

*California Department of Transportation  
Division of Maintenance*

*Structure Maintenance and Investigations*

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**B**<sub>RIDGE</sub>

**I**<sub>NSPECTION</sub>

**R**<sub>ECORDS</sub>

**I**<sub>NFORMATION</sub>

**S**<sub>YSTEM</sub>

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# Structure Maintenance & Investigations Load Rating Summary Sheet

Bridge Number: 27C0008  
 Facility Carried: MEADOW WAY  
 Location: IN FAIRFAX  
 City: FAIRFAX

Bridge Name: <u>SAN ANSELMO CREEK</u>						
Structural Element <u>All girders</u>						
Rated:						
Rating Summary						
<b>DESIGN LOADING</b>			<b>Critical Location</b>			
	Rating Factor	Metric Tons	Structure	Control Element	Load Action	Location
Inventory:	0.41	13.3	Span 3,4	Girder	Allowable Moment	0.5pt of Span 3,4 Interior Girders
Operating:	0.57	18.5	Span 3,4	Girder	Allowable Moment	0.5pt of Span 3,4 Interior Girders
<b>LEGAL RATING</b>		Posting U.S. Tons				
Type 3 (25T):	0.72	18	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
Type 3S2 (36T):	0.80	28	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
Type 3-3 (40T):	0.88	35	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
<b>PERMIT RATING</b>		Permit Rating				
5 Axle Truck :	0.53	X	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
7 Axle Truck :	0.53	X	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
9 Axle Truck :	0.53	X	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
11 Axle Truck:	0.53	X	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders
13 Axle Truck:	0.53	X	Span 3,4	Girder	Allowable Moment	0.4&0.6pt of Span 3,4 Interior Girders

**RELEVANT LOAD RATING INFORMATION**

**NOTES:**

Overlay Used In Rating: none

Rating Method: 2 AS Allowable Stress Inventory (65)      2 AS Allowable Stress Operating (63)

Analysis Tool Used: VIRTIS 6.3.1 AASHTO

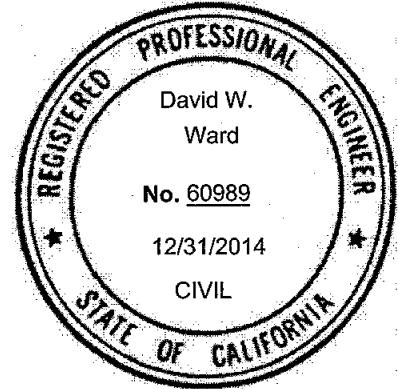
Rating/File Location: VIRTIS Database

Control Rating By: David W. Ward      Rating Date: 06/21/2012

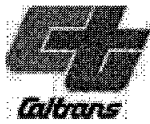
Rating Checked By: Maxine J. Jacoby      *M. Jacoby* 7/2/13

Rating Type: Calculated

Summary Prepared By: David W. Ward      Summary Date: 07/02/2013



*David W. Ward* 7/2/13  
 David W. Ward - Registered Engineer (Date)



# Structure Maintenance & Investigations Load Rating Summary Sheet

Bridge Number: 27C0008  
Facility Carried: MEADOW WAY  
Location: IN FAIRFAX  
City: FAIRFAX

## Load Rating Assumptions

### HISTORY (Bridge No. 27C0008)

The bridge was estimated to have been built in 1950. There are no as-built plans or design live load information available for this bridge. The bridge was previously load rated in 1982 using the Allowable Stress Method.

### STRUCTURE DESCRIPTION

The superstructure consists of four main spans with short cantilevered abutment spans at each end. Spans one through four consist of twelve timber stringers with timber plank decks and spans five and six consist of a combination of timber stringers and rolled steel girders with timber plank decks. All spans are supported by non-integral timber bents.

### SCOPE OF WORK

Ratings of the superstructure girder elements were established by analyzing the structure on 06/21/12 using the Load Factor Rating Method for the steel girders and Allowable Stress Rating Method for the timber stringers. The deck and substructure were not included in the rating analysis at this time. The current load rating supersedes all previous rating analyses.

