Rhode Island DOT Replaces Bridges Over Extended Weekends Using PBES and SPMTs

DAVID W. FISH, P.E.
ADMINISTRATOR OF PROJECT MANAGEMENT
RI DEPARTMENT OF TRANSPORTATION

WITOLD H. KLOCZKOWSKI, P.E.
PROJECT MANAGER
COMMONWEALTH ENGINEERS & CONSULTANTS, INC.

EAST SHORE EXPRESSWAY BRIDGE

McCORMICK QUARRY BRIDGE

Opening Remarks
Mr. David W. Fish, P.E.
Administrator of Project Management
RI Department of Transportation

OWNER: RI DEPARTMENT OF TRANSPORTATION

OVERSIGHT: FHWA RI DIVISION

U.S. Department of Transportation
Federal Highway Administration

DESIGN CONSULTANT: COMMONWEALTH ENGINEERS & CONSULTANTS, INC

COMMONWEALTH
ENGINEERS & CONSULTANTS, INC.

CONTRACTOR: MANAFORT BROTHERS INC.

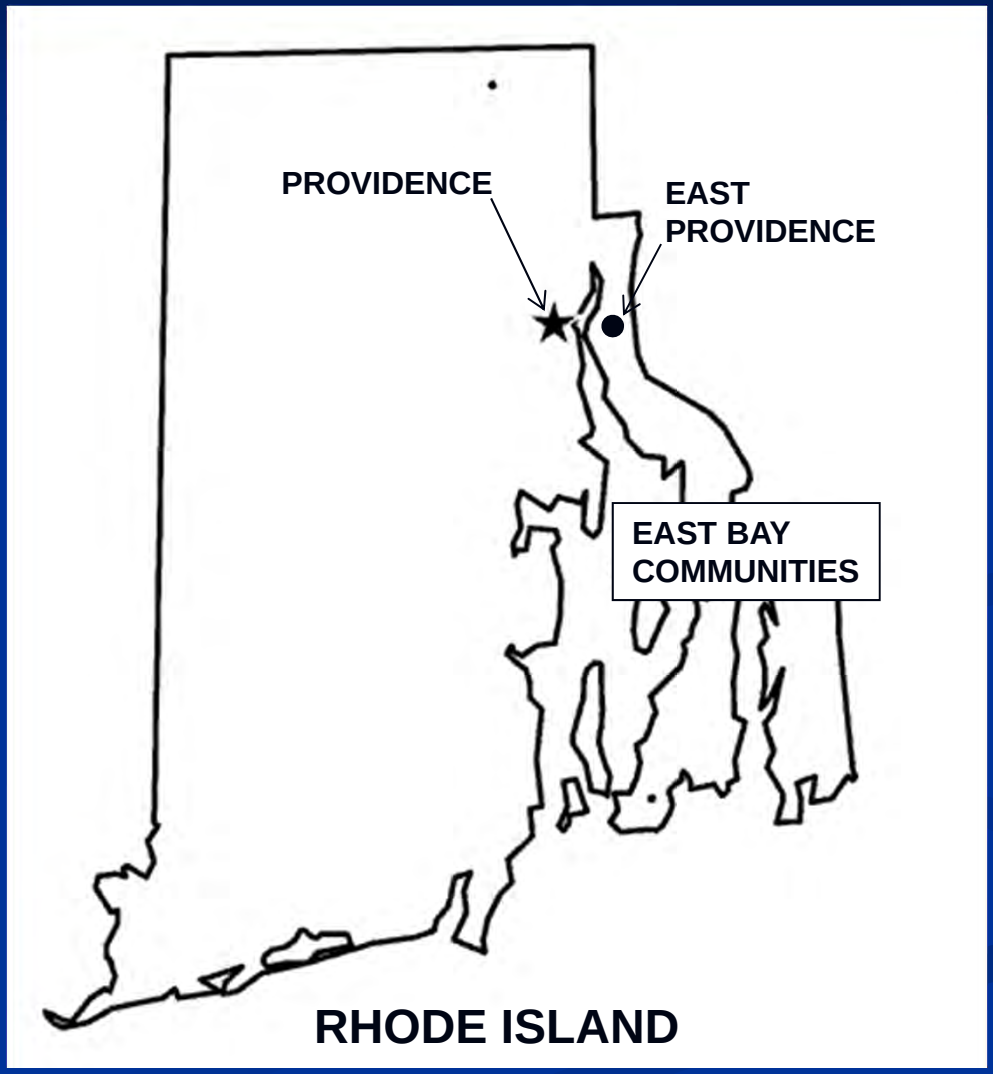
Oldcastle Precast

Manafort Brothers Incorporated

sarens

PROJECT LOCATION

BOTH BRIDGES ARE LOCATED IN EAST PROVIDENCE, RHODE ISLAND



PROJECT LOCATION

TRAFFIC DATA:

- **US ROUTE 6 (WARREN AVE), 19,000 VPD**
- **EAST SHORE EXPRESSWAY, 38,000 VPD**

PROJECT LOCATION

EXISTING BRIDGES

EAST SHORE EXPRESSWAY BRIDGE:
- CONSTRUCTED IN 1958
- 3 SPAN CONTINUOUS T-BEAM
- ~55’ – 110’ – 55’ SPANS
- 60 DEG SKEW

McCORMICK QUARRY BRIDGE:
- CONSTRUCTED IN 1958
- 3 SPAN P/C I-GIRDER
- ~37’ – 69’ – 35’ SPANS
- 40 DEG SKEW

GENERAL BRIDGE CONDITION

EAST SHORE EXPRESSWAY BRIDGE

RATING

TYPE		Strength RF	Service RF	Str. RL (TONS)	POSTING
HL-93	INV	0.05	N/A	N/A	---
	OPER	0.14	N/A	N/A	---
H20		0.79	N/A	15.8	14.0
TYPE 3		0.61	N/A	15.3	11.1
TYPE 3S2		0.44	N/A	15.8	7.2
TYPE 3-3		0.43	N/A	17.2	7.4
SU 4		0.53	N/A	14.3	8.9
SU 5		0.43	N/A	13.3	5.8
SU 6		0.37	N/A	12.9	3.5
SU 7		0.32	N/A	12.4	1.1
RI-BP1		0.34	N/A	12.9	2.2
RI-BP2		0.36	N/A	13.5	3.2
RI-BP3		0.21	N/A	11.0	CLOSED
RI-BP4		0.16	N/A	10.4	CLOSED
RI-OP1		0.35	N/A	19.8	4.0
RI-OP2		0.32	N/A	25.6	2.3
RI-OP3		0.28	N/A	31.6	CLOSED

McCORMICK QUARRY BRIDGE

RATING

VEHICLE TYPE		RF	RL (TONS)	POSTING
HL-93	INV	0.35	---	---
	OPER	0.45	---	---
H20		0.85	17.0	15.7
TYPE 3		0.73	18.2	15.3
TYPE 3S2		0.58	21.0	14.4
TYPE 3-3		0.58	23.4	16.0
LTLLM		0.65	25.9	20.0
SU 4		0.78	21.0	18.5
SU 5		0.69	21.3	17.2
SU 6		0.62	21.5	15.8
SU 7		0.56	21.8	14.3
RI-BP1		0.48	18.3	9.77
RI-BP2		0.49	18.4	10.1
RI-BP3		**0.39**	**20.7**	**6.73**
RI-BP4		0.43	27.7	12.0
RI-OP1		0.47	26.6	---
RI-OP2		0.51	40.8	---
RI-OP3		0.48	54.3	---

WHY ABC?

