

ASHE Harrisburg Section Project of the Year (<\$30M) Sherman Street Bridge Modification/Extension



ASHE Harrisburg | PennDOT District 8-0 | PA Turnpike Joint Conference

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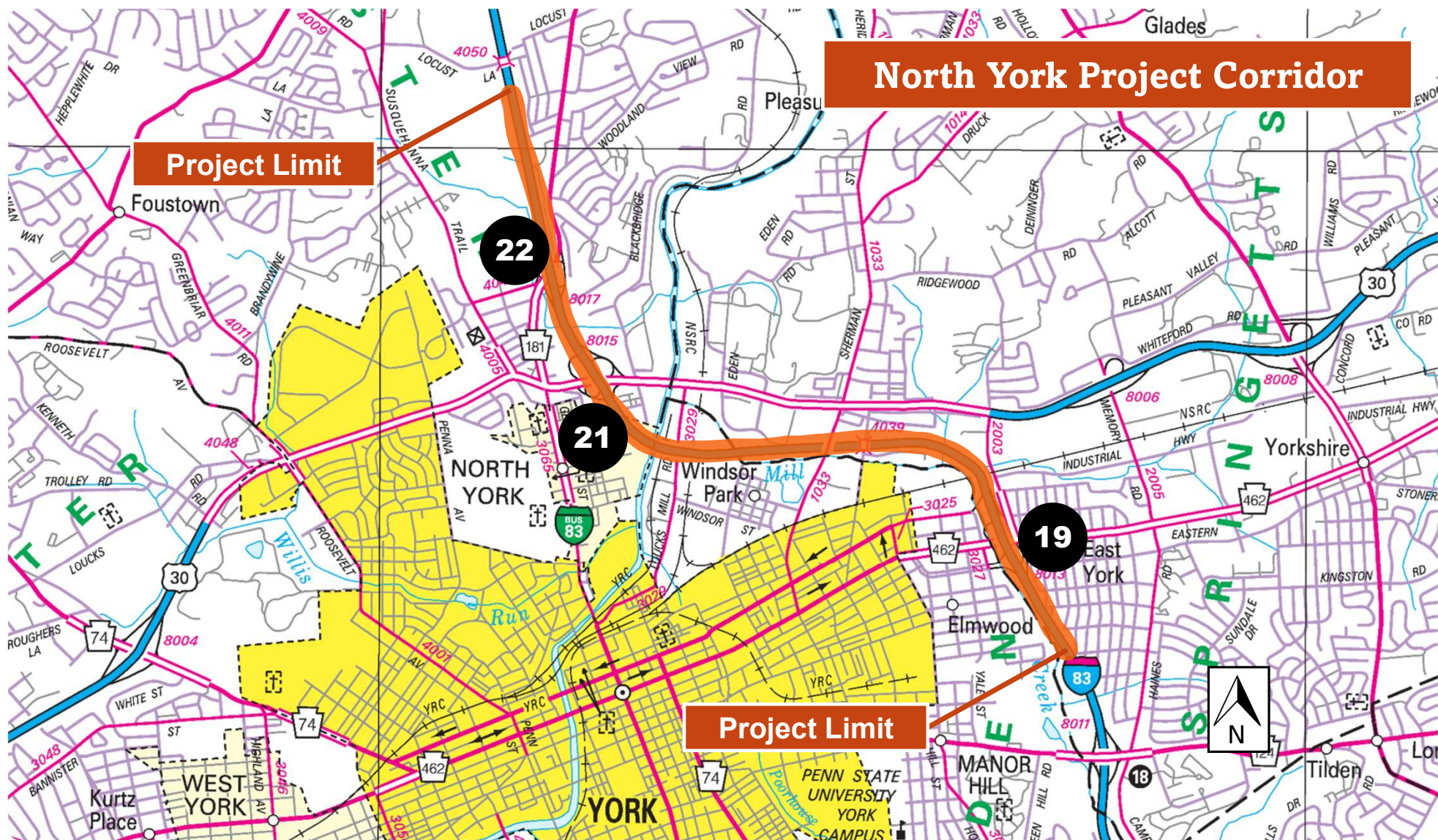
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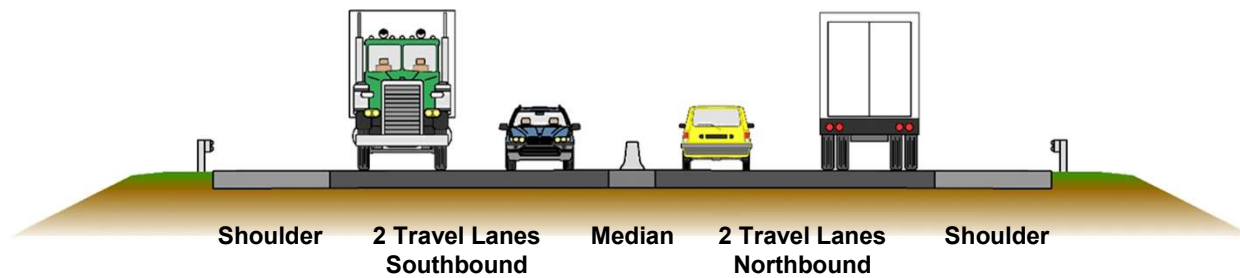
Overall I-83 North York Widening Project



