

American River Watershed, California Common Features Project Natomas Basin Interim General Reevaluation Report

COL William J. Leady
Commander, Sacramento District

Civil Works Review Board
27 September 2010



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US Army Corps of Engineers
BUILDING STRONG®



Presentation Outline

- Purpose of the CWRB
- Project Delivery Process
 - ▶ PDT Members
 - ▶ PDT Meetings
- Overview of Study and Recommended Plan
 - ▶ Project Background
 - ▶ Study Authority
 - ▶ Study Area Description
 - ▶ Plan Formulation
 - ▶ Recommended Plan
- Agency Technical Review
- Independent External Peer Review
- Environmental Operating Principles
- Environmental Compliance
- USACE Strategic Campaign Plan
- Public Involvement
- Project Implementation
- Policy Compliance
- Summary
- Recommendation



Purpose of Briefing



- Provide the CWRB with an overview of the Natomas Project
- Answer questions and address comments
- Obtain CWRB approval for State and Agency Review
- Discuss the next steps in the approval process toward a Chief's Report



Project Delivery Team Members

- Project Management
- Planning
 - ▶ Plan Formulation
 - ▶ Environmental
 - ▶ Economics
- Engineering
 - ▶ Technical Leads
 - ▶ Hydraulics
 - ▶ Hydrology
 - ▶ Geotechnical
 - ▶ Cost Engineering
 - ▶ Value Engineering
- Office of Counsel
- PAO
- Operations/Regulatory
- Real Estate
- ATR Team
- Sponsors
 - ▶ SAFCA
 - ▶ CVFPB
 - ▶ California DWR
- Resource Agencies
 - ▶ U.S. Fish and Wildlife Service
 - ▶ National Marine Fisheries Service
 - ▶ California Department of Fish and Game
 - ▶ EPA Region 9
 - ▶ Sacramento Metropolitan Air Management District

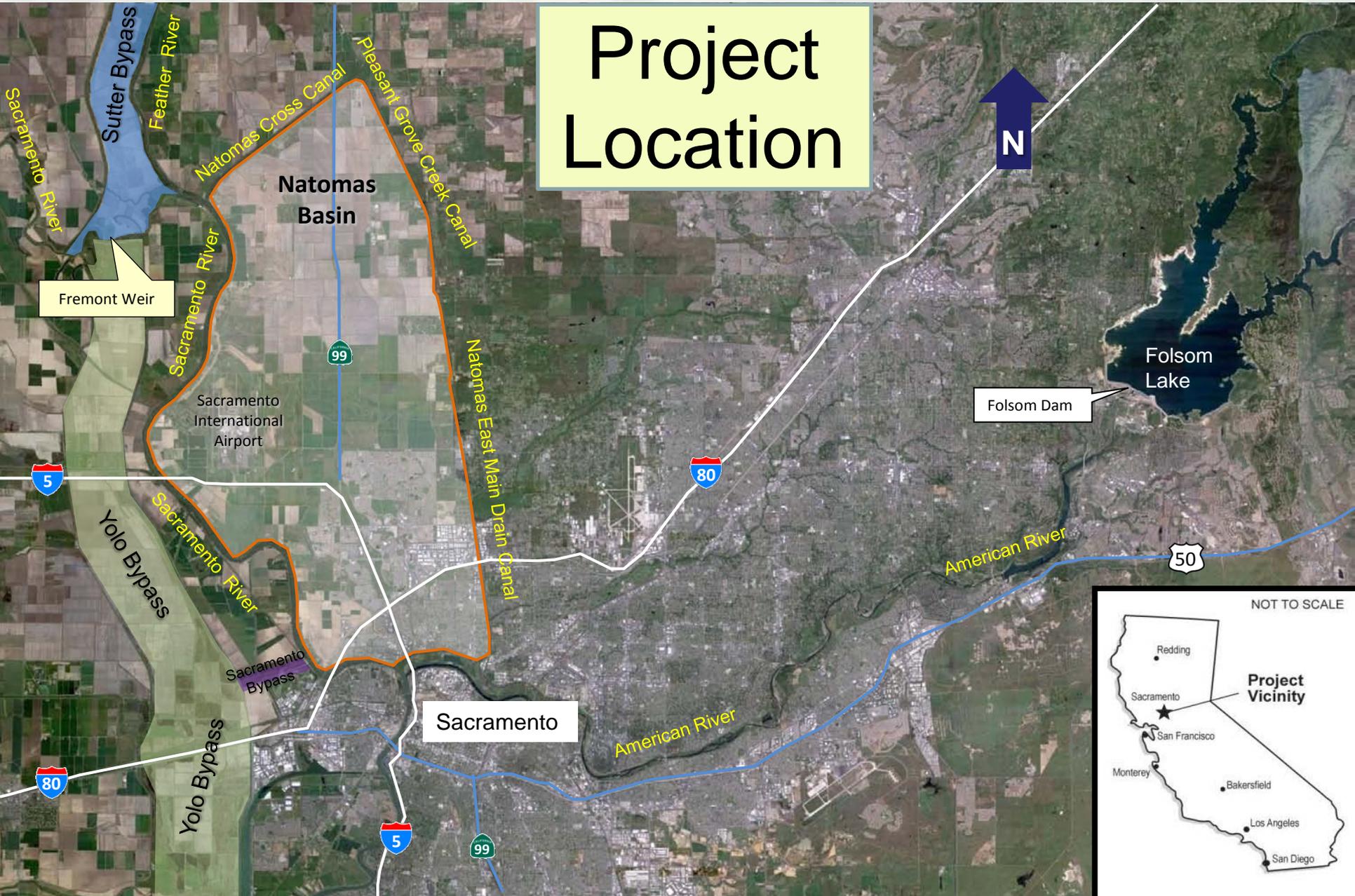


PDT Meetings

- Regularly scheduled meetings
 - ▶ Bi-monthly meetings of PDT and contractors
 - ▶ Bi-monthly meetings with Sponsors
 - ▶ Weekly coordination meeting with Geotechnical, Hydraulics, and Economics on Risk Analysis
 - ▶ Bi-weekly In-Progress Review meetings with vertical team
 - ▶ Monthly geotechnical subcommittee meetings with Corps, DWR, SAFCA, and local experts
- Meetings to discuss issues as they arose



Project Location



Sacramento

Folsom Dam

Folsom Lake

Fremont Weir



Study Area Description

- Existing system consists of 42 miles of levee
- Population at risk in the Natomas Basin is 80,000
- Area within levees is 55,000 acres
- 23,000 structures valued at \$8.5 billion
 - ▶ Commercial
 - ▶ Industrial
 - ▶ Residential
 - ▶ Public
- Mix of urban and agricultural use
- Sacramento International Airport
- Two interstate highways, I-80 and I-5, and State Highway 99
- Endangered and protected species
- Hydrologic unit



Project Background

- The Natomas levees were originally constructed from 1911 to 1913 to reclaim land for agriculture
- Sacramento River Flood Control Project was authorized in 1917.
- Natomas levees were brought into the Federal system of flood protection in 1917
- 1986 - Record Flood: The February 1986 storm dumps 10 inches of rain on Sacramento in 11 days
- 1997 - Record Flood: The fifth record flood in 46 years occurs. Unprecedented flows from rain and snowmelt surge into the Feather and the San Joaquin rivers. Sacramento is spared when levees upstream fail



Authority

Section 101 of WRDA 1996

SEC. 101. Project Authorization

(a) PROJECTS WITH CHIEF'S REPORTS. Except as provided in this subsection, the following projects for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plans, and subject to the conditions, described in the respective reports designated in this subsection:

(1) American River Watershed, California.

(A) IN GENERAL. The project for flood damage reduction, American and Sacramento Rivers, California: Report of the Chief of Engineers, dated June 27, 1996, at a total cost of \$56,900,000, with an estimated Federal cost of \$42,675,000 and an estimated non-Federal cost of \$14,225,000, consisting of

(i) approximately 24 miles of slurry wall in the levees along the lower American River;

(ii) approximately 12 miles of levee modifications along the east bank of the Sacramento River downstream from the Natomas Cross Canal.



Authority (cont.)

Section 366 in WRDA 1999

(a) IN GENERAL. The project for flood damage reduction, American and Sacramento Rivers, California, authorized by section 101(a)(1) of the Water Resources Development Act of 1996 (110 Stat. 3662-3663), is modified to direct the Secretary to include the following improvements as part of the overall project:

(3) Modifying the south levee of the Natomas Cross Canal for a distance of 5 miles to ensure that the south levee is consistent with the level of protection provided by the authorized levee along the east bank of the Sacramento River.

(4) Modifying the north levee of the Natomas Cross Canal for a distance of 5 miles to ensure that the height of the levee is equivalent to the height of the south levee as authorized by paragraph (3).



Post-Authorization Timeline

WRDA 1996 –
Authorized levee
improvements
features common
to all alternative
evaluated in the
1996
Supplemental
Information Report



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1997 floods
provide evidence
that levee
problems are
worse than first
thought. Levee
repairs soon to be
made under
Common Features
authority need to
be more extensive
than authorized.



Post-Authorization Timeline

WRDA 1996 – Authorized levee improvements features common to all alternative evaluated in the 1996 Supplemental Information Report

1997 floods provide evidence that levee problems are worse than first thought. Levee repairs soon to be made under Common Features authority need to be more extensive than authorized.

October 2007 – Work begins on a Common Features GRR with a goal of authorization in a WRDA 2010. This study will reevaluate all of the levees protecting Sacramento.



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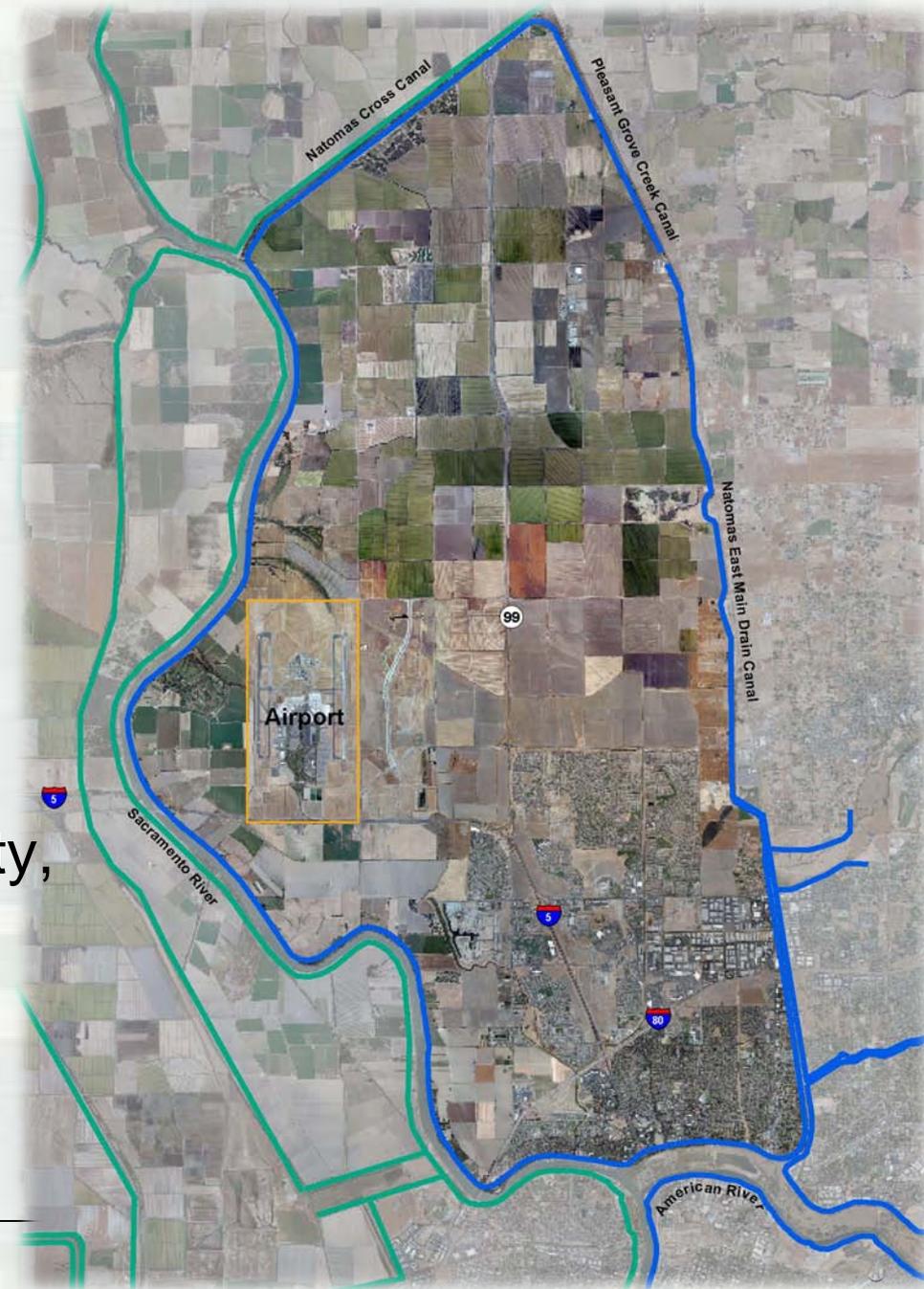
June 2009 – District determines that a complete GRR covering all of Sacramento cannot be complete for a potential WRDA 2010. Work on the GRR is scaled back to Natomas only.

August 2010 – Natomas Post-Authorization Change Report/Interim GRR is completed.

