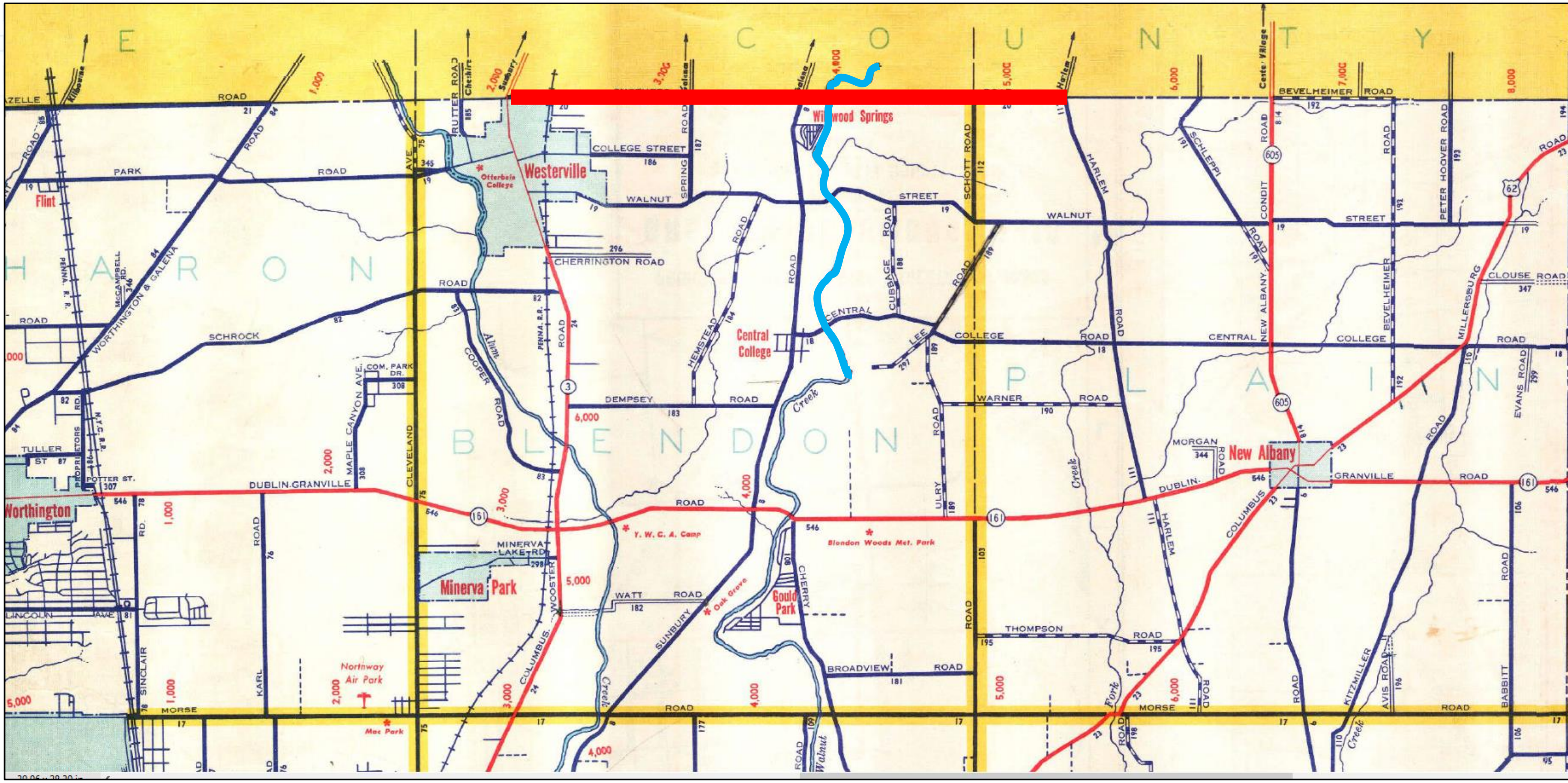

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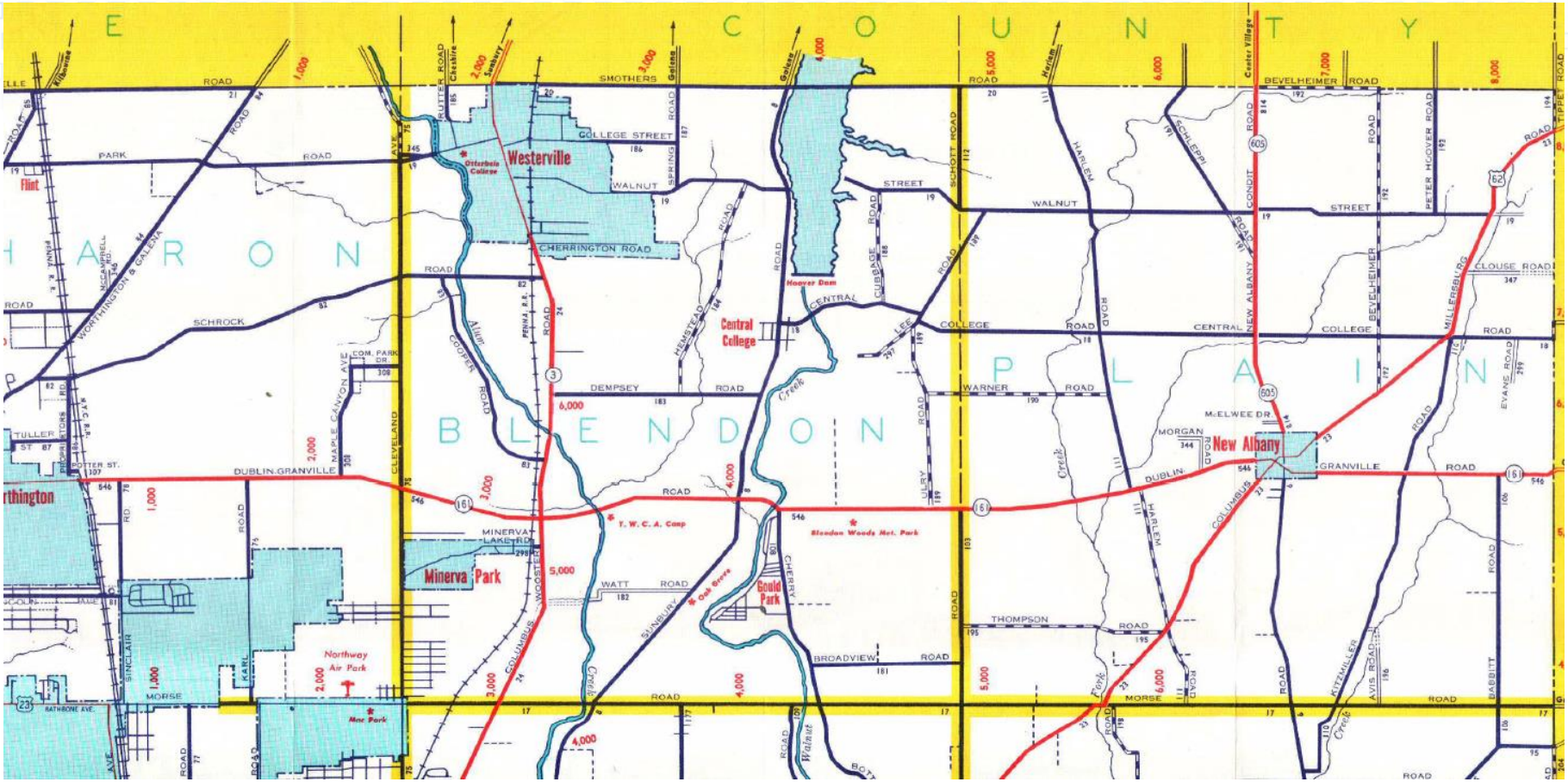