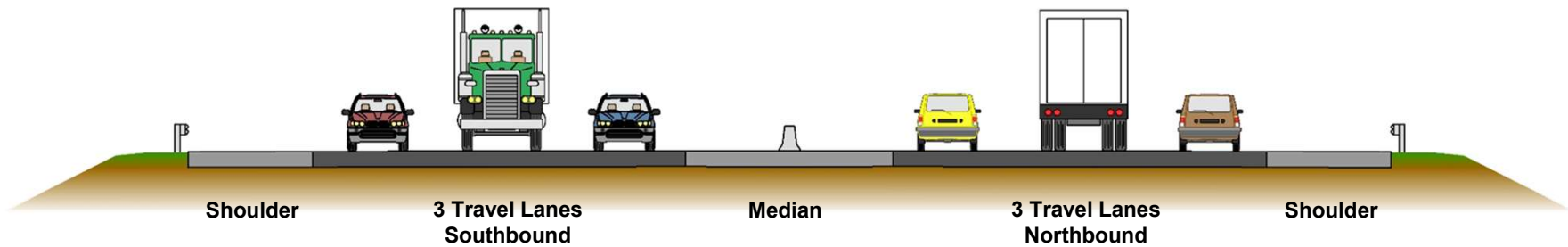




I-83: Widening to 6 Lanes



Out to Out Width of 68-ft



Out to Out Width of 122-ft

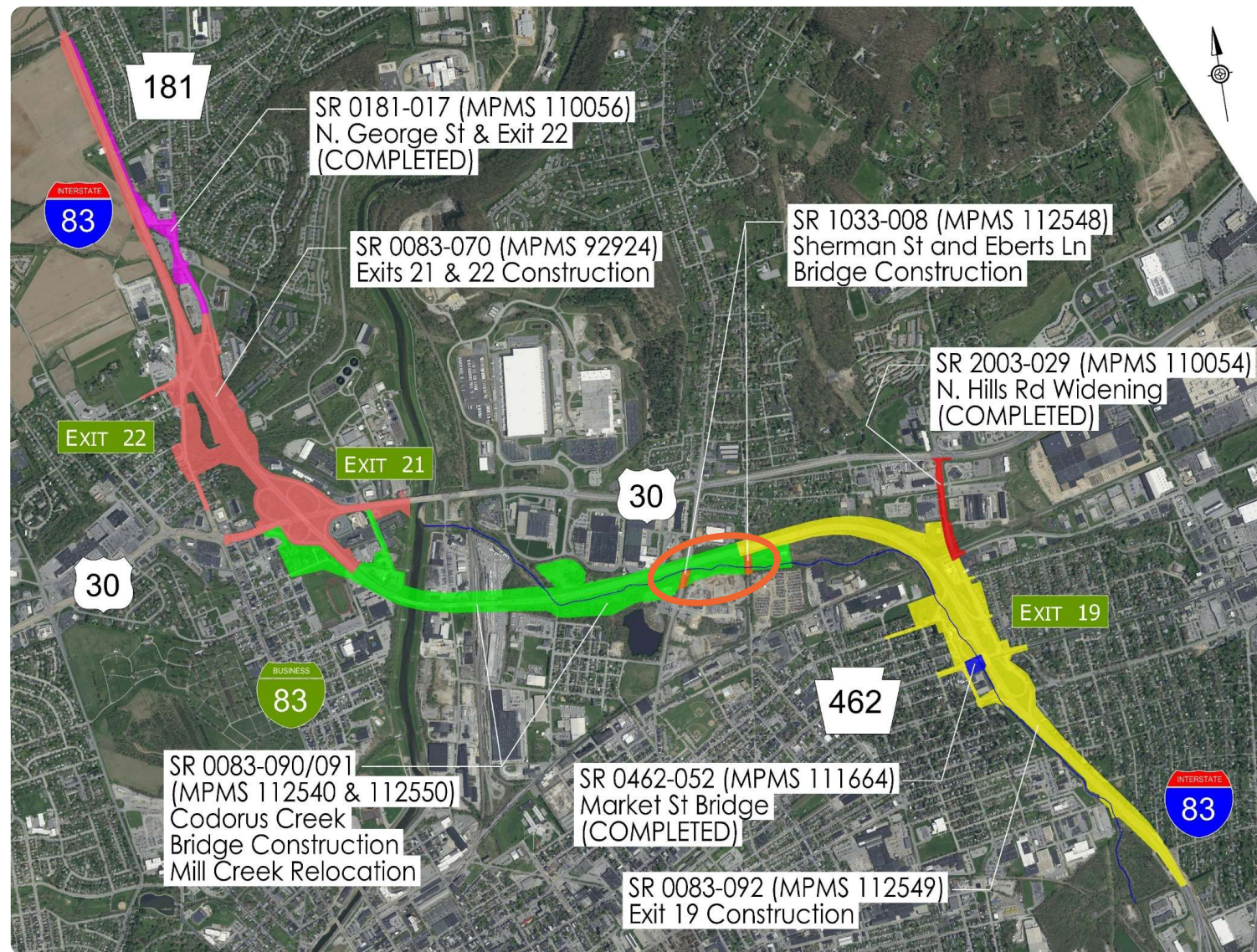


Project Delivery

4 Mainline Projects

4 Early Action Projects

1 ROW and Demolition Project





Eberts Lane Bridge

Replaced the existing four-span concrete bridge with a two-span, bulb-tee beam bridge





Sherman St Bridge

Existing two-span steel plate girder bridge





Why Modify the Sherman Street Bridge?

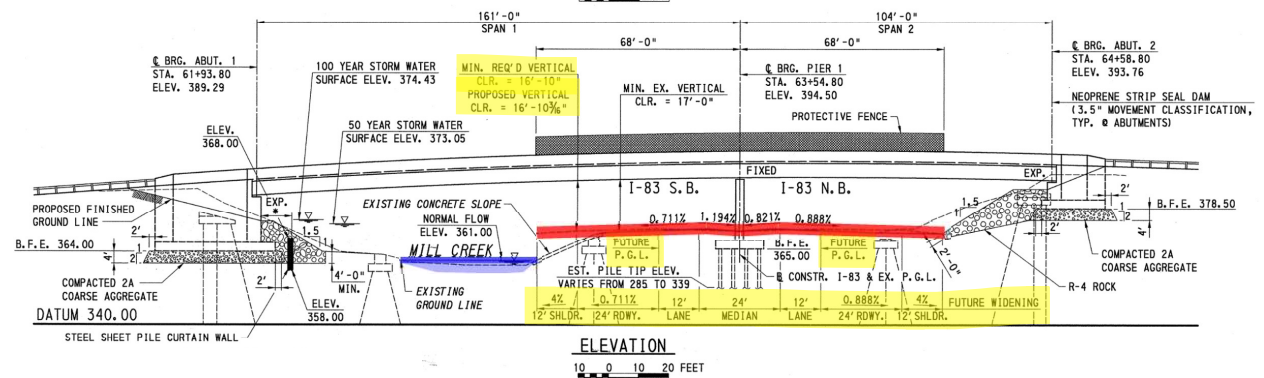
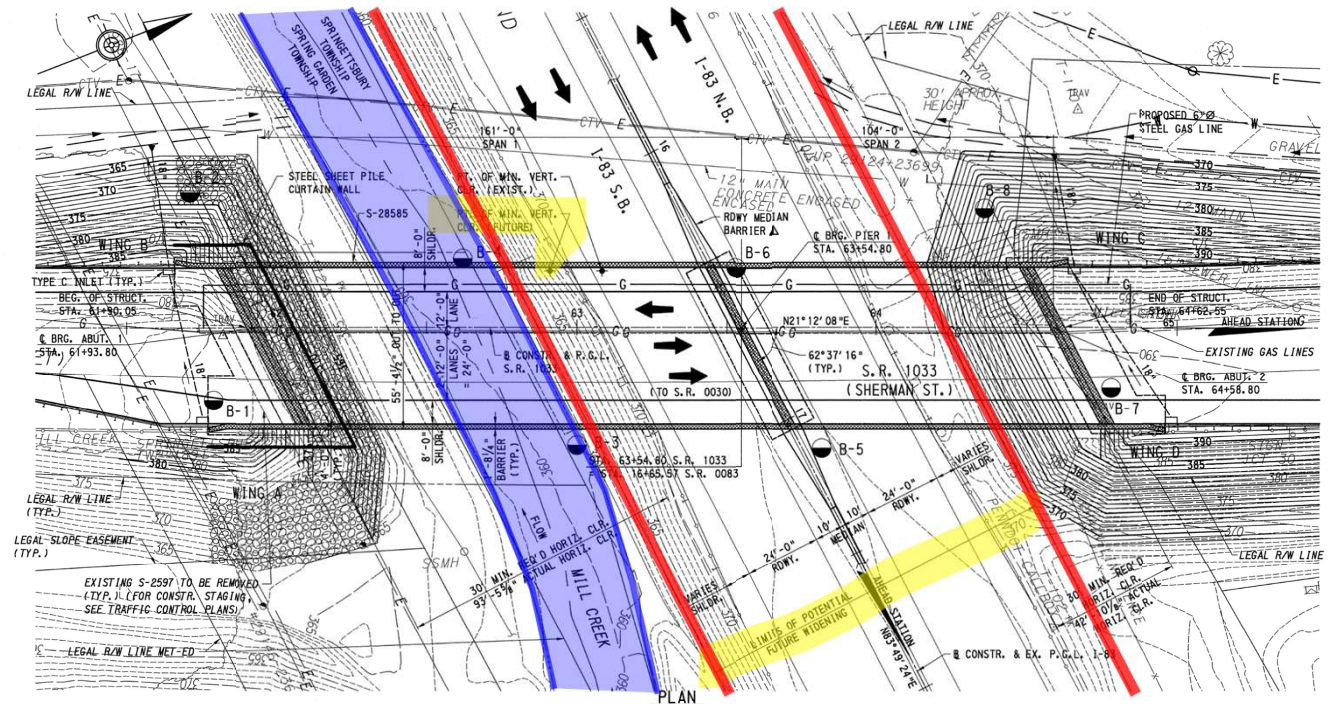




