



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

STRUCTURE TYPE STUDY

Bridge No. SUM-76-0914

*I-76/77 over Manchester Road (S.R. 93)
SFN 7703481*

Prepared For:

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Ohio Department of Transportation
District 4
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Prepared By:



DLZ Job No. 1822-1016-00

August 30, 2019

EXECUTIVE SUMMARY

The Ohio Department of Transportation has identified the need to perform a major reconstruction of I-76/77 from the Eastern Interchange to the Central Interchange in the City of Akron, Summit County, Ohio. The design-built project will include the replacement or rehabilitation of the mainline interstate bridges, including Bridge No. SUM-76-0914, I-76/77 over Manchester Road (S.R. 93). DLZ Ohio, Inc. (DLZ) was retained by E.L. Robinson Engineering to provide engineering support services, including performing the Bridge Type Study for this structure.

DLZ considered three feasible alternatives for the bridge, as follows:

- **Alternative No. 1 – Deck Replacement**
Perform a major rehabilitation of the existing bridge including replacement of the deck slabs and approach slabs, installation of continuity plate retrofits on the existing beams, and conversion of the abutments to semi-integral design.
- **Alternative No. 2 – Superstructure Replacement**
Perform a major rehabilitation of the existing bridge including a full replacement of the existing superstructure, replacement of the approach slabs, and conversion of the abutments to semi-integral design.
- **Alternative No. 3 – Complete Structure Replacement**
Remove the existing bridge. Construct a new three-span continuous steel beam bridge with integral abutments and cap-and-column piers.

A summary of the estimates of probable construction costs for each alternative is included below.

Alternative	Estimate of Probable Initial Construction Cost (2021 Dollars)	Total Life Cycle Cost (2021 Dollars)
No. 1 – Deck Replacement	\$3,964,000	\$6,618,000
No. 2 – Superstructure Replacement	\$3,876,000	\$6,375,000
No. 3 – Complete Structure Replacement	\$3,857,000	\$6,376,000

BRIDGE DESCRIPTION

Bridge No. SUM-76-0914 (SFN 7703481) is located on I-76/77 approximately 2.4 miles west of the Central Interchange. The existing structure is a three-span continuous steel beam bridge with a non-composite reinforced concrete deck and reinforced concrete substructures. It was originally built in 1964, and previous rehabilitation work has included deck replacement in 1984 and replacement of an asphalt concrete wearing course in 2011.

The existing bridge has spans of 45'-6"(\pm), 64'-6"(\pm) and 45'-6"(\pm) c/c bearings, a skew of 12°07'15"(\pm) left forward. The superstructure consists of separate left and right side bridge decks with a 1"(\pm) open joint at the median. Each deck is supported by ten (10) W36x150 steel beams. Each deck carries four (4) 12'-0" traffic lanes for one direction of I-76/77, providing an 11'-6"(\pm) outside shoulder width and an 8'-9"(\pm) inside shoulder width. The existing twin bridge decks have a total width of 142'-4"(\pm) out/out and an overall length of 160.10'(\pm). The existing substructures consist of reinforced concrete stub abutments and reinforced concrete cap-and-column piers, with all substructures supported on HP12x53 steel piles driven to rock. No signs of settlement or substructure failure are evident.

ALTERNATIVE ANALYSIS

DLZ considered three (3) alternatives feasible for the rehabilitation or replacement of the structure:

- Alternative No. 1 – Deck Replacement
- Alternative No. 2 – Superstructure Replacement
- Alternative No. 3 – Complete Structure Replacement

A "no-build" alternative is not feasible because the bridge deck has reached the end of its service life and the bridge requires rehabilitation or replacement in conjunction with the major reconstruction of the highway.

For all alternatives, DLZ has assumed that there will be no change to the horizontal alignment of I-76/77, which is tangent through the bridge per the original construction plans. In addition, we have assumed that there will be no change to the traffic lane positions relative to the centerline of I-76/77 – i.e., an offset of 10'-0" from the centerline to the edge of the inside lane each side will be maintained. For the outside shoulders of all alternatives, we have assumed a width of 12'-0" to be provided from the edge of lane to the face of the bridge railing, equal to a proposed 10'-0" treated shoulder width plus 2'-0" guardrail offset for uncurbed approach shoulders in accordance with the ODOT Location and Design Manual, Volume 1, Figure 301-3. This is 6" more than the existing outside shoulder width, and it increases the total width out/out by 1'-0".

For all alternatives, the proposed outside bridge railing is a single slope concrete bridge railing per Standard Drawing SBR-1-13 (3'-6" tall by 1'-6" wide, plus a 2" deck reveal), and the proposed inside (median) bridge railing is single slope concrete median bridge railing per Standard Drawing SBR-2-13 (4'-9" tall x 1'-9" wide, with a 2" open joint at the centerline).

The existing minimum vertical clearance over Manchester Road (S.R. 93) is 15'-2"(\pm). In accordance with the ODOT Location and Design Manual, Volume 1, Figure 302-1, "Design Criteria for New and Reconstructed Bridges", the required vertical clearance over the roadway for an arterial road is 16.5', with a note stating that 15.5' minimum clearance may be used in highly developed urban areas if attainment of 16.5' clearance would be unreasonably costly and there is an alternate bypass route which provides a minimum 16.5' vertical clearance.

For all alternatives, providing a proposed minimum vertical clearance of 15.5' is feasible without making a significant change to the existing profile grade, which is a tangent grade of -3.64% through the bridge per the original construction plans. For all alternatives, providing a proposed minimum vertical clearance of 16.5' would require raising the forward end of the bridge by reducing the steepness of the profile grade through the structure or, if the tangent grade is maintained, raising the entire profile grade uniformly by approximately one foot (1.0'). The magnitude and cost of the additional roadway work required to raise the profile grade for increased vertical clearance would be similar for all alternatives and is not included in the cost estimates. Drainage spread on the bridge deck will not be impacted if the existing grade of -3.64% is maintained, as this longitudinal grade combined with a deck cross-slope of 0.160 ft/ft is more than adequate to keep flow confined to the existing shoulders for the length of the bridge.

For all alternatives, phase construction will be required to maintain traffic on I-76/77 during construction. Two lanes of traffic must be maintained in each direction. The existing/proposed bridge deck widths provide four lanes plus shoulders under normal conditions, which is more than enough width to maintain two lanes of traffic shifted to one-half of the existing/proposed bridge behind portable barriers while work is performed on the other half of the bridge.

Descriptions of issues pertinent to each feasible alternative are included herein. All construction costs have been inflated to the anticipated construction midpoint date of December 9, 2022, based on an anticipated award date of January 1, 2021 and construction completion date of November 15, 2024. Preliminary estimates of probable construction costs have been calculated for each alternative and are included in *Appendix 1 – Estimates of Probable Construction Cost*.

Life cycle maintenance costs for the alternatives presented have been estimated in terms of current year (2021) dollars for a 50-year period (2071). Costs for maintenance work occurring after the 50-year period are prorated. Life cycle costs are calculated as follows:

$$\text{Adjusted Cost (Prorated Year)} = \text{Cost (2021 dollars)} \times (1 + i)^n \quad \text{for } n \leq 50 \text{ years}$$

$$\text{Adjusted Cost (Prorated Year)} = \text{Cost (2021 dollars)} \times (1 + i)^{50} \times (n/50) \quad \text{for } n > 50 \text{ years}$$

$$\text{Present Worth (2021 dollars)} = \text{Present Worth Factor (P/F)} \times \text{Adjusted Cost (Prorated Year)}$$

$$\text{where: Present Worth Factor (P/F)} = 1 / (1 + i)^n$$

$$n = \text{year of maintenance work}$$

i = inflation at 3.8% for preliminary life cycle cost estimates

The total Life Cycle Cost is equal to the sum of the Present Worth (2021 dollars) of all anticipated maintenance work over the service life of the structure. ODOT's Estimator program has been utilized for standard pay items in these cost estimates. The residual value of the structure, upon completion of the 50-year study period, was not included in the life cycle cost analysis.

Alternative No. 1 – Deck Replacement

This alternative consists of performing a major rehabilitation of the existing bridge including replacement of the deck slabs and approach slabs, installation of continuity plate retrofits on the existing beams, and conversion of the abutments to semi-integral design.

Design considerations for Alternative No. 1 are as follows:

- **Span and Skew:** The existing spans are 45'-6"(\pm), 64'-6"(\pm) and 45'-6"(\pm) c/c bearings and the existing skew is 12°07'15"(\pm) left forward.
 - **Abutment Type:** The existing reinforced concrete stub abutments are converted to semi-integral design. To accomplish this, the existing abutment backwalls, turned-back wingwalls, and beam seat will be removed to approximately one foot below the existing beam seat elevation. New turned-back wingwalls will be constructed outside the width of the deck (in accordance with Standard Drawing SICD-1-96). The beam seat will be reconstructed to a lower elevation than existing to allow for the standard 9" minimum depth of concrete encasement below the beams for the new semi-integral abutment diaphragms, and semi-integral diaphragm guides will be added.
 - **Pier Type:** The existing reinforced concrete cap and column piers will remain. Concrete patching repairs will be performed as needed. Based on the existing shear stirrup spacing and analysis of similar existing cap and column piers on this project, fiber wrapping of the pier caps will be required to increase their shear capacity. No modification to the existing pier seat elevations is anticipated based on a proposed replacement of the existing low-profile steel bearings with elastomeric bearings (see next page).
 - **Foundation Type:** Pile foundations are assumed for the new abutment wingwalls based on the existing abutment foundations being supported on piles. Preliminary estimates use HP12x53 piles to match the existing abutment piles.
 - **Superstructure Type:** The proposed superstructure consists of separate left and right side composite reinforced concrete bridge decks with a 2" open joint at the median. Each deck is supported by ten (10) existing W36x150 steel beams. Bolted flange plate retrofits will be installed at the ends of all top
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flange beam continuity weld cover plates, in accordance with 2019 BDM 404.1.2.4.b.A. The proposed twin bridge decks have a total width of 143'-4" out/out and an overall length of 160.10'(±).

- **Bearing Replacement:** As part of converting the existing abutments to semi-integral design, the existing low-profile steel bearings at the abutments and piers will be removed and replaced with laminated elastomeric bearings. At the piers, the height of the proposed elastomeric bearings will be designed to equal that of the existing bearings plus the upward change in the bottom of beam elevations.
- **Superstructure Jacking:** In coordination with the bearing replacement, the existing beams will be raised by approximately 3" to increase vertical clearance and allow for the standard 9" minimum depth of concrete encasement below the beams for the new semi-integral abutment diaphragms. This adjustment is possible while maintaining the existing profile grade and providing 8.5" deck thickness and 2.0" minimum sacrificial haunch depth, for a total depth of 10.75" to top of beam, because there is excessive existing deck thickness. The excess is due to a 2.25"(±) to 1.25"(±) thick latex modified concrete overlay (feathered to be thickest at the abutments) and a uniform 3.0"(±) thick asphalt concrete overlay on the existing 8.25"(±) thick reinforced concrete bridge deck, for a total depth of 13.5"(±) to top of beam at the abutments.
- **Seismic Design:** Conversion of the abutments to semi-integral design and installation of expansion elastomeric bearings at the abutments and piers will satisfy AASHTO LRFD and ODOT BDM seismic design policy requirements for lateral restraint of the superstructure. In accordance with the ODOT BDM seismic design policy, the elimination of fixed bearings at the piers (by using elastomeric bearings) and providing seismic restraint at the abutments (by conversion to semi-integral design) will mean that no seismic retrofits to the existing pier columns will be required.
- **Approach Slabs:** The approach slab length is based on the requirements of 2019 BDM 209.5. The resulting length is 25 feet for the rear and forward approach slabs.

The rehabilitated bridge is expected to have a service life of 75 years, after which it will need to be rehabilitated or replaced. Costs involved in this alternative include initial construction costs and maintenance costs. The maintenance work required for this alternative during its service life includes the following:

- Reseal concrete surfaces (every 15 years).
- Paint the structural steel (at 25 years and at 50 years).
- Place MSC overlay on bridge deck and approach slabs (at 30 years).
- Replace the bridge deck and approach slabs; patch substructure concrete (at 45 years).

The total initial cost of **Alternative No. 1** is **\$3,964,000**.

The total cost, including life cycle costs, of **Alternative No. 1** is **\$6,618,000**.

Refer to *Appendix 1 – Estimates of Probable Construction Cost* for additional information.

Alternative No. 2 – Superstructure Replacement

This alternative consists of performing a major rehabilitation of the existing bridge including a full replacement of the existing superstructure, replacement of the approach slabs, and conversion of the abutments to semi-integral design.

Design considerations for Alternative No. 2 are as follows:

- Span and Skew: The existing spans are 45'-6"(\pm), 64'-6"(\pm) and 45'-6"(\pm) c/c bearings and the existing skew is 12°07'15"(\pm) left forward.
 - Abutment Type: The existing reinforced concrete stub abutments are converted to semi-integral design. To accomplish this, the existing abutment backwalls, turned-back wingwalls, and beam seat will be removed to approximately one foot below the existing beam seat elevation. New turned-back wingwalls will be constructed outside the width of the deck (in accordance with Standard Drawing SICD-1-96). The beam seat will be reconstructed to a lower elevation than existing to allow for the standard 9" minimum depth of concrete encasement below the beams for the new semi-integral abutment diaphragms, and semi-integral diaphragm guides will be added.
 - Pier Type: The existing reinforced concrete cap and column piers will remain. Concrete patching repairs will be performed as needed. Based on the existing shear stirrup spacing and analysis of similar existing cap and column piers on this project, fiber wrapping of the pier caps will be required to increase their shear capacity. No modification to the existing pier seat elevations is anticipated based on a proposed replacement of the existing low-profile steel bearings with elastomeric bearings (see below).
 - Foundation Type: Pile foundations are assumed for the new abutment wingwalls based on the existing abutment foundations being supported on piles. Preliminary estimates use HP12x53 piles to match the existing abutment piles.
 - Superstructure Type: The proposed superstructure consists of separate left and right side composite reinforced concrete bridge decks with a 2" open joint at the median. Each deck is supported by nine (9) proposed W33x118 steel beams. The proposed twin bridge decks have a total width of 143'-4" out/out and an overall length of 160.10'(\pm).
 - Bearing Replacement: As part of the superstructure replacement, laminated elastomeric bearings will be installed at the abutments and piers. At the piers, the height of the proposed elastomeric bearings will be designed to equal that of the existing bearings plus the upward change in the bottom of beam elevations.
 - Seismic Design: Conversion of the abutments to semi-integral design and installation of expansion elastomeric bearings at the abutments and piers will satisfy AASHTO LRFD and ODOT BDM seismic design requirements for lateral restraint of the superstructure. In accordance with the ODOT BDM
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seismic design policy, the elimination of fixed bearings at the piers (by using elastomeric bearings) and providing seismic restraint at the abutments (by conversion to semi-integral design) will mean that no seismic retrofits to the existing pier columns will be required.

