

Life Cycle Costs

With all other items considered basically equal for the alternatives involved, we looked at the alternatives for Bridge No. 6947, the proposed bridge to carry the new two-lane ramp from I-91 NB to Route 15 NB. Three alternatives were studied as follows:

- Alternative 1 – Five Span Continuous Steel Girder with Trapezoidal Box Girders
- Alternative 2 – Three Span Continuous Steel Girder Bridge
- Alternative 3 – Five Span Continuous with Plate Girders

All three options are considered to have a 75-year life with weathering steel superstructures. Maintenance for each was considered to be milling and repaving two inches of the wearing surface at years 15 and 45 and substructure repairs, complete removal of the wearing surface, replacement of the waterproofing membrane and repaving of the deck at years 30 and 60. The following table summarizes the present value and the future value at 75 years (with both costs including the maintenance described above). The future value utilized 3.5% inflation per year and a discount rate of 0%, consistent with CTDOT practices.

Alternative	Present Value	Future Value
1	\$41,214,000	\$45,593,895
2	\$42,079,000	\$47,078,738
3	\$39,862,000	\$45,404,579

Eliminating Alternative 2 as the highest cost option, Alternatives 1 and 3 were considered. Even though Alternative 1 is more expensive at present day values, the life cycle cost of the two alternatives are very close. Ultimately, Alternative 1 was chosen as it is easier to construct, has fewer girders to erect over traffic and requires one less straddle bent, which increase the complexity of replacement.

Bridge No. 6947 Alternatives - Life Cycle Cost analysis and Summary of Estimated Future Project Costs

Project No. 63-703 Interchange 29 Flyover Ramp

Bridge Life Cycle Cost Analysis

$$PV = FV / (1 + DR)^N$$

PV= Present Value
 FV= Future Value at time N
 DR= Real Discount Rate =
 N= Period (Years)

INPUT

0.00 %

Bridge Costs- 75 Year Life - future projections

P= Present Cost
 FV= Future Cost
 i = inflation rate
 N= Period (Years)

$$F = P * (1 + i)^N$$

3.50 %

Alternate 1 - New 5 span Structure with Trapezoidal Box Girders

Item	Present Value	Discount Rate	Period (Years)	Future Value
Full Replacement (75 Year Service Life*)	\$39,812,000	0.0000	0	\$0
Milling and Paving (Year 15)	\$50,000	0.0000	15	\$27,000
Substr. Patch, SPM & Paving (Year 30)	\$651,000	0.0000	30	\$180,000
Milling & Paving (Year 45)	\$50,000	0.0000	45	\$27,000
Substr. Patch, SPM & Paving (Year 60)	\$651,000	0.0000	50	\$2,701,000
Milling and Paving (Year 75)	\$0	0.0000	75	\$0
Residual Value	\$0	0.0000	75	\$0
Total Cost	\$41,214,000			

*Substructure age controls
 Full Replacement
 Bridge to be Replaced, No Mill & Fill
 0 yr remaining service life, until need major super rehab or replacement

Alternate 1 - New 5 span Structure with Trapezoidal Box Girders

Item	Present Cost	Inflation Rate	Period (Years)	Future Cost
Full Replacement (75 Year Service Life*)	\$39,812,000	0.04	0	\$39,812,000
Milling and Paving (Year 15)	\$50,000	0.04	15	\$83,767
Substr. Patch, SPM & Paving (Year 30)	\$651,000	0.04	30	\$1,827,223
Milling & Paving (Year 45)	\$50,000	0.04	45	\$235,118
Substr. Patch, SPM & Paving (Year 60)	\$651,000	0.04	50	\$3,635,787
Milling and Paving (Year 75)	\$0	0.04	75	\$0
Total Cost:	\$41,214,000			\$45,593,895

Alternate 2 - New 3 span Structure with Trapezoidal Box Girders

Item	Present Value	Discount Rate	Period (Years)	Future Value
Full Replacement (75 Year Service Life*)	\$40,883,000	0.0000	0	\$0
Milling and Paving (Year 15)	\$45,000	0.0000	15	\$27,000
Substr. Patch, SPM & Paving (Year 30)	\$553,000	0.0000	30	\$102,000
Milling & Paving (Year 45)	\$45,000	0.0000	45	\$27,000
Substr. Patch, SPM & Paving (Year 60)	\$553,000	0.0000	60	\$102,000
Milling and Paving (Year 75)	\$0	0.0000	75	\$0
Residual Value	\$0	0.0000	75	\$0
Total Cost	\$42,079,000			