Existing Structure

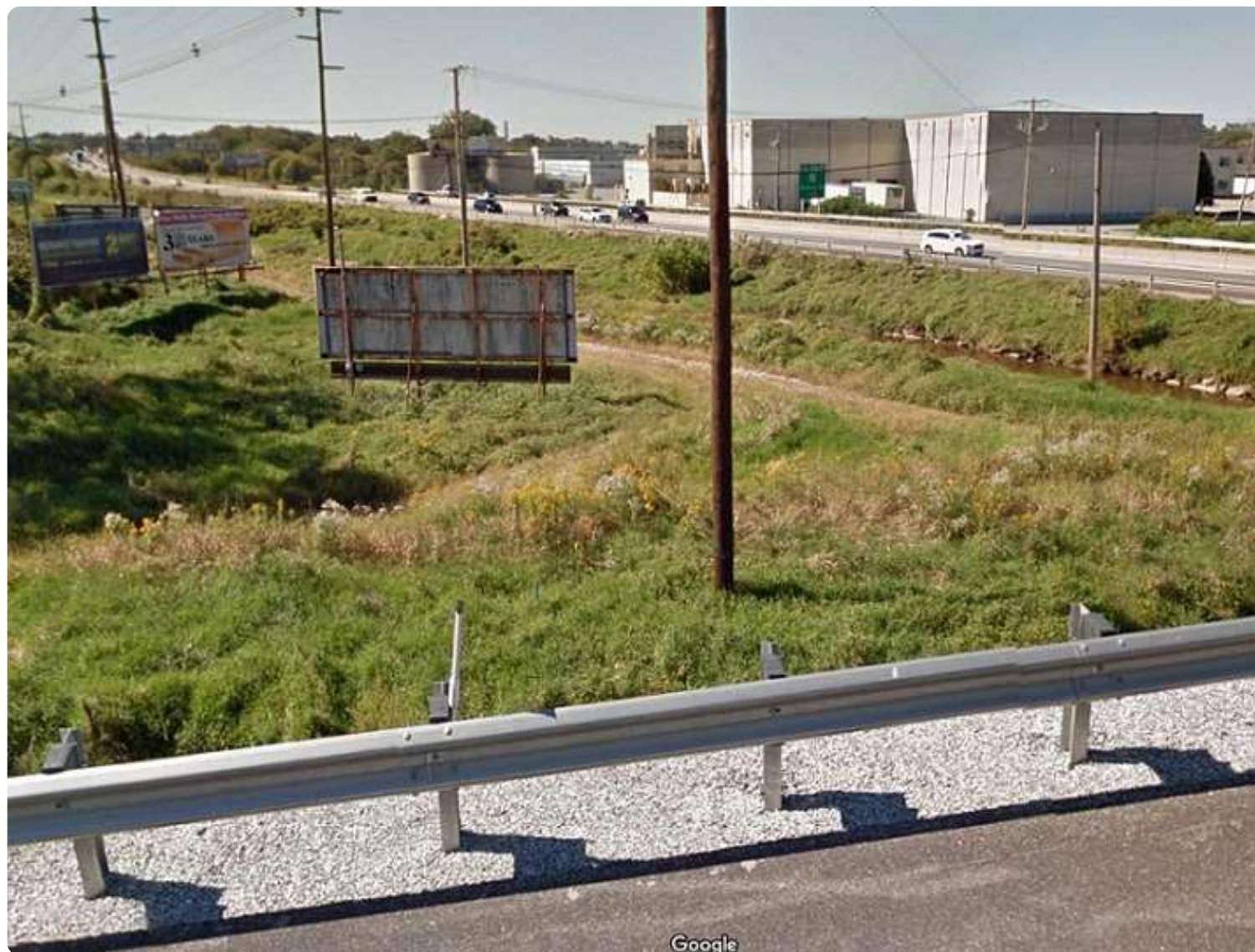
Constructed In 2012

Designed to Accommodate the Future Widening





Mill Creek





Mill Creek

Flooding reportedly
circa 2006 or 2011
(Hurricane Irene or
Tropical Storm Lee)





