Appendix C – Cost Estimates

Computations

Project **General Sullivan Bridge over Little Bay** Project # **52381.01**
Location **Newington/Dover, NH** Sheet
Calculated by **MAC** Date **1/15/2019**
Reviewed by **GSG** Date **1/15/2019**
Title **Conceptual Cost Estimate Summary**

Conceptual Cost Estimate Summary

General Sullivan Bridge - Alternative Initial Capital and Life Cycle Cost Estimate Summary			
SEIS Cost Estimates:			
Alt:	Description:	Initial Capital Cost	Life Cycle Cost *(2018 Dollars)*
No Action	Remove the General Sullivan Bridge and Supporting Substructure Entirely	$8,000,000	N/A
1D	Rehabilitation of the General Sullivan Bridge - 16' Path	$43,000,000	$74,000,000
2E	Superstructure Replacement - Truss Alternative - 16' Path	$37,750,000	(See Note 3)
3C	Partial Rehabilitation - 16' Path	$42,250,000	$61,750,000
4C	Complete Replacement - 16' Path	$31,750,000	(See Note 3)
6C	Southbound Little Bay Bridge - Widened Deck on Pier Extension - 16' Path	$28,000,000	$31,250,000
7B	Southbound Little Bay Bridge - Independent Deck on Pier Extension - 16' Path	$29,500,000	$32,250,000
9B	Superstructure Replacement - Girder Alternative - 16' Path	$28,500,000	$31,250,000

Notes:
1. "*Initial Capital Cost*" Is the cost of initial construction to bring the alternative into service.
2. "*Life Cycle Cost (2018 Dollars)*" Is the total cost to construct and maintain the alternative in todays dollars.
3. Life Cycle Cost estimates for Alternatives 2E and 4C were not completed since these alternatives were eliminated from consideration for other reasons.
4. The costs presented do not include Design Engineering, Permitting or Cultural Resource Mitigation costs.

Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** Project # **52381.01**
Location **Newington/Dover, NH** Sheet
Calculated by **MAC** Date **2/7/2020**
Reviewed by Date
Title **Bridge Removal Only Alternative**

Conceptual Cost Estimate - Bridge Removal Only

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE REMOVAL - SPANS 1-3, 8 AND 9 (684 LF)	U	1	$ 1,300,000	$ 1,300,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS	U	1	$ 1,600,000	$ 1,600,000
502.02	SUBSTRUCTURE REMOVAL - ABUTMENTS & PIERS	U	1	$ 1,900,000	$ 1,900,000

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-3, 8 AND 9 (684 LF) is a causeway needed for removal of the bridge where water is too shallow for barges.

2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS* cost considers cost reduction due to no members needing to be salvaged.

3) Item SUBSTRUCTURE REMOVAL - ABUTMENTS AND PIERS cost consider removing the abutments and piers in their entirety.

Items Sub Total	$ *4,800,000*
20% Standard Contingency	$ 960,000
Sub Total	$ *5,760,000*
10% Mobilization	$ 576,000
5% Construction Inspection	$ 288,000
Total	$ *6,624,000*
Construction Engineering	$ *165,600*
Risk Contingency	$ *1,250,000*
Total Cost[E]	**$ 8,000,000**

Notes:

A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **2.50%** of "*Total*" value, and is based on **1.0** year assumed construction duration
D) Risk Contingency Cost is approximately = **22%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Cultural Resource mitigation cost is not included in this conceptual estimate.

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** Project # **52381.01**
Location **Newington/Dover, NH** Sheet
Calculated by **MAC** Date **1/15/2019**
Reviewed by **GSG** Date **1/15/2019**
Title **Alternative 1D**

Conceptual Cost Estimate - Alternative 1D

Rehabilitation of Existing General Sullivan Bridge - 75 Year Service Life, 16' Multiuse Path Width

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 4,800,000	$ 4,800,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND SELECT MEMBERS	U	1	$ 1,600,000	$ 1,600,000
502.02	SUBSTRUCTURE REMOVAL - NEWINGTON ABUTMENT (PARTIAL)	U	1	$ 10,000	$ 10,000
520.7	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	920	$ 1,150	$ 1,058,000
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	237,000	$ 1.50	$ 355,500
548.01	FIXED BEARINGS	EA	10	$ 5,000	$ 50,000
548.02	EXPANSION BEARINGS	EA	18	$ 5,000	$ 90,000
548.03	JACKING FOR BEARING REPLACEMENT	EA	28	$ 5,000	$ 140,000
550.01	TEMPORARY STRUCTURAL SHORING - SPAN 7	U	1	$ 115,000	$ 115,000
550.02	STEEL TRUSS REPAIRS - LOCALIZED REPAIR DETAILS, ALL SPANS	LB	54,000	$ 15	$ 810,000
550.03	STEEL TRUSS REPAIRS - CHORD MEMBER REPLACEMENT, SPAN 7	LB	12,000	$ 15	$ 180,000
550.04	STEEL TRUSS REPAIRS - REPLACE RIVETS WITH BOLTS, ALL SPANS	EA	20,000	$ 115	$ 2,300,000
550.05	STEEL TRUSS REPAIRS - NEW BOLT LOCATIONS, ALL SPANS	EA	4,000	$ 115	$ 460,000
550.06	STRUCTURAL STEEL - FLOOR SYSTEM, ALL SPANS	LB	455,000	$ 6.00	$ 2,730,000
550.07	STRUCTURAL STEEL - BRACING MEMBERS, ALL SPANS	LB	186,000	$ 8.00	$ 1,488,000
556	CLEAN AND PAINT EXISTING STRUCTURAL STEEL - ALL SPANS	U	1	$ 6,436,900	$ 6,436,900
559.41	ASPHALTIC PLUG FOR CRACK CONTROL (F)	LF	37	$ 100	$ 3,700
560.1	PREFABRICATED COMPRESSION SEAL EXPANSION JOINT (F)	LF	19	$ 700	$ 13,300
561.1	PREFABRICATED STRIP SEAL EXPANSION JOINT (F)	LF	19	$ 800	$ 15,200
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	37	$ 1,400	$ 51,800
563	PEDESTRIAN BRIDGE RAIL	LF	3,056	$ 300	$ 916,800
571	REPOINT STONE MASONRY PIERS	LF	11,200	$ 175	$ 1,960,000
1001	PERMANENT ACCESS PLATFORM - SPANS 1-4 & 6-9	U	1	$ 530,000	$ 530,000
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 10,000	$ 10,000

Major Assumptions:

1) Item *ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)* is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.