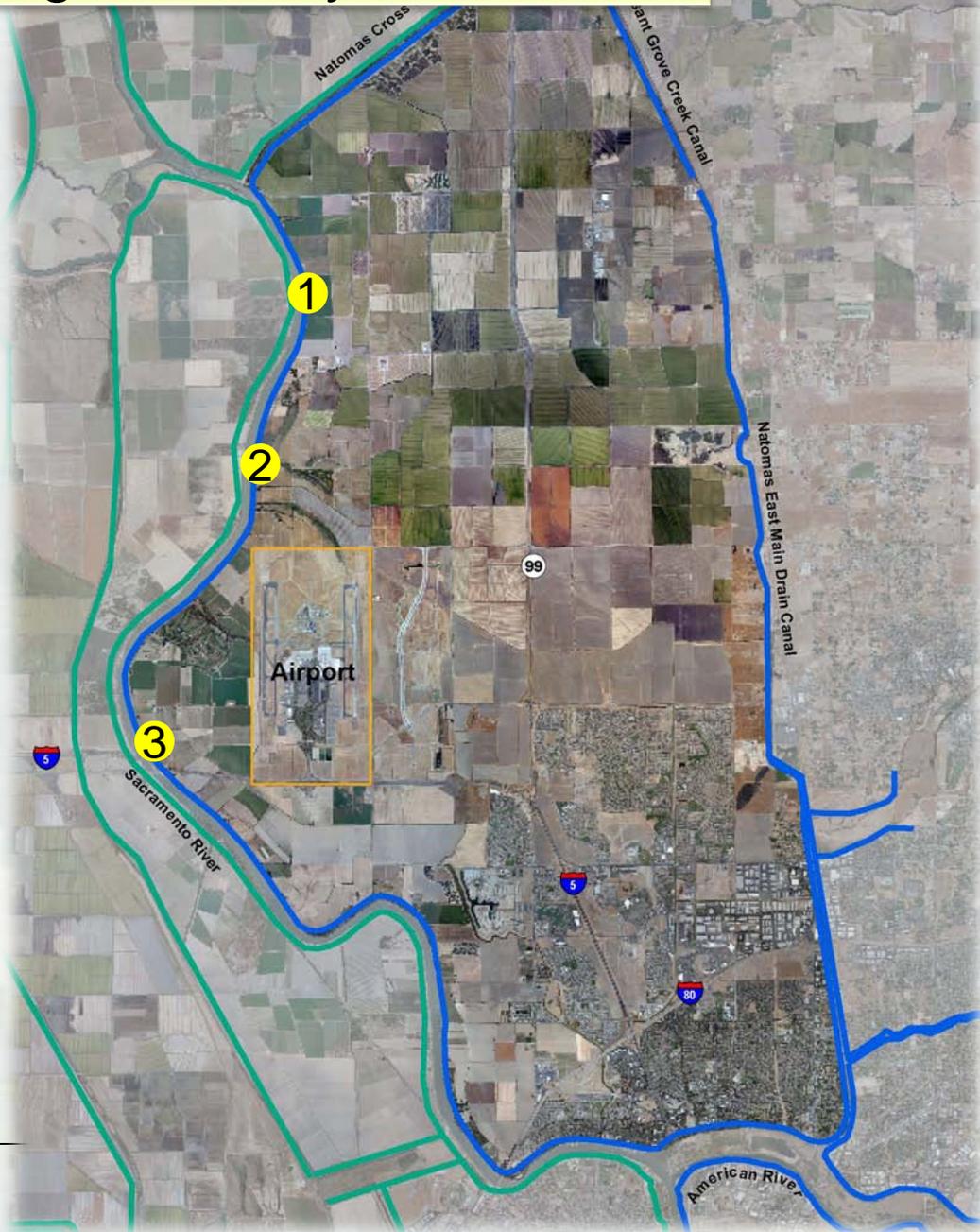


Problems

- Levee Performance Issues
 - Through-seepage
 - Underseepage
 - Levee Erosion
 - Levee Stability
 - Levee Overtopping
 - Vegetation and Encroachments
- Risk to Lives, Health & Safety, & Flood Damages
 - Floodplains
 - Flood Damages
 - Health and Safety



Seepage, Stability, and Erosion

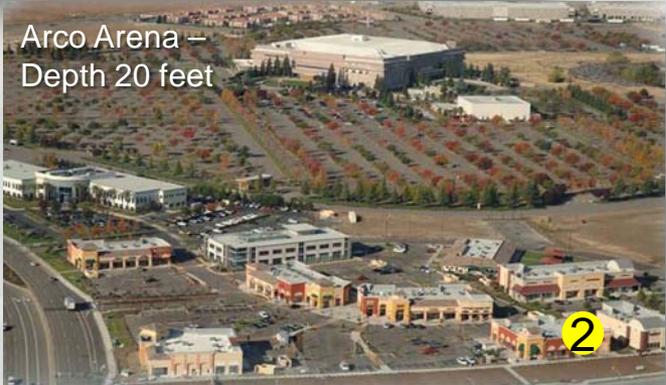




Airport –
Depth 15 feet

Floodplains

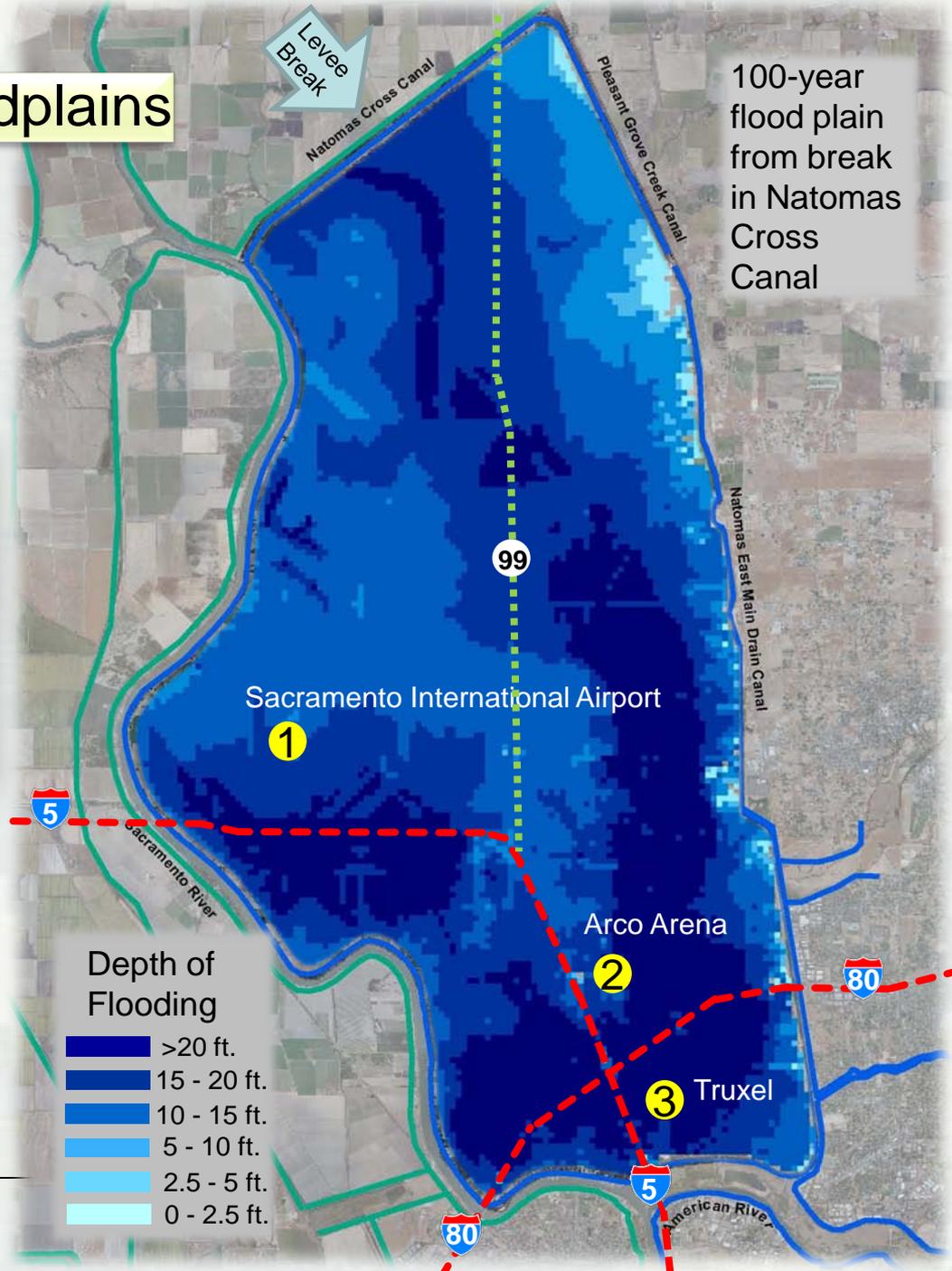
100-year
flood plain
from break
in Natomas
Cross
Canal



Arco Arena –
Depth 20 feet



Truxel –
Depth 25 feet



Urbanization and Vegetation



Urbanization

1



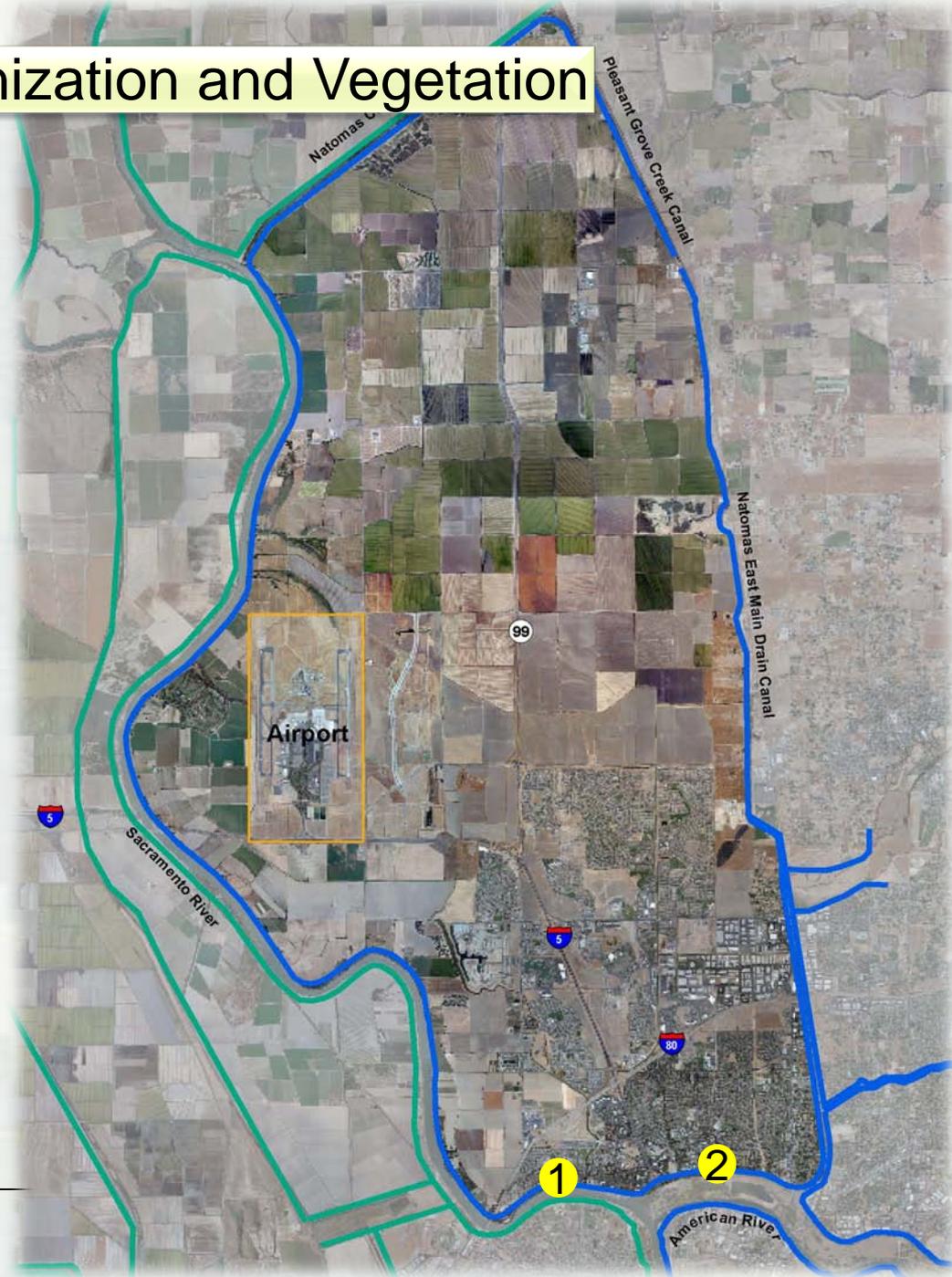
Urbanization

2



Waterside Vegetation

2



Evacuation Times

Reach	Minimum Time until Urban Evacuation Routes are Impassible
Sacramento River just above Confluence with American River	1 hour
Sacramento River	1.5 days
Natomas Cross Canal	1.5 days
Upper Natomas East Side Levees	1.5 - 2 days
Lower Natomas East Main Drainage Canal	2 hours
American River North Levee	30 minutes



Future Without-Project Condition

- Levee performance continues to decline.
- Vegetation on levees continues to pose challenges to improving levee performance. Removal would be done in accordance with a life cycle approach.
- For the purpose of this report, the levee improvement work accomplished by SAFCA does not exist.



