I-95 SECTION BRO – BETSY ROSS INTERCHANGE

pennsylvania
DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
Federal Highway Administration

PROJECT MANAGEMENT:
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STV 100 Years

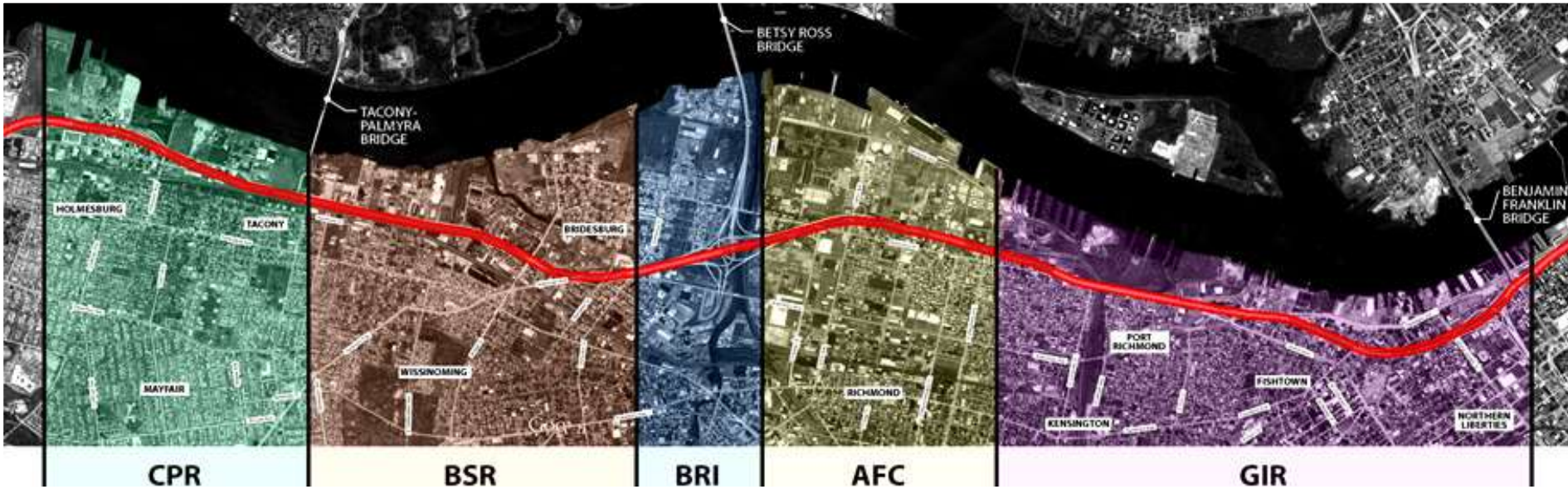
I-95 in Pennsylvania

- PennDOT's "I-95 REVIVE" Program
- Includes all 51 miles in Delaware, Philadelphia, and Bucks Counties
- Corridor divided into four sectors based on condition
  - *Sector A – From I-676 to Bleigh Ave*
  - *Sector B – From Navy Yard to I-676*
  - *Sector C – Delaware County*
  - *Sector D – Bucks County*
- 23% of highway is on structure
- 190,000 ADT in the City of Philadelphia
- 20 MPH is the Avg. PM Rush Hour Speed

