
CALFED Levee Stability Program, California

Report to Congress On the U.S. Army Corps of Engineers Strategy for Action

May 2006



U.S. Army Corps of Engineers
Sacramento District
South Pacific Division

EXECUTIVE SUMMARY

As the hub of California's two largest water distribution systems, the Sacramento-San Joaquin Delta (Delta) supplies drinking water to more than 22 million people and irrigation water to millions of acres of some of the world's most highly productive agricultural land. It is a haven for 750 plant and animal species and home to hundreds of thousands of people.

Yet, most of this valuable national resource is inadequately protected by a fragile levee system that threatens to fail at any time, even under fair weather conditions. Unlike other levee systems that protect against high water events, many miles of the Delta's mostly non-Federal levees must work all day, every day, to keep water from inundating people and property located below sea level. These hardworking levees are part of the State-wide water conveyance system, which have suffered as local reclamation districts struggle to properly maintain and improve them.

Recognizing the threat of serious levee failure and its widespread effects, Congress passed the CALFED Bay-Delta Authorization Act (CALFED Act) in 2004. The CALFED Act directed the U.S. Army Corps of Engineers (USACE) to deliver a report that identifies and prioritizes potential levee stability projects in the Delta that could be carried out through 2010 with the authorized \$90 million in Federal funds. To quickly identify critically needed projects with active non-Federal support, the USACE invited Delta stakeholders to submit project proposals with letters stating their willingness to participate as cost-sharing sponsors. In response, Delta area reclamation districts and flood management agencies submitted 54 project proposals totaling more than \$1 billion in estimated costs.

USACE evaluated proposals and prioritized potential projects according to how well they met USACE environmental, economic, and other implementation criteria. The USACE short-term strategy is to move quickly to construction on high priority levee reconstruction projects identified in this report. The authorized \$90 million of Federal funds, plus the required non-Federal funds, would be an important first step to address Delta-wide levee system needs.

The long-term strategy will be developed in the cost-shared Sacramento-San Joaquin Delta Islands and Levees Feasibility Study. The study will assess existing and future flood risks in the Delta area, as well as ecosystem restoration, recreation, and water supply needs, and develop a comprehensive vision and roadmap for future Federal participation in the Delta. The plan, in conjunction with California Department of Water Resources' Delta Risk Management Study, will address remaining levee stability work beyond the \$90 million Federal effort authorized in the CALFED Act.

This report is the first step in a multi-year effort to address levee stability concerns in the Delta region. The prioritized list represents levee repair projects that could be accomplished within the funding and procedural limits of the CALFED Act. Many more potential projects were identified than could be accomplished within the limits of the CALFED Act. Therefore, an additional list has been provided to include all of the identified projects in prioritized order in the event that the authorization is modified or non-Federal implementation is pursued.

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1.0 PURPOSE & SCOPE

1.1 Purpose

As directed by Congress, the U.S. Army Corps of Engineers (USACE) prepared this report to describe levee stability reconstruction projects and priorities that would be carried out under the CALFED Bay-Delta Authorization Act, Public Law 108-361 (CALFED Act) through fiscal year (FY) 2010. It also presents the USACE long-term strategy for levees in the Delta.

1.2 Scope

This report complies with the CALFED Act and provides both short-term and long-term strategies to address levee stability in the Delta. It was prepared to follow the Levee System Integrity Program (LSIP) element of the CALFED Program and 2000 Record of Decision (ROD). The study area in this report includes the Legal Delta as stated in Section 12220 of the State of California Water Code, and Suisun Marsh if appropriate, which is outside the Legal Delta.

Projects proceeding under the CALFED Act would require separate decision documents to include feasibility, site-specific design, and environmental compliance studies. These actions would take at least two to four years prior to start of construction.