2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND SELECT MEMBERS* cost considers complexity of removal without damaging members that are to remain.

3) Unit cost for Item *STRUCTURAL STEEL - BRACING MEMBERS, ALL SPANS* accounts for more complex connection detailing and field fitting.

4) Item *PERMANENT PATH APPROACH WORK* carries cost for minor approach work behind the Newington abutment - no work anticipated behind the Dover abutment.

5) Life cycle costs are NOT included in this estimate.

Items Sub Total	$ *26,824,200*
20% Standard Contingency	$ 5,364,840
Sub Total	$ *32,189,040*
10% Mobilization	$ 3,218,904
5% Construction Inspection	$ 1,609,452
Total	$ *37,017,396*
Construction Engineering	$ *1,665,783*
Risk Contingency	$ *4,250,000*
Total Cost[E]	**$ 43,000,000**

Notes:

A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **4.5%** of "*Total*" value, and is based on **3.0** year assumed construction duration
D) Risk Contingency Cost is approximately = **13%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** — Project # **52381.01**
Location **Newington/Dover, NH** — Sheet
Calculated by **MAC** — Date **1/15/2019**
Reviewed by GSG — Date 1/15/2019
Title **Alternative 2E**

Conceptual Cost Estimate - Alternative 2E

Replacement of Existing General Sullivan Bridge Superstructure with New Truss Superstructure, 16' Multiuse Path Width

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 4,800,000	$ 4,800,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS	U	1	$ 1,100,000	$ 1,100,000
502.02	SUBSTRUCTURE REMOVAL - NEWINGTON ABUTMENT & PIER 7 (PARTIAL)	U	1	$ 45,000	$ 45,000
520.12	CONCRETE CLASS A, ABOVE FOOTINGS (F)	CY	120	$ 1,300	$ 156,000
520.7002	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	880	$ 1,150	$ 1,012,000
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	247,000	$ 1.50	$ 370,500
548.21	ELASTOMERIC BEARING ASSEMBLIES (F)	EA	32	$ 5,000	$ 160,000
559.41	ASPHALTIC PLUG FOR CRACK CONTROL (F)	LF	55	$ 100	$ 5,500
560.1001	PREFABRICATED COMPRESSION SEAL EXPANSION JOINT (F)	LF	37	$ 700	$ 25,900
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	55	$ 1,400	$ 77,000
563	PEDESTRIAN BRIDGE RAIL	LF	3,056	$ 300	$ 916,800
569.01	PREFABRICATED TRUSS - FAB. & DELIVERED, SPANS 1-3 & 7-9, 18'-4" WIDE	LB	1,300,000	$ 4.00	$ 5,200,000
569.02	PREFABRICATED TRUSS - FAB. & DELIVERED, SPANS 4-6, 21'-0" WIDE	LB	1,070,000	$ 4.00	$ 4,280,000
569.03	PREFABRICATED TRUSS - METALIZED & COLORED, ALL SPANS	SF	125,000	$ 13.50	$ 1,687,500
569.04	PREFABRICATED TRUSS - ERECTED, ALL SPANS	LB	2,370,000	$ 1.40	$ 3,318,000
571	REPOINT STONE MASONRY PIERS	LF	11,200	$ 175	$ 1,960,000
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 10,000	$ 10,000

Items Sub Total $ *25,824,200*
20% Standard Contingency $ 5,164,840
Sub Total $ *30,989,040*
10% Mobilization $ 3,098,904
5% Construction Inspection $ 1,549,452
Total $ *35,637,396*
Construction Engineering $ *890,935*
Risk Contingency $ *1,250,000*
Total Cost[E] **$ 37,750,000**

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF) is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.
2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS* cost considers cost reduction due to no members needing to be salvaged.
3) Item *SUBSTRUCTURE REMOVAL - NEWINGTON ABUTMENT & PIER 7 (PARTIAL)* includes the removal of the Newington abutment structural topping slab, and the top portion of Pier 7.
4) In item *PREFABRICATED TRUSS - FAB & DELIVERED, SPANS 1-3 & 7-9, 18'-4" WIDE* the out-to-out spacing of truss chords is set equal to the overall bridge deck width (path width plus curb widths) as these spans are not governed by wind overturning forces.
5) In item *PREFABRICATED TRUSS - FAB & DELIVERED, SPANS 4-6, 21'-0" WIDE,* the out-to-out spacing of truss chords is determined by comparing wind overturning forces to truss and deck system self weight, and chord spacing. Heavier structure & wider spacing = more overturning resistance.
6) Item *PERMANENT PATH APPROACH WORK* carries cost for minor work behind the Newington abutment - no work anticipated behind the Dover abutment.
7) Life cycle costs are NOT included in this estimate.

Notes:

A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **2.5%** of "*Total*" value, and is based on **1.0** year assumed construction duration
D) Risk Contingency Cost is approximately = **4%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** — Project # **52381.01**
Location **Newington/Dover, NH** — Sheet
Calculated by **MAC** — Date **1/15/2019**
Reviewed by **GSG** — Date **1/15/2019**
Title **Alternative 3C**

Conceptual Cost Estimate - Alternative 3C

Replacement of General Sullivan Bridge Approach Spans (1-3 & 7-9) with New Truss Superstructure, 16' Multiuse Path Width