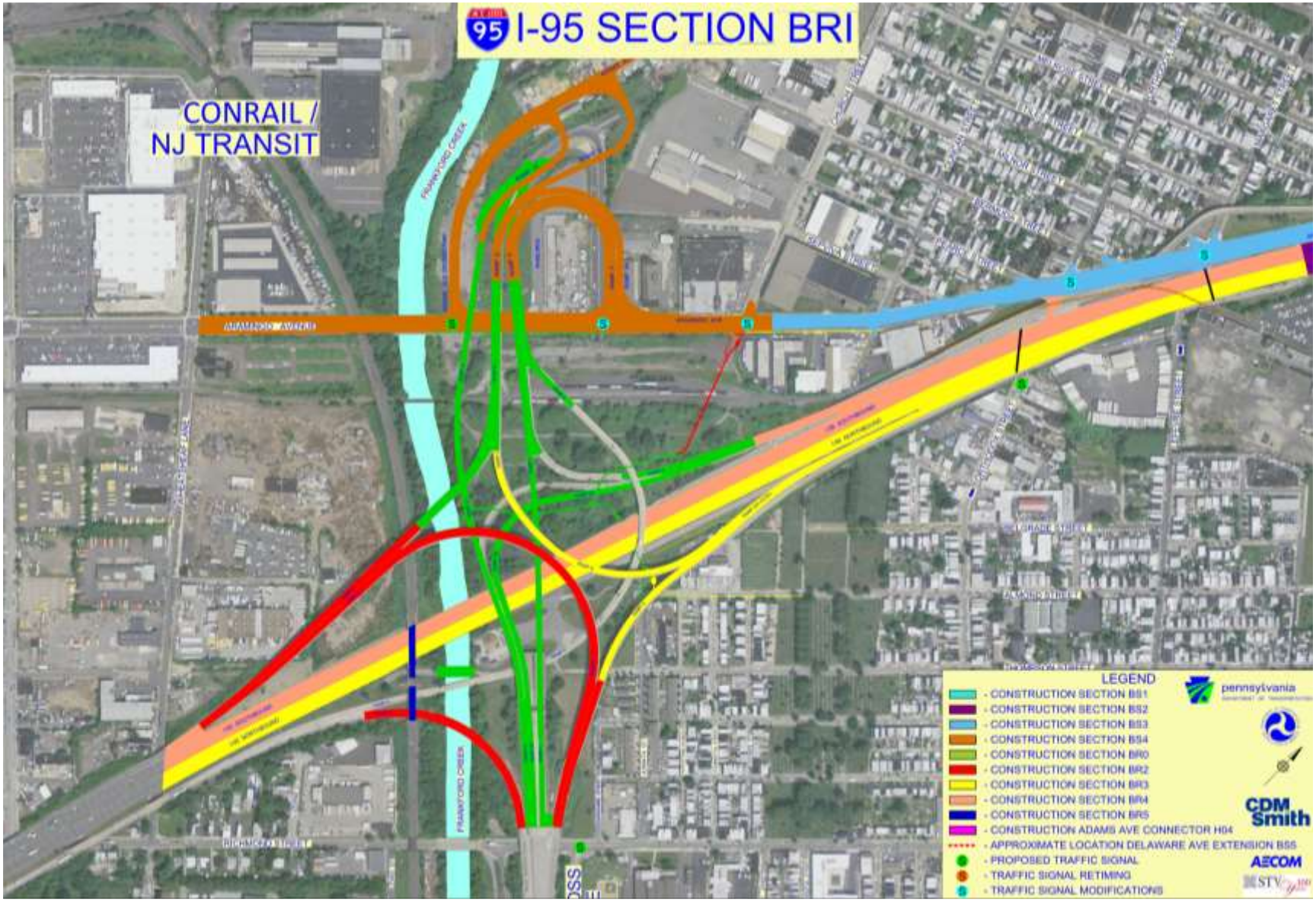
I-95 Overview: *Sector A*

- $2 Billion – 20 year program
- 8 miles from I-676 to Cottman Avenue
- Five major interchanges
- Twenty-four construction contracts

