MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

I-895 BRIDGE PROJECT

PROJECT CHALLENGES AND BEST PRACTICE SOLUTIONS

MARCH 22, 2022

REPLACEMENT OF THE
CANTON VIADUCT
AND
REHABILITATION OF THE
BALTIMORE HARBOR TUNNEL
AND APPROACHES

MDTA Maryland Transportation Authority

WRA

Agenda

- Introduction
- Purpose and Scope
- Project Site Features
- Stakeholders
- Project Highlights
- Concrete Highlights
- Challenges and Best Practice Solutions
- Concluding Remarks
- Questions

Introduction

Construction NTP: April 2018
Substantial Completion: September 2021
Delivery Method: Design Bid Build

MDTA Engineering and Construction

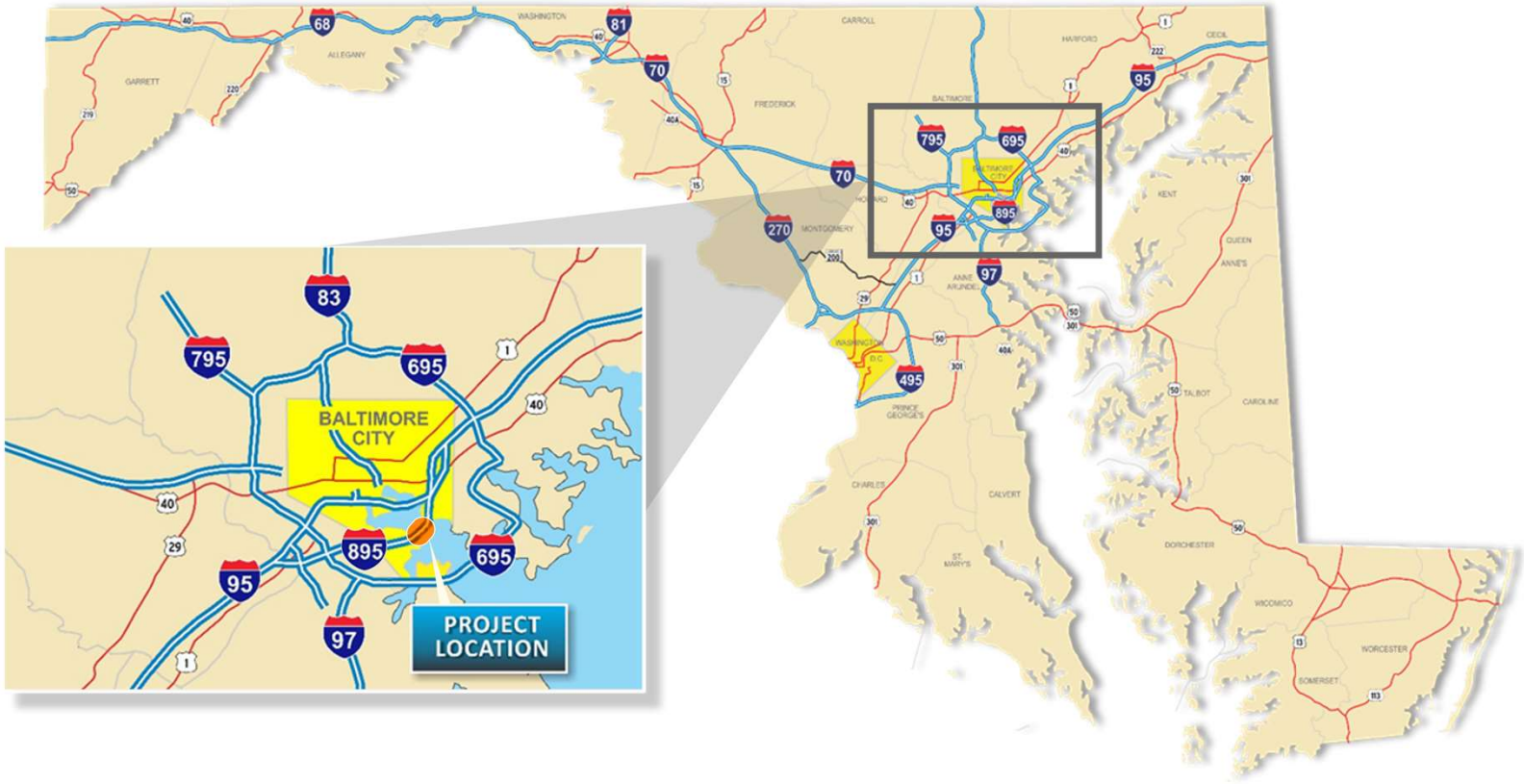
Design Team

- Whitman Requardt & Associates, LLP
  - Project Management
  - Replacement of Canton Viaduct
- The Wilson T. Ballard Co.
  - BHT Overlay and Approach
- Johnson Mirmiran & Thompson, Inc.
  - BHT Fire Suppression and Sump Pumps
- Modjeski and Masters
  - BHT Tile Replacement

Contractor

- Tutor Perini Corporation
- Swank Construction Company, LLC

Project Location



Project Location

- Industrial/Urban Corridor
- I-895 – 2.85 miles
  - 1000 ft. south of tunnel (MM 8.8)
  - Boston Street exit (MM 11.65)

Purpose and Scope

Replace Canton Viaduct

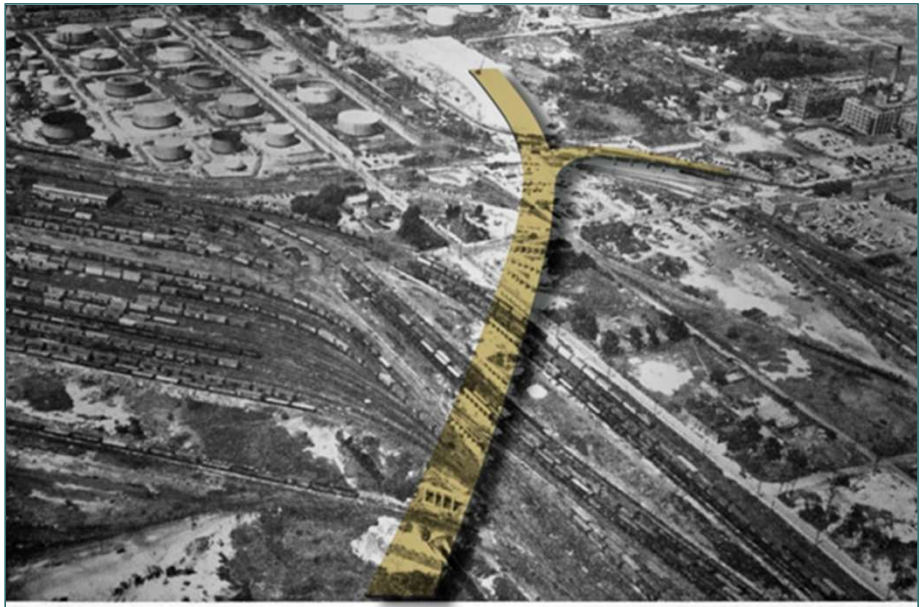
- Constructed 1957 and widened 1985
- Overall poor condition
- MDTA's only structurally deficient bridge

Replace Holabird Avenue Ramp Bridge

- Constructed 1957
- Overall fair condition

Rehabilitate Baltimore Harbor Tunnel

- Constructed 1957 and rehabilitated 1985
- Deck, approaches, and retaining walls
- Interior tile
- Fire suppression standpipes



AERIAL VIEW OF NORTH APPROACH THROUGH CANTON AREA OF BALTIMORE CITY—JUNE 28, 1956

Project Site Features

Canton Viaduct Bridge

- Crosses
  - 23 railroad tracks
  - 3 interstate ramps
  - 3 City streets
- Existing Bridge
  - NB – 28 spans
  - SB – 29 spans
  - 3,300 ft. long
  - 2 abutments and 55 piers
  - Foundations
    - Steel H-piles
    - Concrete filled monotube piles
    - Spread footings

Project Site Features

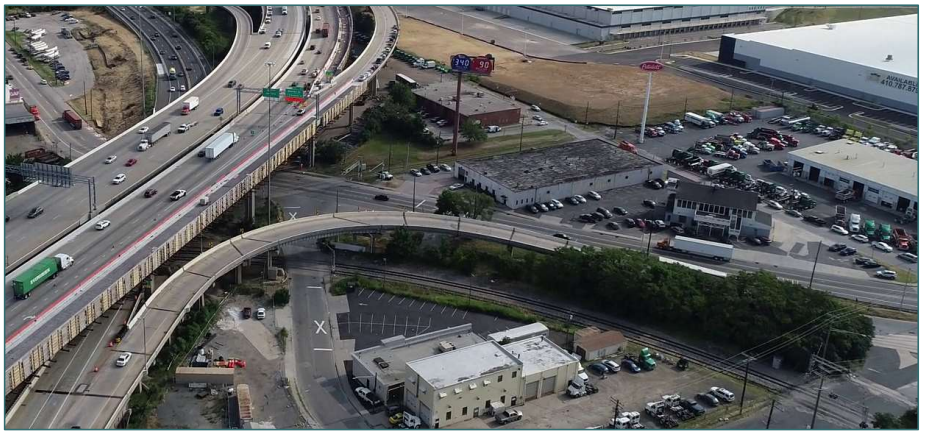
I-95 Overpass (built late 1970s)