- TWO SEASON, TWO PHASE “CONVENTIONAL” CONSTRUCTION RAISED TRAFFIC CONCERNS FOR THIS MAJOR EXPRESSWAY.
- RIDOT SUCCESSFULLY EMPLOYED SPMT’S FOR A PRIOR CONTRACT.
- PROJECT SITE IS WELL SUITED TO SPMT’S, DUE TO PROXIMITY OF BSA’S AND SHORT TRAVEL PATHS.
- CONSULTED WITH AN SPMT CONTRACTOR. ALL AGREED THE SITE WAS IDEAL.
- CONSULTANT PROPOSED GEOSYNTHETIC REINFORCED SOIL (GRS) ABUTMENTS, TO BE CONSTRUCTED IN ADVANCE OF THE W/E CLOSURE, UNDER THE EXISTING BRIDGE.
- PRECAST CONCRETE SUBSTRUCTURE COMPONENTS HELPED TO SPEED UP THE REPLACEMENT.

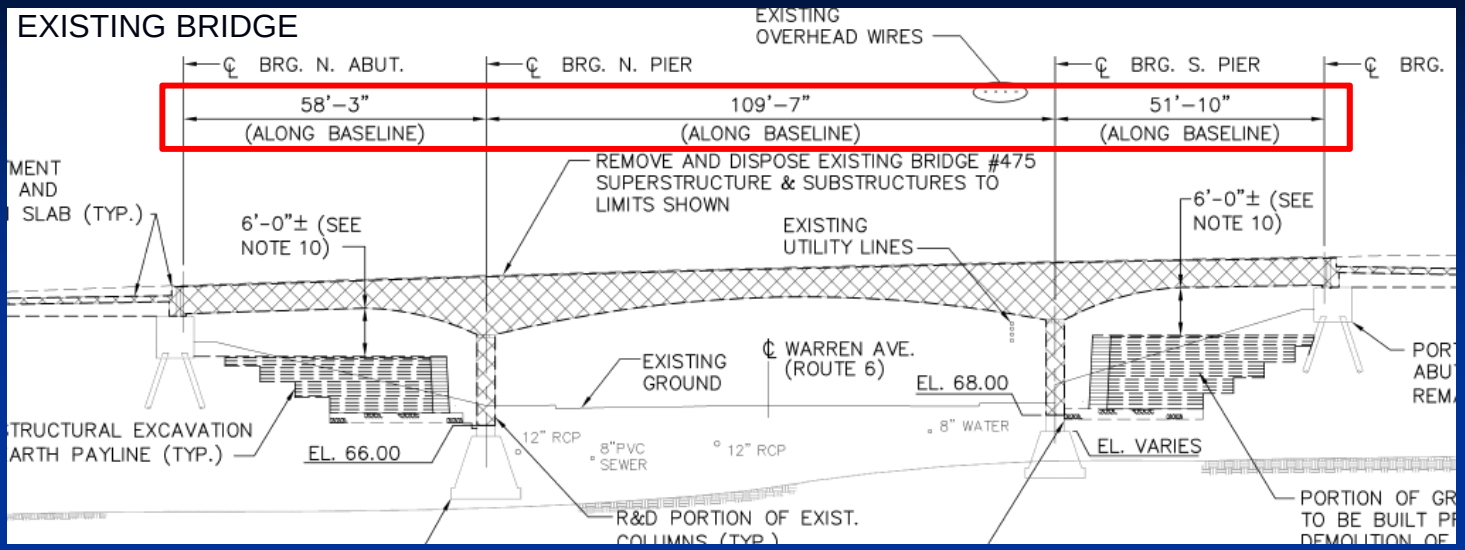

GRS


SPMT’s

NEW BRIDGE CONFIGURATIONS

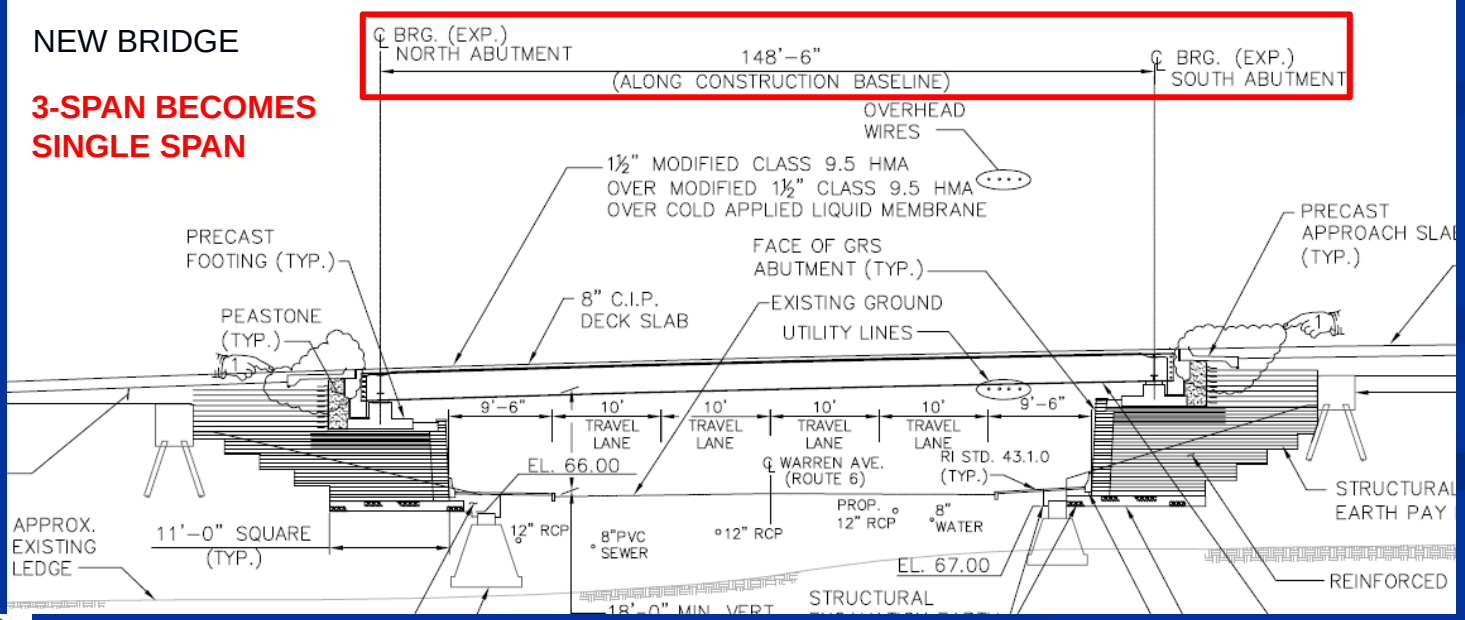
EAST SHORE EXPRESSWAY BRIDGE

EXISTING BRIDGE



NEW BRIDGE

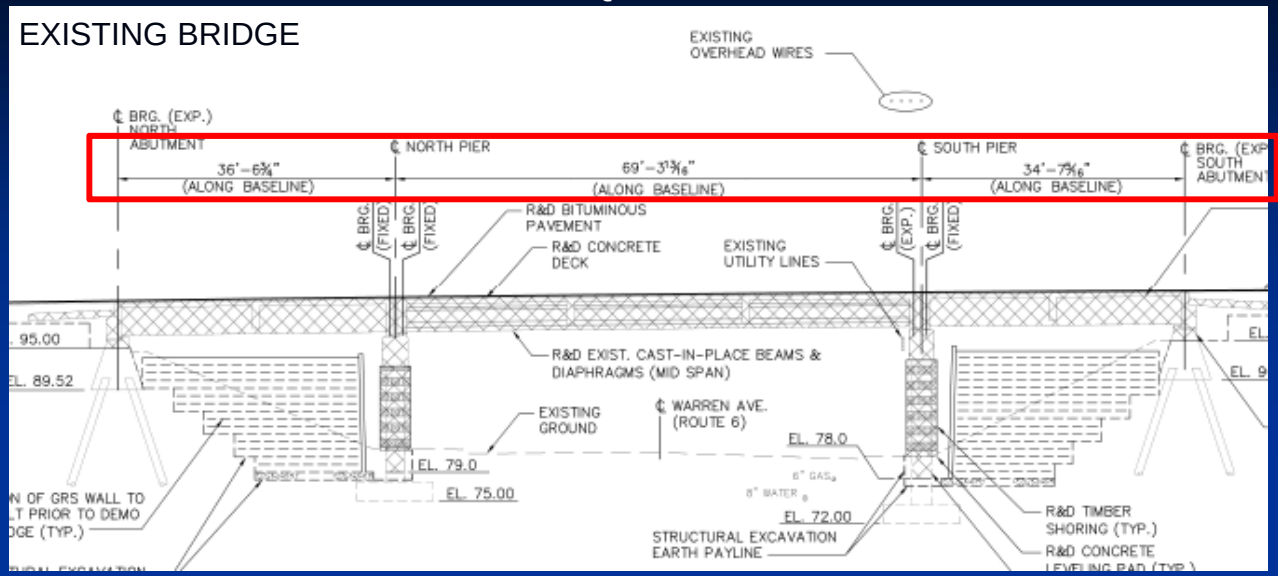
3-SPAN BECOMES SINGLE SPAN



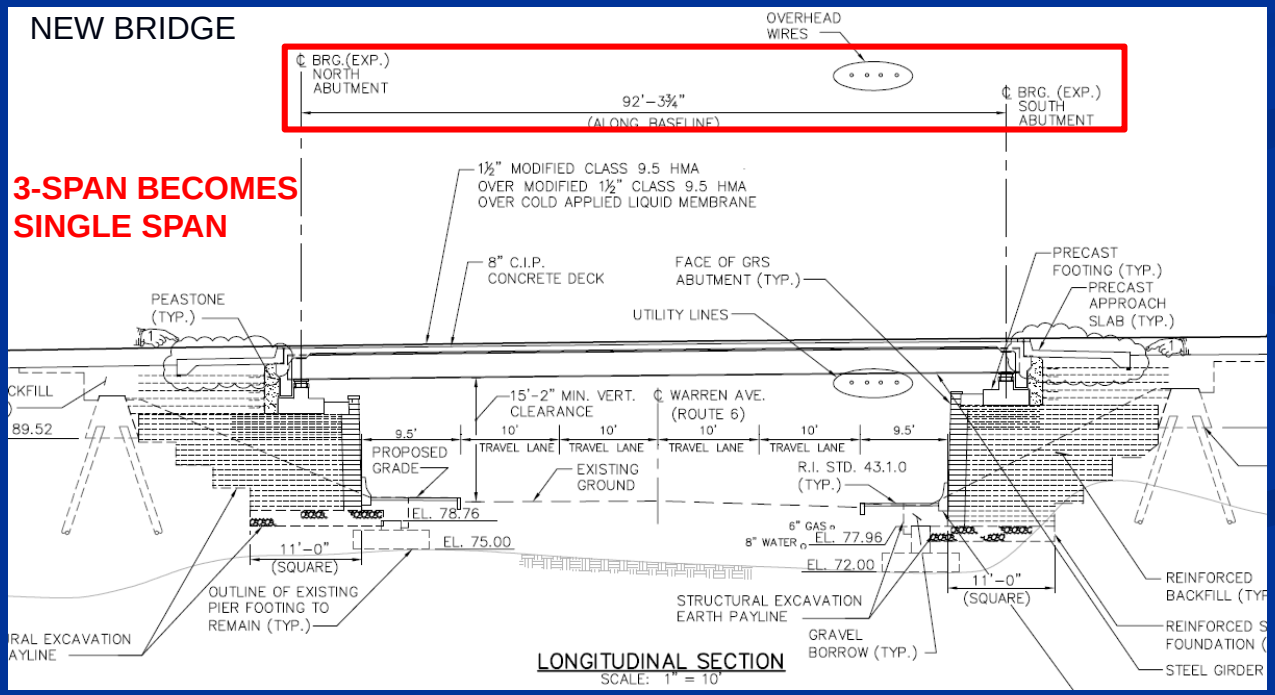
NEW BRIDGE CONFIGURATIONS

McCORMICK QUARRY BRIDGE

EXISTING BRIDGE

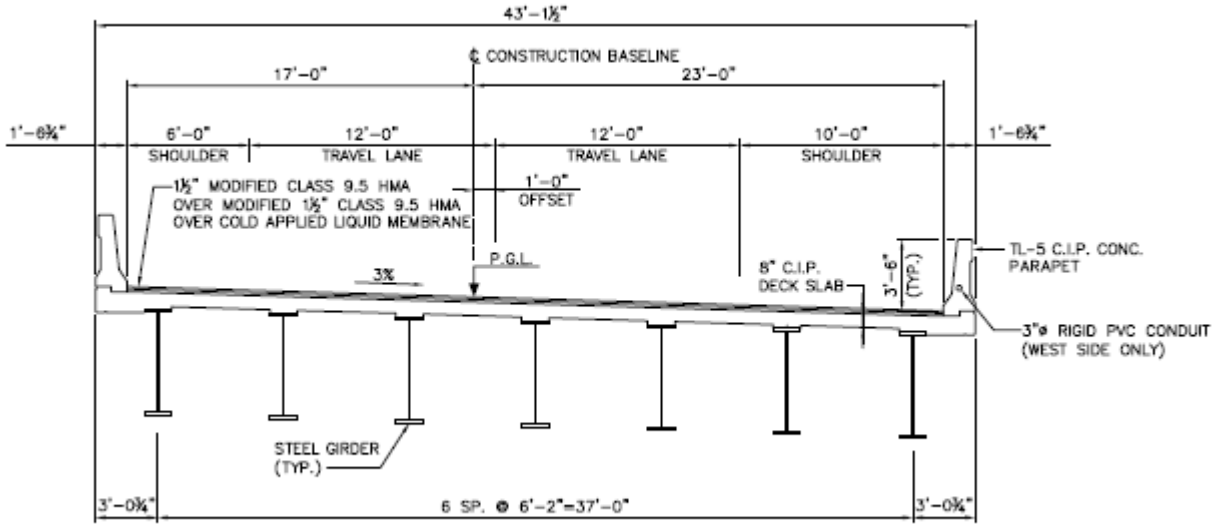


NEW BRIDGE



NEW BRIDGE CONFIGURATIONS

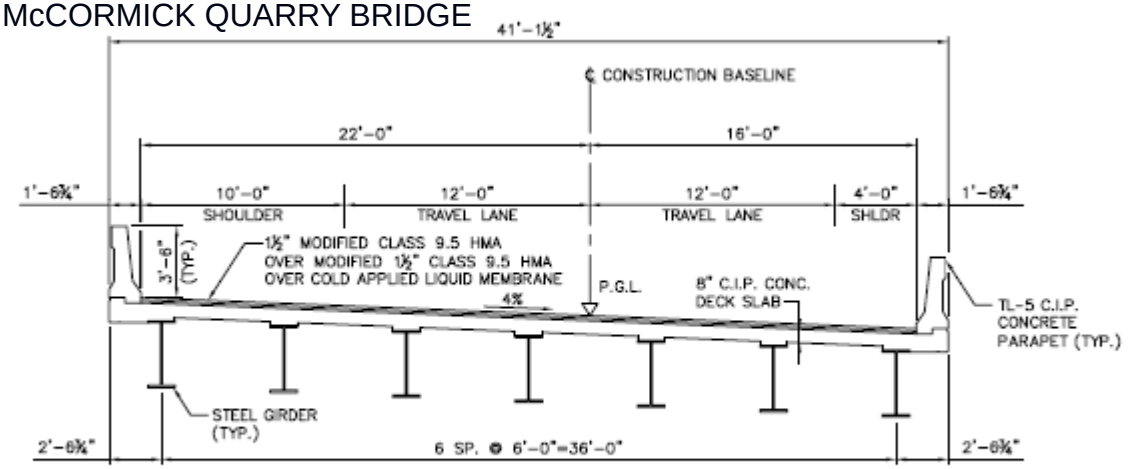
EAST SHORE EXPRESSWAY BRIDGE



TRANSVERSE CROSS SECTION

SCALE: ¼"=1'-0"