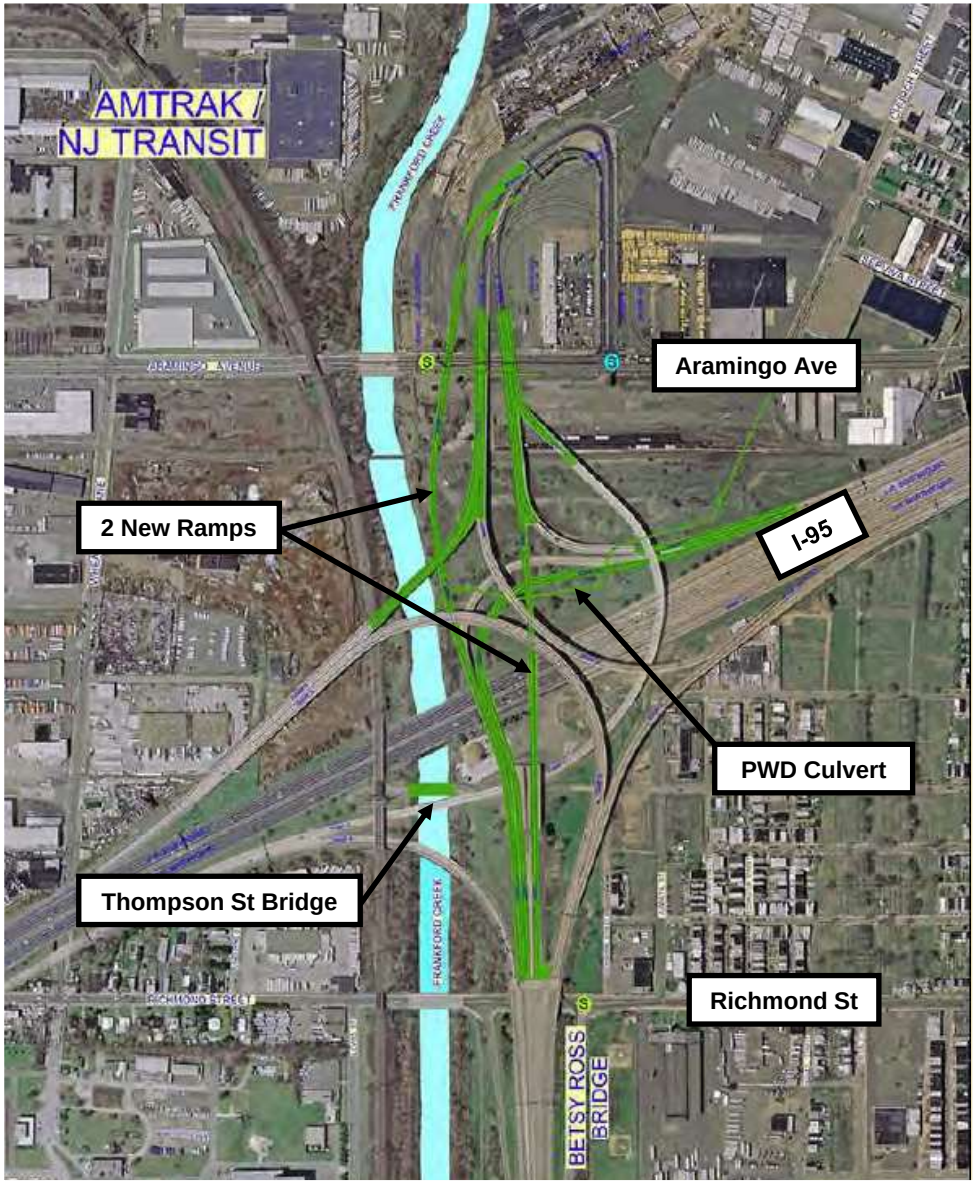
- Five separate design sections
  - *Girard Avenue Interchange (GIR)*
  - *Ann Street to Frankford Creek (AFC)*
  - *Betsy Ross Interchange (BRI)*
  - *Bridge Street Ramps (BSR)*
  - *Cottman-Princeton Ramps (CPR)*



I-95 Overview: *BRI Project Map*



Project Background: *Section BR0*



Major Items of Work

- Build 2 new ramps connecting the Betsy Ross Bridge and Aramingo Avenue
- Widen several ramps to provide additional travel lanes to/from I-95
- Remove the bridge at Thompson Street over Frankford Creek
- Relocate a PWD combination sanitary/storm sewer
- Build a geotechnical embankment

Project Background: *Statistics*

- 2.6 lane-miles of Ramps
- 154,867 SF of Pavement
- Structures
  - *7 bridges (286,470 SF Deck Area)*
  - *12 sign structures*
- Materials
  - *4,080,000 LB of reinforcement*
  - *34,000 CY of concrete*
  - *66,835 LF of steel H-piles*

