

**Meeting of the Central Valley Flood Protection Board  
April 27, 2012**

**Staff Report – Encroachment Permit  
Reclamation District 1001  
Emergency Levee Repair, Sutter County**

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**1.0 – ITEM**

Consider approval of Permit No. 18735 (Attachment B)

**2.0 – APPLICANT**

Reclamation District 1001

**3.0 – LOCATION**

The project is located at approximately LM1.6 on the right (north) bank levee of the Natomas Cross Canal. (Natomas Cross Canal, Sutter County, see Attachment A)

**4.0 – DESCRIPTION**

Applicant proposes to perform emergency repair to the landside slope of existing levee; including degrading and reconstruction to portions of the existing levee for approximately 330-linear-feet; construction of a new stability berm along approximately 470-linear-feet of the existing levee toe & construction of a new access ramp.

**5.0 – PROJECT ANALYSIS**

The proposed project to perform an emergency repair as described above has been completed. The work was done under a Letter of Authorization from the Central Valley Flood Protection Board dated August 24, 2011 and signed by Jay Punia (Attachment C).

## **5.1 – Hydraulic Analysis**

The project as designed does not require a hydraulic analysis.

## **5.2 – Geotechnical Analysis**

A slope stability analysis was performed.

## **6.0 – AGENCY COMMENTS AND ENDORSEMENTS**

The comments and endorsements associated with this project, from all pertinent agencies are shown below:

- Reclamation District 1001 has endorsed this project with no conditions.
- The U.S. Army Corps of Engineers 208.10 comment letter has been received for this application. The USACE District Engineer has no objection to the project, subject to conditions. The letter is incorporated into the permit as Exhibit A.

## **7.0 – CEQA ANALYSIS**

Board staff has prepared the following CEQA determination:

The Board has determined that the project is categorically exempt from CEQA under a Class 1 Categorical Exemption (CEQA Guidelines Section 15301) covering reconstruction and repair of existing structures.

## **8.0 – SECTION 8610.5 CONSIDERATIONS**

1. Evidence that the Board admits into its record from any party, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

The Board will make its decision based on the evidence in the permit application and attachments, this staff report, and any other evidence presented by any individual or group.

2. The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

The accepted industry standards for the work proposed under this permit as regulated by Title 23 have been applied to the review of this permit.

3. Effects of the decision on the entire State Plan of Flood Control:

The placement of the pipe through will have a positive effect on the State Plan of Flood Control because it restores a damaged section of levee to design criteria.

4. Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

Effects to the proposed project from reasonable projected future events will be positive as it improves upon the prior existing levee.

## **9.0 – STAFF RECOMMENDATION**

Staff recommends that the Board adopt the CEQA findings, approve the permit, and direct staff to file a Notice of Exemption with the State Clearinghouse.

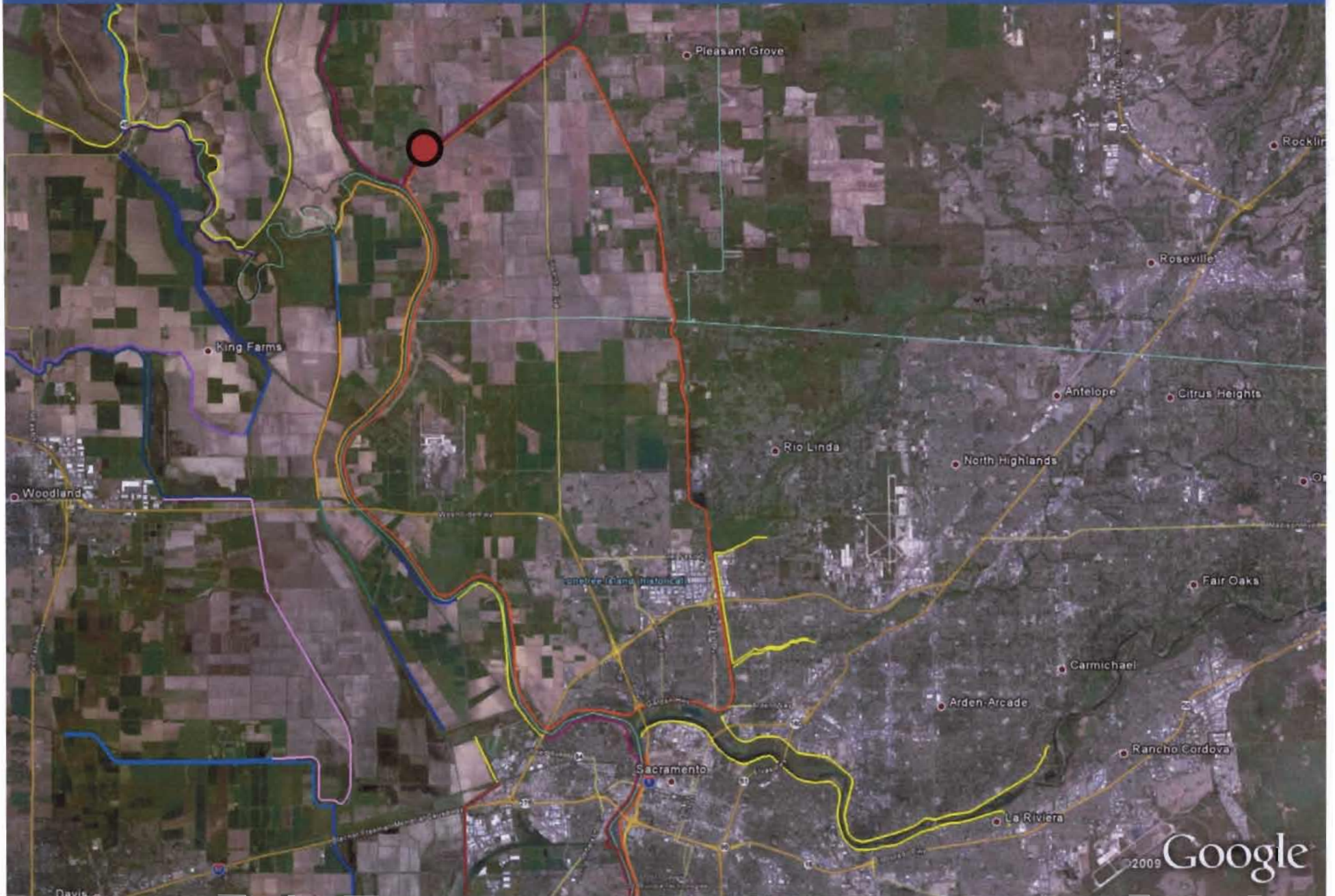
## **10.0 – LIST OF ATTACHMENTS**

- A. Location Maps and photos
- B. Draft Permit No. 18735
- C. Design Drawings
- D. Letter of Authorization

Design Review:	Steve Dawson
Environmental Review:	James Herota / Andrea Mauro
Document Review:	Mitra Emami P. E., Len Marino P. E.