2.0 AUTHORIZATION

2.1 CALFED Bay-Delta Authorization Act of 2004

This Act authorized the USACE participation in the CALFED Program. Specifically, Section 103(f)(3) states:

“(A) IN GENERAL. - For purposes of implementing the CALFED Bay-Delta Program within the Delta (as defined in Cal. Water Code section 12220), the Secretary of the Army is authorized to undertake the construction and implementation of levee stability programs or projects for such purposes as flood control, ecosystem restoration, water supply, water conveyance, and water quality objectives.

(B) REPORT. - Not later than 180 days after the date of enactment of this Act, the Secretary of the Army shall submit to the appropriate authorizing and appropriating committees of the Senate and the House of Representatives a report that describes the levee stability reconstruction projects and priorities that will be carried out under this title during each of fiscal years 2005 through 2010.

(C) SMALL FLOOD CONTROL PROJECTS. - Notwithstanding the project purpose, the authority granted under section 205¹ of the Flood Control Act of 1948 (33 U.S.C. 701s) shall apply to each project authorized under this paragraph.

¹ Section 205 is a legislative authority under which the Secretary of the Army, acting through the Chief of Engineers, is authorized to plan, design, and construct certain types of water resources projects without additional and specific congressional authorization. Under this authority, projects are formulated for flood damage reduction primarily, but incidental water resources purposes may be included. Each project is limited to \$7 million Federal funding.

(D) PROJECTS². - Of the amounts authorized to be appropriated under section 109³, not more than \$90,000,000 may be expended to –

(i) reconstruct Delta levees to a base level of protection (also known as the “Public Law 84-99 standard”);

(ii) enhance the stability of levees that have particular importance in the system through the Delta Levee Special Improvement Projects Program;

(iii) develop best management practices to control and reverse land subsidence on Delta islands;

(iv) develop a Delta Levee Emergency Management and Response Plan that will enhance the ability Federal, State, and local agencies to rapidly respond to levee emergencies;

(v) develop a Delta Risk Management Strategy after assessing the consequences of Delta levee failure from floods, seepage, subsidence, and earthquakes;

(vi) reconstruct Delta levees using to the maximum extent practicable, dredged materials from the Sacramento River, the San Joaquin River, and the San Francisco Bay in reconstructing Delta levees;

(vii) coordinate Delta levee projects with flood management, ecosystem restoration, and levee protection projects of the lower San Joaquin River and lower Mokelumne River floodway improvements and other projects under the Sacramento-San Joaquin Comprehensive Study; and

(viii) evaluate and, if appropriate, rehabilitate the Suisun Marsh levees.”

The Act also provided additional funding for program management, oversight, and coordination. Specifically, Section 103(f)(4)(A) states: “Not more than \$25 million may be expended by Secretary or other heads of Federal agencies for program support... tracking of schedules, finances and performance...oversight and coordination...public outreach and involvement...and development of annual reports.”

2.2 Energy and Water Development Appropriations Act of 2006

Through transfer of funds from the U.S. Bureau of Reclamation, the Energy and Water Development Appropriations Act provided funding for preparation of this report. Specifically, it states: “...\$500,000 shall be transferred to the Army Corps of Engineers to carry out the report on levee stability reconstruction projects and priorities authorized under Section 103(f)(3) of Public Law 108-361.”

2.3 Management and Coordination with Other Agencies

This report presents the USACE perspective, plans, roles, and responsibilities for facing the nationally important regional challenges in the Delta. It is consistent with current guidance⁴ to provide capability to facilitate, convene, advise, and work collaboratively with other Federal and State programs in developing solutions that integrate program, policies, and projects across agencies. USACE is to promote and establish effective partnerships with the Secretary of the Interior/Bureau of Reclamation consistent with the existing

² This report will refer to these as project categories to avoid confusion with the common usage of the term “project” by USACE.

³ Section 109: “Authorization of Appropriation. There are authorized to be appropriated to the Secretary and the heads of the Federal agencies to pay the Federal share of the cost of carrying out the new and expanded authorities described in subsections (e) and (f) of section 103 \$389,000,000 for the period of fiscal years 2005 through 2010, to remain available until expended.”