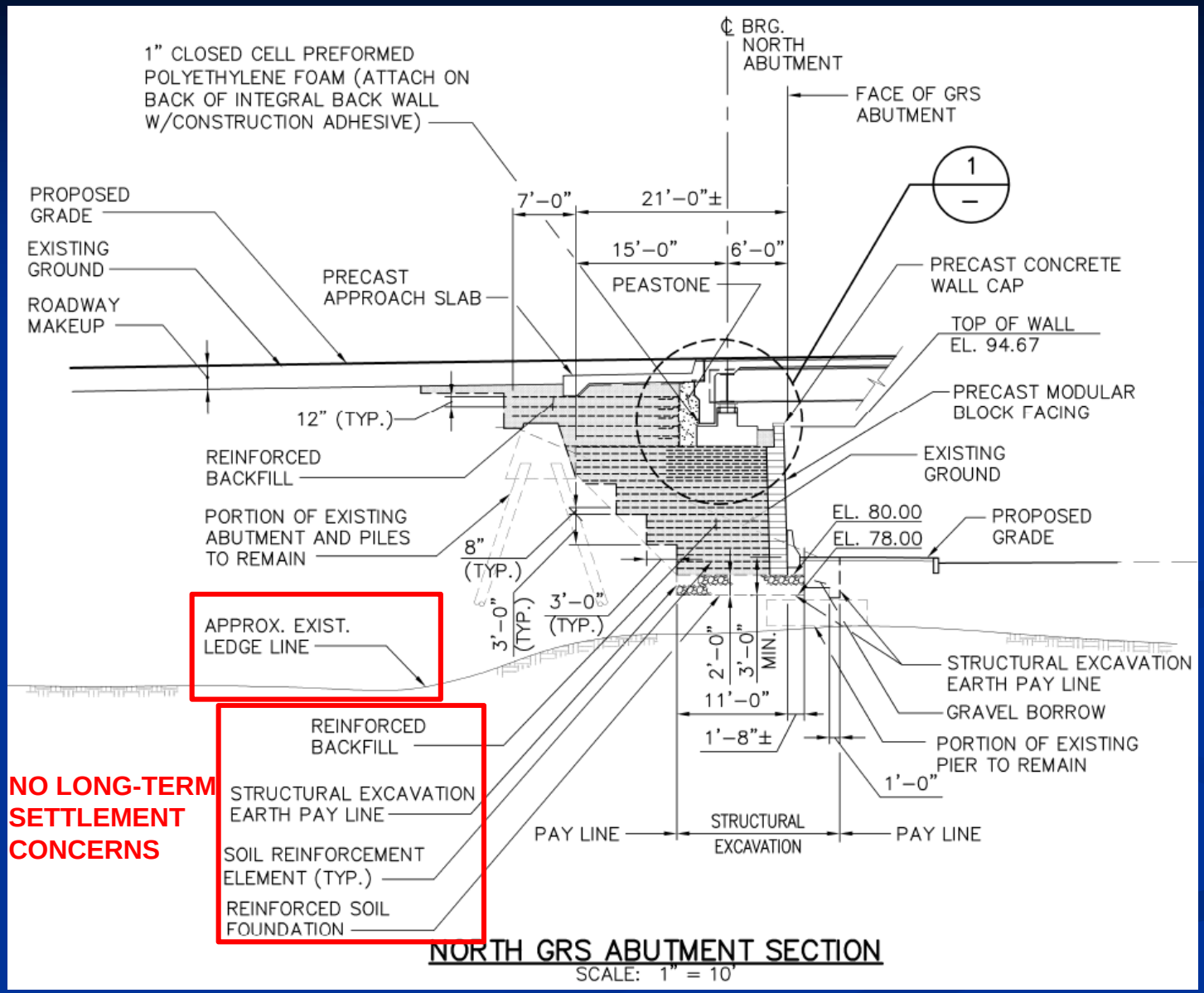
McCORMICK QUARRY BRIDGE



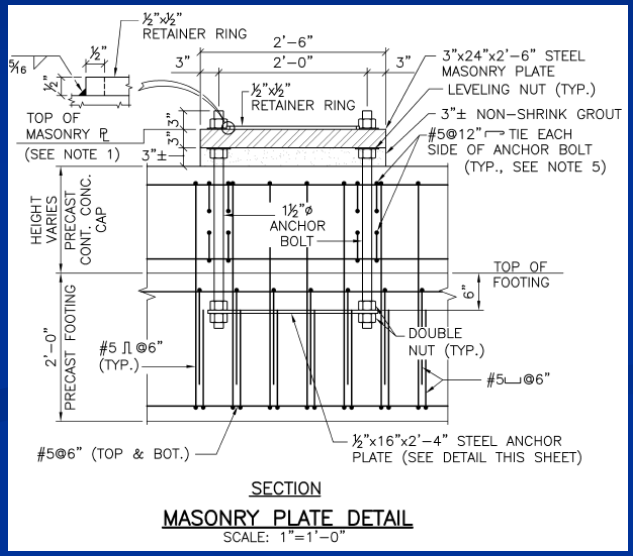
TRANSVERSE CROSS SECTION

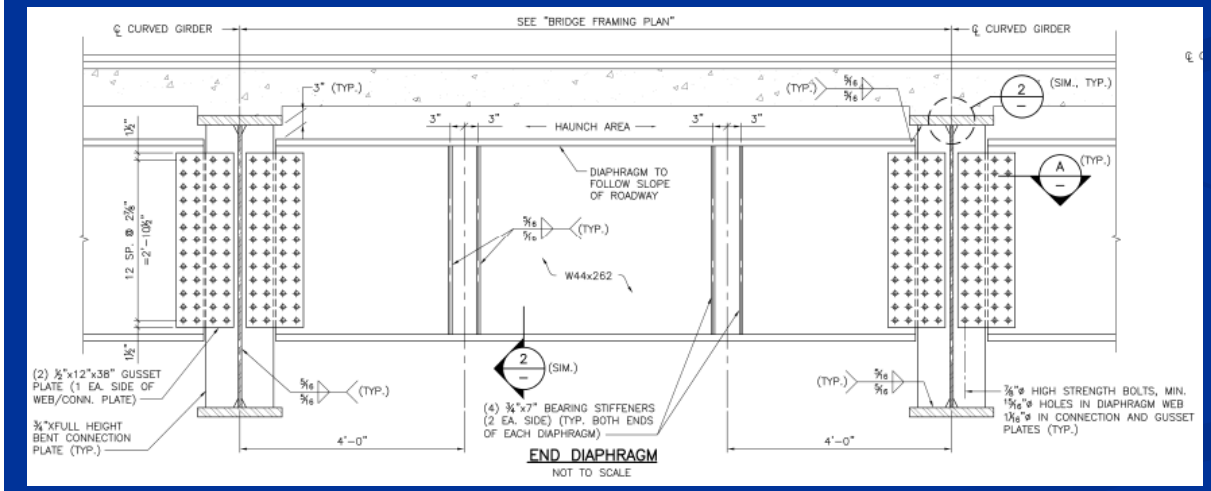
SCALE: ¼"=1'-0"