- **Approach Slabs:** The approach slab length is based on the requirements of 2019 BDM 209.5. The resulting length is 25 feet for the rear and forward approach slabs.

The rehabilitated bridge is expected to have a service life of 75 years, after which it will need to be rehabilitated or replaced. Costs involved in this alternative include initial construction costs and maintenance costs. The maintenance work required for this alternative during its service life includes the following:

- Reseal concrete surfaces (every 15 years).
- Paint the structural steel (at 25 years and at 50 years).
- Place MSC overlay on bridge deck and approach slabs (at 30 years).
- Replace the bridge deck and approach slabs; patch substructure concrete (at 45 years).

The total initial cost of **Alternative No. 2** is **\$3,876,000**.

The total cost, including life cycle costs, of **Alternative No. 2** is **\$6,375,000**.

Refer to *Appendix 1 – Estimates of Probable Construction Cost* for additional information.

Alternative No. 3 – Complete Structure Replacement

This alternative consists of removing the existing bridge and constructing a new three-span continuous steel beam bridge with integral abutments and cap-and-column piers.

Design considerations for Alternative No. 3 are as follows:

- **Span and Skew:** The proposed spans are 45'-6", 64'-6" and 45'-6" c/c bearings and the proposed skew is 12°07'15" left forward.
 - **Abutment Type:** The proposed abutments are reinforced concrete integral abutments (in accordance with standard drawing ICD-1-82).
 - **Pier Type:** The proposed piers are reinforced concrete cap-and-column type piers.
 - **Foundation Type:** The proposed abutments will be supported on a single row of steel piles. The proposed piers will reuse the existing steel piles. Preliminary estimates use HP12x53 piles at the abutments.
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- Superstructure Type: The proposed superstructure consists of separate left and right side composite reinforced concrete bridge decks with a 2" open joint at the median. Each deck is supported by nine (9) proposed W33x118 steel beams. The proposed twin bridge decks have a total width of 143'-4" out/out and an overall length of 157.55'(±).
- Bearings: Laminated elastomeric bearings will be installed at the proposed piers.
- Seismic Design: The use of integral abutments and expansion elastomeric bearings at the piers will satisfy AASHTO LRFD and ODOT BDM seismic design requirements for lateral restraint of the superstructure. The proposed piers will be designed and detailed in accordance with all applicable AASHTO LRFD and ODOT BDM requirements for new structures.
- Approach Slabs: The approach slab length is based on the requirements of 2019 BDM 209.5. The resulting length is 25 feet for the rear and forward approach slabs.

The new bridge is expected to have a service life of 75 years, after which it will need to be rehabilitated or replaced. Costs involved in this alternative include initial construction costs and maintenance costs. The maintenance work required for this alternative during its service life includes the following:

- Reseal concrete surfaces (every 15 years).
- Paint the structural steel (at 25 years and at 50 years).
- Place MSC overlay on bridge deck and approach slabs (at 30 years).
- Replace the bridge deck and approach slabs; patch substructure concrete (at 45 years).

The total initial cost of Alternative No. 3 is **\$3,857,000**.

The total cost, including life cycle costs, of Alternative No. 3 is **\$6,376,000**.

Refer to *Appendix 1 – Estimates of Probable Construction Cost* for additional information.

CONCLUSIONS

The existing bridge requires replacement or rehabilitation in conjunction with the major reconstruction of the highway. The major difference between the three alternatives considered in this Bridge Type Study is the extent of replacement versus rehabilitation.

After reviewing the information presented in this report, DLZ concludes Alternative No. 2 – Superstructure Replacement has the least total cost, including life cycle cost, of the three feasible alternatives considered. The initial construction cost and total cost, including life cycle cost, of Alternative No. 2 is approximately 2.8% and 3.8%, respectively, lower than that of Alternative No. 1 – Deck Replacement. The initial construction cost of Alternative No. 3 – Complete Structure Replacement, is approximately 0.5% less than that of Alternative No. 2, but the total cost, including life cycle costs, of these two alternatives is approximately equal.

The construction duration for Alternative No. 1 – Deck Replacement and Alternative No. 2 – Superstructure Replacement will be approximately the same. Alternative No. 3 – Complete Structure Replacement will require a longer construction duration than the other alternatives due to the additional demolition, pile driving, and substructure construction required. A longer bridge construction duration will require longer maintenance of traffic phase durations, which translates to greater maintenance of traffic costs for the overall project. In addition, the initial construction cost for Alternative No. 3 – Complete Structure Replacement does not include costs related to the potential disturbance to Manchester Road, including costs to remove and replace pavement to construct the pier foundations and costs to maintain traffic on Manchester Road.

Alternative	Estimate of Probable Initial Construction Cost (2021 Dollars)	Total Life Cycle Cost (2021 Dollars)
No. 1 – Deck Replacement	\$3,964,000	\$6,618,000
No. 2 – Superstructure Replacement	\$3,876,000	\$6,375,000
No. 3 – Complete Structure Replacement	\$3,857,000	\$6,376,000



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

Structure Type Study
Bridge No. SUM-76-0914
Appendix 1

Appendix 1 – Estimates of Probable Construction Cost





CLIENT E.L. Robinson
PROJECT SUM-76/77-8.42/9.77 / PID 102329
SUBJECT Bridge No. SUM-76-0914C
Life Cycle Costs - Table of Alternatives

PROJECT NO. 1822-1016-00
COMP. BY PAT DATE 2/26/2019
CHECKED BY JAM DATE 3/18/2019

Summary of Total Construction Costs				
Option	Initial 2021 Const. Cost	Maintenance Costs	Life Cycle Cost *	Least Life Cycle Cost
Alternative No. 1 - Deck Replacement	\$ 3,964,000	\$ 2,654,000	\$ 6,618,000	
Alternative No. 2 - Superstructure Replacement	\$ 3,876,000	\$ 2,499,000	\$ 6,375,000	X
Alternative No. 3 - Complete Structure Replacement	\$ 3,857,000	\$ 2,519,000	\$ 6,376,000	

** Life Cycle Costs are based on a 50 year period.*

Calculation of Initial Construction Costs			
Option	Est. 2019 Const. Cost	Inflation 12.6%	Initial 2021 Const. Cost
Alternative No. 1 - Deck Replacement	\$ 3,520,000	\$ 443,520	\$ 3,964,000
Alternative No. 2 - Superstructure Replacement	\$ 3,441,500	\$ 433,629	\$ 3,876,000
Alternative No. 3 - Complete Structure Replacement	\$ 3,424,900	\$ 431,537	\$ 3,857,000

Inflation rate is per ODOT 2019-2023 Business Plan Inflation Calculator (Rev. 1/15/19) for construction midpoint date of 12/09/22.



CLIENT E.L. Robinson
PROJECT SUM-76/77-8.42/9.77 / PID 102329
SUBJECT Bridge No. SUM-76-0914C
Life Cycle Costs - Maintenance Costs

PROJECT NO. 1822-1016-00
COMP. BY PAT DATE 2/26/2019
CHECKED BY JAM DATE 3/19/2019

Determine annual maintenance costs for structure elements for a 50-year period in order to calculate Life Cycle Costs for each option.

Determine the present worth of each option's annual maintenance costs, $PWF = 1/((1 + I)^n)$

Baseline Information:

Year of Initial Construction = =

Discount Rate/Rate of Inflation =

Life Cycle Analysis for Year = =

Design Service Life = =



CLIENT E.L. Robinson
 PROJECT SUM-76/77-8.42/9.77 / PID 102329
 SUBJECT Bridge No. SUM-76-0914C
 Life Cycle Costs - Maintenance Costs

PROJECT NO. 1822-1016-00
 COMP. BY PAT DATE 2/26/2019
 CHECKED BY JAM DATE 3/19/2019

Estimated Quantities (Maintenance): Alternative No. 1 - Deck Replacement

At 15, 60 Years: Reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
512	SEALING OF CONCRETE SURFACES	1130	SY	\$ 20.00	\$ 22,600.00
SPECIAL	URETHANE TOP COAT SEALER	444	SY	\$ 15.00	\$ 6,660.00
SUBTOTAL =					\$ 29,260.00
20% CONTINGENCY =					\$ 5,852.00
TOTAL 2021 CONSTRUCTION COST =					\$ 35,112.00

At 25, 50 Years: Clean and repaint structural steel.

Item No.	Description	Quantity	Unit	Unit price	Cost
514	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	33,300	SF	\$ 8.00	\$ 266,400.00
514	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	33,300	SF	\$ 2.00	\$ 66,600.00
514	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	33,300	SF	\$ 1.75	\$ 58,275.00
514	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	33,300	SF	\$ 1.50	\$ 49,950.00
514	GRINDING FINS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL	40	MNHR	\$ 100.00	\$ 4,000.00
514	FINAL INSPECTION REPAIR	25	EACH	\$ 250.00	\$ 6,250.00
SUBTOTAL =					\$ 451,475.00
20% CONTINGENCY =					\$ 90,295.00
TOTAL 2021 CONSTRUCTION COST =					\$ 541,770.00

At 30 Years: Place MSC overlay on deck and approach slabs; reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
512	SEALING OF CONCRETE SURFACES	1130	SY	\$ 20.00	\$ 22,600.00
SPECIAL	URETHANE TOP COAT SEALER	444	SY	\$ 15.00	\$ 6,660.00
848	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION (1.25	1591	SY	\$ 65.00	\$ 103,415.00
848	SURFACE PREPARATION USING HYDRODEMOLITION	1591	SY	\$ 55.00	\$ 87,505.00
848	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS), MATER	4	CY	\$ 300.00	\$ 1,200.00
848	HAND CHIPPING	32	SY	\$ 100.00	\$ 3,200.00
848	TEST SLAB	1	LS	\$ 1,400.00	\$ 1,400.00
848	FULL DEPTH REPAIR	4	CY	\$ 650.00	\$ 2,600.00
SUBTOTAL =					\$ 228,580.00
20% CONTINGENCY =					\$ 45,716.00
TOTAL 2021 CONSTRUCTION COST =					\$ 274,296.00

At 45 Years: Replace deck and approach slabs; repair substructure concrete; reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
202	PORTIONS OF STRUCTURE REMOVED	792	CY	\$ 250.00	\$ 198,000.00
202	APPROACH SLAB REMOVED	793	SY	\$ 25.00	\$ 19,825.00
511	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	636	CY	\$ 690.00	\$ 438,840.00
511	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	156	CY	\$ 450.00	\$ 70,200.00
512	SEALING OF CONCRETE SURFACES	1130	SY	\$ 20.00	\$ 22,600.00
SPECIAL	URETHANE TOP COAT SEALER	444	SY	\$ 15.00	\$ 6,660.00
519	PATCHING CONCRETE STRUCTURE	301	SF	\$ 120.00	\$ 36,120.00
526	REINFORCED CONCRETE APPROACH SLABS (T=15")	793	SY	\$ 250.00	\$ 198,250.00
526	TYPE A INSTALLATION	288	FT	\$ 125.00	\$ 36,000.00
SUBTOTAL =					\$ 1,026,495.00
20% CONTINGENCY =					\$ 205,299.00
TOTAL 2021 CONSTRUCTION COST =					\$ 1,231,794.00



CLIENT E.L. Robinson
 PROJECT SUM-76/77-8.42/9.77 / PID 102329
 SUBJECT Bridge No. SUM-76-0914C
 Life Cycle Costs - Maintenance Costs

PROJECT NO. 1822-1016-00
 COMP. BY PAT DATE 2/26/2019
 CHECKED BY JAM DATE 3/19/2019

Estimated Quantities (Maintenance): Alternative No. 2 - Superstructure Replacement

At 15, 60 Years: Reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
512	SEALING OF CONCRETE SURFACES	1129	SY	\$ 20.00	\$ 22,580.00
SPECIAL	URETHANE TOP COAT SEALER	444	SY	\$ 15.00	\$ 6,660.00
SUBTOTAL =					\$ 29,240.00
20% CONTINGENCY =					\$ 5,848.00
TOTAL 2021 CONSTRUCTION COST =					\$ 35,088.00

At 25, 50 Years: Clean and repaint structural steel.