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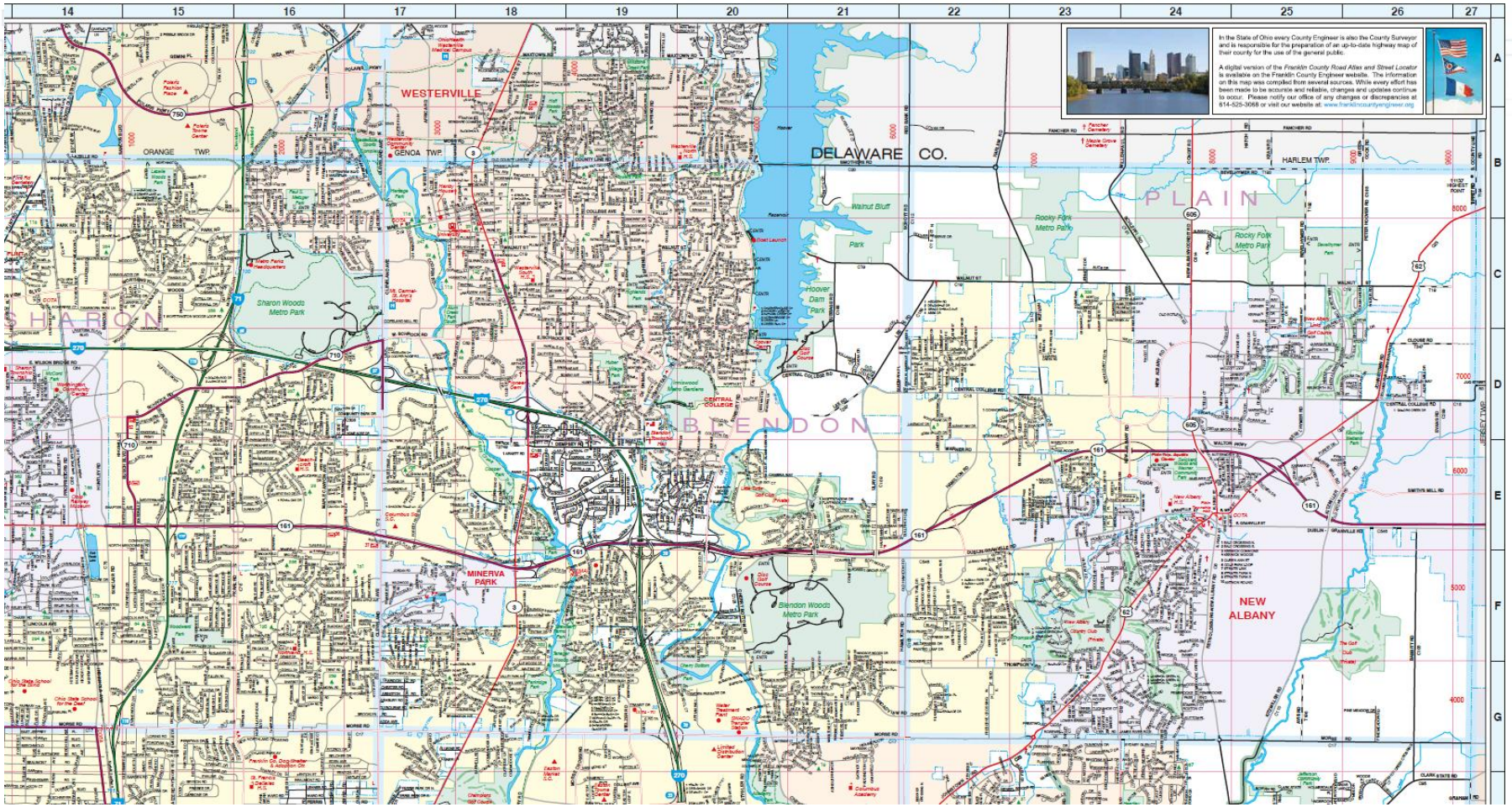
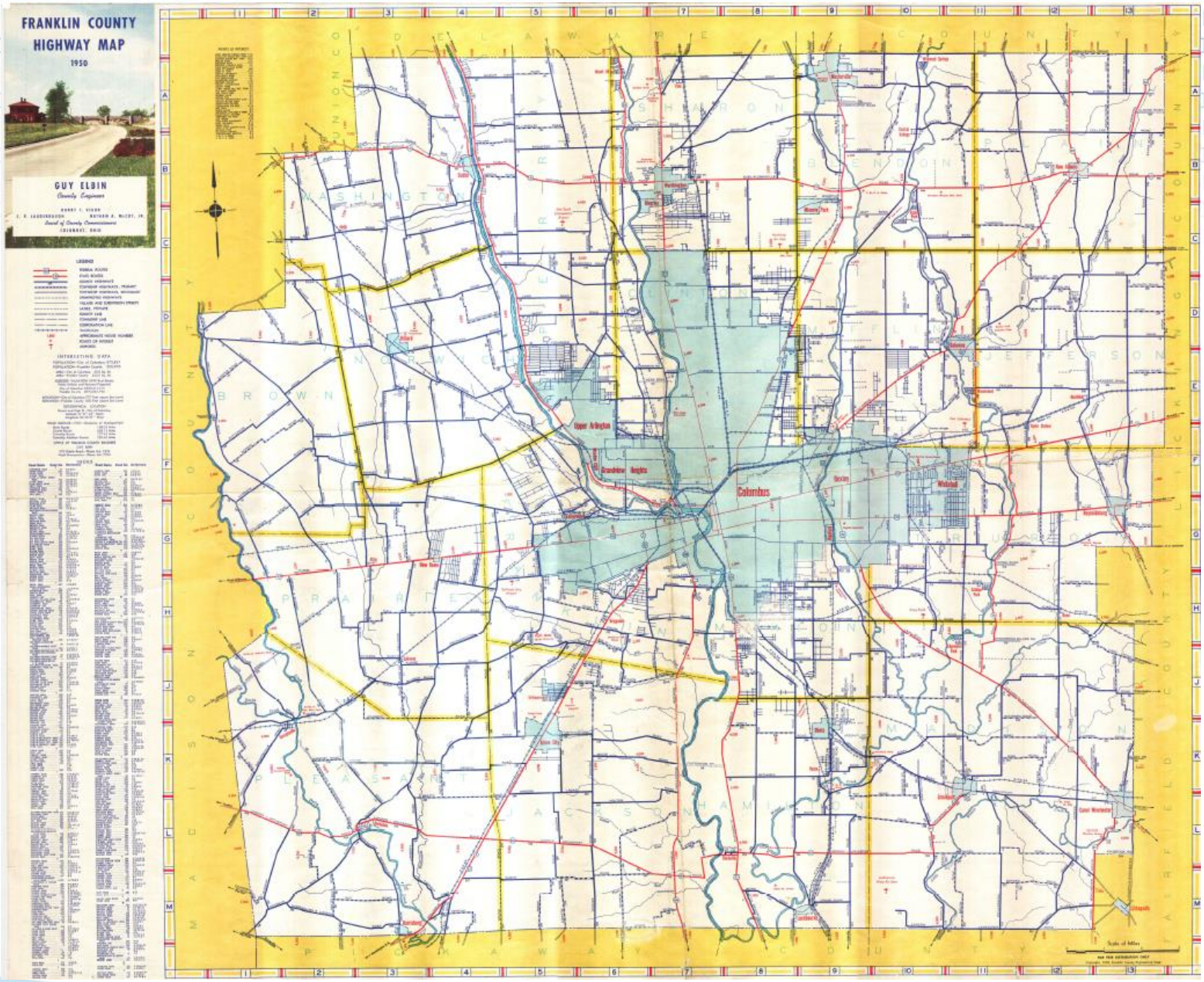
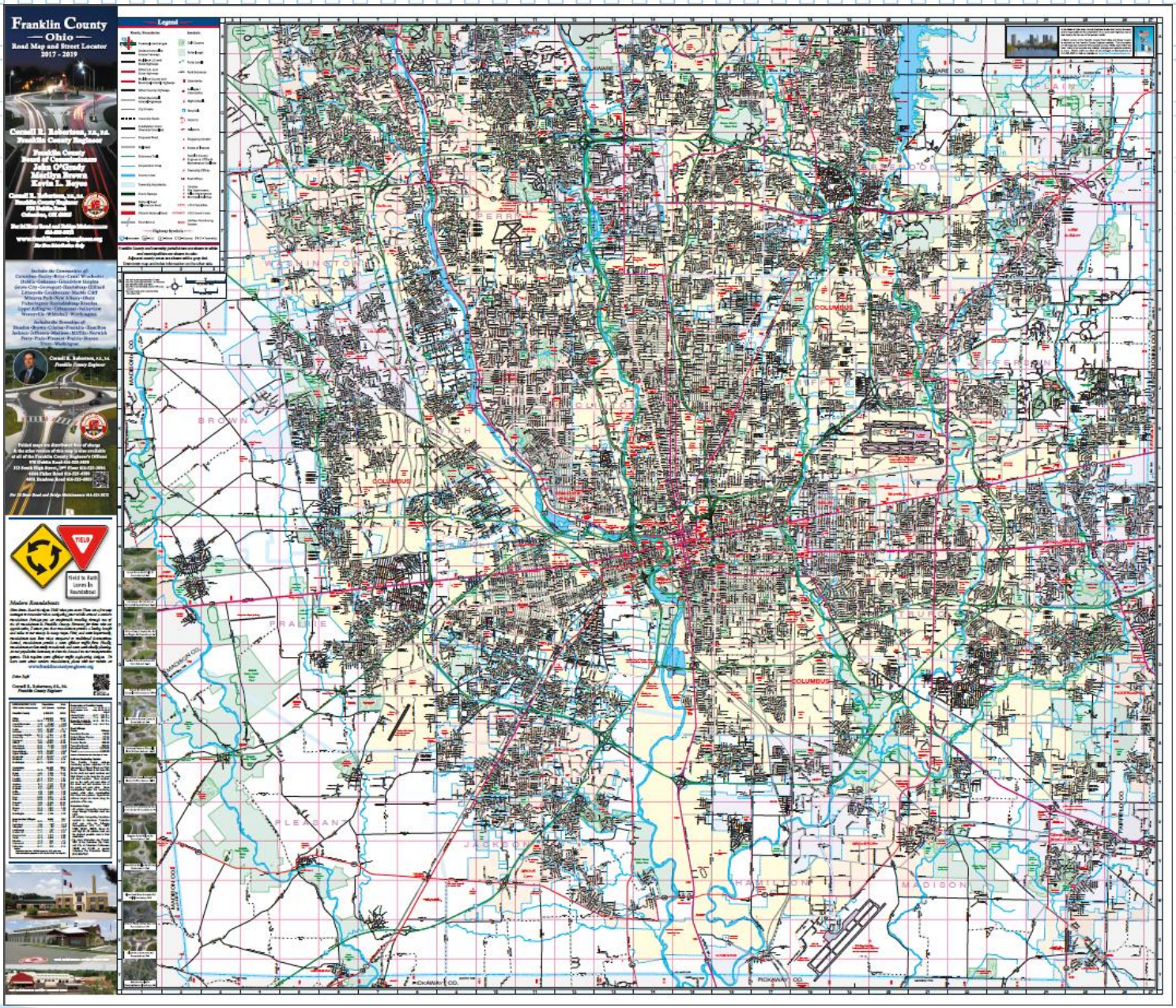