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 4,800,000	$ 4,800,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND TRUSS SPANS 1-3 & 7-9	U	1	$ 1,300,000	$ 1,300,000
502.02	SUBSTRUCTURE REMOVAL - NEWINGTON ABUTMENT & PIER 7 (PARTIAL)	U	1	$ 45,000	$ 45,000
520.12	CONCRETE CLASS A, ABOVE FOOTINGS (F)	CY	120	$ 1,300	$ 156,000
520.7002	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	920	$ 1,150	$ 1,058,000
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	257,000	$ 1.50	$ 385,500
548.03	JACKING FOR BEARING REPLACEMENT	EA	8	$ 5,000.00	$ 40,000
548.21	ELASTOMERIC BEARING ASSEMBLIES (F)	EA	32	$ 5,000	$ 160,000
550.02	STEEL TRUSS REPAIRS - LOCALIZED REPAIR DETAILS, SPANS 4, 5 & 6	LB	33,000	$ 15	$ 495,000
550.04	STEEL TRUSS REPAIRS - REPLACE RIVETS WITH BOLTS, SPANS 4, 5 & 6	EA	14,500	$ 115.00	$ 1,667,500
550.05	STEEL TRUSS REPAIRS - NEW BOLT LOCATIONS, SPANS 4, 5 & 6	EA	1,250	$ 115.00	$ 143,750
550.06	STRUCTURAL STEEL - FLOOR SYSTEM, SPANS 4, 5 & 6	LB	285,000	$ 6.00	$ 1,710,000
550.07	STRUCTURAL STEEL - BRACING MEMBERS, SPANS 4, 5 & 6	LB	82,000	$ 8.00	$ 656,000
556	CLEAN AND PAINT EXISTING STRUCTURAL STEEL	U	1	$ 3,399,100	$ 3,399,100
559.41	ASPHALTIC PLUG FOR CRACK CONTROL (F)	LF	55	$ 100	$ 5,500
560.1001	PREFABRICATED COMPRESSION SEAL EXPANSION JOINT (F)	LF	37	$ 700	$ 25,900
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	55	$ 1,400	$ 77,000
563	PEDESTRIAN BRIDGE RAIL	LF	3,056	$ 300	$ 916,800
569.01	PREFABRICATED TRUSS - FAB. & DELIVERED, SPANS 1-3 & 7-9, 18'-4" WIDE	LB	1,300,000	$ 4.00	$ 5,200,000
569.03	PREFABRICATED TRUSS - METALIZED & COLORED, SPANS 1-3 & 7-9	SF	69,000	$ 13.50	$ 931,500
569.04	PREFABRICATED TRUSS - ERECTED, SPANS 1-3 & 7-9	LB	1,300,000	$ 1.40	$ 1,820,000
571	REPOINT STONE MASONRY PIERS	LF	11,200	$ 175	$ 1,960,000
1001	PERMANENT ACCESS PLATFORM, SPANS 4 & 6	U	1	$ 170,000	$ 170,000
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 10,000	$ 10,000

Items Sub Total $ *27,832,550*
20% Standard Contingency $ 5,566,510
Sub Total $ *33,399,060*
10% Mobilization $ 3,339,906
5% Construction Inspection $ 1,669,953
Total $ *38,408,919*
Construction Engineering $ *1,344,312*
Risk Contingency $ *2,500,000*
Total Cost[E] **$ 42,250,000**

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF) is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.
2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND TRUSS SPANS 1-3 & 7-9* considers removal of entire deck system, spans 1-3 and 7-9, and select bracing members in spans 4-6. The cost considers cost reduction due to no members being salvaged in spans 1-3 and 7-9, and cost increase due to complexity of removal of members within spans to remain.
3) In item *PREFABRICATED TRUSS - FAB. & DELIVERED, SPANS 1-3 & 7-9, 18'-4" WIDE* the out-to-out spacing of truss chords is set equal to the overall bridge width (path width plus curb widths) as these spans are not governed by wind overturning forces.
4) Life cycle costs are NOT included in this estimate.

Notes:

A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **3.5%** of "*Total*" value, and is based on **2.0** year assumed construction duration
D) Risk Contingency Cost is approximately = **7%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed by GSG | Date 1/15/2019
Title **Alternative 4C**

Conceptual Cost Estimate - Alternative 4C

Complete Replacement of General Sullivan Bridge, 16' Multiuse Path Width

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 5,400,000	$ 5,400,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS	U	1	$ 1,100,000	$ 1,100,000
502.02	SUBSTRUCTURE REMOVAL - ABUTMENTS & PIERS	U	1	$ 1,900,000	$ 1,900,000
509	DRILLED SHAFT PIER, CAP AND REINFORCEMENT	EA	8	$ 640,000	$ 5,120,000
520	ABUTMENT	EA	2	$ 250,000	$ 500,000
520.7002	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	920	$ 1,150	$ 1,058,000
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	240,000	$ 1.50	$ 360,000
548.21	ELASTOMERIC BEARING ASSEMBLIES (F)	EA	30	$ 5,000	$ 150,000
550.1	STRUCTURAL STEEL - WEATHERING (F)	LB	1,790,000	$ 2.10	$ 3,759,000
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	37	$ 1,400	$ 51,800
563	PEDESTRIAN BRIDGE RAIL	LF	3,056	$ 300	$ 916,800
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 10,000	$ 10,000

Items Sub Total $ *21,025,600*
20% Standard Contingency $ 4,205,120
Sub Total $ *25,230,720*
10% Mobilization $ 2,523,072
5% Construction Inspection $ 1,261,536
Total $ *29,015,328*
Construction Engineering $ *1,015,536*
Risk Contingency $ *1,750,000*
Total Cost[E] **$ 31,750,000**

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF) is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.
2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS* cost considers cost reduction due to no members needing to be salvaged.
3) Item *DRILLED SHAFT PIER, CAP AND REINFORCEMENT* is a single drilled shaft pier of similar dimensions to the SBLBB. Cost includes rock socket, shaft casing, stainless steel reinforcement (within drilled shaft only), epoxy reinforcement, specialized equipment mobilization and concrete. Cost derived from SBLBB bid tabulation and increased by 16% as recommended by consumer price index.
4) Item *PERMANENT PATH APPROACH WORK* carries cost for minor approach work behind the Newington abutment - no work anticipated behind the Dover abutment.
5) Life cycle costs are NOT included in this estimate.
6) A minimum path width of 16' (18'-4" overall deck width) is recommended as the minimum witdth. A 12' path technically meets aeroelastic instability limits defined by the AASHTO LRFD Manual; however there is concern from an engineering judgement standpoint with anything narrower than the 16' path for this particular alternative.

