



### 3. COUNTERMEASURE RECOMMENDATION

#### A. Completed Countermeasures:

Channel improvements completed by Department of Water Resources include regrading the channel banks and adding riprap to stabilize the banks. The regraded channel banks were also shaped to redirect the angle of flow to cut down on hydraulic skew at the piers, thus reducing local scour. Date of completion, 2003.

#### B. Proposed Countermeasures:

For the time being, passive monitoring by USGS gages and gages monitored by the Merced Irrigation District. The eventual ultimate countermeasure is bridge replacement.

Countermeasures Not Required. (Please explain)

Install Scour Countermeasures (See 4 and 5)

	<u>Estimated Cost</u>
___ Riprap with monitoring program	\$
___ Guide bank	\$
___ Spurs / Bendway weirs / Barbs	\$
___ Relief bridge / Culvert	\$
___ Channel improvements	\$
<u>X</u> Monitoring	\$ 2,500/Yr
___ Monitoring device	\$
___ Check Dam	\$
___ Substructure Modification	\$
<u>X</u> Bridge replacement	\$ 4,400,000
___ Other	\$

Close Bridge (See 6)

C.

### 4. COUNTERMEASURE IMPLEMENTATION SCHEDULE

#### Countermeasure Implementation Project Type:

Proposed Construction Project – Bridge Replacement

Lead Agency \_\_\_ Caltrans

Maintenance Project

**Advertised Date:** 8/2006

**Other scheduling information:** EA 1A0701

## 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. The SM&I Structure Hydraulics Branch will monitor the bridge during yearly inspections to check for signs of degradation, undermining of main channel spreadfootings, and bridge settlement. District Maintenance personnel will monitor the bridge site during storm events and will be called by the Merced Irrigation District when flowrates at the bridge site reach 5,000 cfs. At this time, the bridge will be monitored onsite by maintenance personnel who will survey the bridge deck for any signs of foundation settlement. Monitoring will continue on a daily basis until flowrates subside below 5,000 cfs. District Maintenance personnel will contact SM&I Structure Hydraulics and the Area Bridge Maintenance Engineer to discuss what action should be taken if flowrates continue above 5,000 cfs.

### Monitoring Authority: Caltrans

**Regular Inspection Program of 24 months**  w/surveyed cross sections

Items to Watch: Undermining of spreadfootings at piers in the main channel.

**Increased Inspection Interval of 12 months**  w/surveyed cross sections

Items to Watch: after each high flows the footing exposure at the piers debris and any channel bed material erosion.

**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: \_3000 cfs\_\_\_\_\_

Action required if scour-critical elevation detected:

The bridge inspector at the district office will notify the district maintenance engineer.

**Other Monitoring Program**

Type:  Visual

Instrument

Portable  Geophysical  Sonar

Other gages CDEC Stage Gages DSN, MSN

Flood monitoring required:  Yes  No

Flood monitoring event defined by:

Discharge over 5000 cfs the bridge should have onsite monitoring.

Stage \_\_\_\_\_

Elev. measured from \_\_\_\_\_

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

Scour critical elevation: channel elevation 172 feet

Action required if scour-critical elevation detected: Close bridge.

## 6. BRIDGE CLOSURE PLAN

**Bridge ADT: 2230**

**Built: 1953**

**% Trucks: 10**

**Bridge Length (ft): 473.1**

The first bench mark flow will warrant a daily elevation survey of the structure once the stream flow has reached 5000 cfs as dictated by the Merced Irrigation District. Results which differ from the baseline elevations by more than 1/2" will warrant possible closure of the structure. Closure will be discussed by SM&I Hydraulics, the Area Bridge Maintenance Engineer, and Maintenance personnel. The bridge should be closed if the channel elevation reaches 172 feet.

