Accelerated Design-Build
Replacement of SEPTA's Crum Creek Viaduct

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Rail Conference

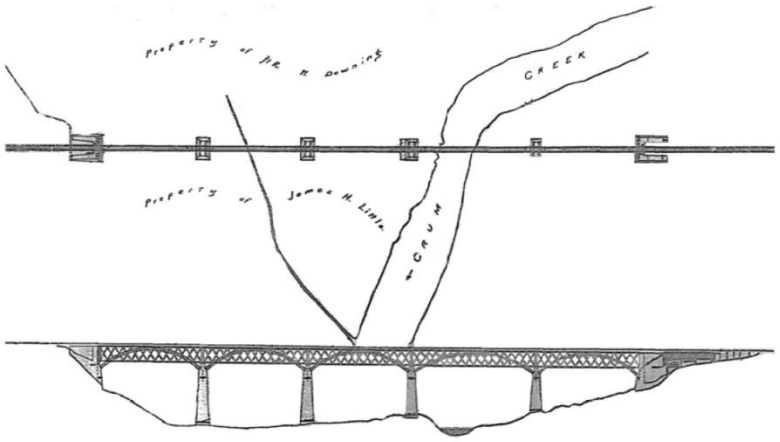
Key Presentation Take-Aways

NEED TO QUICKLY REPLACE BRIDGE TO ENSURE RAIL SERVICE WILL REMAIN SAFE AND RELIABLE INTO THE FUTURE.

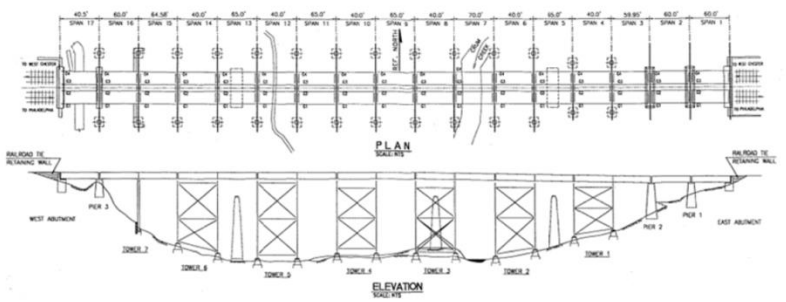
- Accelerated Project Delivery
- Balance Customer Needs versus Construction Efficiencies
- Obtain Long Service Life
- Maintain Safe Operations and Work Force Activities

Crum Creek

Viaduct Replacement Project



1854 Structure



1895 Structure

Completed Crum Creek Viaduct

Accelerated Project Delivery Method

- Design-Build Procurement
- Design to 30% Level
- Use of Stipends for Bidding
- Public Outreach
- Advance Permitting

History

- Original viaduct constructed in 1854
- Steel viaduct constructed in 1895, 17 spans, 915 feet long and 100 feet high.
- SEPTA acquired ownership from Conrail in 1982.
- 25 year life extension project performed in 1983.
- Serves the Media/Elwyn Regional Rail Line.
- Carries more than 320 passenger trains a week.

Wood and stone viaduct - constructed 1854

Steel Viaduct - constructed 1895

Project Schedule

- PA Act 89 passed – November 2013 (Funding for Project)
- Issued Step 1 of Procurement December 2013
- Five teams pre-qualified by SEPTA in August 2014.
- Three design-build bids were received on October 2014.
- Design/Build Contract Awarded December 2014
  - Walsh Construction Company with Figg Engineering
- Construction Began March 2015
- Shutdown Summer Outage: (11 weeks) June 17, 2016 – September 4, 2016.
- Viaduct went into Revenue Service September 5, 2016.
- All Work and Site Restoration Completed November 2016.

Permitting – By SEPTA

NEPA/Historic Review

- SHPO – Pennsylvania Historical and Museum Commission
- Mitigation Efforts – Survey and Document Historic Bridges on Line