FRANKLIN COUNTY
HIGHWAY MAP
1950
GUY ELBIN
County Engineer
Upper Arlington
Columbus
Grove City
Hilliard
Canal Winchester
Scale of Miles



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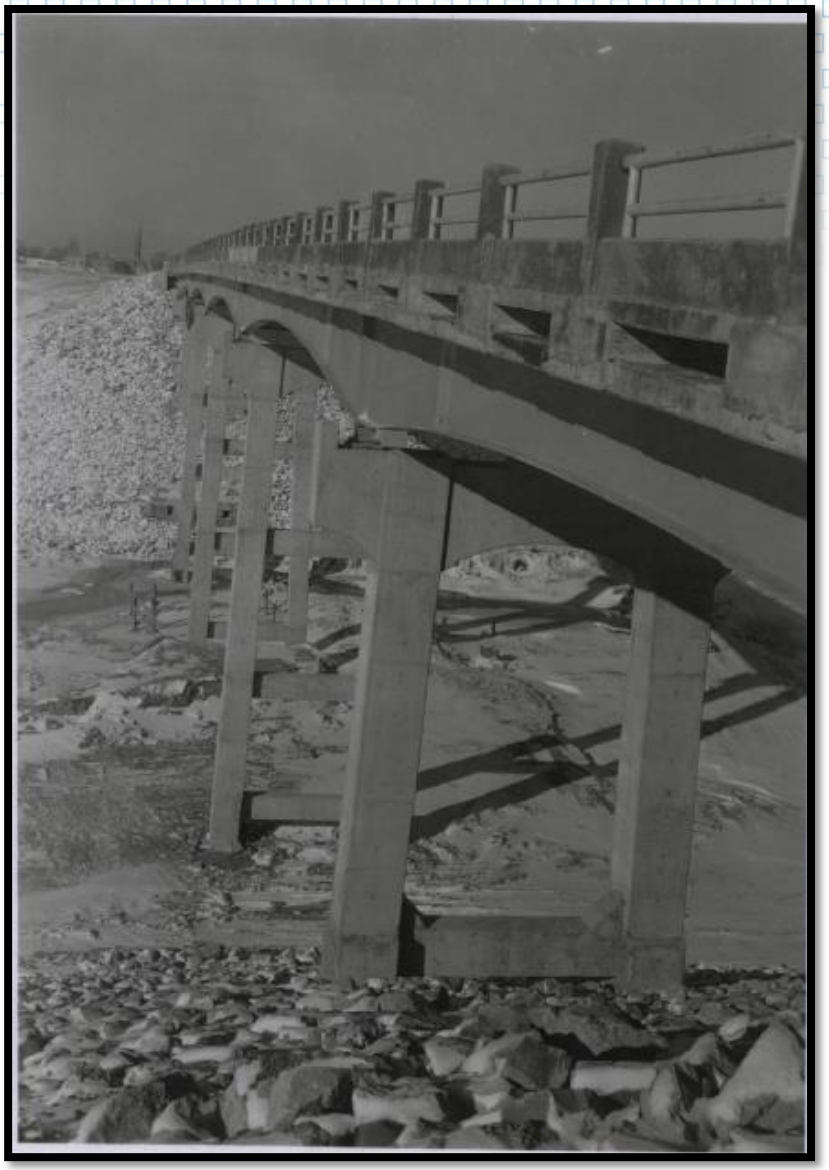

The Existing Bridge

- Built in 1953 (redecked in 1980)
- 6-spans (72.8, 99.7, 100.1, 100.1, 99.7, 72.8)
- Bridge Limits: 546’-2”
- Reinforced concrete slab on 3-haunched steel girders
- 30’-0” f/f guardrail
- Stub abutments on piles
- 80’+ tall cap-and-column piers on piles and spread footings
- Strip seal expansion joints and rocker type bearings.

Existing Bridge Issues

- Approach causeway and abutment settlement and slope failure
- Fracture critical – 3 girder system
- Fatigue-prone steel detailing
- Limited right shoulder width
- Deteriorated abutment bearing seats
- Deteriorated concrete deck


OZEU
9/2000

Coordination

- ODOT
- CEAO
- COC Division of Water
- COC Dept. of Public Service
- Columbus Recreation & Parks
- Delaware County
- Westerville
- Blendon Twp. (Franklin)
- Genoa Twp. (Delaware)

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Project Design Schedule

- April 2013 – Consultant Authorization
- October 2013 – Preliminary Engineering Study
- January 2014 – Stage 1
- March 2014 – Contractor Constructability Review
- July 2014 – Stage 2
- Project selected for Federal Exchange Process Funding
- February 2015 – Stage 3
- March 2016 – Tracings
- August 2016 – Project Sold

Design Perspective

Mike Killian, PE

Burgess & Niple, Inc.

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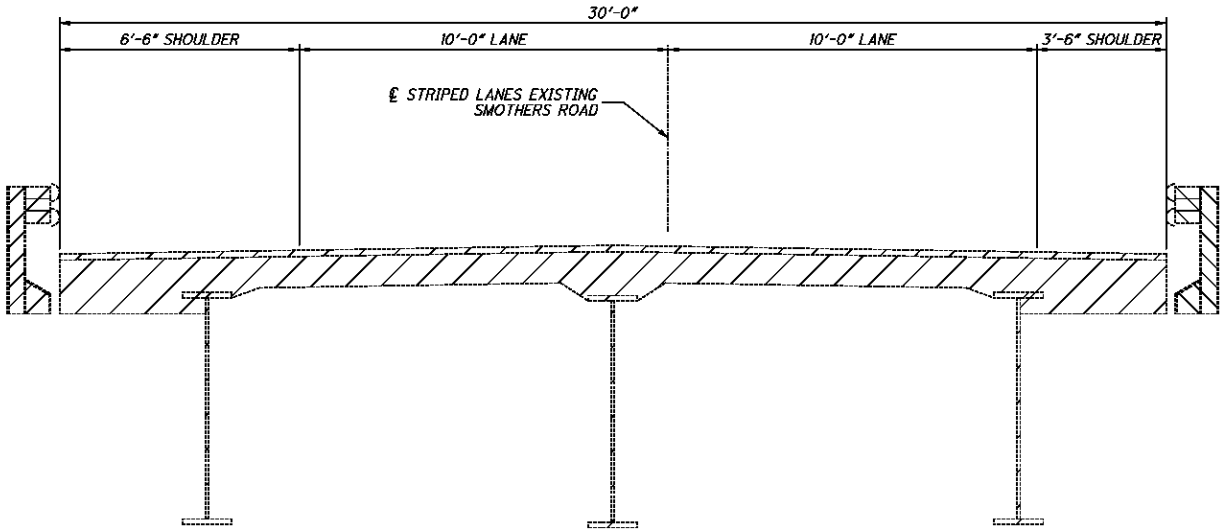
Project Design Scope / Goals