*New structure age controls
 Bridge to be Replaced, No Mill & Fill
 0 yr remaining service life, until need major super rehab or replacement

Alternate 2 - New 3 span Structure with Trapezoidal Box Girders

Item	Present Cost	Inflation Rate	Period (Years)	Future Cost
Full Replacement (75 Year Service Life*)	\$40,883,000	0.04	0	\$40,883,000
Milling and Paving (Year 15)	\$45,000	0.04	15	\$75,391
Substr. Patch, SPM & Paving (Year 30)	\$553,000	0.04	30	\$1,552,157
Milling & Paving (Year 45)	\$45,000	0.04	45	\$211,606
Substr. Patch, SPM & Paving (Year 60)	\$553,000	0.04	60	\$4,356,584
Milling and Paving (Year 75)	\$0	0.04	75	\$0
Total Cost:	\$42,079,000			\$47,078,738

Alternate 3 - New 5 span Structure with Plate Girders

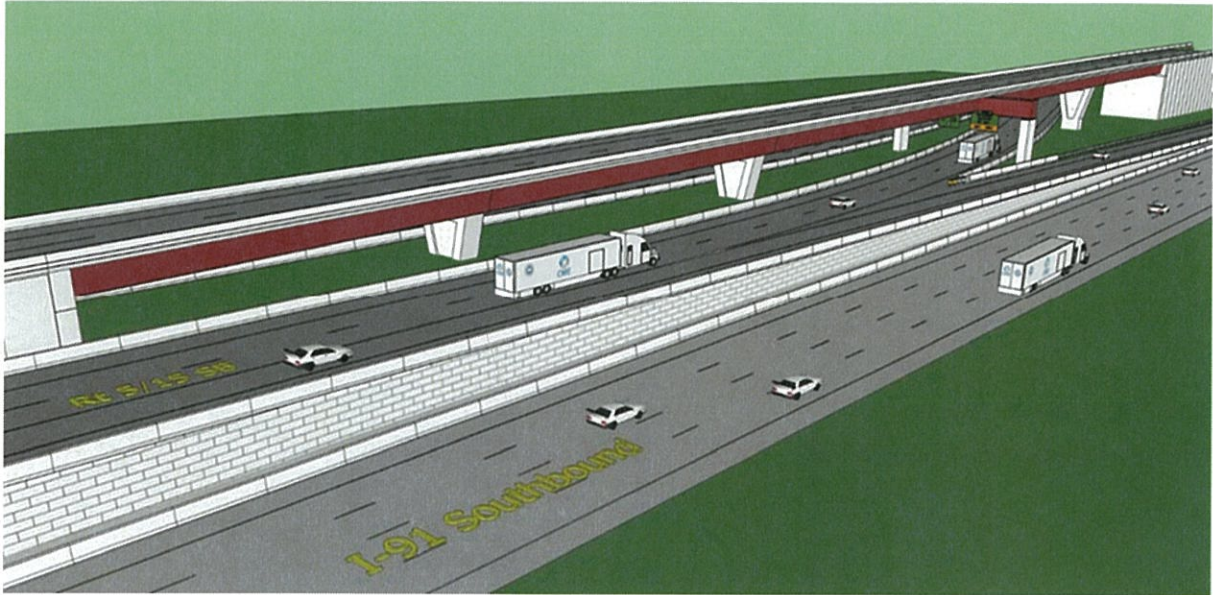
Item	Present Value	Discount Rate	Period (Years)	Future Value
Full Replacement (75 Year Service Life*)	\$38,540,000	0.0000	0	\$0
Milling and Paving (Year 15)	\$46,000	0.0000	15	\$27,000
Substr. Patch, SPM & Paving (Year 30)	\$615,000	0.0000	30	\$102,000
Milling & Paving (Year 45)	\$46,000	0.0000	45	\$27,000
Substr. Patch, SPM & Paving (Year 60)	\$615,000	0.0000	60	\$102,000
Milling and Paving (Year 75)	\$0	0.0000	75	\$0
Residual Value	\$0	0.0000	75	\$0
Total Cost	\$39,862,000			

*New structure age controls
 Bridge to be Replaced, No Mill & Fill
 0 yr remaining service life, until need major super rehab or replacement

Alternate 3 - New 5 span Structure with Plate Girders

Item	Present Cost	Inflation Rate	Period (Years)	Future Cost
Full Replacement (75 Year Service Life*)	\$38,540,000	0.04	0	\$38,540,000
Milling and Paving (Year 15)	\$46,000	0.04	15	\$77,066
Substr. Patch, SPM & Paving (Year 30)	\$615,000	0.04	30	\$1,726,178
Milling & Paving (Year 45)	\$46,000	0.04	45	\$216,308
Substr. Patch, SPM & Paving (Year 60)	\$615,000	0.04	60	\$4,845,026
Milling and Paving (Year 75)	\$0	0.04	75	\$0
Total Cost:	\$39,862,000			\$45,404,579