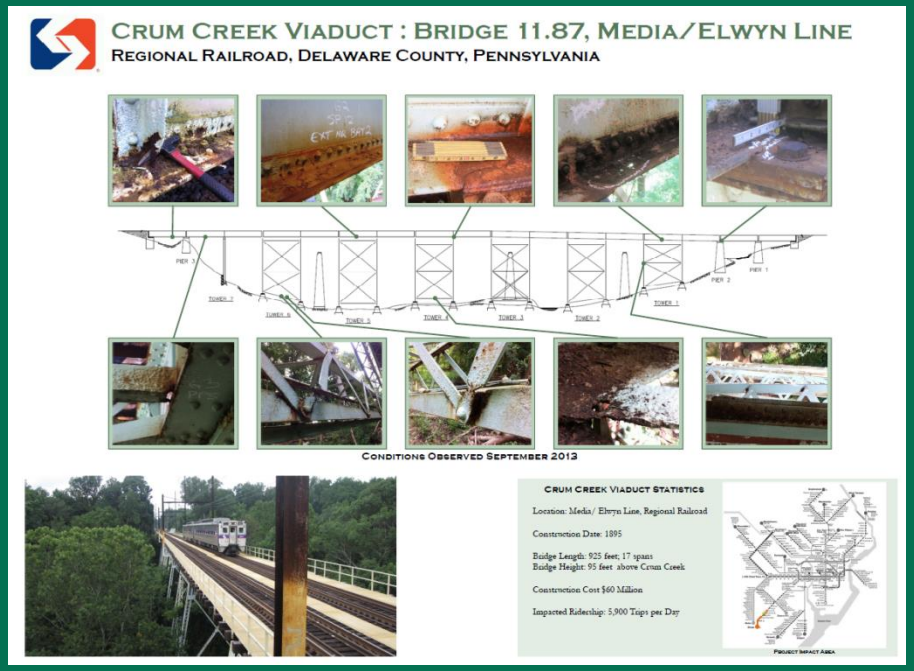
Waterway Permits

- Joint Permit Application (JPA) – from USACOE and PADEP
- Assess impacts to water (streams and wetlands) due to project.
- Pennsylvania Natural Diversity Inventory (PNDI)

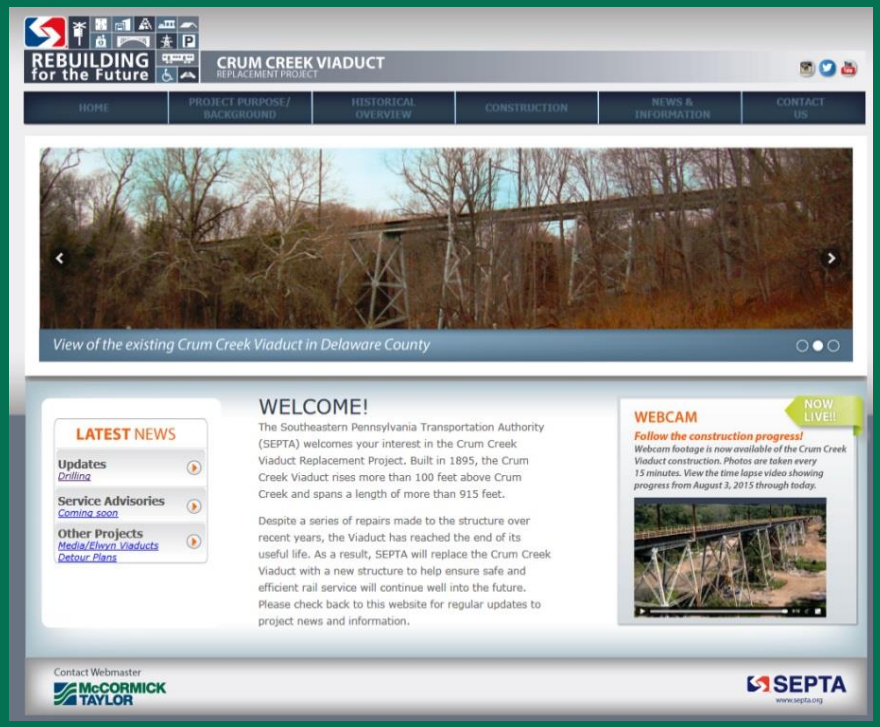
Earth Disturbance Permit (NPDES)

- Erosion and Sediment Control Plan (ESC) for all construction sequence
- Stormwater analysis (pre vs. post) for rate and volume
  - Land cover type effects run-off and DEP has requirements for retaining 2- year run-off on site
  - Erosion and Sediment Control Plan (ESC) for all construction sequence

Public Outreach



- Community Meetings
- Stakeholder Meetings
- Web Site
- Live Web Cams
- Information Posters



Requirements

- Specified Acceptable Structure Type
  - Steel Framing with Concrete Deck
  - 100 Year Design Life
- Must Match Existing Track Alignment
- Designed to minimize effects on the existing structure while it remained in service. (Real-Time Monitoring)
- Must be in service by Labor Day 2016 (September 5, 2016).
- Designed to accommodate a TOTAL track outage time of 11 weeks
  - Summer of 2016
  - 9 weeks "owned: by Contractor for construction *($75k/day penalty*)
  - 2 weeks "owned" by SEPTA for Catenary, Signal Work and Testing

ABC Accelerated Bridge Construction

Real Estate Issues and Site Constraints

- Site on Swarthmore College Grounds and Within Arboretum.
- Limited Access - Site is landlocked by College and I-476.
- Access Road for Construction was integral to design process.
- Nearest public road is Rodgers Lane
- College maintains nature trails and research projects throughout the area.
- Shallow Depth Sewer Line and Petroleum Pipe Lines along Access Route.
- Stream Crossing.