Item No.	Description	Quantity	Unit	Unit price	Cost
514	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	28,500	SF	\$ 8.00	\$ 228,000.00
514	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	28,500	SF	\$ 2.00	\$ 57,000.00
514	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	28,500	SF	\$ 1.75	\$ 49,875.00
514	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	28,500	SF	\$ 1.50	\$ 42,750.00
514	GRINDING FINS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL	40	MNHR	\$ 100.00	\$ 4,000.00
514	FINAL INSPECTION REPAIR	23	EACH	\$ 250.00	\$ 5,750.00
SUBTOTAL =					\$ 387,375.00
20% CONTINGENCY =					\$ 77,475.00
TOTAL 2021 CONSTRUCTION COST =					\$ 464,850.00

At 30 Years: Place MSC overlay on deck and approach slabs; reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
512	SEALING OF CONCRETE SURFACES	1129	SY	\$ 20.00	\$ 22,580.00
SPECIAL	URETHANE TOP COAT SEALER	444	SY	\$ 15.00	\$ 6,660.00
848	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION (1.25	1591	SY	\$ 65.00	\$ 103,415.00
848	SURFACE PREPARATION USING HYDRODEMOLITION	1591	SY	\$ 55.00	\$ 87,505.00
848	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS), MATER	4	CY	\$ 300.00	\$ 1,200.00
848	HAND CHIPPING	32	SY	\$ 100.00	\$ 3,200.00
848	TEST SLAB	1	LS	\$ 1,400.00	\$ 1,400.00
848	FULL DEPTH REPAIR	4	CY	\$ 650.00	\$ 2,600.00
SUBTOTAL =					\$ 228,560.00
20% CONTINGENCY =					\$ 45,712.00
TOTAL 2021 CONSTRUCTION COST =					\$ 274,272.00

At 45 Years: Replace deck and approach slabs; repair substructure concrete; reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
202	PORTIONS OF STRUCTURE REMOVED	790	CY	\$ 250.00	\$ 197,500.00
202	APPROACH SLAB REMOVED	793	SY	\$ 25.00	\$ 19,825.00
511	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	634	CY	\$ 690.00	\$ 437,460.00
511	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	156	CY	\$ 450.00	\$ 70,200.00
512	SEALING OF CONCRETE SURFACES	1129	SY	\$ 20.00	\$ 22,580.00
SPECIAL	URETHANE TOP COAT SEALER	444	SY	\$ 15.00	\$ 6,660.00
519	PATCHING CONCRETE STRUCTURE	309	SF	\$ 120.00	\$ 37,080.00
526	REINFORCED CONCRETE APPROACH SLABS (T=15")	793	SY	\$ 250.00	\$ 198,250.00
526	TYPE A INSTALLATION	288	FT	\$ 125.00	\$ 36,000.00
SUBTOTAL =					\$ 1,025,555.00
20% CONTINGENCY =					\$ 205,111.00
TOTAL 2021 CONSTRUCTION COST =					\$ 1,230,666.00



CLIENT E.L. Robinson
 PROJECT SUM-76/77-8.42/9.77 / PID 102329
 SUBJECT Bridge No. SUM-76-0914C
 Life Cycle Costs - Maintenance Costs

PROJECT NO. 1822-1016-00
 COMP. BY PAT DATE 2/26/2019
 CHECKED BY JAM DATE 3/19/2019

Estimated Quantities (Maintenance): Alternative No. 3 - Complete Structure Replacement

At 15, 60 Years: Reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
512	SEALING OF CONCRETE SURFACES	1429	SY	\$ 20.00	\$ 28,580.00
SUBTOTAL =					\$ 28,580.00
20% CONTINGENCY =					\$ 5,716.00
TOTAL 2021 CONSTRUCTION COST =					\$ 34,296.00

At 25, 50 Years: Clean and repaint structural steel.

Item No.	Description	Quantity	Unit	Unit price	Cost
514	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	28,500	SF	\$ 8.00	\$ 228,000.00
514	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	28,500	SF	\$ 2.00	\$ 57,000.00
514	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	28,500	SF	\$ 1.75	\$ 49,875.00
514	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	28,500	SF	\$ 1.50	\$ 42,750.00
514	GRINDING FINS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL	40	MNHR	\$ 100.00	\$ 4,000.00
514	FINAL INSPECTION REPAIR	23	EACH	\$ 250.00	\$ 5,750.00
SUBTOTAL =					\$ 387,375.00
20% CONTINGENCY =					\$ 77,475.00
TOTAL 2021 CONSTRUCTION COST =					\$ 464,850.00

At 30 Years: Place MSC overlay on deck and approach slabs; reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
512	SEALING OF CONCRETE SURFACES	1429	SY	\$ 20.00	\$ 28,580.00
848	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION (1.25	1572	SY	\$ 65.00	\$ 102,180.00
848	SURFACE PREPARATION USING HYDRODEMOLITION	1572	SY	\$ 55.00	\$ 86,460.00
848	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS), MATER	4	CY	\$ 300.00	\$ 1,200.00
848	HAND CHIPPING	31	SY	\$ 100.00	\$ 3,100.00
848	TEST SLAB	1	LS	\$ 1,400.00	\$ 1,400.00
848	FULL DEPTH REPAIR	4	CY	\$ 650.00	\$ 2,600.00
SUBTOTAL =					\$ 225,520.00
20% CONTINGENCY =					\$ 45,104.00
TOTAL 2021 CONSTRUCTION COST =					\$ 270,624.00

At 45 Years: Replace deck and approach slabs; repair substructure concrete; reseal concrete surfaces.

Item No.	Description	Quantity	Unit	Unit price	Cost
202	PORTIONS OF STRUCTURE REMOVED	771	CY	\$ 250.00	\$ 192,750.00
202	APPROACH SLAB REMOVED	782	SY	\$ 25.00	\$ 19,550.00
511	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	625	CY	\$ 690.00	\$ 431,250.00
511	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	146	CY	\$ 450.00	\$ 65,700.00
512	SEALING OF CONCRETE SURFACES	1429	SY	\$ 20.00	\$ 28,580.00
519	PATCHING CONCRETE STRUCTURE	640	SF	\$ 120.00	\$ 76,800.00
526	REINFORCED CONCRETE APPROACH SLABS (T=15")	782	SY	\$ 250.00	\$ 195,500.00
526	TYPE A INSTALLATION	288	FT	\$ 125.00	\$ 36,000.00
SUBTOTAL =					\$ 1,046,130.00
20% CONTINGENCY =					\$ 209,226.00
TOTAL 2021 CONSTRUCTION COST =					\$ 1,255,356.00



CLIENT E.L. Robinson
 PROJECT SUM-76/77-8.42/9.77 /PID 102329
 SUBJECT Bridge No. SUM-76-0914C
 Life Cycle Costs - Maintenance Costs (continued)

PROJECT NO. 1822-1016-00

COMP. BY PAT DATE 2/26/2019
 CHECKED BY JAM DATE 3/18/2019

Use Life Cycle Analysis for Year 50. Costs after the analysis year have been prorated.

Alternative No. 1 - Deck Replacement

Item	Number of Occurrences	Frequency of Occurrences	Year	Prorated Year	Date	Cost (2021 Dollars)	Adjusted Cost (Prorated Year)	P/F for Year 0	
								Factor	Cost (2021 \$)
Seal concrete surfaces	1	-	15	15	2036	\$ 35,112	\$ 61,435	0.57	\$ 35,112
Clean and repaint structural steel	1	-	25	25	2046	\$ 541,770	\$ 1,376,413	0.39	\$ 541,770
Place MSC overlay; seal concrete surfaces	1	-	30	30	2051	\$ 274,296	\$ 839,731	0.33	\$ 274,296
Replace deck; patch substructure; seal concrete surfaces	1	-	45	45	2066	\$ 1,231,794	\$ 6,598,102	0.19	\$ 1,231,794
Clean and repaint structural steel	1	-	50	50	2071	\$ 541,770	\$ 3,496,895	0.15	\$ 541,770
Seal concrete surfaces	1	-	60	50	2081	\$ 35,112	\$ 188,861	0.15	\$ 29,260
Total Maintenance Cost for Alternative No. 1 - Deck Replacement =								\$	\$ 2,654,002

Alternative No. 2 - Superstructure Replacement

Item	Number of Occurrences	Frequency of Occurrences	Year	Prorated Year	Date	Cost (2021 Dollars)	Adjusted Cost (Prorated Year)	P/F for Year 0	
								Factor	Cost (2021 \$)
Seal concrete surfaces	1	-	15	15	2036	\$ 35,088	\$ 61,393	0.57	\$ 35,088
Clean and repaint structural steel	1	-	25	25	2046	\$ 464,850	\$ 1,180,991	0.39	\$ 464,850
Place MSC overlay; seal concrete surfaces	1	-	30	30	2051	\$ 274,272	\$ 839,657	0.33	\$ 274,272
Replace deck; patch substructure; seal concrete surfaces	1	-	45	45	2066	\$ 1,230,666	\$ 6,592,059	0.19	\$ 1,230,666
Clean and repaint structural steel	1	-	50	50	2071	\$ 464,850	\$ 3,000,409	0.15	\$ 464,850
Seal concrete surfaces	1	-	60	50	2081	\$ 35,088	\$ 188,732	0.15	\$ 29,240
Total Maintenance Cost for Alternative No. 2 - Superstructure Replacement =								\$	\$ 2,498,966

Alternative No. 3 - Complete Structure Replacement

Item	Number of Occurrences	Frequency of Occurrences	Year	Prorated Year	Date	Cost (2021 Dollars)	Adjusted Cost (Prorated Year)	P/F for Year 0	
								Factor	Cost (2021 \$)
Seal concrete surfaces	1	-	15	15	2036	\$ 34,296	\$ 60,007	0.57	\$ 34,296
Clean and repaint structural steel	1	-	25	25	2046	\$ 464,850	\$ 1,180,991	0.39	\$ 464,850
Place MSC overlay; seal concrete surfaces	1	-	30	30	2051	\$ 270,624	\$ 828,489	0.33	\$ 270,624
Replace deck; patch substructure; seal concrete surfaces	1	-	45	45	2066	\$ 1,255,356	\$ 6,724,311	0.19	\$ 1,255,356
Clean and repaint structural steel	1	-	50	50	2071	\$ 464,850	\$ 3,000,409	0.15	\$ 464,850
Seal concrete surfaces	1	-	60	50	2081	\$ 34,296	\$ 184,472	0.15	\$ 28,580
Total Maintenance Cost for Alternative No. 3 - Complete Structure Replacement =								\$	\$ 2,518,556

Estimate SUM-76-0914 (1)

Estimated Cost:\$2,933,272.69

Contingency: 20.00%

Estimated Total: \$3,519,927.23

SUM-76-0914 (Manchester Rd/SR 93) Bridge
Alternative 1 - Deck Replacement

Base Date: 01/01/21

Spec Year: 19

Unit System: E

Work Type: BRIDGE REHABILITATION

Highway Type:

Urban/Rural Type: URBAN CLASS

Season: SUMMER

County: SUMMIT

Latitude of Midpoint: 410340

Longitude of Midpoint: 813303

District: 04

Federal/State Project Number: 102329

Estimate Type: Type Study

Prepared by PAT on 03/20/19

Checked by JAM on 03/20/19

Approved by CJS on 08/28/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 0001: Structures (Alternative No. 1)

0001	202E11203	1.000	LS	\$280,000.00000	\$280,000.00
PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN					
0002	202E22900	533.000	SY	\$20.57861	\$10,968.40
APPROACH SLAB REMOVED					
0003	202E23500	2,961.000	SY	\$4.26749	\$12,636.04
WEARING COURSE REMOVED					
0004	202E32800	1,571.000	SY	\$15.94421	\$25,048.35
CONCRETE SLOPE PROTECTION REMOVED					
0005	503E11100	1.000	LS	\$50,000.00000	\$50,000.00
COFFERDAMS AND EXCAVATION BRACING					
0006	503E21100	368.000	CY	\$52.74210	\$19,409.09
UNCLASSIFIED EXCAVATION					
0007	505E11100	1.000	LS	\$25,000.00000	\$25,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0008	507E00200	420.000	FT	\$30.65019	\$12,873.08
STEEL PILES HP12X53, FURNISHED					
0009	507E00250	380.000	FT	\$11.88802	\$4,517.45
STEEL PILES HP12X53, DRIVEN					
0010	509E10000	197,200.000	LB	\$0.88273	\$174,074.36
EPOXY COATED REINFORCING STEEL					
0011	511E33501	4.000	EACH	\$3,000.00000	\$12,000.00
SEMI-INTEGRAL DIAPHRAGM GUIDE, AS PER PLAN					
0012	511E34446	796.000	CY	\$690.00000	\$549,240.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK					
0013	511E34450	156.000	CY	\$450.00000	\$70,200.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0014	511E43512	68.000	CY	\$700.00000	\$47,600.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT INCLUDING FOOTING					
0015	512E10100	1,130.000	SY	\$18.04207	\$20,387.54
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0016	512E71500	444.000	SY	\$15.32694	\$6,805.16
SPECIAL - URETHANE TOP COAT SEALER					
0017	513E10200	2,800.000	LB	\$9.15016	\$25,620.45
STRUCTURAL STEEL MEMBERS, LEVEL UP					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0018	513E20000	9,420.000	EACH	\$3.04887	\$28,720.36
WELDED STUD SHEAR CONNECTORS					
0019	513E95030	80.000	EACH	\$1,100.00000	\$88,000.00
STRUCTURAL STEEL, MISC.: CONTINUITY PLATE RETROFIT, LEVEL UF					
0020	514E00050	33,300.000	SF	\$7.57749	\$252,330.42
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL					
0021	514E00056	33,300.000	SF	\$1.83826	\$61,214.06
FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT					
0022	514E00060	33,300.000	SF	\$1.62474	\$54,103.84
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0023	514E00066	33,300.000	SF	\$1.28601	\$42,824.13
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0024	514E00504	40.000	MNHR	\$96.87331	\$3,874.93
GRINDING FINS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL					
0025	514E10000	25.000	EACH	\$231.14170	\$5,778.54
FINAL INSPECTION REPAIR					
0026	516E14020	314.000	FT	\$21.70367	\$6,814.95
SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0027	516E44100	80.000	EACH	\$1,000.00000	\$80,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0028	516E47000	1.000	LS	\$120,000.00000	\$120,000.00
JACKING AND TEMPORARY SUPPORT OF SUPERSTRUCTURE					
0029	518E21200	192.000	CY	\$72.00000	\$13,824.00
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0030	519E00100	8,426.000	SF	\$60.00000	\$505,560.00
SPECIAL - COMPOSITE FIBER WRAP SYSTEM					
0031	519E11100	74.000	SF	\$104.60777	\$7,740.97
PATCHING CONCRETE STRUCTURE					
0032	526E25010	793.000	SY	\$233.12024	\$184,864.35
REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=15")					
0033	526E90010	288.000	FT	\$103.24917	\$29,735.76
TYPE A INSTALLATION					
0034	601E21000	1,762.000	SY	\$57.60866	\$101,506.46
CONCRETE SLOPE PROTECTION					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Total for Group 0001:\$2,933,272.69

Estimate SUM-76-0914 (2)

Estimated Cost:\$2,867,882.52

Contingency: 20.00%

Estimated Total: \$3,441,459.02

SUM-76-0914 (Manchester Rd/SR 93) Bridge
Alternative 2 - Superstructure Replacement

Base Date: 01/01/21

Spec Year: 19

Unit System: E

Work Type: BRIDGE REHABILITATION

Highway Type:

Urban/Rural Type: URBAN CLASS

Season: SUMMER

County: SUMMIT

Latitude of Midpoint: 410340

Longitude of Midpoint: 813303

District: 04

Federal/State Project Number: 102329

Estimate Type: Type Study

Prepared by PAT on 03/20/19

Checked by JAM on 03/20/19

Approved by CJS on 08/28/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 0001: Structures (Alternative No. 2)

