

Submitted to:

Town of Acton

Acton Town Hall
472 Main Street
Acton, MA 01720

Attention: Don P. Johnson
Town Manager

May 16, 2007

Towns of Acton, Carlisle and Westford

Bruce Freeman Rail Trail

Existing Structures Evaluation and Modification Report

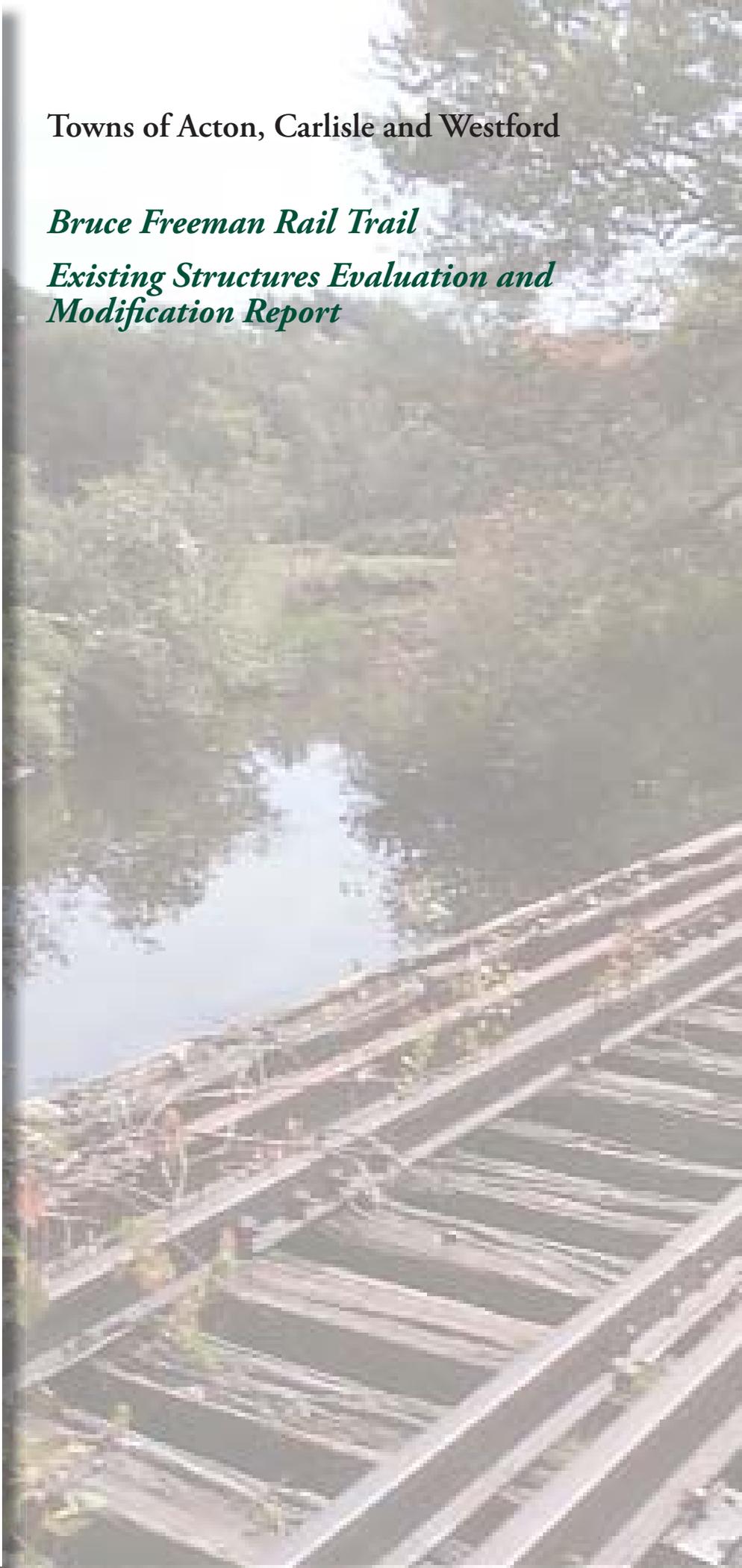


GPI

Submitted by:

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GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

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GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

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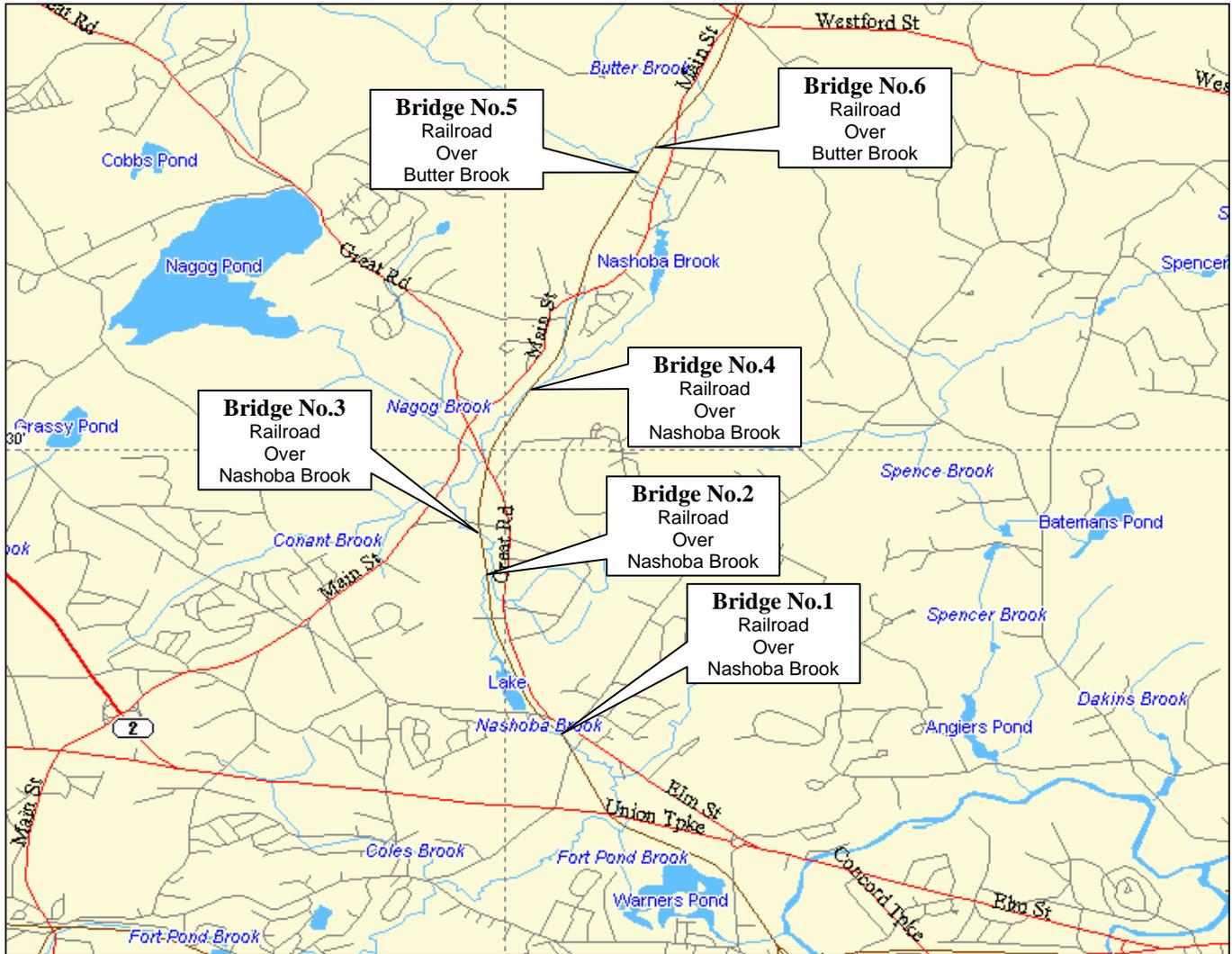
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GENERAL PLAN





GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

INTRODUCTION

The abandoned Penn Central railroad runs in a northerly direction through the town of Acton. It connects with the towns of Westford in the north and Concord in the south. Train service ceased on the railroad in the early 1980's.

The Bruce Freeman Rail Trail is proposed to provide pedestrian and bicycle recreational use along the existing railroad. Modifications to the existing bridges are required to facilitate pedestrian use.

Inspection of the existing bridge structures were performed on the 15th of December and on the 18th of December, 2006. During the inspection bridge dimensions, configuration and condition was noted. Also the substructure was observed and checked for scour.

The condition of the existing bridges is unsatisfactory for pedestrian use and GPI recommends that the bridges be fenced off to prevent access until construction activities are complete.

BRIDGE LOADING

During the period that the bridges were in service, the maximum loading was from an E38.6 Locomotive. Bridge plans and design loadings are not available. This load is approximately 38,600 lbs/(5x12) equal to 643 psf (pounds per square foot) with 5 foot axle spacing over a 12 foot wide deck.

In comparison, the proposed design live load for a pedestrian bridge is 85 psf. The live lane load for an H10 maintenance vehicle is approximately (320 pounds per linear foot)/10ft. = 32 psf, with a concentrated load of 13,000 lbs. The axle weight for the H10 vehicle is 4 kips and 16 kips for the front and rear axle respectively for a total truck weight of 20,000 lbs.

Ref. CE Handbook 3rd Ed. Chapter. 17, Table 17-5

The difference in the existing and proposed dead load is insignificant.



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

PROPOSED BRIDGE MODIFICATIONS

The modifications required to the existing bridge structures for use by pedestrians and cyclists is similar for all six structures and includes:

Remove existing rails.

Remove existing railroad ties.

Remove trees and vegetation that has grown adjacent to existing abutments and retaining walls. Provide Rip Rap along earthen slopes retained by walls to prevent the reoccurrence of vegetative growth.

Replace/reset missing granite blocks.

Grout joints between granite blocks.

Remove all debris and dirt from beam seats and replace bearings with deeper elastomeric bearings so as to ensure that beam ends are above debris and dirt that may accumulate again in the future.

Construct new bridge deck from 3" x 8" pressure treated timber & 8" x 8" cross timber beams.

Provide new 4'-9" timber safety railing with protective screen.

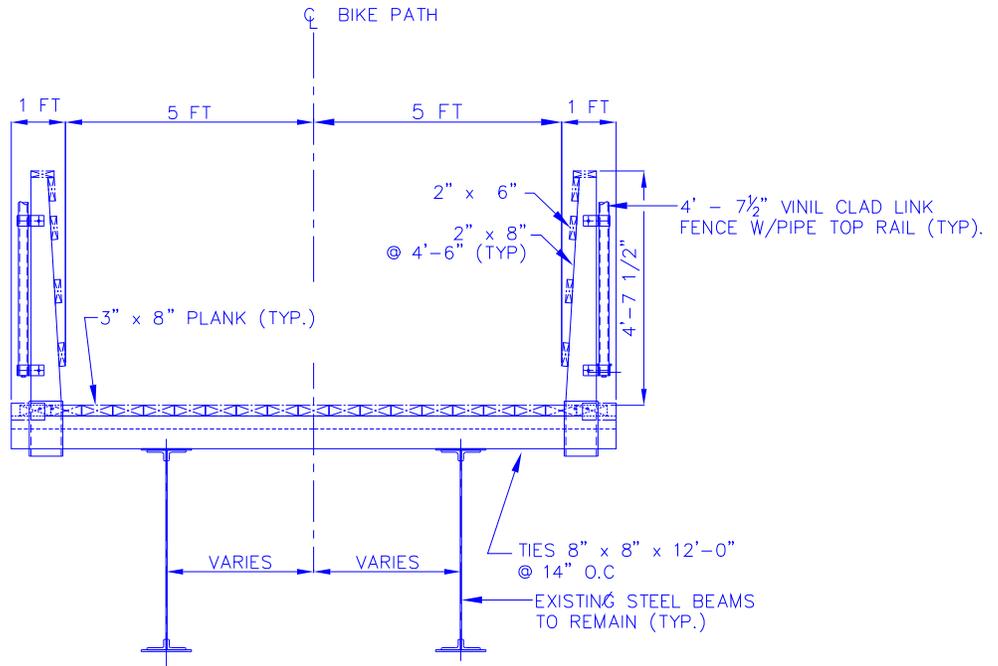
Provide timber approach railing at approaches to bridge.