⁴ USACE Regulation, Engineer Circular 1105-2-409, “Planning in a Collaborative Environment.”

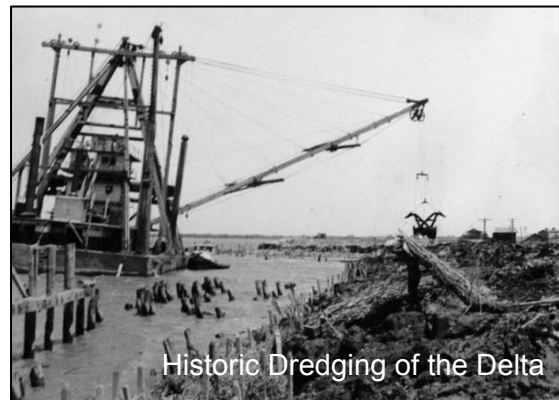
Memorandum of Agreement, and with other Federal and State agencies to include, for example, the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, California Department of Water Resources (DWR), and California Department of Fish and Game, as well as concerned members of Congress and other stakeholders.

3.0 HISTORY AND BACKGROUND

3.1 History of the Delta Levees

The development of the Delta began in 1850 when the Swamp and Overflow Land Act conveyed ownership of all swamp and overflow land, including Delta marshes, from the Federal Government to the State. During the 1850s, levees were built along the river banks by hand and horses to claim land for farming. These levees were improved as necessary, usually using dredged material obtained from the river channels. As farmers worked the land, the organic peat soil decayed and oxidized into dust, causing the interior of the islands to subside and drop below sea level over time. Meanwhile, the levees themselves typically settled and sunk into the soft organic foundation soils, necessitating the regular addition of new material to the levee crests to help maintain levee height. Most Delta islands are now best described as “bowls” rather than islands, with interiors of many islands over 15 feet below sea level, and some as much as 20 feet below sea level. It is important to note, however, that islands on the perimeter of the Delta region are founded on mineral soils, allowing a more stable levee foundation and interior island elevations at or above sea level.

In the late 1870s, developers began to realize that hand- and horse-powered labor could not maintain the reclaimed Delta islands. Steam-powered dredges began to move the large volume of alluvial soils from the river channels to construct the large levees. After World War I, nearly all Delta marshland had been reclaimed and the Delta had been transformed from a large tidal marsh to a series of channels, levees, and islands similar to what exists today.



During the last century, 162 levee failures in the Delta have caused flood damage to Delta islands. In many cases, the flooding proved costly to residents, farmers and the State as a whole. A levee failure at Jones Tract in June 2004, for example, inundated about 12,000 acres causing nearly \$100 million in damages. Around-the-clock emergency crews spent 25 days closing a 500-foot levee breach with 200,000 tons of rock. Six months of continuous pumping operations saved the island. Plate 1 is a map of historic Delta levee failures from 1967 to 2004.

Levee failures in the Suisun Marsh have also occurred with significant impacts to local and statewide interests. In February 1998, 11 exterior levee breaches in the Suisun Marsh inundated more than 22,000 acres.

3.2 Description of the Delta

The Sacramento-San Joaquin Delta (Plate 2) is largely a rural area in a complex maze of tributaries, sloughs, and islands; a transportation network (roads, railroads, and navigation channels); and an altered remnant of the largest estuary on the West Coast. It is a haven for plants and wildlife, supporting more than 750 plant and animal species. The Delta consists of about 738,000 acres of land in six counties, segregated into some 80 tracts and islands with 1,100 miles of levees. As the hub of California's two largest water distribution systems – the Bureau of Reclamation's Central Valley Project and the California's State Water Project – the Delta is critical to the national economy because it supplies drinking water to more than 22 million Californians and irrigation water for more than 7 million acres of some of the most highly productive agricultural land in the world. The Delta also supports a population of more than 500,000 in the cities of Antioch, Brentwood, Isleton, Pittsburg, and Tracy within the Delta, and in other cities adjoining the Delta such as Sacramento, Stockton, and West Sacramento.