Mill Creek

2021
Hurricane Irene



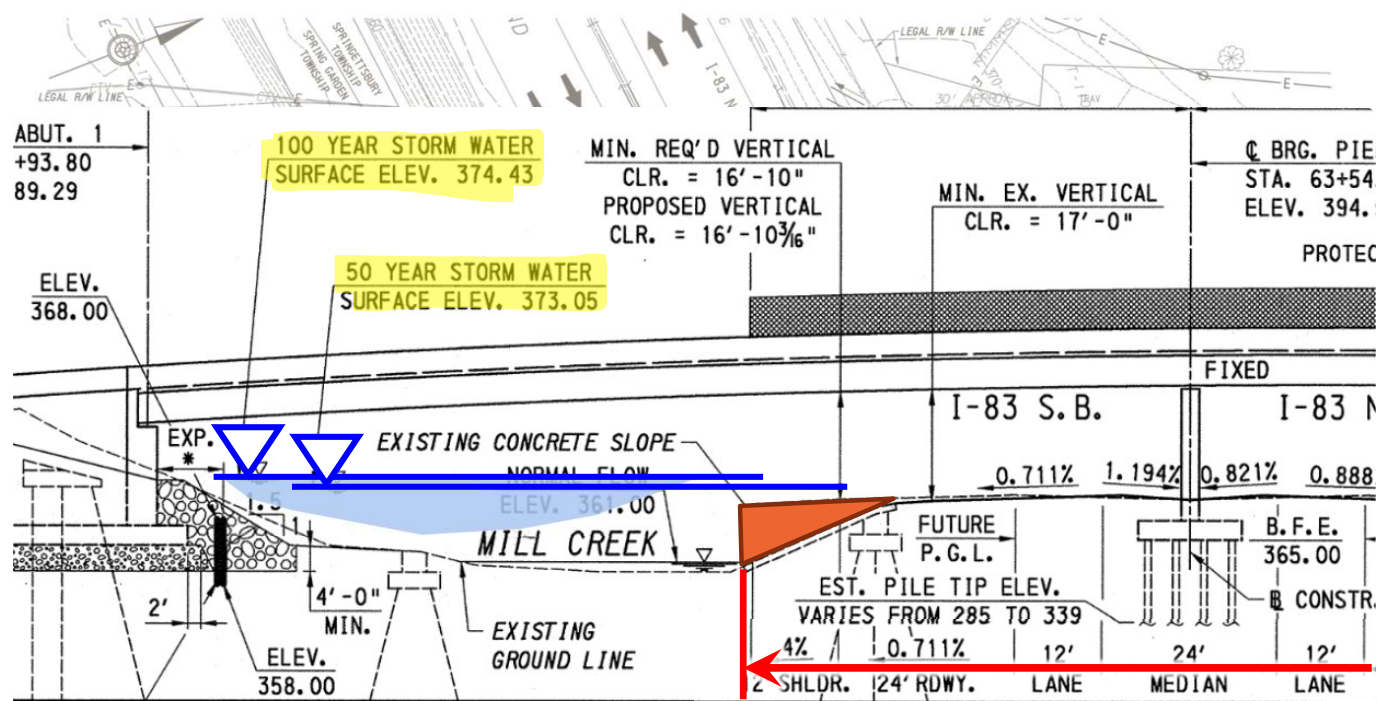


Existing Structure

Constructed in 2012

Designed to accommodate the future widening

Future widening reduced hydraulic opening



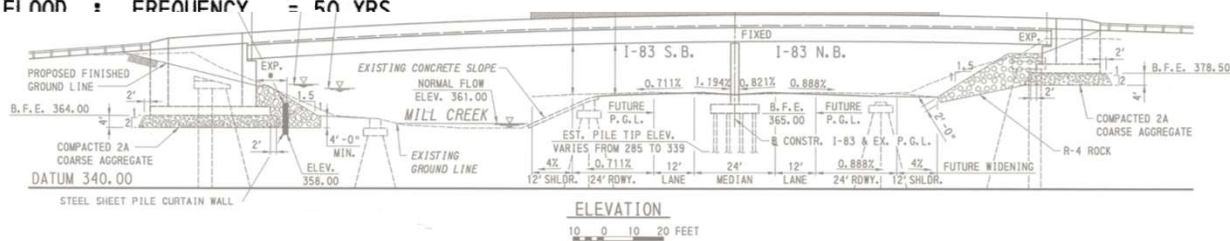
MILL CREEK HYDRAULIC DATA

RAINAGE AREA : 16.84 SQ. MILES

DESIGN FLOOD : FREQUENCY = 50 YRS

ELEVATION

10 0 10 20 FEET



Mill Creek Stream Impacts



Mill Creek Stream Impacts





Mill Creek Stream Relocation





Girder Splice

Splice-in at Existing Splice Location

Pros:

- Conventional work – “Common” Approach
- No temporary support required

Cons:

- Removes nearly half of the existing superstructure
- MPT on I-83 required during removal and erection operations – Added Cost

SELECTED!

Cut Existing Girders and Use New Splice Location

Pros:

- No MPT needed on I-83
- Retains 90 feet of the existing superstructure

Cons:

- Requires specialty work to cut and finish the beam
- Requires a temporary support during construction