TYPICAL GRS DETAIL

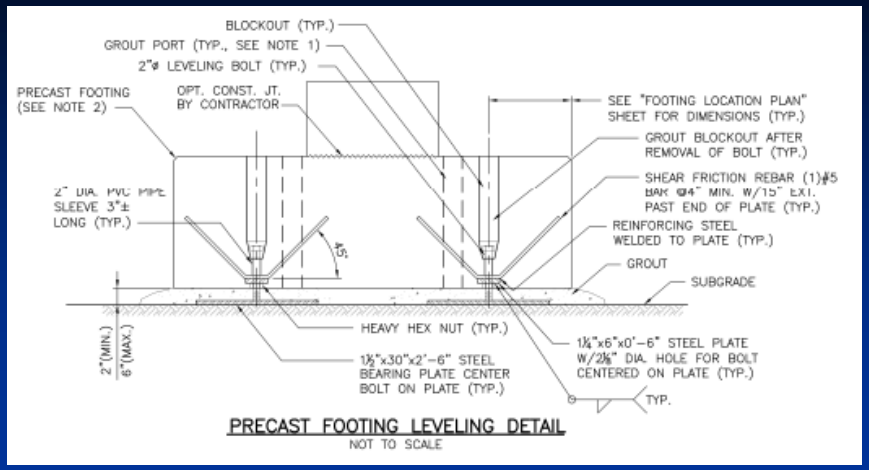


SKEW/RACKING ACCOMMODATIONS



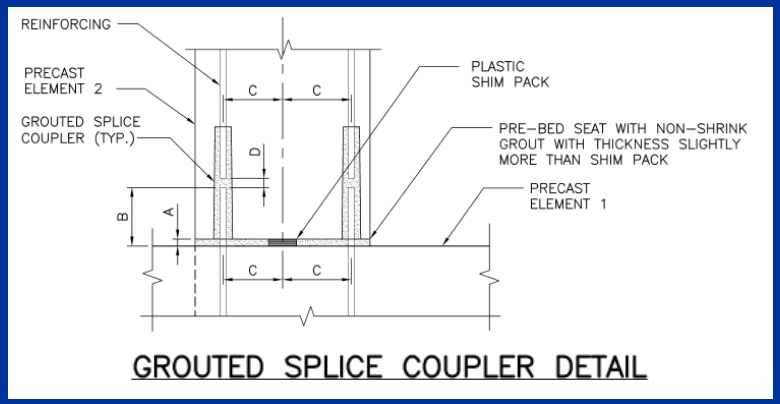


PRECAST ELEMENTS & INTEGRAL BACKWALL

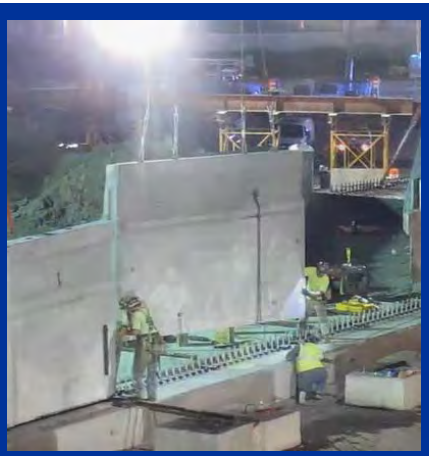


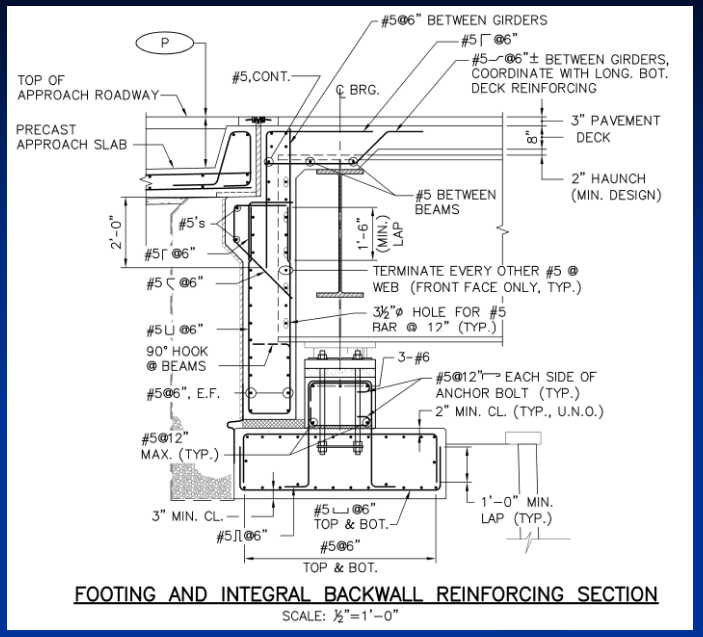
PRECAST FOOTING LEVELING DETAIL

NOT TO SCALE



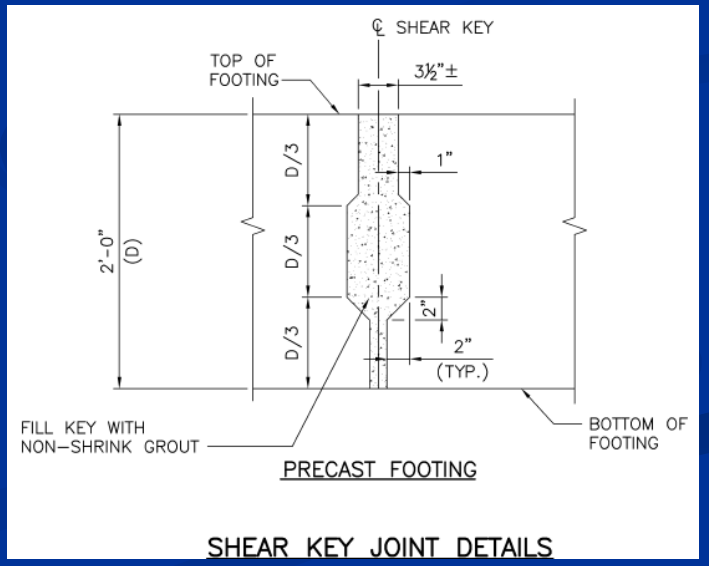
GROUTED SPLICE COUPLER DETAIL





FOOTING AND INTEGRAL BACKWALL REINFORCING SECTION

SCALE: ½"=1'-0"



PRECAST FOOTING

SHEAR KEY JOINT DETAILS

TYPICAL FOOTING SEGMENT SIZE = 20'X13'X2', 78,000 LBS.
LARGER WALL SEGMENT SIZE = 20'x11'x1'-7", 52,000 LBS.

INCENTIVES & DISINCENTIVES

EACH BRIDGE WAS ASSIGNED A DISTINCT 80 HOUR EXTENDED WEEKEND INCENTIVE CLOSURE PERIOD, FROM 9PM FRIDAY TO 5AM TUESDAY (CONTINUOUS DAY/NIGHT).

CONTRACT LANGUAGE:

INTERIM COMPLETION TIMES:

Monetary incentives or disincentives will be applied to the following interim completion times according to the terms herein:

- Interim Completion Time 1 (hereafter referred to as "ICT1"): 5:00 a.m. on the Tuesday ending the 80 hour ABC Period associated with East Shore Expressway Bridge No. 475
- Interim Completion Time 2 (hereafter referred to as "ICT2"): 5:00 a.m. on the Tuesday ending the 80 hour ABC Period associated with McCormick Quarry Bridge No. 476

INCENTIVE AND DISINCENTIVE ASSESSMENT:

Incentive (positive assessment): For each hour that the defined work is completed prior to its associated ICT, the following value will be added to any monies due the Contractor. This incentive will be calculated from the defined ICT to the actual time of completion of the work. The actual time of completion will be rounded back or ahead to the nearest hour based on whether it occurs before or after the half-hour point, respectively. The incentive will be applied separately for each ICT:

- ICT1, East Shore Expressway Bridge No. 475 - $9,000 per hour
- ICT2, McCormick Quarry Bridge No. 476 - $8,000 per hour

Disincentive (negative assessment): Correspondingly, for each hour that the defined work remains incomplete after its associated ICT, the following value will be deducted from any monies due the Contractor. This disincentive will be calculated from the defined ICT to the actual time of completion of the work. The actual time of completion will be rounded back or ahead to the nearest hour based on whether it occurs before or after the half-hour point, respectively. The disincentive will be applied separately for each ICT.