0001	202E11203	1.000	LS	\$300,000.00000	\$300,000.00
PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN					
0002	202E22900	533.000	SY	\$20.57861	\$10,968.40
APPROACH SLAB REMOVED					
0003	202E23500	2,961.000	SY	\$4.26749	\$12,636.04
WEARING COURSE REMOVED					
0004	202E32800	1,571.000	SY	\$15.94421	\$25,048.35
CONCRETE SLOPE PROTECTION REMOVED					
0005	503E11100	1.000	LS	\$50,000.00000	\$50,000.00
COFFERDAMS AND EXCAVATION BRACING					
0006	503E21100	368.000	CY	\$52.74210	\$19,409.09
UNCLASSIFIED EXCAVATION					
0007	505E11100	1.000	LS	\$25,000.00000	\$25,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0008	507E00200	420.000	FT	\$30.65019	\$12,873.08
STEEL PILES HP12X53, FURNISHED					
0009	507E00250	380.000	FT	\$11.88802	\$4,517.45
STEEL PILES HP12X53, DRIVEN					
0010	509E10000	195,800.000	LB	\$0.88351	\$172,991.26
EPOXY COATED REINFORCING STEEL					
0011	511E33501	4.000	EACH	\$3,000.00000	\$12,000.00
SEMI-INTEGRAL DIAPHRAGM GUIDE, AS PER PLAN					
0012	511E34446	784.000	CY	\$690.00000	\$540,960.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK					
0013	511E34450	156.000	CY	\$450.00000	\$70,200.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0014	511E43512	78.000	CY	\$700.00000	\$54,600.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT INCLUDING FOOTING					
0015	512E10100	1,129.000	SY	\$18.04436	\$20,372.08
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0016	512E71500	444.000	SY	\$15.32694	\$6,805.16
SPECIAL - URETHANE TOP COAT SEALER					
0017	513E10260	365,700.000	LB	\$1.33512	\$488,253.38
STRUCTURAL STEEL MEMBERS, LEVEL 3					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0018	513E20000	8,478.000	EACH	\$3.05425	\$25,893.93
WELDED STUD SHEAR CONNECTORS					
0019	514E00060	28,500.000	SF	\$1.72780	\$49,242.30
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0020	514E00066	28,500.000	SF	\$1.35916	\$38,736.06
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0021	514E10000	23.000	EACH	\$231.71522	\$5,329.45
FINAL INSPECTION REPAIR					
0022	516E14020	314.000	FT	\$21.70367	\$6,814.95
SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0023	516E44100	72.000	EACH	\$1,000.00000	\$72,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0024	518E21200	192.000	CY	\$72.00000	\$13,824.00
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0025	519E00100	8,426.000	SF	\$60.00000	\$505,560.00
SPECIAL - COMPOSITE FIBER WRAP SYSTEM					
0026	519E11100	74.000	SF	\$104.60777	\$7,740.97
PATCHING CONCRETE STRUCTURE					
0027	526E25010	793.000	SY	\$233.12024	\$184,864.35
REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=15")					
0028	526E90010	288.000	FT	\$103.24917	\$29,735.76
TYPE A INSTALLATION					
0029	601E21000	1,762.000	SY	\$57.60866	\$101,506.46
CONCRETE SLOPE PROTECTION					

Total for Group 0001:\$2,867,882.52

Estimate SUM-76-0914 (3)

Estimated Cost:\$2,854,065.68

Contingency: 20.00%

Estimated Total: \$3,424,878.82

SUM-76-0914 (Manchester Rd/SR 93) Bridge
Alternative 3 - Complete Structure Replacement

Base Date: 01/01/21

Spec Year: 19

Unit System: E

Work Type: BRIDGE REPLACEMENT

Highway Type:

Urban/Rural Type: URBAN CLASS

Season: SUMMER

County: SUMMIT

Latitude of Midpoint: 410340

Longitude of Midpoint: 813303

District: 04

Federal/State Project Number: 102329

Estimate Type: Type Study

Prepared by PAT on 03/20/19

Checked by JAM on 03/20/19

Approved by CJS on 08/28/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 0001: Structures (Alternative No. 3)

0001	202E11003	1.000	LS	\$530,000.00000	\$530,000.00
STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN					
0002	202E22900	533.000	SY	\$20.46449	\$10,907.57
APPROACH SLAB REMOVED					
0003	202E23500	2,961.000	SY	\$4.26749	\$12,636.04
WEARING COURSE REMOVED					
0004	202E32800	1,571.000	SY	\$13.06527	\$20,525.54
CONCRETE SLOPE PROTECTION REMOVED					
0005	503E11100	1.000	LS	\$50,000.00000	\$50,000.00
COFFERDAMS AND EXCAVATION BRACING					
0006	503E21100	596.000	CY	\$36.34656	\$21,662.55
UNCLASSIFIED EXCAVATION					
0007	505E11100	1.000	LS	\$25,000.00000	\$25,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0008	507E00200	2,310.000	FT	\$28.35499	\$65,500.03
STEEL PILES HP12X53, FURNISHED					
0009	507E00250	2,090.000	FT	\$12.05855	\$25,202.37
STEEL PILES HP12X53, DRIVEN					
0010	509E10000	231,800.000	LB	\$0.86531	\$200,578.86
EPOXY COATED REINFORCING STEEL					
0011	511E34446	733.000	CY	\$690.00000	\$505,770.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK					
0012	511E34450	146.000	CY	\$450.00000	\$65,700.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0013	511E41012	212.000	CY	\$522.80804	\$110,835.30
CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS					
0014	511E43512	202.000	CY	\$700.00000	\$141,400.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT INCLUDING FOOTING					
0015	511E46512	146.000	CY	\$255.47580	\$37,299.47
CLASS QC1 CONCRETE WITH QC/QA, FOOTING					
0016	512E10100	1,429.000	SY	\$16.22973	\$23,192.28
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0017	513E10260	365,700.000	LB	\$1.33512	\$488,253.38
STRUCTURAL STEEL MEMBERS, LEVEL 3					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0018	513E20000	8,478.000	EACH	\$3.16086	\$26,797.77
WELDED STUD SHEAR CONNECTORS					
0019	514E00060	28,500.000	SF	\$1.72780	\$49,242.30
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0020	514E00066	28,500.000	SF	\$1.49090	\$42,490.65
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0021	514E10000	23.000	EACH	\$335.52887	\$7,717.16
FINAL INSPECTION REPAIR					
0022	516E14014	324.000	FT	\$21.03453	\$6,815.19
INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0023	516E44100	36.000	EACH	\$1,000.00000	\$36,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0024	518E21200	208.000	CY	\$72.00000	\$14,976.00
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0025	526E25010	782.000	SY	\$242.97006	\$190,002.59
REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=15")					
0026	526E90010	288.000	FT	\$115.84967	\$33,364.70
TYPE A INSTALLATION					
0027	601E21000	1,762.000	SY	\$63.67533	\$112,195.93
CONCRETE SLOPE PROTECTION					

Total for Group 0001:\$2,854,065.68

SUM-76-8.42/SUM-77-9.77

Structure Type Study

SUM-76-0954

SFN 7703457 - PID 102329

Bridge No. SUM-76-0954 I-76/77 over Bowery St. and Ohio Canal



Submitted to ODOT - District 4

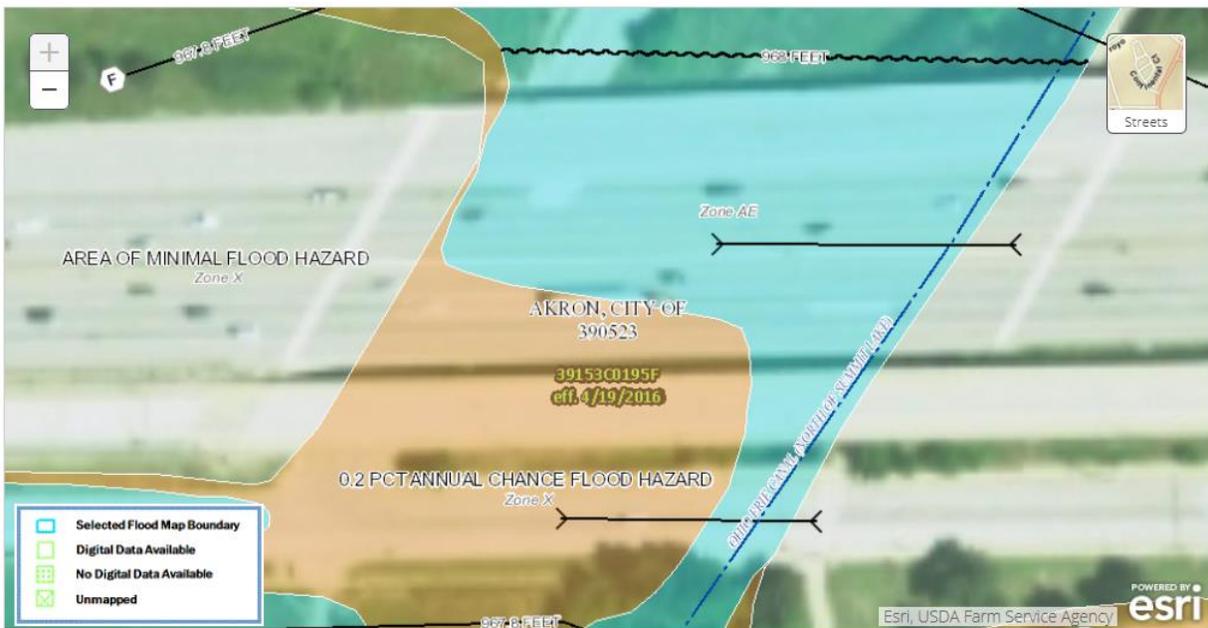
August 2019

Prepared By



E.L. Robinson Engineering of Ohio Co. (ELR) has prepared this SUM-76-0954 Structure Type Study for the Ohio Department of Transportation (ODOT) to identify feasible rehabilitation or replacement alternatives for the existing Interstate Route 76 bridge (SFN 7703457) over Bowery Street and the Ohio Canal. This project is part of a larger Design Build project involving roadway improvements and major rehabilitation work along Interstate Routes 76 and 77. This bridge is under consideration for rehabilitation or replacement due to the bridge nearing the end of the service life. The existing structure, built in 1963 and rehabilitated in 1986, consists of one eastbound bridge and one westbound bridge. The bridges are six-span continuous rolled beam bridges with reinforced concrete deck on reinforced cap and column piers and stub abutments. The total structure length is approximately 425.8' and has a skew of 33°26'15" L.F. The structure carries eight lanes of traffic, three eastbound lanes with an overall width of 59'-2" and five westbound lanes with a varying overall width of 91'-2" to 98'-9". The existing vertical clearance over Bowery Street is approximately 15.34' and the vertical clearance over the Ohio Canal is 22.18'. The required vertical clearance over Bowery Street is 14'-6".

The bridge is currently in a Zone AE FEMA floodplain. It was determined that the FEMA floodplain was developed using the approximate method without a defined floodway. ELR contacted FEMA to determine options for work within this floodplain. The water surface elevation (WSE) may only be raised one foot from its undeveloped condition. A new analysis of the canal by itself would need to be run, then the freeway and bounding roadways would need to be added to determine if the WSE raised more than a foot. The South Street bridge likely raises the WSE most of the one foot all by itself. ELR is skeptical that we could substantially fill in the 1st, 2nd, and 3rd spans and meet this 1-foot requirement.



ELR considered four alternatives that would be appropriate for this structure. The four alternatives consist of a deck replacement, superstructure and partial abutment replacement, a total replacement of the structure in kind, and a total replacement of the structure as a single span bridge.

Alternative 1:

- Deck Replacement

This alternative provides a replacement of the reinforced concrete deck, backwall, and barriers. The eastbound structure will have an out to out width of 59'-5", carrying three lanes of traffic. This is 3 inches wider than the existing due to the lateral clearance requirements of the 10-foot shoulder for an urban interstate with uncurbed shoulders. The westbound structure will be the same as the existing and have a varying out to out width of 91'-2" to 98'-9". This allows for three lanes of traffic, two 10' shoulders and two additional lanes of traffic coming from the State Route 59 Southwest Ramp.

The abutment will not be converted to semi-integral due to the extra loading it would require on the existing spread footings, which could cause settlement problems. The existing abutment A2 (East Abutment) has settled approximately 4 inches since the original construction as evidenced by the fill plates under the bearings and the difference in elevation between the widened ramp abutment and the original abutment



The proposed alternative will match the existing profile and consist of an 8½" reinforced concrete deck designed as composite. The proposed barriers will follow the ODOT standard drawings, SBR-1-13, and SBR-2-13 for the median. The vertical clearance over Bowery Street and low chord elevation of the Ohio Canal will remain the same as the existing condition, and the beams will not be required to be raised. Additionally, the beams will require fatigue retrofit plates, for the cover plates and beam continuity welds, and painting.

The existing bridge was rated using the AASHTOWare Bridge Rating program BrR. Per the 2019 Bridge Design Manual, rehabilitated structures are to be designed per LRFD using the HL-93 Inventory Loading with accommodations for a 60 psf future wearing surface. Using this loading with the 60 psf future wearing surface load and non-composite deck, all of the beams failed to meet inventory loading on the Westbound portion of the bridge, and all but one beam failed on the Eastbound portion. The proposed bridge deck was then rated as composite using the same inventory loading. This resulted in the original beams meeting inventory loading, but the five beams for the ramp portion failed to meet the HL-93 inventory loading with future wearing surface. The five beams carrying the SR-59 SB entrance ramp to I-76 westbound were constructed with no moment plates welded to the top flange over the piers, however, there are moment plates welded to the bottom flange. This was done to eliminate a fatigue prone detail in the tension areas over the pier. The addition of bolted moment plates to the top flanges over the piers may allow for the ramp beams to be strengthened to meet the HL-93 Inventory Loading with future wearing surface. The original beams have moment plates both top and bottom over the piers. For all the beams to be reused with a deck replacement, the existing ramp beams would require a design exception or need to be strengthened at the piers.

Pier 3, which is fixed, will require a seismic retrofit. This consists of wrapping the full height of all the columns for this pier with composite fiber wrap. All of the pier caps, excluding the ramp piers, are failing in shear and some of them are also failing in moment. To strengthen the mainline caps, they must all be wrapped with a composite fiber wrap. In addition, the moment capacity of the pier caps is not adequate for HL-93 with the future wearing surface.