Estimated cost savings approx. **\$300k**





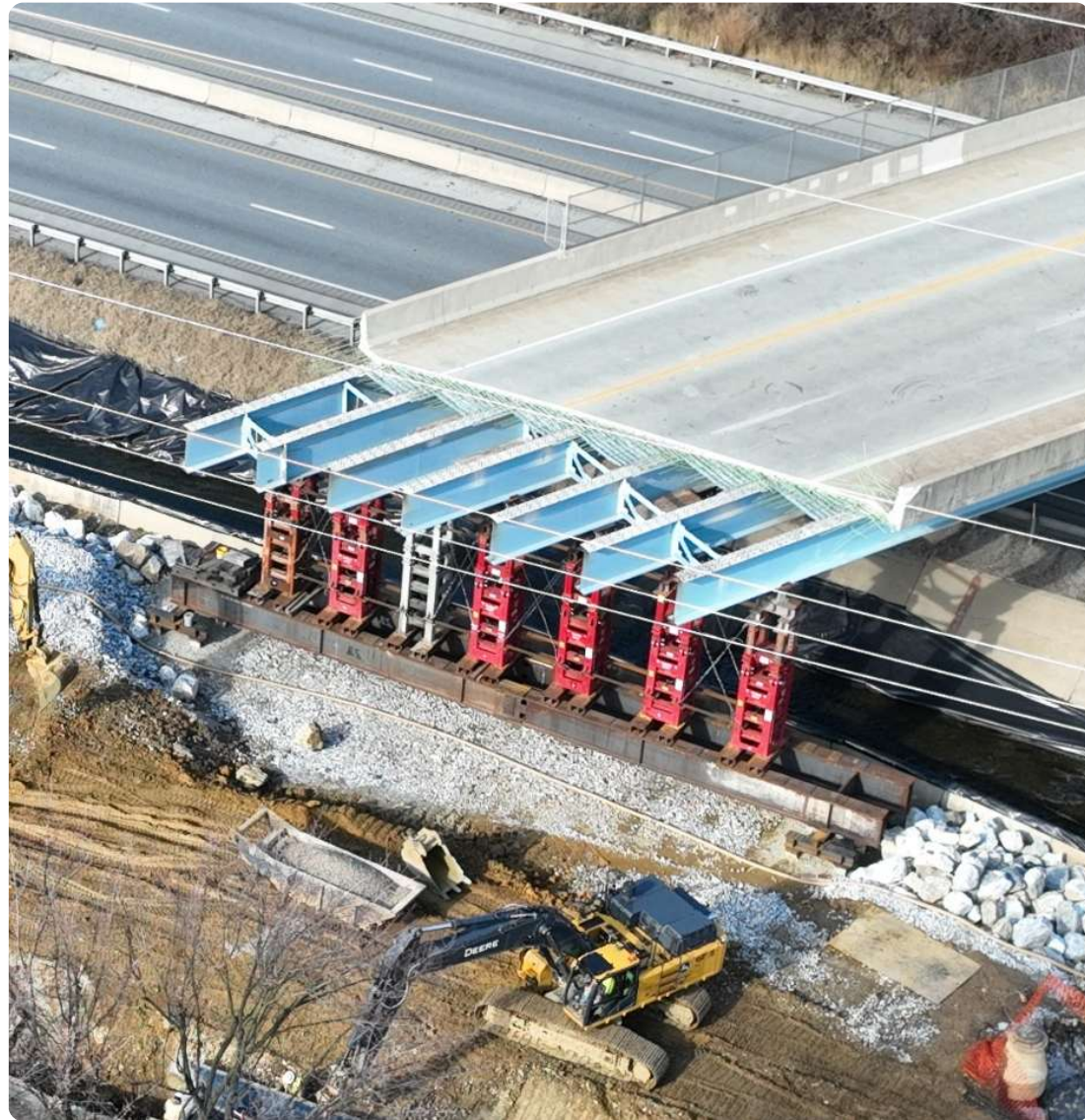
Temporary Support

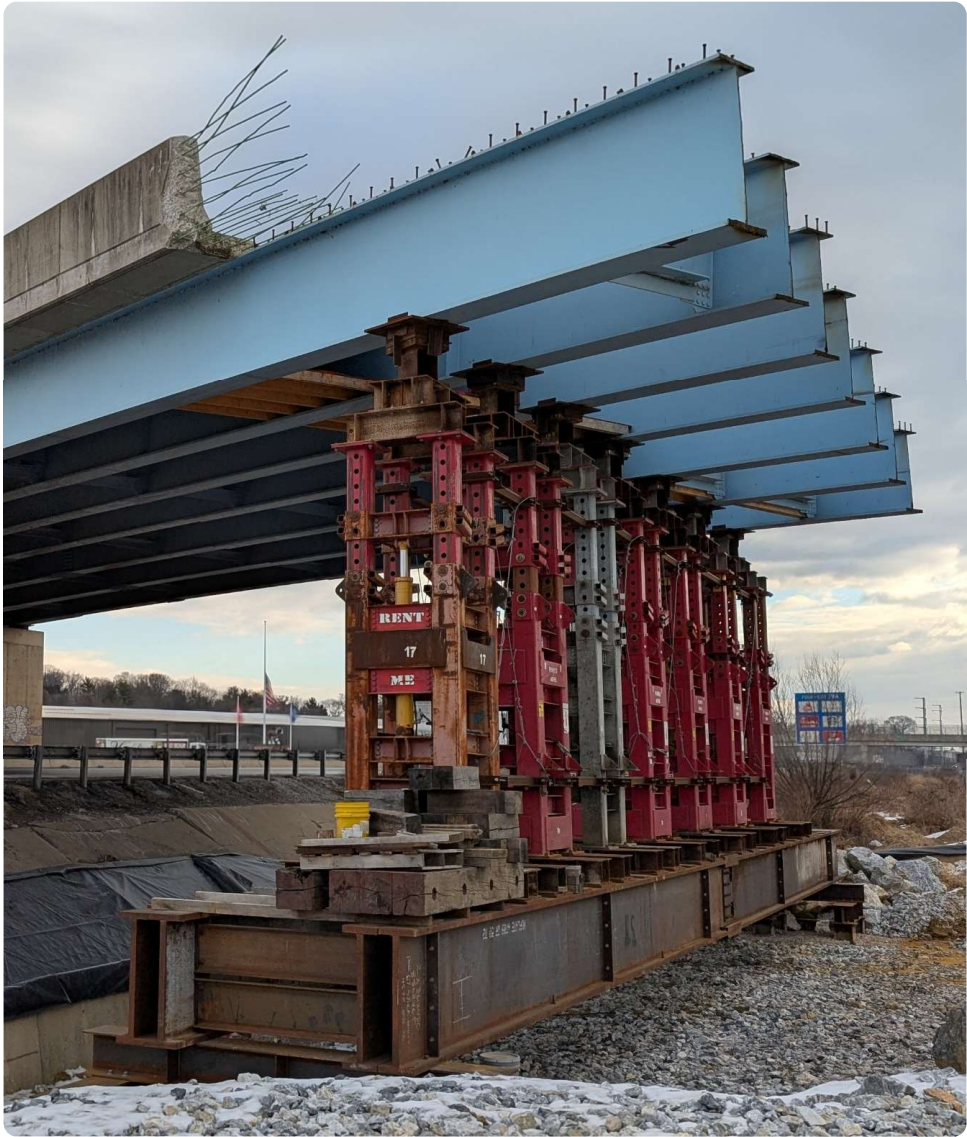
Scour Considerations

- Provisions for temporary bridges during a flood event, but not temporary supports
- Deep foundations were required

Temporary Support Deflections

- Monitor for movement
- Jacking provisions for fine adjustments







Construction Challenges





Ground Water and Sanitary Sewer Challenges

Eberts Lane Water Treatment

- Anticipated flow rate was 100 GPM
- Actual flow rate encountered **700 GPM**

Solutions

- Added Dog Box Inlets for bypass pumping
- Installed Well Points to assist in filtering sediment
- “Agility Concept” between the Department and Springettsbury Township
- System of Pod Filters, Filter Bags, and Sanitary Sewer to control water flow





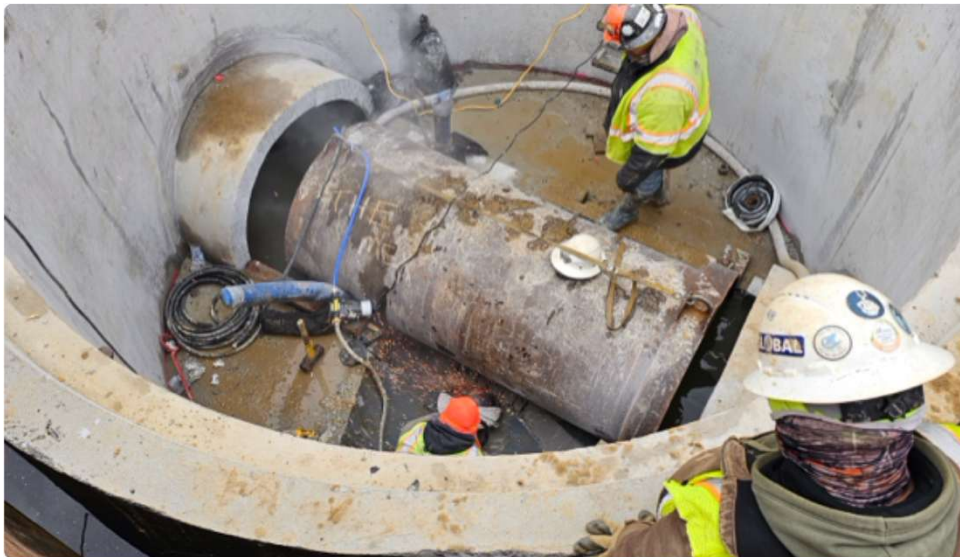


Ground Water and Sanitary Sewer Challenges

Lessons Learned applied at Sherman Street Bridge

- Established Well Points
- Use two rows of Silt Sock
- Larger Manholes and live switch between the existing Sanitary Sewer System and the relocated system
- Geosynthetic Reinforced Soil (GRS) placed below new pipes







Foundations

KARST



Existing Structure Foundation Design

Existing plans showed driven piles.

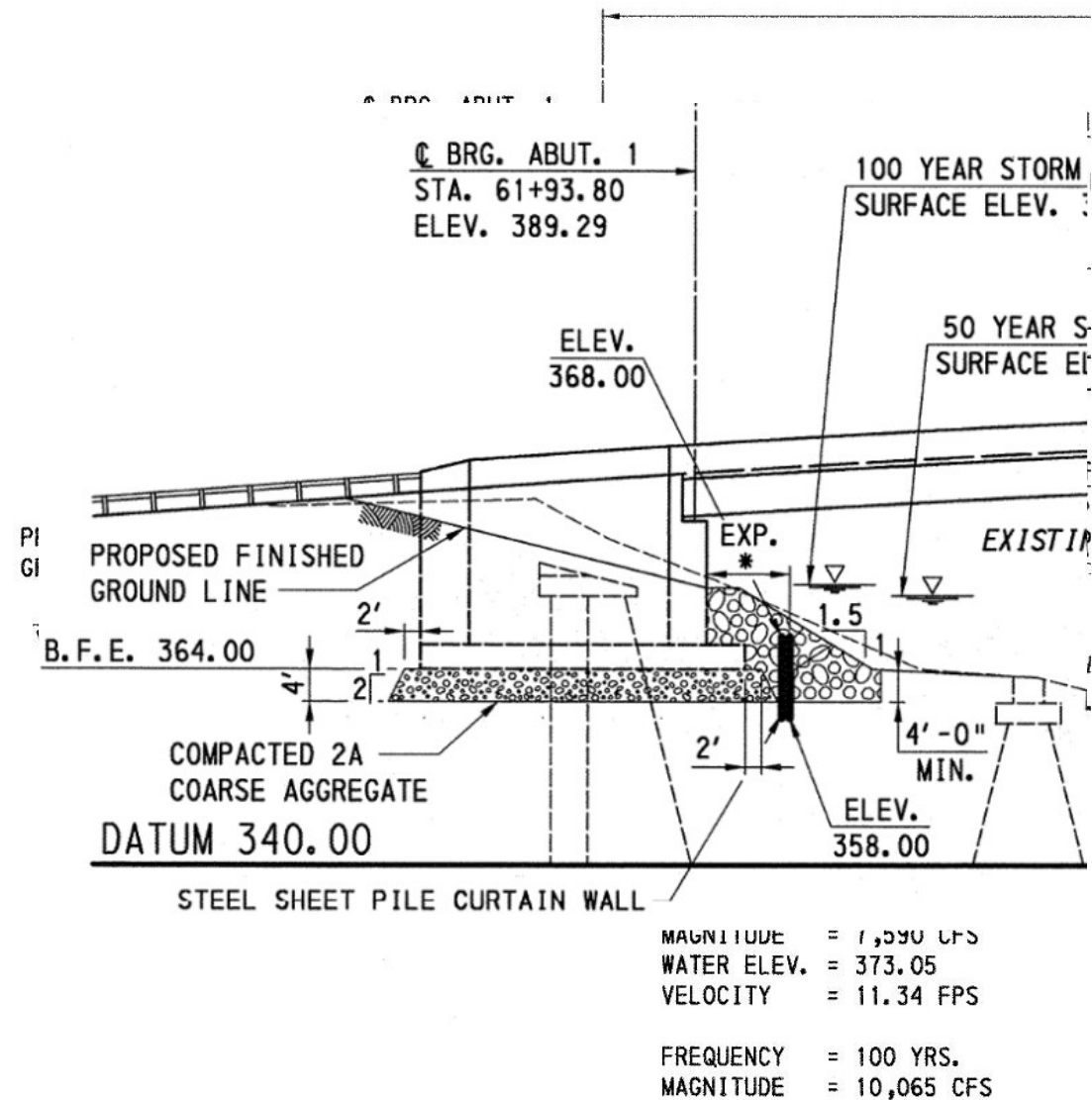
At some point during construction, foundations were converted to spread footings, reportedly due to driving issues.