- 800 ft. length of I-895
- Vertical clearances under I-95
  - Varies between 14’-7” and 15’-9”
- Vertical clearances under I-895
  - Min. over RR = 22’-4”
  - Min. over Ponca Street = 18’-2”
- I-95 Columns
  - Limited alternative alignments
  - Limited widening of I-895

Project Site Features

Holabird Avenue Ramp Bridge

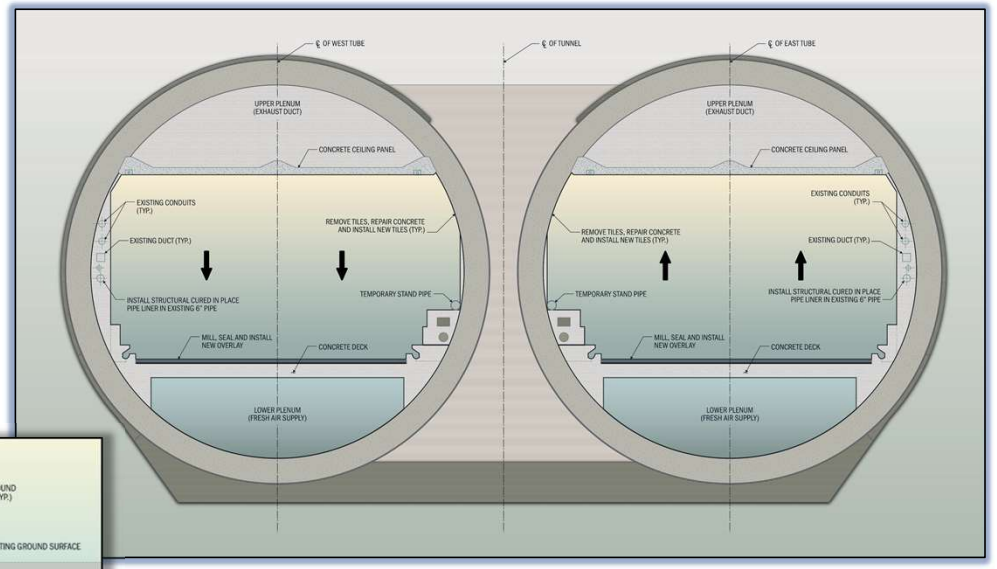
- Crosses
  - 3 railroad tracks
  - 1 City streets
- Existing bridge
  - 11 spans
  - 595 ft. long
  - 1 abutment and 10 piers
  - Foundations
    - Steel H-piles
    - Spread footings
- Retained fill section - 150 ft. long

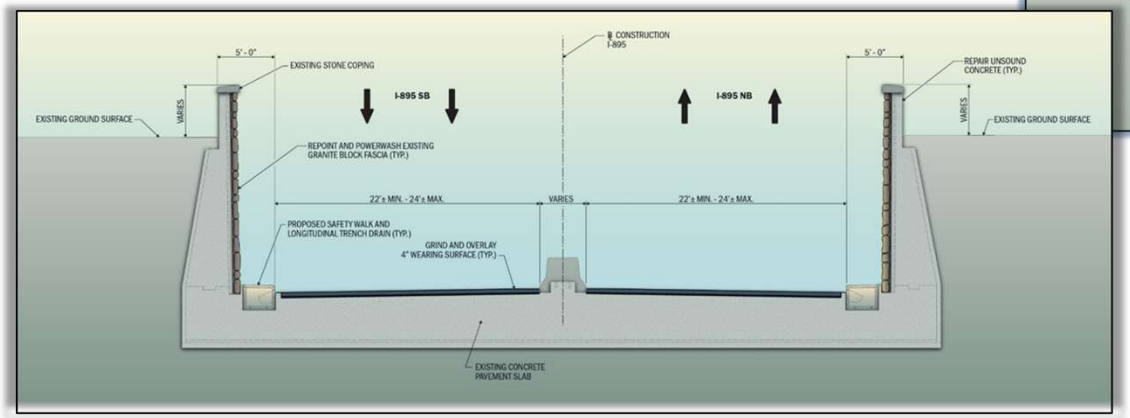


Project Site Features

Baltimore Harbor Tunnel

- 2 tubes
  - Each over 7,600 ft. long
  - 2 – 11 ft. lanes
- 4 retaining walls
  - Total length – over 3,100 ft. long





Project Site Features

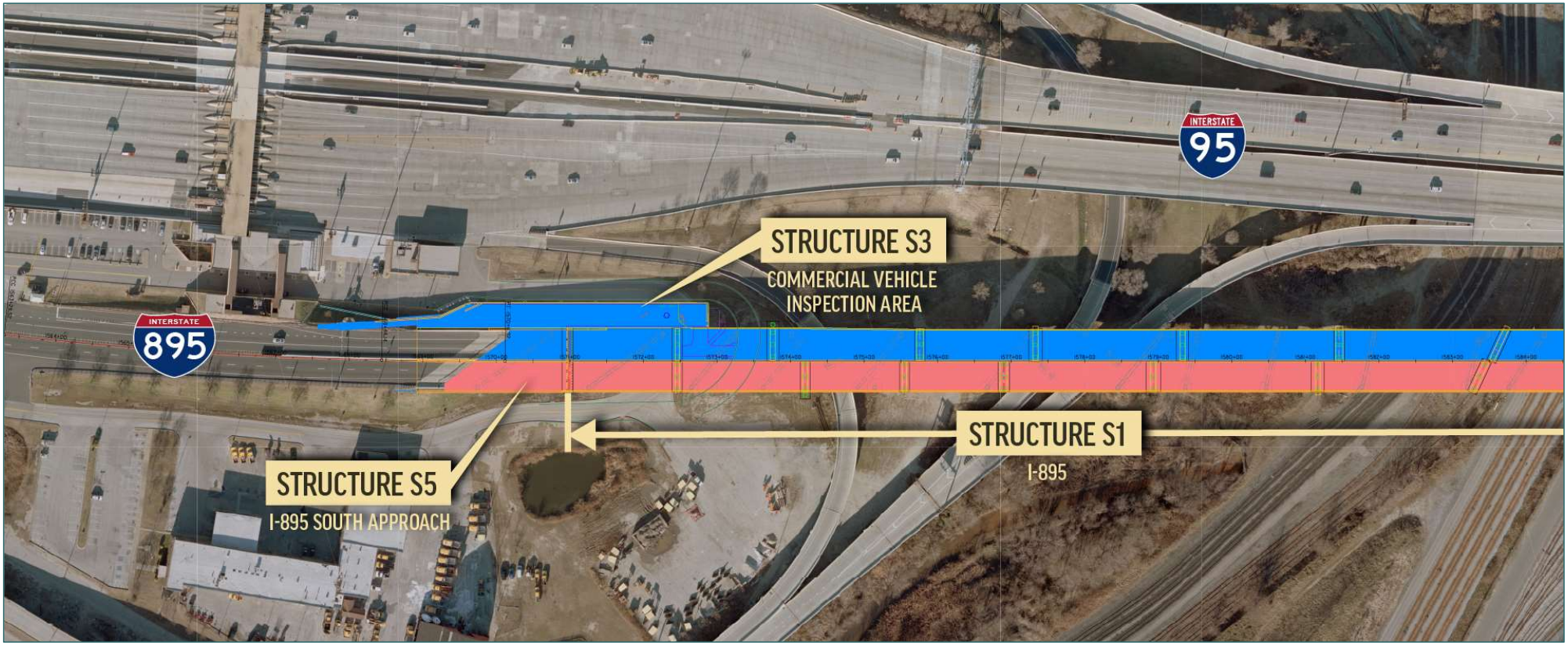
Railroads

- CNX Marine Terminal (CONSOL Energy)
  - 4 inbound tracks
  - 4 outbound tracks
- Norfolk Southern
  - 9 tracks
- CSX Railroad
  - 3 tracks
- Canton Railroad
  - 3 tracks

