

DRAFT

Suisun Marsh Levee Investigation Report

4/20/00

I. Summary and Findings

<To be refined as investigation continues>

The Suisun Marsh Levee Investigation Team recommends that Suisun Marsh levees be included in the CALFED Bay Delta Program. The Team has identified significant links between Suisun Marsh Levee maintenance and achievement of CALFED Bay-Delta Program goals, particularly regarding water quality and ecosystem restoration. Furthermore, modeling research indicates there is significant risk of water quality impacts in the Delta if Suisun Marsh levees are inadequately maintained and breach. This investigation report presents the detailed results of the Suisun Marsh Levee Investigation Team's modeling analysis, ecosystem restoration research, and public outreach efforts.

The Team further recommends that more detailed planning efforts be pursued and focused on the following regions of the Suisun Marsh:

<To be completed. Does the Team still want to make regional recommendations?>

More detail to support this recommendation is included in section VII "Analysis of Modeling and Research Results." ***In addition, the Team has outlined recommended elements for a Suisun Marsh Levee Program based on the Investigation research and public outreach efforts.***

II. Investigation Background

A. Basis for the Investigation

The decision of the CALFED policy group in spring of 1998 to adopt inclusion of the Suisun Marsh levees in the CALFED levees program as an optional strategy to achieve CALFED goals provided the impetus for the Suisun Marsh Levee Investigation effort. The issue of whether or not Suisun Marsh levees should be included in the CALFED Levee program was initially raised as part of the Agency Revision Team Process (ART). The ART Process was established in spring of 1998 to discuss and, if possible, resolve issues that the CALFED agencies had regarding the CALFED program and the Draft Programmatic EIS/EIR. If issues could not be resolved by ART, then those issues were elevated to CALFED management team and policy group for resolution. The California Department of

Fish and Game originally raised the Suisun Marsh levees issue during the ART Process.

The Suisun Marsh is located in Solano County and is a principal waterfowl wintering area in California. It is a brackish marsh consisting of approximately 84,000 acres of tidal marsh, managed wetlands, and waterways. Two types of levees make up the levee system in the Suisun Marsh. Interior levees are the lower levees used to control and spread water or separate ponds within the boundaries of the diked marshland. These levees enable property owners to apply some degree of individual water management within the leveed portions of their property to enhance waterfowl habitat. The exterior levees are the larger levees which protect the marshland against tidal inundation and uncontrolled flooding. The Suisun Marsh area received heightened attention in February 1998 when numerous exterior levee breaches resulted in inundation of over 22,000 acres and threatened the integrity of Department of Water Resources/United States Bureau of Reclamation facilities including Roaring River Distribution System, the Morrow Island Distribution System, and the Suisun Marsh Salinity Control Gates. DWR and the Bureau provided emergency repair resources at a cost of approximately 1.1 million dollars.

When the issue of including Suisun Marsh levees in the CALFED Bay-Delta Program was discussed during the ART process, the four major concerns included:

1. **Uncertainty of Linkage to CALFED Objectives:** There was uncertainty as to whether or not Suisun Marsh levees provided the same benefits as Delta levees to the CALFED objectives. Although, at the time, it was recognized that maintaining some Delta levees provided critical water quality benefits in the Delta, the water quality benefits to the CALFED Program resulting from Suisun Marsh levee integrity was not well known.
2. **Competition for Funds:** It was recognized that expansion of the Levee Program into the Suisun Marsh could result in the limited funding available to the Levee Program being diluted further and result in insufficient funding for the Delta itself. Delta stakeholders were, and continue to be, generally opposed to any action that would diminish the available funding needed to protect the Delta's levees.
3. **Lack of Coordination between Levee Work and Tidal and Seasonal Wetland Strategies:** At the time, it was feared that funds could be expended unnecessarily because of future actions to restore tidal emergent wetlands and tidal perennial aquatic habitat to achieve Ecosystem Restoration Program targets. In other words, it would be an inefficient use of public funds to maintain and rehabilitate any Suisun Marsh levees, which could be torn down a few years later. Levee work could interfere with achieving tidal wetlands restoration targets.