Although all of the piers were not analyzed, by comparison to the piers that were checked, we anticipate the other mainline piers will definitely require shear strengthening and will most likely require strengthening for moment. See Table 1 for details. In order to increase the pier cap moment capacity, the existing bearings would be replaced with elastomeric bearings and the top of each cap would be raised. This would increase the depth and allow supplemental reinforcement to be added. It should be noted that raising the pier caps alone will not be sufficient to address the shear deficiency and the fiber wrap will still be required.

SUM-076-0954 BRIDGE OVER BOWERY STREET					
Substructure Unit	Construction Year	# Load Cases Checked	Loading	Overall Shear Capacity Check	Overall Moment Capacity Check
Pier 1	1961	3	HL-93 & 60 psf FWS	FAIL	FAIL
Pier 3	1961	3	HL-93 & 60 psf FWS	FAIL	FAIL
Ramp Pier 1	1984	2	HL-93 & 60 psf FWS	PASS	FAIL

Table 1 – Shear and Moment Check

During construction, two 11-foot lanes of traffic will be maintained in each direction. To keep the eastbound and westbound traffic on their respective structures, the temporary shoulders will need to be reduced to one foot. (If two-foot shoulders are desired, a contraflow MOT scheme would be required). The construction can be completed in either two or three phases. To be completed in two phases, the State Route 59 Southbound Ramp will need to be closed for a portion of the construction. If the ramp needs to remain open, then the construction can be completed in three phases while maintaining one lane of traffic for the ramp.

Alternative 2:

- Superstructure and Abutment Replacement, Piers to Remain

This alternative provides a replacement of the reinforced concrete decks, median, bridge barriers, rolled steel beams, cross frames, bearings, and the abutments for the original bridge. The proposed eastbound structure will be 59'-5" wide, carrying three lanes of traffic and the westbound structure will vary from 91'-2" to 98'-9" wide, carrying five lanes of traffic. The eastbound structure is 3 inches wider than the existing due to the lateral clearance requirements of the 10-foot shoulder for an urban interstate with uncurbed shoulders. The proposed deck will be an 8½" composite reinforced concrete deck and will maintain a similar profile as the existing structure. The proposed barriers will follow the ODOT standard drawing, SBR-1-13, and SBR-2-13 for the median.

The existing abutments under the original bridge will be removed and replaced with reinforced concrete semi-integral abutments. The bridge exceeds the 400-foot limit in the Bridge Design Manual for Semi-Integral abutments by 25 feet. Though this exceeds the recommendation of the BDM, ELR recommends Semi-Integral Abutments be allowed for this structure to eliminate future issues with expansion joints. Integral abutments cannot be used for this bridge due to the 32° skew being larger than the 30° skew limit. The proposed abutments will be placed on either steel or cast-in-place concrete piles. The existing abutments under the ramp portion of the bridge are on piles and may be converted to semi-integral if additional analysis of the substructure is performed by the design-build team for the proposed loading. The existing beams will be replaced with either new steel rolled beams, or prestressed concrete I-beams. With the steel beam option, the beams will be replaced with similar sized sections, but with additional evaluation the beam sizes may be reduced. The prestressed concrete I-beams may not be a viable option due to the additional weight. Substructure evaluation by the design-build team would be required.

For both replacement types, steel beams and concrete I-beams, the existing bearings will be replaced with elastomeric bearings. Changing from the existing rocker type to elastomeric bearings will reduce the bearing height, which will require additional concrete at the abutments and piers to maintain the current vertical clearance over Bowery Street, the Ohio Canal, and the Tow Path. This alternative will not require a seismic retrofit since all of the pier bearings will be replaced with expansion bearings, but all of the mainline pier caps will still require a composite fiber wrap to strengthen them for shear capacity. As stated under Alternative 2, the pier caps will need to be strengthened for moment, which can be accomplished when raising the pier caps to accommodate the elastomeric bearings and adding additional reinforcing steel and increasing the depth of the pier cap.

During construction, two 11-foot lanes of traffic will be maintained in each direction. To keep the eastbound and westbound traffic on their respective structures, the temporary shoulders will need to be reduced to one foot. (If two-foot shoulders are desired, a contraflow MOT scheme would be required). The construction can be completed in either two or three phases. To be completed in two phases, the State Route 59 Southbound Ramp will need to be closed for a portion of the construction. If the ramp needs to remain open, then the construction can be completed in three phases while maintaining one lane of traffic for the ramp. Depending on the dead load deflections, a closure pour may be needed.

Alternative 3:

- Total Replacement of the Structure with Similar Bridge Limits

This alternative provides a complete structure replacement, similar to the existing six-span continuous rolled beam bridge. The proposed eastbound structure will be 59'-5" wide, carrying three lanes of traffic and the westbound structure will vary from 91'-2" to 98'-9" wide, carrying five lanes of traffic. The eastbound structure is 3 inches wider than the existing due to the lateral clearance requirements of the 10-foot shoulder for an urban interstate with uncurbed shoulders. The proposed deck will be an 8½" composite reinforced concrete deck and will maintain a similar profile as the existing structure. The proposed barriers will follow the ODOT standard

drawing, SBR-1-13, and SBR-2-13 for the median. The beams will be replaced with either new steel rolled beams or prestressed concrete I-beams. The existing rocker type bearings will be replaced with elastomeric bearings.

All of the substructures will be replaced as well, including both abutments, wingwalls, spread footings, and the five sets of piers. The rear and forward abutments will be replaced with reinforced concrete semi-integral abutments placed on either steel or cast-in-place piles. Integral abutments may be used for this bridge if the proposed structure skew is reduced to 30° skew or less. The rear abutment will remain continuous between the two bridges with a width of approximately 176 feet. The forward abutment will also remain continuous between the two bridges with an approximate width of 187 feet. The five sets of piers will be replaced with new reinforced concrete cap and columns. The existing piles may be able to be reused after further evaluation by the design-build team with the new loads, otherwise new cast-in-place piles should be installed.

During construction, two 11-foot lanes of traffic will be maintained in each direction. All the traffic will be shifted to the existing eastbound or westbound bridge for the first phase of construction. Then traffic will be shifted to the new eastbound or westbound bridge for the second phase of construction. The temporary shoulders for both phases will be two feet. The State Route 59 southwest ramp will be closed during the removal and construction of the westbound bridge. It is anticipated that a contraflow type of MOT would be easier for construction, but half width phasing could also be done with reducing the temporary shoulder widths to one foot. On Bowery Street, lane closures will be needed and should be coordinated with the City of Akron.

Alternative 4:

- Total Replacement of the Structure to Single Span

This alternative provides a complete structure replacement, reducing the existing six-span structure to a single span structure over the Ohio Canal and Tow Path Trail. The proposed eastbound structure will be 59'-5" wide, carrying three lanes of traffic and the westbound structure will vary from approximately 95'-4" to 98'-9" wide, carrying five lanes of traffic. The eastbound structure is 3 inches wider than the existing due to the lateral clearance requirements of the 10-foot shoulder for an urban interstate with uncurbed shoulders. The proposed deck will be an 8½" composite reinforced concrete deck and will maintain a similar profile as the existing structure. The proposed barriers will follow the ODOT standard drawing, SBR-1-13, and SBR-2-13 for the median. The beams will be replaced with either new steel rolled beams or prestressed concrete I-beams. The existing rocker type bearings will be replaced with elastomeric bearings.

The rear abutment will be removed and relocated closer to where the current fourth pier is, near the Ohio Canal, so that the bridge will have only one span. With the utilizations of MSE walls, the area under the existing bridge from rear abutment to pier 4, approximately 270' in length, will be filled in. This will shorten the new bridge to a span of approximately 150'-0". Additionally, this will permanently close Bowery Street under the bridge and require a detour along Lake Shore Boulevard and Russel Avenue. The proposed abutments will be reinforced concrete semi-integral abutments placed on either steel or cast-in-place piles. The rear abutment will remain

continuous between the two bridges with a width of approximately 180 feet and also have an MSE in front of it. The forward abutment will also remain continuous between the two bridges with an approximate width of 187 feet.

During construction, two 11-foot lanes of traffic will be maintained in each direction. All the traffic will be shifted to the existing eastbound or westbound bridge for the first phase of construction. Then traffic will be shifted to the new eastbound or westbound bridge for the second phase of construction. The temporary shoulders for both phases will be two feet. The State Route 59 southwest ramp will be closed during the removal and construction of the westbound bridge. It is anticipated that a contraflow type of MOT would be easier for construction, but half width phasing could also be done with reducing the temporary shoulder widths to one foot.

Borings from earlier geotechnical explorations (1960s and 1980s) encountered deposits of peat and marly organic clayey silt. This material is highly compressible and has low shear strength. Attempting to build embankment on this soil will greatly increase the risk of slope instability, possibly leading to a slope failure into the Ohio Canal. While a stable embankment could possibly be constructed, replacing the existing bridge with embankment will also cause significant settlement of the embankment that can add many months to the construction schedule. With phased construction, placing embankment near the existing bridge piers can cause lateral movement of the pier foundations. This happened in 2014 on the I-495 bridge in Delaware, leading the DOT to close the bridge for two months while repairs were made. Placing embankment near the existing bridge piers will also cause settlement of the soil around the pier piles, creating additional downdrag loads that the piles were not designed for. To avoid all these risks, we recommend not changing the extent of the bridge limits.

Additionally, as stated above, the bridge is currently in a Zone AE FEMA floodplain. A new analysis of the canal by itself would need to be run, then the freeway and bounding roadways would need to be added to determine if the WSE raised more than a foot. The South Street bridge likely raises the WSE most of the one foot all by itself. ELR is skeptical that we could substantially fill in the 1st, 2nd, and 3rd spans and meet this 1-foot requirement.

Conclusions:

This report provides the preliminary design for four replacement alternatives. Preliminary cost estimates have been developed for each alternative. The cost for Alternative 1 includes the cost to strengthen the pier caps and ramp beams as well as the cost of the fatigue retrofit plates. The Alternative 2 estimate included the cost to strengthen the pier caps and is based on using new steel beams. The estimates for Alternatives 3 and 4 assume that steel beams will be used. All four cost estimates include a 20% contingency. See Table 2 and Attachment A for detailed cost estimates.

The life cycle costs for Alternative 1 are anticipated to be the most of all the alternatives due to possible future rehabilitation or replacement of beam ends and painting. For Alternatives 2 and 3, the life cycle costs will be similar. These alternatives will require painting of the beams and sealing of the concrete structures at similar time frames. The life cycle costs of Alternative 4 will likely be the smallest of the four options due to the decreased bridge length. This alternative will require beam painting and at a similar time to Alternatives 2 and 3 but due to the shortened beam lengths this cost will be less.

Cost Comparison Between Alternatives	
Alternative	Initial Structure Cost
1	\$7,575,000
2	\$8,903,000
3	\$11,619,700
4	\$8,165,600

Table 2 – Structure Alternative Cost Comparison

Alternative 1 has the lowest estimated cost but it also requires a significant amount of strengthening and retrofitting. Future maintenance costs for Alternatives 1 through 3 are anticipated to be similar for steel superstructures. If concrete beams were used for Alternatives 2 and 3, then the maintenance costs would be reduced. Alternative 4 should have lower maintenance cost due to the reduced bridge length. However, Alternative 4 is not recommended due to the settlement concerns discussed previously.

ATTACHMENTS:

Attachment A – Detailed Cost Estimates

Estimate Bowery Street

Estimated Cost:\$6,312,467.95

Contingency: 20.00%

Estimated Total: \$7,574,961.54

Bowery Street - Deck Replacement

Base Date: 03/19/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number: 7703457

Prepared by Lauren Hedges on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 1500: Structure

0006	202E22900 APPROACH SLAB REMOVED	824.000	SY	\$28.83221	\$23,757.74
0007	202E23500 WEARING COURSE REMOVED	7,089.000	SY	\$3.74761	\$26,566.81
0008	503E11100 COFFERDAMS AND EXCAVATION BRACING	1.000	LS	\$12,500.00000	\$12,500.00
0009	503E21301 UNCLASSIFIED EXCAVATION, AS PER PLAN	1.000	LS	\$15,000.00000	\$15,000.00
0011	509E10000 EPOXY COATED REINFORCING STEEL	505,645.000	LB	\$1.17000	\$591,604.65
0012	510E10000 DOWEL HOLES WITH NONSHRINK, NONMETALLIC GROUT	1,266.000	EACH	\$13.76697	\$17,428.98
0013	511E21522 CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	1,896.000	CY	\$661.66666	\$1,254,519.99
0014	511E34450 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	332.000	CY	\$410.00000	\$136,120.00
0015	511E44112 CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING	106.000	CY	\$525.00000	\$55,650.00
0016	512E10100 SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	3,877.000	SY	\$14.82687	\$57,483.77
0017	512E74000 REMOVAL OF EXISTING COATINGS FROM CONCRETE SURFACES	1,861.000	SY	\$9.56241	\$17,795.65
0019	513E20000 WELDED STUD SHEAR CONNECTORS	35,471.000	EACH	\$2.81529	\$99,861.15
0020	513E90000 STRUCTURAL STEEL, MISC.: CROSS FRAME REPLACEMENT	12,448.000	LB	\$5.00000	\$62,240.00
0021	513E90000 STRUCTURAL STEEL, MISC.: FATIGUE RETROFIT AND BEAM STRENGTHENING PLATES	72,318.000	LB	\$10.00000	\$723,180.00
0022	514E00050 SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	88,488.000	SF	\$8.20242	\$725,815.74
0023	514E00056 FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	88,488.000	SF	\$1.67010	\$147,783.81
0024	514E00060 FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	88,488.000	SF	\$2.35742	\$208,603.38
0025	514E00066 FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	88,488.000	SF	\$2.29028	\$202,662.30