Technical Details and Challenges: *Bridge Modifications*

- Changes to geometry
- Curved girders with highly skewed piers
- Girder fit up (splicing old to new)
- Large haunches
- Substructure modification
- Half-width construction
- Old to new interfaces
- Existing girder ratings
- Mass concrete pours

Technical Details and Challenges: *Site Constraints*

- Poor soils
- Railroad coordination
  - *Conrail Yard*
  - *Delair Branch*
  - *NJ Transit*
- DRPA property
- Frankford Creek
- PennDOT 6-5 Maintenance yard
- Transmission lines

Technical Details and Challenges: *Construction*

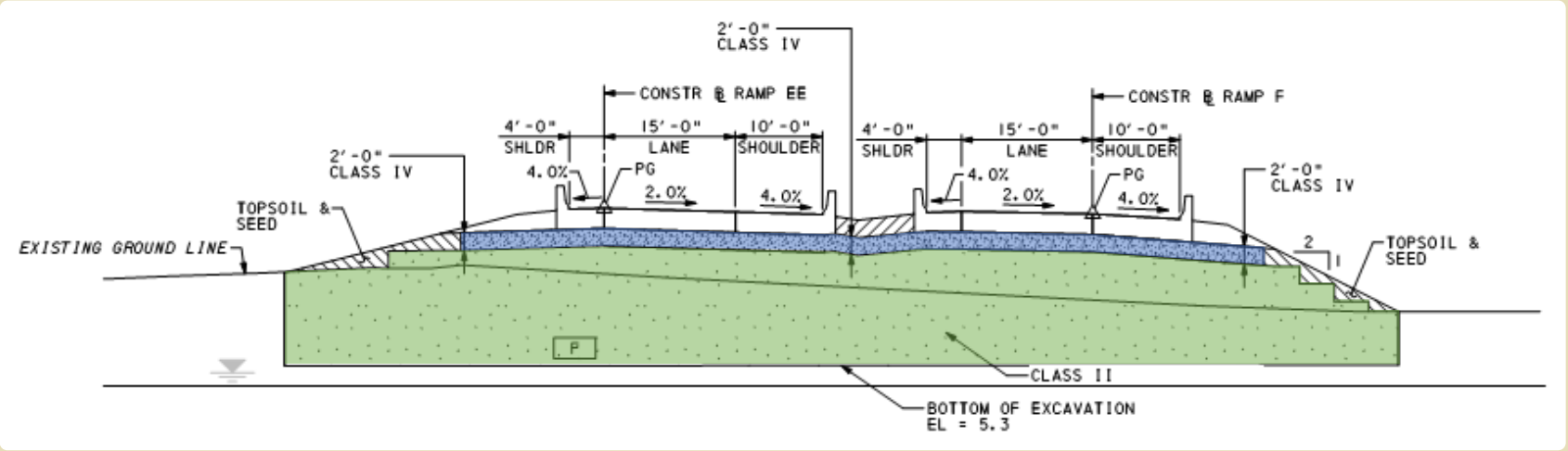
- Material testing and handling
- Hazardous waste management
- Construction staging
- Pipe jacking
- Controlling construction dust/debris/noise/vibrations
- Maintaining local access
- DRPA approach project
- Permitting

Innovation: *Geotechnical Embankments*

- BR0 constructed two types
  - *Compensating fill*
  - *Column-supported embankment*
- Applied under two ramps
- Replaces low-lying structures
- Short-term and long-term settlement monitoring systems
- Designed for a total settlement of less than 1 inch

Innovation: *Geotechnical Embankments*

- Compensating fill (lightweight foamed concrete)
  - *Replaces in-situ soil with lightweight foamed concrete*
  - *Two types of material used*
  - *MSE walls or T-walls can be used as a vertical facing*