### Scour Monitoring Criteria for Consideration of Bridge Closure:

- Water surface elevation reaches \_\_\_\_\_  Overtopping road or structure  
 Scour Measurement Results / Monitoring Device  Loss of Riprap  
 Observed amount of Settlement 0.5"  Loss of Road Embankment  
 Debris Accumulation  
 Other Discharge of 5,000 cfs

**Person / Area Responsible for Closure:** District Maintenance Engineer

**Contact People (Name & Phone No.):** Maintenance Area Superintendent  
 Kevin Flora (State Scour Eval Senior) (916) 227-8015  
 Greg Carter (Area Bridge Maint. Engineer) (916) 227-0410

**Responsible for re-opening after inspection:** Kevin Flora (State Scour Eval. Senior) (916) 227-8015,  
 Gregory J Carter (ABME), (916) 227-0410

## 7. DETOUR ROUTE

**Detour route description** (route number, from - to, etc.) – See attached map.

**Average ADT:** 2230

**Year:** 1997

**% Trucks:** 10

**Length:** 23

### Bridges on Detour Route:

Bridge Number	Waterway	Sufficiency Rating/ Load limitations	Scour 113 code
39c0014	Merced River	5 MS 18 (HS 20)	5
39c0068	Main canal	0 other or Unknown	8

**BRIDGE SCOUR EVALUATION - PLAN OF ACTION**

<b>Br. No.</b> 36 0054	<b>Owner</b> Caltrans	<b>Location</b> 05-SCR-009- 15.49	<b>Facility Carried</b> STATE ROUTE 9	<b>Name</b> KINGS CREEK
<b>Plan of Action Completed By:</b> Yihwin Huang (SM&I Hydraulics)			<b>Date of Completion:</b> 09/19/2005	

**1. SCOUR VULNERABILITY RATING**

**Scour Evaluation Summary:**

- 113 originally coded 5, based on as-built plans showing footings were founded in shale which is visible throughout the channel and along the banks. This material was considered to be erodible by the geologist, but he agreed with 113 coding based on age of structure & local scour not an issue.
- In 2004, ABME voiced concerns about the deteriorating conditions at the footings. Another investigation was made by SM&I Hydraulics and determined that the slow advance of scour in this bedrock did not make it an emergency, but scour countermeasures were deemed necessary to prevent ultimate undermining by stream erosion.

**Scour History:**

- Footing exposure at Bent 2 noted since 1977, but conditions worsened as noted in the 2004 BIR.
- Lateral migration of the channel has caused exposure/undermining of Bent footings, and caused most of the sack PCC protection placed in '83 to wash out.
- Debris was noted to be an issue in '56.

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

b. **Foundation Material**    Known shale    Unknown

Scour Review:                      Done By: Scott Davis (SM&I Hydraulics)                      Date:  
08/09/2004

Structural Assessment:   Done By: (N/A)                      Date:  
Critical Elevation: \_\_\_\_\_

Geotechnical Assessment:   Done By: Mark Palmer                      Date: 07/23/2004  
Critical Elevation: (N/A)                      (Office of Geotechnical Services)

**2. NBIS CODING INFORMATION**

	<u>Most Recent</u>
Inspection date	8/9/04
Item 113      Scour	3
Item 60      Substructure	6
Item 61      Channel & Channel Protection	4
Item 71      Waterway Adequacy	8

### 3. COUNTERMEASURE RECOMMENDATION

#### A. Completed Countermeasures:

- In 1983, backfilled under left Bent 2 footing and place riprap around sides of Bent 2

#### B. Proposed Countermeasures:

- Remove all loose & decomposed bedrock material from beneath undermined portions of the Bent 2 footings, grout the resulting voids between bottom of footing and sound bedrock, and then surround the bent with a 1m thick layer of ½ Ton RSP (Backing Class 1, RSP fabric Type B, Placement Method B). Approximate limits of RSP to be from 3m U/S to 3m D/S & on either side of the bent. Estimated quantities are 2 m<sup>3</sup> of grout and 85 m<sup>3</sup> of ½ Ton RSP.