Real Time Structural Monitoring for Existing Bridge During Construction

- Structural Motion and Vibration Sensors were attached at key points to detect excessive structural motion or movement of elements.
- Inclinometers installed in critical slopes.
- Real time reporting to Contractor, Construction Manager and SEPTA Engineering.
- Remotely accessible cameras in addition to web cams.

Final Design

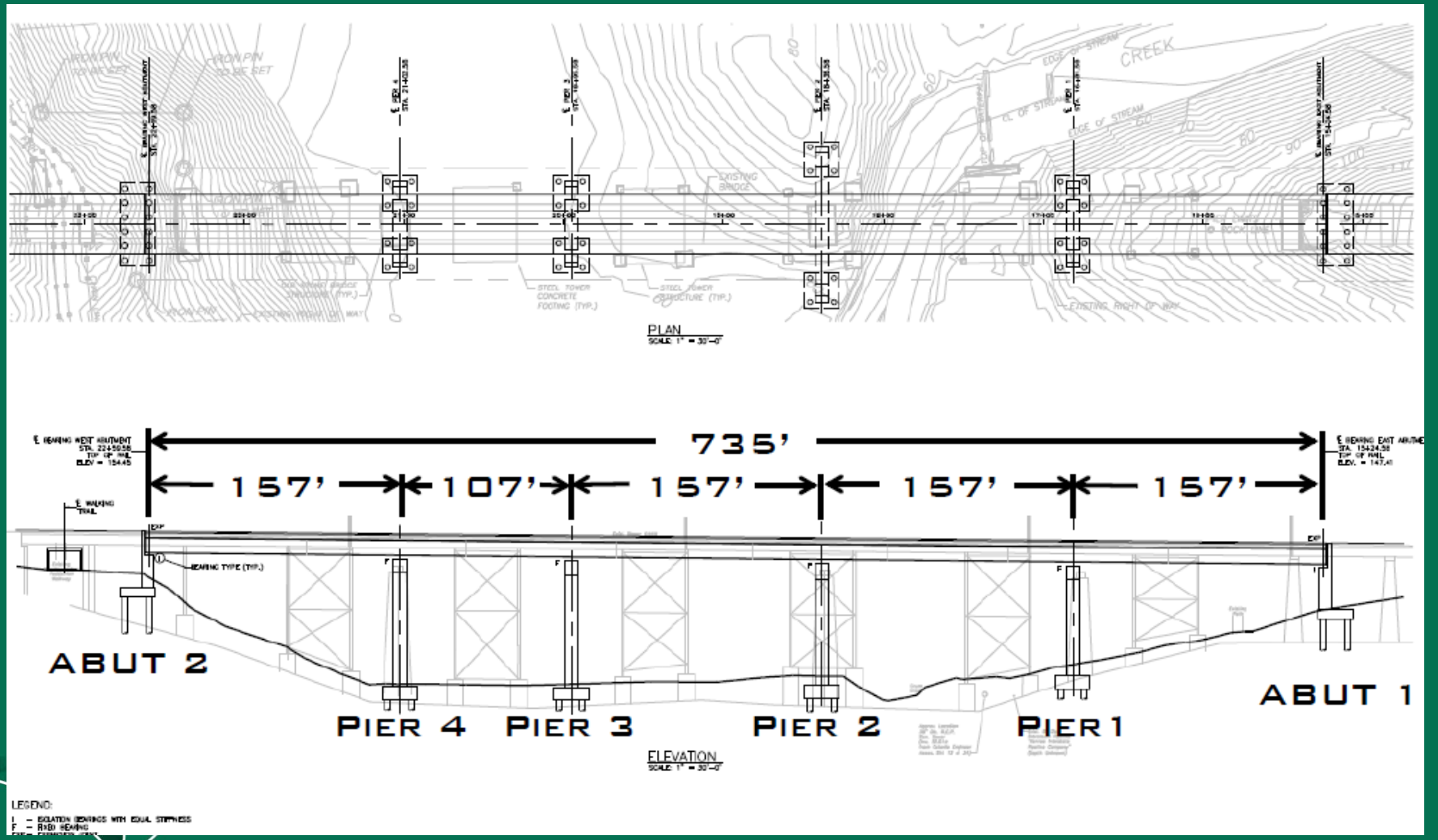
- 5-span continuous, composite, weathering steel girder bridge with four straddle piers each with a post-tensioned concrete pier cap.
- 735 Foot Long Bridge with 157 foot maximum span length.
- Foundations are 42” diameter drilled shafts, four per column.
- Bridge length was reduced by constructing high abutments and placing fill behind post and plank wingwalls at both ends.
- A precast concrete “tunnel” over the Leiper-Smedley trail paralleling I-476.
- Contractor chose straddle piers to allow for larger machinery outside of limits of existing bridge.
- Bearings are fixed “pot” bearings on the piers and seismic isolation bearings at the abutments.