Alternate 1 – Five Span Continuous Steel Girder Bridge with Trapezoidal Box Girders



This alternate consists of a 5 span continuous girder superstructure with span lengths from south to north of 140', 215', 215', 170', and 140'. The total bridge length will be 880 feet. The superstructure will be comprised of Grade 50 weathering steel girders composite with an 8.5" cast-in-place reinforced concrete deck. The girder type can either be a steel I girder or a trapezoidal box girder. The box girders are typically more efficient at span lengths over 200 feet and aesthetically more pleasing, therefore they were used for this alternate.

As previously stated, full height cantilever abutments are proposed at each end of the bridge in order to limit the overall length of the spans. Pier Nos. 1, 3, and 4 are proposed to be reinforced concrete wall piers with steel integral bent caps which cantilever out to support the exterior girders. A minimum of two (2) bearings can be located under the steel integral bent cap to provide torsional stability for the superstructure.

The significant skew of the roadways creates a detailing challenge near the center of the bridge at Pier No. 2. This limits the use of wall piers in this area. The only practical solution to this situation is the use of a steel integral straddle bent cap supported by two reinforced concrete columns. The cap will span over Route 5/15 SB. The west column of Pier No. 2 will be located in the gore area between Route 5/15 SB and the ramp to I-91 SB. This column will be protected on both sides by concrete barrier. The east column can be placed in the area between Route 5/15 NB and SB.

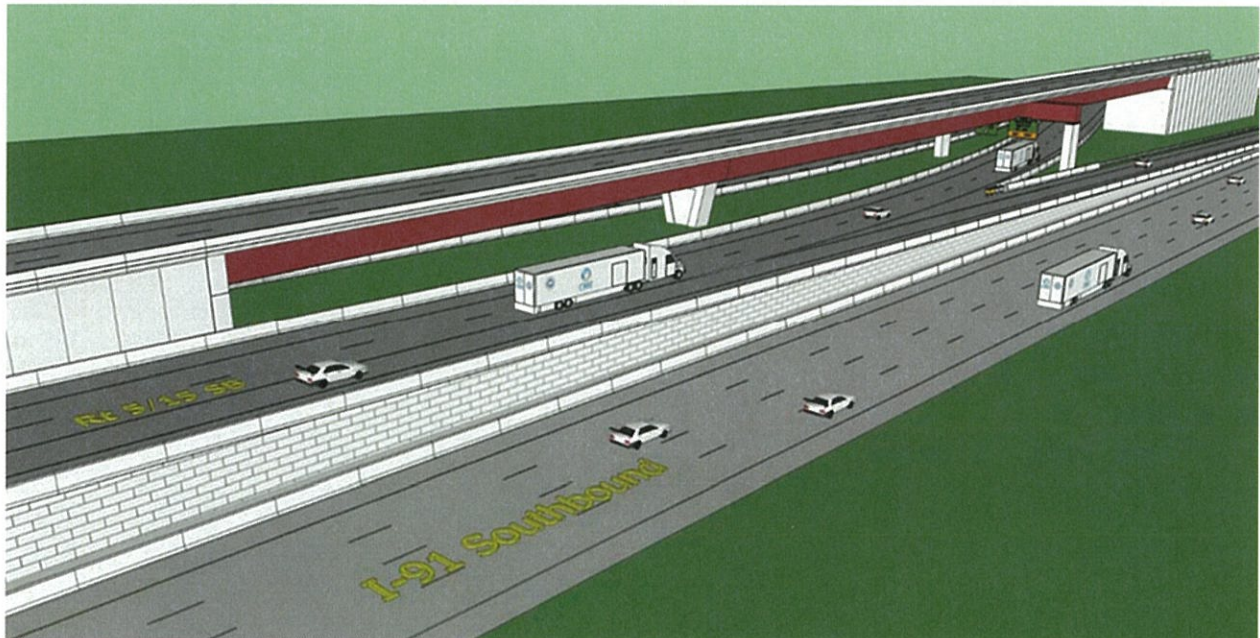
Pier No. 2 is the only integral straddle bent cap proposed on the bridge and is due to the high skew angle between the proposed ramp and Route 5/15 SB below the bridge. Efforts to remove the straddle bent were investigated but it would require an impractical span of over 430 feet near the center of the bridge. This span length is beyond the limits of most normal bridges.