Countermeasures Not Required. (Please explain)

Install Scour Countermeasures (See 4 and 5)

	<u>Estimated Cost</u>
<input type="checkbox"/> Riprap with monitoring program	\$
<input type="checkbox"/> Guide bank	\$
<input type="checkbox"/> Spurs / Bendway weirs / Barbs	\$
<input type="checkbox"/> Relief bridge / Culvert	\$
<input type="checkbox"/> Channel improvements	\$
<input type="checkbox"/> Monitoring	\$
<input type="checkbox"/> Monitoring device	\$
<input type="checkbox"/> Check Dam	\$
<input type="checkbox"/> Substructure Modification	\$
<input type="checkbox"/> Bridge replacement	\$
<input checked="" type="checkbox"/> Other (see summary above)	\$50,000

Close Bridge (See 6)

### 4. COUNTERMEASURE IMPLEMENTATION SCHEDULE

#### Countermeasure Implementation Project Type:

- Proposed Construction Project  
Lead Agency
- Maintenance Project

#### Advertised Date:

(N/A)

#### Other scheduling information:

The status of this recommended work is still "Proposed" (as of 09/19/2005)

## 5. MONITORING PLAN

### Monitoring Plan Summary:

- Annual inspection of the undermining/exposure at Bent 2 by the SM&I Hydraulics. At least until the proposed scour mitigation work is completed.

Monitoring Authority: Caltrans

**Regular Inspection Program of 12 mo.**  w/surveyed cross sections

Items to Watch: undermining/exposure of the footing at Bent 2

**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 (USGS gage no. 11160020)

Flood monitoring required:  Yes  No

Flood monitoring event defined by:

Discharge over Q<sub>100</sub> (6,200cfs)

Stage Q<sub>100</sub> (519')

Elev. measured from (datum provided in the July 1927 as-builts)

Frequency of flood monitoring:  1 hr.  3 hr.  6 hrs.  Other (12 hrs.)

Scour critical elevation: (N/A)

Action required if scour-critical elevation detected: monitor the bridge for signs of settlement; if excessive settlement occurs bridge closure may need to be considered.

## 6. BRIDGE CLOSURE PLAN

**Bridge ADT: 5350**

**Built: 1927**

**% Trucks: 4**

**Bridge Length (ft): 87.9**

### Closure Plan Summary

- Contact ABME, and with their aid follow their procedure for bridge closure

### Scour Monitoring Criteria for Consideration of Bridge Closure:

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Water surface elevation reaches <u>519'</u>    | <input type="checkbox"/> Overtopping road or structure |
| <input type="checkbox"/> Scour Measurement Results / Monitoring Device             | <input type="checkbox"/> Loss of Riprap                |
| <input checked="" type="checkbox"/> Observed amount of Settlement ( <u>≥1/2"</u> ) | <input type="checkbox"/> Loss of Road Embankment       |
| <input type="checkbox"/> Debris Accumulation                                       |  |
| <input type="checkbox"/> Other _____   |  |

### Person / Area Responsible for Closure:

- Steve Price (Deputy District Director): (O) 805-549-3281, (C) 805-748-8421

### Contact People (Name & Phone No.):

- Summer Silveira (ABME): (O) 916-227-8384, (C) 916-798-7184
- Anthony Traina (ABME – Senior): (O) 916-227-8647, (C) 916-798-7182
- Yihwin Huang (SM&I Hydraulics): (O) 916-227-9472
- Kevin Flora (SM&I Hydraulics – Senior): (O) 916-227-8036, (C) 916-799-1423
- Steve Price (Deputy District Director): (O) 805-549-3281, (C) 805-748-8421
- Russell Reed (North Region Manager): (O) 831-783-3003, (C) 805-550-5098
- Tom Barnett (SCr. Area Superintendent): (O) 831-476-1351, (C) 831-601-0034, (P) 831-769-2028

### Responsible for re-opening after inspection:

Kevin Flora (SM&I Hydraulics - Senior) and/or Anthony Traina (ABME – Senior)

## 7. DETOUR ROUTE

**Detour route description** (route number, from - to, etc.) – attach map.

NB: Right onto “Pool Dr.”, Left onto “Old County Hwy.”, Right onto “HWY 9”.

SB: Left onto “Old County Hwy.”, Right onto “Pool Dr.”, Left onto “HWY 9”.

**Average ADT:** unknown

**Year:**

**% Trucks:** unk.

**Length:** 0.3 mi.

### Bridges on Detour Route:

Bridge Number	Waterway	Sufficiency Rating/ Load limitations	Scour 113 code
N/A (could be culvert)	Kings Creek	N/A	N/A

EWOOD RD

San Lorenzo River

Redwood Grove

36 0054 KINGS CREEK

Kings Creek

Kings Creek

Kings Creek

Kings C