Study Assumptions

- Why an interim document?
 - ▶ Better understanding of the risk in Natomas and need for immediate action
 - ▶ Measures in this study are effective, efficient, useful in improving levee performance
 - ▶ Measures retained neither promote nor constrain future plan formulation in the follow-on GRR



Study Assumptions (continued)

- Hydraulic model built with NGVD 29
- Datum conversion to NAVD 88 in progress
- Seepage and stability concerns are not affected by datum conversion issues
- Interim GRR does not address overtopping problems



Plan Formulation Strategy

- Natomas Basin is surrounded by a levee system
- System is only as good as its weakest link
- Lives and property are at significant risk due to estimates of performance of the existing system
- Solution must be a system improvement
- All reaches must be improved to provide a complete alternative



Plan Formulation Strategy

- To understand the system, problem identification was done by reach
- To address the performance issues, measures were evaluated by reach
- Measures were analyzed to identify the most efficient engineering fixes for each reach



Plan Formulation Strategy

- Reaches are dependent; effective risk management requires inclusion of all reaches
- Most efficient measures for each reach were combined to form system-wide alternatives
- Doing so enables differentiation of outputs for effectiveness and efficiency by reach
- Reduce need of evacuation and reduce potential for loss of life



Measures Eliminated from Consideration (for the interim GRR)

- Upstream storage
- Yolo Bypass improvements
- Widening the Sacramento Bypass
- Transitory storage
- Cross-Natomas levee
- New setback levee



Measures Considered

- Underseepage and through-seepage measures
 - ▶ Seepage berms
 - ▶ Relief wells
 - ▶ Seepage cutoff walls
- Erosion
 - ▶ Rock riprap
 - ▶ Cobble slope/existing vegetation
 - ▶ Instream woody material

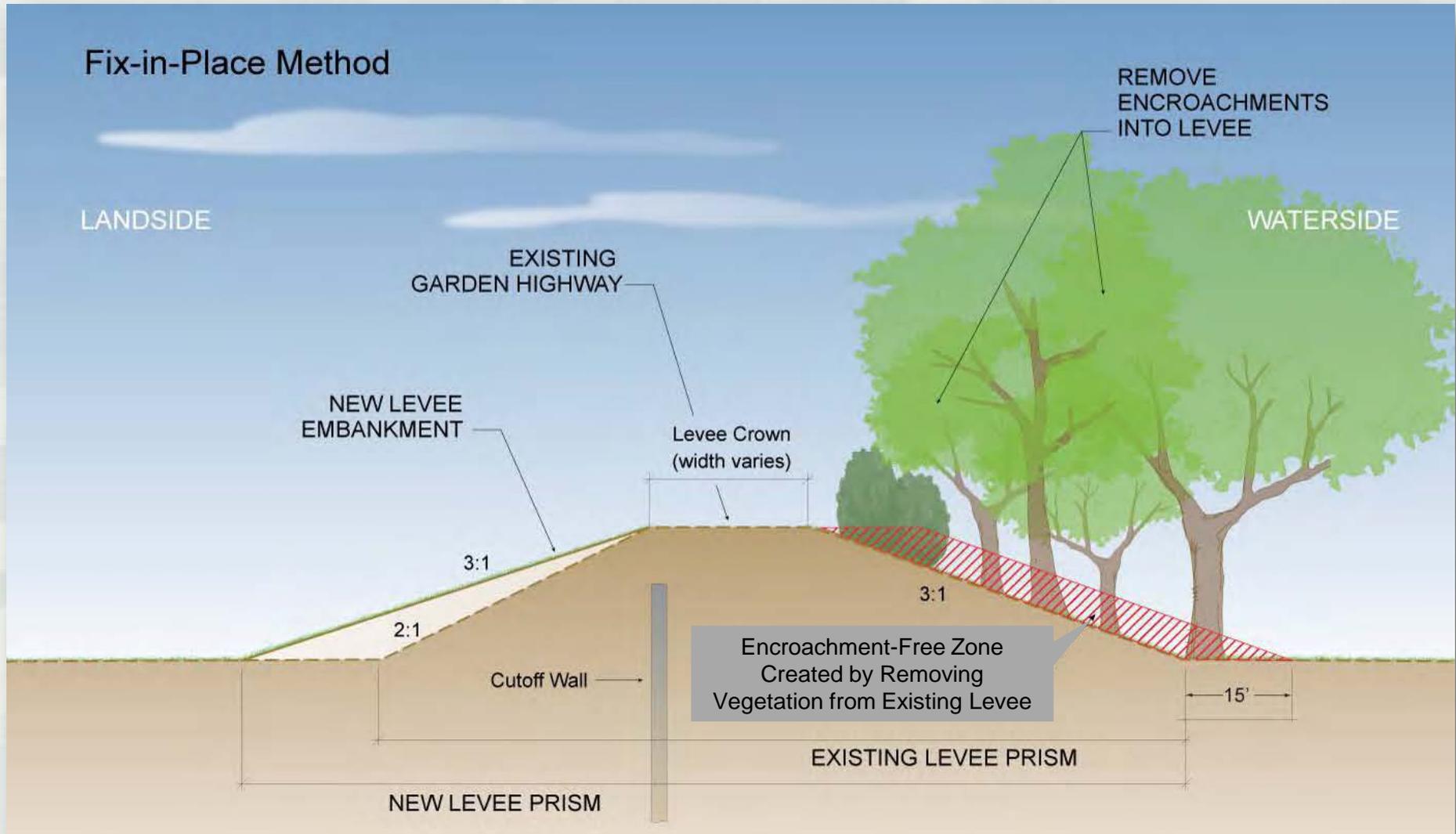


Measures Considered

- Stability
 - ▶ Adjacent levee
 - ▶ Fix slopes in place
- Vegetation and encroachments
 - ▶ Removal
 - ▶ Adjacent levee (with variance to ETL)
- Non-Structural measures
 - ▶ Zoning and building codes
 - ▶ Communication of Flood Risk
 - ▶ Response plans



Fix In-Place Measure



Adjacent Levee Measure

Adjacent Levee Method

LANDSIDE

WATERSIDE

EXISTING
GARDEN HIGHWAY

ADJACENT
LEVEE

15' Expanded
Crown Width

3:1

2:1

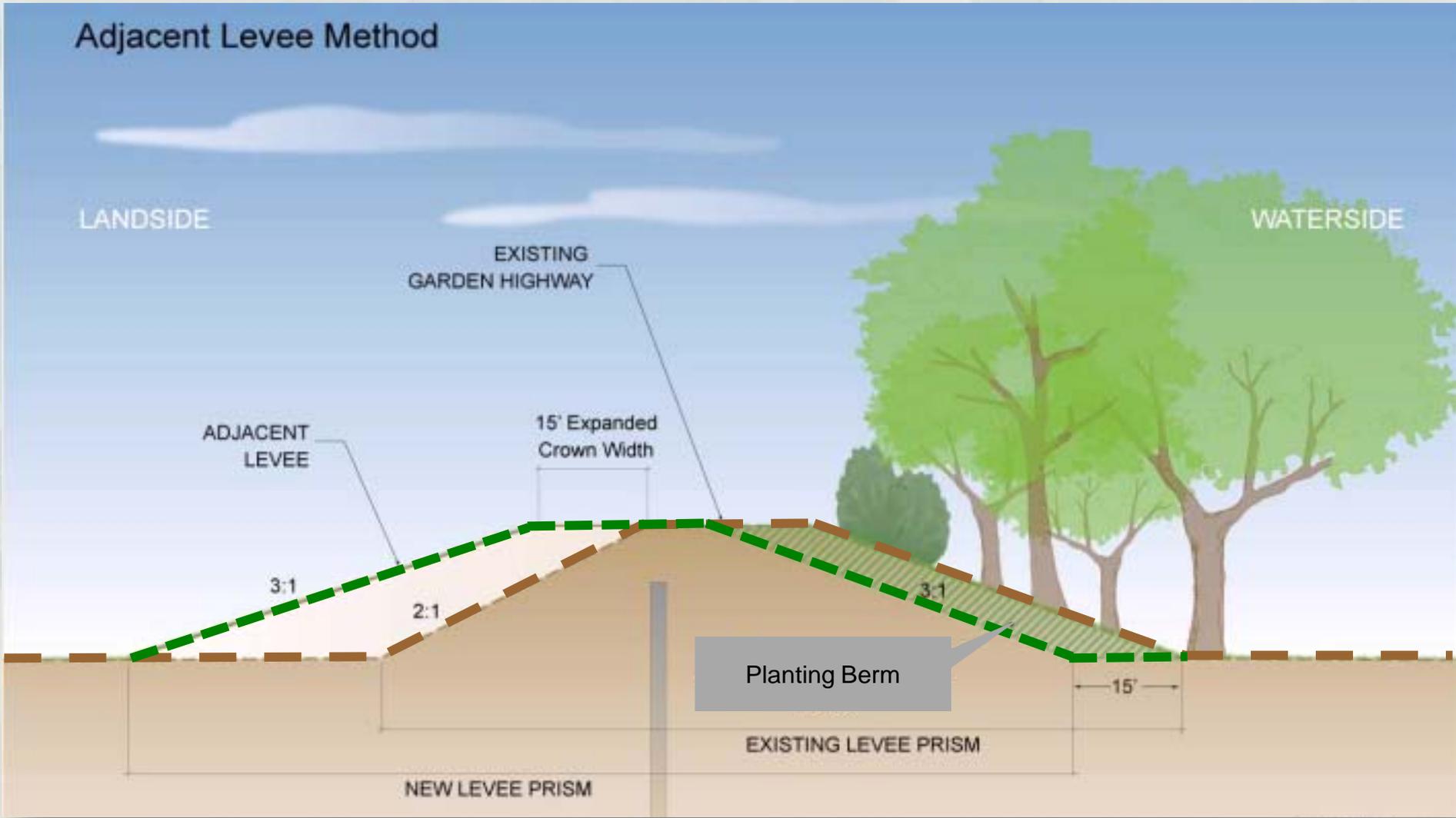
3:1

Planting Berm

15'

EXISTING LEVEE PRISM

NEW LEVEE PRISM



Alternatives Considered

- Plan 1 - No Action
- Plan 2 - Authorized Project
 - ▶ 12 miles levee work along Sacramento River
 - ▶ 5 miles of levee work along Natomas Cross Canal



Alternatives Considered

- Plan 3 - Fix In-Place Plan
 - ▶ Levees stabilized in place at all locations
 - ▶ Vegetation removed from waterside levee slopes
 - ▶ Seepage measures
 - ▶ Erosion measures
- Plan 4 - Adjacent Levee Plan
 - ▶ Levees stabilized with adjacent levee along the Sacramento River
 - ▶ Fix in place at other locations
 - ▶ Seepage measures
 - ▶ Erosion measures



Vegetation Variance

(applies to Adjacent Levee Plan)

- CVFPB and SAFCA applied for variance for adjacent levee plan in April 2010
- Corps' Levee Safety Officer at the Directorate of Civil Works at HQUSACE approved a vegetation variance request for this interim GRR in June 2010
- Variance approved for 25.6 miles of levee; not approved for 0.4 mile



Plan Evaluation and Comparison Strategy

- Engineering and economic analyses of alternatives
- Economic analysis by reach, with reaches considered to be dependent
- Criteria were reduction of flood risk, associated loss of life and damages
- Reduction of flood risk associated with levee performance



Plan Evaluation and Comparison

- No-Action and Authorized Plan are incomplete in that they do not reduce flood damages to basin
- Fix In-Place and Adjacent Levee plans
 - ▶ The plans have the same increase in project performance and economic benefits
 - ▶ Adjacent Levee plan more environmentally sustainable
 - ▶ Adjacent Levee plan costs less



Recommended Plan

- Adjacent Levee Plan
 - ▶ Adjacent levee where practical
 - 18 miles along the Sacramento River
 - ▶ Fix In-Place where more appropriate
 - 24 miles on remainder of perimeter
 - ▶ Entire 42 mile perimeter
 - ▶ Seepage cutoff walls or seepage berms
 - ▶ Erosion protection where necessary
 - ▶ Environmental mitigation features
 - ▶ Interim NED Plan



Recommended Plan

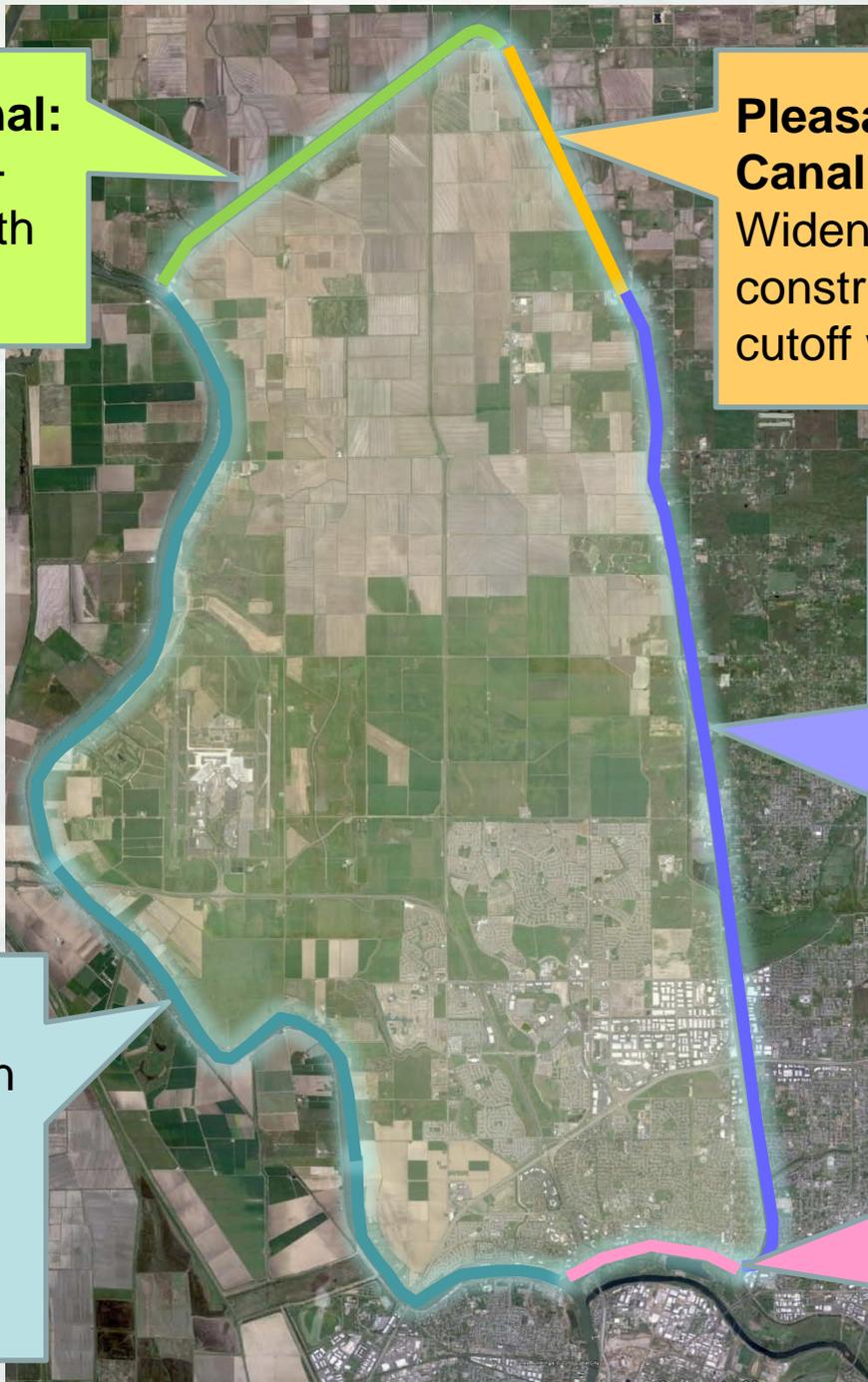
- Cost \$1.1B; Benefit to Cost Ratio 6.5 to 1
- Due to study constraints, approach does not address full problem
- The Recommended Plan is an interim decision
- Broader GRR underway to address residual risk
- Sponsors implementing additional measures to address residual risk