- Replace existing bridge deck (detour MOT)
- Replace existing bridge girders (redundant system, no fatigue-prone details)
- Convert abutments to semi-integral and salvage the existing piers (if possible)
- Minimize the approach causeway work
- Minimize disruption to traffic and the surrounding community
- Incorporate provisions for a shared-bike shoulder
- Maintain or improve vertical boating clearance

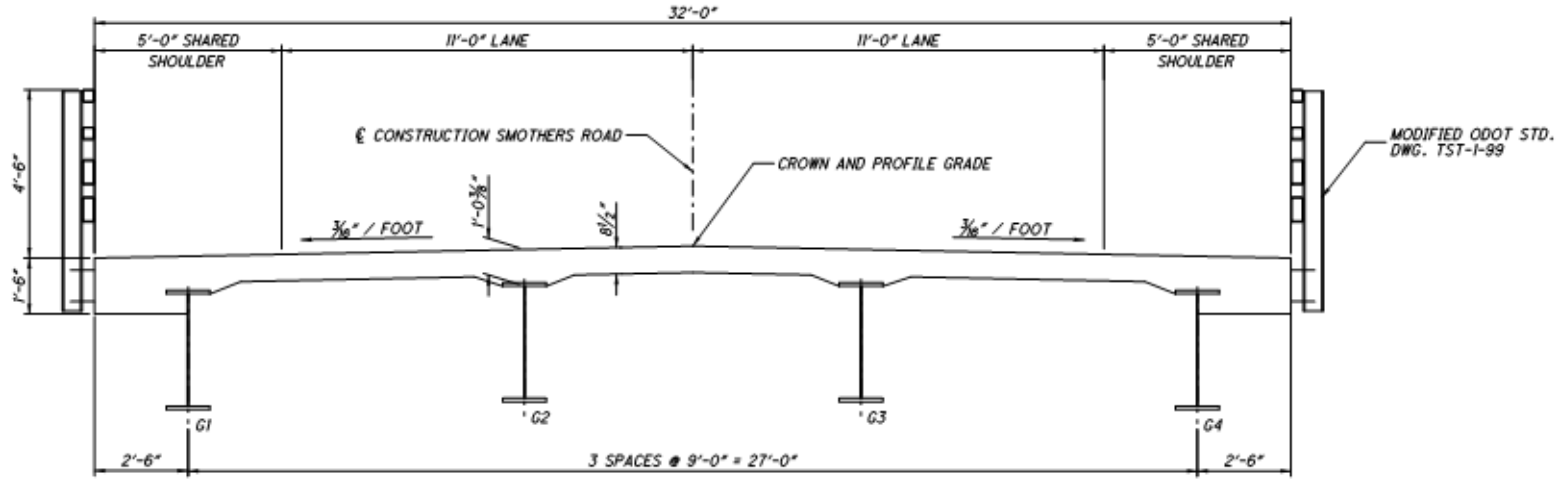
Preliminary Bridge Design –

Structure Types Considered

- Haunched steel plate girders
- Rolled steel beams
- Prestressed concrete I-girders
- Prestressed concrete box beams
- Constant depth steel plate girders (selected)