Innovation: *Geotechnical Embankments*

- Compensating fill – construction stages

Innovation: *Geotechnical Embankments*

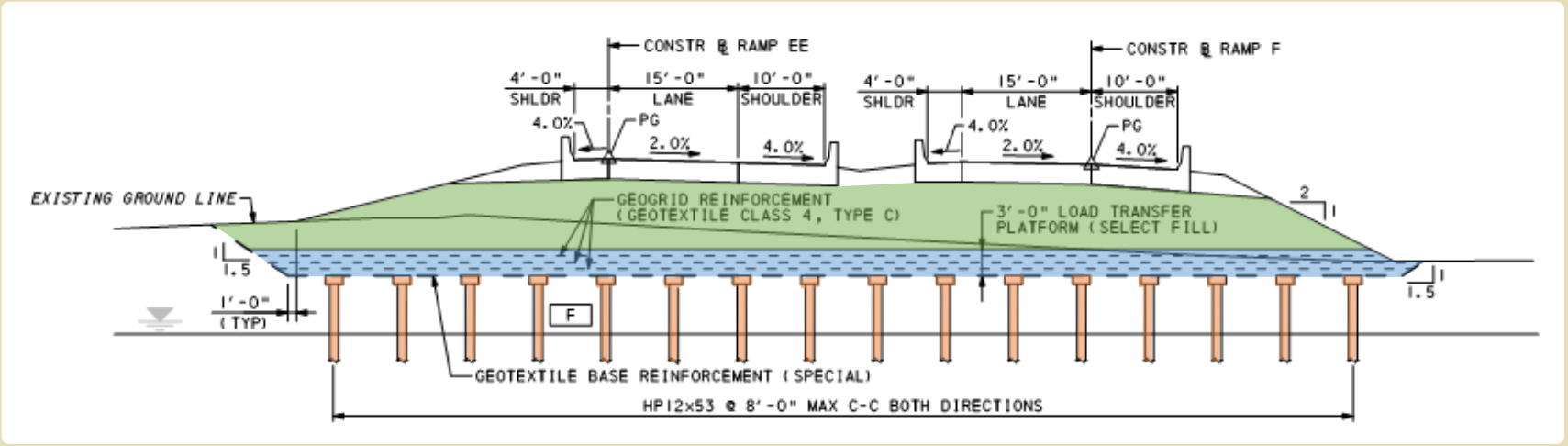
- Compensating fill – construction stages

Innovation: *Geotechnical Embankments*

- Compensating fill
  - *Other considerations*
    - Staging areas for on-site mixing equipment
    - Earthwork balancing
    - Weather conditions
    - Pour Sequencing
    - Drainage Installation
    - Ground water elevation
  - *BRO Statistics*
    - Class II Material
      - 16,500 CY total
      - 720 CY average per day
    - Class IV Material
      - 3,600 CY total
      - 900 CY average per day

Innovation: *Geotechnical Embankments*

- Column-supported embankment
  - *Consists of a load transfer platform supported by columns*
  - *Load Transfer Platform typically is layers of geotextiles and aggregate*
  - *Columns can be designed as friction or bearing*



Innovation: *Geotechnical Embankments*

- Column-supported embankment – construction



Innovation: *Geotechnical Embankments*

- Column-Supported Embankment
  - *Other considerations*
    - Column type and spacing can vary depending on embankment height
    - Drainage and utility conflicts with Load Transfer Platform
    - Typically extends to toe of slope
    - Working platform may be required
    - Staged construction interfaces
    - Abutment/wall transitions
    - Column repair procedures
  - *BR0 Statistics*
    - 17,500 LF Total
    - 500 Columns (33’-35’ average length)
    - 40-50 CMCs/Day

Innovation: *Geotechnical Embankments*

- Proposed I-95 Section BRI applications
  - *Replace up to 650,000 SF of existing bridge deck*
  - *Significant construction cost savings versus structure alternatives*
  - *Combining two alternatives to construct higher embankments*
  - *Reuse of stockpiled materials in embankments*
- Other factors to consider
  - *Waste generation (compensating fill)*
  - *Borrow availability (column-supported embankment)*
  - *Reduces opportunities for alternate use under I-95*

Construction: *BR0 Overview*

- Let in October 2014
- Contractor: Driscoll-Pierson (JV)
- Low Bid: $160,296,564.41
- Schedule
  - *Notice to Proceed in February 2015*
  - *Substantial completion in December 2017*
- Work Order % = 0.36%