Plan Accomplishments

- Reduction in risk
 - ▶ From 1 in 3 chance of failure to 1 in 67 in any given year
- Reduction in Expected Annual Damages
 - ▶ From \$462M to \$19M
- Environmental
 - ▶ Minimizes effects to endangered species through avoidance
 - ▶ Provides opportunity for on-site mitigation





Natomas Cross Canal:
Widen levee by fix in-place construction with seepage cutoff wall

Pleasant Grove Creek Canal:
Widen levee by fix in-place construction with seepage cutoff wall

Natomas East Main Drainage Canal:
Widen levee by fix in-place construction with seepage cutoff wall

American River
Widen levee by fix in-place construction with seepage cutoff wall

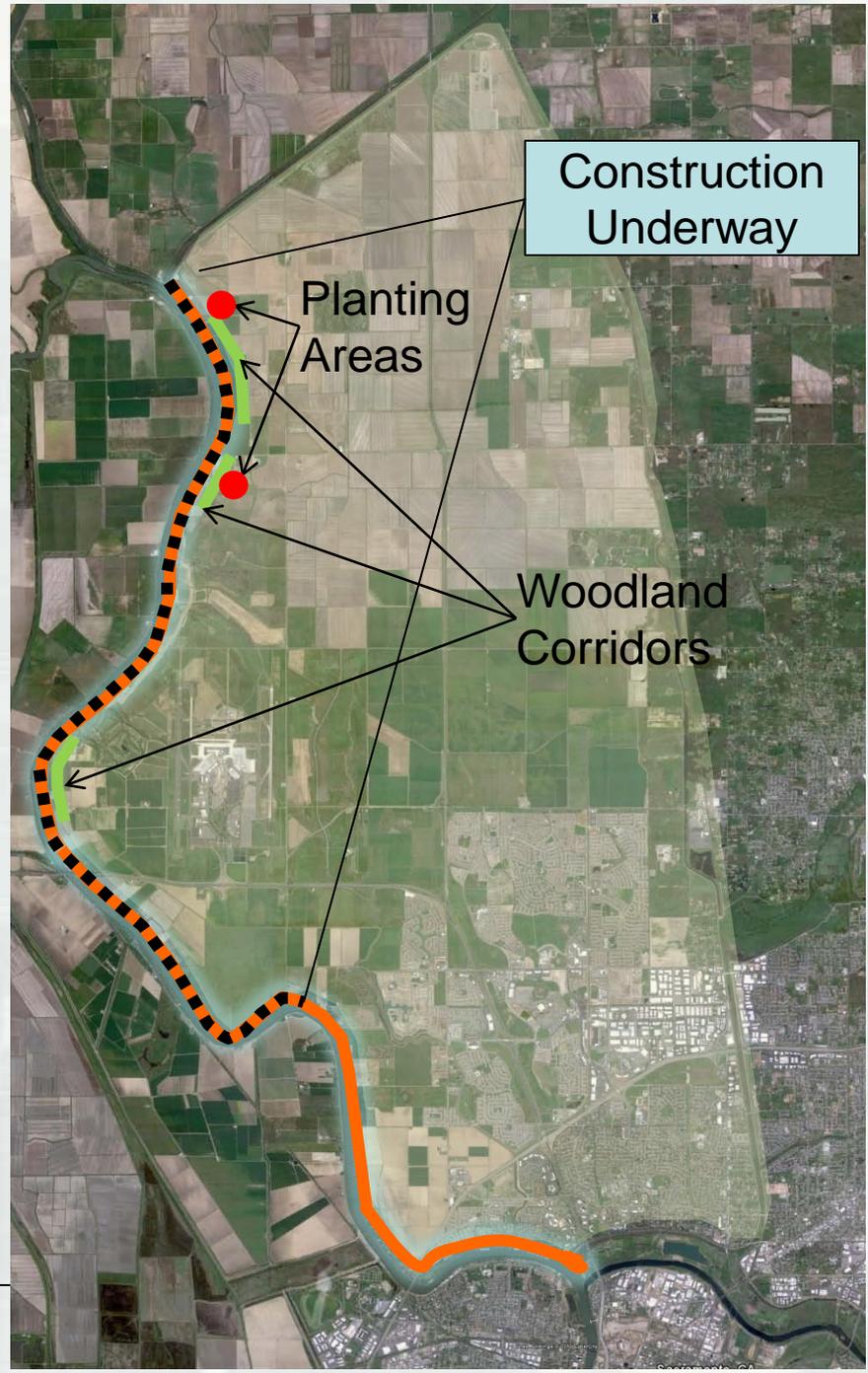
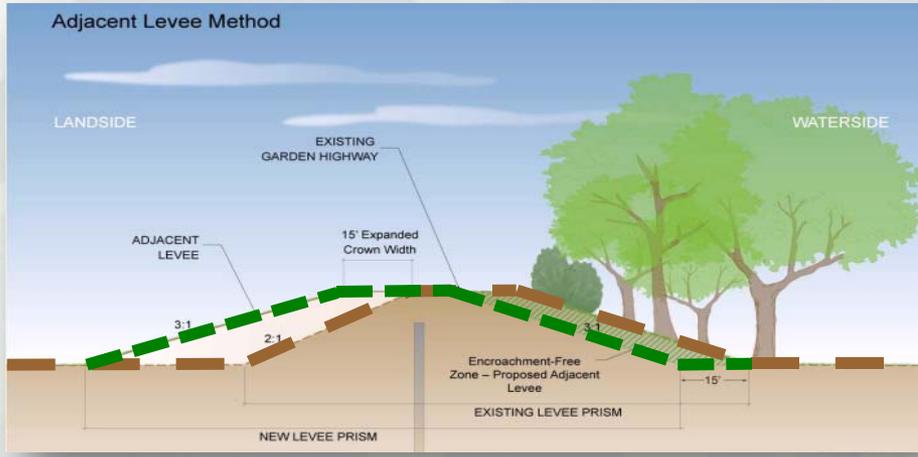
Sacramento River:
Widen by construction of an adjacent levee or seepage berm and construct seepage cutoff wall

Recommended Plan

Recommended Plan

Sacramento River

- Widen 18.9 miles of levee a minimum of 15 feet by construction of an adjacent levee
- Construct 12.3 miles of soil bentonite seepage cutoff wall ranging in depth from 19 to 115 feet
- Construct 8.3 miles of seepage berm ranging in width from 80 to 500 feet
- Portions under construction by SAFCA



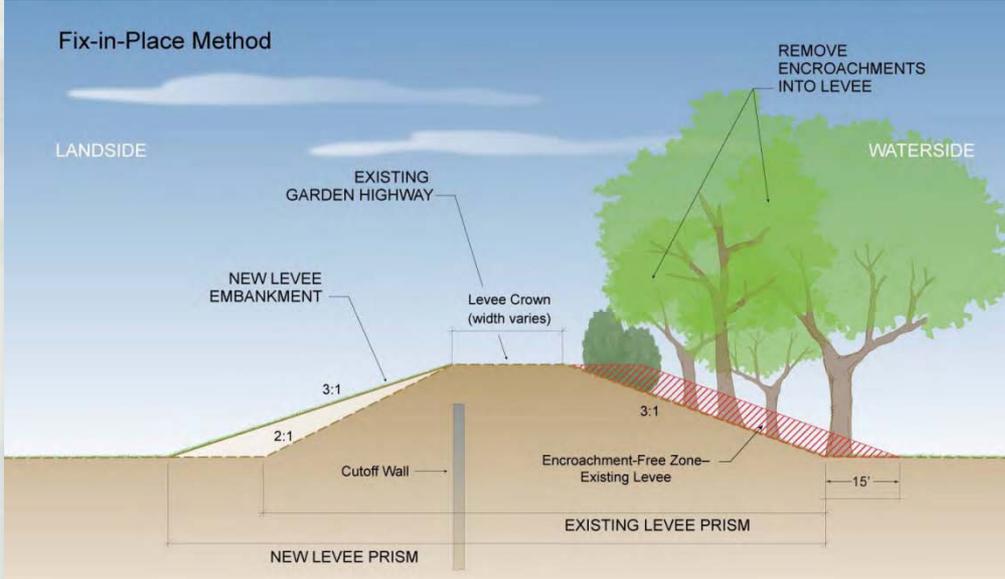
Constructed Adjacent Levee



Recommended Plan

Natomas Cross Canal

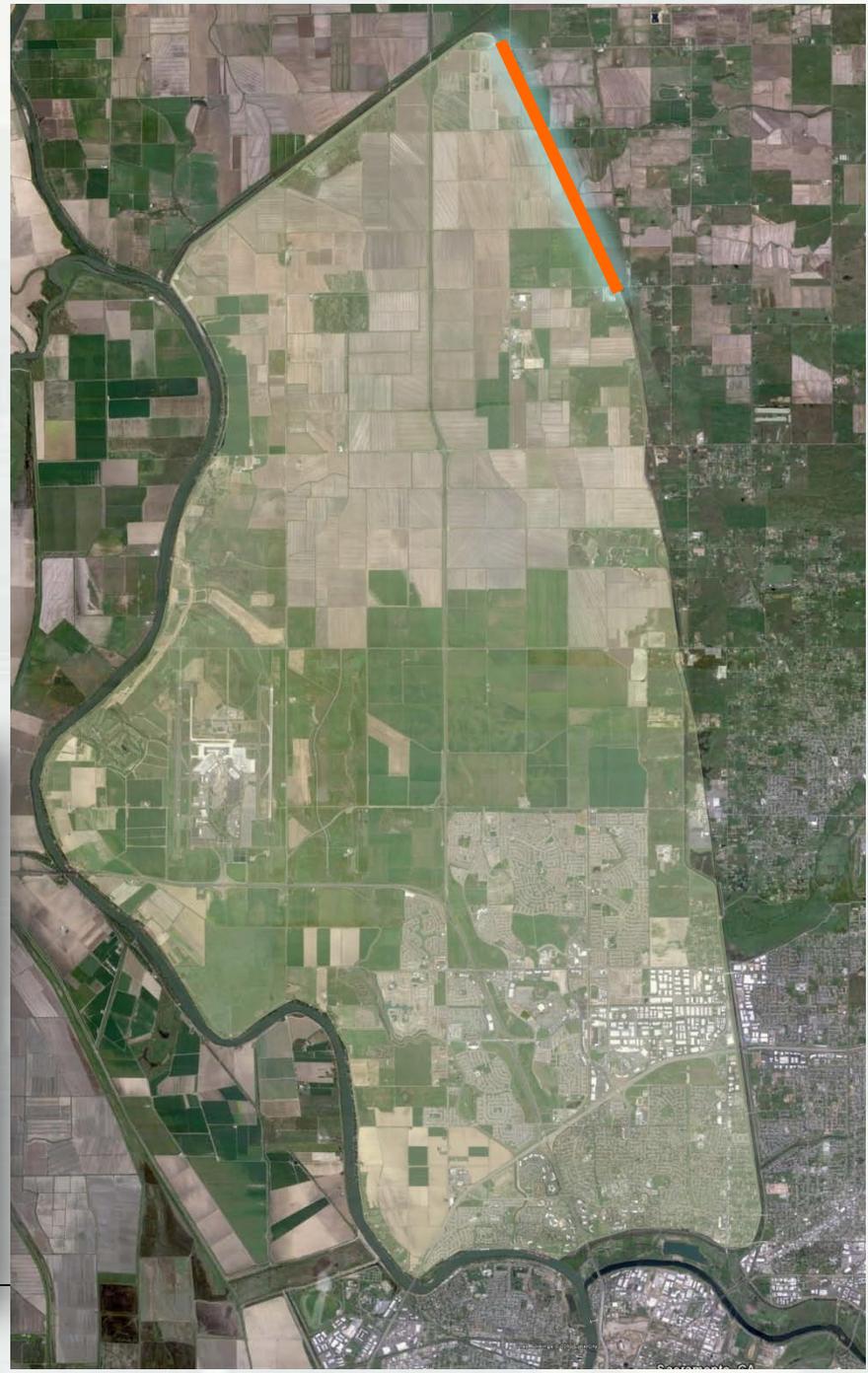
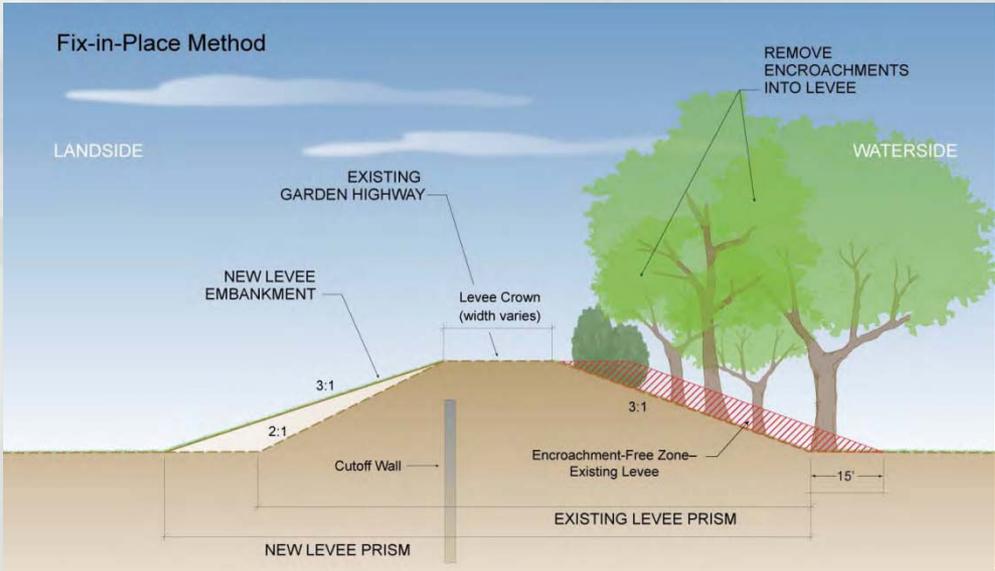
- Widen 5.5 miles of levee by fix in-place construction
- Construct 5.5 miles of soil bentonite seepage cutoff wall ranging in depth from 60 to 75 feet