EXISTING TYPICAL SECTION AND REMOVALS

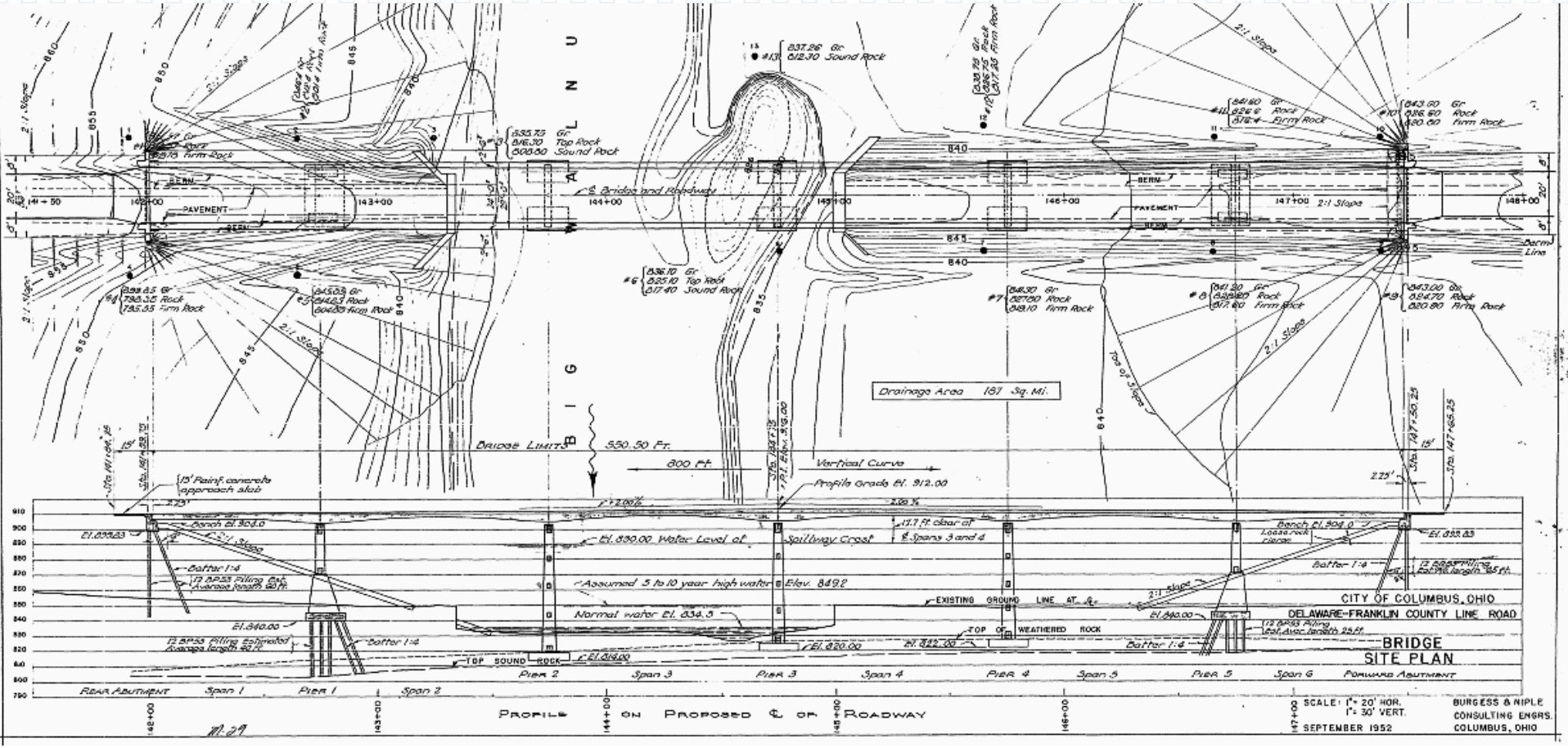


PROPOSED TYPICAL SECTION

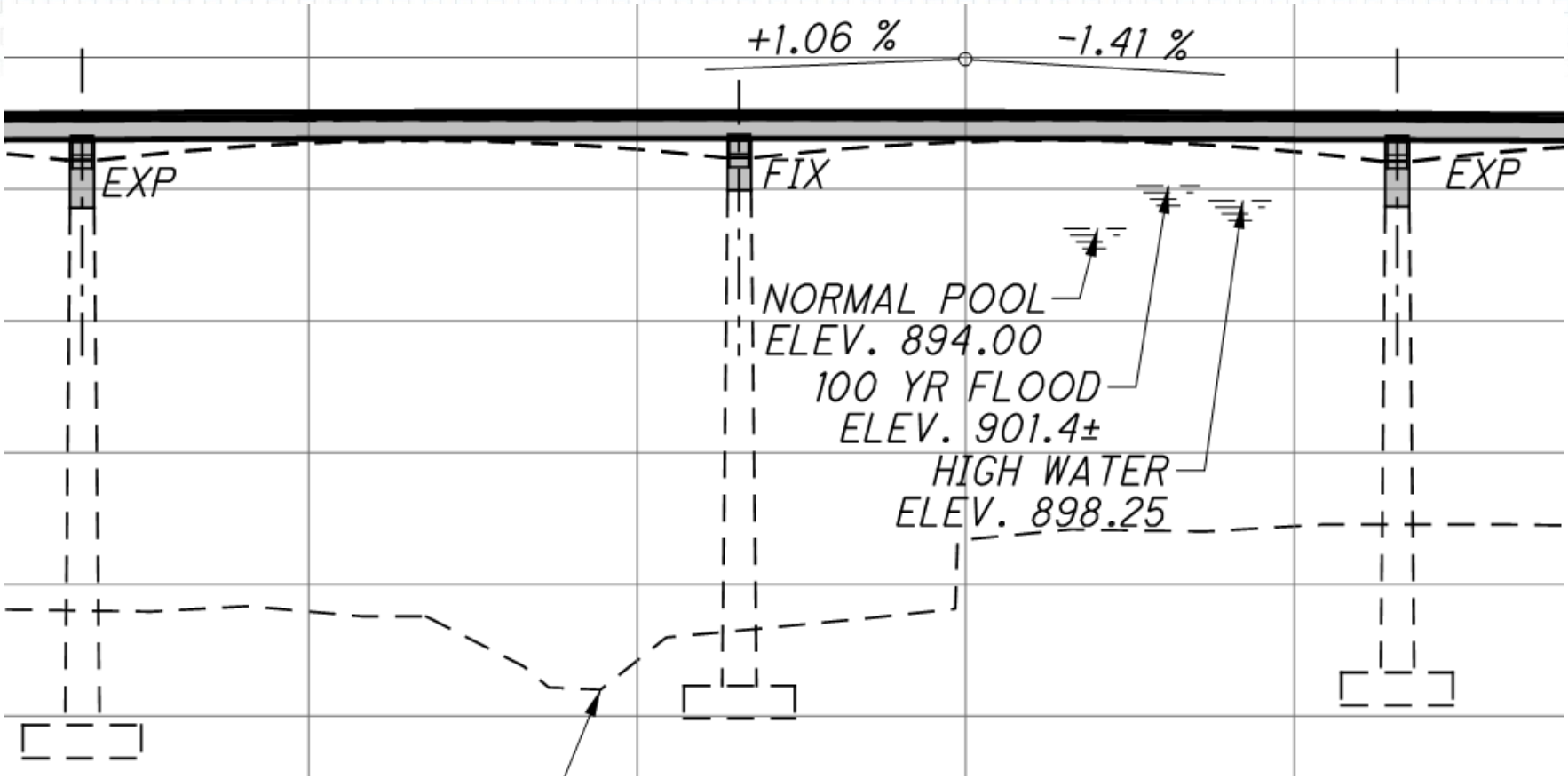
Contractor Constructability Review

- **Coordinated with Ohio Contractors Association and two different local contractors**
- **Obtained input on:**
  - Constructability
  - Site access
  - Methods for accelerating construction and minimizing impact to surrounding community.
- **Notable outcome:**
  - Minimum closure time = 120-days
  - No to precast elements
  - SIP forms would be the best solution for reducing construction time.
  - Barges would be used for both demo and construction – but that dock location and design should be left up to contractor.

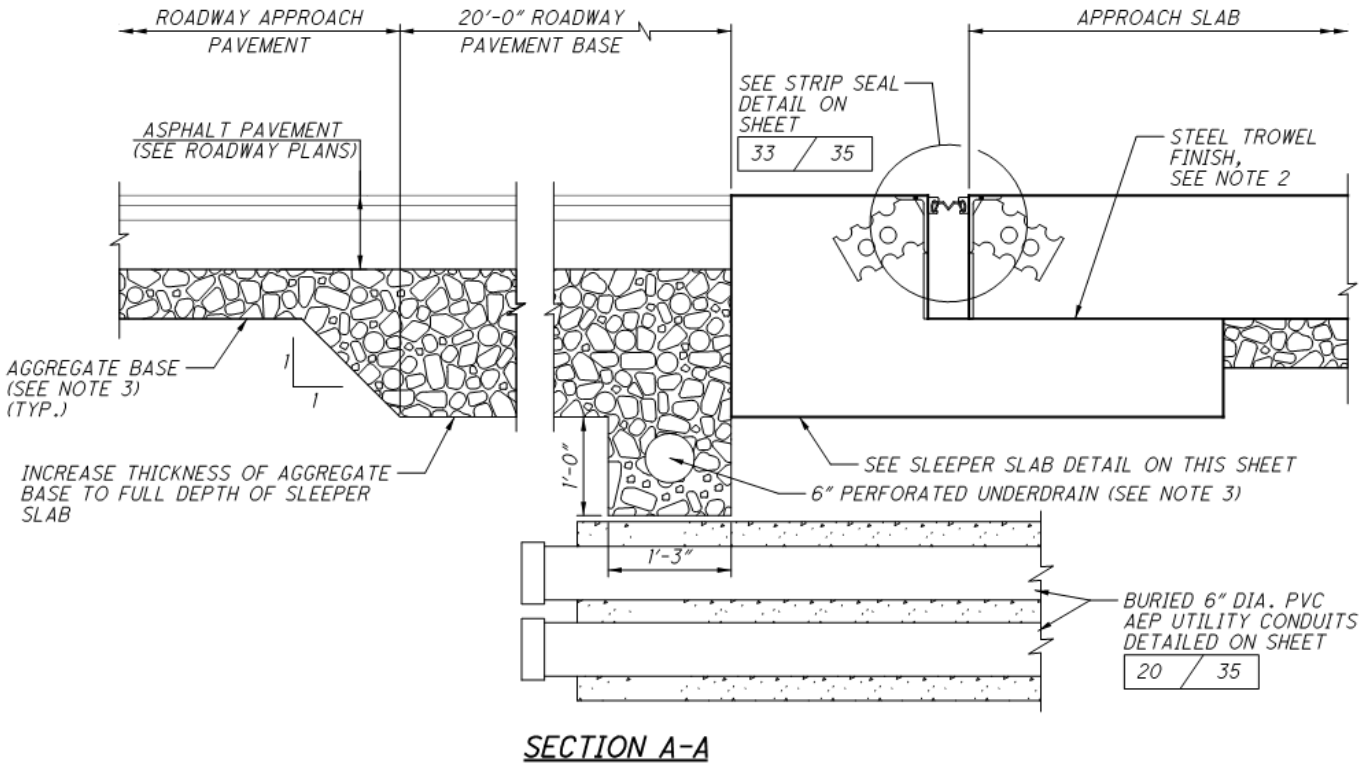
Detail Design –
Semi-Integral Conversion Design



Semi-Integral Conversion Design (continued)



Semi-Integral Conversion Design (continued)



Bearing and Seismic design

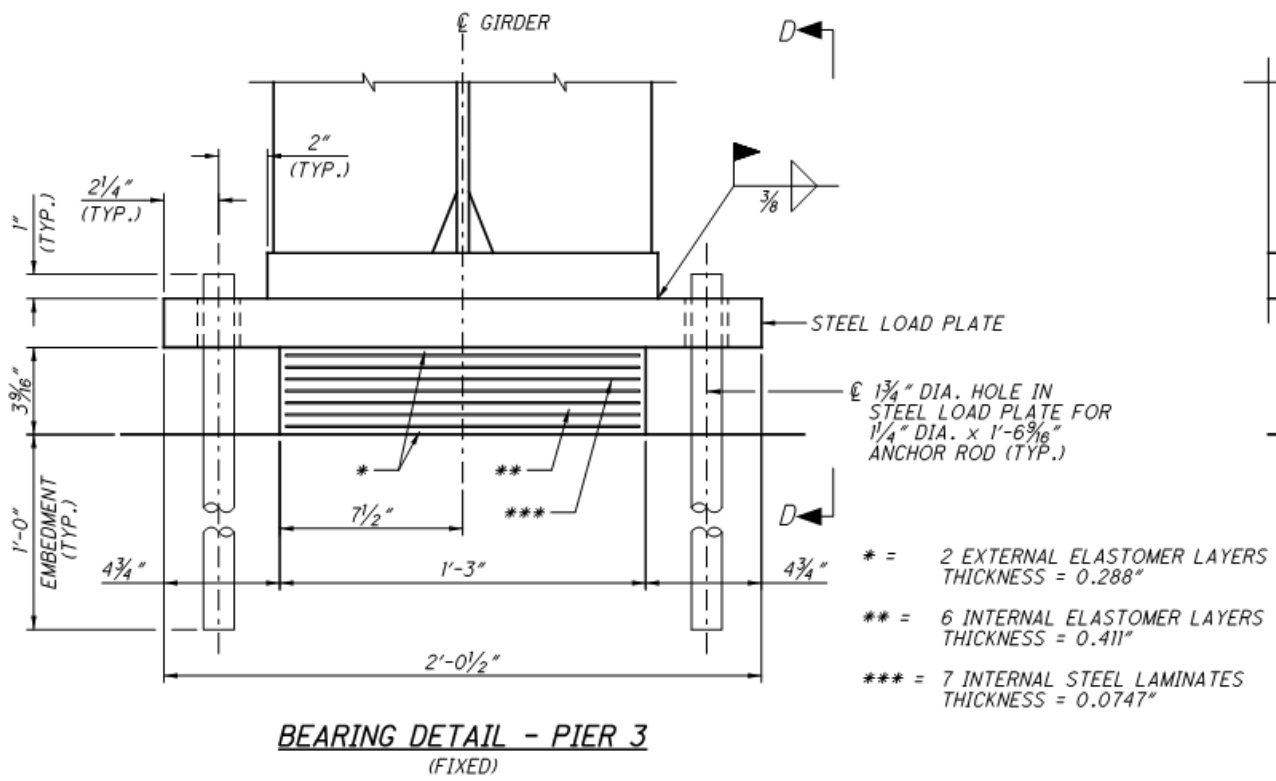
AASHTO – LRFD Bridge Design Specs - 2012