No documentation of this change was available.

Details of reasons and issues were murky.

Project was a Design-Build (sort of).

Contacted EOR for the Existing bridge.

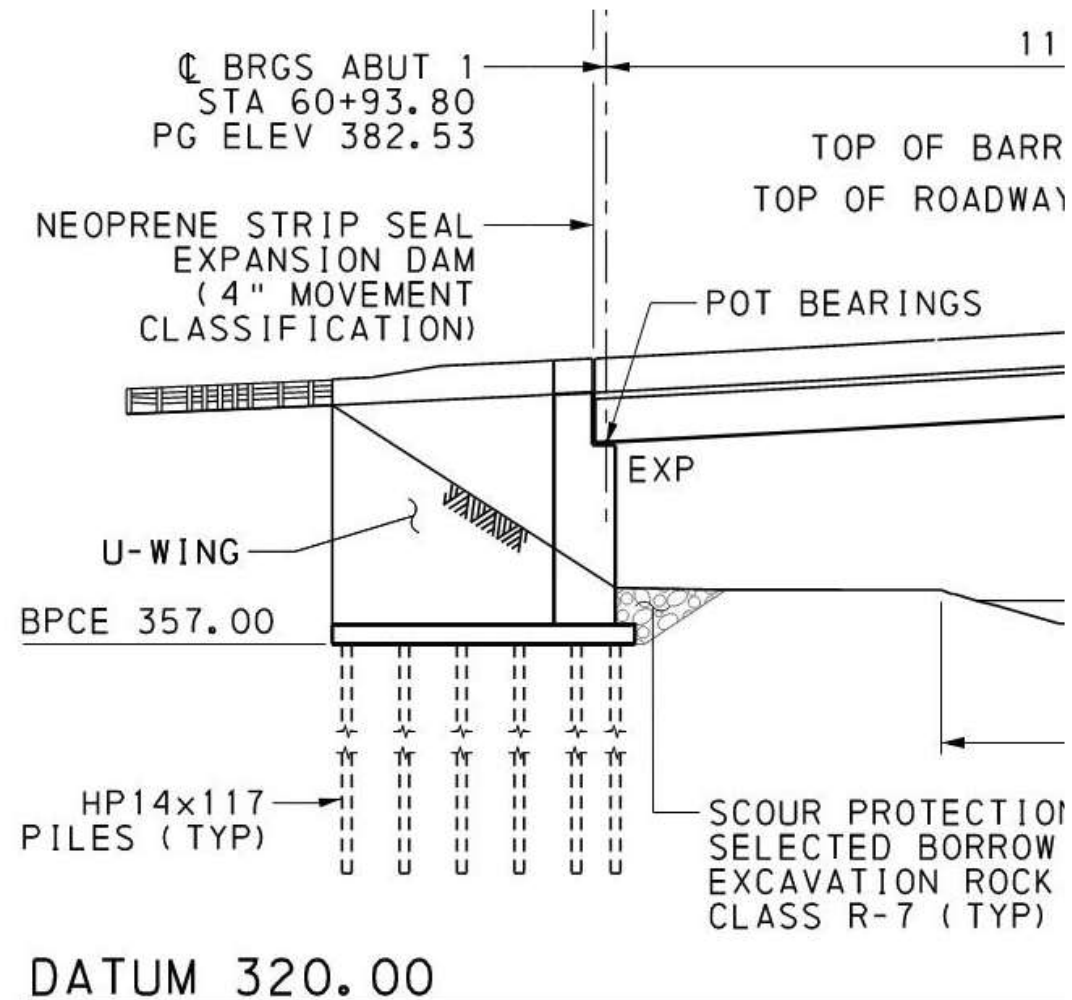


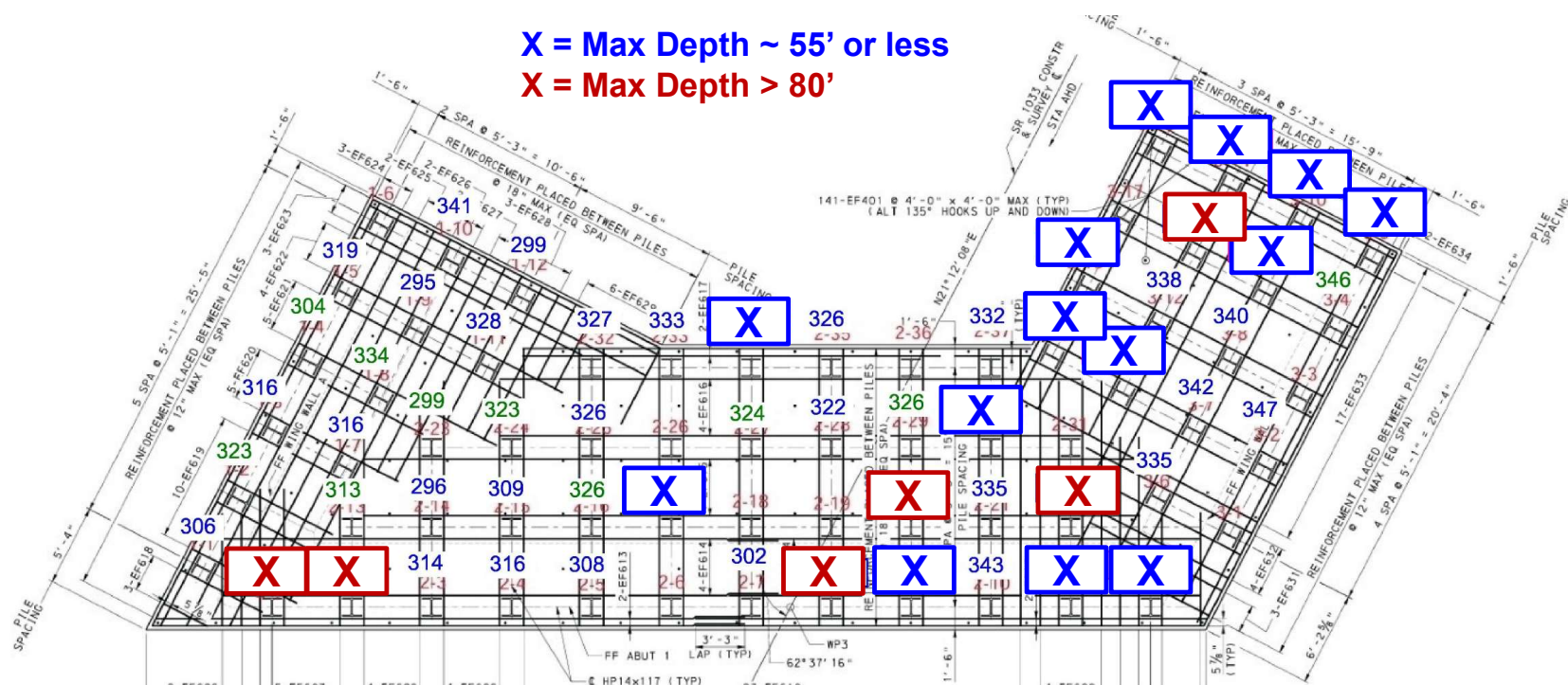


Proposed Foundations

Predrilled Piles with Grouted Tips

- Vertical piles
- Predrilled into 5 ft of rock with 5 ft of competent rock below
- Grouted tips provided lateral resistance
- Air-track drilled to determine depth before drilling