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
	Description <u>Supplemental Description</u>				
	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT				
0026	514E00504 GRINDING FINIS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL	148.000	MNHR	\$96.81322	\$14,328.36
0027	514E10000 FINAL INSPECTION REPAIR	92.000	EACH	\$176.61696	\$16,248.76
0028	516E10010 ARMORLESS PREFORMED JOINT SEAL	309.000	FT	\$25.00000	\$7,725.00
0029	516E11210 STRIP SEAL EXPANSION JOINT ANCHORED WITH ELASTOMERIC CONCRET E	309.000	FT	\$400.00000	\$123,600.00
0030	516E13600 1" PREFORMED EXPANSION JOINT FILLER	41.000	SF	\$6.11223	\$250.60
0031	516E45304 REFURBISH BEARING DEVICE	10.000	EACH	\$1,000.00000	\$10,000.00
0032	516E46700 RESET BEARING	6.000	EACH	\$448.42354	\$2,690.54
0033	516E47000 JACKING AND TEMPORARY SUPPORT OF SUPERSTRUCTURE	1.000	LS	\$10,000.00000	\$10,000.00
0034	518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC	134.000	CY	\$72.98315	\$9,779.74
0035	519E00100 SPECIAL - COMPOSITE FIBER WRAP SYSTEM	10,481.000	SF	\$55.00000	\$576,455.00
0036	519E11100 PATCHING CONCRETE STRUCTURE	1,127.000	SF	\$104.00000	\$117,208.00
0037	526E25000 REINFORCED CONCRETE APPROACH SLABS (T=15")	824.000	SY	\$220.00000	\$181,280.00
0038	526E90030 TYPE C INSTALLATION	309.000	FT	\$138.89449	\$42,918.40
0040	630E02100 GROUND MOUNTED SUPPORT, NO. 2 POST	15.000	FT	\$12.37995	\$185.70
0041	630E80100 SIGN, FLAT SHEET	2.000	SF	\$29.98104	\$59.96
0042	630E84900 REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL	2.000	EACH	\$15.58309	\$31.17
0043	202E11002 STRUCTURE REMOVED, OVER 20 FOOT SPAN	1.000	LS	\$650,000.00000	\$650,000.00
0044	511E40512 CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS	96.000	CY	\$688.88279	\$66,132.75

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

0045	516E44100	105.000	EACH	\$1,000.00000	\$105,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					

Total for Group 1500:\$6,312,467.95

Group 9000: INCIDENTALS

0001	103E05000	0.000	LS	\$0.00000	\$0.00
PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND					

0002	614E11000	0.000	LS	\$0.00000	\$0.00
MAINTAINING TRAFFIC					

0003	624E10000	0.000	LS	\$0.00000	\$0.00
MOBILIZATION					

0004	619E16000	0.000	MNTH	\$0.00000	\$0.00
FIELD OFFICE, TYPE A					

Total for Group 9000:\$0.00

Estimate Bowery Street

Estimated Cost:\$7,419,202.97

Contingency: 20.00%

Estimated Total: \$8,903,043.56

Bowery Street - Superstructure and Partial Abutment Replacement

Base Date: 02/22/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number:

Prepared by Lauren Hedges on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 1500: Structure

0005	202E11002	1.000	LS	\$750,000.00000	\$750,000.00
STRUCTURE REMOVED, OVER 20 FOOT SPAN					
0006	202E22900	824.000	SY	\$28.83221	\$23,757.74
APPROACH SLAB REMOVED					
0007	202E23500	7,089.000	SY	\$3.74761	\$26,566.81
WEARING COURSE REMOVED					
0008	503E11100	1.000	LS	\$12,500.00000	\$12,500.00
COFFERDAMS AND EXCAVATION BRACING					
0009	503E21301	1.000	LS	\$15,000.00000	\$15,000.00
UNCLASSIFIED EXCAVATION, AS PER PLAN					
0010	505E11100	1.000	LS	\$10,000.00000	\$10,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0011	507E00500	2,800.000	FT	\$19.00000	\$53,200.00
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN					
0012	507E00550	3,080.000	FT	\$24.24113	\$74,662.68
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED					
0013	509E10001	537,986.000	LB	\$1.17000	\$629,443.62
EPOXY COATED REINFORCING STEEL, AS PER PLAN					
0014	510E10000	1,266.000	EACH	\$12.00000	\$15,192.00
DOWEL HOLES WITH NONSHRINK, NONMETALLIC GROUT					
0015	511E21522	1,896.000	CY	\$661.66666	\$1,254,519.99
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE					
0016	511E33500	4.000	EACH	\$1,991.63684	\$7,966.55
SEMI-INTEGRAL DIAPHRAGM GUIDE					
0017	511E34450	332.000	CY	\$410.00000	\$136,120.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0018	511E41012	96.000	CY	\$900.00000	\$86,400.00
CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS					
0019	511E44112	244.000	CY	\$525.00000	\$128,100.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING					
0020	511E46512	186.000	CY	\$312.09812	\$58,050.25
CLASS QC1 CONCRETE WITH QC/QA, FOOTING					
0021	512E10100	3,877.000	SY	\$14.82687	\$57,483.77
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0022	512E74000	1,861.000	SY	\$9.56241	\$17,795.65

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
REMOVAL OF EXISTING COATINGS FROM CONCRETE SURFACES					
0023	513E10260	2,163,445.000	LB	\$1.19000	\$2,574,499.55
STRUCTURAL STEEL MEMBERS, LEVEL 3					
0024	513E20000	35,471.000	EACH	\$2.81529	\$99,861.15
WELDED STUD SHEAR CONNECTORS					
0026	514E00060	88,488.000	SF	\$2.35742	\$208,603.38
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0027	514E00066	88,488.000	SF	\$2.29028	\$202,662.30
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0028	514E10000	92.000	EACH	\$176.61696	\$16,248.76
FINAL INSPECTION REPAIR					
0029	516E10010	309.000	FT	\$25.00000	\$7,725.00
ARMORLESS PREFORMED JOINT SEAL					
0030	516E13600	41.000	SF	\$6.11223	\$250.60
1" PREFORMED EXPANSION JOINT FILLER					
0031	516E13900	1,158.000	SF	\$7.59541	\$8,795.48
2" PREFORMED EXPANSION JOINT FILLER					
0032	516E14020	363.000	FT	\$28.01319	\$10,168.79
SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0033	516E44100	147.000	EACH	\$1,000.00000	\$147,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0034	518E21200	134.000	CY	\$72.98315	\$9,779.74
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0035	518E40000	363.000	FT	\$5.69245	\$2,066.36
6" PERFORATED CORRUGATED PLASTIC PIPE					
0036	518E40012	100.000	FT	\$13.63482	\$1,363.48
6" NON-PERFORATED CORRUGATED PLASTIC PIPE					
0037	519E00100	8,714.000	SF	\$55.00000	\$479,270.00
SPECIAL - COMPOSITE FIBER WRAP SYSTEM					
0038	519E11100	1,127.000	SF	\$58.30753	\$65,712.59
PATCHING CONCRETE STRUCTURE					
0039	523E20000	1.000	EACH	\$3,961.50433	\$3,961.50
DYNAMIC LOAD TESTING					
0040	526E25000	824.000	SY	\$220.00000	\$181,280.00
REINFORCED CONCRETE APPROACH SLABS (T=15")					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0041	526E90030 TYPE C INSTALLATION	309.000	FT	\$138.89449	\$42,918.40
0043	630E02100 GROUND MOUNTED SUPPORT, NO. 2 POST	15.000	FT	\$12.37995	\$185.70
0044	630E80100 SIGN, FLAT SHEET	2.000	SF	\$29.98104	\$59.96
0045	630E84900 REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL	2.000	EACH	\$15.58309	\$31.17
Total for Group 1500:					\$7,419,202.97

Group 9000: Group

INCIDENTALS					
0001	103E05000 PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND	0.000	LS	\$0.00000	\$0.00
0002	614E11000 MAINTAINING TRAFFIC	0.000	LS	\$0.00000	\$0.00
0003	624E10000 MOBILIZATION	0.000	LS	\$0.00000	\$0.00
0004	619E16000 FIELD OFFICE, TYPE A	0.000	MNTH	\$0.00000	\$0.00
Total for Group 9000:					\$0.00

Estimate Bowery Street

Estimated Cost:\$9,683,089.05

Contingency: 20.00%

Estimated Total: \$11,619,706.86

Bowery Street - Total Replacement in Kind

Base Date: 02/22/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number: 7703457

Prepared by Lauren Hedges on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 1500: Structures

0005	202E11002	1.000	LS	\$850,000.00000	\$850,000.00
STRUCTURE REMOVED, OVER 20 FOOT SPAN					
0006	202E22900	824.000	SY	\$28.83221	\$23,757.74
APPROACH SLAB REMOVED					
0007	202E23500	7,089.000	SY	\$3.74761	\$26,566.81
WEARING COURSE REMOVED					
0008	202E98200	12,645.000	FT	\$25.00000	\$316,125.00
REMOVAL MISC.: PILE REMOVAL					
0009	503E11100	1.000	LS	\$12,500.00000	\$12,500.00
COFFERDAMS AND EXCAVATION BRACING					
0010	503E21301	1.000	LS	\$15,000.00000	\$15,000.00
UNCLASSIFIED EXCAVATION, AS PER PLAN					
0011	505E11100	1.000	LS	\$10,000.00000	\$10,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0012	507E00500	25,450.000	FT	\$15.58333	\$396,595.75
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN					
0013	507E00550	26,565.000	FT	\$31.83333	\$845,652.41
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED					
0014	509E10001	790,794.000	LB	\$1.17000	\$925,228.98
EPOXY COATED REINFORCING STEEL, AS PER PLAN					
0015	511E21522	1,896.000	CY	\$661.66666	\$1,254,519.99
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE					
0016	511E33500	4.000	EACH	\$1,991.63684	\$7,966.55
SEMI-INTEGRAL DIAPHRAGM GUIDE					
0017	511E34450	332.000	CY	\$410.00000	\$136,120.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0018	511E41012	1,028.000	CY	\$900.00000	\$925,200.00
CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS					
0019	511E44112	303.000	CY	\$525.00000	\$159,075.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING					
0020	511E46512	790.000	CY	\$252.29521	\$199,313.22
CLASS QC1 CONCRETE WITH QC/QA, FOOTING					
0021	512E10100	3,877.000	SY	\$14.82687	\$57,483.77
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0022	513E10260	2,163,445.000	LB	\$1.19000	\$2,574,499.55

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
STRUCTURAL STEEL MEMBERS, LEVEL 3					
0023	513E20000	35,471.000	EACH	\$2.81529	\$99,861.15
WELDED STUD SHEAR CONNECTORS					
0025	514E00060	88,488.000	SF	\$2.35742	\$208,603.38
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0026	514E00066	88,488.000	SF	\$2.29028	\$202,662.30
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0027	514E10000	92.000	EACH	\$176.61696	\$16,248.76
FINAL INSPECTION REPAIR					
0028	516E10010	309.000	FT	\$25.00000	\$7,725.00
ARMORLESS PREFORMED JOINT SEAL					
0029	516E13600	41.000	SF	\$6.11223	\$250.60
1" PREFORMED EXPANSION JOINT FILLER					
0030	516E13900	1,158.000	SF	\$7.59541	\$8,795.48
2" PREFORMED EXPANSION JOINT FILLER					
0031	516E14020	363.000	FT	\$28.01319	\$10,168.79
SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0032	516E44100	147.000	EACH	\$1,000.00000	\$147,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0033	518E21200	208.000	CY	\$68.76080	\$14,302.25
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0034	518E40000	363.000	FT	\$5.69245	\$2,066.36
6" PERFORATED CORRUGATED PLASTIC PIPE					
0035	518E40012	100.000	FT	\$13.63482	\$1,363.48
6" NON-PERFORATED CORRUGATED PLASTIC PIPE					
0036	523E20000	1.000	EACH	\$3,961.50433	\$3,961.50
DYNAMIC LOAD TESTING					
0037	526E25000	824.000	SY	\$220.00000	\$181,280.00
REINFORCED CONCRETE APPROACH SLABS (T=15")					
0038	526E90030	309.000	FT	\$138.89449	\$42,918.40
TYPE C INSTALLATION					
0040	630E02100	15.000	FT	\$12.37995	\$185.70
GROUND MOUNTED SUPPORT, NO. 2 POST					
0041	630E80100	2.000	SF	\$29.98104	\$59.96
SIGN, FLAT SHEET					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
	Description				
	Supplemental Description				
0042	630E84900	2.000	EACH	\$15.58309	\$31.17
	REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL				

Total for Group 1500:\$9,683,089.05

Group 9000: Group

INCIDENTALS

0001	103E05000	0.000	LS	\$0.00000	\$0.00
	PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND				
0002	614E11000	0.000	LS	\$0.00000	\$0.00
	MAINTAINING TRAFFIC				
0003	624E10000	0.000	LS	\$0.00000	\$0.00
	MOBILIZATION				
0004	619E16000	0.000	MNTH	\$0.00000	\$0.00
	FIELD OFFICE, TYPE A				

Total for Group 9000:\$0.00

Estimate Bowery Street

Estimated Cost:\$6,804,663.61

Contingency: 20.00%

Estimated Total: \$8,165,596.33

Bowery Street - Total Replacement Single Span

Base Date: 02/28/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number: 7703457

Prepared by Lauren Hedges on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 1500: Structure

0005	202E11002	1.000	LS	\$950,000.00000	\$950,000.00
STRUCTURE REMOVED, OVER 20 FOOT SPAN					
0006	202E22900	824.000	SY	\$28.83221	\$23,757.74
APPROACH SLAB REMOVED					
0007	202E23500	7,089.000	SY	\$3.74761	\$26,566.81
WEARING COURSE REMOVED					
0008	202E98200	1,050.000	FT	\$25.00000	\$26,250.00
REMOVAL MISC.: PILE REMOVAL					
0009	503E11100	1.000	LS	\$12,500.00000	\$12,500.00
COFFERDAMS AND EXCAVATION BRACING					
0010	503E21301	1.000	LS	\$30,000.00000	\$30,000.00
UNCLASSIFIED EXCAVATION, AS PER PLAN					
0011	505E11100	1.000	LS	\$20,000.00000	\$20,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0012	507E00500	7,000.000	FT	\$13.41510	\$93,905.70
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN					
0013	507E00550	7,500.000	FT	\$31.83333	\$238,749.98
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED					
0014	509E10000	250,599.000	LB	\$0.87770	\$219,950.74
EPOXY COATED REINFORCING STEEL					
0015	511E21522	786.000	CY	\$661.66666	\$520,069.99
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE					
0016	511E33500	4.000	EACH	\$1,991.63684	\$7,966.55
SEMI-INTEGRAL DIAPHRAGM GUIDE					
0017	511E34450	122.000	CY	\$410.00000	\$50,020.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0018	511E44112	306.000	CY	\$525.00000	\$160,650.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING					
0019	511E46512	245.000	CY	\$299.70414	\$73,427.51
CLASS QC1 CONCRETE WITH QC/QA, FOOTING					
0020	512E10100	1,013.000	SY	\$18.03766	\$18,272.15
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0021	513E10260	914,760.000	LB	\$1.31119	\$1,199,424.16
STRUCTURAL STEEL MEMBERS, LEVEL 3					
0022	513E20000	12,600.000	EACH	\$2.98918	\$37,663.67