4. Inadequate Expansion of the Levee Program into the Suisun Marsh: It was thought that the scope of the proposed program expansion may have been inadequate. If it only included the Emergency Response portion of the program, it could result in lost opportunities to make relatively minor repairs and maintenance that would avoid costly levee breaks in the future.

At the time, the DFG recommended the extension of selected elements of the Levee Program to the Suisun Marsh and that sufficient additional funding be included in the CALFED Levee Program to ensure no conflict with Delta needs. This recommendation included that the Base Level Protection Plan and Special Improvements Projects and the Emergency Management Plan elements would be extended to the Marsh and not the Subsidence Control Plan and Seismic Risk Assessment.

DFG presented the rationale that this option ensured that the seasonal wetland implementation objectives and targets for the Suisun Marsh contained in the ERP would be met and that inclusion of the option would contribute to fostering support for CALFED from stakeholders in the Marsh. A sudden failure of levees in the Marsh would not necessarily guarantee that the best available lands would be voluntarily transformed into tidally influenced wetlands. As well, a break could threaten the integrity of other internal levees that are not built to serve the role as an external levee and further levee failure and subsequent habitat changes could delay the ERPP's overall ability to achieve its goals, objectives, and targets. Improved levees would help ensure that conversion to tidal wetlands would not be due to levee failure, but instead, would be planned with consideration of landowner support, ERP targets, regional wetland goals, and endangered species recovery plans. It was stressed that the conversion of managed seasonal wetlands to tidally influenced wetland would require that willing participants be found. It was also identified at that time that increased costs to the CALFED program were unknown and would need to be evaluated.

The issue of whether or not the Suisun Marsh levees should be included in the CALFED Program was not resolved during the ART Process, and was elevated to CALFED Management Team and Policy Group. At the July, 1998 Management Team meeting, the issue was discussed and the Management Team generally supported the addition of the Suisun Marsh levees, but asked that additional information be provided at the Policy Group meeting on the linkages of Suisun Marsh levees to the CALFED mission and objectives and the feasibility of adding the levees in the time frame of the Revised Draft EIS/EIR. Subsequently, the CALFED Policy group approved adopting the Suisun Marsh Levees in the CALFED Levee Program as an optional strategy to meet CALFED objectives and launched the Suisun Marsh Levee Investigation Team effort to gather more information and more completely address the concerns raised during the ART process.

In the interim, the DFG prepared a write-up on potential impacts for the CALFED EIS/EIS. This provided the necessary legal Programmatic documentation for the potential impacts of including the Suisun Marsh Levees in the CALFED program should further research indicate fully adopting the strategy.

The Suisun Marsh Levee Investigation Team proceeded to develop the necessary information to enable CALFED to make an informed decision on whether or not spending money on Suisun Marsh levees is a cost-effective way to meet its primary objectives and solution principles.

B. Scope of the Investigation

The scope of this Investigation includes the boundaries of the Suisun Marsh area as represented by the Suisun Resource Conservation District. The Suisun Marsh is located in southern Solano County, south of the cities of Fairfield and Suisun City. The Marsh is bounded on the south by Suisun Bay, Honker Bay, and the confluence of the Sacramento and San Joaquin Rivers. On the west it extends west of Highway 680 to the city limits of the City of Fairfield. On the north it is bound by the Southern Pacific railroad embankment to the city of Suisun City, and then by Highway 12 to Shiloh Road. On the east it is bound by Shiloh Road south of Highway 12 to Collinsville and shown in Figure 1.

C. Investigation Goals

The goal of the Suisun Marsh Levee Investigation is to develop the necessary information to enable CALFED to make an informed decision on whether or not spending money on Suisun Marsh levees is a cost-effective way to meet its primary objectives and solution principles.

The primary objectives of the CALFED program include:

- *Ecosystem Quality:* Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species.
- *Water Supply:* Reduce the mismatch between Bay-Delta water supplies and the current and projected beneficial uses dependant on the Bay-Delta system.
- *Water Quality:* Provide good water quality for all beneficial uses.
- *Vulnerability of Delta Functions.* Reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees.