### RATING ANALYSIS AND ASSUMPTIONS

#### General:

All girder elements were analyzed using Virtis 6.3.1 with AASHTO LFR engine and Madero ASD engine utilizing moment and shear demands. Per the most recent BIR dated 09/22/2010 the deck, superstructure, and substructure were in good condition (condition state 7).

#### Assumptions made in creating the model include:

- All utilities listed in Encroachment Panel are supported by substructure elements.
- Stringers at beginning and end of bridge are cantilevered and unsupported at ends approximately 3.5ft at BB and 2ft at EB.
- Steel girders carry 100 percent of live load in spans five and six. Timber girders in these spans were not load rated.
- Pedestrian loading is 50 percent maximum of the 85lb per square foot design load due to rural and remote location.
- One lane traffic only. Any widening work would require revised load rating analysis.

#### Materials:

Material strengths were assigned based on year of construction for the structural steel and visual identification/condition for the timber as follows:  $F_y$  of 33ksi for structural steel, and Doug Fir-Larch Select Structural  $F_b = 1600$ psi and  $F_v = 85$ psi for the timber stringer components.

#### Dead Loads:

Timber barriers and wheel guards on both sides of bridge. No wearing course, utilities, or sign structures were included in the analysis.

#### Live Loads:

LLDF values were calculated in accordance with Caltrans Bridge Design Specifications (April 2000). P5 to P13, 48-kip split-axle (24 kips/axle) truck configuration was used in the analysis. A pedestrian live load equal to one half of the maximum design value was applied and distributed equally to all girders rated. This reduced pedestrian live load is based on the rural/remote location of this bridge.

#### Rating Summary:

Controlling rating factors can be found on the first page of this LRSS dated 07/02/2012. Rating factors of all girders can be found in the Rating electronic archives.

### REVISED LOAD RATINGS

Based on this analysis the NBI Operating Rating (Item code 64) has changed from 17.2 to 18.5 and the Inventory Rating (Item code 66) has changed from 11.8 to 13.3 metric tonnes respectively. Posting limits have changed from 16 to 18 US Tons for Type 3 trucks, from 26 to 28 US Tons for Type 3S2 trucks, and from 32 to 35 US Tons for Type 3-3 trucks. Permit ratings remain XXXXX.

All assumptions listed above, along with the overall condition of the structure, must be field verified where possible and documented in a routine Bridge Inspection Report for this load rating to be valid and to meet FHWA requirements



Photo No. 1  
Roadway looking east.



Photo No. 2  
Elevation looking north.



Photo No. 3  
Deck runner planks split.



Photo No. 4

All steel girders are covered with blanket rust.



Photo No. 5  
Debris at Pier 4.





Photo No. 6  
Bent cap 4 has a horizontal check full length.



Photo No. 7  
Vertical split in Bent cap 2.



DEPARTMENT OF TRANSPORTATION  
Structure Maintenance & Investigations

Bridge Number : 27C0008  
Facility Carried: MEADOW WAY  
Location : IN FAIRFAX  
City : FAIRFAX  
Inspection Date : 09/22/2010

## Bridge Inspection Report

Inspection Type

Routine  FC Underwater Special Other

**STRUCTURE NAME: SAN ANSELMO CREEK**

### CONSTRUCTION INFORMATION

Year Built : 1950 Skew (degrees): 0  
Year Widened: N/A No. of Joints : 0  
Length (m) : 21.3 No. of Hinges : 0

Structure Description: A 5 span simply supported timber stringer (12 in spans 1, 2, 3 and 4; 5 timber and 4 steel stringers in Span 4) supported by timber bents and concrete abutments.

Span Configuration : 0.30 m, 3.35 m, 2 @ 4.27, 7.01 m.