Notes:

A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **3.50%** of "*Total*" value, and is based on **2.0** year assumed construction duration
D) Risk Contingency Cost is approximately = **7%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed by **GSG** | Date **1/15/2019**
Title **Alternative 6C**

Conceptual Cost Estimate - Alternative 6C

Southbound Little Bay Bridge Superstructure Widening and Extended Substructure, 16' Multiuse Path Width

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 4,800,000	$ 4,800,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS	U	1	$ 1,100,000	$ 1,100,000
502.02	SUBSTRUCTURE REMOVAL - ABUTMENTS, PIER 1, & PIER 7 (PARTIAL)	U	1	$ 195,000	$ 195,000
502.03	STRUCTURE REMOVAL - DOVER APPROACH BRIDGE	U	1	$ 160,000	$ 160,000
509	DRILLED SHAFT PIER, CAP AND REINFORCEMENT	EA	2	$ 650,000	$ 1,300,000
520	ABUTMENTS	U	2	$ 250,000	$ 500,000
520.01	CONCRETE CLASS AA - PRECAST PIER COLUMN	CY	120	$ 2,000	$ 240,000
520.02	CONCRETE CLASS AA - PIER CAP EXTENSION	CY	345	$ 2,000	$ 690,000
520.7002	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	980	$ 1,250	$ 1,225,000
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	349,000	$ 1.50	$ 523,500
548	PINNED BEARING FOR PIER COLUMN	EA	7	$ 10,000.00	$ 70,000
548.21	ELASTOMERIC BEARING ASSEMBLIES (F)	EA	32	$ 5,000	$ 160,000
550.1	STRUCTURAL STEEL - WEATHERING (F)	LB	1,325,828	$ 2.10	$ 2,784,239
559.41	ASPHALTIC PLUG FOR CRACK CONTROL (F)	LF	37	$ 100	$ 3,700
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	37	$ 1,400	$ 51,800
563	PEDESTRIAN BRIDGE RAIL	LF	2,654	$ 300	$ 796,302
563.01	PROTECTIVE SCREENING	LF	3,381	$ 55	$ 185,974
571	REPOINT STONE MASONRY PIERS	LF	9,800	$ 175	$ 1,715,000
592	DOVER APPROACH MSE WALL	SF	6,739	$ 85	$ 572,832
606	CONCRETE BARRIER, DOUBLE-FACED	LF	1,173	$ 390	$ 457,470
606.41741	PORTABLE CONCRETE BARRIER FOR TRAFFIC CONTROL - BRIDGE	LF	1,375	$ 45	$ 61,875
619.1	MAINTENANCE OF TRAFFIC	U	1	$ 150,000	$ 150,000
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 180,000	$ 180,000

Items Sub Total $ *18,622,692*
20% Standard Contingency $ 3,724,538
Sub Total $ *22,347,230*
10% Mobilization $ 2,234,723
5% Construction Inspection $ 1,117,362
Total $ *25,699,315*
Construction Engineering $ *770,979*
Risk Contingency $ *1,500,000*
Total Cost[E] **$ 28,000,000**

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF) is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.
2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS* cost considers cost reduction due to no members needing to be salvaged.
3) Item *DRILLED SHAFT PIER, CAP AND REINFORCEMENT* is a single drilled shaft pier of similar dimensions to the SBLBB. Cost includes rock socket, shaft casing, stainless steel reinforcement (within drilled shaft only), epoxy reinforcement, specialized equipment mobilization and concrete. Cost derived from SBLBB bid tabulation and increased by 16% as recommended by consumer price index.
4) Item *PERMANENT PATH APPROACH WORK* carries cost for required approach work behind the Newington abutment due to profile raise, Dover approach work is structural.
5) Dover approach bridge and elevated MSE wall path to be removed and replaced due to significant grade differential of incoming proposed superstructure and existing abutment elevation (difference = 7.2' +/-) due to maintaining 5% grade.
6) Unit cost of Item *CONCRETE BRIDGE DECK (QC/QA) (F)* is higher than other alt's. due to more difficult deck forming off of SBLBB

Notes

A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **3.0%** of "*Total*" value, and is based on **1.5** year assumed construction duration
D) Risk Contingency Cost is approximately = **7%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.
H) This alternative carriers durability concerns with drilling into existing pier caps - needs further protection of existing structure consideration

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed by **GSG** | Date **1/15/2019**
Title **Alternative 7B**

Conceptual Cost Estimate - Alternative 7B

Independent Superstructure on Southbound Little Bay Bridge Extended Substructure, 16' Multiuse Path Width

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 4,800,000	$ 4,800,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS	U	1	$ 1,100,000	$ 1,100,000
502.02	SUBSTRUCTURE REMOVAL - ABUTMENTS, PIER 1, & PIER 7 (PARTIAL)	U	1	$ 195,000	$ 195,000
502.03	STRUCTURE REMOVAL - DOVER APPROACH BRIDGE	U	1	$ 160,000	$ 160,000
509	DRILLED SHAFT PIER, CAP AND REINFORCEMENT	EA	2	$ 650,000	$ 1,300,000
520	ABUTMENTS	U	2	$ 250,000	$ 500,000
520.01	CONCRETE CLASS AA - PRECAST PIER COLUMN	CY	120	$ 2,000	$ 240,000
520.02	CONCRETE CLASS AA - PIER CAP EXTENSION	CY	345	$ 2,000	$ 690,000
520.7002	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	1,010	$ 1,150	$ 1,161,500
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	357,000	$ 1.50	$ 535,500
548	PINNED BEARING FOR PIER EXTENSION COLUMNS	EA	7	$ 10,000.00	$ 70,000
548.21	ELASTOMERIC BEARING ASSEMBLIES (F)	EA	32	$ 5,000	$ 160,000
550.1	STRUCTURAL STEEL - WEATHERING (F)	LB	1,978,084	$ 2.10	$ 4,153,976
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	37	$ 1,400	$ 51,800
563	PEDESTRIAN BRIDGE RAIL	LF	3,827	$ 300	$ 1,148,202
563.01	PROTECTIVE SCREENING	LF	1,691	$ 55	$ 92,987
571	REPOINT STONE MASONRY PIERS	LF	9,800	$ 175	$ 1,715,000
592	DOVER APPROACH MSE WALL	SF	6,739	$ 85	$ 572,832
606.41741	PORTABLE CONCRETE BARRIER FOR TRAFFIC CONTROL - BRIDGE	LF	1,375	$ 45	$ 61,875
619.1	MAINTENANCE OF TRAFFIC	U	1	$ 150,000	$ 150,000
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 180,000	$ 180,000

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF) is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.