Recommended Plan

Pleasant Grove Creek Canal

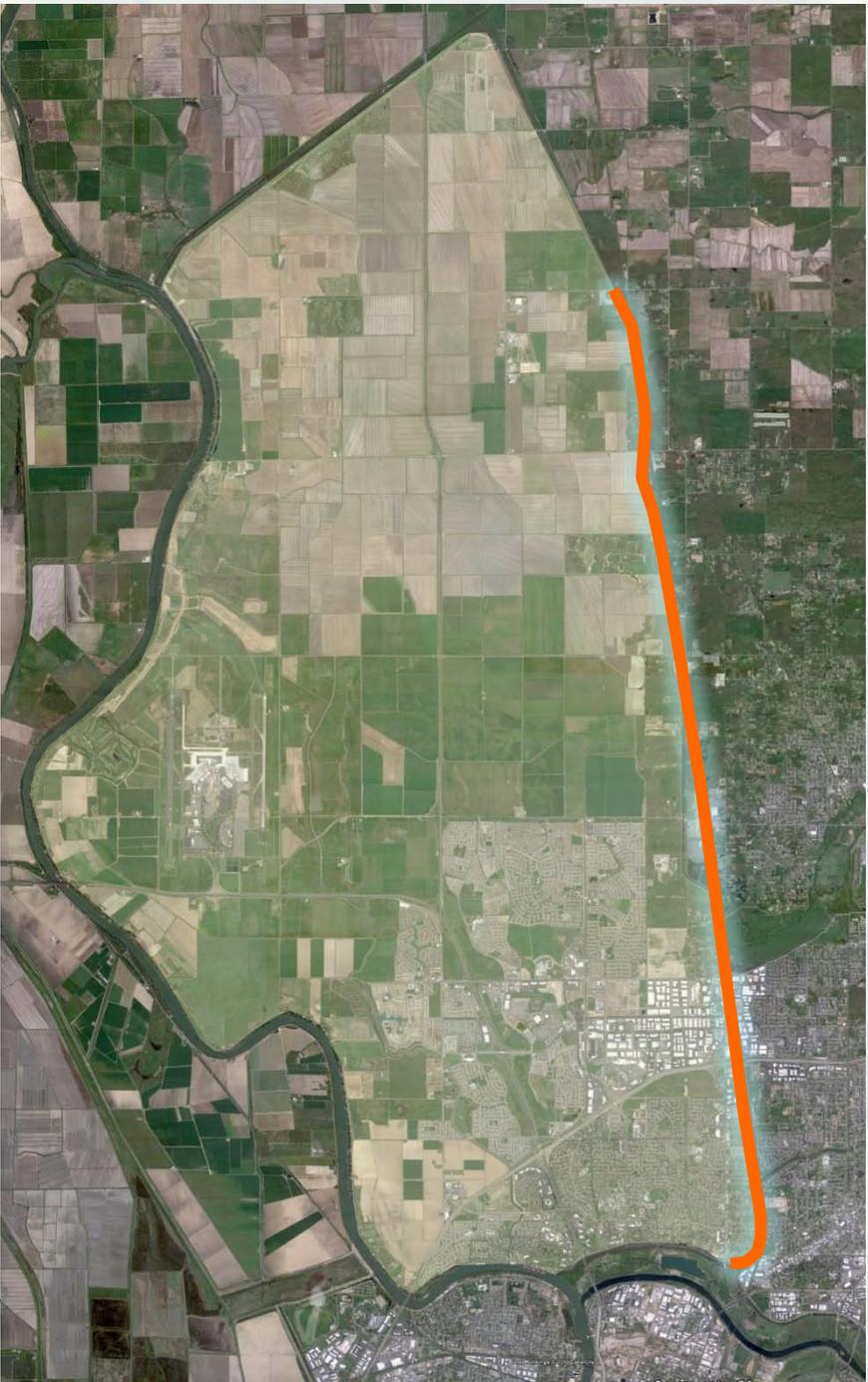
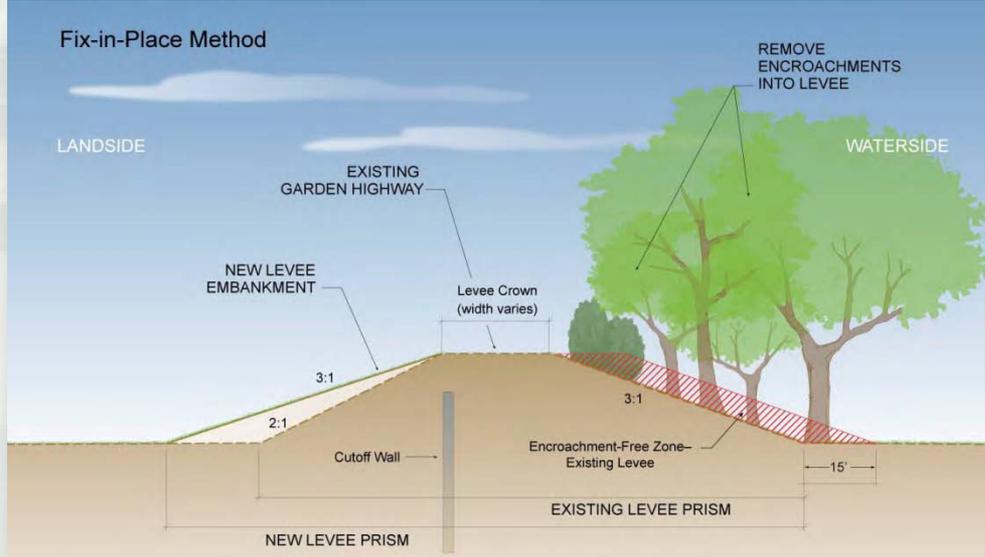
- Widen 3.3 miles of levee by fix in-place construction
- Construct 3.3 miles of soil bentonite seepage cutoff wall ranging in depth from 65 to 70 feet



Recommended Plan

Natomas East Main Drainage Canal

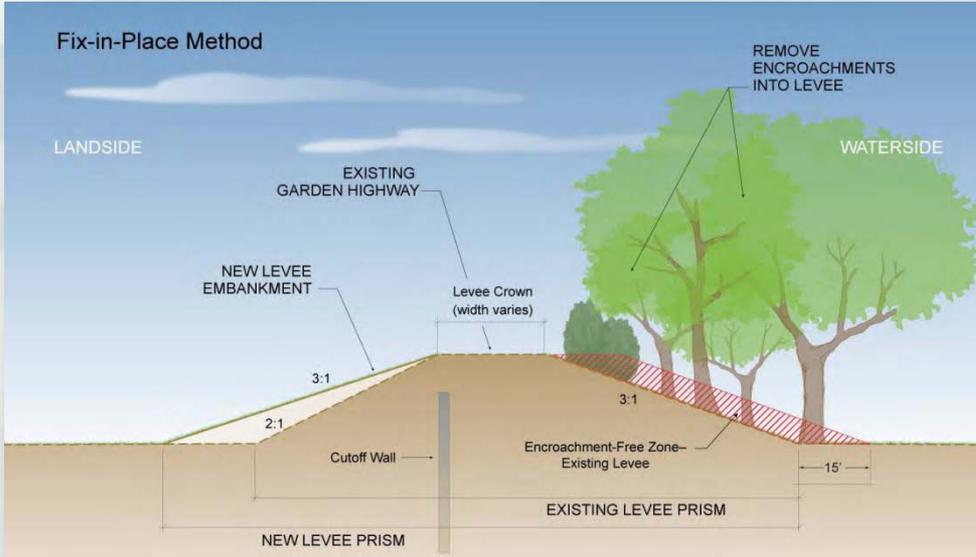
- Widen 12.8 miles of levee by fix in-place construction
- Construct 10.7 miles of soil bentonite seepage cutoff wall ranging in depth from 41 to 53 feet



Recommended Plan

American River North Levee

- Widen 1.8 miles of levee by fix in-place construction
- Construct 1.8 miles of soil bentonite seepage cutoff wall with a depth of 37 feet



Mitigation Components

- Project was planned to avoid and minimize impacts to habitat and endangered species
- Early Coordination with Resource agencies
- On-Site mitigation in the Natomas Basin
- Borrow sites converted to Endangered Species Habitat
- Ecosystem based evaluation
- Challenged by airport restriction



Executive Order 11988

- Planning objectives driving formulation are for improving existing levee performance
- Implemented through ER 1165-2-26
- Completed 8-step process
- Concluded broader EO objectives are met



ER 1165-2-26

Compliance Process

1. Determine if a proposed action is in the base floodplain (that area which has a one percent or greater chance of flooding in any given year)
2. Conduct early public review, including public notice
3. Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain
4. Identify impacts of the proposed action
5. If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate
6. Reevaluate alternatives
7. Present the findings and a public explanation
8. Implement the action



Residual Risk

- Remaining risk of levee overtopping (1 in 67)
- Common Features GRR will address levee raises, levee superiority, and residual risk analysis
- Non-federal partners will discuss their measures to address residual risk



Authorization Needed

Original Authorization – WRDA 1996 & WRDA 1999

Work in three areas of Sacramento:

- Natomas
- American River north levee
- Greater Sacramento area

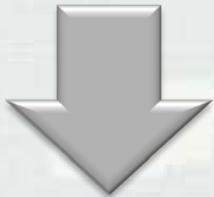


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Existing Common Features Project

Constructed and
Unconstructed
Features

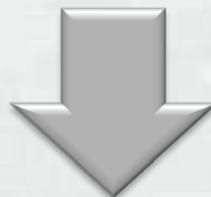
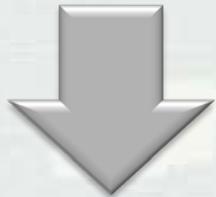


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Existing Common Features Project

Constructed and Unconstructed Features



Natomas Interim GRR Recommended Plan

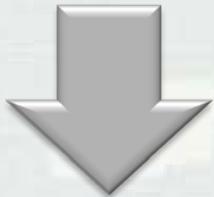


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Existing Common Features Project

Constructed and Unconstructed Features



Natomas Interim GRR Recommended Plan



New Authorization

Total Common Features Recommended Plan

Economic Summary

Item	Natomas Features of Recommended Plan (\$1,000)	Existing Authorized Common Features Project (\$1,000)	Total Common Features Recommended Plan (\$1,000)
First Cost	1,111,560	277,980	1,389,540
Interest During Construction	158,591	17,988	176,589
Project Investment Cost	1,263,573	294,788	1,558,361
Interest and Amortization	62,644	14,615	77,259
OMRR&R	5,180	85	5,265
Total Annual Costs	67,824	14,700	82,524
Total Annual Benefits	443,000	59,500	502,500
Net Annual Benefits	375,176	44,800	419,976
Benefit to Cost Ratio	6.5	4.0	6.1
Benefit to Cost Ratio @ 7%	4.2	2.6	3.9

Decisions in this Interim GRR

- This interim GRR establishes the level of Federal participation in addressing levee performance issues in Natomas
- Given that SAFCA has already constructed portions of the project, this interim GRR forms the basis for evaluating Federal interest in that construction
- Funding stream can be approximated



Crediting

- Sponsors have three approved requests for credit eligibility under Section 104
- An additional request is expected before authorization
- The three requests total an estimated \$387,230,000
- Requests cover features along the Sacramento River and the Natomas Cross Canal



Agency Technical Review

- Review led by LRL with reviewers from SPL and NWK
- AFB submittal reviewed April/May 2010
- Cost Estimates reviewed and certified by Cost Engineering Center of Expertise 26 August 2010
- All comments were resolved and closed except one
- Final ATR certified 27 August 2010



ATR Comment – Geotechnical Stability

- Levee performance curves for the risk and uncertainty analysis contain some elements of judgment
- As a result of an ATR comment, an expert elicitation was held to quantify that component of the curve



ATR Comment – Formulation of NED Plan

- Is it appropriate to recommend levee raises (even at sponsor's expense) at this time?
- How to best evaluate, compare and select a recommended plan from a systems perspective?
- Can NED be identified from the focused scope of this Interim GRR?