### LOAD CAPACITY AND RATINGS

Design Live Load: UNKNOWN  
Inventory Rating: 11.8 metric tonnes Calculation Method: ALLOWABLE STRESS  
Operating Rating: 17.2 metric tonnes Calculation Method: ALLOWABLE STRESS  
Permit Rating : XXXXX  
Posting Load : Type 3: 16 U.S. Tons Type 3S2: 26 U.S. Tons Type 3-3: 32 U.S. Tons

### DESCRIPTION ON STRUCTURE

Deck X-Section: 0.21 m br, 3.08 m, 0.15 m wg, 0.76 m sw, 0.19 m br  
Total Width: 4.3 m Net Width: 3.0 m No. of Lanes: 1  
Rail Description: Light Timber Railing. Rail Code : 0000  
Min. Vertical Clearance: Unimpaired

### DESCRIPTION UNDER STRUCTURE

Channel Description: Natural creek channel - soil, sand and rock.

### INSPECTION COMMENTARY

#### INSPECTION ACCESS

- The channel was dry. All portions of the substructure were observed on the date of this investigation.

#### CONDITION OF STRUCTURE

##### DECK AND RAIL:

1. Thirty percent (30%) of the deck runner planks have split. See photo 3.
2. The timber rails were inspected and they are generally in good condition.

##### SUPERSTRUCTURE:

All steel girders are covered with blanket rust. No section loss is observed. See photo 4.

##### SUBSTRUCTURE:

1. There is a vertical split in Bent cap 2, which extends from the left end to half length of the bent cap. See photo 7.
2. Bent cap 4 has a horizontal check full length. This condition was first noted in the 8/10/1999 report and has not significantly changed at this time. See photo 6.
3. There are about 5 cu. ft. of debris at Pier 4. See photo 5.

**INSPECTION COMMENTARY****SIGNS**

The following sign is placed only at the Northerly approach:

**WEIGHT LIMIT**

- 16 TONS PER VEHICLE
- 26 TONS PER SEMI-TRAILER COMBINATION
- 32 TONS PER TRUCK AND FULL-TRAILER

**EXISTING POSTING**

The following posting has been placed as per the Order of Director of Transportation dated 2/4/1986:

- 16 TONS PER VEHICLE
- 26 TONS PER SEMI-TRAILER COMBINATION
- 32 TONS PER TRUCK AND FULL-TRAILER

**RECOMMENDED POSTING**

Retain existing posting.

**SAFE LOAD CAPACITY**

The timber stringers of the structure are the controlling item. A stress analysis indicated that the bridge is not capable of sustaining any combination of legal loads. The existing posting is applicable for as long as this structure remains in the same general condition as it was during this investigation.

**ELEMENT INSPECTION RATINGS**

Elem No.	Element Description	Env	Total Qty Units	Qty in each Condition State				
				St. 1	St. 2	St. 3	St. 4	St. 5
31	Timber Deck - Bare	2	60 sq.m.	60	0	0	0	0
106	Unpainted Steel Open Girder/Beam	2	29 m.	0	29	0	0	0
111	Timber Open Girder/Beam	2	190 m.	190	0	0	0	0
206	Timber Column or Pile Extension	2	12 ea.	12	0	0	0	0
215	Reinforced Conc Abutment	2	9 m.	9	0	0	0	0
235	Timber Cap	2	27 m.	9	18	0	0	0
332	Timber Bridge Railing	2	46 m.	46	0	0	0	0

**WORK RECOMMENDATIONS** - NONE

Inspected By : AN.Dang/AR.Nojourni

  
 Andy N. Dang (Registered Civil Engineer)



**STRUCTURE INVENTORY AND APPRAISAL REPORT**

\*\*\*\*\* IDENTIFICATION \*\*\*\*\*

(1) STATE NAME- CALIFORNIA 069  
 (8) STRUCTURE NUMBER 27C0008  
 (5) INVENTORY ROUTE (ON/UNDER) - ON 150000000  
 (2) HIGHWAY AGENCY DISTRICT 04  
 (3) COUNTY CODE 041 (4) PLACE CODE 23168  
 (6) FEATURE INTERSECTED- SAN ANSELMO CREEK  
 (7) FACILITY CARRIED- MEADOW WAY  
 (9) LOCATION- IN FAIRFAX  
 (11) MILEPOINT/KILOMETERPOINT 0  
 (12) BASE HIGHWAY NETWORK- NOT ON NET 0  
 (13) LRS INVENTORY ROUTE & SUBROUTE  
 (16) LATITUDE 37 DEG 58 MIN 33.65 SEC  
 (17) LONGITUDE 122 DEG 36 MIN 00.84 SEC  
 (98) BORDER BRIDGE STATE CODE % SHARE %  
 (99) BORDER BRIDGE STRUCTURE NUMBER