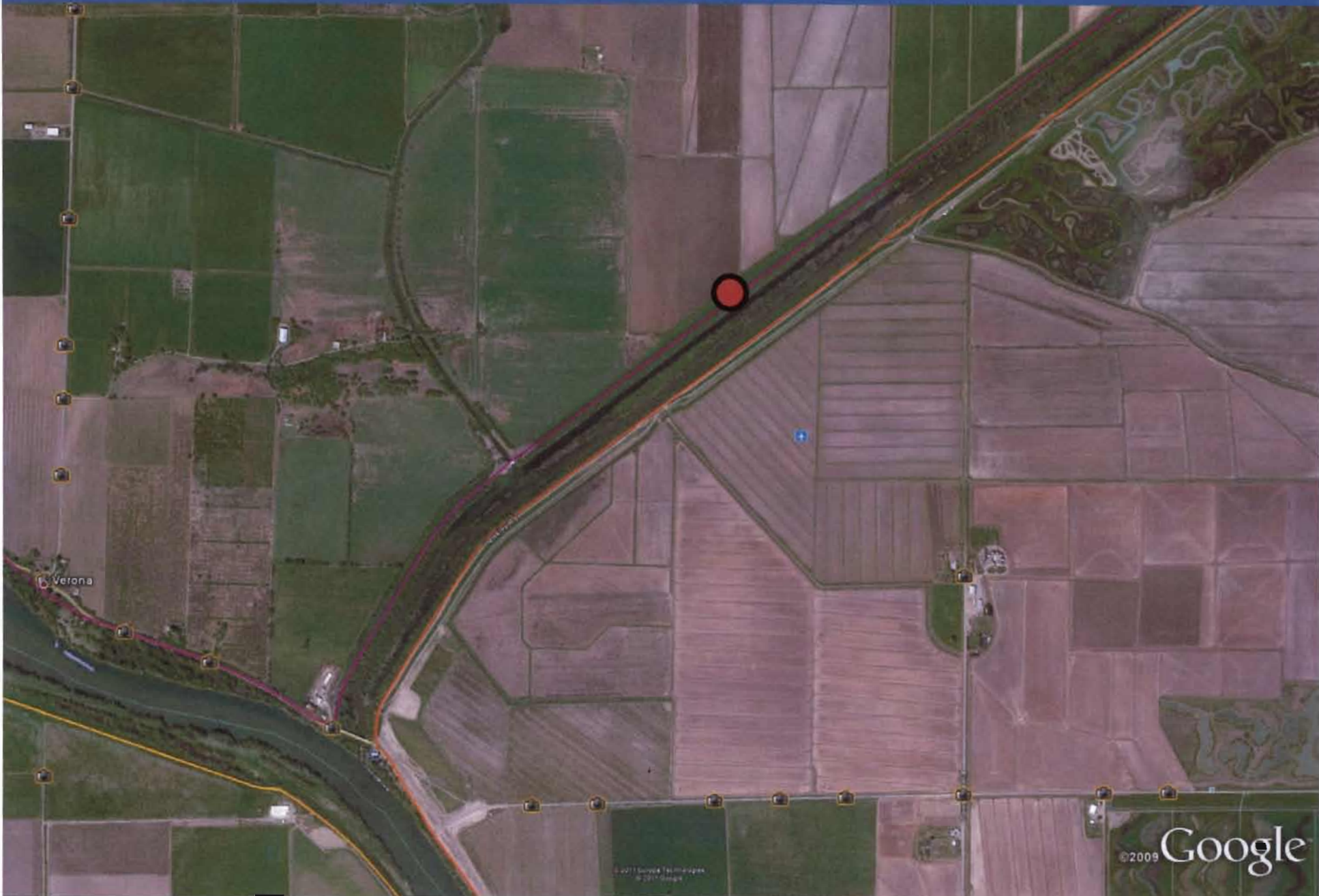
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# Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)



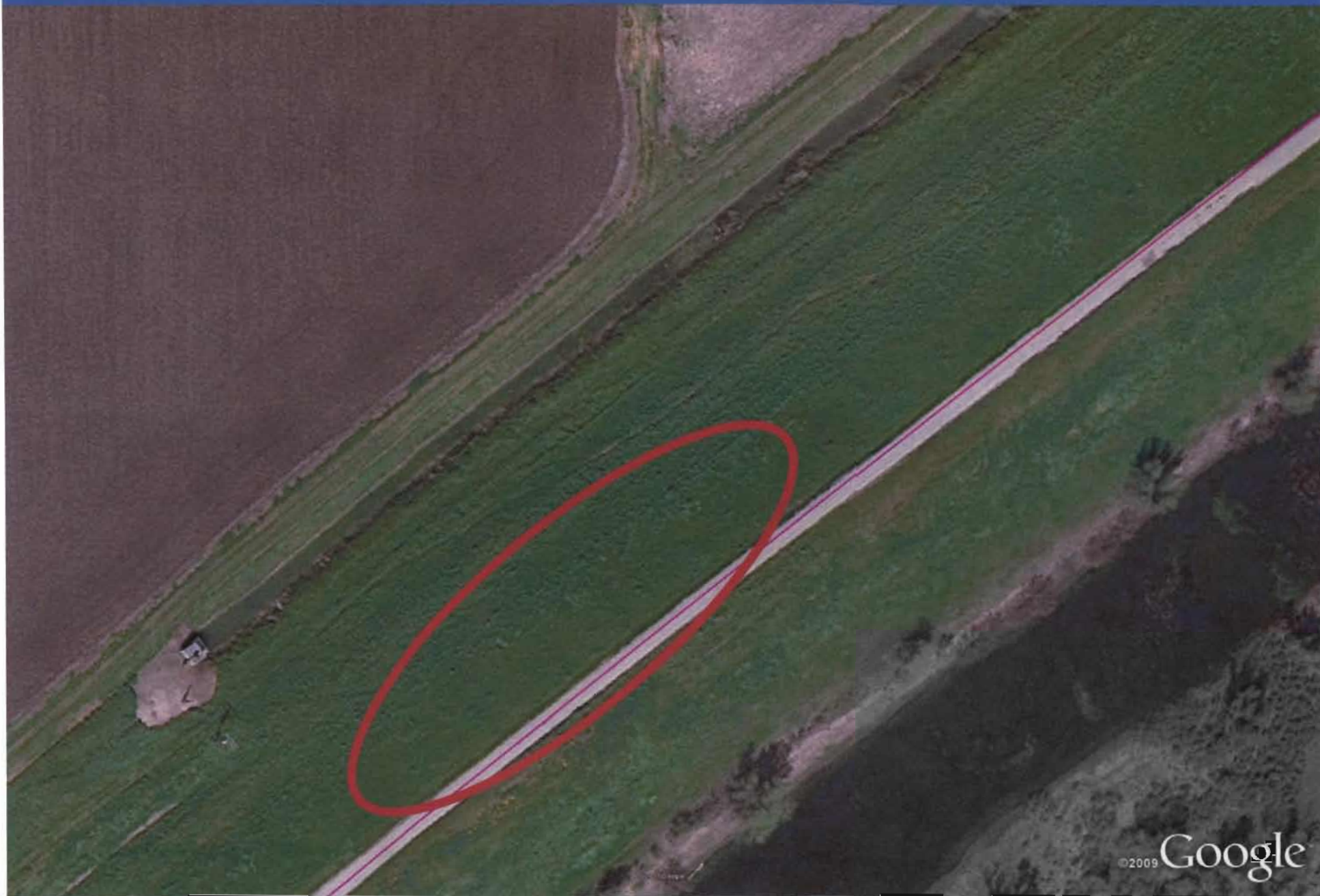


# Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)





Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)





**Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)**  
**View of Upper Slide Scarp through Plastic Cover - Looking East (03-27-11)**





Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)  
View of Upper Slide Scarp Through Cut in Plastic (03-27-11)





**Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)**  
View of Apparent Bulging on Lower Slope - Looking East (03-27-11)



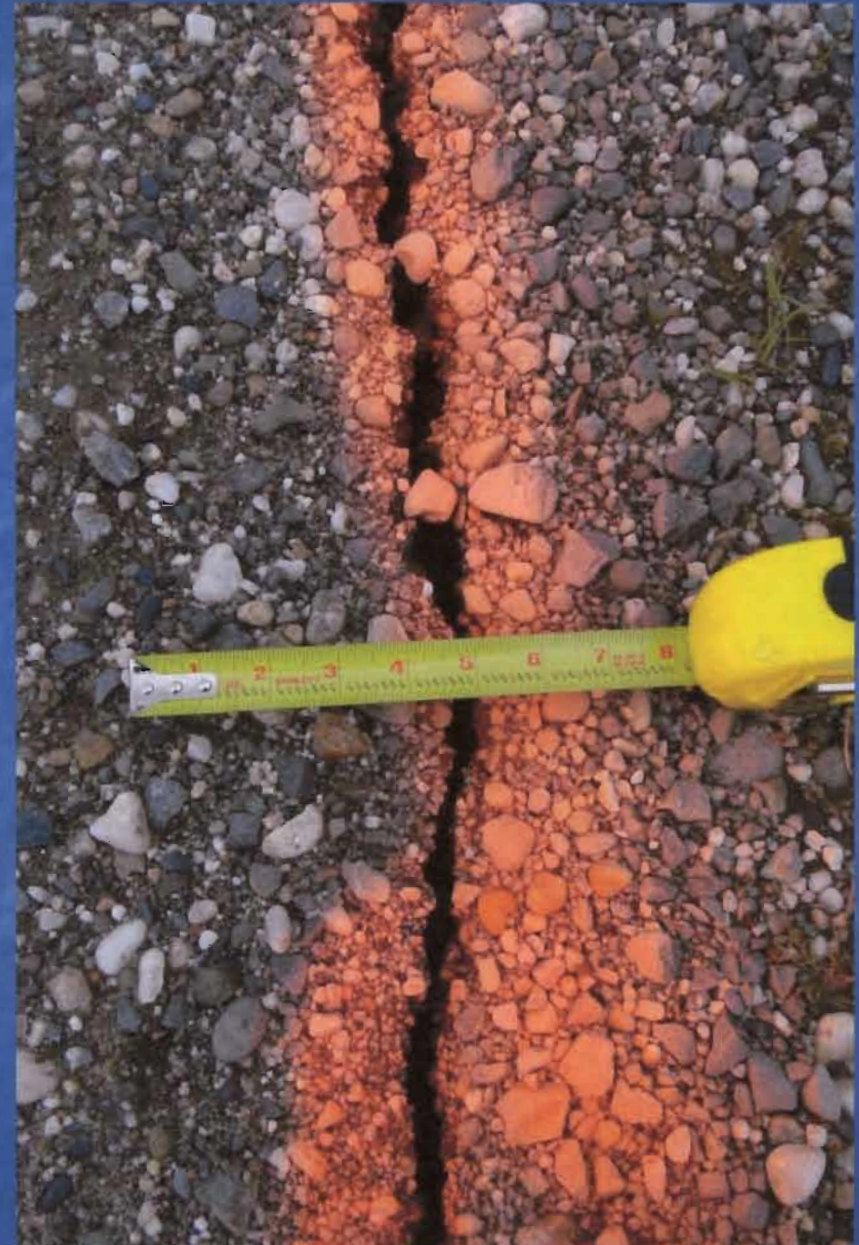


Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)  
View Looking West (03-27-11)





**Landside Slope Cracking/Slumping on North Levee of Natomas Cross Canal (RD 1001)**  
**Progression of Eastern Edge of Cracking on Levee Crown - March 26 and March 27 - Looking West (03-27-11)**



**DRAFT**

STATE OF CALIFORNIA  
THE RESOURCES AGENCY  
**THE CENTRAL VALLEY FLOOD PROTECTION BOARD**

**PERMIT NO. 18735 BD**

**This Permit is issued to:**

Reclamation District 1001  
1959 Cornelius Avenue  
Rio Oso, California 95674

To authorize the emergency repair to the landside slope of existing levee. To degrade and reconstruct portions of the existing levee for approximately 330-linear-feet; construct a new stability berm along approximately 470 linear-feet of existing levee toe and construct a new access ramp. Natomas Cross Canal (North) bank, Unit 5, Levee Mile 1.5 (Section 13, T11N, R3E, MDB&M, Reclamation District 1001, Natomas Cross Canal, Sutter County).

**NOTE:** Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

**(SEAL)**

Dated: \_\_\_\_\_

\_\_\_\_\_  
Executive Officer

**GENERAL CONDITIONS:**

**ONE:** This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

**TWO:** Only work described in the subject application is authorized hereby.

**THREE:** This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

**FOUR:** The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

**FIVE:** Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

**SIX:** This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

**SEVEN:** It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

**EIGHT:** This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

**NINE:** The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

**TEN:** The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

**ELEVEN:** The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

**TWELVE:** Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

#### **SPECIAL CONDITIONS FOR PERMIT NO. 18735 BD**

**THIRTEEN:** Upon receipt of this document it is to become attached to the Authorization Request to Perform Emergency Maintenance Repair dated 24 August, 2011 and signed by Len Marino, Chief Engineer of the Central Valley Flood Protection Board on 24 August, 2011.

**FOURTEEN:** All addendums or other changes made to the submitted documents by the permittee after issuance of this permit are subject to submittal and review for approval by the Central Valley Flood Protection Board prior to incorporation into the permitted project. Upon review and approval of any new submitted documents the permit shall be revised, if needed, prior to construction related to the proposed changes. The Central Valley Flood Protection Board shall have up to 5 days after receipt of any documents, plans, drawings, and specifications for the review process. The Central Valley Flood Protection Board and/or the Department of Water Resources may extend this review period by written notification.

**FIFTEEN:** Within three years from completion of the construction of the work authorized under this permit, the permittee shall provide the Sacramento and San Joaquin Drainage District, acting by and through the Central Valley Flood Protection Board of the State of California, a permanent easement and/or a joint use agreement granting all flood control rights upon, over and across the property that is or will be occupied by the existing and to-be-reconstructed levee including the area of the stability berm. The easement must include the area within 10 feet waterward of the waterward levee toe, the existing levee and to-be-reconstructed levee and stability berm and 10 feet landward from the landward levee and stability berm toes not presently encumbered by a Central Valley Flood Protection Board easement. For information regarding existing Central Valley Flood Protection Board Easements, please contact Angelica Aguilar at (916) 653-5782.

**SIXTEEN:** All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood



Protection Board.