2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS* cost considers cost reduction due to no members needing to be salvaged.

3) Item *DRILLED SHAFT PIER, CAP AND REINFORCEMENT* is a single drilled shaft pier of similar dimensions to the SBLBB. Cost includes rock socket, shaft casing, stainless steel reinforcement (within drilled shaft only), epoxy reinforcement, specialized equipment mobilization and concrete. Cost derived from SBLBB bid tabulation and increased by 16% as recommended by consumer price index.

Items Sub Total	$ *19,738,672*
20% Standard Contingency	$ 3,947,734
Sub Total	$ *23,686,406*
10% Mobilization	$ 2,368,641
5% Construction Inspection	$ 1,184,320
Total	$ *27,239,367*
Construction Engineering	$ *817,181*
Risk Contingency	$ *1,500,000*
Total Cost[E]	**$ 29,500,000**

4) Item *PERMANENT PATH APPROACH WORK* carries cost for required approach work behind the Newington abutment due to profile raise, Dover approach work is structural.

5) Dover approach bridge and elevated MSE wall path to be removed and replaced due to significant grade differential of incoming proposed superstructure and existing abutment elevation (difference = 7.2' +/-) due to maintaining 5% grade.

6) A minimum path width of 16' (18'-4" overall deck width) is recommended as the minimum width. A 12' path technically meets aeroelastic instability limits defined by the AASHTO LRFD Manual; however there is concern from an engineering judgement standpoint with anything narrower than the 16' path for this particular alternative.

Notes
A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **3.0%** of "*Total*" value, and is based on **1.5** year assumed construction duration
D) Risk Contingency Cost is approximately = **6%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.
H) This alternative carriers durability concerns with drilling into existing pier caps - needs further protection of existing structure consideration

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Conceptual Cost Estimate

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed by **GSG** | Date **1/15/2019**
Title **Alternative 9B**

Conceptual Cost Estimate - Alternative 9B

Replacement of Existing General Sullivan Bridge Superstructure with "V-Shaped" Rigid Steel Frame Superstructure - 16'-0" Path

CONCEPTUAL ESTIMATE OF QUANTITIES AND COST

Item No.	Item Description	Unit	Quantity	Unit Cost	Total Cost
500	ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF)	U	1	$ 4,800,000	$ 4,800,000
502.01	SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS	U	1	$ 1,100,000	$ 1,100,000
502.02	SUBSTRUCTURE REMOVAL - ABUTMENTS, & PIER 7 (PARTIAL)	U	1	$ 100,000	$ 100,000
520	ABUTMENTS	U	2	$ 250,000	$ 500,000
520.12	CONCRETE CLASS A, ABOVE FOOTINGS (F)	CY	120	$ 1,300	$ 156,000
520.7002	CONCRETE BRIDGE DECK (QC/QA) (F)	CY	930	$ 1,150	$ 1,069,500
544.2	REINFORCING STEEL, EPOXY COATED (F)	LB	263,000	$ 1.50	$ 394,500
548	BEARING ASSEMBLIES	EA	30	$ 5,000	$ 150,000
550.1	STRUCTURAL STEEL - WEATHERING (F)	LB	2,330,000	$ 3.00	$ 6,990,000
550.9	STRUCTURAL STEEL - METALIZED & COLORED (LEGS ONLY)	SF	26,000	$ 13.50	$ 351,000
561.2	PREFABRICATED MODULAR BRIDGE JOINT SYSTEM (F)	LF	37	$ 1,400	$ 51,800
563	PEDESTRIAN BRIDGE RAIL	LF	3,056	$ 300	$ 916,800
571	REPOINT STONE MASONRY PIERS	LF	11,200	$ 175	$ 1,960,000
1002	TEMPORARY MULTI-USE PATH ON NB LITTLE BAY BRIDGE	U	1	$ 700,000	$ 700,000
1003	PERMANENT PATH APPROACH WORK	U	1	$ 10,000	$ 10,000

Major Assumptions:

1) Item ACCESS PLATFORM FOR BRIDGE CONSTRUCTION - SPANS 1-4 & 6-9 (1253 LF) is a causeway (460 LF) & trestle (793 LF) needed for all stages of construction.

2) Item *SUPERSTRUCTURE REMOVAL - DECK SYSTEM AND ENTIRE TRUSS* cost considers cost reduction due to no members needing to be salvaged.

3) Item *SUBSTRUCTURE REMOVAL - ABUTMENTS & PIER 7 (PARTIAL)* includes the removal of both abutments, and the top portion of Pier 7.

4) Item *PERMANENT PATH APPROACH WORK* carries cost for minor work behind the Newington abutment - no work anticipated behind the Dover abutment.

5) Life cycle costs are NOT included in this estimate.

6) A minimum path width of 16' (18'-4" overall deck width) is recommended as the minimum witdth. A 12' path technically meets aeroelastic instability limits defined by the AASHTO LRFD Manual; however there is concern from an engineering judgement standpoint with anything narrower than the 16' path for this particular alternative.

Items Sub Total	$ *19,249,600*
20% Standard Contingency	$ 3,849,920
Sub Total	$ *23,099,520*
10% Mobilization	$ 2,309,952
5% Construction Inspection	$ 1,154,976
Total	$ *26,564,448*
Construction Engineering	$ *796,933*
Risk Contingency	$ *1,250,000*
Total Cost[E]	**$ 28,500,000**

Notes:
A) Standard Contingency cost based on "*Items Sub Total*" Value
B) Mobilization and Construction Inspection costs based on "*Sub Total*" Value
C) Construction Engineering = **3.0%** of "*Total*" value, and is based on **1.5** year assumed construction duration
D) Risk Contingency Cost is approximately = **5%** of "*Sub Total*" value
E) Total Cost is the sum of "*Total*", "*Construction Engineering*" and "*Risk Contingency*" costs rounded to the nearest $250,000
F) Vessel Collision loading/protection criteria is to be waived by the New Hampshire DOT, Bureau of Bridge Design
G) Cultural Resource mitigation cost is not included in this conceptual estimate.