Considering these objectives, specific tasks were identified to gather information regarding areas of greatest potential benefit. The areas of greatest potential benefit to the CALFED Bay-Delta Program are ecosystem quality, water quality and water supply reliability. Investigation tasks under each area include:

Ecosystem Quality

Ensuring the integrity of the exterior levees in the Suisun Marsh is critical to sustaining seasonal wetland values provided by the Marsh's managed wetlands. Improved levees would also ensure that conversion to tidal wetlands will not be due to levee failure, but instead, will be planned with consideration of landowner support, ERP targets, regional wetland goals, and endangered species recovery plans.

In order to quantify potential ecosystem benefits in the Suisun Marsh, habitat scenarios must be developed. These scenarios are necessary to perform model runs to assess potential water supply reliability and water quality benefits as well as to assess potential benefit in achieving the ERP goals. These scenarios will be developed taking into consideration landowner support, ERP targets, regional wetland goals, and endangered species recovery plans.

TASK 1: Develop scenarios showing how many acres of tidal wetlands and other habitat types could be established in the Suisun Marsh considering landowner support, ERP targets, regional wetland goals, and endangered species recovery plans.

Water Supply Reliability & Water Quality

Ensuring the integrity of the exterior levees in the Suisun Marsh may be critical to sustaining Water Quality and therefore Water Supply Reliability in the Delta. Preliminary modeling results indicate that large levee breaches on Suisun Bay tend to increase Suisun Bay and Delta Salinity. As well, small levee breaches in certain areas of the Marsh may lead to reduction in Delta salinity of up to 10%.

This preliminary finding needs to be verified and quantified. Also, model runs need to be performed using various habitat scenarios to assess the potential water supply reliability and water quality benefits of each.

TASK 2: Continue Suisun Marsh modeling including 2-D model verification of preliminary results.

TASK 3: Quantify the potential water quality benefits, to in-Delta water users and exporters, from the different habitat scenarios developed in TASK 1.

TASK 4: Using the results from TASK 3, identify scenarios that would provide water quality and ecosystem benefits. Determine the length of exterior levees that would be breached and maintained.

TASK 5: Develop cost estimates to breach levees as necessary, upgrade and maintain all other levees, mitigate for lost managed wetlands, and other associated costs to implement scenarios identified in TASK 4. Quantify the geotechnical and site access problems. Quantify the Emergency Response liabilities and benefits.

Results from completion of the above tasks are presented in this Investigation Report.

D. Conduct of the Investigation

A kick-off meeting for the Suisun Marsh Levee Investigation Team was held on January 15, 1999. The group included DFG, SRCD, ESO Modeling Staff *<state qualifications and related work experience for active members- Does the group want to provide this information? >*. There was a request for suggestions on additional parties to be contacted for input. BCDC, Solano County, and the USBR were later included.

At the time the investigation effort was initiated, DWR's Environmental Services Office was producing a report to summarize the results of Suisun Marsh modeling that was performed following the extensive flooding that occurred due to breaks from the February 1998 floods. It was suggested that a team of modelers be assembled for the modeling review to assess potential water quality benefits. This effort became the starting point for the investigation. Detailed results of the modeling review are presented in Sections V. and VI.

Suisun Marsh Levee Investigation Team Participants:

Rob Cooke, CALFED (Levee Program Manager)
Gwen Knittweis, CALFED (Chair)
Chris Enright, DWR (Modeling)
Kamyar Guivetchi, DWR (Modeling)
Terry Mills, CALFED, (Ecosystem Restoration)
Jim Starr, DFG (Ecosystem Restoration)
Gilbert Cosio, MBK (Engineering and Cost Estimates)
Steven Chappell, SRCD
Curt Scmutte, DWR
Dave Gore, USBR
Arnold Lenk, Local landowner representative

It was intended that the group be well-rounded to provide sensitivity to numerous stakeholder concerns. Individuals that were not able to make the meetings and meeting participants were kept informed of investigation developments by an e-mail reflector that was set up for the Suisun Marsh Levee Investigation.