ATR Comment - Cost Sharing

- Cost share originally differentiated between Authorized Project (75%-25%) features and new features (65%-35%)
- Cost sharing percentages were adjusted based on ATR comments
- Recommended Plan cost sharing is in accordance with WRDA 1986



ATR Comment - O&M, Existing Vegetation, and Associated Environmental Concerns

- Existing vegetation on levees was treated as deferred O&M for plan comparison
- Costs for removal and mitigation of existing vegetation were not included in estimates



Open ATR Comment

Flood damages occurring in the study area for the without project condition

- Economic models forecast massive and frequent flood damages
- Actual history of area shows there have been virtually no historic damages
- Reflects difficulty of Corps models and policies to accurately account for flood fighting efforts and upstream levee failures during actual flood events
- Report recommendations are based on certified model results with fully vetted data as the more conservative engineering approach to addressing flood risk management
- A consensus resolution was reached by the vertical team



Flood Fighting & Upstream Levee Failures

1997



1986



Resolution: Model results without consideration of upstream failures and flood fighting were used, as they were considered to be more conservative



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Independent External Peer Review

- Contracted through Battelle Memorial Institute
- Reviewed public release version of PAC July – August 2010
- Battelle was briefed on changes in report
- Completed 16 September 2010, in accordance with EC 1165-2-209
- 35 Final Panel Comments (35 concurred)
 - ▶ 6 high significance
 - ▶ 15 medium significance
 - ▶ 14 low significance
- No new issues



USACE Campaign Plan

Goal 2: Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders

2a) Deliver integrated, sustainable, water resource solutions

- Existing levee system approached and analyzed as a complete system to provide the intended flood risk management benefits to the local community
- Levee system viewed in context with the overall Sacramento River Flood Control Project to ensure that the Recommended Plan complemented the goals of the larger system and did not induce any negative impacts to other system components



USACE Campaign Plan

2b) Implement collaborative approaches to effectively solve water resource problems

- Sponsors engaged throughout the Feasibility process
- Recommended Plan is integrated with Sponsors' Natomas Levee Improvement Project
- Federal and State agencies coordinated with during NEPA document preparation and invited to provide comment during the Draft Report comment period
- Comments and responses incorporated into the final report



Environmental Operating Principles

Planning with the environment (EOP 1,2 4, and 5)

- Worked with local resource agencies during planning phase to minimize impacts to the environment and construct on-site mitigation
- Designed project to keep activities within the Natomas Basin when feasible
- Avoid cumulative impacts to the river systems within the project vicinity

Environmental balance and sustainability (EOP 1,2,3 &4)

- Project avoids or minimizes environmental impacts while maximizing future safety and economic benefits to the community
- Borrow returned to agricultural use or designed to mitigate for project impacts
- Designed to comply with the Corps ETL and maintain important Endangered Species Habitat



Environmental Compliance

- Final EIS/EIR
- ROD signature in Spring 2011
- Significant Issues
 - ▶ ESA Compliance with USFWS and NMFS through the vegetation variance
 - ▶ Adjusted construction schedule to meet Air Quality Standards and reduce emissions from construction equipment
 - ▶ Avoiding impacts to existing mitigation lands



Public Involvement

- Notice of Intent – 29 February 2008
- Common Features GRR Scoping Meetings
 - ▶ 5 March, 10 March, 12 March, and 13 March 2008
- Notice of Preparation – 5 November 2009
 - ▶ Mailed to 900 recipients
 - ▶ Advertised in Sacramento Bee
- Natomas Scoping Meeting – 18 November 2009
- Draft Natomas PACR released to public – 2 July 2010
 - ▶ 45-day public review
- Post Document Release Public Meetings
 - ▶ 13 July, 15 July, 21 July, and 4 August 2010



Public Concerns

- Vegetation removal and variances
- Consultation and coordination with local Native American tribes
- Cultural resources preservation
- Transfer of risk of flooding
- Property owner concerns

No opposition from environmental groups

No fundamental change in project

Next Steps

- Notice to EPA - 1 October
- State and Agency Review - 8 Oct-7 Nov
- Address comments as appropriate
- Finalize Chief's Report - 10 Dec
- Sign Chief's Report - 13 Dec



Project Implementation

September
2010

- CWRB

December
2010

- Final Chief's Report

Spring 2011

- ASA(CW) Determination of Crediting
- Execute cost sharing agreement

August 2011

- Plans and Specs for First Contract Complete
- Real Estate Acquisition Completed for First Contract

October
2011

- Advertise First Construction Contract

October
2016

- Completion of All Construction



Project Summary

- Project formulated using a systems approach within the Natomas Basin
- Provides reliable flood risk reduction
- Improves safety for 80,000 residents of the Natomas Basin
- Provides reduction of risk to \$8.5B in infrastructure investment
- Strong return on investment; Natomas Benefit/Cost Ratio of 6.5
- Project has broad public & agency support
- Total Natomas project cost is \$1.1B;
Cost Share: \$723M Federal, \$399M Sponsors



Recommendation

To approve the American River Watershed, California, Common Features Project, Natomas Basin Interim General Reevaluation Report for release for State and Agency Review



Comments by the Non-Federal Sponsors

- Gary Bardini

- ▶ Chief, Division of Flood Management
- ▶ California Department of Water Resources /Central Valley Flood Protection Board (CVFPB)



- Stein Buer

- ▶ Executive Director
- ▶ Sacramento Area Flood Control Agency (SAFCA)



CALIFORNIA FLOOD RISK MANAGEMENT & FLOODSAFE OVERVIEW

**United States Army Corps of Engineers
Civil Works Review Board**

PRESENTED BY

GARY BARDINI

DEPARTMENT OF WATER RESOURCES

SEPT. 27, 2010

Key Points

- On behalf of both CVFPB and DWR, thank USACE for efforts to expedite NLIP
- California strongly supports NLIP – for both its public safety and economic benefits
- NLIP is a no regrets project essential to protecting a large existing urban population
- California is vigorously addressing all aspects of flood risk through FloodSAFE, especially floodplain development concerns

FloodSAFE California

Improve integrated flood management in the State through a system-wide approach, while carrying out regional projects and enhancing core flood management programs, with the following strategic goals.

- Reduce the chance of flooding
- Reduce the consequence of flooding
- Sustain economic growth
- Protect and enhance ecosystem
- Promote sustainability



SB 5 (Central Valley Flood Protection Act)

- Prepare & adopt a Central Valley Flood Protection Plan (CVFPP) by Jul. 2012
- Prepare preliminary maps for 100-yr & 200-yr floodplains protected by project levees & notify property owners
- Develop criteria for urban level of flood protection (1-in-200 annual chance of flooding)
- Develop building codes to reduce consequences of flooding in urban areas
- 5 additional 2007 bills focus on reducing flood risk in CA

Federal, State, & Local FloodSAFE Related Investments in CA Flood Risk Reduction Projects

Project Type	State (\$M)	Local (\$M)	Federal (\$M)	Total Budget (\$M)
Critical Levee Repairs	\$160	-	(\$160) ⁺	\$160
Early Implementation Program (EIP)	\$626	\$211	(\$544) ⁺⁺	\$837
US Army Corps of Engineers / CVFPB Capital Outlay Projects	\$573	\$293	\$1,622	\$2,489
USACE / CVFPB Feasibility Studies Program	\$16	\$18	\$34	\$68
Subvention Program	\$156	\$67	\$343	\$566
Sub-Total	\$1,531	\$589	\$2,543	\$4,120

+ Funding for the Critical Levee Repairs has come from DWR, but DWR is seeking \$160M in Federal reimbursement

++ Federal funds for the EIP projects have not yet been included, but DWR is seeking \$544M in Federal cost share credit.



Stein Buer

Executive Director

Sacramento Area Flood Control
Agency (SAFCA)



- The Sacramento Area Flood Control Agency (SAFCA) supports the Natomas levee improvements proposed in the PACR



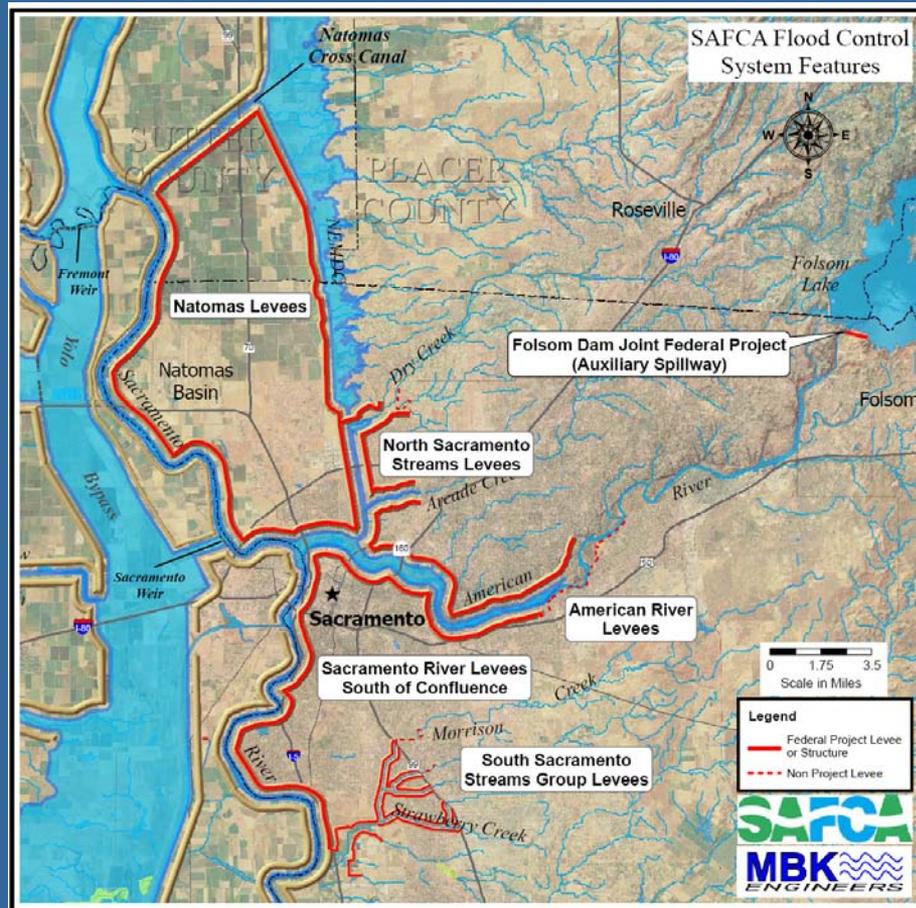
Post-Authorization Change Report
And Interim General Reevaluation Report
American River Watershed
Common Features Project
Natomas Basin
Sacramento and Sutter Counties, California



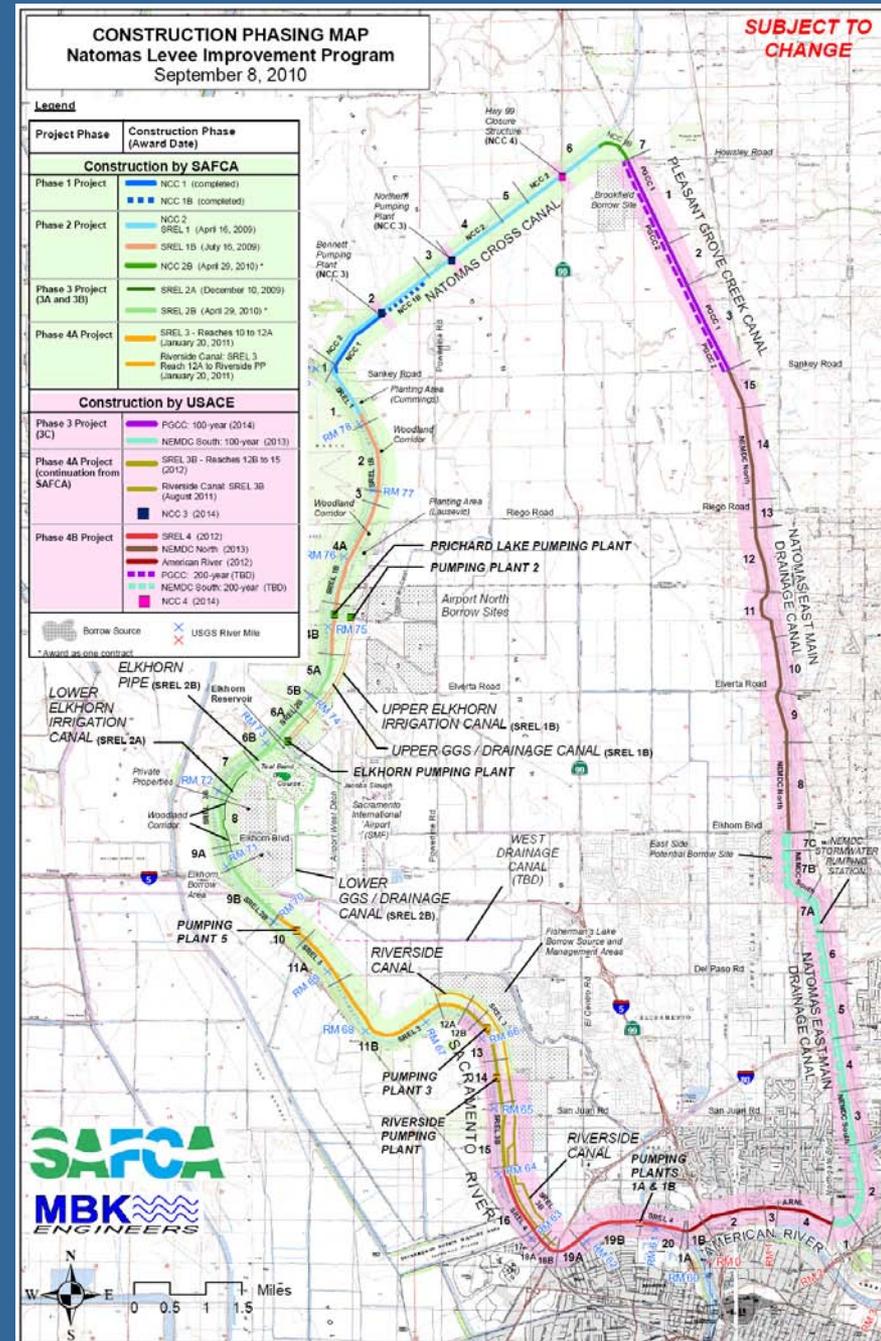
Main Report

US Army Corps of Engineers
Sacramento District
July 2010

- Natomas Levee Improvement Program is one of several activities addressing the larger flood control system for the Sacramento area