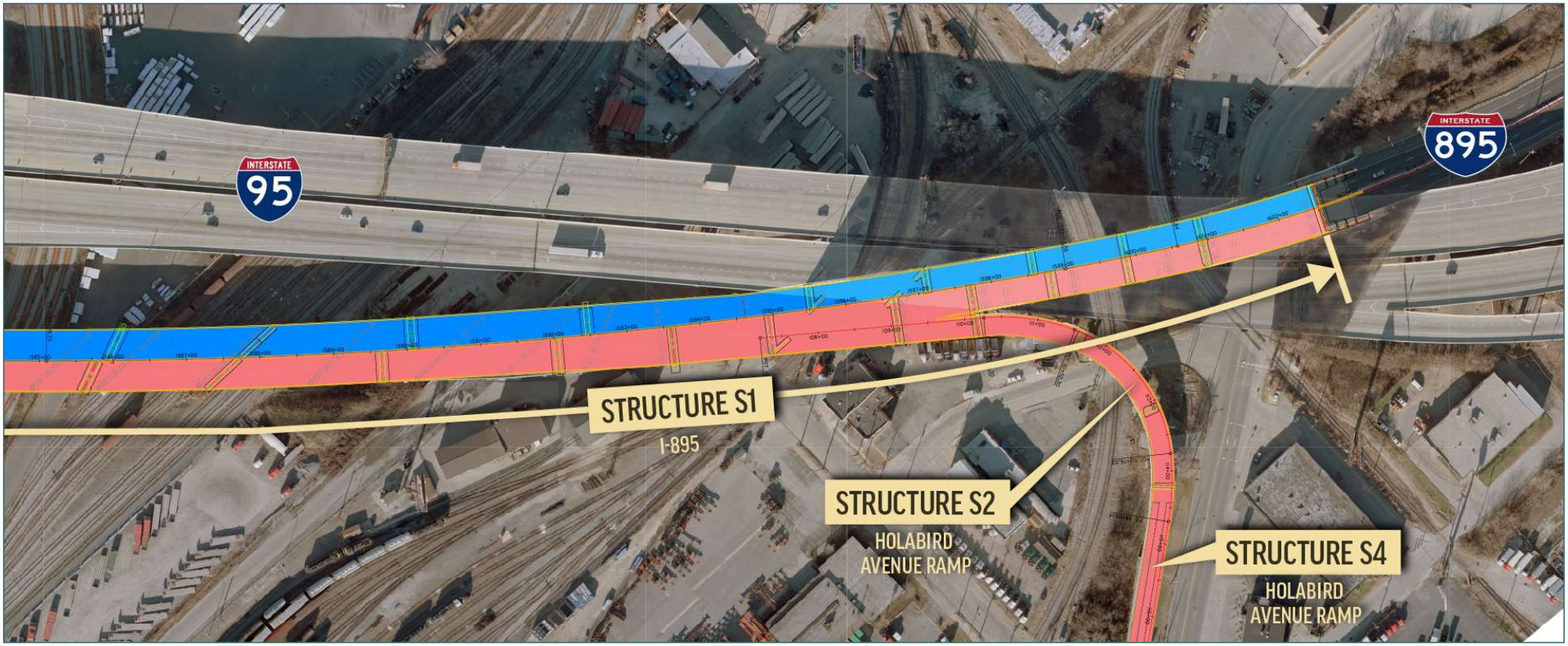
Stakeholders

- MDTA and tollpayers
- Baltimore City
  - DPW - Water, Sewer, Storm Drain
  - DOT – Traffic, Conduits
  - Fire Department
- Railroads
- BGE
  - Gas
  - Electric
- Businesses – direct impact
  - Mid-Atlantic Wholesale Lumber
  - Jim's Diner
  - GAF
- Businesses – served by I-895
  - Amazon, Johns Hopkins Bayview

Project Highlights



Project Highlights



Project Highlights

Structures

- Structure S1 (I-895)
  - 3,155 ft. long
  - 19-span NB and 18-span SB
  - 2 abutments and 35 piers
  - Hybrid steel plate girders
  - Grade 75 stainless steel rebar
  - Lightweight foamed concrete fill
- Structure S2 (Holabird Ave Ramp)
  - 410 ft. long
  - 3-span on 200 ft. radius
  - Steel plate girders
  - Grade 75 stainless steel rebar

Project Highlights

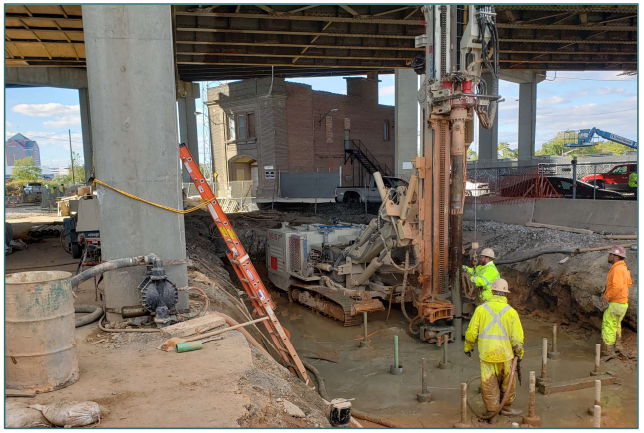
Structures

- Structure S3 (CVIA)
  - 437 ft. long pile supported MSE wall
  - Lightweight foam concrete fill
  - Accommodate future modular building
- Structure S4 (Holabird Ave Ramp)
  - 260 ft. long MSE wall
  - Porous backfill
- Structure S5 (I-895 South Approach)
  - 197 ft. long pile supported MSE wall
  - Lightweight foam concrete fill
  - CIP concrete pavement

Project Highlights

Foundations

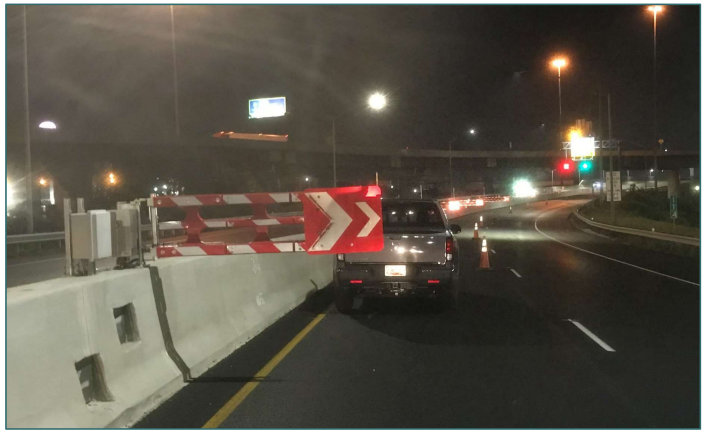
- Structure S1 (I-895)
  - Micropiles (21) and H-piles (16)
  - VECP – 9 piers to H-piles
- Structure S2 (Holabird Ave Ramp)
  - H-piles
- Structure S3 (CVIA)
  - Micropiles and H-piles
- Structure S4 (Holabird Ave Ramp)
  - Leveling pads
- Structure S5 (I-895 South Approach)
  - Micropiles
- HMLs and sign structures
  - Drilled piers



Project Highlights

Safety Enhancements

- Commercial Vehicle Inspection Area
- Increased I-895 bridge width
- ITS improvements
  - Automated lane closure system
  - CCTV
  - Lane use control signals
  - Over height detection system
- Tall wall parapet at I-95 columns
- NB I-895 approach shoulder widening
- Full lighting replacement



Project Highlights

Tunnel and Approaches

- New LMC overlay
  - Approx. 168,000 SF per tube
  - Approx. 70,000 SF on approaches
- New pre-cast concrete trench drains on approaches
- Repoint granite fascia on retaining walls
- New tile - select areas of tunnel wall
  - Over 43,500 SF
- Standpipe rehabilitation
  - Structural cured in place pipe liner

Project Highlights

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

Tunnel and Approaches

Project Highlights

MOT – No Fault Incentives/Liquidated Damages

- Stage 2 through Stage 3 – Single Lane NB and SB I-895
  - Bridge replacement
  - Approach roadway work
- Stage 2C – NB Tunnel Closure
  - NB tunnel LMC overlay
  - NB approach roadway LMC overlay
- Stage 3C – SB Tunnel Closure
  - SB tunnel LMC overlay
  - SB approach roadway LMC overlay

Project Highlights

MOT – No Fault Incentives/Liquidated Damages

Stage	No. of Calendar Days	No Fault Incentive	Liquidated Damages
Stage 2 and 3 I-895 Bridge	800	**Maximum $4,200,000** Prorated $70,000/Day up to 60 calendar days that work is completed before the 800th calendar day	$35,000/Day
Stage 2C NB Tunnel and Approaches	60	**Maximum $100,000** Prorated $12,500/day up to 8 calendar days that work is completed before the 60th calendar day	$12,500/Day
Stage 3C SB Tunnel and Approaches	60	**Maximum $100,000** Prorated $12,500/day up to 8 calendar days that work is completed before the 60th calendar day	$12,500/Day

MRMCA
MARYLAND READY MIX
CONCRETE ASSOCIATION

Concrete Highlights

Concrete Highlights

Structural Concrete

- Mix No. 3
  - Footings, abutment stems, pier crash walls, pier columns, retaining wall copings
- Mix No. 6
  - Abutment backwalls, pier caps, bridge decks, moment slabs
  - Parapets – slip formed
- Suppliers
  - Rowen Concrete, Inc.
  - Schuster Concrete
- Winter concreting
- Surface smoothness test - Structure S1 and S2 concrete deck
  - International Roughness Index (IRI)
- Quantities
  - Mix No. 3: over 10,350 CY
  - Mix No. 6: over 15,450 CY