\*\*\*\*\* STRUCTURE TYPE AND MATERIAL \*\*\*\*\*

(43) STRUCTURE TYPE MAIN:MATERIAL- STEEL  
 TYPE- STRINGER/MULTI-BEAM OR GDR CODE 302  
 (44) STRUCTURE TYPE APPR:MATERIAL- WOOD OR TIMBER  
 TYPE- STRINGER/MULTI-BEAM OR GDR CODE 702  
 (45) NUMBER OF SPANS IN MAIN UNIT 1  
 (46) NUMBER OF APPROACH SPANS 4  
 (107) DECK STRUCTURE TYPE- TIMBER CODE 8  
 (108) WEARING SURFACE / PROTECTIVE SYSTEM:  
 A) TYPE OF WEARING SURFACE- TIMBER CODE 7  
 B) TYPE OF MEMBRANE- NONE CODE 0  
 C) TYPE OF DECK PROTECTION- NONE CODE 0

\*\*\*\*\* AGE AND SERVICE \*\*\*\*\*

(27) YEAR BUILT 1950  
 (106) YEAR RECONSTRUCTED 0000  
 (42) TYPE OF SERVICE: ON- HIGHWAY 1  
 UNDER- WATERWAY 5  
 (28) LANES: ON STRUCTURE 01 UNDER STRUCTURE 00  
 (29) AVERAGE DAILY TRAFFIC 55  
 (30) YEAR OF ADT 1981 (109) TRUCK ADT 0 %  
 (19) BYPASS, DETOUR LENGTH 199 KM

\*\*\*\*\* GEOMETRIC DATA \*\*\*\*\*

(48) LENGTH OF MAXIMUM SPAN 7.0 M  
 (49) STRUCTURE LENGTH 21.3 M  
 (50) CURB OR SIDEWALK: LEFT 0.8 M RIGHT 0.0 M  
 (51) BRIDGE ROADWAY WIDTH CURB TO CURB 3.0 M  
 (52) DECK WIDTH OUT TO OUT 4.3 M  
 (32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 5.5 M  
 (33) BRIDGE MEDIAN- NO MEDIAN 0  
 (34) SKEW 0 DEG (35) STRUCTURE FLARED NO  
 (10) INVENTORY ROUTE MIN VERT CLEAR 99.99 M  
 (47) INVENTORY ROUTE TOTAL HORIZ CLEAR 3.0 M  
 (53) MIN VERT CLEAR OVER BRIDGE RDWY 99.99 M  
 (54) MIN VERT UNDERCLEAR REF- NOT H/RR 0.00 M  
 (55) MIN LAT UNDERCLEAR RT REF- NOT H/RR 0.0 M  
 (56) MIN LAT UNDERCLEAR LT 0.0 M

\*\*\*\*\* NAVIGATION DATA \*\*\*\*\*

(38) NAVIGATION CONTROL- NO CONTROL CODE 0  
 (111) PIER PROTECTION- CODE  
 (39) NAVIGATION VERTICAL CLEARANCE 0.0 M  
 (116) VERT-LIFT BRIDGE NAV MIN VERT CLEAR M  
 (40) NAVIGATION HORIZONTAL CLEARANCE 0.0 M