Construction: *Bridges to "nowhere"*

Construction: *Fun Facts*

Structures:

- Substructure: 67 Piers/Abutments
- Ramp EE: 674,000 LBs of fabricated structural steel, 30 P/S Bulb-Tee beams approx. 90 LF
- Ramp JJ: 90 P/S Bulb-Tee beams ranging from 90 LF to 130 LF
- Ramp IFC: 891,000 LBs of fabricated structural steel
- Ramp I: 55 P/S Bulb-Tee beams, ranging from 90 LF to 136 LF
- Ramp D: 1,220,000 LBs fabricated structural steel
- Box Culvert: $10 million (7'x10') Length = approx. ¼ mile

Construction: *Beam Erection*

Construction: *Causeways*

Construction: *Piers*

Construction: *Avoiding Existing Structures*

Construction: *Fitting Old to New*

Construction: *PWD Culvert*

Construction: *Fun Facts*

- Deck Pours:
  - *Largest single day deck pour @ 240 CY*
  - *Poured 600-800 CY per month during peak season*
  - *1000 CY best month in July 2017*
- Total Concrete:
  - *15,000 CY of A*
  - *4,500 CY of AA*
  - *9,000 CY of AAA*
- Rebar: 4,050,000 LB
- Steel Piles: 66,835 LF
  - *Averaged 11-12 sticks a day, driven approx. 55 LF/Deep*
- Wood Piles: 15,000 LF

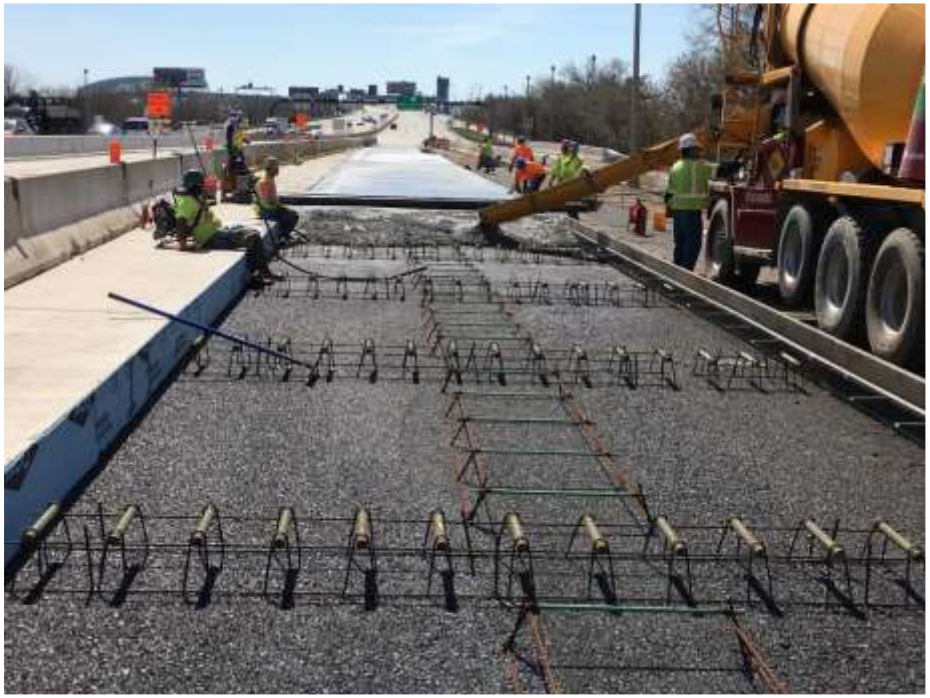
Construction: *Decks*

Construction: *Decks*

Construction: *Fun Facts*

Earthwork:

- 112,500 CY Class 1
  - *140,000 tabbed, able to modify quantity & remove payment of 27,000 CY*
- 26,000 CY Class 3
- 20,000 CY Class 4