SEVENTEEN: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

EIGHTEEN: A civil engineer registered in the State of California representing the permittee shall provide periodic reports and records to the Department of Water Resources that are acceptable to the Central Valley Flood Protection Board which certifies that all work accomplished by contract to the permittee was thoroughly inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

NINETEEN: The Central Valley Flood Protection Board and Department of Water Resources shall not be held liable for any damages to the permitted encroachment(s) resulting from flood fight, operation, maintenance, inspection, or emergency repair.

TWENTY: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

TWENTY-ONE: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

TWENTY-TWO: The permittee shall be responsible for repair of any damages to the project levee and other flood control facilities due to construction, operation, or maintenance of the proposed project.

TWENTY-THREE: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

TWENTY-FOUR: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

TWENTY-FIVE: If the project, or any portion thereof, is to be abandoned in the future, the permittee

or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

TWENTY-SIX: The permittee shall provide supervision and inspection services acceptable to the Central Valley Flood Protection Board. A professional engineer registered in the State of California shall certify that all work was inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

TWENTY-SEVEN: The stability of the levee shall be maintained at all times during construction.

TWENTY-EIGHT: Excavations below the design flood plane and within the levee section or within 10 feet of the projected waterward and landward levee slopes shall have side slopes no steeper than 1 horizontal to 1 vertical. Flatter slopes may be required to ensure stability of the excavation.

TWENTY-NINE: Imported material shall be used when developing the stability berm and access ramp, and no cuts shall remain in the levee section upon completion.

THIRTY: Fill material shall be placed only within the area indicated on the approved plans.

THIRTY-ONE: The fill surface area shall be graded to direct drainage away from the toe of the levee, stability berm and access ramp.

THIRTY-TWO: The proposed access ramp shall be graded to direct all surface drainage away from the levee section.

THIRTY-THREE: Prior to placement of fill against the levee slope and within 10 feet of the levee toe, all surface vegetation shall be removed to a depth of 6 inches. Organic soil and roots larger than 1-1/2 inches in diameter shall be removed to a depth of 3 feet.

THIRTY-FOUR: Fill on the levee slope shall be keyed into the existing levee section with each lift.

THIRTY-FIVE: The levee crown patrol road and access ramp shall be surfaced with a minimum of 4 inches of compacted, Class 2, aggregate base (Caltrans Specification 26-1.02A).

THIRTY-SIX: Aggregate base material shall be compacted to a relative compaction of not less than 95 percent per ASTM Method D1557-91, with a moisture content sufficient to obtain the required compaction.

THIRTY-SEVEN: Density tests by a certified materials laboratory will be required to verify compaction of backfill within the foundation area, levee section, stability berm and access ramp.

THIRTY-EIGHT: Any excavations made in the levee section or within 10 feet of the levee toes shall be backfilled, along with all imported fill, in 4- to 6-inch layers with impervious material with 20 percent or more passing the No. 200 sieve, a plasticity index of 8 or more, and a liquid limit of less than 55 (so long as the average of the last ten tests is below 50) and free of lumps or stones exceeding 3 inches in greatest dimension, vegetative matter, or other unsatisfactory material. Backfill material shall be compacted in 4- to 6-inch layers to a minimum of 97 percent relative compaction as measured by ASTM Method D698.

THIRTY-NINE: The levee section and project site shall be restored to at least the condition that existed prior to commencement of work.

FORTY: The permittee shall replant or reseed the levee slopes to restore sod, grass, or other non-woody ground covers if damaged during project work.

FORTY-ONE: During construction of the project, any and all anticipated or unanticipated conditions encountered which may impact levee integrity or flood control shall be brought to the attention of the Flood Project Inspector immediately and prior to continuation. Any encountered abandoned encroachments shall be completely removed or properly abandoned under the direction of the Department of Water Resources Inspector.

FORTY-TWO: All debris generated by this project shall be disposed of outside the floodway and off the levee section and stability berm.

FORTY-THREE: Within 120 days of completion of the project, the permittee shall submit to the Central Valley Flood Protection Board proposed revisions to the Corps of Engineers, Supplement to Standard Operation and Maintenance Manual, Sacramento River Flood Control Project, UNIT NO. 142 and associated "as-built" drawings for system alterations approved by this permit that are to be incorporated into the federal Sacramento River Flood Control Project.

FORTY-FOUR: Within 120 days of completion of the project, the permittee shall submit to the Central Valley Flood Protection Board a certification report, stamped and signed by a professional engineer registered in the State of California, certifying the work was performed and inspected in accordance with the Central Valley Flood Protection Board permit conditions and submitted drawings and specifications.

FORTY-FIVE: If FEMA certification of the levee by the Corps of Engineers is being considered, the project proponent should contact the U. S. Army Corps of Engineers regarding inspection of this project during construction for FEMA certification purposes.

FORTY-SIX: The permittee shall contact the U. S. Army Corps of Engineers regarding inspection of the project during construction as the proposed work is an alteration to the existing Federal Flood Control Project that will be incorporated into the Lower San Joaquin River Flood Control Project, an adopted plan of flood control.

FORTY-SEVEN: By acceptance of this permit, the permittee acknowledges the authority of the Central Valley Flood Protection Board to regulate all future encroachments along this levee reach including those that may encroach upon alterations approved by this permit prior to incorporation into the federal Lower San Joaquin River Flood Control Project by the Corps of Engineers.

FORTY-EIGHT: All temporary fencing, gates and signs shall be removed upon completion of the project.

FORTY-NINE: All fencing, gates and signs removed during construction of this project shall be replaced in kind and at the original locations. If it is necessary to relocate any fence, gate or sign, the permittee is required to obtain written approval from the Central Valley Flood Protection Board prior to



installation at a new location.

FIFTY: The permittee acknowledges that some portions of the levee improvements may be overbuilt to account for settlement and that upon adoption of the updated Central Valley Flood Protection Plan the permittee shall perform a levee crown profile survey of all levee crown covered by this permit and said profile shall be compared to the levee crown profile adopted in the updated Central Valley Flood Protection Plan . The permittee shall ensure that the reconstructed levee crown does not exceed the updated Central Valley Flood Protection Plan profile.

FIFTY-ONE: The permittee shall comply with all conditions set forth in the letter from the Department of the Army dated April 17, 2012, which is attached to this permit as Exhibit A and is incorporated by reference.

FIFTY-TWO: Upon completion of the project, the permittee shall submit as-built drawings to: Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite 256, Sacramento, California 95821.



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Sacramento  
Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Flood Protection and Navigation Section (18735)

APR 17 2012

Mr. Jay Punia, Executive Officer  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Room 151  
Sacramento, California 95821

Dear Mr. Punia:

We have reviewed a permit application by Reclamation District 1001 (application number 18735). The project includes authorizing an emergency repair of the landside slope of the right bank levee of the Natomas Cross Canal. Work consists of degrading and reconstructing 330 linear feet of existing levee, constructing 470 linear feet of stability berm, and constructing a new access ramp on the landside levee slope. The project is located north of Sacramento on the Natomas Cross Canal, between 38.7960°N 121.5883°W and 38.7982°N 121.5846°W NAD83, in Sutter County, California.