\*\*\*\*\* SUFFICIENCY RATING = 44.1

STATUS FUNCTIONALLY OBSOLETE  
 HEALTH INDEX 95.5  
 PAINT CONDITION INDEX = N/A

\*\*\*\*\* CLASSIFICATION \*\*\*\*\* CODE

(112) NBIS BRIDGE LENGTH- YES Y  
 (104) HIGHWAY SYSTEM- NOT ON NHS 0  
 (26) FUNCTIONAL CLASS- LOCAL URBAN 19  
 (100) DEFENSE HIGHWAY- NOT STRAHNET 0  
 (101) PARALLEL STRUCTURE- NONE EXISTS N  
 (102) DIRECTION OF TRAFFIC- 1 LANE, 2 WAY 3  
 (103) TEMPORARY STRUCTURE-  
 (105) FED.LANDS HWY- NOT APPLICABLE 0  
 (110) DESIGNATED NATIONAL NETWORK - NOT ON NET 0  
 (20) TOLL- ON FREE ROAD 3  
 (21) MAINTAIN- CITY OR MUNICIPAL HIGHWAY AGENCY 04  
 (22) OWNER- CITY OR MUNICIPAL HIGHWAY AGENCY 04  
 (37) HISTORICAL SIGNIFICANCE- NOT ELIGIBLE 5

\*\*\*\*\* CONDITION \*\*\*\*\* CODE

(58) DECK 7  
 (59) SUPERSTRUCTURE 7  
 (60) SUBSTRUCTURE 7  
 (61) CHANNEL & CHANNEL PROTECTION 6  
 (62) CULVERTS N

\*\*\*\*\* LOAD RATING AND POSTING \*\*\*\*\* CODE

(31) DESIGN LOAD- UNKNOWN 0  
 (63) OPERATING RATING METHOD- ALLOWABLE STRESS 2  
 (64) OPERATING RATING- 17.2  
 (65) INVENTORY RATING METHOD- ALLOWABLE STRESS 2  
 (66) INVENTORY RATING- 11.8  
 (70) BRIDGE POSTING- 30.0 - 39.9% BELOW 1  
 (41) STRUCTURE OPEN, POSTED OR CLOSED- P  
 DESCRIPTION- POSTED FOR LOAD

\*\*\*\*\* APPRAISAL \*\*\*\*\* CODE

(67) STRUCTURAL EVALUATION 4  
 (68) DECK GEOMETRY 2  
 (69) UNDERCLEARANCES, VERTICAL & HORIZONTAL N  
 (71) WATER ADEQUACY 5  
 (72) APPROACH ROADWAY ALIGNMENT 4  
 (36) TRAFFIC SAFETY FEATURES 0000  
 (113) SCOUR CRITICAL BRIDGES U

\*\*\*\*\* PROPOSED IMPROVEMENTS \*\*\*\*\*

(75) TYPE OF WORK- REPLACE FOR DEFICIENC' CODE 31  
 (76) LENGTH OF STRUCTURE IMPROVEMENT 21.3 M  
 (94) BRIDGE IMPROVEMENT COST \$209,300  
 (95) ROADWAY IMPROVEMENT COST \$41,860  
 (96) TOTAL PROJECT COST \$351,624  
 (97) YEAR OF IMPROVEMENT COST ESTIMATE 2010  
 (114) FUTURE ADT 105  
 (115) YEAR OF FUTURE ADT 2028

\*\*\*\*\* INSPECTIONS \*\*\*\*\*

(90) INSPECTION DATE 09/10 (91) FREQUENCY 24 MO  
 (92) CRITICAL FEATURE INSPECTION: (93) CFI DATE  
 A) FRACTURE CRIT DETAIL- NO MO A)  
 B) UNDERWATER INSP- NO MO B)  
 C) OTHER SPECIAL INSP- NO MO C)

**BRIDGE SCOUR EVALUATION - PLAN OF ACTION**

<u>Br. No.</u>	<u>Owner</u>	<u>Location</u>	<u>Facility Carried</u>	<u>Name</u>
27C-0008	Town of Fairfax	In Fairfax	Meadow Way	San Anselmo Creek
<b>Plan of Action Completed By:</b> Kathleen Wilkie, Director of Public Works				<b>Date of Completion:</b> 9/1/10

**1. SCOUR VULNERABILITY RATING**

**Scour Evaluation Summary:**

This four-span, wood-framed bridge was reportedly constructed in 1950 (Caltrans). The structure is approximately 70 feet long and carries a single lane of vehicular traffic, plus a narrow bicycle/pedestrian path. The timber roadway surface is about 25-feet above the channel bottom with spans between foundation elements ranging from 11 to 23 feet. Other than Caltrans Bridge Inspection Reports (BIRs), there were no structural plans or geotechnical data (i.e., boring logs or laboratory strength data) available for this evaluation. The channel bottom was free of actively-flowing water, although water was ponding in a localized (low) area near the south end of the structure.