Of the 1,100 miles of levees in the Delta, 385 miles are project levees. These levees were improved and incorporated into the Sacramento and San Joaquin Federal Flood Control Projects, and are generally located along the Sacramento and San Joaquin Rivers. The remaining Delta levees are non-project levees and generally do not meet project levee standards. Both project and non-project levees are maintained by local reclamation districts with assistance from the State.

Even with assistance from the State, local reclamation districts have struggled to improve and maintain the critical Delta levees that define the river channels and the State's water delivery systems. Unlike river levees, most Delta levees are in a tidal zone and hold water on a daily basis. Levee instability, erosion, and seepage problems are constant concerns in the west and central Delta. Subsidence adjacent to levees and earthquakes is also a real threat to Delta levees. When Delta levees fail, water rushes in to fill the island, drawing brackish water in from the San Francisco Bay and causing short- and long-term effects to water quality, supply, and conveyance. Flooded islands also impact neighboring islands by increasing the potential for seepage and erosion.

Despite the constant risks to Delta levees, these levees are generally successful at holding back water every day. Soft foundation conditions and seismic risks are concerns in the west and central Delta, but do not pertain to the Delta region as a whole. Levees in the south and perimeter of the Delta region usually have a more firm foundation of mineral soils, and are further away from the most active earthquake faults.

3.3 Description of the Suisun Marsh

Bordered on the east by the Delta, Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America. Comprising about 116,000 acres, the Suisun Marsh managed wetlands are a mosaic of public and private ownerships protected by 220 miles of fragile levees. The marsh's mix of salty Bay water and fresh Delta water creates a unique brackish marsh ecosystem that represents the nation's largest contiguous brackish marsh and ten percent of California's remaining natural marshland.

Most of the levees protecting this resource were constructed more than 100 years ago with limited engineering and consideration for their soft structural foundations. These

levees protect managed wetlands, habitat, and infrastructure. Only 3.5 miles of Suisun Marsh levees fall within the Legal Delta and are eligible for maintenance under the State's Delta Levees Maintenance and Subventions Program. Only 20 miles of levees are eligible to participate in the California Department of Water Resource's Special Projects Program (AB-360). Consequently, nearly 200 miles of exterior levees in the Suisun Marsh are publicly or privately maintained without financial assistance from existing levee maintenance programs. Daily, these levees are subjected to wind erosion, storm events, wave action, rodent damage, settlement, and other physical and environmental stressors.

3.4 The CALFED Program

By the 1990s, the Delta was no longer reliable as a water supply source, and it was also failing as an ecosystem to sustain many species of concern. Stakeholders, regulators, and policymakers were unable to agree on a course of action for the Delta region. In June 1994, twenty five State and Federal agencies with management and regulatory responsibilities in the Delta signed a Framework Agreement and formed CALFED. This unique multi-agency team representing agricultural, environmental, urban, fishery, water supply and business interests committed to adopting mutually acceptable water quality standards and to developing long-term strategies addressing fish and wildlife, water supply reliability, levee stability and water quality needs. A list of CALFED participating agencies is provided in Appendix A.

The purpose of CALFED's three-phase program is to develop a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. Phase 1 was completed in September 1996, identifying three preliminary categories of solutions for Delta water conveyance. Phase II was completed with the publication of the Final Programmatic Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) and signing of the ROD on August 28, 2000. The ROD was adopted as a joint Federal-State guiding document and defined the programmatic plan. The CALFED Program is now in Phase III -- implementation of the preferred alternative.

The USACE participated in CALFED at its inception by providing technical expertise in levee system integrity and water resource planning. The USACE management at the District and Division levels participated in defining the program. During Phases 1 and 2, District staff helped to prepare initial and interim CALFED reports, the Programmatic EIS/EIR, and the LSIP. CALFED determined that the Delta levee system is critical to all CALFED objectives and named USACE as the Federal lead of the LSIP.