3.10—EARTHQUAKE EFFECTS: *EQ*

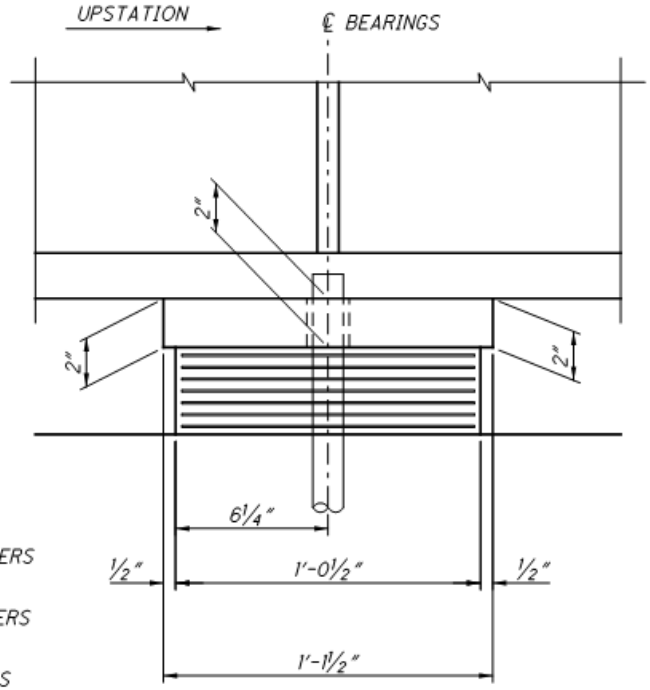
3.10.9.2—Seismic Zone 1

The horizontal design connection force shall be addressed from the point of application through the substructure and into the foundation elements.

Bearing and Seismic design (continued) (fuse concept)



BEARING DETAIL - PIER 3
(FIXED)



VIEW D-D

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Bearing and Seismic design (continued)

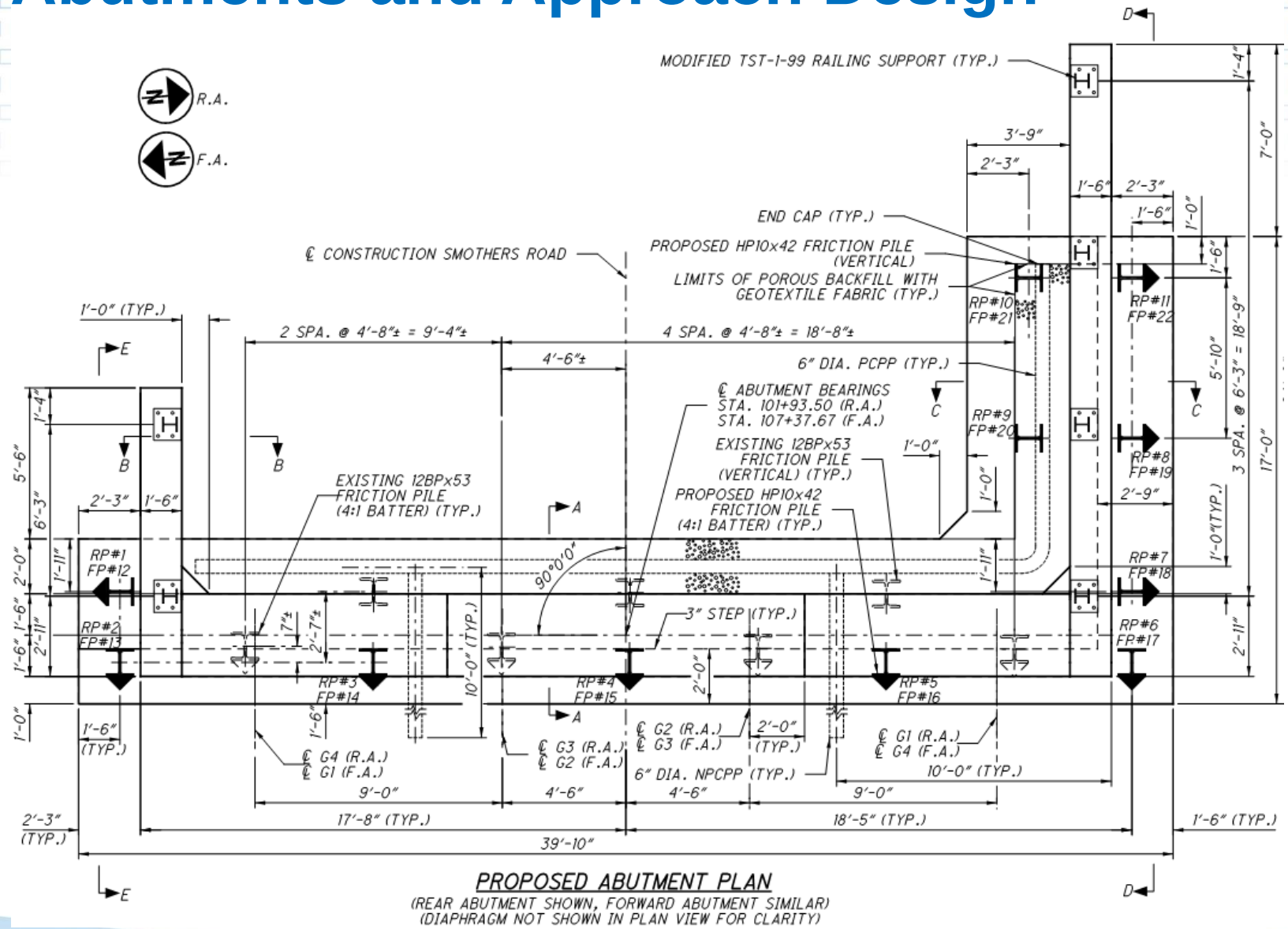
It should be noted that after the design was completed…

AASHTO – LRFD Bridge Design Specs – 2014 – (2015 Interim)

3.10.9.2—Seismic Zone 1

Delete paragraph 3 of this Article.

Abutments and Approach Design



PROPOSED ABUTMENT PLAN

(REAR ABUTMENT SHOWN, FORWARD ABUTMENT SIMILAR)
(DIAPHRAGM NOT SHOWN IN PLAN VIEW FOR CLARITY)