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Computations

Project: General Sullivan Bridge over Little Bay | Project #: 52381.01
Location: Newington/Dover, NH | Sheet:
Calculated by: MAC | Date: 1/15/2019
Reviewed By: GSG | Date: 1/15/2019
Title: Alternative 1D

Life Cycle Cost Analysis:

Planning Horizon	75	Years	Fiscal planning time span for the General Sullivan Bridge Project
Design Life	75	Years	Anticipated useful life of bridge before major repair/replacement
Discount Rate	3%		Typically between 3% and 5% per FHWA LCCA Primer

Alternative Cost Summary:	
Initial Capital Cost	$43,000,000
Total Cost - Constant Year	$74,000,000
Total Cost - Present Value	$52,500,000

$$PV = \frac{FV}{(1+R)^N}$$ Present Value Equation

PV = Present Value
FV = Future Value (Assume same as Present Value)
R = Discount Rate
N = Number of Years from Year 0 (now) to time of Preservation Work

Life Cycle Cost Analysis and Breakdown

Preservation Item During Service Life:	*Cost per Occurrence*	*Preservation Work Schedule (Years)*											*Sub-Total Cost: Constant Year*	*Sub-Total Cost: Present Value*
		Interval[5]	*1st*	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*		
Maintenance - Clean Deck, Joints, Piers and Drainage Systems	$6,550	1	-	-	-	-	-	-	-	-	-	-	$491,250	$194,547
Coating System - Touch-Up Painting	$2,238,920	-	20	-	-	-	-	-	-	-	-	-	$2,238,920	$1,239,636
Coating System - Maintenance Repaint (Overcoat)	$3,918,110	-	27	-	-	-	-	-	-	-	-	-	$3,918,110	$1,763,890
Coating System - Abrasive Blast Clean and Paint	$7,556,355	-	37	-	-	-	-	-	-	-	-	-	$7,556,355	$2,531,250
Coating System - Touch-Up Painting	$3,022,542	-	57	-	-	-	-	-	-	-	-	-	$3,022,542	$560,597
Coating System - Maintenance Repaint (Overcoat)	$5,289,449	-	64	-	-	-	-	-	-	-	-	-	$5,289,449	$797,679
Coating System - Touch-Up Painting[7]	$3,022,542	-	74	-	-	-	-	-	-	-	-	-	$3,022,542	$339,170
Detailed Bridge Inspection and Maintenance	$151,000	3	-	-	-	-	-	-	-	-	-	-	$3,775,000	$1,451,026
Joints - Replacement	$110,880	-	25	50	-	-	-	-	-	-	-	-	$221,760	$78,249
Concrete Deck - Rehabilitation	$174,997	-	50	-	-	-	-	-	-	-	-	-	$174,997	$39,918
Piers - Repointing	$635,250	-	25	50	-	-	-	-	-	-	-	-	$1,270,500	$448,304
Residual Value	$0	-	75	-	-	-	-	-	-	-	-	-	$0	$0

Total	$30,981,425	$9,444,266
Say	$31,000,000	$9,500,000

Notes/Assumptions:

1) "Initial Capital Cost" is the cost in todays dollars to perform all work necessary to bring the proposed alternative structure into initial Service.

2) "Constant Year" is the cost in todays dollars assuming no annual discount of Preservation Work.

3) "Present Value" is the cost in todays dollars assuming an annual discount at the assumed "Discount Rate" from year 0 until the year the Preservation Work is performed.

4) "Cost per Occurrence" is the cost in todays dollars to complete the item of Preservation Work one time.

5) "Interval" is used for preservation work items that occur on a regular basis (Examples: Annually = 1, Bi-Annually = 2, Every Five Years = 5)

6) "Residual Value" calculates the value of the remaining design life of the structure based on the Planning Horizon

7) A full blast and recoat at year 74 is recomended by KTA Tator if the structure is planned to stay in service beyond 75 years. The planned design life is 75 years; however it is anticipated that the bridge will stay in active service for several years after the planned design life while replacement decisions and new structure design are completed. Therefore, it is reasonable to account for a coating maintenance cost to keep the bridge safe service during this anticipated planning period.

Item Cost Calculations:

Computations

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed By **GSG** | Date **1/15/2019**
Title **Alternative 3C**

Life Cycle Cost Analysis:

Planning Horizon	75	Years	Fiscal planning time span for the General Sullivan Bridge Project
Design Life	75	Years	Anticipated useful life of bridge before major repair/replacement
Discount Rate	3%		Typically between 3% and 5% per FHWA LCCA Primer

Alternative Cost Summary:	
Initial Capital Cost	$42,250,000
Total Cost - Constant Year	$61,750,000
Total Cost - Present Value	$48,000,000

$$PV = \frac{FV}{(1+R)^N}$$ Present Value Equation

PV = Present Value
FV = Future Value (Assume same as Present Value)
R = Discount Rate
N = Number of Years from Year 0 (now) to time of Preservation Work