The reflector included:

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<include names>

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For specific analysis efforts, sub-teams were formed as needed. For example, a sub-team of biologists was formed to focus on interpreting the results of modeling analysis in terms of CALFED ERP goals and impacts to the existing environment.

The Investigation Team organized a public outreach effort, the results of which are described in Section VII of this report. Some investigation oversight was provided by the Levees and Channels Technical Team, a group formed to provide technical input and oversight for the CALFED Levee Program.

III. The Suisun Marsh

(To be completed by Biologists)

IV. Investigation Considerations

(To be completed by CALFED w/ Sub-Team Input)

A. Potential Links to CALFED Objectives

A key focus of the Investigation has been identifying links between pursuing a Levee Program in the Suisun Marsh and the achievement of CALFED objectives. The areas of greatest potential benefit to the CALFED

Bay-Delta Program are ecosystem quality, water quality and water supply reliability.

B. Study Methodology

As a starting point for developing linkages to CALFED objectives, the Investigation focused on ongoing modeling being performed by DWR's Environmental Services office. To further examine the modeled salinity response to levee breaches and to see if it could be correlated with CALFED Ecosystem Restoration Program goals, potential breach scenarios were developed. The scenarios were developed by a sub-team of biologists, taking into consideration ERP targets and endangered species recovery plans. The scenarios were designed to represent a wide geographical range and proximity to bays and channels and were assigned relatively equal volumes. It is stressed that the role of the Investigation is for information gathering and as such some regional assumptions needed to be made as a starting point for modeling. No preference for breaching of any Marsh locations or intended designation of any specific parcels for conversion was indicated by the scenarios developed.

From the model run results, general conclusions were reached regarding salinity response that are presented in sections V. and VI. of this report. A sub-team of biologists analyzed the potential of these breach scenarios to also support ERP goals. Other considerations such as public outreach and the results of the cost estimate, presented in Section X. of this report, were factored in to arrive at Investigation conclusions.

C. Other Considerations

In arriving at the Investigation conclusions outlined in the "Investigation Conclusions" summary, numerous items were taken into considered including, but not limited to, the results of modeling analysis, CALFED ERP and MSCS targets, local landowner input, and existing agreements and regulatory constraints. For example, provisions of the Suisun Marsh Preservation Agreement were considered. As well, potential impacts on DWR infrastructure including Roaring River, Morrow Island, and the Salinity Control Gates were considered.

Key points regarding any potential CALFED Suisun Marsh efforts that arose early in the Investigation process and were presented during the initial public outreach workshops include:

- **Program Would Be Based on Willing Participation**
- **Do Not Want to Create Tidal Wetlands at the Expense of Managed Wetlands**
- **More Intensive Maintenance Must Be Part of Any Package**
- **Do Not Want to Reduce Existing Funding for In-Delta Levees**

A detailed summary of additional points gathered from the public outreach process is presented in section IV.

V. Modeling Results

(To be completed by DWR-ESO)

Include list of Chris Enright's modeling caveats.

VI. RMA Modeling Results

(To be completed by RMA)

VII. Public Outreach and Other Research

(To be completed by SRCD)

Recognizing that the success of any proposed Suisun Marsh Levee Program hinges on willing landowner participation, public outreach and landowner input was highly stressed in the Investigation effort. Information gathered from the Public outreach process provided valuable input into the Suisun Marsh Levee Investigation. The Suisun Marsh Levee Investigation Team started conducting a series of public outreach workshops in March, 2000. An overview of the CALFED program and the Suisun Levee Investigation was presented and landowner input was solicited, both in the workshop and through mail-in comment forms. The following summary highlights key input from the public outreach effort.