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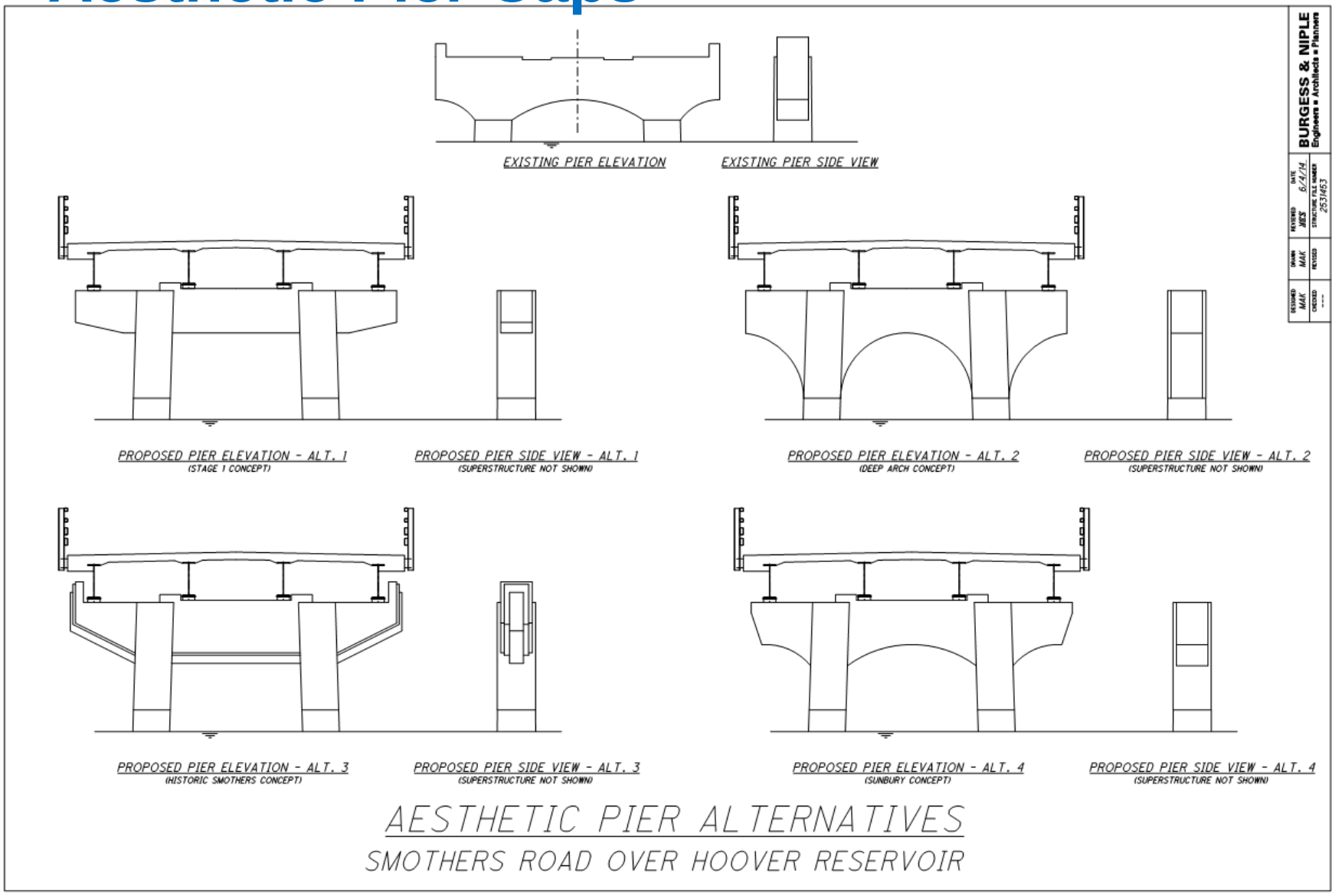
Modified TST Railing

Aesthetic Pier Caps



Environmental

- Federal Exchange Process –
  - No NEPA documents required (i.e. 4F, Cultural, Ecological)
- Wetland Delineation Report completed
  - 3 small wetland areas were identified
- 404 permit was not prepared. Existing boat facility to the north available for use. But, each contractor will likely want to do something different.
- Structural Steel
  - Weathering and galvanized steel options were considered
  - Pre-painted with 3-coats (prime, intermediate, finish) (similar to Sunbury Road Bridge)

Construction Perspective

Kevin Gothberg

Kokosing Construction Company

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Challenges

- Tight Schedule
- Weather – Winter Start
- Access – Causeway not feasible, limited roadway width
- Obtain 404 permit
- Overhead utilities at south edge of bridge

Schedule

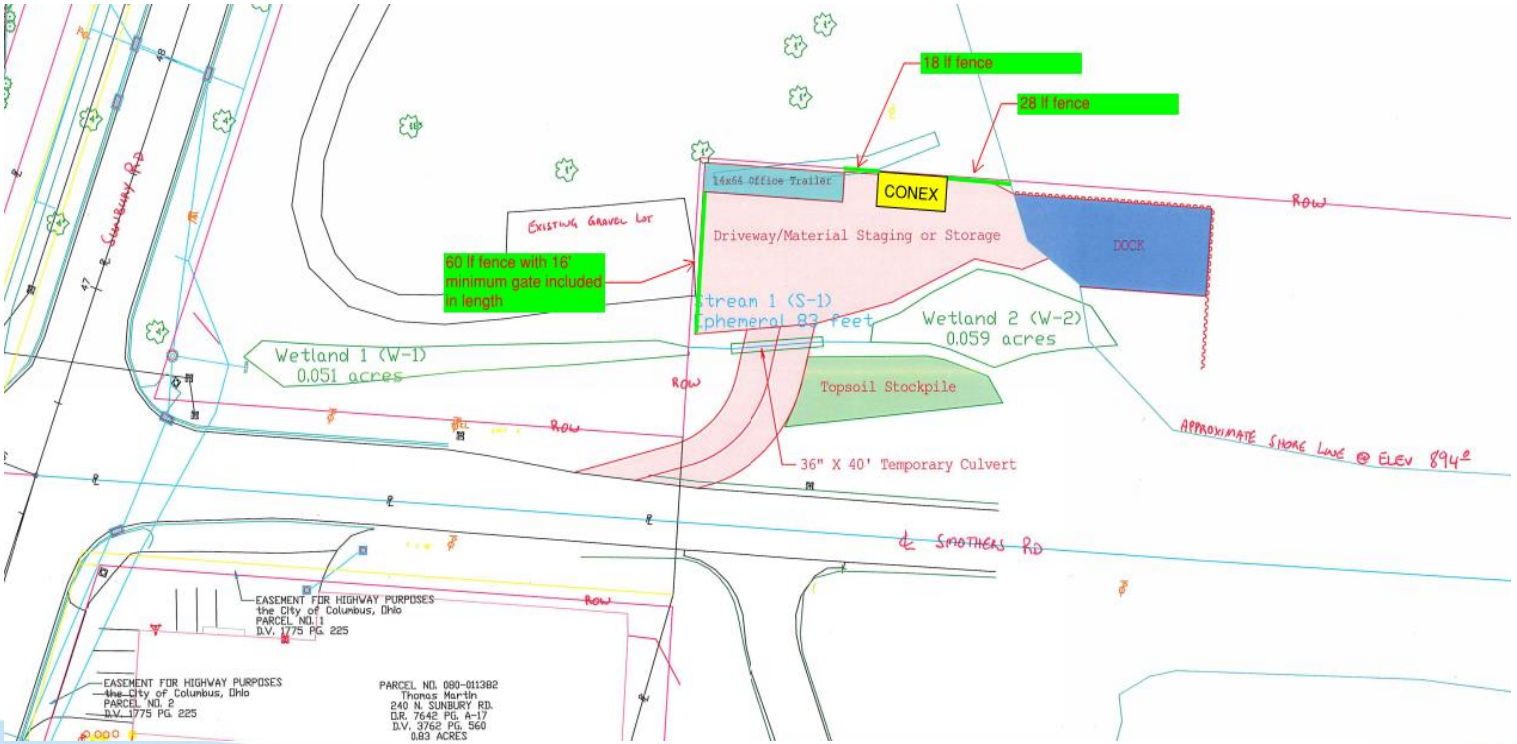
- 120 day closure with an early road closure date of 2/13. Incentive was $5,000 per day and disincentive was $7,000 per day.
- Weather delays were allowed to move the completion date, but did not move the incentive date.
- Internally decided incentive was not realistic. Schedule too linear and weather too uncertain to financially rationalize pursuing incentive.
- Still accelerated by using winter concrete protection, overtime, and 6 day work weeks as needed.
- 3 sets of prefabricated pier forms used.
- Specification allowed for metal deck.

Weather

- Concrete saw, asphalt mill, water freezing, etc.
- Winter Concrete
- Wind impacts on barges and cranes
- Wind on picked members

Access

- Access from closed Smothers to avoid traffic and turns in and out of busy road.
- Had to thread drive through 2 wetlands.
- Access road and dock fill required 404 Permit



Overhead Utilities

- Electrical and Communications
- Required removal for piling, demo, and erection

Overhead Utilities

- Electrical was removed with services back fed from a temporary substation. AEP was fantastic.
- We were able to work around communications lines.