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
	Description <u>Supplemental Description</u>				
	WELDED STUD SHEAR CONNECTORS				
0023	514E00060 FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	33,575.000	SF	\$3.51198	\$117,914.73
0024	514E00066 FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	33,575.000	SF	\$3.29092	\$110,492.64
0026	514E10000 FINAL INSPECTION REPAIR	31.000	EACH	\$206.14226	\$6,390.41
0027	516E10010 ARMORLESS PREFORMED JOINT SEAL	309.000	FT	\$25.00000	\$7,725.00
0028	516E13600 1" PREFORMED EXPANSION JOINT FILLER	41.000	SF	\$6.11223	\$250.60
0029	516E13900 2" PREFORMED EXPANSION JOINT FILLER	1,168.000	SF	\$7.59307	\$8,868.71
0030	516E14020 SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL	369.000	FT	\$28.01319	\$10,336.87
0031	516E44100 ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	42.000	EACH	\$1,000.00000	\$42,000.00
0032	518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC	211.000	CY	\$68.62747	\$14,480.40
0033	518E40000 6" PERFORATED CORRUGATED PLASTIC PIPE	367.000	FT	\$5.67868	\$2,084.08
0034	518E40011 6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S, AS PER PLAN	100.000	FT	\$13.63482	\$1,363.48
0035	526E25000 REINFORCED CONCRETE APPROACH SLABS (T=15")	830.000	SY	\$220.00000	\$182,600.00
0036	526E90030 TYPE C INSTALLATION	309.000	FT	\$138.89449	\$42,918.40
0038	630E02100 GROUND MOUNTED SUPPORT, NO. 2 POST	15.000	FT	\$12.37995	\$185.70
0039	630E80100 SIGN, FLAT SHEET	2.000	SF	\$29.98104	\$59.96
0040	630E84900 REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL	2.000	EACH	\$15.58309	\$31.17
0041	840E20000 MECHANICALLY STABILIZED EARTH WALL	15,850.000	SF	\$22.69536	\$359,721.46

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
	Description				
	Supplemental Description				
0042	840E23000	39,783.000	CY	\$55.00000	\$2,188,065.00
	SELECT GRANULAR BACKFILL				

Total for Group 1500:\$6,804,663.61

Group 9000: INCIDENTALS

0001	103E05000	0.000	LS	\$0.00000	\$0.00
	PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND				
0002	614E11000	0.000	LS	\$0.00000	\$0.00
	MAINTAINING TRAFFIC				
0003	624E10000	0.000	LS	\$0.00000	\$0.00
	MOBILIZATION				
0004	619E16000	0.000	MNTH	\$0.00000	\$0.00
	FIELD OFFICE, TYPE A				

Total for Group 9000:\$0.00

SUM-76-8.42/SUM-77-9.77

Structure Type Study

SUM-76-0964

SFN 7703392- PID 102329 - SUM-76-0964

Bridge No. SUM-76-0954 I-76/77 over *Lakeshore Boulevard*



Submitted to ODOT - District 4

August 2019

Prepared By



E.L. Robinson Engineering of Ohio Co. (ELR) has prepared this abbreviated SUM-76-0964 Structure Type Study for the Ohio Department of Transportation (ODOT) to identify feasible rehabilitation or replacement alternatives of the existing Interstate Route 76 Bridge (SFN 7703392) over Lakeshore Boulevard. This project is part of a larger Design Build project involving roadway improvements and major rehabilitation work along Interstate Routes 76 and 77. This bridge is under consideration for rehabilitation or replacement due to the bridge nearing the end of the service life. The existing structure, built in 1963, consists of one westbound bridge and one eastbound bridge. The bridges are 3-span continuous steel rolled beam bridges at zero skew with reinforced concrete decks on reinforced cap and column piers and stub abutments. Each have a total structure length of approximately 173 feet and a total width of 59'-2". Each carry three lanes of traffic with a toe to toe width of 55'-7". The minimum vertical clearance of the existing structure is 15.84'.

ELR evaluated three different alternatives for this structure. The three alternatives consisted of a deck replacement, partial replacement, or total bridge replacement.

Alternative 1:

- Deck Replacement

This alternative provides replacement of the existing abutment backwalls, decks, bearings at the piers, median, and bridge barriers. A semi-integral abutment conversion is not recommended because of the poor condition of the soil in the area. Since the existing abutments are founded on spread footings, the additional applied loadings due to a conversion will most likely cause a settlement, bearing capacity or sliding problem for the foundation. There are shim plates under all the abutment bearings and displacement is evidence of settlement at both abutments since the original construction.



This alternative also includes refurbishment of the abutment bearings at the corners of each bridge and resetting a few additional bearings. The proposed 8½" composite reinforced concrete decks will be 59'-5" wide, carrying three lanes of traffic with a 56'-0" distance from toe to toe of barrier. The deck is 3 inches wider than the existing due to the lateral clearance requirements of a 10-foot shoulder for an urban interstate with uncurbed shoulders. The proposed barriers will follow the ODOT standard drawing, SBR-1-13, and SBR-2-13 for the median. The existing profile of the road will be maintained, and since only the deck is being replaced, the minimum vertical clearance of the structure will remain 15.84'. Raising the deck will not be necessary because the minimum required vertical clearance is 14.5'.

The existing condition of this structure was rated using the AASHTOWare Bridge Rating program BrR to check the capacity of the superstructure. Per the 2019 Bridge Design Manual, rehabilitated structures are to be designed per LRFD using the HL-93 Inventory Loading with

accommodations for a 60 psf future wearing surface. Under the applied 60 PSF future wearing surface load and HL-93 loading, the beams rated well for inventory and operating and so can be reused. However, the cover plates and beam continuity welds at the splices will require fatigue retrofits and the beams will require painting.

The piers were also analyzed for the additional loading of the future wearing surface and HL-93 truck. As shown in Table 1, the pier caps failed in both shear and moment. To strengthen the caps for shear, they must all be wrapped with a composite fiber wrap. Due to the inadequate moment capacity of the pier caps, additional concrete will need to be added to the pier caps. This will be done by raising the beam seats at the piers and replacing the bearings with new elastomeric bearings. This would increase the depth and allow supplemental reinforcement to be added. It should be noted that raising the pier caps alone will not be sufficient to address the shear deficiency and the fiber wrap will still be required. The existing bearings at the piers are rockers and bolsters, about 15.125" thick. Raising the pier caps and replacing the bearings with these significantly smaller bearings corrects the moment problem and maintains the existing profile as well as the minimum vertical clearance. Seismic retrofit of the fixed pier columns with a composite fiber wrap system will also be required.

SUM-076-0964 BRIDGE OVER LAKESHORE BOULEVARD					
Substructure Unit	Construction Year	# Load Cases Checked	Loading	Overall Shear Capacity Check	Overall Moment Capacity Check
Piers 1 & 2	1961	3	HL-93 & 60 PSF FWS	Fail	Fail

Table 1 – Pier Cap Capacity Summary

Construction will be done in two phases in order to maintain two 11-foot lanes of traffic in each direction. To keep the eastbound and westbound traffic on their respective structures, the temporary shoulders will need to be reduced to 1 foot. If 2-foot shoulders are desired, a contraflow MOT scheme would be required.

Alternative 2:

- Superstructure and Abutment Replacement, Piers to Remain

This alternative includes replacement of the existing abutments, bearings, beams, cross frames, concrete slope protection, decks, median, and bridge barriers. The proposed structures will be 59'-5" wide, carrying three lanes of traffic with a 56'-0" distance from toe to toe of barrier. The deck is 3 inches wider than the existing to accommodate the lateral clearance requirements of a 10-foot shoulder for an urban interstate with uncurbed shoulders. The proposed deck will be an 8½" composite reinforced concrete deck and will maintain a similar profile as the existing structure. The proposed barriers will follow the ODOT standard drawing, SBR-1-13, and SBR-2-13 for the median.

The existing stub abutments, wingwalls, and spread footings will be completely removed and replaced with an integral abutment on a single row of steel piles. The existing beams will be replaced with new steel rolled beams. Prestressed concrete I-beams may not be a viable option due to the additional load this will place on the piers. Substructure evaluation by the design-

build team would be required. Looking at the steel beam option, the size of the beams used could possibly be reduced compared to the existing with further evaluation.

The proposed integral abutment will require an expansion bearing at pier 1 and will no longer be fixed. Since the bearings at the piers will be replaced with new expansion elastomeric bearings, the piers will not require any seismic retrofit. The existing bearings at the piers are rockers and bolsters, about 15.125" thick. The thickness of the new bearings will be significantly smaller and will require raising the pier cap beam seats in order to maintain the existing vertical clearance over Lakeshore Boulevard. The additional concrete at the piers is also necessary to provide adequate moment capacity in the pier caps as shown in Table 1. This would increase the depth and allow supplemental reinforcement to be added. It should be noted that raising the pier caps alone will not be sufficient to address the shear deficiency and the composite fiber wrap will still be required.

Phased construction will be utilized as described in Alternative 1 in order to maintain two 11-foot lanes of traffic in each direction. To keep the eastbound and westbound traffic on their respective structures, the temporary shoulders will need to be reduced to 1 foot. Depending on the dead load deflections between phases, a closure pour may be needed. If 2-foot shoulders are desired, a contraflow MOT scheme would be required. Any impact to Lakeshore Ave. with proposed work should be coordinated with the City of Akron.

Alternative 3:

- Total Replacement of Structure

This alternative provides a complete structure replacement. The proposed structures will be 59'-5" wide, carrying three lanes of traffic with a 56'-0" distance from toe to toe of barrier. The deck is 3 inches wider than the existing to accommodate the lateral clearance requirements of a 10-foot shoulder for an urban interstate with uncurbed shoulders. The proposed deck will be an 8½" composite reinforced concrete deck and will maintain a similar profile as the existing structure. The proposed barriers will follow the ODOT standard drawing, SBR-1-13, and SBR-2-13 for the median. The beams will be replaced with either new steel rolled beams or prestressed concrete I-beams, if permitted by the minimum vertical clearance. The existing rocker and bolster type bearings will be replaced with elastomeric bearings.

The entire existing substructure, including both abutments, wingwalls, spread footings, and piers, will need to be removed. The abutments will be replaced with an integral abutment on a single row of piles. The piers will be replaced down to the footings with similar cap and column piers. With further evaluation by the design-build team, the existing piles at the piers may be able to be reused based on their existing condition and the proposed superstructure loads. If the piles cannot be reused, the pier locations will need to be shifted and the span lengths will change. The proposed pier caps will match the existing at 58'-2" wide. Replacement of the underpass lighting will be coordinated with the City of Akron.

Phase construction will be utilized for this alternative in order to maintain two 11-foot lanes of traffic in each direction. For constructability purposes, all traffic will be shifted to the existing eastbound or westbound bridge for the first phase of construction. Then traffic will be shifted to

the new eastbound or westbound bridge for the second phase of construction. The temporary shoulders for both phases will be 2 feet. On Lakeshore Boulevard, lane closures will be needed and should be coordinated with the City of Akron.

Conclusions:

This report provides three preliminary design alternatives for the SUM-76-0964 structure. Preliminary cost estimates have been developed for each alternative. The cost for Alternative 1 includes the cost to strengthen the pier caps as well as the cost of the fatigue retrofit plates. The cost for Alternative 2 includes the cost to strengthen the pier caps and is based on using new steel beams. The estimate for Alternative 3 assumes that steel beams will be used. All three cost estimates include a 20% contingency. See Table 2 and Attachment A for detailed cost estimates.

The life cycle costs for Alternatives 2 and 3 are anticipated to be similar. These alternatives will require painting of the beams and sealing of concrete structures at similar time frames. The life cycle costs for Alternative 1, however, are anticipated to be larger than Alternatives 2 and 3 due to possible future rehabilitation or replacement of beam ends and painting.

COST COMPARISON BETWEEN ALTERNATIVES	
Alternative	Initial Structure Cost
1	\$3,125,700
2	\$3,280,700
3	\$3,752,600

Table 2 – Structure Alternative Cost Comparison

Alternative 1 has the lowest estimated cost but it also requires a significant amount of strengthening and retrofitting. Future maintenance costs for Alternatives 1 through 3 are anticipated to be similar for steel superstructures. If concrete beams were used for Alternatives 2 and 3, then the maintenance costs would be reduced.

ATTACHMENTS:

Attachment A – Detailed Cost Estimates

Estimate Lakeshore Blvd.