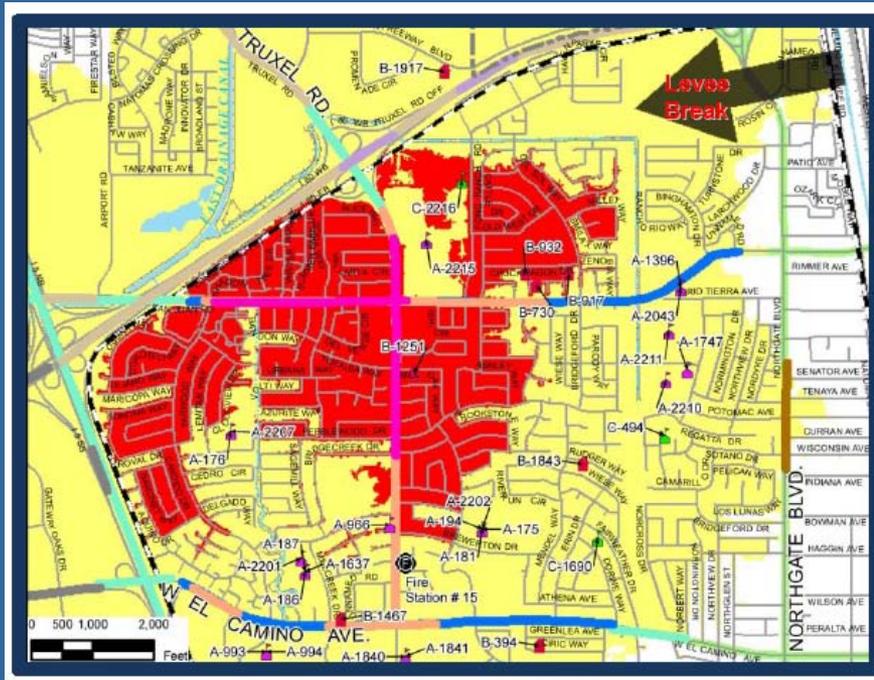


- Recommended work in PACR is critical
- SAFCA and the State initiated early implementation
 - Natomas Levee Improvement Program (NLIP)
 - Construction of SAFCA's portion of the NLIP to be completed in 2011
 - SAFCA and the State will have spent more than \$350 million



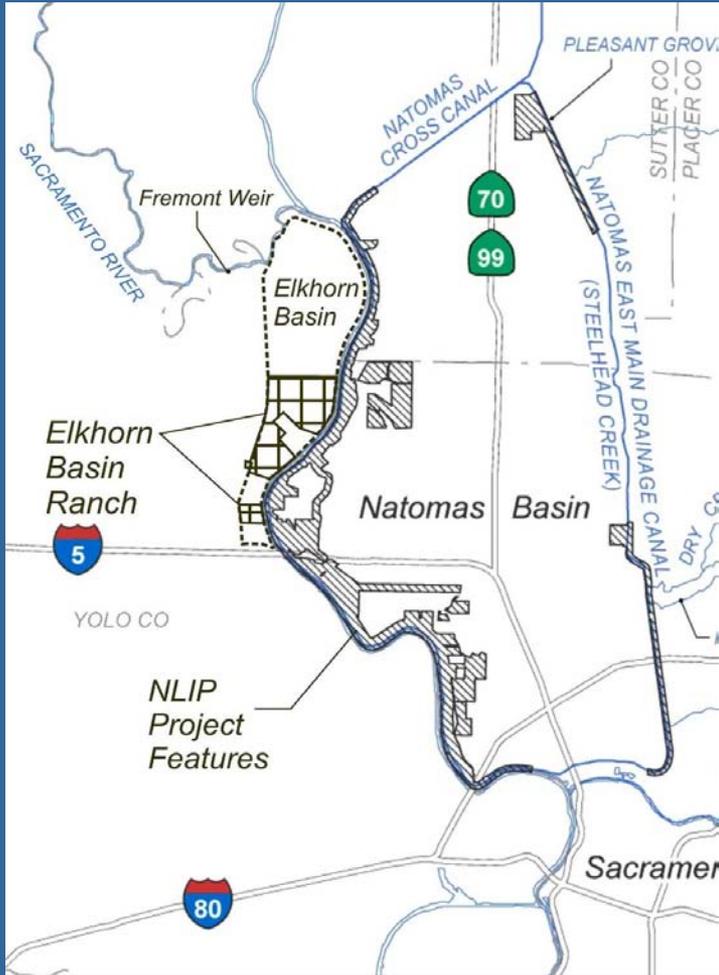
Natomas Floodplain Management Plan, March 2010

- Requirement of Section 202 (c) of WRDA 1996
 - Requirement of ROD
 - 408 approval
 - 404 permit
 - Approved by Corps - Sep 14, 2010
- Several Jurisdictions
 - Sacramento Area Flood Control Agency
 - City of Sacramento
 - County of Sacramento
 - County of Sutter
 - Reclamation District 1000
- Public Safety and Public Information
 - Flood Emergency Operations
 - Natomas Flood Emergency Planning
 - Flood Warning & Evacuations
 - Emergency Operations Preparedness
 - Recovery



- As one way to continue to address residual risk, SAFCA has implemented its Development Impact Fee program
 - The Fee Program would mitigate the impact of additional development in the Sacramento area floodplain
 - Fund flood risk reduction projects that would build on the PACR project
 - Ensure that new structures placed in the basin do not increase Sacramento's exposure to flood damages
 - Increased protection would offset the additional property damage exposure created by new development in the basin
 - Avoid any substantial increase in expected annual damages





- SAFCA has taken actions to control where development occurs as well:
- SAFCA has acquired agricultural conservation easements in the Elkhorn Basin (located west of the Natomas Basin)
 - Advance regional flood protection by helping to concentrate new development in well protected urban areas
 - SAFCA will help preserve the agricultural character of the property with the goal of reducing the long-term risk of flooding
 - The agricultural conservation easements achieve the objective of precluding development which could increase flood risks for the region.
- SAFCA has acquired other conservation easements
 - Goal of preserving habitat, open space, agricultural land, and precluding development which could increase flood risks





- As the local sponsor of the PACR, SAFCA will continue to work closely with the Corps and the State of California in implementing this vitally important project for our region
- Thank you for all your support

AMERICAN RIVER WATERSHED, CA COMMON FEATURES PROJECT NATOMAS BASIN INTERIM GENERAL REEVALUATION REPORT

PRESENTATION TO THE CIVIL WORKS REVIEW BOARD

Christine T. Altendorf, PhD., P.E.
South Pacific Division
U.S. Army Corps of Engineers
27 September 2010



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Briefing Objectives

- **Rationale for support**
- **Quality Assurance Activities**
- **Expected Response to the Draft Report of Chief of Engineers**



Rationale for SPD Support

- **Report complies with all applicable policy & laws**
- **Recommended plan is technically sound, economically feasible and environmentally acceptable**
- **Recommended plan supported by the Sponsors, Congressional delegation, and the Public**



Rationale for SPD Support

- **Recommended Plan improves levee performance of the existing levees**
- **Federal Interest – the Recommended Plan is the Interim National Economic Development (NED) Plan**
- **Flood Risk Management projects with robust BCRs are one of the highest budget priorities for the Corps**



Rationale for SPD Support USACE Campaign Plan

- **Objective 2a: Deliver Integrated and Sustainable Water Resource Solutions (SPD IPLAN Action 4)**
 - Plan provides significant positive FRM outputs
 - Integrated Systems Approach
 - Adjacent and set-back levees add system resiliency
- **Objective 2b: Collaborative Approaches (SPD IPLAN Action 5)**
 - CA levees Roundtable: Central Valley Improvement Framework
 - CADWR, SAFCA, CVFPB, NMFS Vegetation Variance
 - HEC: System Risk Analysis (33 USC 408)
- **Objective 4b: Communicate Strategically and Transparently (SPD IPLAN Action 10)**
 - Monthly reports to Congresswoman Matsui & SAFCA/CVFPB
 - Regular presentations to the CVFPB
 - Vertical Team communication for study status



Legal and Policy Compliance Certification

- **Technical and Policy Compliance: ATR of total project cost baseline by NWW Cost-Engineering CX; completed 26 August 2010**
- **ATR compliance review of Decision Document by team comprised of members from CELRL, CESPL and CENWK; completed 27 August 2010**
- **One Open ATR comment**
- **All policy compliance issues have been resolved**
- **Legal certification of the Final Interim GRR & EIS Report completed 31 August 2010**
- **IEPR**



SPD Quality Assurance Activities

- **Continuous involvement throughout development of the Final Report**
- **Facilitated issue resolution and dialog among the vertical and horizontal team throughout the study process**
- **Review of Policy Guidance Memo: All significant issues adequately addressed**
- **Division Engineer's Transmittal Letter signed 31 August 2010**



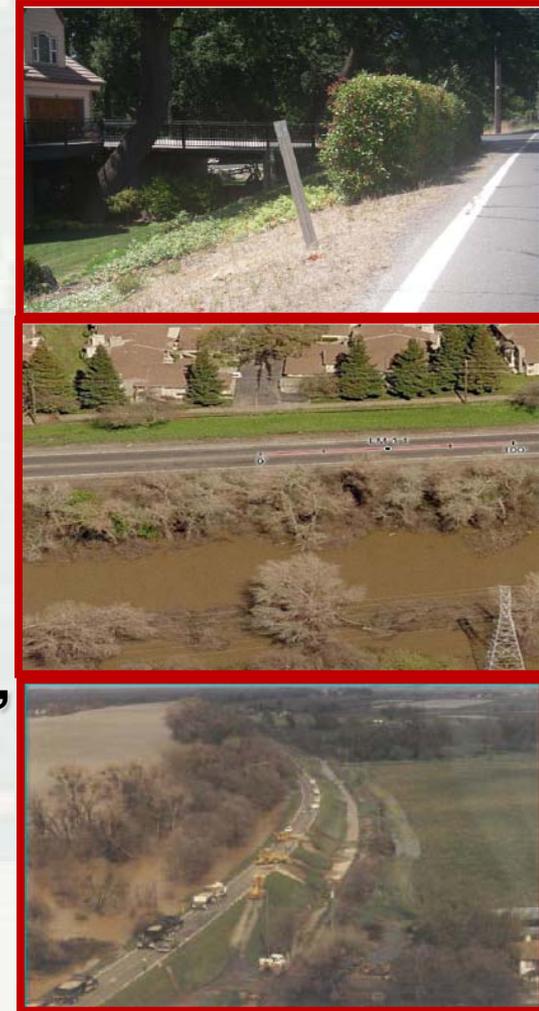
Expected Response to the Draft Report of the Chief of Engineers

- **Expectations are a favorable response to the draft Chief's Report**
- **Recommendation supported by non-Federal partners**
- **Robust collaboration with Resource Agencies and stakeholders throughout study process**
- **Public support for timely project construction**



Policy Issues

- **Corporate FDA Model**
 - **Certification of Natomas @ Risk Model**
 - **Risk Analysis methodology vs. history of damage**
- **OMRR&R of existing Federal Project**
- **33 USC Sec. 408 Permission to modify Federal Projects for Sponsors' Early Implementation Projects and associated crediting under Sec. 104 WRDA 86**
- **ER 1165-2-26 (EO 11988) compliance**



SPD Recommendation

- **Approval to Release Draft Chief's Report for State and Agency Review**
- **Release Final Interim GRR and EIS for Public and Agency Review**
- **Approve Final Report**
- **Complete Chief's Report**
- **Complete Crediting Report**





HQUSACE POLICY REVIEW CONCERNS

Civil Works Review Board

American River Watershed, CA

Common Features Project

Natomas Basin

Interim General Reevaluation Report

Scott Nicholson

Office of Water Project Review

Planning and Policy Division

Washington, DC –27 August 2010





HQUSACE Team Reviews:

- **Feasibility Scoping Meeting** **March 11, 2009**
- **Alternative Formulation Briefing** **May 24, 2010**
- **In Progress Review** **June-July**
- **Draft Report (Concurrent Review)** **June 30, 2010**
- **Division Engineer Transmittal** **August 31, 2010**
- **CWRB** **September 27, 2010**



Summary of Policy Issues Addressed During AFB and Draft Report Reviews

- 1. Benefit Analysis: Flood Fighting and Upstream Levee Failure**
- 2. Benefit Analysis: Without Project Condition Flood Damages**
- 3. Benefit Analysis: Risk Assessment Methodology and History of Levee Performance**
- 4. Identification of the NED Plan: System Definition and Analysis**
- 5. EO 11988 Floodplain Management: Compliance**
- 6. Future With Out Project Condition: Levee Vegetation Variance**
- 7. Sec. 408 Permission to Modify Federal Projects**
- 8. Cost Sharing: O&M of the Existing Federal Project**
- 9. Interim Report Limitations**



American Rivers Watershed, Natomas Basin

Benefit Analysis: Flood Fighting and Upstream Levee Failure

- **CONCERN:** The flood risk assessment for the Natomas levees did not consider the potential impact of flood fighting or upstream levee failures on flood risk in the Natomas basin. Each of these situations has the potential to reduce the risk of flooding in the study area. In addition, both flood fighting and upstream levee failures have occurred in the past and resulted in a reduction in the flood threat at Natomas.
- **REASON:** Corps guidance {ER 1105-2-100, Appendix E, O.(5)} requires sensitivity analysis to address assumptions about which reasonable persons might differ.
- **RESOLUTION:** The District conducted sensitivity analyses considering both upstream levee failures and flood fighting. The conclusion of the sensitivity analyses was that nominal changes in the probability-stage curves to account for possible upstream levee failures have only negligible impact to the EAD and AEP results. Additionally, EAD and AEP results changed only minimally with modifications to the probability of failure values made to model the effects of flood fighting."
- **RESOLUTION IMPACT:** The concern is resolved.



American Rivers Watershed, Natomas Basin

Benefit Analysis: Without Project Condition Flood Damages

- **CONCERN:** Natomas flood plain occupants have a 21% chance of significant flooding annually. Initially, the economic analysis assumed that the flood plain would continue to be occupied at the same level throughout the period of analysis. This assumption was not considered realistic with human behavior noted in other flood plains
- **REASON:** It takes time for residents to rebuild and reoccupy the flood plain. Some residents will leave the area rather than suffer multiple significant flood events. Corps guidance {ER1105-2-100, Appendix E, E-19.L.(3)} requires consideration of less intensive use of the floodplain due to high levels of flooding.
- **RESOLUTION:** The District developed a spreadsheet model that assumes rebuilding in the “without” project condition would occur over a three year period. The model also assumed that 20% of flood plain occupants would relocate after a major flood event, and that all residents would relocate after three such events. These assumptions were based on observed behavior of flood plain occupants in New Orleans post Katrina.
- **RESOLUTION IMPACT:** Concern resolved. designed to evaluate human behavior where frequent serious flooding occurs Estimated average annual flood damages in the “without” project condition declined from \$1.363 billion to \$462 million with a certified economic model.