3.5 Ongoing Problems and Needs

The aging Delta levee system is subject to risks from high inflows during storm events, high tides (particularly during high flow events), high winds, low capacity of adjacent channels due to sedimentation, earthquakes, wind waves and erosion, waves generated by boat and ship traffic, subsidence, seepage, burrowing animals, sea level rise, and inadequate maintenance practices and funding.

Maintenance and improvement of Delta levees is very difficult and costly, and is the responsibility of the local levee reclamation districts. Funding has not been adequate due to the reclamation districts' low tax bases of predominately agricultural lands. If maintenance and improvement needs are not met, levees will fail at an increasing rate due to ongoing

processes such as levee settlement and sea level rise. Levee failures are extremely costly to repair, and the potential extended economic consequences of levee failures are enormous. Over the years, the efforts to respond to the ongoing maintenance and improvement needs have addressed only a very small part of a growing problem. In 2000, CALFED estimated that it would cost about \$1.3 billion to improve all Delta levees to the base level Delta Public Law (PL) 84-99⁵ standard, which does not even equate to 100-year flood protection.

The Delta PL 84-99 standard was developed by USACE for non-Federal levees in the Legal Delta to be considered eligible for post-flood rehabilitation under the National PL 84-99 program. The supplemental guidelines⁶ for the Delta PL 84-99 standard call for 1.5 feet of freeboard above the 100-year flood stage, a 16-foot crown width with an all-weather patrol road, a minimum water side slope of 1V:2H, and a minimum land side slope dependent upon the levee height and depth of peat.

Late February 2006, the Sacramento Chapter of American Society of Civil Engineers issued a “report card” that rated the condition of Central Valley levees based on their condition, past flood performance and future capacity, maintenance, age, flood preparedness, amount of property protected by levees and presence of a master plan for their improvement. Delta levees received an “F” grade⁷.



Delta Levee Breach, 1986

Because exact risks from catastrophic flooding and/or seismic events are unknown, the State of California DWR has initiated a Delta Risk Management Strategy (DRMS) study, which is scheduled for completion in December 2007. A catastrophic earthquake in or near the Delta might cause multiple levee failures that would draw seawater into the Delta, rendering the water unfit for irrigation or human consumption until levees are repaired and the brackish water is flushed from the Delta. Water supply to the Bay Area and Southern California could be impacted for months.

⁵ This refers to the National PL 84-99, the USACE’s authority pursuant to Section 5 of Public Law 77-288, as amended by Public Law 99, 84th Congress, to provide emergency activities whenever and wherever required to any natural disaster; flood fighting and rescue operations; post flood response; emergency repair and restoration of flood damaged or destroyed flood control works such as levees and emergency protection of Federal shore protection structures damaged or destroyed by wind, wave, or water action of other than ordinary nature.

⁶ From “Guidelines for Rehabilitation of Non-Federal Levees in the Sacramento-San Joaquin Legal Delta,” USACE 24 March 1988. Freeboard is the vertical distance between the design water level and top of dam or levee. It is also a factor of safety usually expressed in feet above a flood level for purposes of designing flood protection facilities and for floodplain management. Freeboard is used to compensate for the many uncertain factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action and bridge obstructions. Side slope of 1V:2H is a side of a levee that is shaped into a slope formed by 1 vertical unit by 2 horizontal units such as a side slope of 1V:1H, 1 foot vertical by 1 foot horizontal, forming a 45 degree slope.

⁷ From the February 22, 2006 article by Matt Weiser of the Sacramento Bee.