The following are the advantages and disadvantages of this alternate:

Advantages	Disadvantages
This design only requires the use of one straddle bent over Route 5/15 SB.	5 spans requires more piers than Alternate 2, which will require more future maintenance.

Advantages	Disadvantages
Shorter spans when compared to Alternate 2, which will facilitate the construction of the structure in the narrow work zone.	The profile of the new ramp will need to be higher than Alternate 3 to achieve the necessary vertical under clearance.
The shorter span lengths will allow for shallower girder depths than Alternate 2. The loads on each pier will be lower resulting in less piles per pier and smaller cap girders.	
The shallower girder depth minimizes the elevation of the profile required to span Route 5/15 SB.	
No modifications are required to the existing retaining wall on the right side of Route 5/15 SB (when compared to Alternate 3).	
Longer total length reduces the retaining walls required.	

Alternate 2 – Three Span Continuous Steel Girder Bridge



This alternate consists of a 3 span continuous girder superstructure with span lengths from south to north of 250', 280', and 250'. The total bridge will be 780 feet. The superstructure will be comprised of Grade 50 weathering steel girders composite with an 8.5" cast-in-place reinforced concrete deck. The girder type can either be a steel I girder or a trapezoidal box girder. The box girders are typically more efficient at span lengths over 200 feet and aesthetically more pleasing, therefore they were used for this alternate.

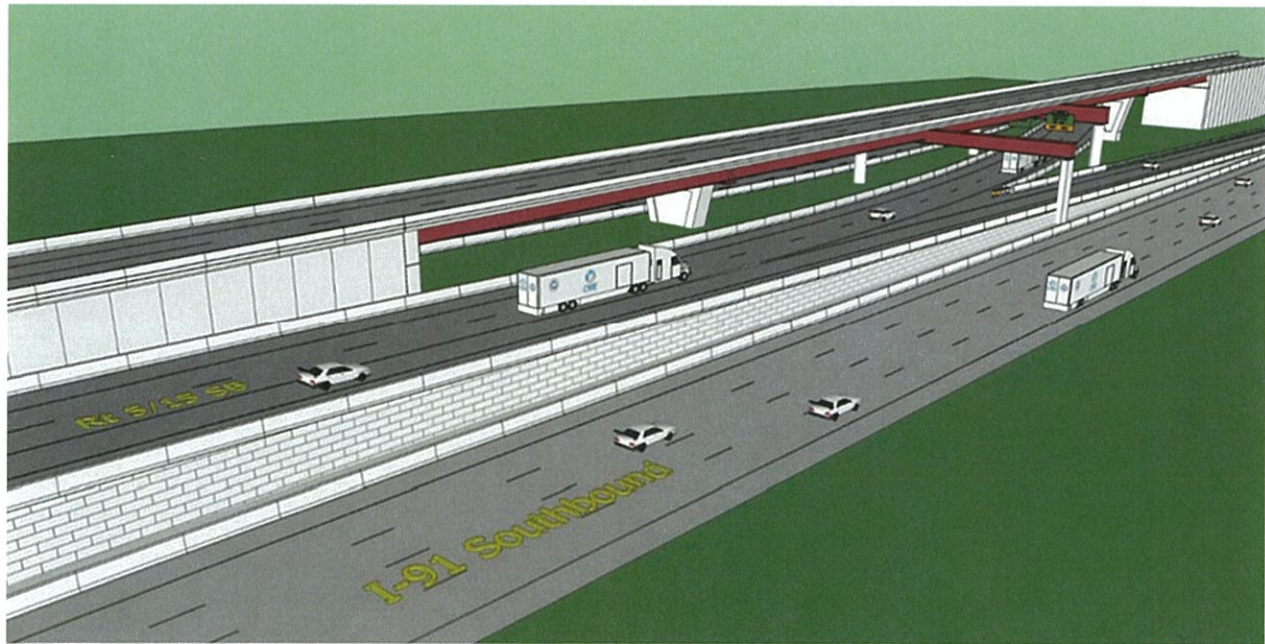
Full height cantilever abutments are proposed at each end of the bridge in order to limit the overall length of the spans. Pier No. 2 is proposed to be a reinforced concrete wall pier with a steel integral bent cap that cantilever out to support the exterior girders. A minimum of two (2) bearings can be located under the steel integral bent

cap to provide torsional stability for the superstructure. Pier No. 1 will consist of a steel integral straddle bent cap supported by two reinforced concrete columns that spans over Route 5/15 SB. The west column of Pier No. 1 will be located in the gore area between Route 5/15 SB and the ramp to I-91 SB. This column will be protected on both sides by concrete barrier. The east column can be placed in the area between Route 5/15 NB and SB.