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ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

PROPOSED TYPICAL SECTION





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ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

SUMMARY OF BRIDGE REHABILITATION COSTS

Qty	Unit	Item Description	Unit Price	Total
29	TON	EXISTING RAILROAD TIE REMOVAL	\$ 260	\$ 7,605
759	FT	EXISTING STEEL RAIL REMOVAL	\$ 23	\$ 17,449
1	L.S.	REMOVE TREES AND VEGETATION	\$ 3,000	\$ 3,000
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$ 7,500	\$ 7,500
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$ 6,000	\$ 6,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$ 7,500	\$ 7,500
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$ 48,000	\$ 48,000
32	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$ 1,725	\$ 55,097
21	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$ 1,725	\$ 36,353
		TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$ 1,725	\$ 3,122
2	C.Y.		\$ 1,725	\$ 3,122
6	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$ 1,725	\$ 9,886
379	FT	PROTECTIVE SCREEN	\$ 70	\$ 26,553
TOTAL				\$228,066



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE #1

DESCRIPTION

This structure currently carries a disused railroad over Nashoba Brook. The structure consists of plate girders constructed from steel plates, rolled angles and rivets. From plaques affixed to nearby bridge structures the estimated date of construction is 1919.

The bridge span is 40'-2" and is supported on abutments constructed from large granite blocks. The depth of the beam members is a constant 43 ¼".

Lateral bracing is provided to the compression flange by means of inclined angles at quarter points along the span.

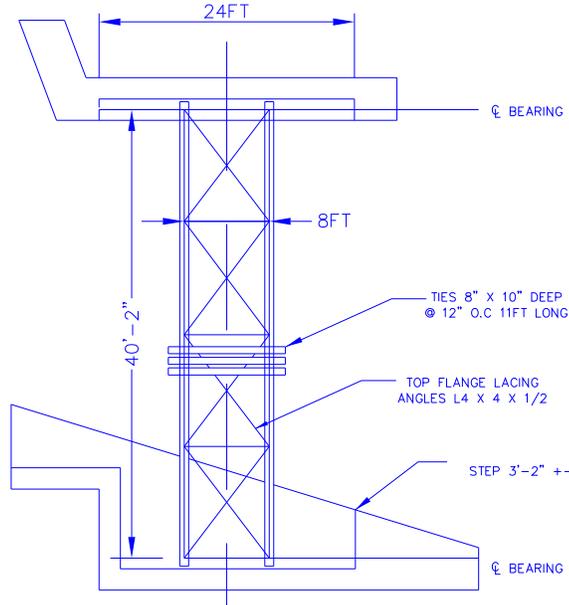
CONDITION

The Steel superstructure is in good condition with no significant section loss. Almost all the original paint has been lost.

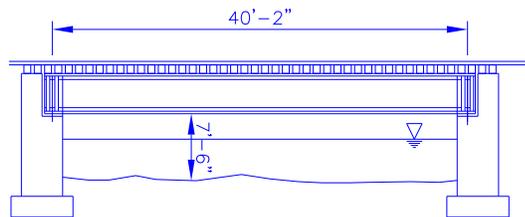
The Granite substructure is in good condition with some gaps in joints and missing/moved blocks in the adjacent retaining walls.

Abutments and retaining walls are not affected by scour.

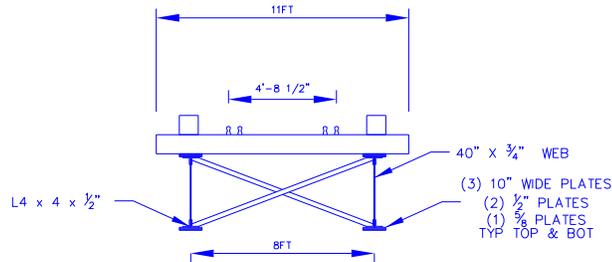
SKETCHES OF EXISTING BRIDGE #1



PLAN (N.T.S)



ELEVATION (N.T.S)



CROSS SECTION (N.T.S)



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ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE LOADING COMPARISON (BRIDGE #1)

The difference in the existing and proposed dead load is insignificant. Therefore, a closer look at the difference in live load yields the following for a 40.2-foot beam span: (Ref. CE Handbook 3rd Ed. Chapt. 17, Table 17-5)

Live load	Moment	Shear	Equivalent load
Pedestrian	86k-ft	9kip	.43klf
H10 truck	98k-ft	10kip	.48klf
E38.6	1265k-ft	146kip	6.26klf

From the above table it is evident that the existing bridge was designed for substantially higher loads than the loads that shall be imparted by the proposed bikeway.

ESTIMATE OF COST(BRIDGE #1)

Qty	Unit	Item Description	Unit Price	Total
6	TON	EXISTING RAILROAD TIE REMOVAL	\$260	\$1,599
161	FT	EXISTING STEEL RAIL REMOVAL	\$23	\$3,695
1	L.S.	REMOVE TREES AND VEGETATION	\$500	\$500
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$1,250	\$1,250
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$1,000	\$1,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$1,250	\$1,250
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$7,000	\$7,000
7	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$1,725	\$11,547
4	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$1,725	\$7,699
0	C.Y.	TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$1,725	\$645
1	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$1,725	\$2,094
80	FT	PROTECTIVE SCREEN	\$70	\$5,623
TOTAL				\$43,903

PHOTOGRAPHS (BRIDGE #1)



Plan View



PHOTOGRAPHS (BRIDGE #1)



Typical Abutment



Typical Bracing



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE #2

DESCRIPTION

This structure currently carries a disused railroad over Nashoba Brook. The structure consists of plate girders constructed from steel plates, rolled angles and rivets. From plaques affixed to nearby bridge structures the estimated date of construction is 1919.

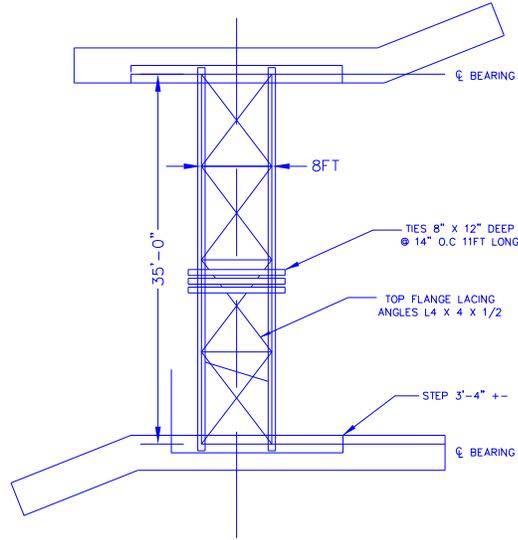
The bridge span is 35'-0" and is supported on abutments constructed from large granite blocks. The depth of the beam members vary as cover plates of varying lengths are used along the beams. The depth ranges from 40" adjacent to the bearings to 43" at the center of the span.

CONDITION

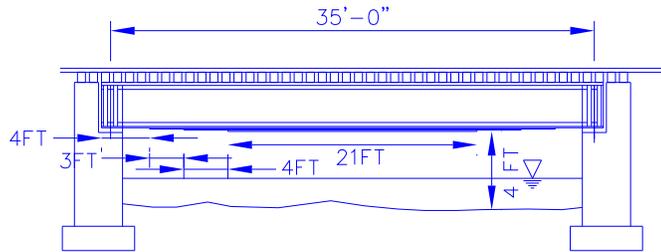
The Steel Superstructure is in good condition with no significant section loss. Almost all the original paint has been lost. Timber rail ties on top of the bridge are in poor condition. A small hole exists in the web of one of the supporting beams. The hole is small and will have a negligible effect on the structural capacity.

The Granite substructure is in good condition with some gaps in joints and missing/moved blocks in the adjacent retaining walls. Abutments and retaining walls are not affected by scour.

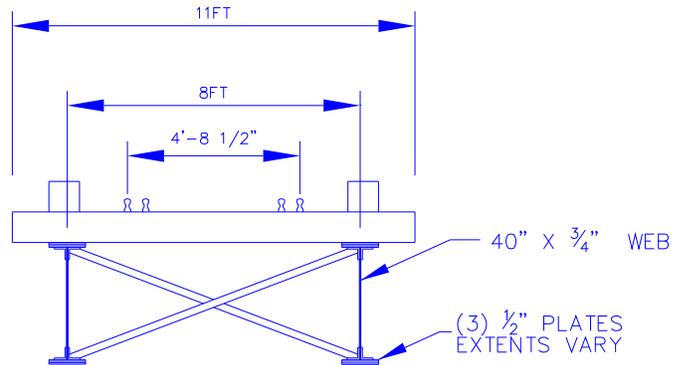
ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
SKETCHES OF EXISTING BRIDGE #2



PLAN (N.T.S)



ELEVATION (N.T.S)



NOTE NO COVER PLATES TO ANGLES AT ENDS OF BEAMS

CROSS SECTION (N.T.S)



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
BRIDGE LOADING (BRIDGE #2)

The difference in the existing and proposed dead load is insignificant. Therefore, a closer look at the difference in live load yields the following for a 35 foot beam span: (Ref. CE Handbook 3rd Ed. Chapt. 17, Table 17-5)

Live load	Moment	Shear	Equivalent load
Pedestrian	65k-ft	7kip	.43klf
H10 truck	81k-ft	9kip	.53klf
E38.6	1009k-ft	134kip	6.59klf

From the above table it is evident that the existing bridge was designed for substantially higher loads than the loads that shall be imparted by the proposed bikeway.

ESTIMATE OF COST (BRIDGE #2)

Qty	Unit	Item Description	Unit Price	Total
5	TON	EXISTING RAILROAD TIE REMOVAL	\$ 260	\$1,404
140	FT	EXISTING STEEL RAIL REMOVAL	\$ 23	\$3,220
1	L.S.	REMOVE TREES AND VEGETATION	\$ 500	\$500
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$ 1,000	\$1,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$ 7,000	\$7,000
6	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$ 1,725	\$10,228
4	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$ 1,725	\$6,708
0	C.Y.	TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$ 1,725	\$568
1	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$ 1,725	\$1,824
70	FT	PROTECTIVE SCREEN	\$ 70	\$4,900
TOTAL				\$39,852

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
PHOTOGRAPHS(BRIDGE #2)



Plan View



Elevation View

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
PHOTOGRAPHS (BRIDGE #2)



Typical Abutment



Damage on the Beam Web



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
BRIDGE #3

DESCRIPTION

This structure currently carries a disused railroad over Nashoba Brook. The structure consists of plate girders built from steel plates, rolled angles and rivets. From a plaque affixed to the bridge structure the estimated date of construction is 1919.

The bridge span is 48'-0" and is supported on abutments constructed from large granite blocks. The depth of the beam members vary as cover plates of varying lengths are used along the beams. The depth ranges from 48" adjacent to the bearings to 51" at the center of the span.

CONDITION

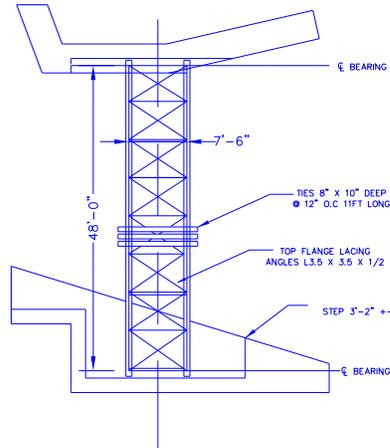
The Steel Superstructure is in good condition with no significant section loss. Almost all the original paint has been lost. Timber rails on top of the bridge are in poor condition.

There is a significant build up of dirt and debris at beam seats/bearings which should be removed.

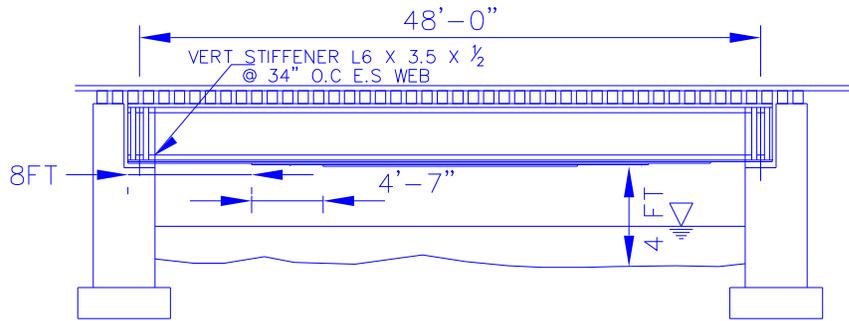
The Granite substructure is in good condition with some gaps in joints and missing/moved blocks in the adjacent retaining walls.

Abutments and retaining walls are not affected by scour.

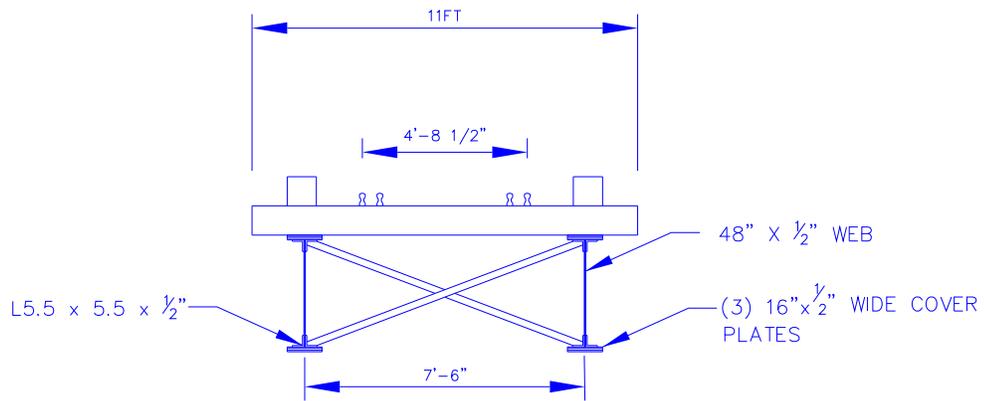
ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
SKETCHES OF EXISTING BRIDGE #3



PLAN (N.T.S)



ELEVATION (N.T.S)



CROSS SECTION (N.T.S)



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
BRIDGE LOADING (BRIDGE #3)

The difference in the existing and proposed dead load is insignificant. Therefore, a closer look at the difference in live load yields the following for a 48 foot beam span: (Ref. CE Handbook 3rd Ed. Chapt. 17, Table 17-5)

Live load	Moment	Shear	Equivalent load
Pedestrian	122k-ft	10kip	.43klf
H10 truck	124k-ft	10kip	.43klf
E38.6	1721k-ft	163kip	5.98klf

From the above table it is evident that the existing bridge was designed for substantially higher loads than the loads that shall be imparted by the proposed bikeway.



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

ESTIMATE OF COST (BRIDGE #3)

Qty	Unit	Item Description	Unit Price	Total
7	TON	EXISTING RAILROAD TIE REMOVAL	\$ 260	\$1,911
192	FT	EXISTING STEEL RAIL REMOVAL	\$ 23	\$4,416
1	L.S.	REMOVE TREES AND VEGETATION	\$ 500	\$500
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$ 1,000	\$1,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$ 7,000	\$7,000
8	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$ 1,725	\$13,857
5	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$ 1,725	\$9,200
0	C.Y.	TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$ 1,725	\$755
1	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$ 1,725	\$2,502
96	FT	PROTECTIVE SCREEN	\$ 70	\$6,720
			TOTAL	\$50,361

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
PHOTOGRAPHS (BRIDGE #3)



Plan view



Elevation View

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
PHOTOGRAPHS (BRIDGE #3)



Typical Abutment



Rusted Bearing Bolt

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
PHOTOGRAPHS (BRIDGE #3)



Bridge Plaque



Typical Bracing



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
BRIDGE #4

DESCRIPTION

This structure currently carries a disused railroad over Nashoba Brook. The structure consists of plate girders built from steel plates, rolled angles and rivets. From plaques affixed to nearby bridge structures the estimated date of construction is 1919.

The bridge span is 30'-0" and is supported on abutments constructed from large granite blocks. The depth of the beam members is a constant 43 ¼".

Lateral bracing is provided to the compression flange by means of inclined angles at fifth points along the span.

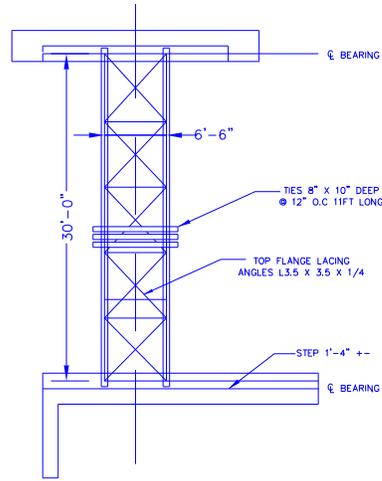
CONDITION

The Steel Superstructure is in good condition with no significant section loss. Almost all the original paint has been lost. Timber rails on top of the bridge are in poor condition.

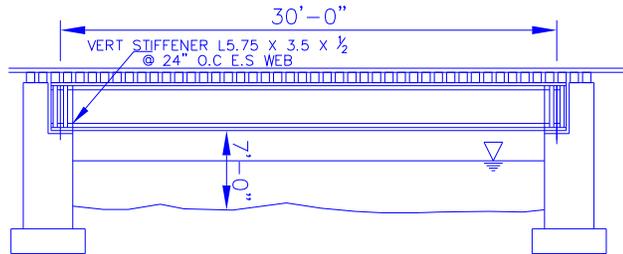
The Granite substructure is in good condition with some gaps in joints and missing/moved blocks in the adjacent retaining walls.

Abutments and retaining walls are not affected by scour.

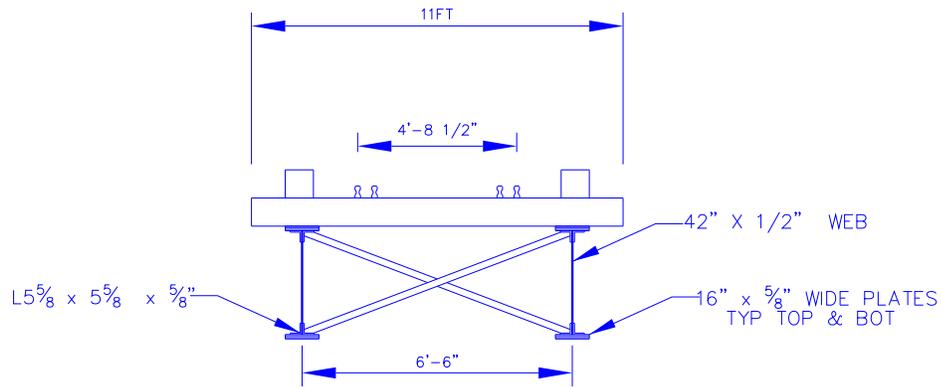
ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT
SKETCHES OF EXISTING BRIDGE 4



PLAN (N.T.S)



ELEVATION (N.T.S)



CROSS SECTION (N.T.S)



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE LOADING(BRIDGE #4)

The difference in the existing and proposed dead load is insignificant. Therefore, a closer look at the difference in live load yields the following for a 30-foot beam span: (Ref. CE Handbook 3rd Ed. Chapt. 17, Table 17-5)

Live load	Moment	Shear	Equivalent load
Pedestrian	48k-ft	6kip	.43klf
H10 truck	67k-ft	9kip	.59klf
E38.6	792k-ft	122kip	7.04klf

From the above table it is evident that the existing bridge was designed for substantially higher loads than the loads that shall be imparted by the proposed bikeway.

ESTIMATE OF COST(BRIDGE #4)

Qty	Unit	Item Description	Unit Price	Total
5	TON	EXISTING RAILROAD TIE REMOVAL	\$ 260	\$1,209
120	FT	EXISTING STEEL RAIL REMOVAL	\$ 23	\$2,760
1	L.S.	REMOVE TREES AND VEGETATION	\$ 500	\$500
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$ 1,000	\$1,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$ 7,000	\$7,000
5	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$ 1,725	\$8,578
3	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$ 1,725	\$5,750
0	C.Y.	TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$ 1,725	\$497
1	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$ 1,725	\$1,564
60	FT	PROTECTIVE SCREEN	\$ 70	\$4,200
TOTAL				\$35,558

PHOTOGRAPHS(BRIDGE #4)



Plan View



Elevation View

PHOTOGRAPHS (BRIDGE #4)



Typical Abutment



Typical Bracing



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE #5

DESCRIPTION

This structure currently carries a disused railroad over Butter Brook. The structure consists of six rolled beams. From plaques affixed to the bridge structure the estimated date of construction is 1907.

The bridge span is 21'-0" and is supported on abutments constructed from large granite blocks. The depth of the beam members is a constant 25".

Lateral bracing is provided to the compression flange of the interior beams by means of inclined angles at fifth points along the span. Steel plates run perpendicular between the three beams to provide lateral bracing to the exterior beams.

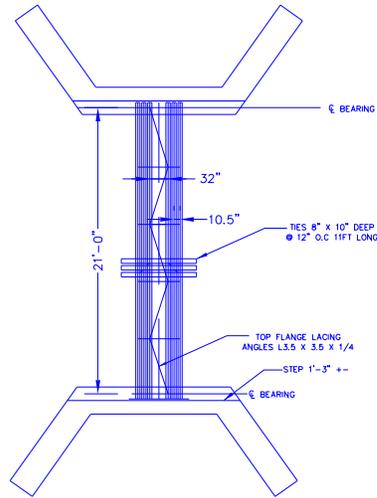
CONDITION

The Steel Superstructure is in good condition with no significant section loss. Almost all the original paint has been lost. Timber rails on top of the bridge are in poor condition.

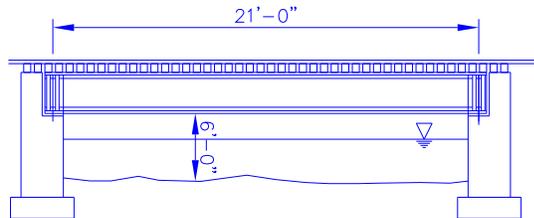
The Granite substructure is in good condition with some gaps in joints and missing/moved blocks in the adjacent retaining walls.

Abutments and retaining walls are not affected by scour.

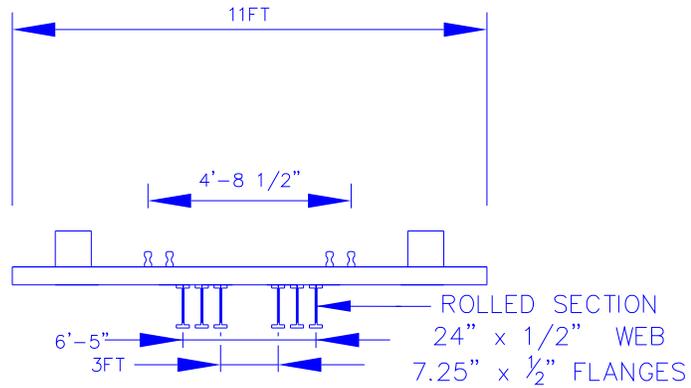
SKETCHES OF EXISTING BRIDGE #5



PLAN (N.T.S)



ELEVATION (N.T.S)



CROSS SECTION (N.T.S)



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE LOADING (BRIDGE #5)

The difference in the existing and proposed dead load is insignificant. Therefore, a closer look at the difference in live load yields the following for a 21 foot beam span: (Ref. CE Handbook 3rd Ed. Chapt. 17, Table 17-5)

Live load	Moment	Shear	Equivalent load
Pedestrian	23k-ft	4kip	.43klf
H10 truck	43k-ft	8kip	.78klf
E38.6	436k-ft	100kip	7.91klf

From the above table it is evident that the existing bridge was designed for substantially higher loads than the loads that shall be imparted by the proposed bikeway.

ESTIMATE OF COST (BRIDGE #5)

Qty	Unit	Item Description	Unit Price	Total
3	TON	EXISTING RAILROAD TIE REMOVAL	\$ 260	\$858
84	FT	EXISTING STEEL RAIL REMOVAL	\$ 23	\$1,932
1	L.S.	REMOVE TREES AND VEGETATION	\$ 500	\$500
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$ 1,000	\$1,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$ 11,000	\$11,000
4	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$ 1,725	\$6,269
2	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$ 1,725	\$4,025
0	C.Y.	TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$ 1,725	\$368
1	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$ 1,725	\$1,095
42	FT	PROTECTIVE SCREEN	\$ 70	\$2,940
TOTAL				\$32,486

PHOTOGRAPHS (BRIDGE #5)



Plan View



Elevation View

PHOTOGRAPHS (BRIDGE #5)



Typical Abutment



Typical Lateral Bracing Support



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE #6

DESCRIPTION

This structure currently carries a disused railroad over Butter Brook. The structure consists of four plate girders built from steel plates, rolled angles and rivets. From plaques affixed to nearby bridge structures the estimated date of construction is 1907.

The bridge span is 15'-6" and is supported on abutments constructed from large granite blocks. The depth of the beam members is a constant 21".

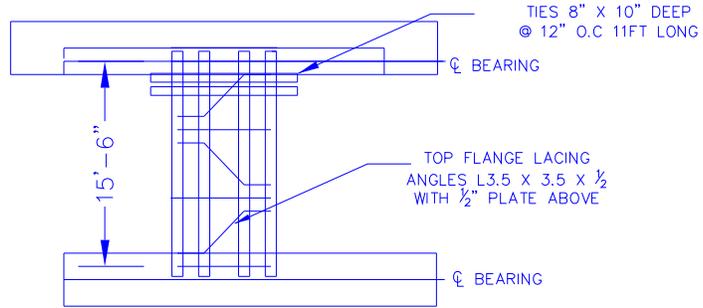
CONDITION

The Steel Superstructure is in good condition with no significant section loss. Almost all the original paint has been lost. Timber rails on top of the bridge are in poor condition.

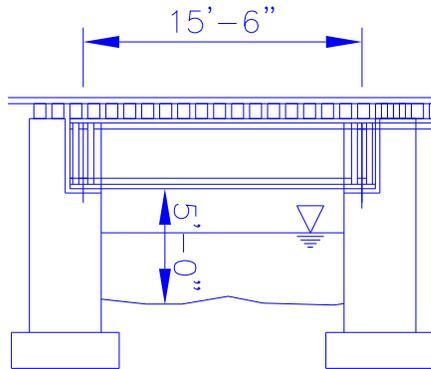
The Granite substructure is in good condition with some gaps in joints and missing/moved blocks in the adjacent retaining walls.

Abutments and retaining walls are not affected by scour.

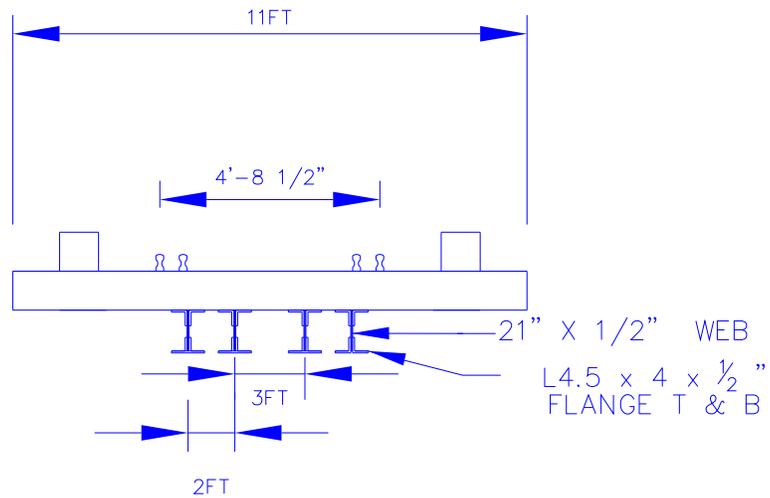
SKETCHES OF EXISTING BRIDGE #6



PLAN (N.T.S)



ELEVATION (N.T.S)



CROSS SECTION (N.T.S)



GREENMAN PEDERSEN, INC. STONEHAM, MA.

ACTON BIKEPATH PRELIMINARY STRUCTURES REPORT

BRIDGE LOADING(BRIDGE #6)

The difference in the existing and proposed dead load is insignificant. Therefore, a closer look at the difference in live load yields the following for a 15.5 foot beam span: (Ref. CE Handbook 3rd Ed. Chapt. 17, Table 17-5)

Live load	Moment	Shear	Equivalent load
Pedestrian	13k-ft	3kip	.43klf
H10 truck	30k-ft	8kip	1.00klf
E38.6	257k-ft	79kip	8.56klf

From the above table it is evident that the existing bridge was designed for substantially higher loads than the loads that shall be imparted by the proposed bikeway.

ESTIMATE OF COST (BRIDGE #6)

Qty	Unit	Item Description	Unit Price	Total
3	TON	EXISTING RAILROAD TIE REMOVAL	\$ 260	\$858
84	FT	EXISTING STEEL RAIL REMOVAL	\$ 23	\$1,932
1	L.S.	REMOVE TREES AND VEGETATION	\$ 500	\$500
1	L.S.	REPLACE/RESET MISSING GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	REMOVE DIRT AND DEBRIS FROM BEAM SEATS	\$ 1,000	\$1,000
1	L.S.	GROUT JOINTS BETWEEN GRANITE BLOCKS	\$ 1,250	\$1,250
1	L.S.	RAISE ENDS OF BRIDGE AND INSTALL ELASTOMERIC BEARINGS	\$ 9,000	\$9,000
4	C.Y.	PROPOSED TIES 7 7/8" x 7 7/8" x 12'-0 TIES	\$ 1,725	\$6,269
2	C.Y.	PROPOSED DECKING (3" X 7 7/8")	\$ 1,725	\$4,025
0	C.Y.	TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	\$ 1,725	\$368
1	C.Y.	TREATED TIMBER RAILING (2" x 5 7/8")	\$ 1,725	\$1,095
42	FT	PROTECTIVE SCREEN	\$ 70	\$2,940
TOTAL				\$30,486

PHOTOGRAPHS (BRIDGE #6)



Plan View



Elevation View

PHOTOGRAPHS (BRIDGE #6)



Typical Abutment



Typical Bracing Connection

PHOTOGRAPHS (BRIDGE #6)



Typical Bearing



Connection between Beams

GREENMAN - PEDERSEN, INC.

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JOB:-BRUCE FREEMAN RAIL TRAIL
 CALCULATIONS BY:-Carl Myers, P.E.

Date :- 4 May, 2007

BRIDGE REHABILITATION QUANTITY & COST ESTIMATE

<u>ITEM 992.2 Bridge 1</u>			
Length	40.167 ft		
Width	12.000 ft		
# of existing ties to be removed	41		
Tie dimensions 8" x 10" x 12' (say 45 lb/cu ft)	12300 lb	6.2 TON	
Removal of Steel Track Rails - Length	161 ft		
PROPOSED TIES			
Spacing of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14 in		
# of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	35		
Volume of Ties	6.69 CY		
PROPOSED DECKING (3" X 7 7/8")			
Volume of Decking	4.46 CY		
TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')			
Spacing of Posts	54 in		
# of Posts	20		
Volume	.37 CY		
TREATED TIMBER RAILING (2" x 5 7/8")			
Length	40.2 ft		
# of Rails	10		
Volume	1.21 CY		
PROTECTIVE SCREEN	80.3 ft		
Elastomeric Bearings	4		

GREENMAN - PEDERSEN, INC.

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JOB:-BRUCE FREEMAN RAIL TRAIL
 CALCULATIONS BY:-Carl Myers, P.E.
 Date :- 4 May, 2007

BRIDGE REHABILITATION QUANTITY & COST ESTIMATE

<u>ITEM 992.2 Bridge 2</u>	
Length	35.000 ft
Width	12.000 ft
# of existing ties to be removed	36
Tie dimensions 8" x 10" x 12' (say 45 lb/cu ft)	10800 lb 5.4 TON
Removal of Steel Track Rails - Length	140 ft
PROPOSED TIES	
Spacing of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14 in
# of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	31
Volume of Ties	5.93 CY
PROPOSED DECKING (3" X 7 7/8")	
Volume of Decking	3.89 CY
TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	
Spacing of Posts	54 in
# of Posts	18
Volume	.33 CY
TREATED TIMBER RAILING (2" x 5 7/8")	
Length	35.0 ft
# of Rails	10
Volume	1.06 CY
PROTECTIVE SCREEN	70.0 ft
Elastomeric Bearings	4

GREENMAN - PEDERSEN, INC.

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JOB:-BRUCE FREEMAN RAIL TRAIL
 CALCULATIONS BY:-Carl Myers, P.E.
 Date :- 4 May, 2007

BRIDGE REHABILITATION QUANTITY & COST ESTIMATE

<u>ITEM 992.2 Bridge 3</u>	
Length	48.000 ft
Width	12.000 ft
# of existing ties to be removed	49
Tie dimensions 8" x 10" x 12' (say 45 lb/cu ft)	14700 lb 7.4 TON
Removal of Steel Track Rails - Length	192 ft
PROPOSED TIES	
Spacing of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14 in
# of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	42
Volume of Ties	8.03 CY
PROPOSED DECKING (3" X 7 7/8")	
Volume of Decking	5.33 CY
TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	
Spacing of Posts	54 in
# of Posts	23
Volume	.44 CY
TREATED TIMBER RAILING (2" x 5 7/8")	
Length	48.0 ft
# of Rails	10
Volume	1.45 CY
PROTECTIVE SCREEN	96.0 ft
Elastomeric Bearings	4

GREENMAN - PEDERSEN, INC.

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JOB:-BRUCE FREEMAN RAIL TRAIL
 CALCULATIONS BY:-Carl Myers, P.E.
 Date :- 4 May, 2007

BRIDGE REHABILITATION QUANTITY & COST ESTIMATE

ITEM 992.2 Bridge 4	
Length	30.000 ft
Width	12.000 ft
# of existing ties to be removed	31
Tie dimensions 8" x 10" x 12' (say 45 lb/cu ft)	9300 lb 4.7 TON
Removal of Steel Track Rails - Length	120 ft
PROPOSED TIES	
Spacing of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14 in
# of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	26
Volume of Ties	4.97 CY
PROPOSED DECKING (3" X 7 7/8")	
Volume of Decking	3.33 CY
TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	
Spacing of Posts	54 in
# of Posts	15
Volume	.29 CY
TREATED TIMBER RAILING (2" x 5 7/8")	
Length	30.0 ft
# of Rails	10
Volume	.91 CY
PROTECTIVE SCREEN	60.0 ft
Elastomeric Bearings	4

GREENMAN - PEDERSEN, INC.

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JOB:-BRUCE FREEMAN RAIL TRAIL
 CALCULATIONS BY:-Carl Myers, P.E.
 Date :- 4 May, 2007

BRIDGE REHABILITATION QUANTITY & COST ESTIMATE

<u>ITEM 992.2 Bridge 5</u>	
Length	21.000 ft
Width	12.000 ft
# of existing ties to be removed	22
Tie dimensions 8" x 10" x 12' (say 45 lb/cu ft)	6600 lb 3.3 TON
Removal of Steel Track Rails - Length	84 ft
PROPOSED TIES	
Spacing of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14 in
# of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	19
Volume of Ties	3.63 CY
PROPOSED DECKING (3" X 7 7/8")	
Volume of Decking	2.33 CY
TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	
Spacing of Posts	54 in
# of Posts	11
Volume	.21 CY
TREATED TIMBER RAILING (2" x 5 7/8")	
Length	21.0 ft
# of Rails	10
Volume	.63 CY
PROTECTIVE SCREEN	42.0 ft
Elastomeric Bearings	12

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JOB:-BRUCE FREEMAN RAIL TRAIL
 CALCULATIONS BY:-Carl Myers, P.E.
 Date :- 4 May, 2007

BRIDGE REHABILITATION QUANTITY & COST ESTIMATE

ITEM 992.2 Bridge 6	
Length	15.500 ft
Width	12.000 ft
# of existing ties to be removed	16
Tie dimensions 8" x 10" x 12' (say 45 lb/cu ft)	4800 lb 2.4 TON
Removal of Steel Track Rails - Length	62 ft
PROPOSED TIES	
Spacing of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14 in
# of proposed 7 7/8" x 7 7/8" x 12'-0 TIES	14
Volume of Ties	2.68 CY
PROPOSED DECKING (3" X 7 7/8")	
Volume of Decking	1.72 CY
TREATED TIMBER RAILING POSTS (2" x 7 7/8" x 4.625')	
Spacing of Posts	54 in
# of Posts	9
Volume	.17 CY
TREATED TIMBER RAILING (2" x 5 7/8")	
Length	15.5 ft
# of Rails	10
Volume	.47 CY
PROTECTIVE SCREEN	31.0 ft
Elastomeric Bearings	8