Foundation Options

Predrilling = \$\$\$\$

- Not feasible given the required depth to rock

Use Spread Footings

(like existing bridge)

- Settlement and movement concerns

Drive Piles using a PDA

- Could be costly given depth to rock

Final Decision: Drive Piles using a PDA

- Same pile size and quantity
- Minor design update to account for pile losses
- Provides least risk in the long-term
- Battered piles are not recommended – alternate solutions for lateral resistance

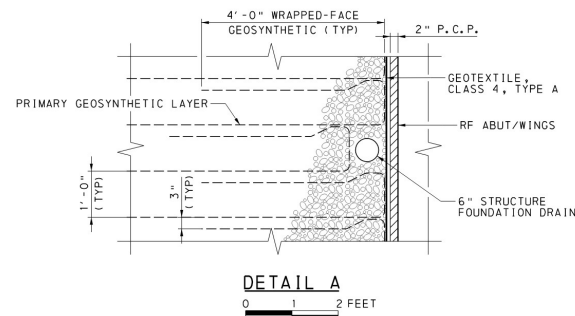
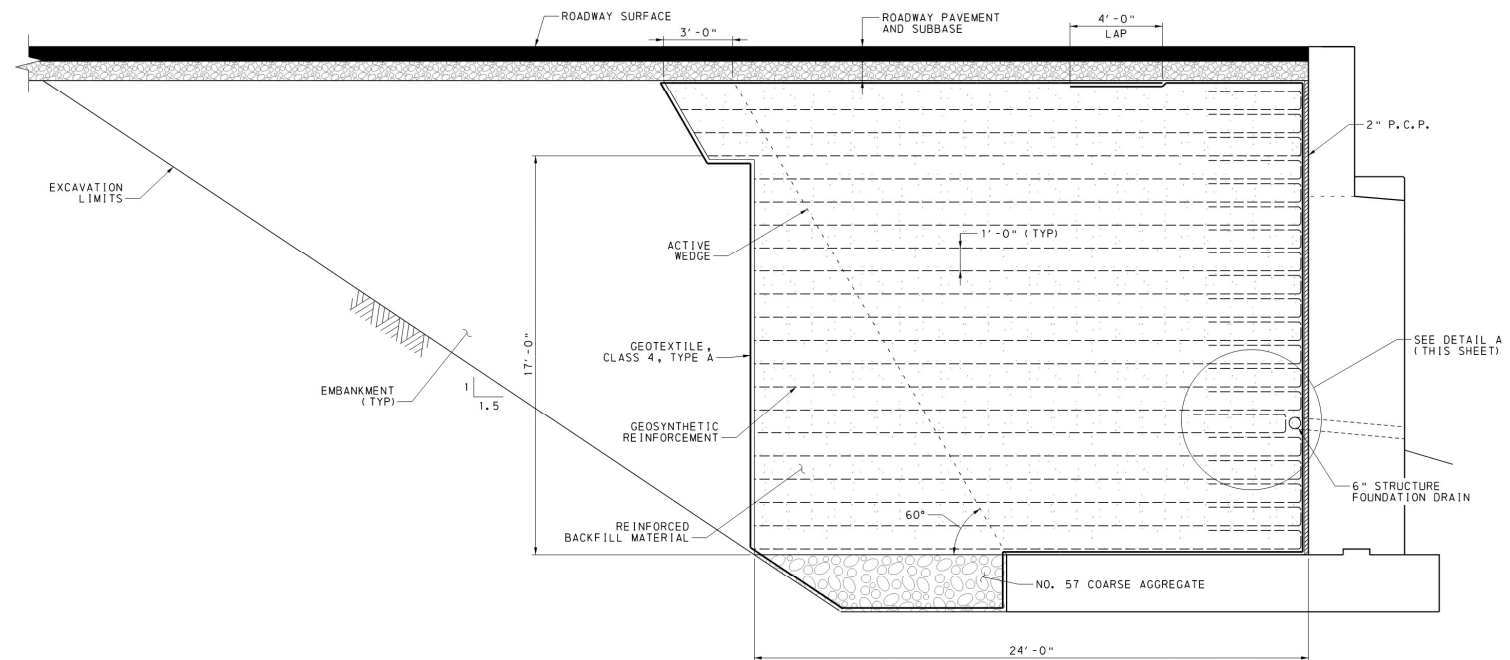




GRS Backfill

Elimination of predrilling reduces lateral capacity of vertical piles

GRS backfill added to reduce lateral loading on the piles



GEOSYNTHETIC REINFORCED STRUCTURE BACKFILL

ABUTMENT SHOWN, WINGWALLS SIMILAR
0 2 4 FEET

LEGEND

- REINFORCED BACKFILL MATERIAL
- ROAD BASE AGGREGATE
- STRUCTURE BACKFILL
- GEOSYNTHETIC REINFORCEMENT
- GEOTEXTILE, CLASS 4, TYPE A



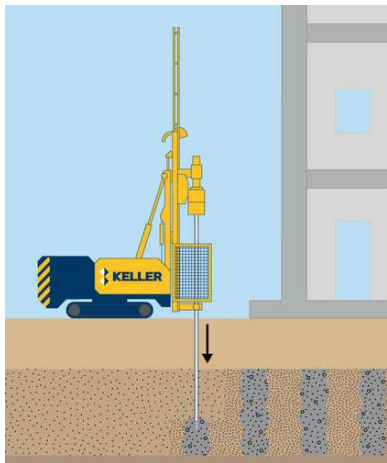




Sinkhole Remediation Options

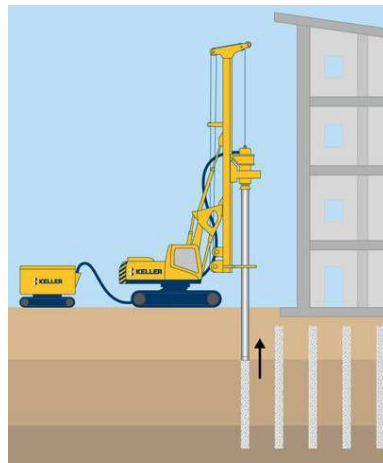
Low Mobility (Compaction) Grouting

- Lowest Risk/Highest Cost
- Est. \$900k



Rigid Inclusions/ Aggregate Column

- Highest Risk/Lowest Cost
- Est. \$300k



Combo of Low Mobility Grouting and Rigid Inclusions

- Medium Risk/Medium Cost
- Est. \$550k

Also looked into other options, such as Dynamic Compaction.