The DWR completed a preliminary study⁸ last year that simulated the potential effects of a plausible magnitude 6.5 earthquake along the perimeter of the Delta, an event similar in probability to that experienced in the New Orleans area from hurricanes Katrina and Rita. The study cited preliminary estimates of \$30 to \$40 billion in costs to the state-wide economy over a 5-year period due to catastrophic effects to communities, properties, infrastructure, gas and power lines and transportation and water service interruptions, losses, and contamination

Urbanization and land use are significant concerns. While it is important to protect lives and property in existing areas, it is also important for the USACE to avoid inducing further development in floodplains and wetlands by improving levees. Executive Order 11988 requires Federal agencies to avoid to the extent possible the long- and short-term adverse effects associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain



development wherever there is a practicable alternative. In accomplishing this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities.”

The USACE was last involved in levee improvement projects in the Delta in the 1960s with construction of the Sacramento and San Joaquin River Flood Control Projects. Since then, USACE involvement in the Delta has been related to emergency flood fight and recovery and maintenance of the navigation channels. The USACE has studied the Delta when limited funds were available, but has never been able to develop a comprehensive Delta plan within existing authorizations and policies. The main challenges have been the lack of sufficient economic justification and the lack of non-Federal cost-sharing partners with funds.

The USACE needs to develop a joint local/State/Federal Delta emergency response plan to coordinate their activities. While the State and local agencies are responsible for the first line of defense and responsiveness in emergency actions, when asked, USACE is ready to assist in flood fighting. Local interests (reclamation districts, counties, and cities) are responsible for emergency warning systems and evacuation. The State will assist these efforts when local resources are insufficient.

⁸ “Preliminary Seismic Risk Analysis Associated with Levee Failures in the Sacramento San Joaquin Delta”, revised May 16, 2005, report by J. R. Benjamin and Associates for California Bay Delta Authority and California Department of Water Resources.

3.6 Opportunities for Delta Improvement

Based on the ongoing problems and needs in the Delta, some of the opportunities for improvement include:

- Reduce the risk to life and property from catastrophic breaching of Delta levees including associated economic activities, water supply, infrastructure, and the ecosystem.
- Promote and support land use planning that sustains valued resources and avoids future urban development in the vulnerable areas in the Delta.
- Promote and support ecosystem restoration and protection of the Delta's environmental assets, water quality, and critical habitat of special status species.
- Improve joint Delta emergency response and coordination; update and clarify roles and responsibilities; and enhance communications and public education.
- Promote beneficial reuse of dredged materials, especially as it relates to the existing Federal navigational channels in the Delta and the Delta ports.

4.0 RELATED DELTA STUDIES AND REPORTS

Numerous studies and reports related to the Delta have been prepared over the years by Federal, State, and local agencies. Major past reports and ongoing studies related to Delta levees are listed in Appendix B.

5.0 OVERVIEW OF ACTION STRATEGIES FOR DELTA

Given the serious need to reconstruct Delta levees, the USACE developed action strategies to address levee improvements and assigned priorities that could be carried out under the CALFED Act through 2010. This is known as the short-term CALFED Levee Stability Program. The long-term strategy for the Delta levees will be developed as part of the Sacramento-San Joaquin Delta Islands and Levees Feasibility Study.

Project categories in the CALFED Act include (1) reconstructing Delta levees to base level protection; (2) further enhancing the stability of levees that have State-wide importance; (3) developing best management practices to control subsidence; (4) developing a Delta levee emergency management and response plan to enhance emergency and readiness response; (5) developing a DRMS after assessment of the consequences of potential Delta levee failures; (6) reconstructing Delta levees using dredged materials to the maximum extent practicable; (7) coordinating levee projects with existing levee and water resources projects; and (8) evaluating and rehabilitating the Suisun Marsh levees, if appropriate.

The CALFED Act authorizes the appropriations of a total of \$90 million from FY 2005 through FY 2010 for the Federal share of these project categories. The USACE received overwhelming response in its requests from Delta interests for levee stability proposals. Of

the 68 submittals received, 54 were considered to be potential projects and were evaluated and assigned priorities. The 54 potential project proposals represented over \$1 billion in estimated project costs.