Concrete Highlights

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

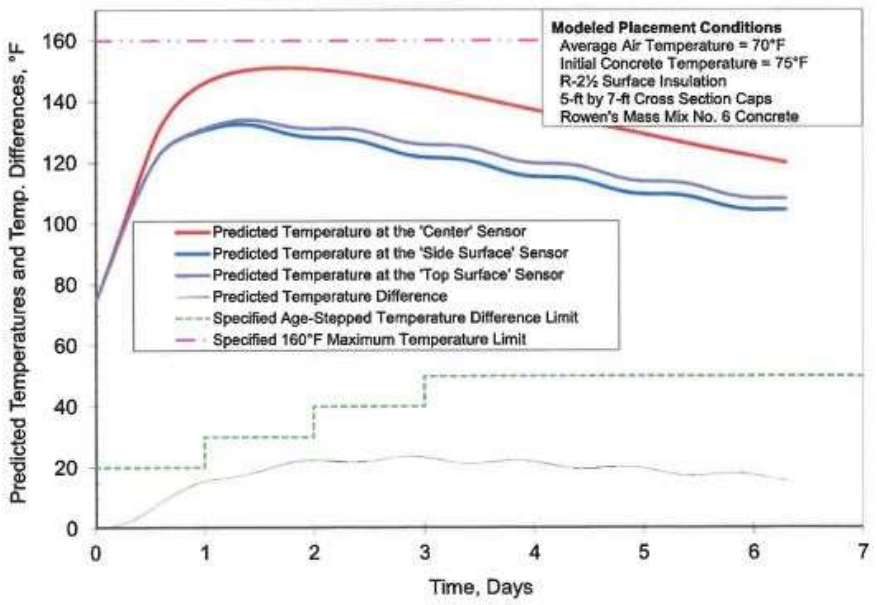
Mix No. 3 and Mix No. 6 Concrete

Concrete Highlights

Mass Concrete Placement

- Applications
  - Footings
  - Pier crash walls, columns, caps
  - Sign structure support columns
- MDOT SHA Approved Mix Designs
  - N3W-N70-53-7, N3W-N30-53-4, N6W-N40-53-4
- Requirements
  - Thermal control plan
  - Max. concrete temperature of 160° F
  - Age-based stepped temperature difference limit
- Controls
  - Thermal modeling included in submittal
  - Insulation on all surfaces
  - Min. 4 temperature sensors
  - Completion of monitoring

Hours after Placement	Maximum Temperature Differential
0 – 24 hours	20°F
24 – 48 hours	30°F
48 – 72 hours	40°F
>72 hours	50°F



Concrete Highlights

Lightweight Foamed Concrete Fill (LFCF)

- Backfill for S1, S3, and S5
- Prequalifications: 5 projects and 12,000 CY in last 5 years
- LFCF Types
  - Type I: 30 pcf and 40 psi
  - Type II: 42 pcf and 120 psi
- Mix design: Aerix Industries
  - Two mix designs per type – with and without flyash
- Approved Installer: Geo-Cell Midwest, LLC
- Installation
  - On-site dry mix method
  - 2 ft. max. lifts; subsequent lifts 12 hr. wait period (max. pour 418 CY)
  - Quality Control
    - Density: Monitor cast density every 30 mins.
    - Compressive Strength: Four 6 in. x 12 in. cylinders per day or each 130 CY material placed
  - Quantities: Type I = 15,225 CY and Type II = 5,700 CY

Concrete Highlights

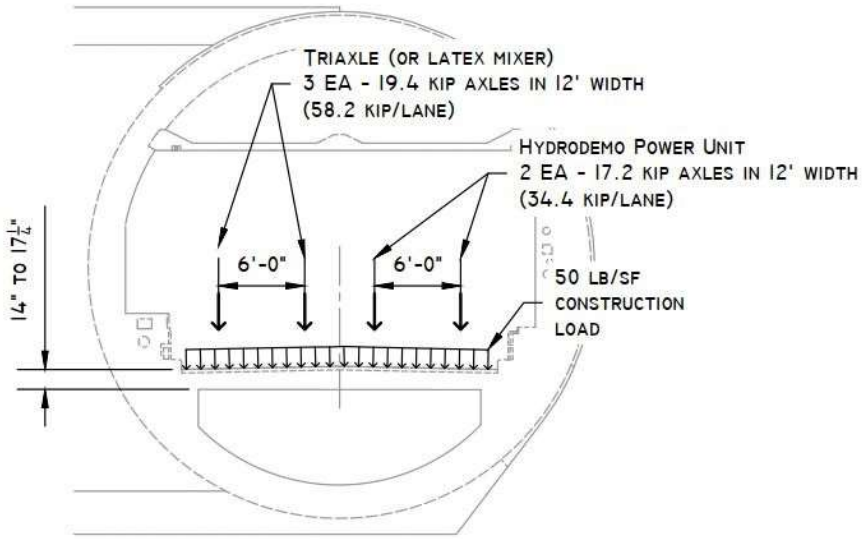
MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

Lightweight Foamed Concrete Fill

Concrete Highlights

Latex Modified Concrete Overlay – Fast Facts

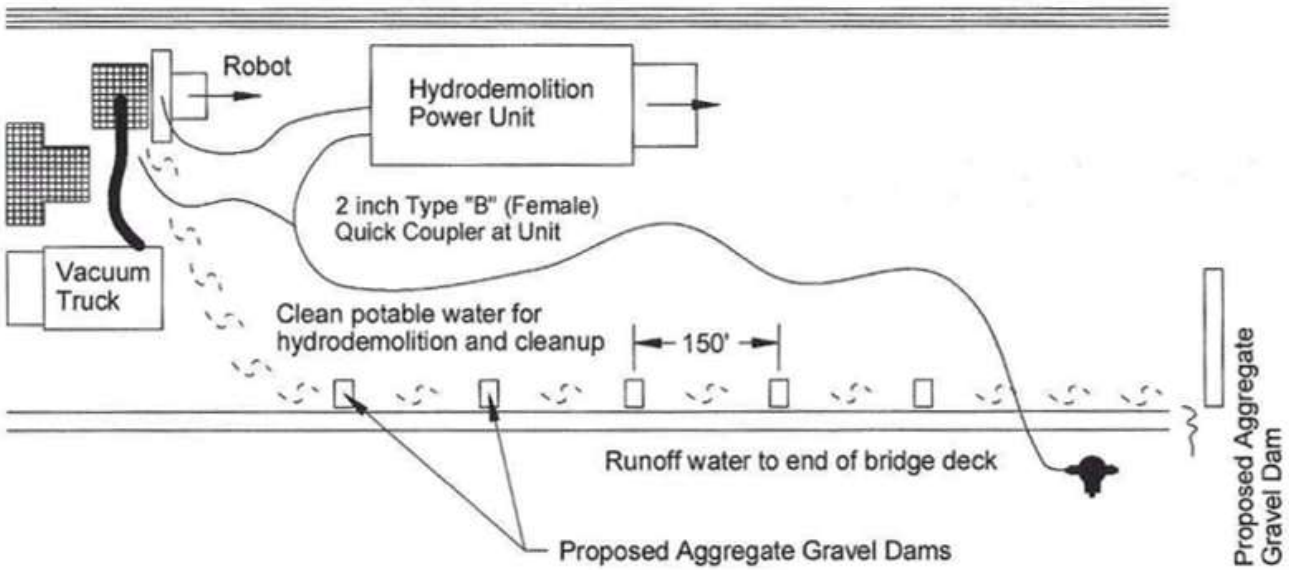
- Tunnel
  - Existing slab 14” to 17 ¼” thick
  - 1 ½” roto milling and ½” hydro-demolition
- Approaches
  - 4 ¼” roto milling and ½” hydro-demolition
  - #4 stainless steel @ 12” each way
- Phased demo and construction
- Construction loading
- LMC overlay (mixed on-site)
  - Material: MDOT SHA Section 902.13
  - Cure: 2 day wet, 3 day air
- Smoothness test of LMC overlay



CONSTRUCTION LOADING
SCALE: 3/32"" = 1'-0"