Estimated Cost:\$2,604,694.62

Contingency: 20.00%

Estimated Total: \$3,125,633.54

Lakeshore Blvd. - Alt. 1 Deck Replacement

Base Date: 03/21/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number: 7703481

Prepared by AEF on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
Group 1500: STRUCTURES					
0005	202E11201	1.000	LS	\$170,000.00000	\$170,000.00
PORTIONS OF STRUCTURE REMOVED, AS PER PLAN					
0006	202E22900	400.000	SY	\$30.69101	\$12,276.40
APPROACH SLAB REMOVED					
0007	202E23500	2,137.000	SY	\$4.97715	\$10,636.17
WEARING COURSE REMOVED					
0009	503E11100	1.000	LS	\$30,000.00000	\$30,000.00
COFFERDAMS AND EXCAVATION BRACING					
0010	503E21301	1.000	LS	\$30,000.00000	\$30,000.00
UNCLASSIFIED EXCAVATION, AS PER PLAN					
0014	509E10001	205,359.000	LB	\$1.17000	\$240,270.03
EPOXY COATED REINFORCING STEEL, AS PER PLAN					
0015	510E10000	320.000	EACH	\$15.58210	\$4,986.27
DOWEL HOLES WITH NONSHRINK, NONMETALLIC GROUT					
0016	511E21522	674.000	CY	\$661.66666	\$445,963.33
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE					
0017	511E34450	161.000	CY	\$410.00000	\$66,010.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0018	511E41012	26.000	CY	\$689.00000	\$17,914.00
CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS					
0019	511E44112	71.000	CY	\$484.94647	\$34,431.20
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTIN G					
0021	512E10100	1,474.000	SY	\$17.07617	\$25,170.27
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0022	512E74000	642.000	SY	\$13.14208	\$8,437.22
REMOVAL OF EXISTING COATINGS FROM CONCRETE SURFACES					
0024	513E20000	10,848.000	EACH	\$3.01520	\$32,708.89
WELDED STUD SHEAR CONNECTORS					
0025	513E90000	4,939.000	LB	\$2.00000	\$9,878.00
STRUCTURAL STEEL, MISC.: REPLACEMENT OF CROSSFRAMES					
0026	513E90000	13,102.000	LB	\$10.00000	\$131,020.00
STRUCTURAL STEEL, MISC.: FATIGUE RETROFITS					
0027	514E00050	30,026.000	SF	\$12.98984	\$390,032.94
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0028	514E00056	30,026.000	SF	\$2.72810	\$81,913.93
FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT					
0029	514E00060	30,026.000	SF	\$3.67714	\$110,409.81
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0030	514E00066	30,026.000	SF	\$3.43136	\$103,030.02
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0031	514E00504	45.000	MNHR	\$98.42884	\$4,429.30
GRINDING FINIS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL					
0032	514E10000	42.000	EACH	\$197.43539	\$8,292.29
FINAL INSPECTION REPAIR					
0033	516E10010	224.000	FT	\$25.00000	\$5,600.00
ARMORLESS PREFORMED JOINT SEAL					
0034	516E11210	224.000	FT	\$403.98783	\$90,493.27
STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL					
0035	516E13600	29.000	SF	\$6.22461	\$180.51
1" PREFORMED EXPANSION JOINT FILLER					
0036	516E45304	9.000	EACH	\$1,000.00000	\$9,000.00
REFURBISH BEARING DEVICE					
0037	516E46700	6.000	EACH	\$448.42354	\$2,690.54
RESET BEARING					
0038	516E47000	1.000	LS	\$10,000.00000	\$10,000.00
JACKING AND TEMPORARY SUPPORT OF SUPERSTRUCTURE					
0039	516E44100	32.000	EACH	\$1,000.00000	\$32,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0040	518E21200	108.000	CY	\$75.14840	\$8,116.03
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0041	519E00100	4,465.000	SF	\$55.00000	\$245,575.00
SPECIAL - COMPOSITE FIBER WRAP SYSTEM					
0042	519E11100	625.000	SF	\$104.00000	\$65,000.00
PATCHING CONCRETE STRUCTURE					
0043	526E25000	622.000	SY	\$220.00000	\$136,840.00
REINFORCED CONCRETE APPROACH SLABS (T=15")					
0044	526E90030	224.000	FT	\$138.89449	\$31,112.37
TYPE C INSTALLATION					
0046	630E02100	15.000	FT	\$12.37995	\$185.70
GROUND MOUNTED SUPPORT, NO. 2 POST					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

0047	630E80100	2.000	SF	\$29.98104	\$59.96
SIGN, FLAT SHEET					

0048	630E84900	2.000	EACH	\$15.58309	\$31.17
REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL					

Total for Group 1500:\$2,604,694.62

Group 9000: Group

INCIDENTALS

0001	103E05000	0.000	LS	\$0.00000	\$0.00
PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND					

0002	614E11000	0.000	LS	\$0.00000	\$0.00
MAINTAINING TRAFFIC					

0003	624E10000	0.000	LS	\$0.00000	\$0.00
MOBILIZATION					

0004	619E16000	0.000	MNTH	\$0.00000	\$0.00
FIELD OFFICE, TYPE A					

Total for Group 9000:\$0.00

Estimate Lakeshore Blvd.

Estimated Cost:\$2,733,900.70

Contingency: 20.00%

Estimated Total: \$3,280,680.84

Lakeshore Blvd. - Alt. 2 Partial Replacement

Base Date: 03/21/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number: 7703481

Prepared by AEF on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
Group 1500: STRUCTURES					
0005	202E11201	1.000	LS	\$270,000.00000	\$270,000.00
PORTIONS OF STRUCTURE REMOVED, AS PER PLAN					
0006	202E22900	400.000	SY	\$30.69101	\$12,276.40
APPROACH SLAB REMOVED					
0007	202E23500	2,137.000	SY	\$4.97715	\$10,636.17
WEARING COURSE REMOVED					
0009	503E11100	1.000	LS	\$30,000.00000	\$30,000.00
COFFERDAMS AND EXCAVATION BRACING					
0010	503E21301	1.000	LS	\$30,000.00000	\$30,000.00
UNCLASSIFIED EXCAVATION, AS PER PLAN					
0011	505E11100	1.000	LS	\$10,000.00000	\$10,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0012	507E00500	1,600.000	FT	\$19.00000	\$30,400.00
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN					
0013	507E00550	1,760.000	FT	\$28.00000	\$49,280.00
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED					
0014	509E10001	237,347.000	LB	\$1.17000	\$277,695.99
EPOXY COATED REINFORCING STEEL, AS PER PLAN					
0015	510E10000	320.000	EACH	\$15.58210	\$4,986.27
DOWEL HOLES WITH NONSHRINK, NONMETALLIC GROUT					
0016	511E21522	674.000	CY	\$661.66666	\$445,963.33
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE					
0017	511E34450	161.000	CY	\$410.00000	\$66,010.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0018	511E41012	26.000	CY	\$900.00000	\$23,400.00
CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS					
0019	511E44112	173.000	CY	\$525.00000	\$90,825.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING					
0020	511E46512	96.000	CY	\$343.98401	\$33,022.46
CLASS QC1 CONCRETE WITH QC/QA, FOOTING					
0021	512E10100	1,448.000	SY	\$17.12061	\$24,790.64
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0022	512E74000	511.000	SY	\$14.06944	\$7,189.48
REMOVAL OF EXISTING COATINGS FROM CONCRETE SURFACES					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0023	513E10240	478,450.000	LB	\$1.13863	\$544,777.52
STRUCTURAL STEEL MEMBERS, LEVEL 2					
0024	513E20000	10,848.000	EACH	\$3.01520	\$32,708.89
WELDED STUD SHEAR CONNECTORS					
0026	514E00060	30,026.000	SF	\$3.67714	\$110,409.81
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0027	514E00066	30,026.000	SF	\$3.43136	\$103,030.02
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0028	514E10000	42.000	EACH	\$197.43539	\$8,292.29
FINAL INSPECTION REPAIR					
0029	516E10010	224.000	FT	\$25.00000	\$5,600.00
ARMORLESS PREFORMED JOINT SEAL					
0030	516E13600	29.000	SF	\$6.22461	\$180.51
1" PREFORMED EXPANSION JOINT FILLER					
0031	516E13900	591.000	SF	\$7.78063	\$4,598.35
2" PREFORMED EXPANSION JOINT FILLER					
0032	516E14014	236.000	FT	\$24.86622	\$5,868.43
INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0033	516E44100	32.000	EACH	\$1,000.00000	\$32,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0034	518E21200	108.000	CY	\$75.14840	\$8,116.03
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0035	518E40000	224.000	FT	\$6.33346	\$1,418.70
6" PERFORATED CORRUGATED PLASTIC PIPE					
0036	518E40012	100.000	FT	\$13.63482	\$1,363.48
6" NON-PERFORATED CORRUGATED PLASTIC PIPE					
0037	519E00100	3,547.000	SF	\$55.00000	\$195,085.00
SPECIAL - COMPOSITE FIBER WRAP SYSTEM					
0038	519E11100	460.000	SF	\$71.01862	\$32,668.57
PATCHING CONCRETE STRUCTURE					
0039	523E20000	1.000	EACH	\$3,961.50433	\$3,961.50
DYNAMIC LOAD TESTING					
0040	526E25000	622.000	SY	\$220.00000	\$136,840.00
REINFORCED CONCRETE APPROACH SLABS (T=15")					
0041	526E90030	224.000	FT	\$138.89449	\$31,112.37

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
TYPE C INSTALLATION					
0042	601E21000	767.000	SY	\$77.07517	\$59,116.66
CONCRETE SLOPE PROTECTION					
0044	630E02100	15.000	FT	\$12.37995	\$185.70
GROUND MOUNTED SUPPORT, NO. 2 POST					
0045	630E80100	2.000	SF	\$29.98104	\$59.96
SIGN, FLAT SHEET					
0046	630E84900	2.000	EACH	\$15.58309	\$31.17
REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL					
Total for Group 1500:					\$2,733,900.70

Group 9000: Group

INCIDENTALS					
0001	103E05000	0.000	LS	\$0.00000	\$0.00
PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND					
0002	614E11000	0.000	LS	\$0.00000	\$0.00
MAINTAINING TRAFFIC					
0003	624E10000	0.000	LS	\$0.00000	\$0.00
MOBILIZATION					
0004	619E16000	0.000	MNTH	\$0.00000	\$0.00
FIELD OFFICE, TYPE A					
Total for Group 9000:					\$0.00

Estimate Lakeshore Blvd.

Estimated Cost:\$3,127,174.89

Contingency: 20.00%

Estimated Total: \$3,752,609.87

Lakeshore Blvd. - Alt. 3 Total Replacement

Base Date: 03/21/19

Spec Year: 16

Unit System: E

Work Type:

Highway Type:

Urban/Rural Type:

Season:

County:

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District:

Federal/State Project Number: 7703481

Prepared by AEF on 03/21/19

Checked by Matt Drockton on 08/07/19

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

Group 1500: STRUCTURES

0005	202E11002	1.000	LS	\$370,000.00000	\$370,000.00
STRUCTURE REMOVED, OVER 20 FOOT SPAN					
0006	202E22900	400.000	SY	\$30.69101	\$12,276.40
APPROACH SLAB REMOVED					
0007	202E23500	2,137.000	SY	\$4.97715	\$10,636.17
WEARING COURSE REMOVED					
0008	202E98200	3,850.000	FT	\$25.00000	\$96,250.00
REMOVAL MISC.: PILE REMOVED					
0009	503E11100	1.000	LS	\$45,000.00000	\$45,000.00
COFFERDAMS AND EXCAVATION BRACING					
0010	503E21301	1.000	LS	\$30,000.00000	\$30,000.00
UNCLASSIFIED EXCAVATION, AS PER PLAN					
0011	505E11100	1.000	LS	\$10,000.00000	\$10,000.00
PILE DRIVING EQUIPMENT MOBILIZATION					
0012	507E00500	5,450.000	FT	\$19.00000	\$103,550.00
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN					
0013	507E00550	6,160.000	FT	\$28.00000	\$172,480.00
12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED					
0014	509E10001	298,435.000	LB	\$1.17000	\$349,168.95
EPOXY COATED REINFORCING STEEL, AS PER PLAN					
0015	511E21522	674.000	CY	\$661.66666	\$445,963.33
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE					
0017	511E34450	161.000	CY	\$410.00000	\$66,010.00
CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)					
0018	511E41012	187.000	CY	\$740.14309	\$138,406.76
CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS					
0019	511E44112	173.000	CY	\$525.00000	\$90,825.00
CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING					
0020	511E46512	240.000	CY	\$300.61442	\$72,147.46
CLASS QC1 CONCRETE WITH QC/QA, FOOTING					
0021	512E10100	1,448.000	SY	\$17.12061	\$24,790.64
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)					
0022	513E10240	478,450.000	LB	\$1.13863	\$544,777.52
STRUCTURAL STEEL MEMBERS, LEVEL 2					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					
0023	513E20000	10,848.000	EACH	\$3.01520	\$32,708.89
WELDED STUD SHEAR CONNECTORS					
0026	514E00060	30,026.000	SF	\$3.67714	\$110,409.81
FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT					
0027	514E00066	30,026.000	SF	\$3.43132	\$103,028.81
FIELD PAINTING STRUCTURAL STEEL, FINISH COAT					
0028	514E10000	42.000	EACH	\$197.43539	\$8,292.29
FINAL INSPECTION REPAIR					
0029	516E10010	224.000	FT	\$25.00000	\$5,600.00
ARMORLESS PREFORMED JOINT SEAL					
0030	516E13600	29.000	SF	\$6.22461	\$180.51
1" PREFORMED EXPANSION JOINT FILLER					
0031	516E13900	591.000	SF	\$7.78063	\$4,598.35
2" PREFORMED EXPANSION JOINT FILLER					
0032	516E14014	236.000	FT	\$24.86622	\$5,868.43
INTEGRAL ABUTMENT EXPANSION JOINT SEAL					
0033	516E44100	32.000	EACH	\$1,000.00000	\$32,000.00
ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)					
0034	518E21200	108.000	CY	\$75.14840	\$8,116.03
POROUS BACKFILL WITH GEOTEXTILE FABRIC					
0035	518E40000	224.000	FT	\$6.33346	\$1,418.70
6" PERFORATED CORRUGATED PLASTIC PIPE					
0036	518E40012	100.000	FT	\$13.63482	\$1,363.48
6" NON-PERFORATED CORRUGATED PLASTIC PIPE					
0037	523E20000	1.000	EACH	\$3,961.50433	\$3,961.50
DYNAMIC LOAD TESTING					
0038	526E25000	622.000	SY	\$220.00000	\$136,840.00
REINFORCED CONCRETE APPROACH SLABS (T=15")					
0039	526E90030	224.000	FT	\$138.89449	\$31,112.37
TYPE C INSTALLATION					
0040	601E21000	767.000	SY	\$77.07517	\$59,116.66
CONCRETE SLOPE PROTECTION					
0042	630E02100	15.000	FT	\$12.37995	\$185.70
GROUND MOUNTED SUPPORT, NO. 2 POST					
0043	630E80100	2.000	SF	\$29.98104	\$59.96
SIGN, FLAT SHEET					

<u>Line #</u>	<u>Item Number</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Price</u>	<u>Extension</u>
<u>Description</u>					
<u>Supplemental Description</u>					

0044	630E84900	2.000	EACH	\$15.58309	\$31.17
REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL					

Total for Group 1500:\$3,127,174.89

Group 9000: INCIDENTALS

0001	103E05000	0.000	LS	\$0.00000	\$0.00
PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND					

0002	614E11000	0.000	LS	\$0.00000	\$0.00
MAINTAINING TRAFFIC					

0003	624E10000	0.000	LS	\$0.00000	\$0.00
MOBILIZATION					

0004	619E16000	0.000	MNTH	\$0.00000	\$0.00
FIELD OFFICE, TYPE A					

Total for Group 9000:\$0.00