Creek bank slopes upstream of the bridge include soils that are inclined from about 2:1 (horizontal to vertical) and locally steeper. At the south end of the bridge, an old 4-foot high (+/-) concrete retaining wall supports the toe of the natural slope. Downstream of the bridge, natural slopes are at perhaps 2:1 and concrete retaining walls up to about 8 feet high retain the toe of creek bank. Slopes are typically vegetated with scattered mature trees, grasses and shrubbery. Bedrock was not observed in the vicinity of the bridge and sands and gravels cover the creek bottom.

This exploration was limited to surficial observations and shallow hand-probing, and based on this level of inspection, the bridge is founded on 12-inch diameter driven wooden pilings. Small concrete abutments are located at the bridge ends, but vertical loads at the bridge ends are also carried by timber piles that are immediately adjacent to the abutment walls. Depths of pilings are unknown, but rotations or lateral displacements that would suggest shallow embedment and historic movement of the piles due to water pressures were not evident.

The bridge spans an average width to relatively wide section of San Anselmo Creek at a very sharp (approximately 130-degree) left channel bend. The right abutment is in a very scour-prone outside bend channel position. It appears that the vertical 4-foot high concrete toe wall was constructed along the toe of the right bank either at the same time as the bridge construction or sometime afterwards to protect against bank erosion there. This toe wall is backfilled with grouted riprap. It extends downstream to nearly meet an existing vertical right bank retaining wall fronting the downstream private property. The toe wall extends upstream and is jointed around the curve of the bank to protect the toe of the bank along most of the outside bend's length.

There are two sets of piers founded in the active channel bed. Those closer to the inside bend are less vulnerable to scour. Those closer to the right bank at the outside bend (Pier 4) form a relatively narrow bay within the low-flow channel between the piers and the concrete toe wall. The narrow right bay appears to further focus bed scour within this narrow portion of the bed. Medium gravel dominates the bed within the inside bend, and coarser gravel and fine cobble-sized material dominates the bed along the outside bend. Debris appears to be commonly trapped at Pier 4. Earlier Caltrans bridge inspection reports recommended removing debris from Pier 4. There is a negligible amount of small woody debris trapped against Pier 4 this season.

There are no exposures of bedrock on the bed or banks within the vicinity of Meadow Way Bridge. The channel is relatively narrowly confined by vertical concrete walls on both banks at a location about 200 feet downstream from the bridge, where there is also a partially failed section of concrete slab covering the channel bed. These features appear to create a jammed riffle form of grade control approximately 150 feet downstream from the bridge. As much as 1.5 feet of long-term bed level degradation appears possible at the Meadow Way Bridge section.

Long-term channel bed degradation potential:	(-) 1.5 feet
Short-term channel bed scour depth during floods:	(-) 3.5 feet

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The potential for short-term bed lowering during floods is greatest along the toe of the right bank and near Pier 4. It appears that there is as much as about 3.5 feet of scour during floods along the toe wall upstream from the bridge and between the toe wall and the closest set of piers.

Bed scour is strongly focused along the concrete toe wall and has presently undercut the toe wall over 15 or more lineal feet and by as much as 4 horizontal feet at a location immediately upstream from the upstream face of the bridge. The toe wall does not appear to have a footing and has, therefore, lost much of its foundation support. However, it appears massive and integral enough to continue to span the undercut region without having failed into the channel or cracked. If the wall were to topple into the creek channel, additional erosion and sloughing would likely occur on the slope above the wall, which could impact the southern bridge abutment. Additionally, an old timber bulkhead "deflection" wall upstream of the bridge should be monitored because if this bulkhead failed, significant erosion/sloughing of the steep creek bank could occur. Sloughing could eventually impact the Meadow Way immediately north of the bridge and/or the northern bridge abutment. Support of this wall could be improved with riprap and grout or underpinning with helical anchors or driven mini-piles. As noted above, monitoring of the wood deflection wall upstream of the bridge should also occur and if additional damage is noted, mitigation may be needed.