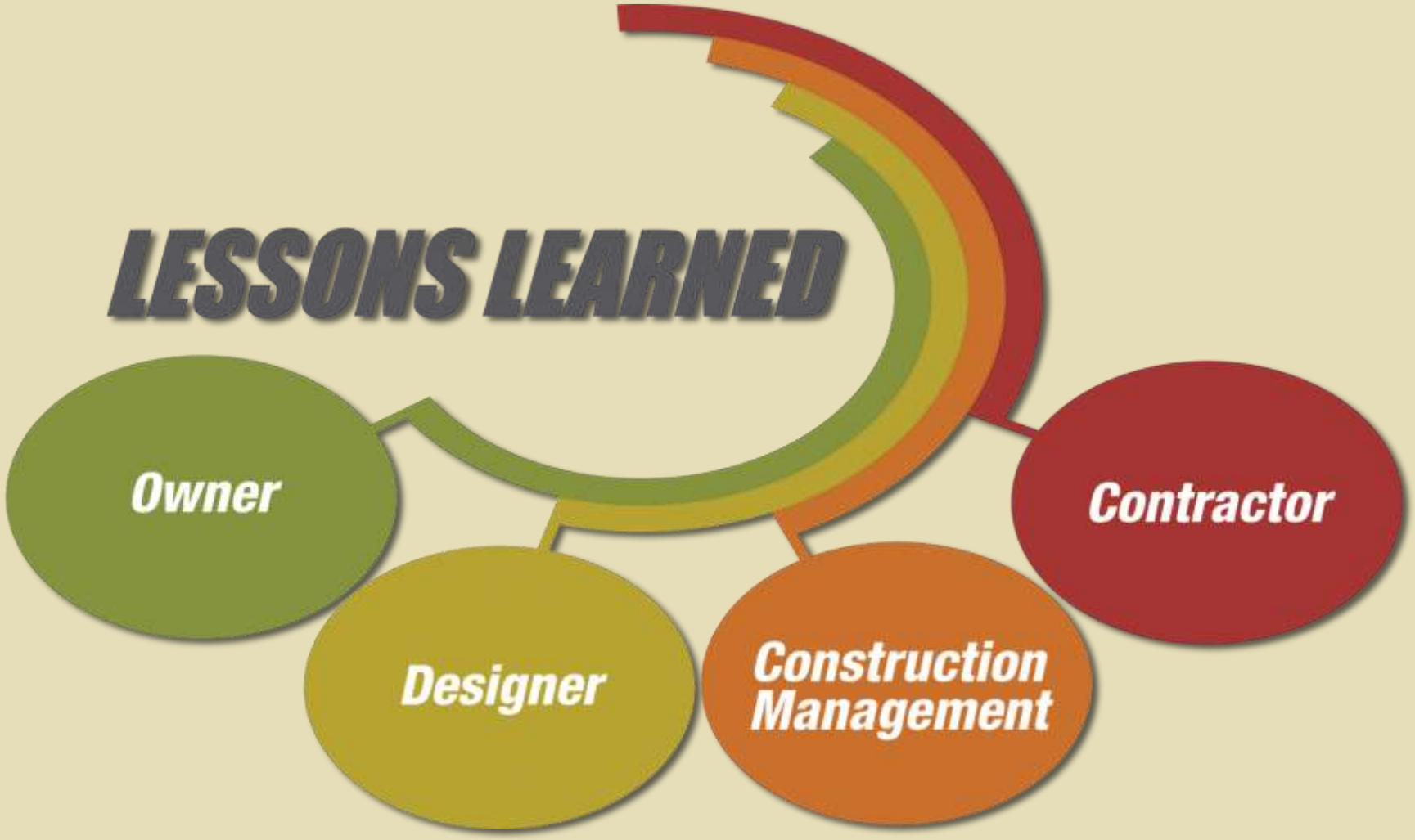


Construction: *Fun Facts*

Soils Disposal:

- Hazardous Soil: 62,000 Tons removed
- Residual Soil:
  - *58,000 Tons Removed*
  - *69,000 Tons Re-Handled on-site*

Lessons Learned



Lessons Learned: *Section BR0*

- Column-supported embankment performance
- Earthwork classification and phasing to maximize reuse
- Soil disposal and waste management specifications
- Reuse of stormwater management BMP in future phases
- Stockpiling of material between construction sections
- Teamwork in construction is key to the project success