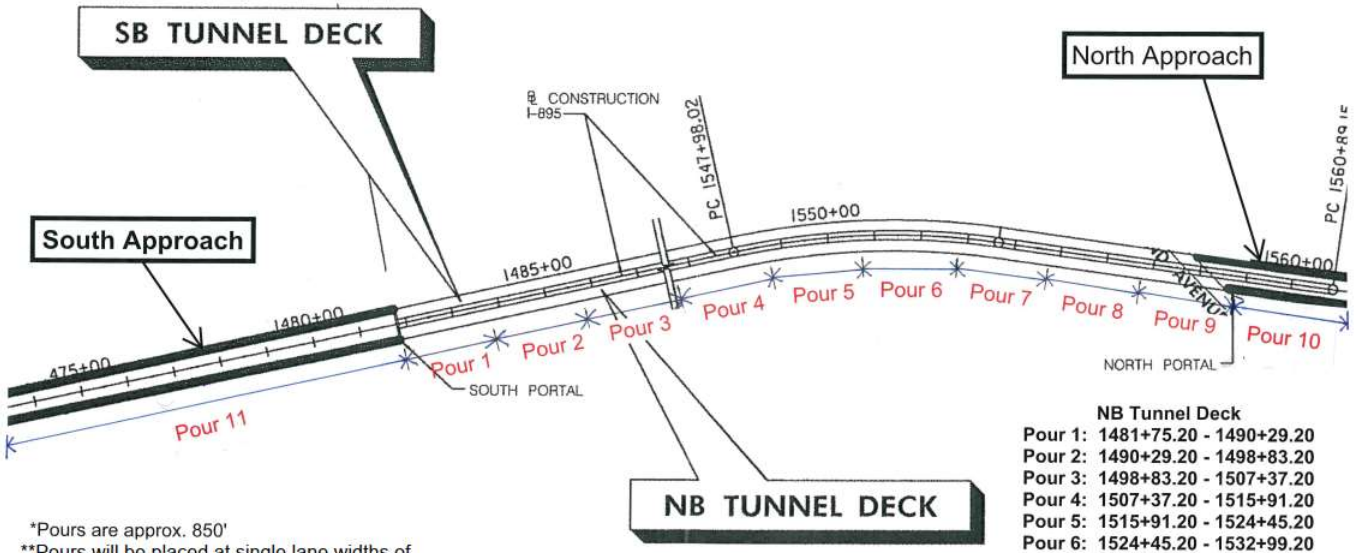
Concrete Highlights

Latex Modified Concrete Overlay – Containment System



Concrete Highlights

Latex Modified Concrete Overlay – Pour Plan

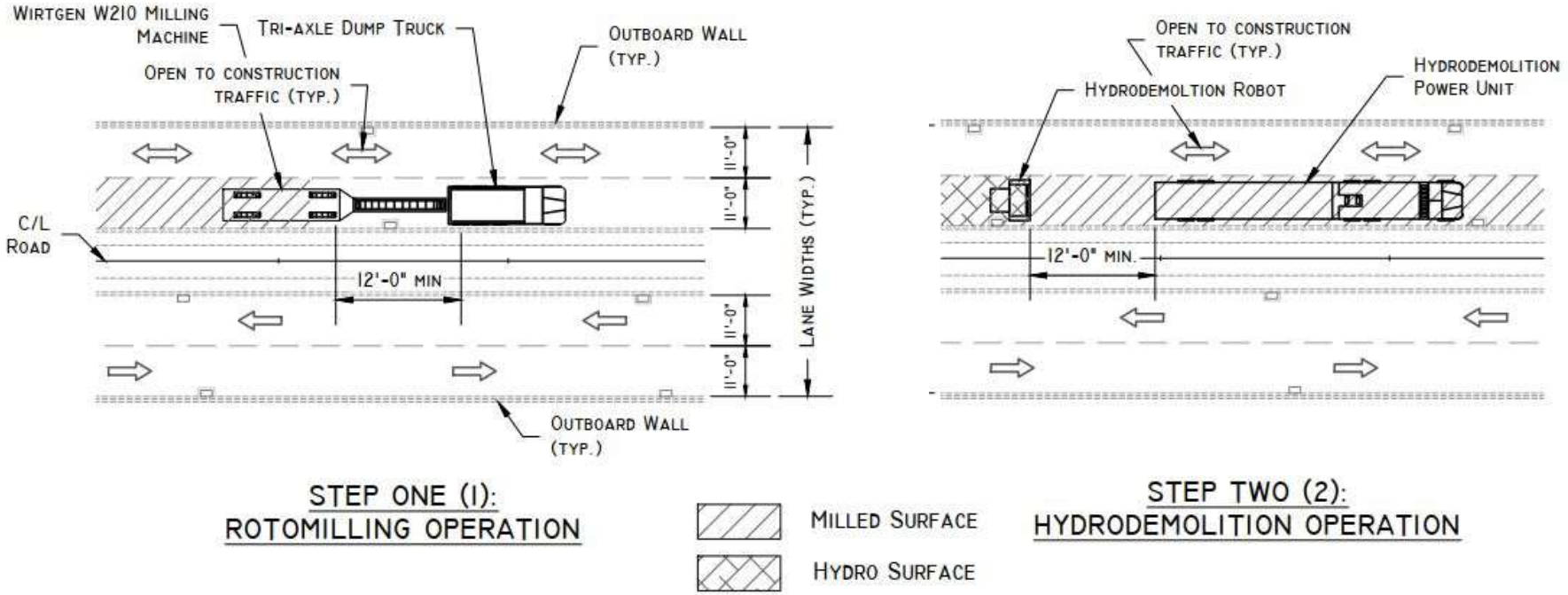


*Pours are approx. 850'
**Pours will be placed at single lane widths of 11ft. Refer to Loading Plan to show operations taking place in single lane widths

NB Tunnel Deck
Pour 1: 1481+75.20 - 1490+29.20
Pour 2: 1490+29.20 - 1498+83.20
Pour 3: 1498+83.20 - 1507+37.20
Pour 4: 1507+37.20 - 1515+91.20
Pour 5: 1515+91.20 - 1524+45.20
Pour 6: 1524+45.20 - 1532+99.20
Pour 7: 1532+99.20 - 1541+53.20
Pour 8: 1541+53.20 - 1550+07.20
Pour 9: 1550+07.20 - 1558+61.45
Northeast Approach (RW4)
Pour 10: 1558+61.45 - 1562+71.33
Southeast Approach (RW2)
Pour 11: 1470+61.33 - 1481+75.20

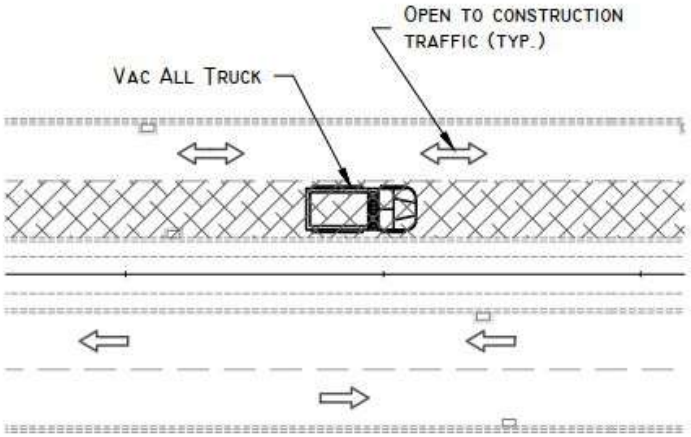
Concrete Highlights

Latex Modified Concrete Overlay – Procedure

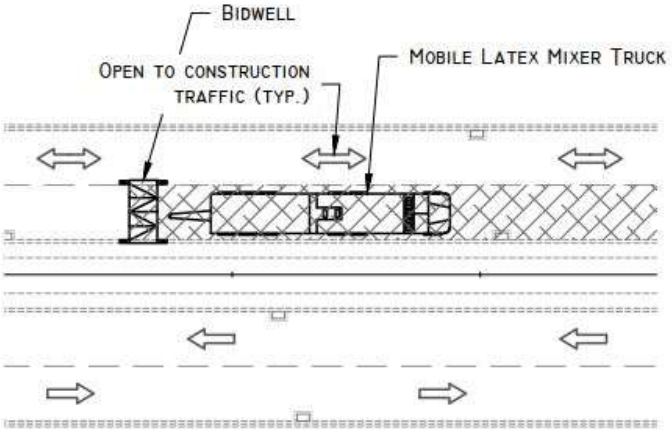


Concrete Highlights

Latex Modified Concrete Overlay – Procedure



STEP THREE (3):
VACUUM OPERATION



STEP FOUR (4):
LATEX PLACEMENT

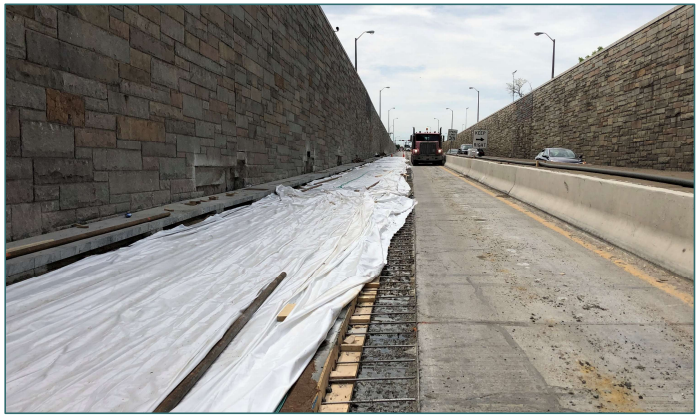
MILLED SURFACE

HYDRO SURFACE

Concrete Highlights

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

Latex Modified Concrete Overlay



Concrete Highlights

Concrete Pavement

- Mix No. 7 (2,400 SY)
  - 10” PCC over 6” GAB
  - Structures S1 and S5
  - Longitudinal and transverse joints
- Mix No. 6 (585 CY)
  - 15” to 27” thick over 6” min. GAB
  - Structure S3 (CVIA)