The District Engineer has no objection to approval of this application by your Board from a flood control standpoint, subject to the following conditions:

- a. That the project work area shall be restored to at least the existing lines and grade.
- b. That maintenance access shall be established along the outer berm toe. This access shall remain free of obstructions for floodfighting and maintenance.

Based upon the information provided, no Section 10 or Section 404 permit is needed.

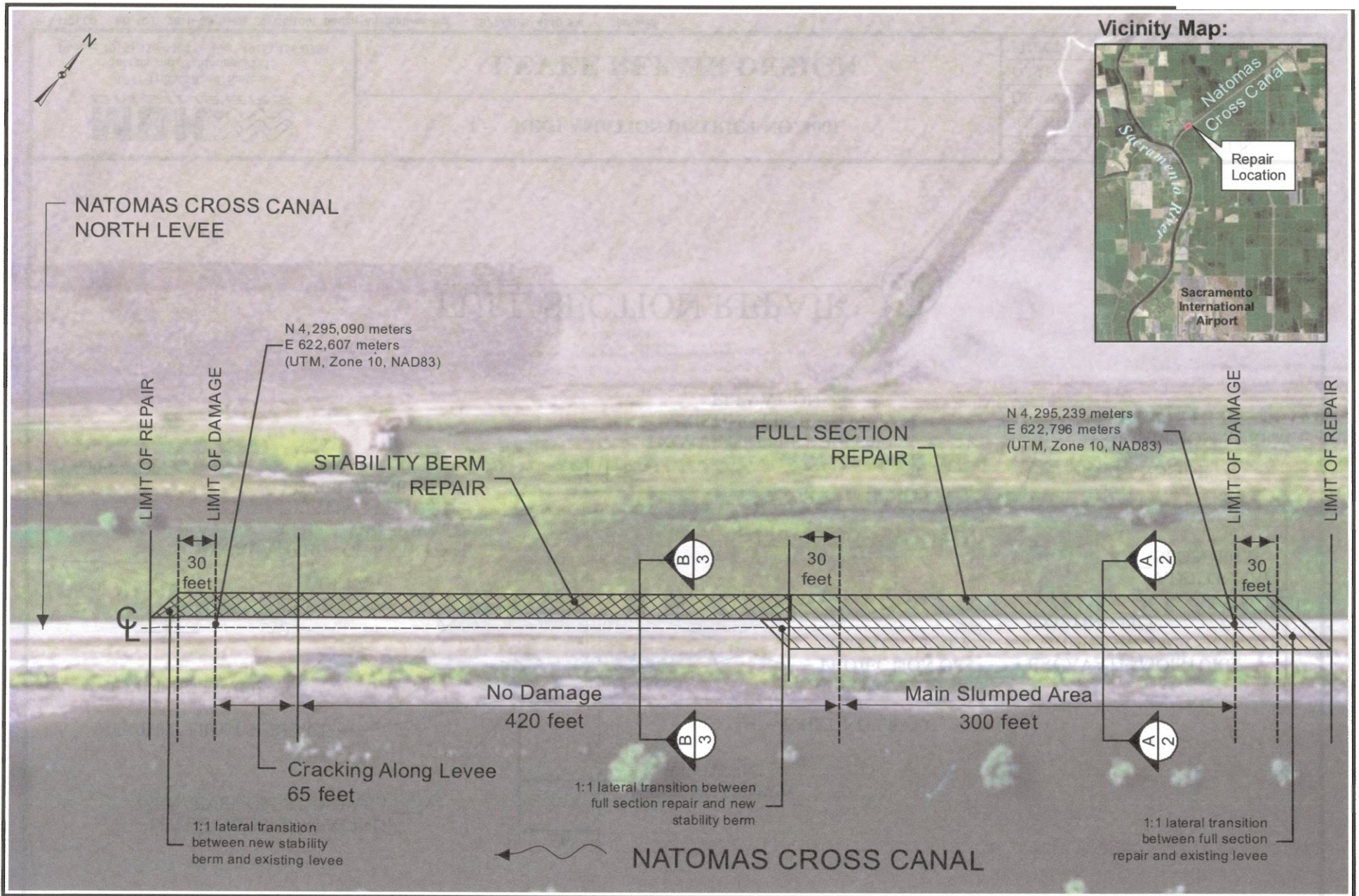
A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite LL30, Sacramento, CA, 95821.

Sincerely,

A handwritten signature in black ink that reads "Rick L. Poeppelman".

Rick L. Poeppelman, P.E.  
Chief, Engineering Division

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1771 Tribute Road, Suite A  
 Sacramento, CA 95815  
 Phone: 916-456-4400 - Fax: 916-456-0253