- ICT1, East Shore Expressway Bridge No. 475 - $9,000 per hour
- ICT2, McCormick Quarry Bridge No. 476 - $8,000 per hour

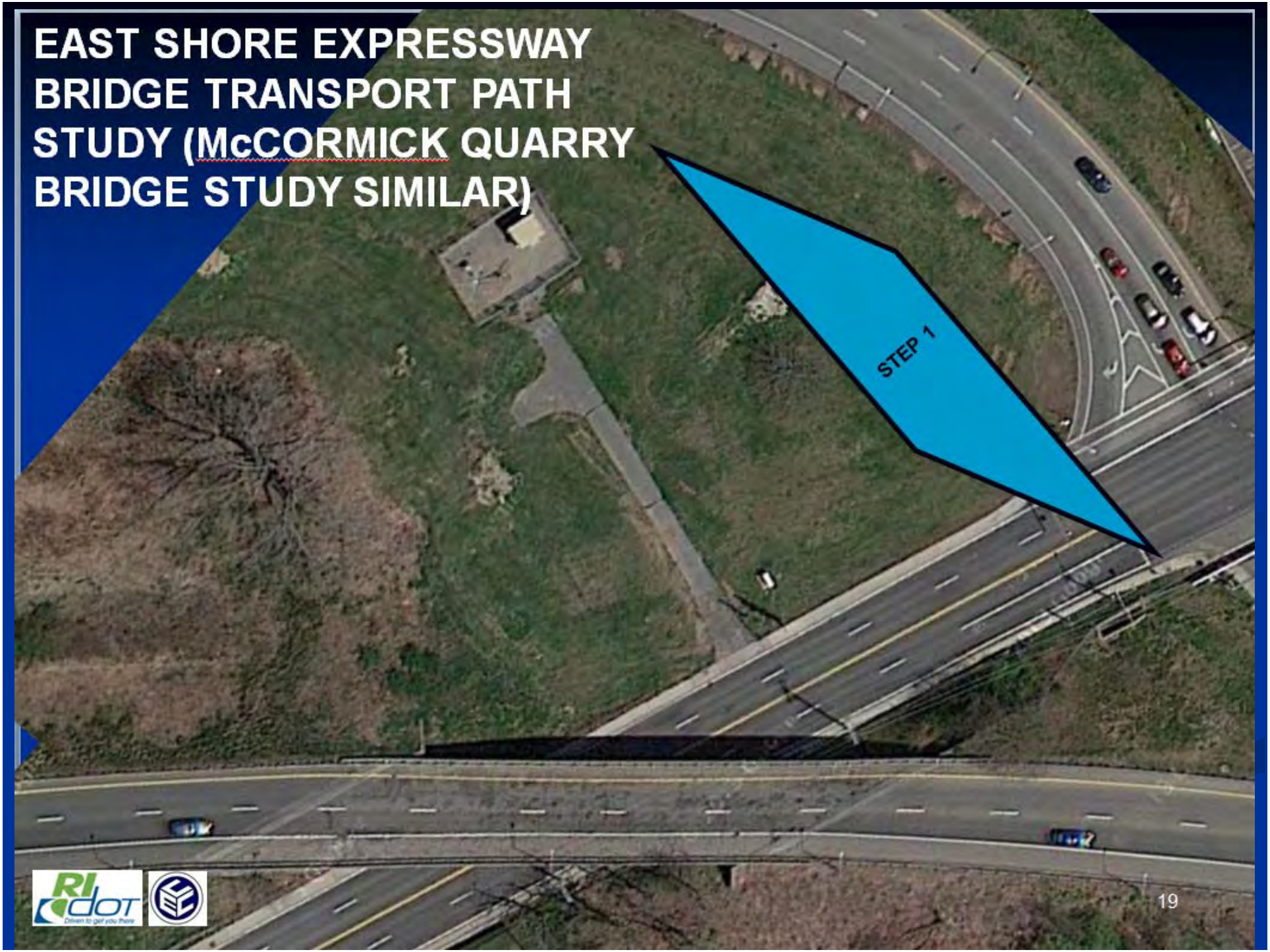
BRIDGE STAGING AREAS

EAST SHORE EXPRESSWAY BRIDGE TRANSPORT PATH STUDY (McCORMICK QUARRY BRIDGE STUDY SIMILAR)

ASSEMBLY

Photo

EAST SHORE EXPRESSWAY BRIDGE TRANSPORT PATH STUDY (McCORMICK QUARRY BRIDGE STUDY SIMILAR)



EAST SHORE EXPRESSWAY BRIDGE TRANSPORT PATH STUDY (McCORMICK QUARRY BRIDGE STUDY SIMILAR)

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EAST SHORE EXPRESSWAY BRIDGE TRANSPORT PATH STUDY (McCORMICK QUARRY BRIDGE STUDY SIMILAR)

ADVANCED UTILITY RELOCATIONS

EAST SHORE EXPRESSWAY BRIDGE (McCORMICK QUARRY BRIDGE SIMILAR)

ADVANCED GRS CONSTRUCTION

McCORMICK QUARRY BRIDGE (BRIDGE EAST SHORE EXPRESSWAY SIMILAR)

CONSTRUCTING GRS ABUTMENTS UNDER THE EXISTING BRIDGE

SUPERSTRUCTURE IN THE BSA

EAST SHORE EXPRESSWAY BRIDGE (McCORMICK QUARRY BRIDGE SIMILAR)

BUILDING THE NEW BRIDGE IN
THE “BRIDGE STAGING AREA”

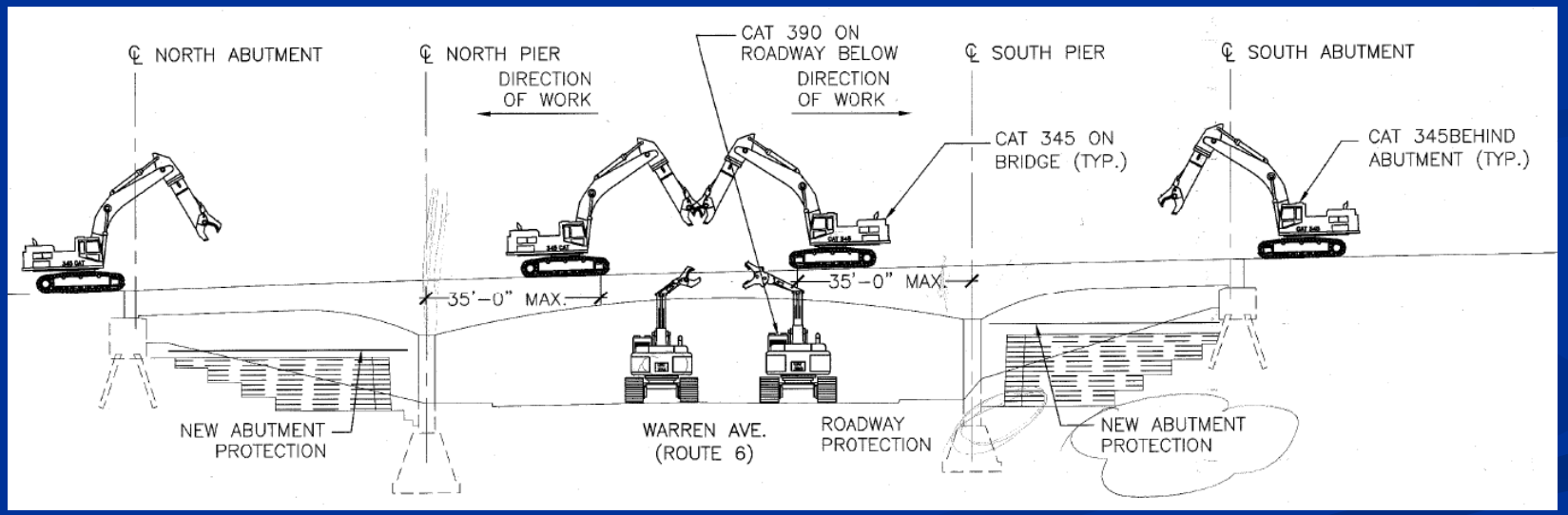
CONSTRUCTION

EAST SHORE EXPRESSWAY BRIDGE (McCORMICK QUARRY BRIDGE SIMILAR)