American Rivers Watershed, Natomas Basin

Benefit Analysis: Risk Assessment Methodology and History of Levee Performance

- **CONCERN:** Historically the Natomas levees have been resilient enough to withstand four significant flood events without a catastrophic failure when aided by local flood fighting efforts. However, the report assumes under the without project condition that the levees provide little or no protection. Consequently, the Corps economic models results in a forecast of massive and frequent flood damages in the study area which is inconsistent with the actual history of the study area.
- **REASON:** The limitations of the qualitative engineering model to predict levee failure represented by the geotechnical fragility curves and the inability to capture the influence of human intervention (flood fighting) could result in the possible over inflation of project benefits and the effect on Federal investment decisions.
- **RESOLUTION:** Qualitative evidence of deteriorating levee performance was assessed to validate the quantitative analysis. This included conducting a sensitivity analysis and little change to AEP and EAD has been demonstrated.
- **RESOLUTION IMPACT:** Concern resolved.



American Rivers Watershed, Natomas Basin

Identification of the NED Plan: System Definition and Analysis

- **CONCERN:** A reach by reach economic analysis was performed for the purpose of identifying the NED Plan that included the evaluation of all nine reaches of the Natomas levee system independently, previously the Draft Report NED plan identified six reaches to be in the Federal interest.
- **REASON:** The NED plan as presented in the Draft Report did not fully account for the unique system of levees that surround the Natomas Basin. Each reach has independent failure modes with the overall system only as good as its weakest link. For a complete analysis that addresses the integrity of the system, it was realized that all reaches are dependent upon all others and there for needed to be reflected as such in the analysis.
- **RESOLUTION:** As a result of further system-wide analysis, the plan formulation process for the final report identified all nine levee reaches as part of the NED plan. The dependent system of levees also reduces residual risk associated with emergency evacuation.
- **RESOLUTION IMPACT:** Concern resolved.



American Rivers Watershed, Natomas Basin

EO 11988 Floodplain Management: Compliance

- **CONCERN:** SAFCA will be leveraging the Federal decision by implementing levee raises, leading to further development and increasing residual risk.
- **REASON:** Even though the planning objectives driving plan formulation are for improving the reliability/performance of the existing Natomas levee system (not proposing any “new” levees), the EIS included evaluation of levee raises proposed by SAFCA.
- **RESOLUTION:** The eight step process was performed and compliance with the EO has been determined.
- **RESOLUTION IMPACT:** Concern resolved.



American Rivers Watershed, Natomas Basin

Future With Out Project Condition: Levee Vegetation Variance

CONCERN: The existing Natomas levee system has substantial vegetation that do not meet current USACE vegetation standards. There are ESA issues in the area. The sponsor is currently implementing various system improvements via phased Section 408 requests and concurrently with the formulation of this project. Both need to meet current Corps vegetation standards. The sponsor submitted a vegetation variance request separate from the 408 requests. This variance was also used for this study. Any deviations in design will require validation that the variance.

REASON: Many levee systems in this area are “legacy” levees. The Corps process for requesting vegetation variances was reissued after two phases of the 408 requests were submitted and after this study was initiated.

RESOLUTION: Because of many of the existing levees in the area have vegetation and ESA issues exist, the Corps and State of CA signed a Framework agreement, which includes how to deal with the vegetation in the interim as CA develops the long-term plan. Natomas was identified as an early implementation project. The sponsor submitted a variance request for the Natomas levee systems via Corps policy and the Framework agreement.

RESOLUTION IMPACT: Concern resolved.



American Rivers Watershed, Natomas Basin

Sec. 408 Permission to Modify Federal Projects

- **CONCERN:** Did the Sponsors' early implementation and associated crediting under Sec. 104 WRDA 86 influence the Federal investment decision? Many of the project features are being built prior to the Federal decision being made.
- **REASON:** The Federal planning process has to be independent in purpose, process and timing from SAFCA's Section 408 and 104 approvals so as to not create an appearance of a potential planning bias.
- **RESOLUTION:** The plan formulation process and decision analysis between the Federal interim report was independent of SAFCA's planning process. Their requirements include addressing compliance with State law associated with urban levees (SB 5).
- **RESOLUTION IMPACT:** Concern resolved.

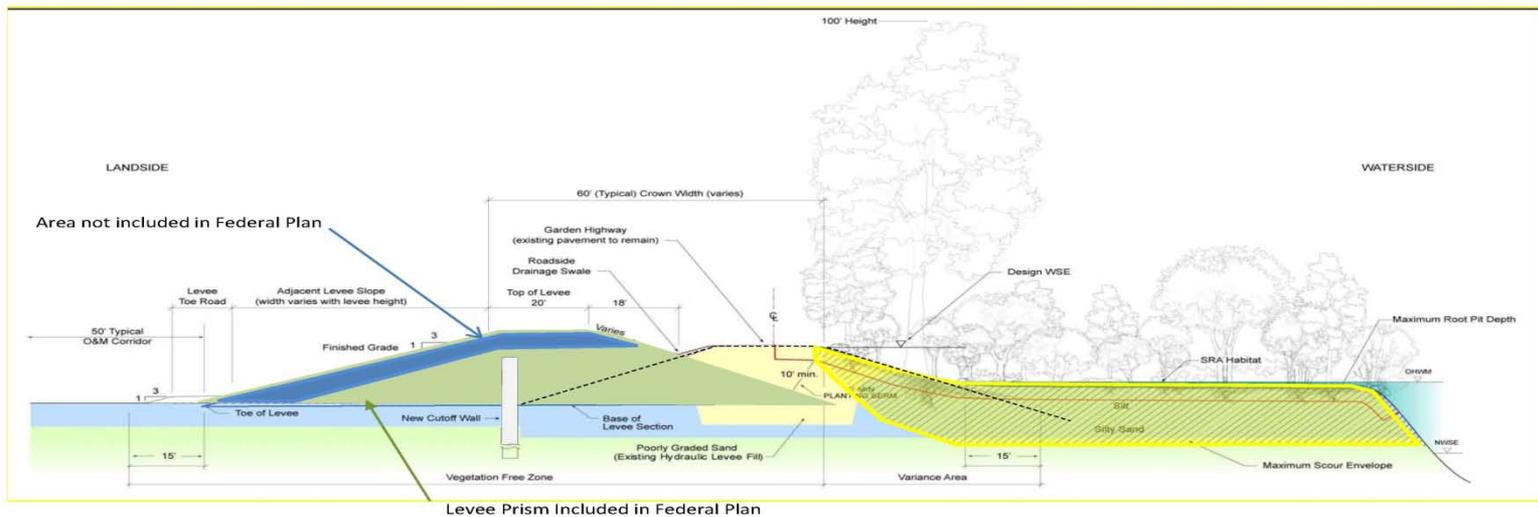


American Rivers Watershed, Natomas Basin

Cost Sharing: O&M of the Existing Federal Project:

- **CONCERN:** The existence of deferred maintenance for vegetation and encroachments can not be considered a project cost: deferred maintenance costs can not be incorporated into project features.
- **REASON:** No new federal investment dollars should be applied towards deferred maintenance because Cost sharing policy requires OMRR&R is the responsibility of the non-federal sponsor.
- **RESOLUTION:** The WOP condition is compliant with the ETL on levee vegetation. Design and construction requirements resulted in no costs associated with vegetation removal and mitigation in the adjacent levee alternative. The recommended plan allows for vegetation to be left in place under the variance approval.
- **RESOLUTION IMPACT:** Concern resolved.

Project Features: Levee Vegetation Variance and Sec 408 Initiatives





American Rivers Watershed, Natomas Basin

Interim Report Limitations:

- **CONCERN:** Due to an incomplete hydrodynamic model of the American and Sacramento River system, this interim report did not develop a system-wide solution beyond the Natomas levee system. Further studies of the larger system will be conducted under the broader General Reevaluation Study after this Interim GRR is completed.
- **REASON:** An interim plan needs to be independently functional and not affected by latter system changes and demonstrate it is a good federal investment.
- **RESOLUTION:** The recommended plan has been characterized as a “no regrets” action because it provides increased integrity for the existing levee structures and neither promotes nor prevents consideration of other solutions for flood risk management in the future
- **RESOLUTION IMPACT:** Concern resolved.



HQUSACE POLICY COMPLIANCE

REVIEW TEAM RECOMMENDATION

Approve Release of draft Chief's Report – Feasibility Report and EIS for S&A Review

- Subject to document revisions reflecting current review of the Final Report.

Lessons Learned

SPK/SPD



District & Division Lessons Learned

General

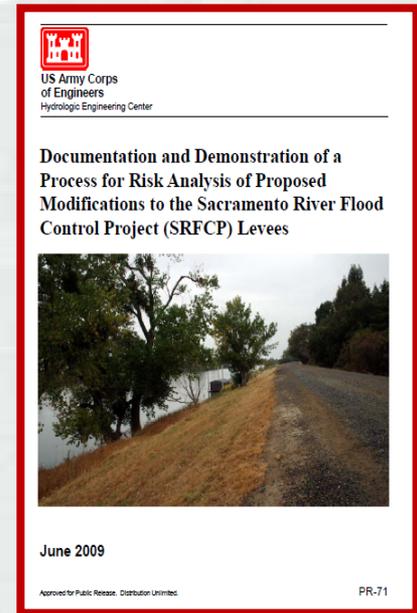
- **Vertical Teaming and Decision Making**
 - **Economic Models**
- **IEPR**
- **33 USC Section 408 process**
- **Collaborative Planning**
 - **Phased vs. Comprehensive planning**



District & Division Lessons Learned

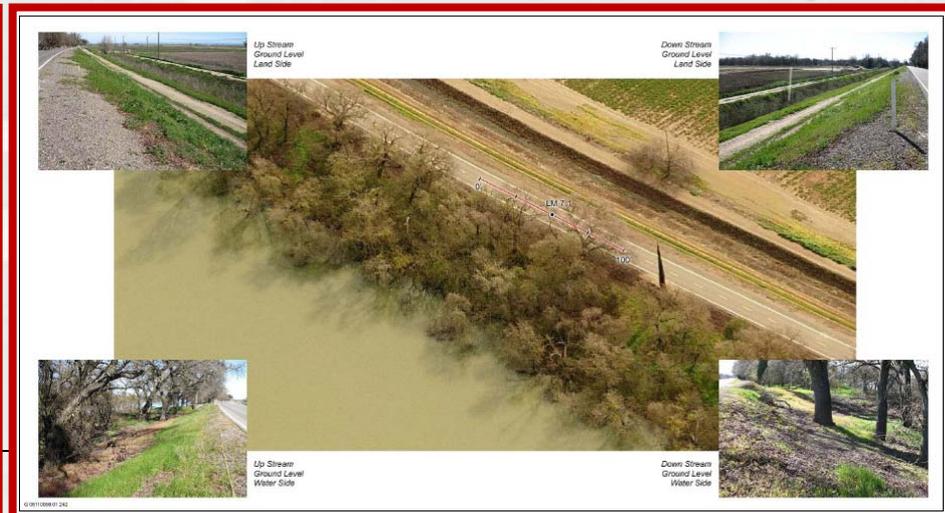
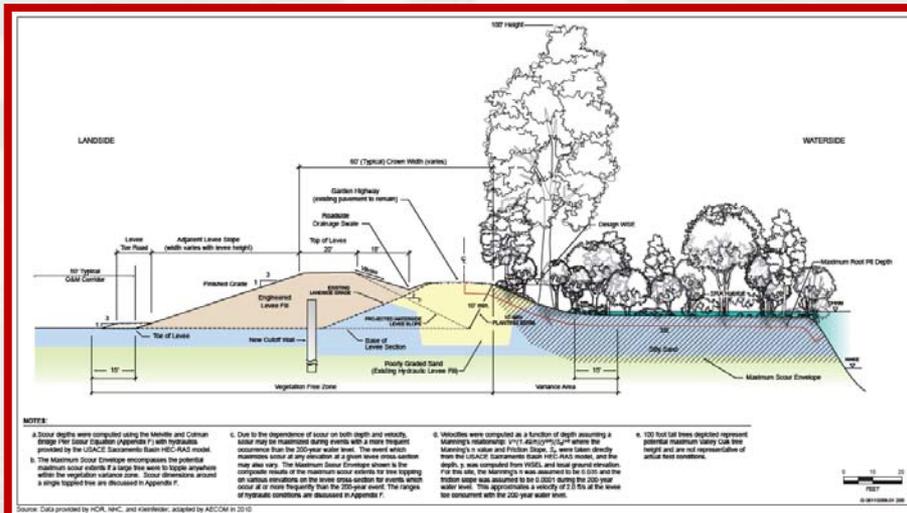
Systems Risk Analysis

- In conjunction with HEC and SAFCA, SPD Demonstrated System Risk Analysis methodology
- HEC “Project Report 71” (June 2009)
- Applied to NLIP 408s
- Lessons Learned:
 - Existing risk analysis tools can be applied in a systems context
 - Technology and procedures need to catch up with policy
 - The product of the demonstration will have value for the Nation



District & Division Lessons Learned Vegetation Variance

- Test case for compliance with the ETL/PGL
- Processing uncertainties:
 - CA CV Flood Improvement System Framework Agreement (27 February 2009)
 - Division Commander endorsement prior to ATR
- Lessons Learned:
 - Significant effort by the Sponsors; numerous submittal iterations
 - Collaborative solution with NMFS, SAFCA, CADWR, and Corps



Sponsor's Lessons Learned

- Upon recognition of the severe extent of the underseepage problems in the existing Natomas Basin levee system, all levels of Government – Federal, State, and local – worked collaboratively to initiate early implementation of the project, while expediting the process to justify and seek Federal participation, demonstrating the success of cooperatively addressing the needs of the American public.