ABC Concept

To accomplish construction in 9 weeks:

- **Build Substructure on each side of existing structure.**
- **Use Straddle Beams between columns, under existing structure.**
- **Erect Temporary Brackets.**
- **Precast Deck Sections.**
- **Erect new girders and deck ahead of outage on temp Brackets.**
- **During 9 week outage, perform lateral slide.**

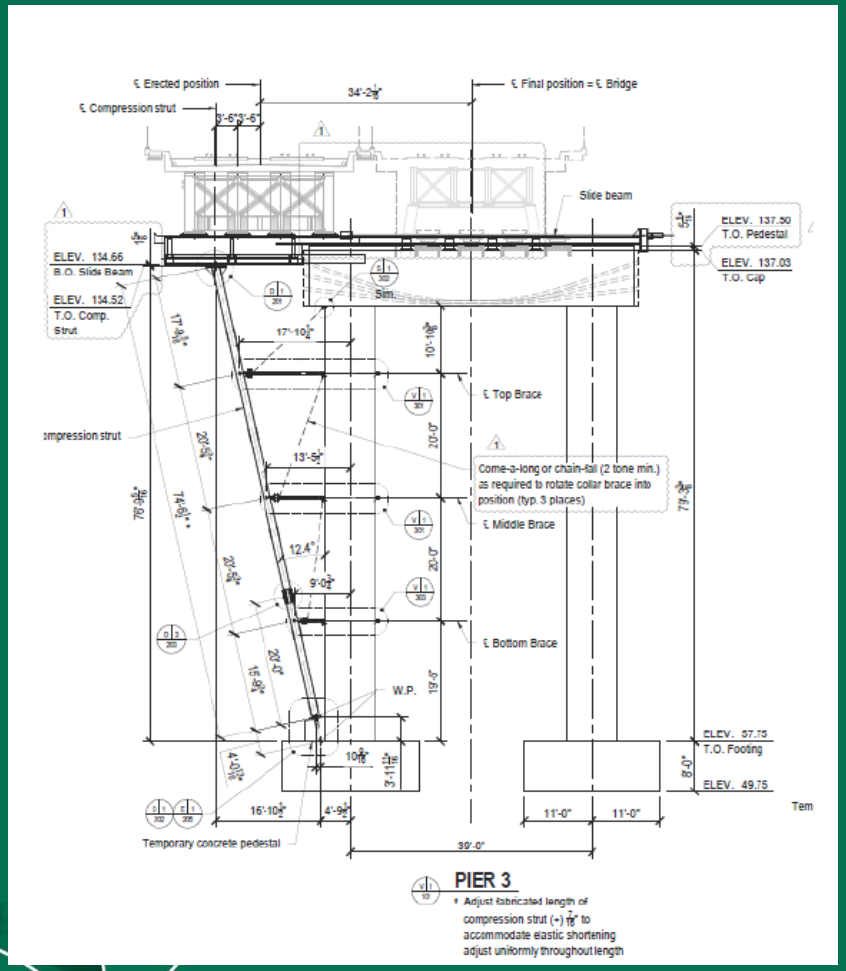
New Bridge Plan Sections



ABC Concept

Construction-Straddle Bents | Crum Creek Viaduct

ABC Concept



Lateral Slide Support System | Crum Creek Viaduct

ABC Concept

Construction – Steel Girders | Crum Creek Viaduct

ABC Concept

Pre-Cast Deck Installation | Crum Creek Viaduct

ABC Concept

Construction – Bridge Slide | Crum Creek Viaduct

Questions and Comments