It also appears that the bridge is particularly vulnerable to trapping of woody debris, especially at Pier 4. Trapping of large debris against Pier 4 during floods may cause severe bank erosion at the right bank as might outflank the existing vertical concrete retaining wall immediately downstream from the bridge. It is possible that a large woody debris jam at Pier 4 would create lateral forces that would damage the piers during the flood or subsequent flood. The bridge should be monitored after floods to determine if there is woody debris building up there which should be removed prior to the next flood.

The bridge has a Sufficiency Rating of 44.1 and is Functionally Obsolete. It is not eligible for NHRP listing as a Historic Structure. The bridge is currently programmed for replacement through the HBP.

**Scour History:**

The 4-foot high concrete wall (see photo) at the toe of the south creek bank has been undermined and a void approximately 4 feet wide and 12 inches or more deep is apparent under most of the wall. Additionally, an old timber bulkhead "deflection" wall upstream of the bridge should be monitored because if this bulkhead failed, significant erosion/sloughing of the steep creek bank could occur.

**Hydrology** - The bridge opening is relatively large. Flood flows are not expected to exceed depths of 9-10 feet at this location. The 1977 Flood Insurance Study indicates that the Meadow Way Bridge deck is not overtopped by the then estimated 500-year flood. The bridge deck was not overtopped during the December 31, 2005 flood. High water marks collected in the vicinity of the bridge were between 6.5 and 8.0 feet above the channel bed.

a. **Foundation Type**       Spread footing     Pile Extension     Footing on Piles     Unknown

b. **Foundation Material**     Known Sands & gravel     Unknown

Scour Review: Done By: N. Tamannaie, PE; Matt Smeltzer, PE; & Mike Morisoli, GE      Date: 8/25/2010

Structural Assessment: Done By: California Infrastructure Consultancy (N. Tamannaie) Date: 8/30/2010  
Critical Elevation: Not stated

Geotechnical Assessment: Done By: Mike Morisoli, GE      Date: 8/25/10  
Critical Elevation: Not stated

2. NBIS CODING INFORMATION	
	<u>Most Recent</u>
Inspection date	8/6/2008
Item 113 Scour	U
Item 60 Substructure	7
Item 61 Channel & Channel Protection	6
Item 71 Waterway Adequacy	5

3. COUNTERMEASURE RECOMMENDATION	
<b>A. Completed Countermeasures:</b> Cemented rock riprap exists below the right abutment slope	
<b>B. Proposed Countermeasures:</b>	
The Town will inspect the structure after any significant storm events. The Town proposes to place riprap at the foundations of the toe wall at the bottom of the right bridge abutment. The bridge has a Sufficiency rating (SR) of 44.1, is Functionally Obsolete (FO) and is programmed for replacement. In light of the noted abutment toe wall foundation scour and the condition of the bridge, the eventual ultimate countermeasure will be bridge replacement.	
<input type="checkbox"/> Countermeasures Not Required. (Please explain)	
<input checked="" type="checkbox"/> <b>Install Scour Countermeasures</b> (See 4 and 5)	<u>Estimated Cost</u>
<input checked="" type="checkbox"/> Riprap with monitoring program	\$75,000
<input type="checkbox"/> Guide bank	\$
<input type="checkbox"/> Spurs / Bendway weirs / Barbs	\$
<input type="checkbox"/> Relief bridge / Culvert	\$
<input type="checkbox"/> Channel improvements	\$
<input checked="" type="checkbox"/> Monitoring	\$2,500/Yr
<input type="checkbox"/> Monitoring device	\$
<input type="checkbox"/> Check Dam	\$
<input type="checkbox"/> Substructure Modification (seismic retrofit)	\$
<input checked="" type="checkbox"/> Bridge replacement	\$2,000,000
<input type="checkbox"/> Other _____	\$
<input type="checkbox"/> <b>Close Bridge</b> (See 6)	

4. COUNTERMEASURE IMPLEMENTATION SCHEDULE	
<b>Countermeasure Implementation Project Type:</b>	
<input checked="" type="checkbox"/> Proposed Construction Project <u>Bridge replacement</u>	
Lead Agency <u>Town of Fairfax</u>	
<input type="checkbox"/> Maintenance Project	
<b>Advertised Date:</b> None	
<b>Other scheduling information:</b> Apply for funds to acquire the permits and place riprap at the bottom of the scoured toe wall. Subsequently, complete bridge replacement design in 2011 and begin its construction in 2013.	