The following are the advantages and disadvantages of this alternate:

Advantages	Disadvantages
This design only requires the use of one straddle bent over Route 5/15 SB.	Longer span lengths will require a deeper superstructure and increased loads on the piers resulting in more piles per pier.
Fewer piers to be constructed over Route 5/15 SB than other alternates.	Large spans will be more difficult to construct than the smaller spans in other alternates.
No modifications are required to the existing retaining wall on the right side of Route 5/15 SB (when compared to Alternate 3).	The profile of the new ramp will need to be higher than Alternate 3 to accommodate the deeper superstructure.
Fewer substructure elements will require less future maintenance than other alternates.	Heavier girder sections will require more splices due to shipping limitations.

Alternate 3 – 5 Span Continuous with Plate Girders



This alternate consists of a 5 span continuous plate girder superstructure with span lengths from south to north of 140', 175', 175', 175', and 140'. The total length is 805'. The superstructure is comprised of Grade 50 weathering steel built up girders composite with an 8.5" cast-in-place reinforced concrete deck.

Full height cantilever abutments are proposed at each end of the bridge in order to limit the overall length of the spans. Pier Nos. 1 and 4 are proposed to be reinforced concrete wall piers with steel integral bent cap that cantilever out to support the exterior girders. A minimum of two (2) bearings can be located under the steel

integral bent cap to provide torsional stability for the superstructure. Pier Nos. 2 and 3 consist of steel integral straddle bent caps supported by two reinforced concrete columns that span over Route 5/15 SB. The west column of Pier No. 2 will be located in the gore area between Route 5/15 SB and the ramp to I-91 SB. This column will be protected on both sides by concrete barriers. The west column of Pier No. 3 is founded in the narrow area between I-91 SB and the ramp to I-91 SB from Route 5/15 SB. The east columns for Piers 2 and 3 can be placed in the area between Route 5/15 NB and SB.

The following are the advantages and disadvantages of this alternate:

Advantages	Disadvantages
Shorter girders that are easier to ship, requiring fewer splices.	Requires two pier caps over Route 5/15 SB.
Shorter spans will be easier to construct than the larger spans in Alternate 2.	5 spans requires additional piers which will require more future maintenance than Alternate 2.
The profile of the proposed ramp is the lowest and it will have the least impact to the approaches.	Requires a pier column along the right side retaining wall on the ramp to I-91 SB. This may limit the potential for future widening of this ramp.
Plate girders will have a lower cost per pound for fabrication.	

Cost Considerations

The following tables include estimated costs that were developed using ConnDOT 2015 Cost Estimating Guidelines and CTDOT English Bid Item List of July 2015. Appendix A includes the quantity and cost estimates for the three proposed bridges.

Proposed Structure Alternates	Cost of Bridge Only	Additional Costs	Bridge Length	\$/SF (bridge only)	Rounded Total Cost
1 – 5 span continuous trapezoidal box girders	\$ 18,266,000	\$ 21,546,000	880'	\$400/SF	\$39,812,000
2 – 3 span continuous trapezoidal box girders	\$ 18,758,000	\$ 22,125,000	780'	\$460/SF	\$40,883,000
3 – 5 span continuous plate girders	\$ 17,680,000	\$ 20,860,000	805'	\$420/SF	\$38,540,000

Additional Costs – Breakdown**	Alternate 1	Alternate 2	Alternate 3
Minor Items (20% of Bridge Cost)	\$ 3,654,000	\$ 3,752,000	\$ 3,536,000
Maintenance and Protection of Traffic	\$ 3,288,000	\$ 3,377,000	\$ 3,183,000
Mobilization	\$ 2,192,000	\$ 2,251,000	\$ 2,122,000
Construction Staking	\$ 548,000	\$ 563,000	\$ 531,000
Incidentals and Contingencies	\$ 8,385,000	\$ 8,612,000	\$ 8,117,000
Utility Relocation	\$ 100,000	\$ 100,000	\$ 100,000
Escalation to Midpoint Construction Year	\$ 3,379,000	\$ 3,470,000	\$ 3,271,000
Total:	\$ 21,546,000	\$ 22,125,000	\$ 20,860,000

** Breakdowns do not include the cost of the retaining walls for the approach roadways.

RECOMMENDATIONS FOR CONSTRUCTION

As seen above, all Alternates have similar costs. This is due to the fact that all of the Alternates have approximately the same length. Alternate 2 has fewer substructure units; however this savings is offset by the increased cost for the superstructure steel.