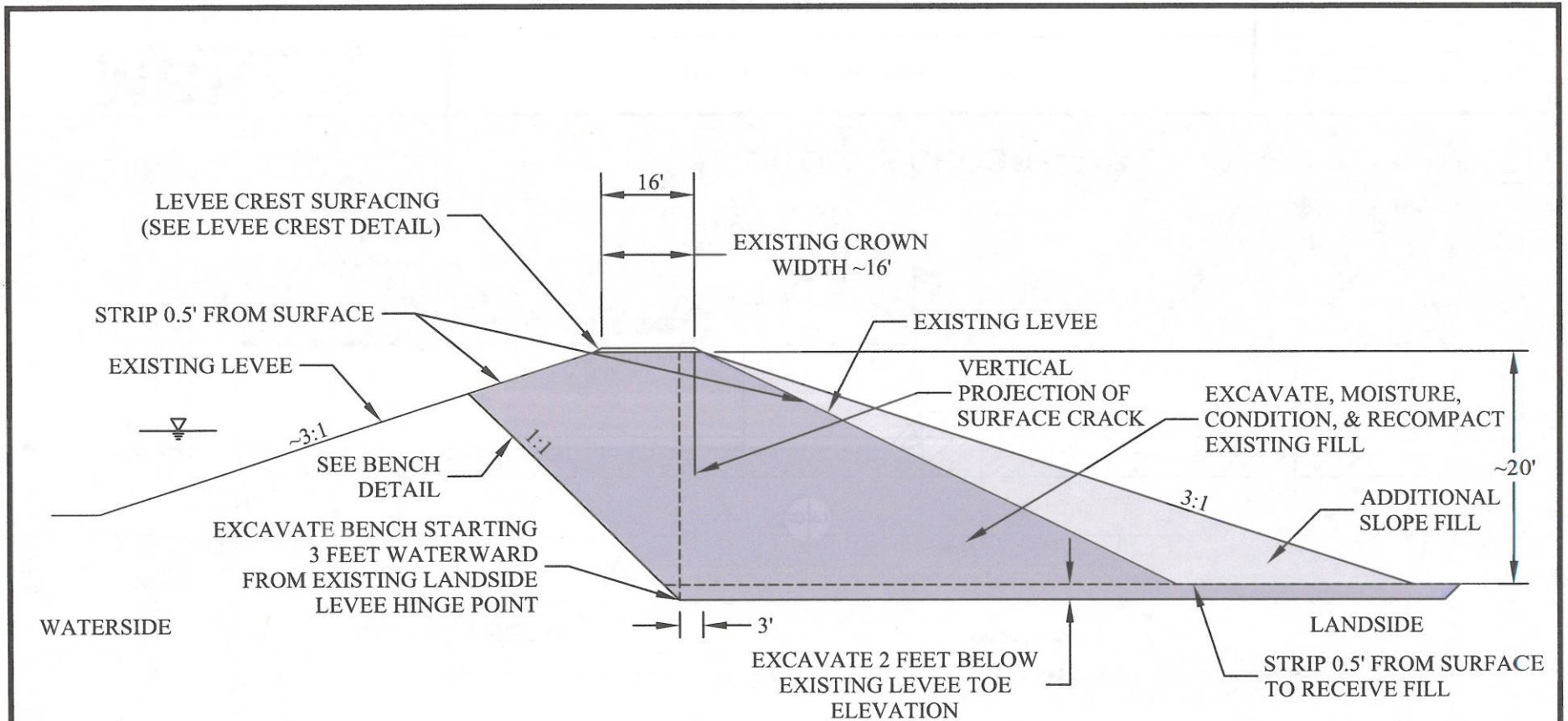
RECLAMATION DISTRICT NO. 1001

**LEVEE REPAIR DESIGN**

SCALE:	1" = 100'
JOB NUMBER:	4172
DRAWN BY:	PM
DATE:	08/26/2011
SHEET:	1 OF 5

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**FULL SECTION REPAIR** (A)



1771 Tribute Road, Suite A  
 Sacramento, California 95815  
 Phone: (916) 456-4400 • Fax: (916) 456-0253

RECLAMATION DISTRICT NO. 1001

**LEVEE REPAIR DESIGN**

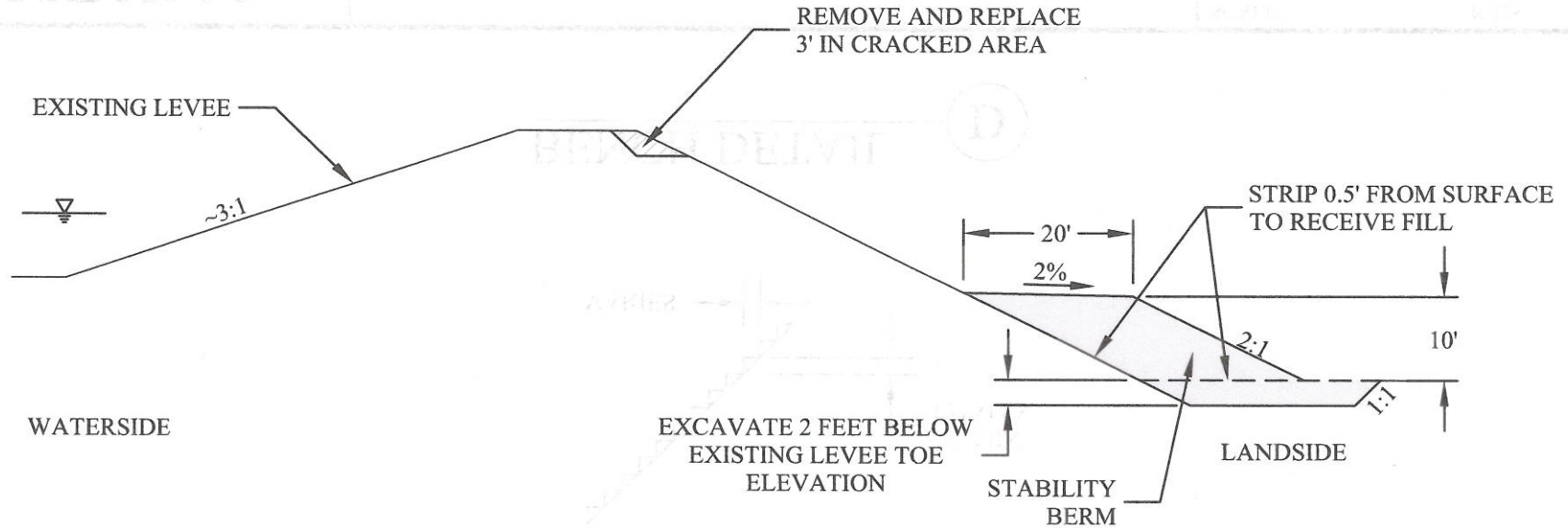
SCALE:	N.T.S.
JOB NUMBER:	--
DRAWN BY:	BJ
DATE:	08/23/2011
SHEET:	2 OF 5



# LEVEE REPAIR DESIGN

RECLAMATION DISTRICT NO. 1001

PROJECT:	1001-2
DATE:	08/23/2011
DRAWN BY:	BJ
DATE:	
SHEET:	3 OF 5



## STABILITY BERM REPAIR

B



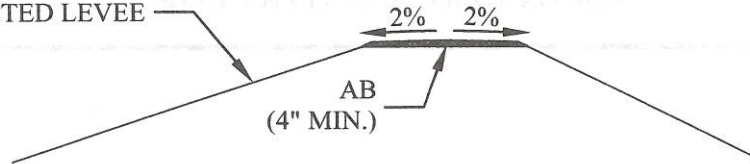
1771 Tribute Road, Suite A  
Sacramento, California 95815  
Phone: (916) 456-4400 • Fax: (916) 456-0253

RECLAMATION DISTRICT NO. 1001

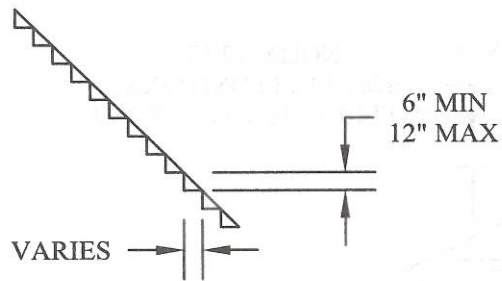
## LEVEE REPAIR DESIGN

SCALE:	N.T.S.
JOB NUMBER:	--
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DATE:	08/23/2011
SHEET:	3 OF 5