## 5. MONITORING PLAN

### Monitoring Plan Summary:

The Area Bridge Maintenance Engineer will monitor the bridge during their biennial inspection, checking for signs of degradation or bridge settlement. Town of Fairfax Maintenance personnel will monitor the bridge site during storm events. The bridge will be monitored onsite by maintenance personnel who will survey the bridge deck for any signs of foundation settlement, scour or other signs of degradation. The maintenance personnel will contact the Director of Public Works to discuss what action should be taken if significant degradation appears.

**Monitoring Authority:** Town of Fairfax

**Regular Inspection Program of 24 mo.**  w/surveyed cross sections

Items to Watch: undermining the two pier footings

**Increased Inspection Interval of \_\_\_\_\_ mo.**  w/surveyed cross sections

Items to Watch:

**Underwater Inspection Program** Frequency \_\_\_\_\_ mo.

Items to Watch:

**Fixed Monitoring Device**

Type of Instrument:

Installation location(s):

Sample Interval:  30 min.  1 hr.  6 hrs.  12 hrs.

Other \_\_\_\_\_

Frequency of data logger downloading:  Weekly  Bi-weekly  Monthly

Other \_\_\_\_\_

Scour-critical discharge: \_\_\_\_\_

Action required if scour-critical elevation detected:

**Other Monitoring Program**

Type:  Visual

Instrument

Portable  Geophysical  Sonar

Other gages

Flood monitoring required:  Yes  No

Flood monitoring event defined by:

Discharge over \_\_\_\_\_

Stage \_\_\_\_\_

Elev. measured from top of deck

Frequency of flood monitoring:  1 hr.  3 hr.  6 hrs.  Other (daily)

Scour critical elevation: None stated

Action required if scour-critical elevation detected:

6. BRIDGE CLOSURE PLAN			
Bridge ADT: 55	Built: 1950	% Trucks: 0	Bridge Length (ft): 70
<b>Closure Plan Summary</b> Follow local procedures for road closure, including notification of Police and Fire.			
<b>Scour Monitoring Criteria for Consideration of Bridge Closure:</b> <input type="checkbox"/> Water surface elevation reaches _____ <input checked="" type="checkbox"/> Overtopping road or structure <input type="checkbox"/> Scour Measurement Results / Monitoring Device <input checked="" type="checkbox"/> Loss of Riprap <input checked="" type="checkbox"/> Observed amount of Settlement <input checked="" type="checkbox"/> Loss of Road Embankment <input type="checkbox"/> Debris Accumulation <input type="checkbox"/> Other _____			
<b>Person / Area Responsible for Closure:</b> Director of Public Works			
<b>Contact People (Name &amp; Phone No.):</b> Kathleen Wilkie (Director of Public Works) (415) 453-0291			
<b>Responsible for re-opening after inspection:</b> Kathleen Wilkie (Director of Public Works) (415) 453-0291			

7. DETOUR ROUTE			
<b>Detour route description</b> (route number, from - to, etc.) – See attached map. <u>No detour is available, as the bridge is the only link to the residences on Meadow Way. During the replacement of the bridge a temporary bridge will be used.</u>			
Average ADT: 55	Year:	% Trucks:	Length:
<b>Bridges on Detour Route:</b> None			
Bridge Number	Waterway	Sufficiency Rating/ Load limitations	Scour 113 code



Aerial courtesy of MAPQUEST



View upstream to right bank showing area of focused bed scour along the toe of the right bank and near Pier 4. The concrete toe wall bank protection structure at the outside bend channel position is undercut by as much as 4 horizontal feet



Scour of the timber wall downstream of the bridge





Photo No. 1  
Horizontal check on Bent cap 4.



Photo No. 1  
Split on Bent cap 2 left.