Based on the findings, we recommend Alternate 1 as the preferred alternative for the proposed bridge. This is due to the following:

- It has a lower cost than Alternate 2.
- It will be easier to construct than the other alternates.
- It has smaller girders than Alternate 2 and one less straddle bent than Alternate 3.
- It has fewer girder pieces to erect over travel lanes when compared to Alternate 3.
- The depth of the superstructure means that it can be built with a reasonable vertical profile.
- Alternate 2 may require modifications to the west end of the Charter Oak Bridge. This may or may not be the case in the final highway alignment, which will be finalized in Preliminary Design.

This alternate provides a structure that meets the intended need of the project and will provide a minimum life of 75 years.

UTILITY IMPACTS

There are no private or public utilities proposed on the new bridge.



COMPUTATION BY TEG	DATE 7/7/15	SHEET 1	OF 1
CHECKED BY JLS	DATE 7/29/15	CME PROJECT NO. 063703	
CLIENT ConnDOT Charter Oak Bridge Project		CLIENT PROJECT NO.	

ITEM
New Bridge Alternate 1 - Five spans of continuous steel trapezoidal box girders

Alternate 1: New 5 Span Trapezoidal Box Girder Bridge

1. Install new bridge and components
2. Install earth retaining structures as extensions of the wingwalls
3. Remove existing retaining wall along west side of I-91 NB South of Bridge
4. Proposed Bridge Area (SF): 45619

STRUCTURE ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	2,140	\$23.40	\$51,000
0216000	PERVIOUS STRUCTURE BACKFILL	CY	7,280	\$45.80	\$334,000
0406171	HMA S0.5	TON	280	\$94.20	\$27,000
0406173	HMA S0.25	TON	560	\$81.00	\$46,000
0520034	STRIP SEAL EXPANSION JOINT SYSTEM	LF	50	\$500.00	\$25,000
0520391	MODULAR EXPANSION JOINT (MOVEMENT CAPACITY 5")	LF	50	\$600.00	\$30,000
0522128	INSTALL BRIDGE BEARINGS	EA	14	\$2,500.00	\$35,000
0601000	CLASS "A" CONCRETE	CY	2,460	\$900.00	\$2,214,000
0601201	CLASS "F" CONCRETE	CY	2,580	\$804.40	\$2,076,000
0602000	DEFORMED STEEL BARS	LB	352,390	\$1.20	\$423,000
0602006	DEFORMED STEEL BARS - EPOXY COATED	LB	251,200	\$1.40	\$352,000
0603768	STRUCTURAL STEEL	LS	1	\$7,840,000.00	\$7,840,000
0702101	FURNISHING STEEL PILES	LB	4,457,330	\$0.60	\$2,675,000
0702111	DRIVING STEEL PILES	LF	52,250	\$26.00	\$1,359,000
0702326	TEST PILE (STEEL HP 12 X 74 - 108' LONG)	EA	2	\$15,750.00	\$32,000
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	4,960	\$80.80	\$401,000
0714050	TEMPORARY EARTH RETAINING SYSTEM	SF	5,140	\$18.00	\$93,000
0904990	METAL BRIDGE RAIL	LF	2,040	\$93.00	\$190,000
STRUCTURE TOTAL:					\$18,203,000

ROADWAY ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
0305001	PROCESSED AGGREGATE	CY	140	\$56.80	\$8,000
0406170	HMA S1.0	TON	170	\$95.00	\$17,000
0406171	HMA S0.5	TON	110	\$94.20	\$11,000
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	700	\$37.60	\$27,000
ROADWAY TOTAL:					\$63,000

STRUCTURE PLUS ROADWAY SUBTOTAL 1: \$18,266,000

Square Foot Bridge Cost: \$400.00

MINOR ITEMS

	UNIT	QUANTITY	UNIT PRICE	TOTAL
Minor Items (20% of Subtotal 1)	LS	1	\$3,654,000	\$3,654,000
				SUBTOTAL 2

LUMP SUM ITEMS

	UNIT	QUANTITY	UNIT PRICE	TOTAL
M & P of Traffic (15% of Subtotal 1 and 2)	LS	1	\$3,288,000	\$3,288,000
Mobilization (10% of Subtotal 1 and 2)	LS	1	\$2,192,000	\$2,192,000
Construction Staking (2.5% of Subtotal 1 and 2)	LS	1	\$548,000	\$548,000
				SUBTOTAL 3