Life Cycle Cost Analysis and Breakdown

Preservation Item During Service Life:	*Cost per Occurrence*	*Preservation Work Schedule (Years)*											*Sub-Total Cost: Constant Year*	*Sub-Total Cost: Present Value*
		Interval[5]	*1st*	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*		
Maintenance - Clean Deck, Joints, Piers and Drainage Systems	$6,550	1	-	-	-	-	-	-	-	-	-	-	$491,250	$194,547
Coating System - Touch-Up Painting[7]	$1,182,280	-	20	-	-	-	-	-	-	-	-	-	$1,182,280	$654,600
Coating System - Maintenance Repaint (Overcoat)[7]	$2,068,990	-	27	-	-	-	-	-	-	-	-	-	$2,068,990	$931,437
Coating System - Abrasive Blast Clean and Paint[7]	$3,990,195	-	37	-	-	-	-	-	-	-	-	-	$3,990,195	$1,336,647
Coating System - Touch-Up Painting[7]	$1,596,078	-	57	-	-	-	-	-	-	-	-	-	$1,596,078	$296,028
Coating System - Maintenance Repaint (Overcoat)[7]	$2,793,137	-	64	-	-	-	-	-	-	-	-	-	$2,793,137	$421,221
Coating System - Touch-Up Painting[7]	$1,596,078	-	74	-	-	-	-	-	-	-	-	-	$1,596,078	$179,102
Coating System - Metalizing Removal and Recoat	$1,863,000	-	50	-	-	-	-	-	-	-	-	-	$1,863,000	$424,963
Detailed Bridge Inspection	$87,000	3	-	-	-	-	-	-	-	-	-	-	$2,175,000	$836,022
Joints - Replacement	$143,088	-	25	50	-	-	-	-	-	-	-	-	$286,176	$100,979
Concrete Deck - Rehabilitation	$174,997	-	50	-	-	-	-	-	-	-	-	-	$174,997	$39,918
Piers - Repointing	$635,250	-	25	50	-	-	-	-	-	-	-	-	$1,270,500	$448,304
Residual Value	$0	-	75	-	-	-	-	-	-	-	-	-	$0	$0

Total	$19,487,681	$5,863,767
Say	$19,500,000	$5,750,000

Notes/Assumptions:

1) "Initial Capital Cost" is the cost in todays dollars to perform all work necessary to bring the proposed alternative structure into initial Service.

2) "Constant Year" is the cost in todays dollars assuming no annual discount of Preservation Work.

3) "Present Value" is the cost in todays dollars assuming an annual discount at the assumed "Discount Rate" from year 0 until the year the Preservation Work is performed.

4) "Cost per Occurrence" is the cost in todays dollars to complete the item of Preservation Work one time.

5) "Interval" is used for preservation work items that occur on a regular basis (Examples: Annually = 1, Bi-Annually = 2, Every Five Years = 5)

6) "Residual Value" calculates the value of the remaining design life of the structure based on the Planning Horizon

7) Painting operations pertain to middle three spans only.

8) At the end of the planning horizon, assume the entire structure will be replaced with a similar truss (alt 2). It is not reasonable to assume replacing only the middle three spans with a new structure, adjacent to 75 year old approach span trusses. It would be logical to replace the entire bridge since removal and access costs are a large portion of the capital cost for any kind of replacement; and the expectation after such expenditure would be to not touch the bridge again for a long period of time and without rigorous maintenance.

Computations

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed By **GSG** | Date **1/15/2019**
Title **Alternative 6C**

Life Cycle Cost Analysis:

Planning Horizon	75	Years	Fiscal planning time span for the General Sullivan Bridge Project
Design Life	100	Years	Anticipated useful life of bridge before major repair/replacement
Discount Rate	3%		Typically between 3% and 5% per FHWA LCCA Primer

Alternative Cost Summary:	
Initial Capital Cost	$28,000,000
Total Cost - Constant Year	$31,250,000
Total Cost - Present Value	$29,250,000

$$PV = \frac{FV}{(1+R)^N}$$ Present Value Equation

PV = Present Value
FV = Future Value (Assume same as Present Value)
R = Discount Rate
N = Number of Years from Year 0 (now) to time of Preservation Work

Life Cycle Cost Analysis and Breakdown

Preservation Item During Service Life:	*Cost per Occurrence*	*Preservation Work Schedule (Years)*											*Sub-Total Cost: Constant Year*	*Sub-Total Cost: Present Value*
		Interval[5]	*1st*	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*		
Maintenance - Clean Deck, Joints, Piers and Drainage Systems	$6,550	1	-	-	-	-	-	-	-	-	-	-	$491,250	$194,547
Coating System - Touch-Up Painting[7]	$304,000	-	25	50	75	-	-	-	-	-	-	-	$912,000	$247,656
Routine Bridge Inspection	$17,000	2	-	-	-	-	-	-	-	-	-	-	$629,000	$247,822
Joints - Replacement	$73,260	-	25	50	75	-	-	-	-	-	-	-	$219,780	$59,682
Concrete Deck - Rehabilitation	$399,515	-	50	-	-	-	-	-	-	-	-	-	$399,515	$91,132
Pier Column Bearings - Replacement	$134,750	-	50	-	-	-	-	-	-	-	-	-	$134,750	$30,737
Concrete Barrier - Double Faced	$82,436	-	25	50	-	-	-	-	-	-	-	-	$164,872	$58,176
Protective Screening	$17,742	-	25	50	-	-	-	-	-	-	-	-	$35,483	$12,520
Piers - Repointing	$635,250	-	25	50	75	-	-	-	-	-	-	-	$1,905,750	$517,511
Residual Value	-$1,750,000	-	75	-	-	-	-	-	-	-	-	-	-$1,750,000	-$190,654

Total	$3,142,400	$1,269,130
Say	$3,250,000	$1,250,000

Notes/Assumptions:

1) "Initial Capital Cost" is the cost in todays dollars to perform all work necessary to bring the proposed alternative structure into initial Service.
2) "Constant Year" is the cost in todays dollars assuming no annual discount of Preservation Work.
3) "Present Value" is the cost in todays dollars assuming an annual discount at the assumed "Discount Rate" from year 0 until the year the Preservation Work is performed.
4) "Cost per Occurrence" is the cost in todays dollars to complete the item of Preservation Work one time.
5) "Interval" is used for preservation work items that occur on a regular basis (Examples: Annually = 1, Bi-Annually = 2, Every Five Years = 5)
6) "Residual Value" calculates the value of the remaining design life of the structure based on the Planning Horizon
7) Assume 2/3 the cost of Alternative 2 for touch-up painting. Paint is only in vicinity of Joints since girders are weathering steel, and alternative 6 has four joints as opposed to six joints as in alternative 2.