Sinkhole remediation anticipated to be used in combination with spread footings and sheet pile containment



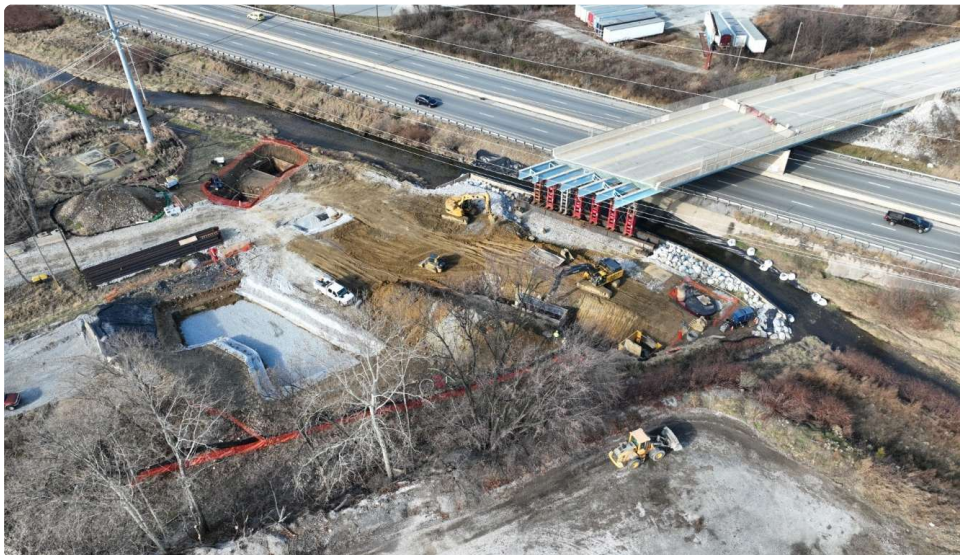


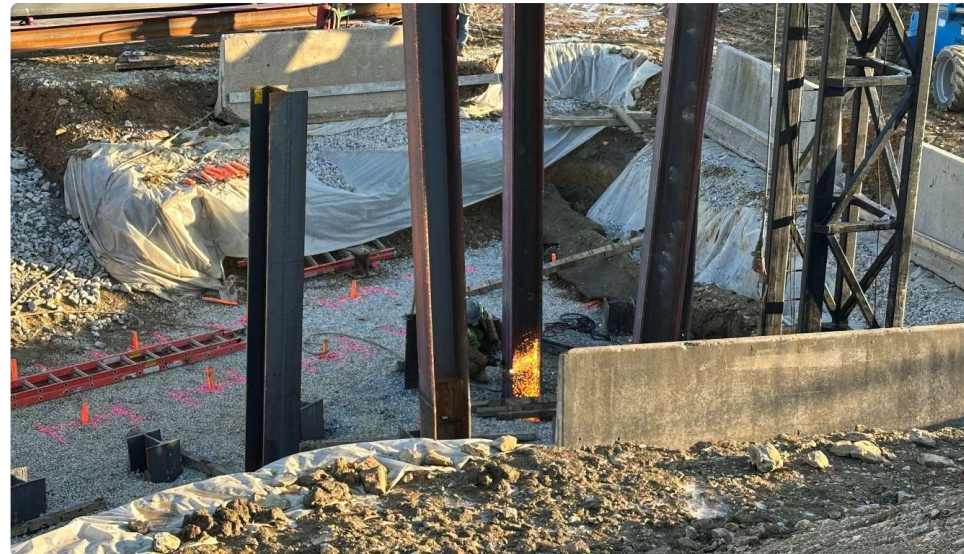
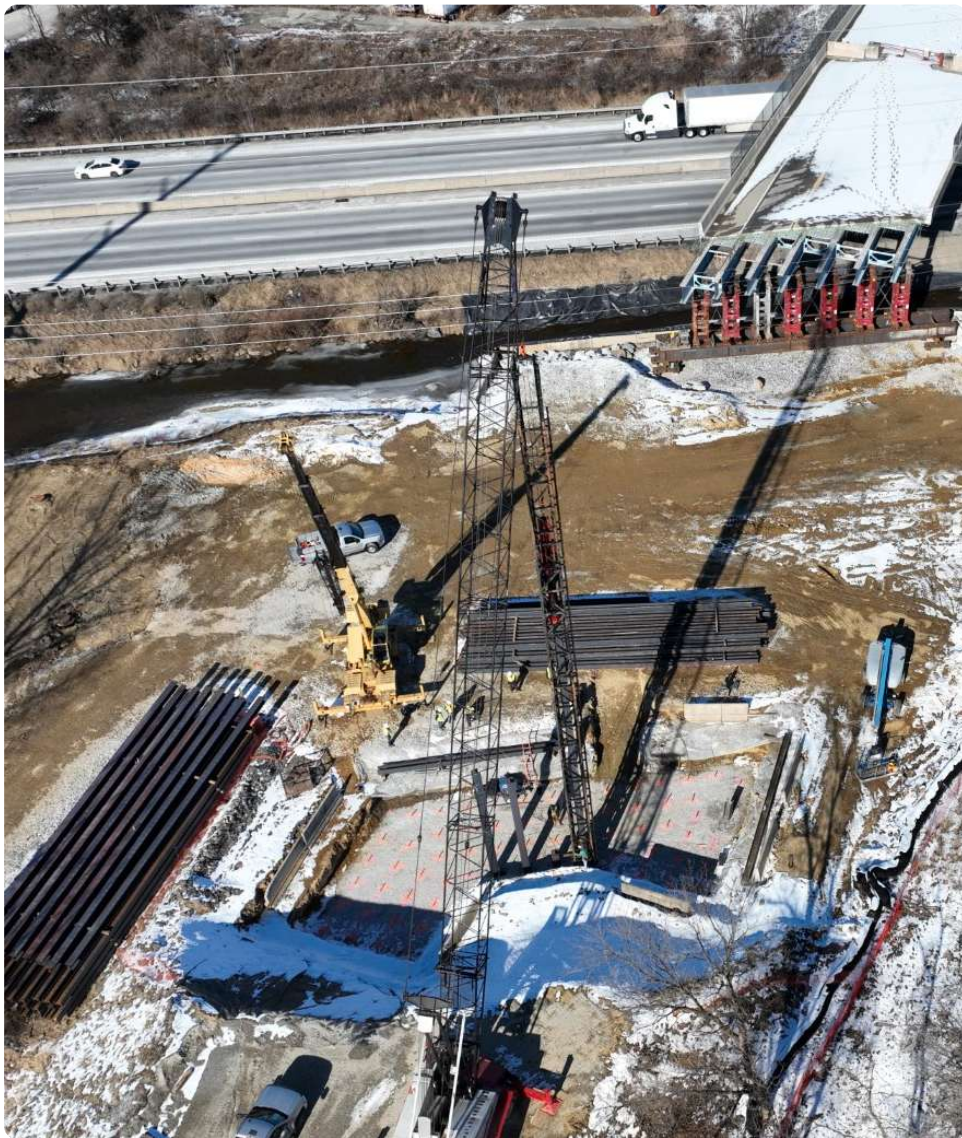
Final Foundation Decision

Stick with driven piles using a
PDA to confirm capacity

***“ A Driven Pile is
a Proven Pile ”***















Construction Costs

Original Bid Price: **\$ 10.1 M**

- Eberts Lane Bridge: **\$ 2.7M**
- Sherman Street Bridge: **\$ 4.4M**

Final Contract Amount: **\$ 11.3 M**

- Added I-83 Repairs: **\$ 760k**
- Eberts Water Treatment: **\$ 430k**
- Sherman Foundations: **\$ 140k**
 - *Additional Work:* **\$ 785k**
 - *Deduct as-designed items:* **(\$ 645k)**
- Misc Adjustments: **(\$ 120k)**

Schedule:

12/31/2024 → 7/19/2025 → **10/13/2025**



Thank you





Panel Discussion

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