RECONSTRUCTED LEVEL



### LEVEE CREST DETAIL C



### BENCH DETAIL D

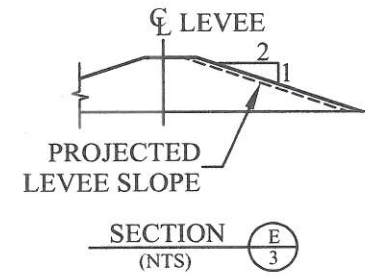
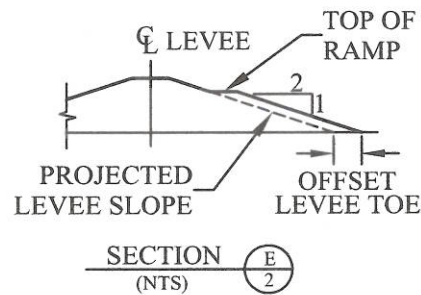
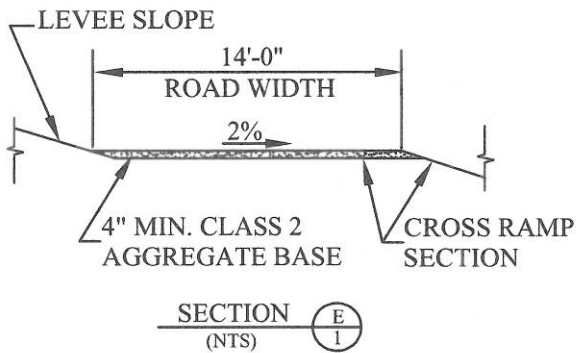
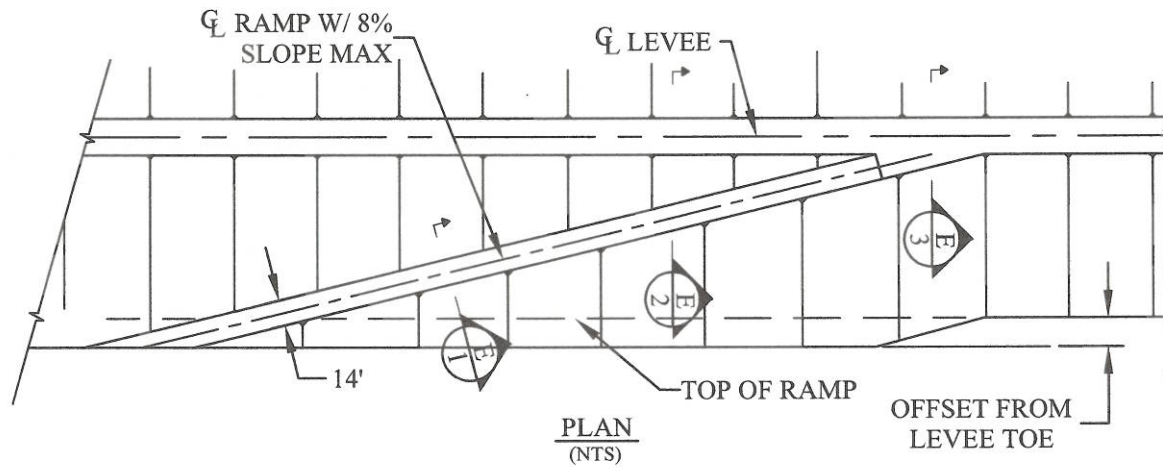


1771 Tribute Road, Suite A  
Sacramento, California 95815  
Phone: (916) 456-4400 • Fax: (916) 456-0253

RECLAMATION DISTRICT NO. 1001

**LEVEE REPAIR DESIGN**

SCALE:	N.T.S.
JOB NUMBER:	--
DRAWN BY:	BJ
DATE:	08/23/2011
SHEET:	4 OF 5



LEVEE CROSS-SECTION  
(TYPICAL)

NOTE  
SEE PLAN VIEW FOR RAMP LOCATIONS.

**MBK**  
ENGINEERS

1771 Tribute Road, Suite A  
Sacramento, California 95815  
Phone: (916) 456-4400 • Fax: (916) 456-0253

RECLAMATION DISTRICT NO. 1001

**LEVEE REPAIR DESIGN**

SCALE:	N.T.S.
JOB NUMBER:	--
DRAWN BY:	BJ
DATE:	08/23/2011
SHEET:	5 OF 5



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24 August 2011

### **Authorization Request to Perform Emergency Maintenance Repair**

Project: Landside Slope Stability Critical Repair  
Reclamation District 1001  
Natomas Cross Canal, North Levee, Levee Mile 1.5

Following up on our meeting on 23 August 2011 regarding this project this is a request to authorize emergency maintenance repair work under emergency provisions. As discussed this project is a critical repair and must be repaired before this year storm season. An application for encroachment permit will be submitted within thirty days of the construction start date.

#### Scope of Work

The scope of this project is to repair approximately 850 feet (including transitions) of unstable levee embankment located in Reclamation District 1001 along the Natomas Cross Canal (North), Unit 5, Levee Mile 1.5. The purpose of this repair is to restore the RD 1001 levee to a stable condition. The proposed levee repair consists of three primary components: 1) a main slip section consisting of about 300 lineal feet of an active vertical and rotational slump with longitudinal surficial cracking, 2) a secondary surficial cracking section (about 170 feet in length) located about 300 feet west of the main slip area, and 3) a 300 foot section of levee located between the main and secondary slip areas. The detailed scope of work is described below; also enclosed are plan and typical cross sections showing limits of the project and the nature of the repair.

#### Main Slip Section

Along the main slip section it is recommended the levee be repaired by excavating the section from the waterside slope on a 1h:1v slope to an elevation at least 2 feet below the landside toe and removing the excavated material for approximately 300 lineal feet of levee. The excavation will also be sloped 1h:1v at the ends of the excavated areas. Prior to excavation, the existing crown surfacing will be removed and stockpiled for reuse. After sufficient excavation of the damaged levee section, the foundation will be scarified and compacted to promote uniform cohesion between the foundation and embankment materials. The embankment will be reconstructed to the pre-project crown width and elevation (plus 0.3 ft to account for settlement) with 3h:1v waterside and landside slopes. Embankment soils will be placed in horizontal lifts not to exceed 6 inches and compacted. Excavated material is anticipated to be re-used for levee embankment reconstruction after being moisture conditioned and tested to meet specifications. Construction specifications will follow California Title 23 requirements for benching into the existing levee embankment, acceptable import materials, moisture conditioning, and relative compaction.

### Secondary Cracking Section and Center Section

For the secondary cracking section (about 170 feet) the repair will consist of removing and replacing the top three feet of cracked embankment. For both secondary cracking section and the center section a 10 foot high and 20 foot wide un-drained stability berm will be constructed for about 470 feet. A keyway at least 3 feet deep and 20 feet wide will be excavated into the foundation layer at the base of the stability berm.

### Access Ramp, Crown Surface, and Disturbed Areas

A permanent access ramp will be constructed from the levee crown to the stability berm and landside foundation to provide operation and maintenance access to the repair area. The crown surface and access ramp will be surfaced with a 6 inch thick aggregate base. The aggregate base will consist of either new Caltrans Class 2 aggregate base or stockpiled material from the crown excavation. Hydroseeding with native grass species will be required on all other disturbed construction areas.

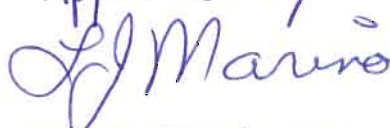
### Other

The project may include additional work as necessary to avoid environmental impacts and may also require the implementation of mitigation measures as specified in regulatory consultation and permits. A geotechnical engineer or certified engineering geologist will monitor the excavation operations and provide recommendations for additional excavations based on conditions encountered.