COMPLETED SUPERSTRUCTURE,
WITH BARRIERS INCLUDED

CONTRACTOR'S DEMOLITION SUBMITTAL

- Demolition equipment, materials, sequence designed by the Contractor to suit his means and methods.
- Contractor's engineer analyzed the existing bridge members to address their condition, and to accommodate the proposed sequence.
- Bridge ratings were made available to the Contractor.
- Demolition was performed entirely during the 80 hour road closure.



EAST SHORE EXPRESSWAY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND

EAST SHORE EXPRESSWAY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND

START OF THE W/E ROAD CLOSURE

EAST SHORE EXPRESSWAY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND

DEMOLITION DURING THE WEEKEND ROAD CLOSURE

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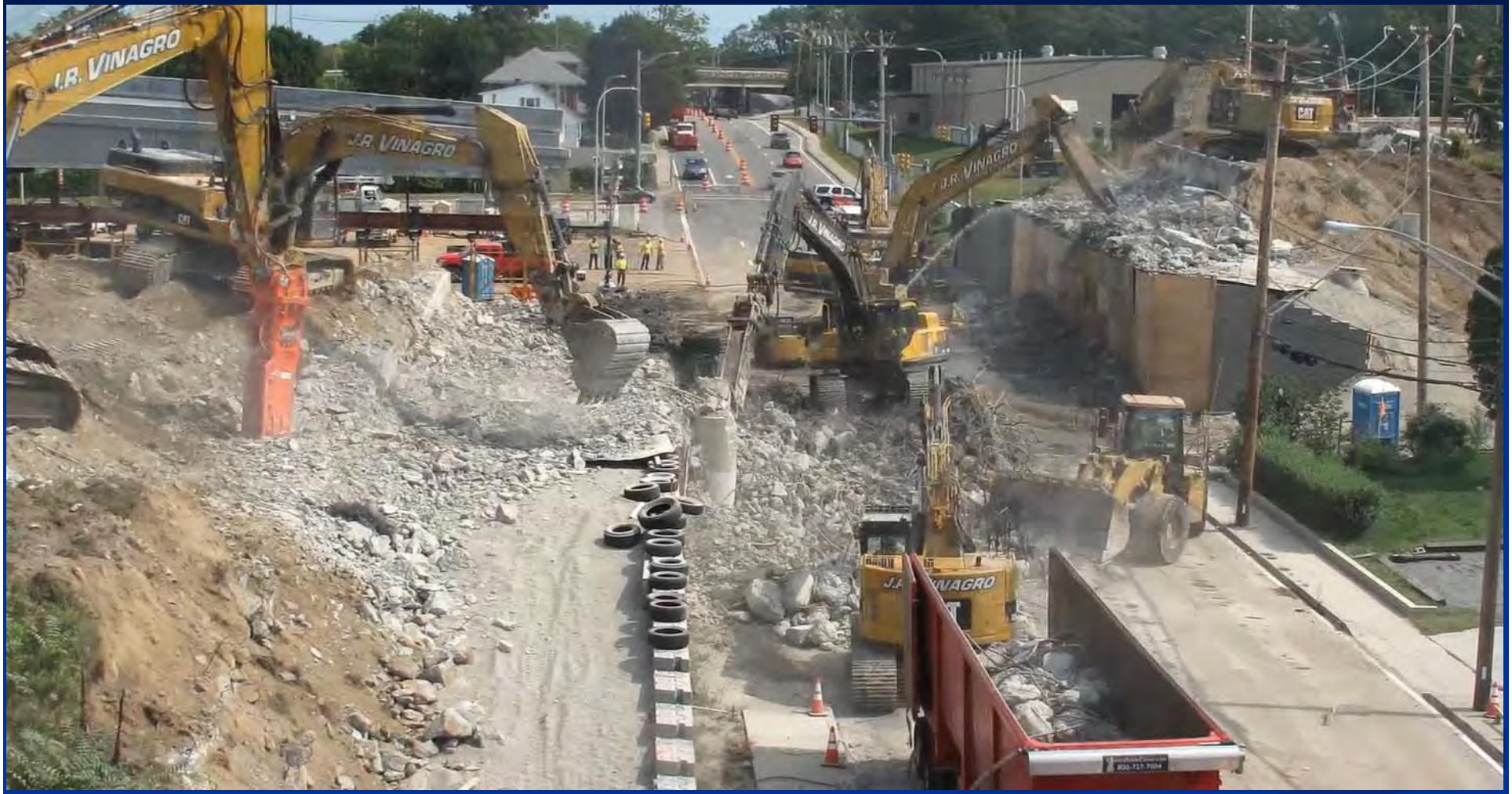

DEMOLITION DURING THE WEEKEND ROAD CLOSURE

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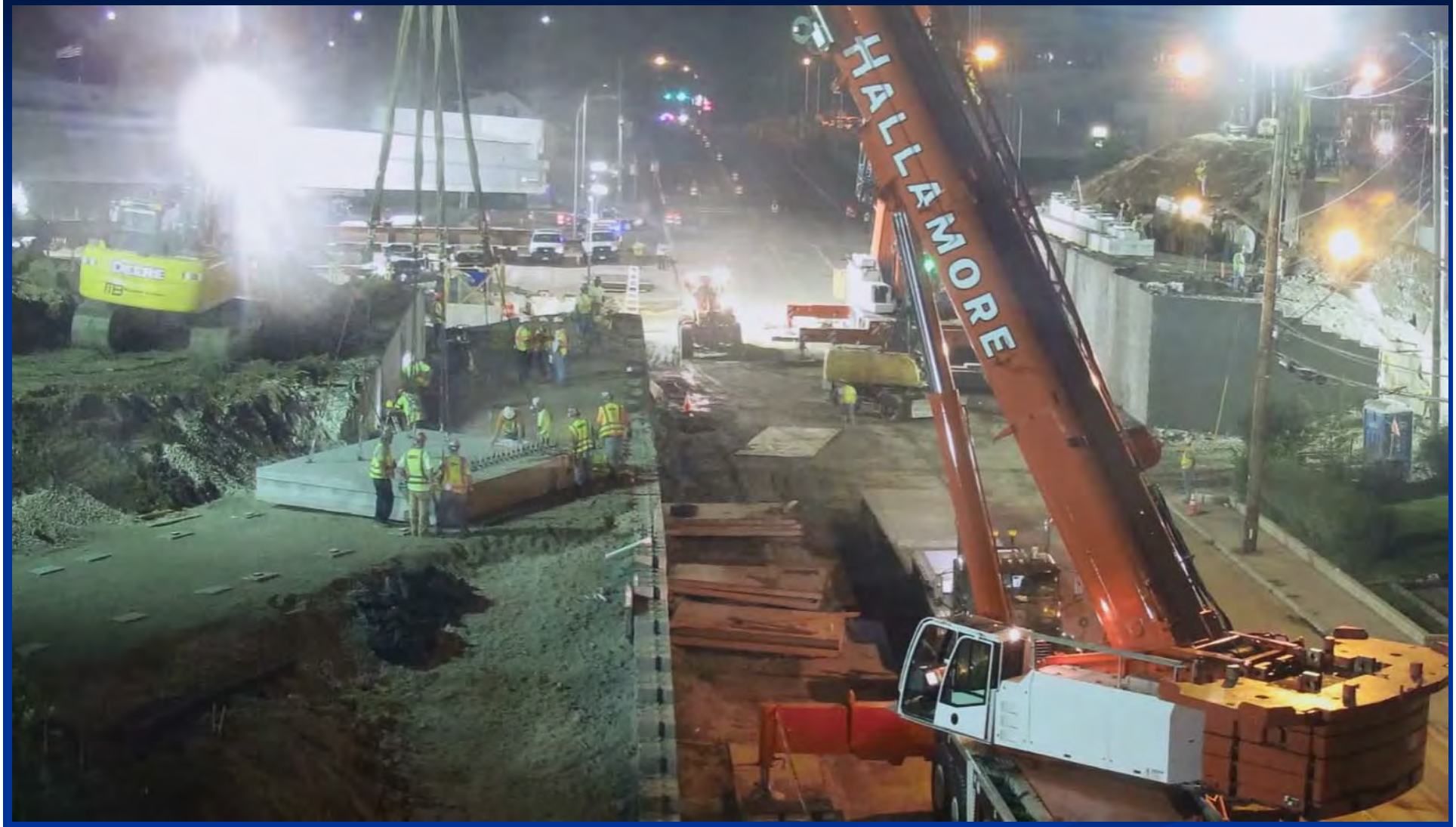