ENGINEERING PERCENTAGES

	TOTAL
Incidentals (10% of Subtotal 1, 2, and 3)	10% INCIDENTALS \$2,795,000
Contingency (20% of Subtotal 1, 2, and 3)	20% CONTINGENCY \$5,590,000
SUBTOTAL 4	

NON-CONTRACT ITEMS

	UNIT	QUANTITY	UNIT PRICE	TOTAL
UTILITY RELOCATION	LS	1	\$100,000.00	\$100,000
				SUBTOTAL 5

ESCALATION TO YEAR OF CONSTRUCTION

	TOTAL
Say 3% per Year to 2018	SUBTOTAL 6 \$3,379,000

TOTAL \$39,812,000

GRAND TOTAL \$39,812,000



COMPUTATION BY TEG	DATE 7/7/15	SHEET 1	OF 1
CHECKED BY JLS	DATE 7/30/15	CME PROJECT NO. 063703	
CLIENT ConnDOT Charter Oak Bridge Project		CLIENT PROJECT NO.	

ITEM
New Bridge Alternate 2 - Three spans of continuous steel trapezoidal box girders

Alternate 2: New 3 Span Trapezoidal Box Girder Bridge

1. Install new bridge and components
2. Install earth retaining structures as extensions of the wingwalls
3. Remove existing retaining wall along west side of I-91 NB South of Bridge
4. Proposed Bridge Area (SF): 40435

STRUCTURE ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	1,780	\$23.40	\$42,000
0216000	PERVIOUS STRUCTURE BACKFILL	CY	7,100	\$45.80	\$326,000
0406171	HMA S0.5	TON	250	\$94.20	\$24,000
0406173	HMA S0.25	TON	500	\$81.00	\$41,000
0520034	STRIP SEAL EXPANSION JOINT SYSTEM	LF	50	\$500.00	\$25,000
0520391	MODULAR EXPANSION JOINT (MOVEMENT CAPACITY 5")	LF	50	\$600.00	\$30,000
0522128	INSTALL BRIDGE BEARINGS	EA	10	\$2,500.00	\$25,000
0601000	CLASS "A" CONCRETE	CY	2,230	\$900.00	\$2,007,000
0601201	CLASS "F" CONCRETE	CY	2,120	\$804.40	\$1,706,000
0602000	DEFORMED STEEL BARS	LB	296,770	\$1.20	\$357,000
0602006	DEFORMED STEEL BARS - EPOXY COATED	LB	225,130	\$1.40	\$316,000
0603768	STRUCTURAL STEEL	LS	1	\$9,845,000.00	\$9,845,000
0702101	FURNISHING STEEL PILES	LB	3,687,850	\$0.60	\$2,213,000
0702111	DRIVING STEEL PILES	LF	43,230	\$26.00	\$1,124,000
0702326	TEST PILE (STEEL HP 12 X 74 - 108' LONG)	EA	2	\$15,750.00	\$32,000
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	4,430	\$80.80	\$358,000
0714050	TEMPORARY EARTH RETAINING SYSTEM	SF	2,900	\$18.00	\$53,000
0904990	METAL BRIDGE RAIL	LF	1,830	\$93.00	\$171,000
STRUCTURE TOTAL:					\$18,695,000

ROADWAY ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
0305001	PROCESSED AGGREGATE	CY	140	\$56.80	\$8,000
0406170	HMA S1.0	TON	170	\$95.00	\$17,000
0406171	HMA S0.5	TON	110	\$94.20	\$11,000
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	700	\$37.60	\$27,000
ROADWAY TOTAL:					\$63,000

STRUCTURE PLUS ROADWAY SUBTOTAL 1: \$18,758,000

Square Foot Bridge Cost:	\$460.00
---------------------------------	-----------------

MINOR ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Minor Items (20% of Subtotal 1)		LS	1	\$3,752,000	\$3,752,000
SUBTOTAL 2					\$3,752,000

LUMP SUM ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
M & P of Traffic (15% of Subtotal 1 and 2)		LS	1	\$3,377,000	\$3,377,000
Mobilization (10% of Subtotal 1 and 2)		LS	1	\$2,251,000	\$2,251,000
Construction Staking (2.5% of Subtotal 1 and 2)		LS	1	\$563,000	\$563,000
SUBTOTAL 3					\$6,191,000

ENGINEERING PERCENTAGES

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Incidentals (10% of Subtotal 1, 2, and 3)				10% INCIDENTALS	\$2,871,000
Contingency (20% of Subtotal 1, 2, and 3)				20% CONTINGENCY	\$5,741,000
SUBTOTAL 4					\$8,612,000

NON-CONTRACT ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
UTILITY RELOCATION		LS	1	\$100,000.00	\$100,000
SUBTOTAL 5					\$100,000

ESCALATION TO YEAR OF CONSTRUCTION

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Say 3% per Year to 2018					
SUBTOTAL 6					\$3,470,000

TOTAL \$40,883,000

GRAND TOTAL	\$40,883,000
--------------------	---------------------



COMPUTATION BY TEG	DATE 7/29/15	SHEET 1	OF 1
CHECKED BY JLS	DATE 7/30/15	CME PROJECT NO. 063703	
CLIENT ConnDOT Charter Oak Bridge Project		CLIENT PROJECT NO.	