Concrete Highlights

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

Precast Concrete

- Trench drains (Over 3,000 LF)
  - 2 ft. high x 3 ft. wide x up to 11 ft long
  - Grout inject annular space
- Underground SW detention
  - 5 ft. high x 8 ft. wide x 200 LF
- R/F concrete pipe (over 2,900 LF)
  - 15” to 54” dia. Class IV or V
- Inlets and manholes
  - 48” to 96” dia. manholes

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

Challenges and Best Practice Solutions

I-895 BRIDGE PROJECT

REPLACEMENT OF THE **CANTON VIADUCT** AND
REHABILITATION OF THE **BALTIMORE HARBOR TUNNEL** AND APPROACHES

MDTA Maryland Transportation Authority

WRA

Challenges and Solutions

10 Challenge: Conflict with Existing Utilities

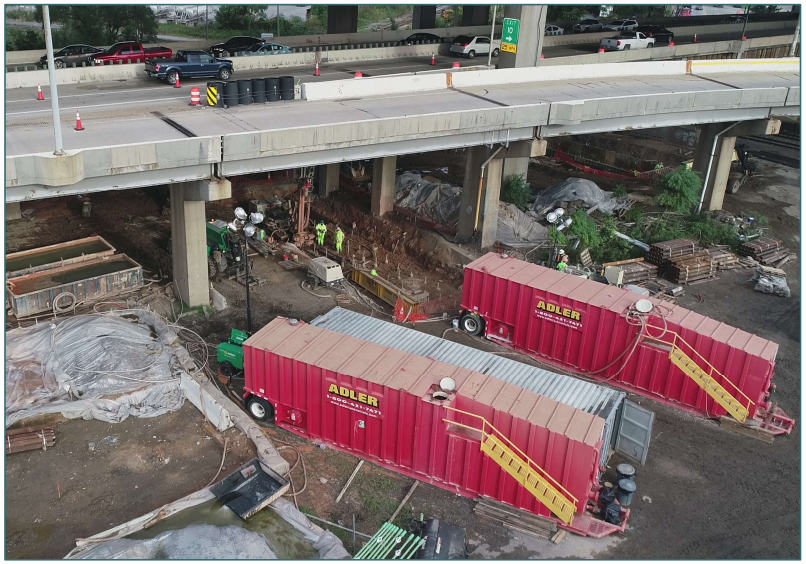
Challenges	Solutions
• Baltimore City Electric conduit duct bank containing BGE Electric at Pier 13N	• Advanced utility relocation contract (HT-3009) to relocate duct bank
• MDTA fiber optic supported on existing southbound bridge	• Dictated sequence of construction - replace the NB bridge first to install needed infrastructure so only 1 relocation was required
• Baltimore City 36” water main with lead joints (1929) at Pier 13N	• Reduced the footprint of Pier 13N; used micropiles to minimize vibrations, and used integral steel pier cap
• BGE gas regulator station at Pier 11S and Holabird Avenue Retaining Wall	• Coordinated with BGE early in design; used micropiles to minimize vibrations; reduced footprint of Pier 11S and used tapered column width
• Baltimore City 16” water main at Pier 17 N	• Relocated 620 LF of 16” water main relocation with jack and bore under CSX tracks
• BGE Electric – overhead power at Pier 8N and Pier 8S	• Advanced coordination and relocation during the design phase of the project

Challenges and Solutions

9 Challenge: Potential for Contaminated Soil and Water

Solution:

- Extensive subsurface investigation program
  - High concentrations
    - Diesel range organics
    - Gasoline range organics
    - Volatile and semi-volatile organic compounds
- Specifications for contaminated ground water and soils.
- Subsurface Investigation Data Report - Appendix to IFB
- Material and Groundwater Management Plans

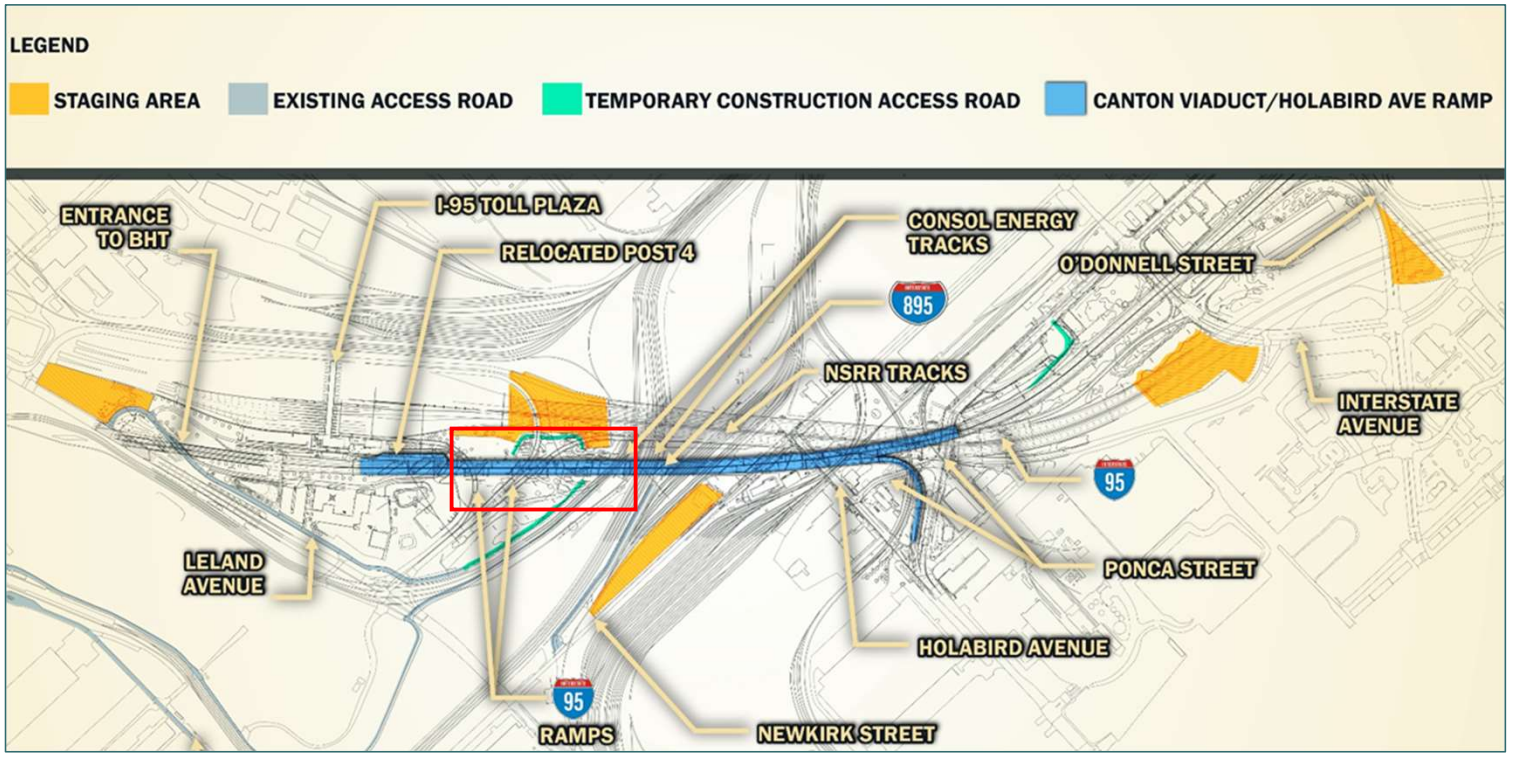


Challenges and Solutions

8 Challenge: Construction Staging and Access

Solution:

- 3 TCARs
  - MDTA property
  - CNX Marine Terminal
  - GAF property
- Existing roads
  - MDTA property
  - Lumber Yard
  - CNX Marine Terminal
- Staging areas
  - MDTA property
  - Norfolk Southern



Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

8 **Challenge:** Construction Staging and Access

Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

7 **Challenge:** Varying Soil Conditions Along Length of Project

Solution:

- Extensive subsurface investigation program
  - Over 100 structural borings
- Geotechnical Data Report – Appendix to IFB
- Pre-construction load test program for micropiles
  - 5 tests conducted
  - Axial compression and lateral load tests

Challenges and Solutions

6 Challenge: Geometric Constraints

- Tunnel portal at the south
- I-95 overpass and columns to the north
- Vertical clearance under I-95 overpass and over CSX and Canton RR
- Adjust superelevation of I-895

Solution: Replace On-Alignment

- Alternative alignment evaluation
- Coordination with CSX and Canton RR to match existing clearances (< 23'-0")
- South end - longer spans to reduce piers
  - Raised profile of I-895 up to 2'-3"
- North end – thread I-895 through opening
  - Balance pier locations and girder depths