SETTING THE PRECAST COMPONENTS

EAST SHORE EXPRESSWAY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND

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EAST SHORE EXPRESSWAY BRIDGE
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MOVING THE BRIDGE ON THE SPMT's

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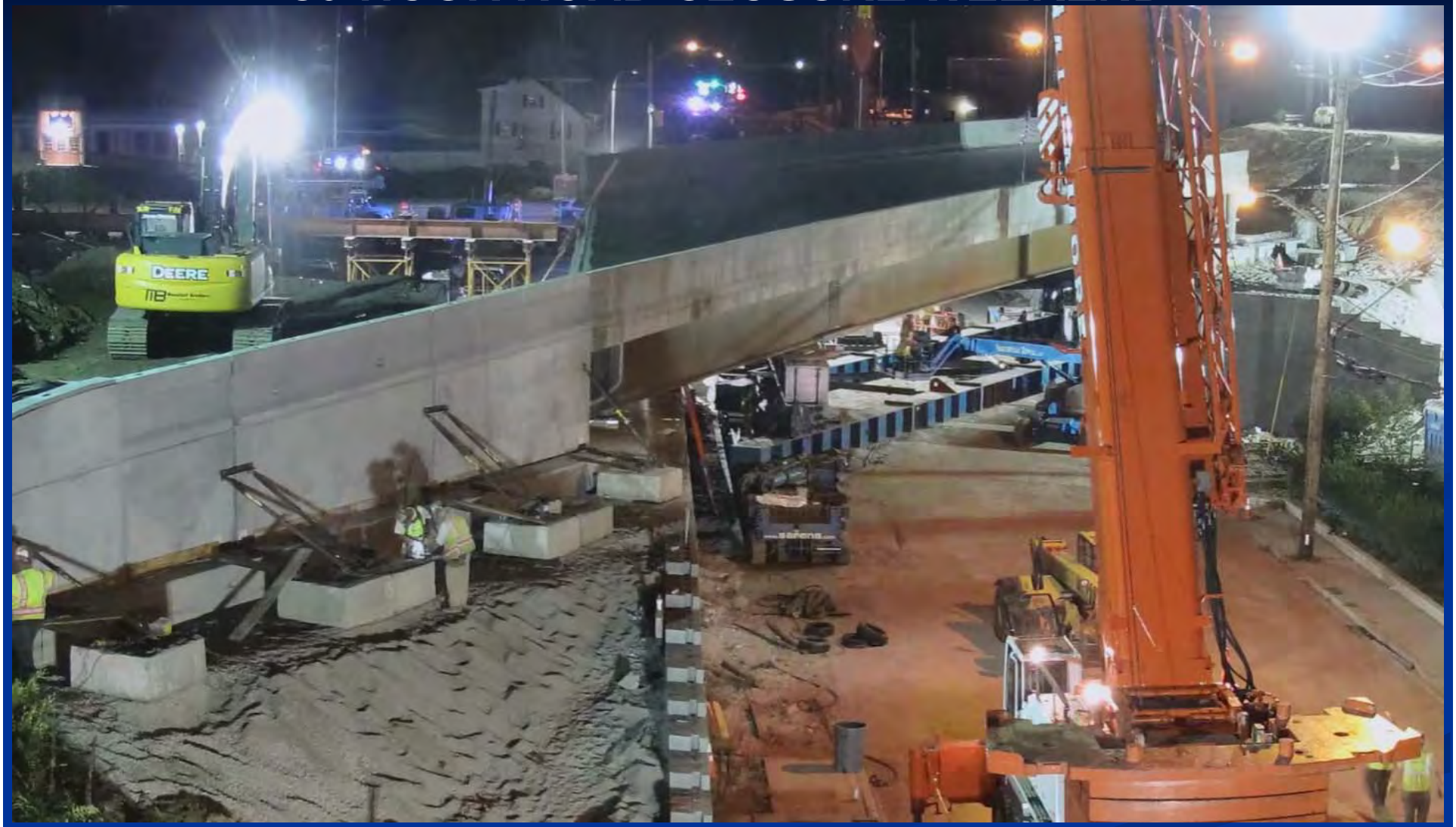
FINISHING THE APPROACH FILL & WALLS

EAST SHORE EXPRESSWAY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND



MOVING THE BRIDGE ON THE SPMT's

EAST SHORE EXPRESSWAY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND

FINISHING THE APPROACH FILL & WALLS

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AFTER THE W/E CLOSURE - NEW STRUCTURE OPEN TO TRAFFIC

McCORMICK QUARRY BRIDGE
80-HOUR ROAD CLOSURE WEEKEND

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START OF THE W/E ROAD CLOSURE

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AFTER THE W/E CLOSURE - NEW STRUCTURE OPEN TO TRAFFIC

A PDF OF THIS PRESENTATION, AND WEB-LINKS TO TIME-LAPSE VIDEO'S WILL BE PROVIDED BY FIU

FINAL STRUCTURES

- Contract Type: Design/Bid/Build
- Total Construction Cost
  - Bid = $12.7 million, to-date = $11.8 million
- Total Construction Duration = 16 months
- East Shore Expressway Bridge incentive payment = $0.00
- McCormick Quarry Bridge incentive payment = $152k = 19hrs x $8k/hr
- Total Incentive Payments - $152k

McCORMICK QUARRY BRIDGE

EAST SHORE EXPRESSWAY BRIDGE

- Contract Closure = 80 hrs per bridge
- Actual Closure:
  - East Shore Expressway Br = 80hrs
  - McCormick Quarry Bridge = 61 hrs

No traffic gridlock!

Key take-aways:

- Conducted successful public out-reach,
- Weekend move = less traffic and short-lived impacts,
- Lesson learned from 1st bridge - construct some of the approach fill and wing walls with wrapped-face system before the SPMT move rather than after,
- Adjustable bearing detail pros/cons.

THANK YOU FOR WATCHING