Respectfully,



Hamid Bonakdar, Chief  
Flood System Sustainability Branch  
916.574.1243

Approved by  
 8/24/11  
Chief Engineer  
Central Valley Flood Protection Board





**Vicinity Map:**



NATOMAS CROSS CANAL  
NORTH LEVEE

N 4,295,090 meters  
E 622,607 meters  
(UTM, Zone 10, NAD83)

N 4,295,239 meters  
E 622,796 meters  
(UTM, Zone 10, NAD83)

LIMIT OF REPAIR  
LIMIT OF DAMAGE

LIMIT OF DAMAGE  
LIMIT OF REPAIR

STABILITY BERM  
REPAIR

FULL SECTION  
REPAIR

30  
feet

30  
feet

30  
feet

GC

A 3

A 2

A 3

A 2

No Damage  
420 feet

Main Slumped Area  
300 feet

Cracking Along Levee  
65 feet

NATOMAS CROSS CANAL

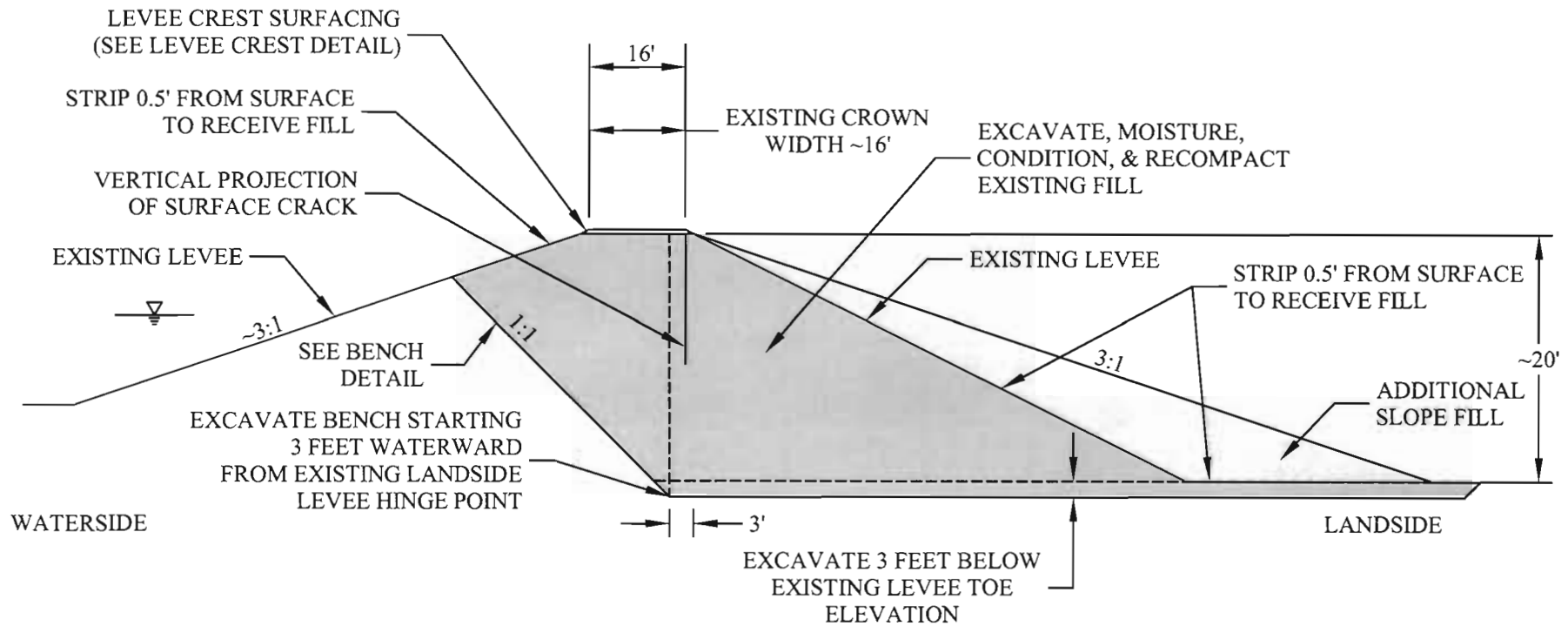


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RECLAMATION DISTRICT NO. 1001

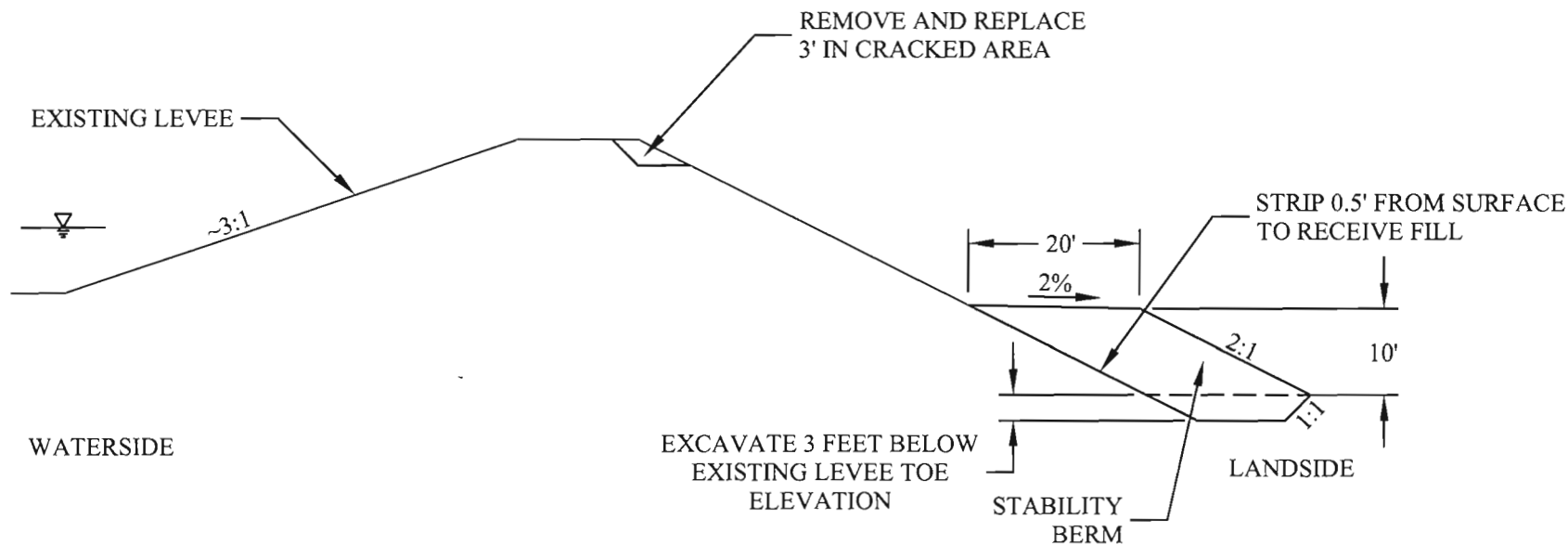
**LEVEE REPAIR DESIGN**

SCALE:	1" = 100'
JOB NUMBER:	4172
DRAWN BY:	PM
DATE:	08/23/2011
SHEET:	1 OF 3



**FULL SECTION REPAIR** A

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	<p><b>LEVEE REPAIR DESIGN</b></p>	<p>JOB NUMBER: --</p>
		<p>DRAWN BY: BJ</p>
		<p>DATE: 08/23/2011</p>
		<p>SHEET: 2 OF 3</p>



## STABILITY BERM REPAIR (B)



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RECLAMATION DISTRICT NO. 1001

**LEVEE REPAIR DESIGN**

SCALE:	N.T.S.
JOB NUMBER:	--
DRAWN BY:	BJ
DATE:	08/23/2011
SHEET:	3 OF 3