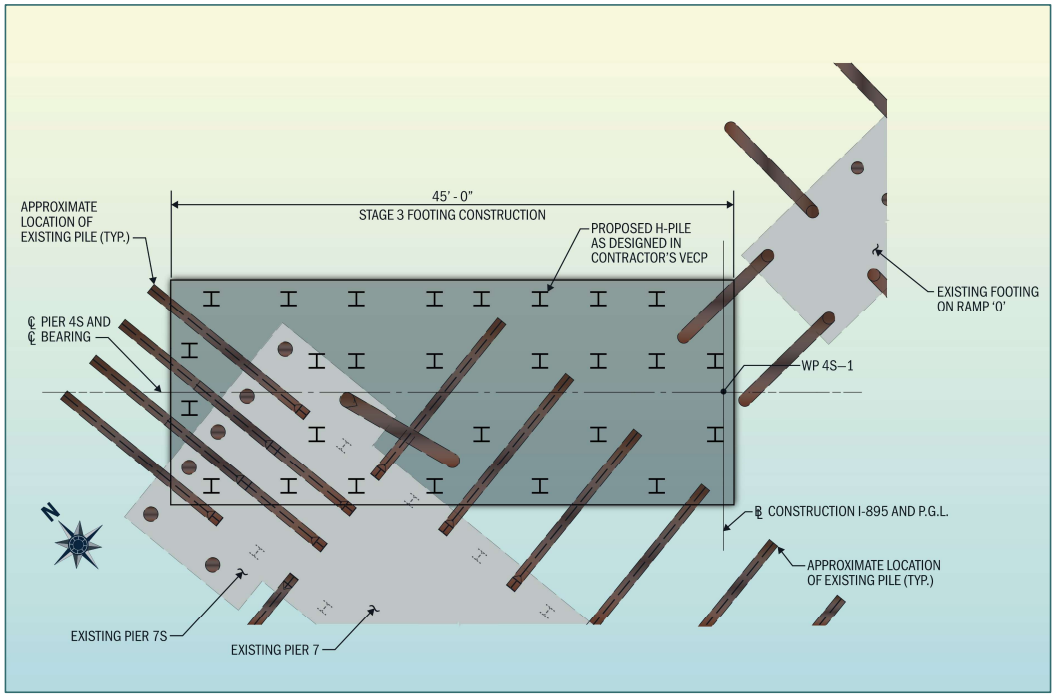
Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

5 Challenge: Conflicts between existing and proposed foundations

Solution:

- Increased span lengths to reduce new piers
- 15 new piers conflict with existing piers
- Altered footprints and elevations
- Test pits by Contractor to locate battered piles
- Non-uniform layout of the piles



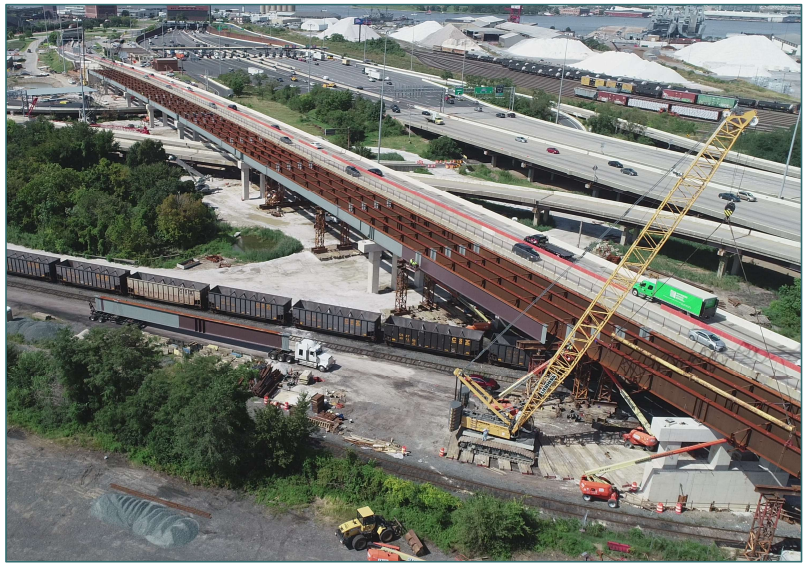
Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

4 Challenge: Construction activity over or adjacent to 23 railroad tracks

Solution:

- Early and often coordination during design
  - Scope of work
  - Schedule
  - Streamlined milestone reviews
- Variance Request Approvals
  - NSRR – girder splice locations
  - NSRR – support of excavation
  - CSX – permanent clearance < 23’-0”
- Special Provisions
  - Maintenance of Railroad Traffic
  - Contractor Railroad Liaison
- Agreements – develop as design progresses



Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

3 **Challenge:** Constructability and Schedule

Solution:

- Girder erection
  - Met with steel fabricators
  - Developed girder erection plan/report
- Conduct constructability workshop
  - MDTA, WRA, industry experts
  - Review of 60% plans, Access, ABC Techniques, CPM Schedule
- Pre-construction micropile load test program
- Develop CPM Schedule during design

Challenges and Solutions

2 Challenge: Maintenance of Traffic

Solution:

- Traffic Management System
  - Contractor installed/maintained
  - Real-time congestion warning and travel times
  - Equipment – 6 portable sensors and 13 PVMSs
  - Remote data collection and automated processing
    - Speed thresholds, volumes and lane occupancy
  - User notifications via text and email with MDTA overrides
- Incident Management Plan
  - Developed for I-895 in single lane (Stage 2 and 3)
  - Collaborative effort between WRA, MDTA, First Responders
  - Includes: Staging, access, police/VRT, emergency response routing, queue relief strategies, CCTV locations

Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

1 **Challenge:** Staging Bridge Replacement and Minimizing Traffic Impact

Solution:

- Evaluated 1-stage, 2-stage and 4-stage
- Performed traffic analyses
  - I-895, I-95, I-695
  - Baltimore Regional Travel Demand Model - diversion percentages
  - VISSIM model – impacts to I-895 and I-95
  - Highway Capacity Manual – impacts to I-695
  - RITIS Speed/Travel Time Reports - calibration

Challenges and Solutions

1 Challenge: Staging Bridge Replacement and Minimizing Traffic Impact

Queue Length and Average Travel Times for the 3 alternatives considered for staging

		I-895 (BHT)		I-95 (FMT)	
Alternative		**Avg. Queue Length *(Miles)***	**Avg. Travel Time *(Minutes)***	**Avg. Queue Length *(Miles)***	**Avg. Travel Time** (Minutes)
Current	**PM NB**	0.05	14.7	0.05	15.1
	AM SB	0.05	9.7	0.15	7.8
One-Stage	**PM NB**	N/A	N/A	4.10	37.0 **21.9 minute DELAY**
	AM SB	N/A	N/A	4.50	21.1 **13.3 minute DELAY**
Two-Stage	**PM NB**	0.60	23.5 **8.8 minute DELAY**	2.20	29.8 **14.7 minute DELAY**
	AM SB	1.30	27.7 **18.0 minute DELAY**	2.40	14.2 **6.4 minute DELAY**
Four-Stage	**PM NB**	Similar to Current	18.5 **3.8 minute DELAY**	Similar to Current	Similar to Current
	AM SB	Similar to Current	Similar to Current	Similar to Current	Similar to Current

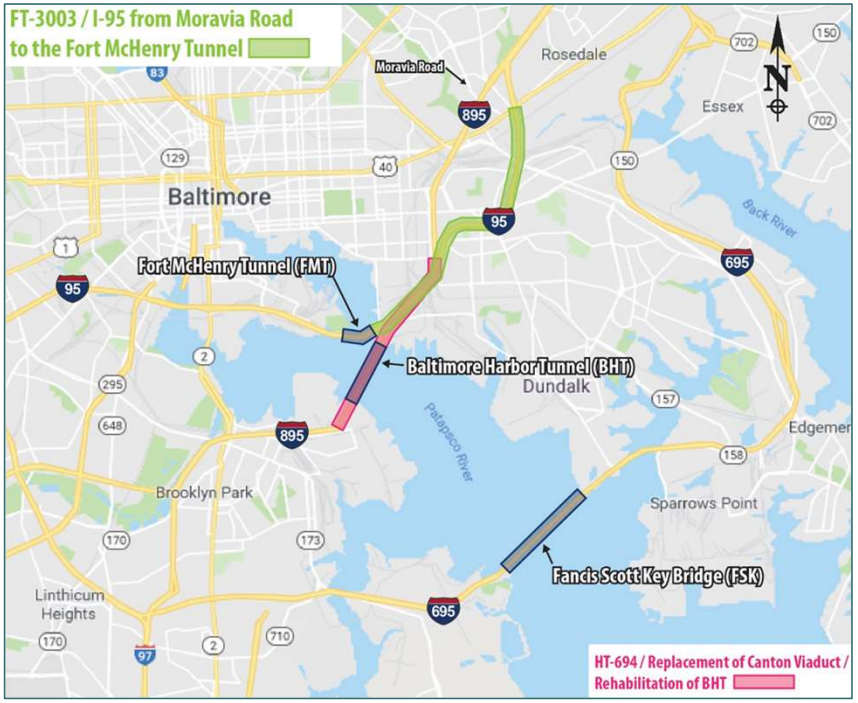
Challenges and Solutions

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

1 Challenge: Staging Bridge Replacement and Minimizing Traffic Impact

Solution (continued):