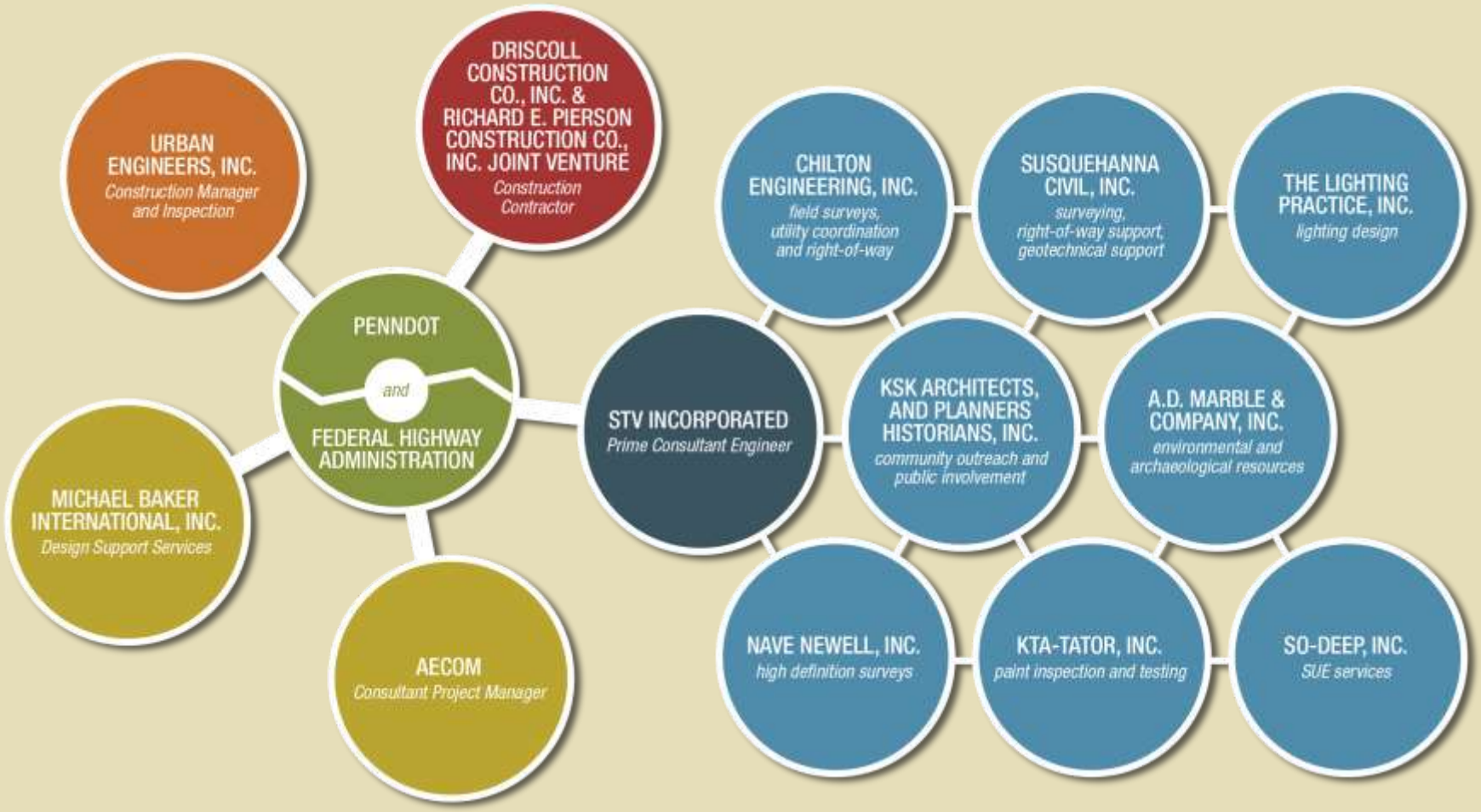
What's Next for BRI?

I-95 Overview: *Betsy Ross Interchange*

For More Information:

- www.95revive.com
- Twitter – @95info

Acknowledgements



THANK YOU!

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