Item Cost Calculations:

Computations

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed By **GSG** | Date **1/15/2019**
Title **Alternative 7B**

Life Cycle Cost Analysis:

Planning Horizon	75	Years	Fiscal planning time span for the General Sullivan Bridge Project
Design Life	100	Years	Anticipated useful life of bridge before major repair/replacement
Discount Rate	3%		Typically between 3% and 5% per FHWA LCCA Primer

Alternative Cost Summary:	
Initial Capital Cost	$29,500,000
Total Cost - Constant Year	$32,250,000
Total Cost - Present Value	$30,750,000

$$PV = \frac{FV}{(1+R)^N}$$ Present Value Equation

PV = Present Value
FV = Future Value (Assume same as Present Value)
R = Discount Rate
N = Number of Years from Year 0 (now) to time of Preservation Work

Life Cycle Cost Analysis and Breakdown

Preservation Item During Service Life:	*Cost per Occurrence*	*Preservation Work Schedule (Years)*											*Sub-Total Cost: Constant Year*	*Sub-Total Cost: Present Value*
		Interval[5]	*1st*	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*		
Maintenance - Clean Deck, Joints, Piers and Drainage Systems	$6,550	1	-	-	-	-	-	-	-	-	-	-	$491,250	$194,547
Coating System - Touch-Up Painting[7]	$304,000	-	25	50	75	-	-	-	-	-	-	-	$912,000	$247,656
Routine Bridge Inspection	$17,000	2	-	-	-	-	-	-	-	-	-	-	$629,000	$247,822
Joints - Replacement	$68,376	-	25	50	75	-	-	-	-	-	-	-	$205,128	$55,703
Concrete Deck - Rehabilitation	$193,592	-	50	-	-	-	-	-	-	-	-	-	$193,592	$44,160
Pier Column Bearings - Replacement	$134,750	-	50	-	-	-	-	-	-	-	-	-	$134,750	$30,737
Piers - Repointing	$635,250	-	25	50	75	-	-	-	-	-	-	-	$1,905,750	$517,511
Residual Value	-$1,843,750	-	75	-	-	-	-	-	-	-	-	-	-$1,843,750	-$200,868

Total	$2,627,720	$1,137,269
Say	$2,750,000	$1,250,000

Notes/Assumptions:

1) "Initial Capital Cost" is the cost in todays dollars to perform all work necessary to bring the proposed alternative structure into initial Service.

2) "Constant Year" is the cost in todays dollars assuming no annual discount of Preservation Work.

3) "Present Value" is the cost in todays dollars assuming an annual discount at the assumed "Discount Rate" from year 0 until the year the Preservation Work is performed.

4) "Cost per Occurrence" is the cost in todays dollars to complete the item of Preservation Work one time.

5) "Interval" is used for preservation work items that occur on a regular basis (Examples: Annually = 1, Bi-Annually = 2, Every Five Years = 5)

6) "Residual Value" calculates the value of the remaining design life of the structure based on the Planning Horizon

7) Assume 2/3 the cost of Alternative 2 for touch-up painting. Paint is only in vicinity of Joints since girders are weathering steel, and alternative 7 has four joints as opposed to six joints as in alternative 2.

Item Cost Calculations:

Computations

Project **General Sullivan Bridge over Little Bay** | Project # **52381.01**
Location **Newington/Dover, NH** | Sheet
Calculated by **MAC** | Date **1/15/2019**
Reviewed By **GSG** | Date **1/15/2019**
Title **Alternative 9B**

Life Cycle Cost Analysis:

Planning Horizon	75	Years	Fiscal planning time span for the General Sullivan Bridge Project
Design Life	100	Years	Anticipated useful life of bridge before major repair/replacement
Discount Rate	3%		Typically between 3% and 5% per FHWA LCCA Primer

Alternative Cost Summary:	
Initial Capital Cost	$28,500,000
Total Cost - Constant Year	$31,250,000
Total Cost - Present Value	$29,750,000

$$PV = \frac{FV}{(1+R)^N}$$ Present Value Equation

PV = Present Value
FV = Future Value (Assume same as Present Value)
R = Discount Rate
N = Number of Years from Year 0 (now) to time of Preservation Work

Life Cycle Cost Analysis and Breakdown

Preservation Item During Service Life:	*Cost per Occurrence*	*Preservation Work Schedule (Years)*											*Sub-Total Cost: Constant Year*	*Sub-Total Cost: Present Value*
		Interval[5]	*1st*	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*		
Maintenance - Clean Deck, Joints, Piers and Drainage Systems	$6,550	1	-	-	-	-	-	-	-	-	-	-	$491,250	$194,547
Coating System - Touch-Up Painting[7]	$152,000	-	25	50	75	-	-	-	-	-	-	-	$456,000	$123,828
Coating System - Metalizing Removal and Recoat	$702,000	-	50	-	-	-	-	-	-	-	-	-	$702,000	$160,131
Routine Bridge Inspection	$17,000	2	-	-	-	-	-	-	-	-	-	-	$629,000	$247,822
Joints - Replacement	$68,376	-	25	50	75	-	-	-	-	-	-	-	$205,128	$55,703
Concrete Deck - Rehabilitation	$174,965	-	50	-	-	-	-	-	-	-	-	-	$174,965	$39,911
Piers - Repointing	$635,250	-	25	50	75	-	-	-	-	-	-	-	$1,905,750	$517,511
Residual Value	-$1,781,250	-	75	-	-	-	-	-	-	-	-	-	-$1,781,250	-$194,059

Total	$2,782,843	$1,145,395
Say	$2,750,000	$1,250,000

Notes/Assumptions:

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3) "Present Value" is the cost in todays dollars assuming an annual discount at the assumed "Discount Rate" from year 0 until the year the Preservation Work is performed.

4) "Cost per Occurrence" is the cost in todays dollars to complete the item of Preservation Work one time.

5) "Interval" is used for preservation work items that occur on a regular basis (Examples: Annually = 1, Bi-Annually = 2, Every Five Years = 5)

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7) Assume 1/3 the cost of Alternative 2 for touch-up painting. Paint is only in vicinity of Joints since girders are weathering steel, and alternative 9 has two joints as opposed to six joints as in alternative 2.

Item Cost Calculations: