

TOWN OF WILMINGTON DEPARTMENT OF PUBLIC WORKS

HighwayWater & SewerEngineeringTreeParks & GroundsCemetery

Interoffice Memorandum

TO:	Jeffrey M. Hull, Town Manager
CC:	
FROM:	Paul M. Alunni, PE, Town Engineer Jamie M. Magaldi, PE, Operations Manager Michael J. Woods, Director of Public Works
SUBJECT:	Butters Row Bridge Review MassDOT Bridge No. W-38-003

DATE: May 4, 2017

Per your request, the Department of Public Works (DPW) has performed a review of known record information for the Butters Row Bridge (MassDOT Bridge No. W-38-003). This bridge is owned by the Massachusetts Department of Transportation (MassDOT); thus is inspected, operated, and maintained by MassDOT.

Bridge Background and History

The Butters Row Bridge is a single lane bridge constructed c.1920 that carries Butters Row traffic over the Massachusetts Bay Transportation Authority (MBTA) Railroad. The bridge deck is approximately 15.5 FT wide with an overall traveled road width of 13.5 FT. There are no sidewalks located along the bridge however there is a chain link fence mounted to a timber curb along either side of the bridge. Two (2) convex mirrors exist on both sides of the bridge for visibility and safety, as approach grades limit sight distance and the bridge width only allows one vehicle to pass at a time.

The bridge structure consists of wood plank deck on timber stringers, supported by timber peirs. The bridge abutments are constructed of concrete. An asphalt wearing surface exists over the wood plank decking. The bridge is currently posted for five (5) tons (or 10,000 lbs).

The bridge underwent reconstruction in 1987 which included replacement of the wood plank deck and a third span added to the eastern edge of the bridge. A more recent log of work performed by MassDOT includes:

December 2011 - Timber decking replaced. June 2012 – Asphalt wearing course replaced over wood deck September 2013 – Repair of asphalt wearing course

MassDOT Bridge Inspection Overview

MassDOT performs bridge inspections using a statewide unified system as dictated by the "MassDOT Bridge Inspection Handbook" (referred herein as the Handbook), which meets the requirements of National Bridge Inspection Standards (NBIS) and supplements the requirements of the Federal Highway Administration (FHWA).

Inspection of bridge structure components fall into three (3) main categories:

- 1. Deck this includes wearing surface, decking, curbs, and railing.
- 2. Superstructure this includes the timber stringers, and timber beams
- 3. Substructure this includes the concrete bridge abutments, and timber piers.

As part of a bridge inspection, a condition rating is given to each main component. The following is the MassDOT condition rating guide:

Code	Condition	Defects
9	Excellent	
8	Very Good	No problem noted.
7	Good	Some minor problems.
6	Satisfactory	Structural elements show some minor deterioration.
5*	Fair	All primary structural elements are sound, but may have minor section loss,
		cracking, spalling or scour.
4**	Poor	Advance section loss, deterioration, spalling or scour.
3	Serious	Loss of section, deterioration, spalling or scour have seriously affected primary
		structural components. Local failures are possible. Fatigue cracks may be present.
2	Critical	Advance deterioration of primary structural elementsunless closely monitored it
		may be necessary to close the bridge until corrective action is taken
1	Imminent Failure	Bridge is closed to traffic but corrective action may put it back in light service.
0	Failed	Out of Service – beyond corrective action.

* According to most recent bridge inspection performed December 20, 2016, the Butters Row Bridge Deck, and Substructure, were each given an overall condition rating of "Fair".

** According to most recent bridge inspection performed December 20, 2016, the Butters Row Superstructure was given an overall condition rating of "Poor".

MassDOT bridges are inspected according to an inspection cycle. The frequency of inspection is dependent upon the condition rating given for the bridge:

- Routine Inspections: These types of inspections are considered "hands on" and as such are defined as inspections within an arm's length of viewing. These types of inspections are due in intervals not to exceed 24 months.
- Special Member Inspections: These types of inspections are required when any part of the inspection covering the deck, superstructure, or substructure are rated 4 (Poor) or less. Where the part is rated a 4, inspection frequency is 1 year (*Note: Butters Row Bridge currently falls into this category*). When any part is rated below 4, inspection frequency is every 6 months.

Status of Butters Row Bridge - W-38-003 (Based on MassDOT Inspection Reports)

The bridge was given a special member inspection in June of 2016 (enclosed herewith). Review of the inspection report indicates the bridge deck and substructure received an overall "fair" condition rating, while the bridge superstructure received an overall "poor" rating. The report also indicates that the wearing surface and timber curbing received a "poor" rating.

This June 2016 inspection report also includes the following remarks:

- Wearing Surface Large areas of missing bituminous overlay throughout.
- Deck Condition In all three spans, all bays have areas of checking, splitting, and rotting....all bays have random steel tie rods/nails popping out of the underside face.
- Timber Beams All beams have moderate longitudinal splitting, up to ¼" wide, with areas of moderate checking, dampness, and efflorescence...all beams have steel tie rods/nails popping out of both faces.

In December of 2016, a Special Damage Inspection was performed as the result of a minor train strike. According to MassDOT, cargo tied atop a freight car likely contacted the timber stringers and beams on the superstructure. The December 2016 inspection report was the last inspection performed on the bridge, and states that the overall component ratings remained unchanged from the June 2016 inspection (previous and present conditions are rated as a 4 and 5).

Per a recent discussion with the MassDOT District 4 Bridge Engineer, MassDOT intends to perform the following work in the 2017 construction season:

- Remove and replace sections of timber decking;
- Resurface wearing course.

The bridge is currently not in any replacement program.

MassDOT Bridge Posting – W-38-003

In April 1995, MassDOT completed a rating report for the Butters Row Bridge. **Based upon the condition of the bridge, the bridge is posted for five (5) tons (or 10,000 lbs).** As a reference, this would include, two axle, Class 1, light duty vehicles such as passenger vehicles, light pickup trucks, motorcycle (with no side car), and vans.

Enclosures (1)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 19

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07-FACILITY CARRIED HWY BUTTERS F	ROW			MEMORIAL NAME/LOCAL NAME 27-Y				yr built 1920	106-YR REBUILT 1987	YRI	REHAI	3'D (N)00(ON 106)	
06-FEATURES INTERSECTED				26-FUNCTIONAL	CLASS		DI	IST. BRIDG	E INSPECT	ION ENGINEER	T. G.	Weil		
RR MBTA/BMRR	Urban Collec	tor												
43-STRUCTURE TYPE 702 : Timber Stringer/Girder				22-OWNER State Highway Agency	21-MAIN State H Agency	itainer lighway /	TE 1	EAM LEAD	ER A. Labi l)				
107-DECK TYPE 8 : Timber				weather Clear	TEMP. (a 28	^{iir)} ℃	TI J	еам мем . ROY,	BERS J. DIDI	EO				
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6.Sidewalks	N	-	b.	Lower Chords		N	F	-	g. Pointing N I h. Footings N I			N H		-
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8.Railing	5	S-A	d.	Lateral Bracing		N	F	-	j. Scour			N 7		-
9.Anti Missile Fence	N	-	e.	e. Sway Bracings N			F	-	I.			/ N		-
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MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 3 OF 19

2-D	IST)4	B.I.N. ST	ΓRU(ROU	CTUR TINE 8	ES INSPE & SPECIAL	ECTION MEMBE	FIELD R INSPE	REI CTI	POF ON	RT		BR. E W-3	DEPT. 1 88-00	NO. 3
CITY	Y/TOWN			8	STRUCTURE NO		11-Kilo POINT	90-RO	UTINE	NSP DA	TE 93*	-SPEC N	лемв і	NSP DAT
w/i				0.	W38003-2NV	-DOT-634			n 10	2016		lun	10 2	016
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HV	VY E	BUTTERS RO	N			IE/LOCAL NAME	27-YR	920	106-11	987		к кена 0	000	JN 106)
06-F	EATURE	ES INTERSECTED			26-FUNCTIONAL Urban Collec	6-FUNCTIONAL CLASS DIST. BRIDGE INSPECTION ENGINEER T. G. Weil Irban Collector								
43-STRUCTURE TYPE22702 : Timber Stringer/GirderAg				22-OWNER State Highway Agency	21-MAINTAINER State Highway Agency	TEAM LEADER	A. Labil	b						
107- 8:	DECK TY	YPE Der			weather Clear	TEMP. (air) 28°C	TEAM MEMBE	rs . DID	EO					
WI	EIGHT	POSTING	Not Ap	plicable		At	bridge	Advar	nce					
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158	וו B: 6 I	59: 6 60: 5	62: -	Date :06	6/01/1994	superst	ructure elen	nent.						
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SP	ECIAI	L MEMBER(S):	1					CON		INV. RA		F MEMB	R	
	Ν	MEMBER	CRACK (Y/N):	CONDITION (0-9)	COLLISION DAMA	GE, STRESS CONCE	NTRATION, ETC.	PREVIOUS (0-9)	PRESENT	FROM H-20	RATING	ANALYS 3S2	IS Defi	iciencies
A	Item Bean	59.4 - Timber ns	N	N	See remarks section.	in commen	ts	5	4	5	10	8		S-A
в														
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Е														
Lis	st of fie	eld tests performed	:	·						I	-58	I-59	I-60	I-62
						(Over	all Previous C	onditio	n)		5	5	6	-
						(Over	(Overall Current Condition) 5 4 5 -						-	
DE	FICIEN	ICY: A defect in a st	ructure that r	equires correct	ive action.									
CA M	ATEGOF = Minor	RIES OF DEFICIEN	CIES: s which are mine	or in nature, gener	ally do not impact the structura	al integrity of the bridge and	could easily be repaired.	Examples ir	nclude but :	are not limit	ed to: Spa	lled concrete	e, Minor po	t
	M= Minor Deficiency - Deficiencies which are more writering on not impact the subcuration integring of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor concrete, Spalled concrete, Minor pot S = Sovere/Major Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and													
		c	orroded rebars,	Considerable set	rement, Considerable scouring	or undermining, Moderate	o extensive corrosion to	structural st	eel with me	easurable lo	ss of secti	on, etc.	undured in t	arih
	S= Criti	ical Structural Defici	ency - A de of th	e bridge.	ent or element of a bridge that po	noses an extreme bazard o	runsafe condition to the		loes not im	nair the stru	ctural into	arrity of the k	uctural inte	yılıy moles
C-	C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.													
UF	GENC	Y OF REPAIR:												
I =	Immedia	ate- [Inspector(s) immed	iately contact Di	strict Bridge Inspe	ction Engineer (DBIE) to report	t the Deficiency and to recei	ve further instruction from	n him/her].	_					
A =	= ASAP- = Prioritiz	[Action/Repair shoul ze- [Shall be prioritized b	d be initiated by by District Mainte	District Maintenar	nce Engineer or the Responsible or the Responsible Party (if not	Ie Party (if not a State owne a State owned bridge) and	d bridge) upon receipt of repairs made when funds	the Inspecti and/or mai	on Report] npower is a	ivailable].				
	V LINIL							0-00						

F.C.(1)7-96

CITY/TOWN WILMINGTON	B.I.N. 2NV	BR. DEPT. NO. W-38-003	8STRUCTURE NO. W38003-2NV-DOT-634	INSPECTION DATE JUN 19, 2016				
REMARKS <u>BRIDGE ORIENTATION</u> The three span structure carries Butter Row over the MBTA/BMRR. According to the bridge plans, the abutments are labeled West and East. The spans and trestles are numbered from west to east. The timber beams are numbered 1-23 simultaneously from north to south in each span. See Sketch 1.								
GENERAL REMARKS All bridge orientation information was found in the 1995 rating report. The bridge was originally a two span structure. The East span was added in 1987, and the deck was replaced. Bridge Inspection currently does not have plans for the 1987 reconstruction.								
The west elevation "At Bridge" V	Veight P	Posting Sign is hidd	len by vegetation. See photo) 1.				
For the purposes of this report, t	the two t	trestles are labeld a	as Piers 1 and 2.					
<u>ITEM 58 - DECK</u>								
Item 58.1 - Wearing surface There are large areas of missing	g bitumir	nous overlay throug	ghout. See photo 2.					
Item 58.2 - Deck Condition In all three spans, all bays have photo 3.	areas o	f checking, splitting	g, and rotting, with moderate e	efflorescence. See				
There are sings of active leakag	e throug	ghout all bays.						
All bays have random steel tie ro	ods/nails	s popping out of the	e underside face.					
In span 1, bays 5 & 7 have char	red area	as from previously	noted fire damage.					
Item 58.4 - Curbs Both curbs have numerous area 5.	is of coll	ision damage with	loose planks and connections	s. See photos 4 &				
There are several planks leaning	g into the	e roadway along th	e full length of both curbs. S	ee photo 6.				
Item 58.8 - Railing Both fences have areas of broke photo 7.	en and lo	cose connections.	There are random areas of re	ust throughout. See				
APPROACHES								
Approaches a - Appr. paveme Both approach roadways have a	nt cond ares of m	lition noderate mapcrack	sing.					
Approaches b - Appr. Roadway Settlement The east approach has washout/settled areas at both corners of the abutmetns. See photo 8.								
1								

CITY/TOWN WILMINGTON	B.I.N. 2NV	BR. DEPT. NO. W-38-003	8STRUCTURE NO. W38003-2NV-DOT-634	INSPECTION DATE JUN 19, 2016					
		REMAR	RKS						
ITEM 59 - SUPERSTRUCTURE	ITEM 59 - SUPERSTRUCTURE								
Item 59.4 - Timber Beams In all three spans, all beams have moderate longitudinal splitting, up to 1/4" wide, with areas of moderate checking, dampness, and efflorescence. See photo 9.									
Span 1: All beams have steel tie rods/nails popping out of both faces. See photo 10.									
Beams 3 and 4 show signs of crushing and crippling at the west end, up to 3/4 of the beam length. Both beams have moderate deflection and vibrating during heavy live loads.									
Beam 6 has large aras of moder	ate che	cking, splitting, an	nd rotting throughout all faces.						
Beam 8 has planks popping out	along th	ne bottom face at t	the west end, 3' long x 6" high.						
<u>Span 2:</u> All beams have areas of checkin	ng. See	photo 11.							
All beams have random steel tie	rods/na	ails popping out ar	nd bulging throughout both faces.						
<u>Span 3:</u> All beams have random steel tie	rods po	opping out of both	faces. See photo 12.						
Beams 17, 18, 20, and 21 have mid-length.	modera	te longitudinal che	ecking, up to 1/4" wide, starting at tl	ne west end to					
Beams 20 and 21 show signs of	cripplin	g and splitting at t	the west end (At Trestle 2). See pl	noto 13.					
SuperStructure Load Deflection	on Note on durine	<u>s</u> g heavy live loads.							
SuperStructure Load Vibration There is moderate to severe vibr	n Notes ration d	uring heavy live lo	ads. See Item 59.4 - Beams.						
ITEM 60 - SUBSTRUCTURE									
<u>Item 60.1 - Abutments</u> Item 60.1.b - Bridge Seats Both bridge seats are mostly cov	vered w	ith debris.							
<u>Item 60.1.c - Backwalls</u> Both breastwalls have large area	as inacc	essible due to del	bris along the bridge seats.						
All visible areas have moderate	All visible areas have moderate scaling and efflorescence throughout.								

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CITY/TOWN WILMINGTON	B.I.N. 2NV	BR. DEPT. NO. W-38-003	8STRUCTURE NO. W38003-2NV-DOT-634	INSPECTION DATE JUN 19, 2016
		REMA	RKS	
<u>Item 60.1.d - Breastwalls</u> Both breastwalls have areas of s	scaling	and delamination	throughout. See photo 14.	
The west breastwall has areas o	of mode	rate spalling and	scaling throughout, up to 4" dee	p. See photo 15.
The east breastwall has a full he	eight ve	rtical crack at bot	h ends, up to 1/4" wide. See ph	ioto 16.
<u>Item 60.1.e - Wingwalls</u> There is a washout area behind	the nor	theast wingwall.	See Item b.Approach Roadway	Settlement.
<u>Item 60.2 - Piers or Bents</u> Item 60.2.b - Caps Both piers have areas of modera	ate che	cking and splitting	g throughout both faces of the ca	ap.
At Pier 1, there area areas of fire	ed dam	age noted in prev	ious reports.	
Item 60.2.c - Columns All columns have areas of check	king and	d rotting.		
<u>Pier 1:</u> Columns 1 & 3 have full height s	splits th	roughout both fac	es, up to 1/2" wide.	
Column 1 has moderate rotting	and che	ecking along the e	edges, up to full height. See ph	oto 17.
<u>Pier 2:</u> Columns 1 & 4 have numerous	full heig	ht splits throughc	out both faces, up to 1/2" wide.	See photo 18.
Item 60.2.f - Footing The exposed footing has areas	of mino	r scaling.		
TRAFFIC SAFETY				
Item 36a - Bridge Railing Both bridge rails consist of chair	nlink fer	nces mounted ont	o the deck panels. See Item 58	.8 - Railing.
Item 36b - Transitions All four corners consist of w-bea at the bridge rail corners; not tie	ım pane d.	els mounted on st	eel posts and spacers, with box	ng glove type ends
Item 36c - Approach Guardrai All four corners consist of w-bea	I Im pane	els mounted on st	eel posts and spacers.	
There is moderate damage at be	oth eas	t corners and the	southwest corner. See photos	19 & 20.
Item 36d - Approach Guardrai All four corners have boxing glo	<u>I Ends</u> ve type	ends.		

All four corners have minor damage and scrapes. See photo 21.

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CITY/TOWN WILMINGTO	DN	B.I.N. 2NV	BR. DEPT. NO. W-38-003	8STRUCTURE NO. W38003-2NV-DOT-634	INSPECTION DATE				
			REMA	RKS					
Sketch / P	hoto Log								
Sketch 1 :	Framing Plan.								
Photo 1 :	West elevation, hid	den "At	t Bridge" Weight I	Posting Sign.					
Photo 2 :	Typical wearing sur	rface, e	xposed deck plai	nks.					
Photo 3 :	Typical rotting, che	cking, a	and efflorescence	throughout the deck.					
Photo 4 :	Typical timber curb	deterio	pration and loose	connection.					
Photo 5 :	Typical broken con	Typical broken connection throughout both curbs.							
Photo 6 :	Curb area leaning into roadway; typical throughout both curbs.								
Photo 7 :	Typical broken fend	ce conn	ection; view of so	outh fence near the west er	nd.				
Photo 8 :	East approach, was	shout/s	ettlement area at	the north corner of the eas	t abutment.				
Photo 9 :	Typical areas of ch	ecking	and splitting thro	ughout all beams.					
Photo 10 :	Span 1, typical area splitting.	as of st	eel tie rods/nails	popping out of both faces o	of all beams; typical				
Photo 11 :	Span 2, typical und	lerside.							
Photo 12 :	Span 3, typical view	w of ran	dom steel tie rod	popping out of beam face.					
Photo 13 :	Span 3, west face of	of Bean	ns 20 & 21, evide	nce of crippling and moder	ate splitting.				
Photo 14 :	Typical scaling thro	ughout	both breastwalls	; view of west breastwall.					
Photo 15 :	West breastwall, no	orth end	d spalling.						
Photo 16 :	East breastwall, so	uth end	vertical crack.						
Photo 17 :	Pier 1, Column 1, ty	ypical r	otting along the fu	ull height of the edges.					
Photo 18 :	Pier 2, column 1, ty	pical v	ertical splitting.						
Photo 19 :	Southeast approac	h guaro	drail damage.						
Photo 20 :	Southwest approac	h guar	drail damage.						

Photo 20 : Southwest approach guardrail damage Photo 21 : Southwest approach rail end damage.



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Photo 1: West elevation, hidden "At Bridge" Weight Posting Sign.















Photo 8: East approach, washout/settlement area at the north corner of the east abutment.

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Photo 9: Typical areas of checking and splitting throughout all beams.



Photo 10: Span 1, typical areas of steel tie rods/nails popping out of both faces of all beams; typical splitting.

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Photo 11: Span 2, typical underside.



Photo 12: Span 3, typical view of random steel tie rod popping out of beam face.

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Photo 13: Span 3, west face of Beams 20 & 21, evidence of crippling and moderate splitting.





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Photo 15: West breastwall, north end spalling.



Photo 16: East breastwall, south end vertical crack.

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Photo 17: Pier 1, Column 1, typical rotting along the full height of the edges.





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Photo 19: Southeast approach guardrail damage.





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Photo 21: Southwest approach rail end damage.

National Bridge Element Inspection

BDEPT#	W-38-003	Date	06/19/2016
B.I.N.	2NV	District Bridge Inspection Eng'r	Thomas G. Weil
Item 8	W38003-2NV-DOT-634	Inspecting Agency	Mass. Highway Dept.
Span Group	1	Team Leader	Andrew Labib
Town	Wilmington	Team	James Roy, Joseph Dideo
District	4	Member(s)	

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4
31	Timber Deck	sq feet	2	1,098.000	%			1,098.000	
Notes :	·	•	· · ·		• •		<u>.</u>	·	
> 1150	Check/Shake	sq feet	2	550.000	%			550.000	
Notes :									
> 1170	Split/Delamination (Timber)	sq feet	2	548.000				548.000	
Notes :									
> 510	Wearing Surfaces	sq feet	2	903.000	%			503.000	400.000
Notes :									
> > 3230	Effectiveness (Wearing Surface)	sq feet	2	903.000	%			503.000	400.000
Notes :			- -						
111	Timber Open Girder	feet	2	533.000					533.000
Notes :			- -		- -				
> 1170	Split/Delamination (Timber)	feet	2	533.000	%				533.000
Notes :									
206	Tim Col or Pile Ext	each	2	8	%			4	4
Notes :								,	
> 1140	Decay/Section Loss	each	2	1					1
Notes :		-							
> 1170	Split/Delamination (Timber)	each	2	7	%			4	3
Notes :									
215	Re Conc Abutment	feet	2	36.000	%			36.000	
Notes :									
> 1080	Delamination/Spall/Patched Area	feet	2	34.000				34.000	
Notes :									

National Bridge Element Inspection

BDEPT#	W-38-003	Date	06/19/2016
B.I.N.	2NV	District Bridge Inspection Eng'r	Thomas G. Weil
Item 8	W38003-2NV-DOT-634	Inspecting Agency	Mass. Highway Dept.
Span Group	1	Team Leader	Andrew Labib
Town	Wilmington	Team	James Roy, Joseph Dideo
District	4	Member(s)	

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4	
> 1130	Cracking (RC and Other)	feet	2	2.000	%			2.000		
Notes :										
235	Timber Pier Cap	feet	2	36.000	%			36.000		
Notes :										
> 1170	Split/Delamination (Timber)	feet	2	36.000	%			36.000		
Notes :	Notes :									
330	Metal Bridge Railing	feet	2	134.000	%		119.000		15.000	
Notes :							·		,	
> 1000	Corrosion	feet	2	119.000	%		119.000			
Notes :										
> 1020	Connection	feet	2	15.000	%				15.000	
Notes :					·					