Deck Demolition

Steel Demolition

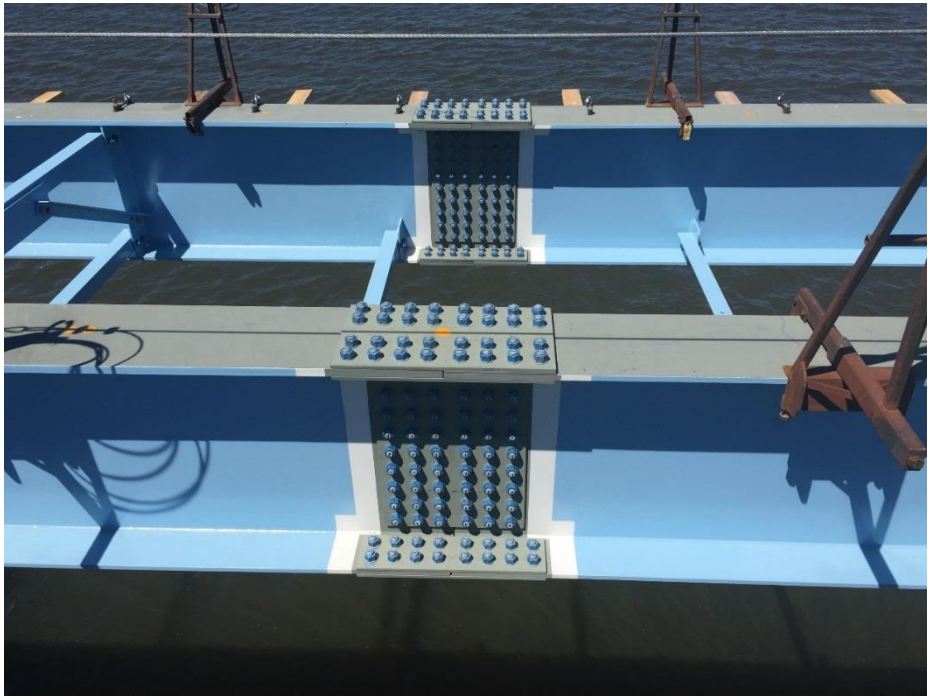
Cap Demo and New Column Extensions

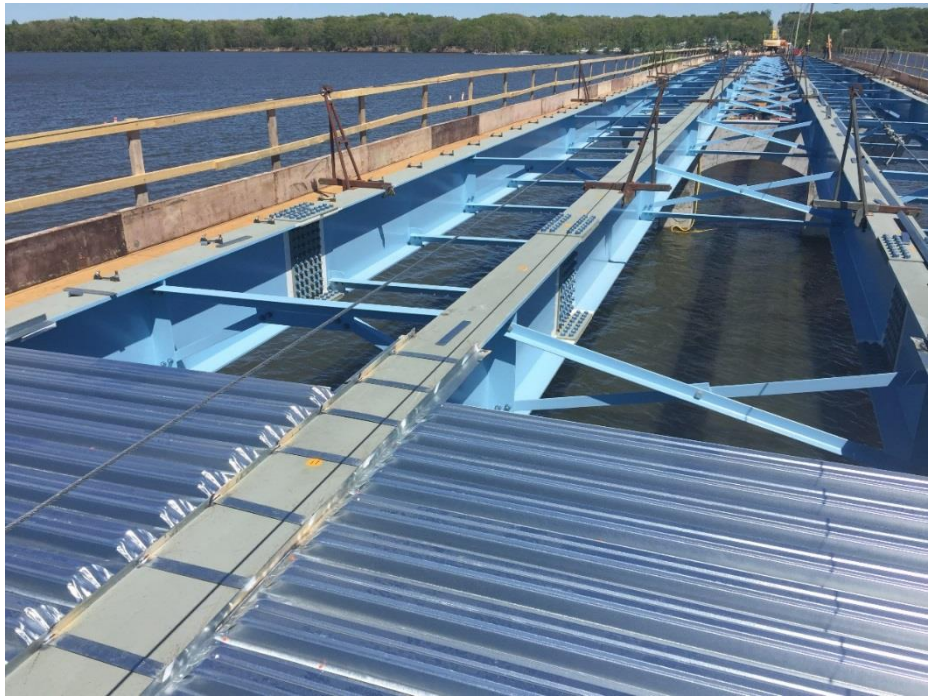
New Pier Caps

Steel Erection

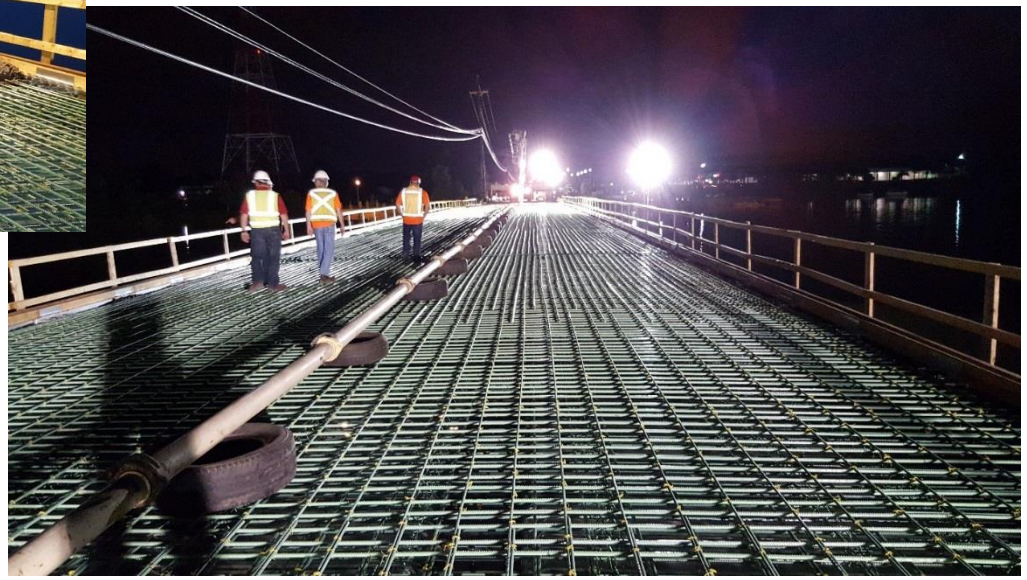
Steel Erection (continued)

Splices and Decking





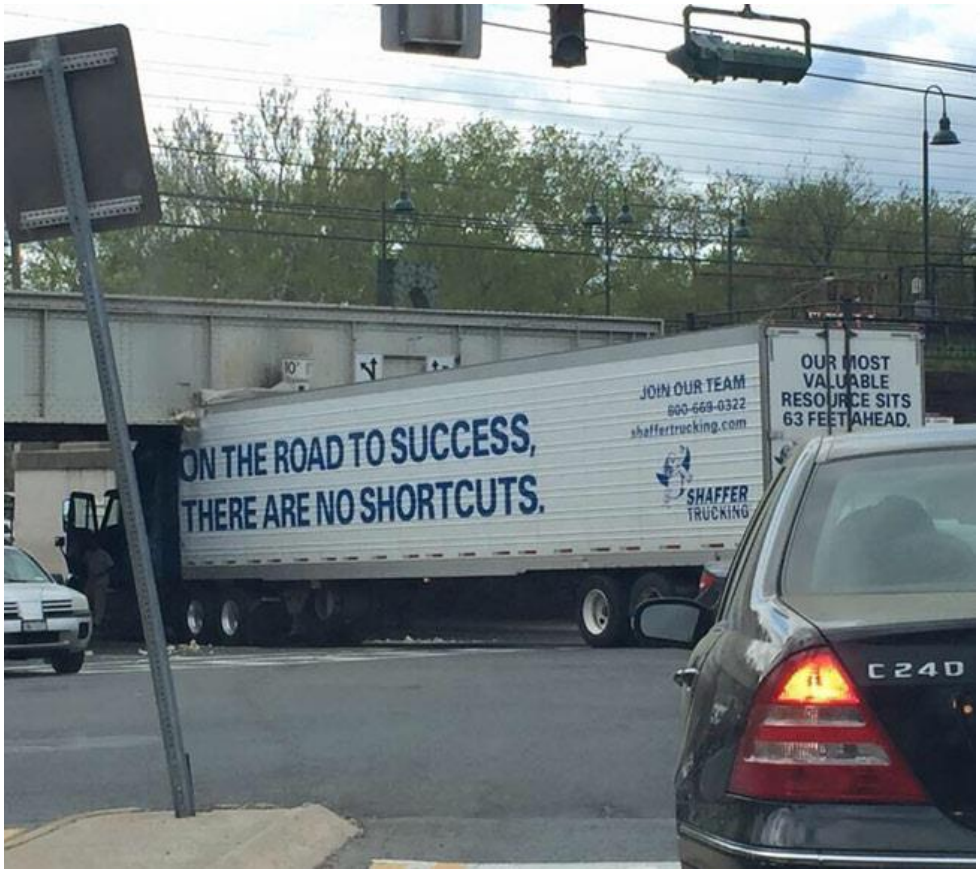
Deck Pour



Bridge Mounted Utility Ducts

Pre Painted Steel Splices/Touch Up

Build it, and he will come!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Thank-you!