ITEM
New Bridge Alternate 3 - Five spans continuous steel I-girder bridge

Alternate 3: New 5 Span I-Girder Bridge

1. Install new bridge and components
2. Install earth retaining structures as extensions of the wingwalls
3. Remove existing retaining wall along west side of I-91 NB South of Bridge
4. Proposed Bridge Area (SF): 41731

STRUCTURE ITEMS

<u>ITEM NO.</u>	<u>ITEM DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	2,230	\$23.40	\$53,000
0216000	PERVIOUS STRUCTURE BACKFILL	CY	9,760	\$45.80	\$448,000
0406171	HMA S0.5	TON	260	\$94.20	\$25,000
0406173	HMA S0.25	TON	520	\$81.00	\$43,000
0520391	MODULAR EXPANSION JOINT (MOVEMENT CAPACITY 5")	LF	50	\$600.00	\$30,000
0522128	INSTALL BRIDGE BEARINGS	EA	20	\$2,500.00	\$50,000
0601000	CLASS "A" CONCRETE	CY	2,870	\$900.00	\$2,583,000
0601201	CLASS "F" CONCRETE	CY	2,420	\$804.40	\$1,947,000
0602000	DEFORMED STEEL BARS	LB	401,290	\$1.20	\$482,000
0602006	DEFORMED STEEL BARS - EPOXY COATED	LB	231,650	\$1.40	\$325,000
0603768	STRUCTURAL STEEL	LS	1	\$6,778,469.72	\$6,779,000
0702101	FURNISHING STEEL PILES	LB	4,607,470	\$0.60	\$2,765,000
0702111	DRIVING STEEL PILES	LF	54,010	\$26.00	\$1,405,000
0702326	TEST PILE (STEEL HP 12 X 74 - 108' LONG)	EA	2	\$15,750.00	\$32,000
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	4,560	\$80.80	\$369,000
0714050	TEMPORARY EARTH RETAINING SYSTEM	SF	5,860	\$18.00	\$106,000
0904990	METAL BRIDGE RAIL	LF	1,880	\$93.00	\$175,000
STRUCTURE TOTAL:					\$17,617,000

ROADWAY ITEMS

<u>ITEM NO.</u>	<u>ITEM DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
0305001	PROCESSED AGGREGATE	CY	140	\$56.80	\$8,000
0406170	HMA S1.0	TON	170	\$95.00	\$17,000
0406171	HMA S0.5	TON	110	\$94.20	\$11,000
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	700	\$37.60	\$27,000
ROADWAY TOTAL:					\$63,000

STRUCTURE PLUS ROADWAY SUBTOTAL 1: \$17,680,000

Square Foot Bridge Cost: \$420

MINOR ITEMS

<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
Minor Items (20% of Subtotal 1)	LS	1	\$3,536,000.00
			SUBTOTAL 2 \$3,536,000

LUMP SUM ITEMS

<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
M & P of Traffic (15% of Subtotal 1 and 2)	LS	1	\$3,183,000.00
Mobilization (10% of Subtotal 1 and 2)	LS	1	\$2,122,000.00
Construction Staking (2.5% of Subtotal 1 and 2)	LS	1	\$531,000.00
			SUBTOTAL 3 \$5,836,000

ENGINEERING PERCENTAGES

	<u>TOTAL</u>
Incidentals (10% of Subtotal 1, 2, and 3)	10% INCIDENTALS \$2,706,000
Contingency (20% of Subtotal 1, 2, and 3)	20% CONTINGENCY \$5,411,000
SUBTOTAL 4 \$8,117,000	

NON-CONTRACT ITEMS

<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
UTILITY RELOCATION	LS	1	\$100,000.00
			SUBTOTAL 5 \$100,000

ESCALATION TO YEAR OF CONSTRUCTION

	<u>TOTAL</u>
Say 3% per Year to 2018	SUBTOTAL 6 \$3,271,000

TOTAL \$38,540,000

GRAND TOTAL \$38,540,000