- Traffic impact mitigation
  - FT-3003 – Reconfigure I-95 to 4 lanes each direction (complete prior to I-895 Bridge Project)
  - Avoid major projects on alternate routes
- Employed practical design solutions
  - 2-Stage I-895 Project + FT-3003 ≈ 4-Stage I-895 Project



Challenges and Solutions

1 Challenge: Staging Bridge Replacement and Minimizing Traffic Impact

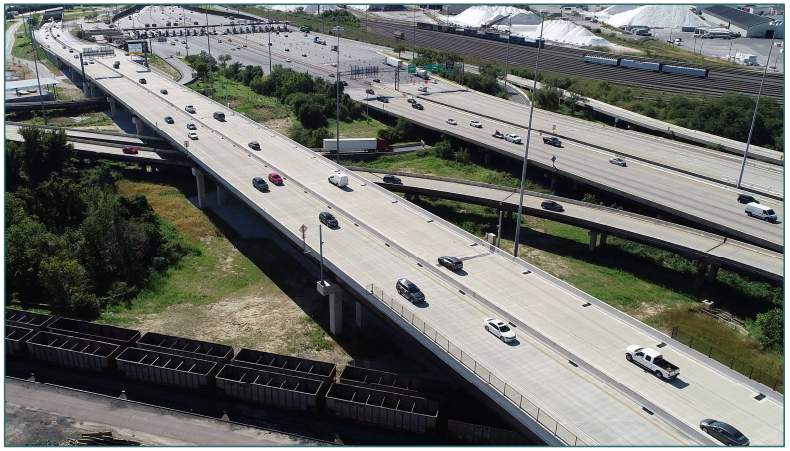
Queue Length and Average Travel Times for the Two-Stage Alternative with and without I-95 Traffic Mitigation (FT-3003)

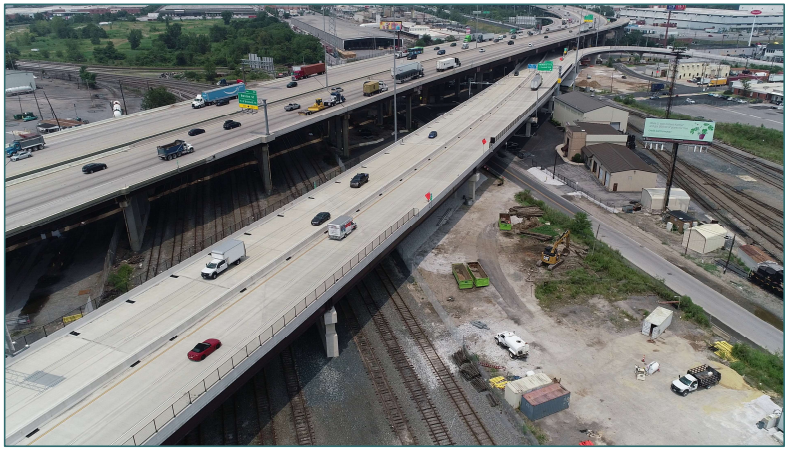
Alternative		I-895 (BHT)		I-95 (FMT)	
		Avg. Queue Length *(Miles)*	Avg. Travel Time *(Minutes)*	Avg. Queue Length *(Miles)*	Avg. Travel Time *(Minutes)*
Current	PM NB	0.05	14.7	0.05	15.1
	AM SB	0.05	9.7	0.15	7.8
Two-Stage (No I-95 Traffic Mitigation)	PM NB	0.60	23.5 **8.8 minute DELAY**	2.20	29.8 **14.7 minute DELAY**
	AM SB	1.30	27.7 **18.0 minute DELAY**	2.40	14.2 **6.4 minute DELAY**
Two-Stage AND I-95 Traffic Mitigation (FT-3003)	PM NB	0.60	23.5 **8.8 minute DELAY**	0.62	18.8 **3.7 minute DELAY**
	AM SB	1.30	27.7 **18.0 minute DELAY**	1.64	13.6 **5.8 minute DELAY**

Concluding Remarks

Project Success

- Design
  - Dedicated resources
  - Tackled challenges head on
  - Milestones – submittals and permitting
  - Railroad agreements and approvals
  - Utility coordination
- Construction
  - Dedicated resources
  - Partnering meetings
  - Dedicated resources for timely reviews
    - Over 650 working drawings
    - Over 360 RFIs





Concluding Remarks

Project Success

- Construction cost
  - Original – $189,380,000.00
  - Final - $188,650,160.43
- Duration
  - Bridge replacement
    - Completed in 740 calendar days
    - Full $4.2M incentive
  - Tunnel and approach LMC overlay
    - Completed in 52 calendar days
    - Full $100,000 incentive
- Achieved Goal: Quality product while minimizing traffic impacts

Special Thanks to the Project Team:

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION

Maryland Transportation Authority
MDTA

RK&K
Program Management & Peer Review Services

AECOM
Peer Review Services

WRA
Project Management and Lead Designer

AB Consultants, Inc.
CEM
JMT Johnson, Mirmiran & Thompson
Modjeski and Masters Experience great bridges.
Navarro & Wright Consulting Engineers, Inc.
rjm
ALA
E2CR, Inc.
JEC
Mercado Consultants, Inc.
PRIME AE
T3 design
Constellation Design Group, Inc.
FTG
Mahan Rykiel Associates Inc
MIN ENGINEERING, INC. Consulting Engineers
REMLINE
WB The Wilson T. Ballard Co.

Questions?

MRMCA
MARYLAND READY MIX CONCRETE ASSOCIATION






I-895 Bridge Project - Fast Facts

- Plans/Specs
  - 1600+ plan sheets
  - Approximately 1500 Pages in IFB plus 13 Appendices
- Design Criteria
  - Speed: I-895 – 60 MPH; HAR – 25 MPH
  - Trucks: 5% I-895 and 11.5% HAR
- Foundations:
  - Micropiles – Length ranged 60 to 95 ft.; 2 to 3 piles installed per day (50 ft. bond zone)
    - 7” Dia – 170 k factored resistance
    - 10” Dia – 275 k factored resistance
  - H-piles – Avg Length; 6 piles installed per day
    - HP 14x73 – 228 k to 325 kip factored resistance
- Coastal Plain Physiographic Province - three (3) major stratums of soil
    - Artificial Fill - up to 20 feet
    - Quaternary-age sediments - 10 to 30 feet
    - Potomac Group – beyond Quaternary-aged sediments
- Contaminated soil (to Date)
  - Non-hazardous – 42,000 CY
  - Hazardous – 350 CY

I-895 Bridge Project - Fast Facts

- Lightweight Foamed Concrete Fill
  - Type I – 30 pcf and 40 psi (height less 6 ft.)
  - Type II – 42 pcf and 120 psi (upper 6 ft.)
- Superstructure
  - Web Plate – range from 38” to 96” deep
  - 16.5M lbs of fabricated structural steel
  - Disc Bearings
- Traffic
  - AADT over 80,000 with 3400 vph in peak direction; 57%/43% directional split.
- The bridge deck of Structure S1 and S2 were subjected to a surface smoothness test. Using the International Roughness Index (IRI) Inertial Profiler
  - Required 3 passes with measuring 25 ft in length and one lane in width
  - QC testing per ASTM E 950 and MSMT 563
  - Corrective action when Mean IRI exceeds 190 inches per mile
  - Corrective action when IRI in 25 ft segment exceeds 250 inches per mile, except roadway joints used 350 inches per mile
  - Diamond grinding was the means used for corrective action

I-895 Bridge Project - Fast Facts

- Tunnel Overlay
  - Tunnel – 1 ½" roto milling and ½" hydro demolition
  - Approach – 4 ¼" roto milling and ½" hydro demolition
  - Phased demo and construction – 11 pours per phase. Approx. 850 LF per pour inside the tunnel
  - 2 day wet cure, 3 day air cure
  - Smoothness tests – Equipment MSMT 563 and used International Roughness Index (IRI); Diamond grind if IRI exceeds 250 inches per mile except where there is expansion joints, which then is 350 inches per mile.
  - Supplier – Modified Concrete Suppliers, LLC
  - Hydro-demo – HTNE Hydrodemolition Services, LLC
- Tunnel Standpipe
  - Pipe lining – Cured In Place Pipe Structural Lining
  - Existing pipe is cleaned and inspected.
  - Liner is a flexible needle perforated felt that is impregnated with a thermo setting resin – process called wet out.
  - Liner is then inserted into the host pipe and then inflated using compressed air until the resin cures.
  - Capable of meeting 150 psi working pressure
  - Aquapipe is one company that performs this work
- WRA Workshop Industry Experts
  - Paul Silvestri (National Constructors Team)
  - David King (IT)
  - Phil Peake (JMT)
  - Gary Miller (JMT)