Key Points from Public Outreach Workshop Participants:

- *There is sensitivity as to how conversion efforts will effect hunting in the Marsh.*
- *There is a concern as to how levee breaches and resulting wetlands will be maintained especially considering the soil composition in the Marsh (peat and other poor structural materials).*
- *There is question as to what the merits for managed wetlands are versus tidal wetlands.*
- *There is a desire to see CALFED target government-owned lands for any conversion efforts first.*

- *There is a desire to make maintenance dredging doable.*
- *There is a concern about localized water quality impacts for the neighbors of parcels that go to tidal wetlands.*
- *Landowners desire assurance that CALFED will deliver on its end of the "package deal."*
- *There is a desire to know how actions might necessitate formation of Reclamation Districts.*
- *Potential participants want to know the minimum acreage requirements to participate in potential conversion activities.*

Key Points/Comments Sent In:

- *There is a concern that CALFED go slow in adoption of new management techniques because of the uncertainty involved.*
- *There is a desire to establish a "measure of merit" for Marsh Habitat such as tons of protein per acre.*
- *It is suggested that CALFED consider the expected decrease in waterfowl population from conversion actions.*
- *It is suggested that CALFED consider plans for public access and how it may affect landowners.*
- *Participants would like to know how much would CALFED pay for a club or conservation easement.*
- *It is suggested that isolated properties may be more appropriate for conversion.*
- *CALFED needs to consider impacts on neighboring water management facilities (i.e. tidal gate drainage capability) from conversion.*
- *Delta/Southern California water interests need to demonstrate a financial interest in Marsh levees in case there is another catastrophic breach that impacts water quality.*

In addition to public outreach efforts, the Investigation consulted the following sources for additional information:

VIII. Analysis of Modeling and Research Results

(To be completed by CALFED w/ Sub-Team input)

(See Matrices)

The biological sub-team analyzed the results of the modeling in terms of ERP goals.

IX. Cost Estimate for Selected Scenarios

(To be completed by MBK)

X. Conclusion and Staff Recommendations

(To be completed by CALFED w/ Sub-Team Input)

The Suisun Marsh Levee Investigation Team recommends that Suisun Marsh levees be included in the CALFED Bay Delta Program. The Team has identified significant links between Suisun Marsh Levee maintenance and achievement of CALFED Bay-Delta Program goals, particularly regarding water quality and ecosystem restoration. Furthermore, modeling research indicates there is significant risk of water quality impacts in the Delta if Suisun Marsh levees are inadequately maintained and breach.

Recommended elements of a Suisun Marsh Levee Program include:

- *A base level Marsh-wide maintenance program modeled on the current Delta Levee Subventions Program and the Base Level Levee Protection program outlined in the Levee System Integrity Program that includes a similar local and non-local cost-share.*
- *A program for enhanced protection that is modeled on the current Special Flood Control Projects Program and the Special Projects Program outlined in the Levee System Integrity Program. A criterion for inclusion should be developed that is based on the enhanced water quality benefits or ecosystem benefits of including a particular levee area.*

- ***Funding for improvements of Suisun Marsh levees should be structured in such a way that it doesn't compete with the already strained resources for the maintenance of levees already included in the Delta Subventions Program.***
- ***An emergency response element should be developed to address Suisun Marsh Levees.***
- ***Criteria should be developed for acceptable patch sizes to effect significant biological or water quality improvements through conversion to tidal wetlands or shallow water habitat.***
- ***Focused research should be applied towards an engineering strategy for levee breaching and maintenance to convert to tidal wetlands or shallow water habitat. Of particular concern is the complexity of successfully maintaining a 100' breach.***
- ***Sedimentation processes in the Marsh should be examined to explore possible means to create sediment accretion throughout the Suisun Marsh to aid shallow water habitat and tidal marsh creation in areas that the topography is currently inappropriate.***
- ***Any tidal marsh conversion efforts should be pursued cautiously using adaptive management techniques. Implementation of pilot projects is highly desirable.***
- ***Suisun Marsh levees should be added to the CALFED Levee Program Risk Assessment and Risk Management strategy.***

XI. Appendices

- A. Detailed DWR Modeling Results**
- B. Detailed RMA Modeling Results**