Under the CALFED Act, the Section 205 Small Flood Control Projects authority would be used to implement projects without regard to the project purpose. Since Federal participation under the Section 205 authority is limited to \$7 million per project and assuming that cost-sharing is 65 percent Federal and 35 percent non-Federal, only 35 of the 54 proposed projects fall within the scope of the Section 205 authority. These prioritized 35 potential projects comprise the short-term strategy, which is presented in Section 6.0.

Under the CALFED Act and Section 205 authority cost limit, only a small portion of the identified levee needs would be addressed. Other levee needs identified within this report would require non-Federal implementation or may be considered as part of the long-term strategy.

The USACE long-term strategy for Delta levees will be developed in the Sacramento-San Joaquin Delta Islands and Levees Feasibility Study. This Feasibility Study will build on recommendations in the State's DRMS. The DRMS is a technical study that is assessing the risks to the Delta levee system and the associated effects of levee failures. Details of the long-term strategy are described in Section 7.0.

USACE will address the project categories in the CALFED Act as part of both the short- and long- term strategies as follows:

- “reconstruct Delta levees to a base level of protection (also known as the ‘Public Law 84-99 standard’).” This is the primary emphasis of the short-term strategy and the authorized \$90 million Federal funds. Although the Delta PL 84-99 standard is not a 100-year level of protection and is considered a minimal standard, CALFED identified the need to reconstruct Delta levees to this base level of protection to meet multiple planning objectives. There is an immediate need to improve levees to this standard to help prevent levee failures at even normal water levels in the Delta. The \$90 million would only address a small percentage of the work required to bring all the Delta levees up to the PL 84-89 standard, therefore this project category is also considered a part of the long-term plan.
- “enhance the stability of levees that have particular importance in the system...” CALFED has identified levees of particular importance in the system, including those that protect water quality, lives, and critical infrastructure. The short-term strategy priority list includes two projects that propose improving levees beyond the base level of protection, but the majority of Special Improvement Projects will be defined as part of the DRMS study, a part of the long-term strategy.
- “develop best management practices to control and reverse subsidence...” The State's DRMS will address the development of best management practices to control subsidence. DRMS is part of the long-term strategy.
- “develop a Delta Levee Emergency Management and Response Plan...” Efforts are needed to enhance the ability of local, State, and Federal agencies to rapidly respond to levee emergencies. Two projects on the priority list are part of the short-

term strategy, but this element will also be addressed as part of the DRMS and long-term strategy.

- “develop a Delta Risk Management Strategy...” The DWR has initiated an effort to develop the DRMS. The DWR study will assess risk to lives, property, the water conveyance system, and key infrastructure in the Delta. The DRMS will be an integral part of the USACE Delta Islands and Levees Feasibility Study, the key to the USACE’s long-term strategy.
- “reconstruct Delta levees using, to the maximum extent practicable, dredged materials...” The beneficial reuse of dredged material for levee reconstruction addresses both the need to maintain channels for navigation and the need for material to improve levees in the Delta. Dredged materials will be used for levee reconstruction whenever practicable. In many cases, environmental concerns related to the potential water quality effects of reuse of dredged materials limit their use. The USACE Pinole Shoal Management (Delta Long Term Management Strategy [LTMS]) study will address these concerns system-wide for the beneficial reuse of dredged materials as part of the long-term strategy.
- “coordinate Delta levee projects with flood management, ecosystem restoration, and levee protection projects...” All efforts to improve Delta levees will require the USACE to coordinate with existing levee and water resources projects in and around the Delta. Both the short-and long-term strategies will address this project category.
- “evaluate and, if appropriate, rehabilitate the Suisun Marsh levees.” The Suisun Marsh levees will be evaluated as part of the State’s DRMS Study, a part of the long-term strategy. One potential project in the Suisun Marsh is included on the short-term strategy priority list.

6.0 SHORT-TERM STRATEGY

The short-term strategy is to implement high priority projects within the Section 205 funding limit. Federal funding of \$90 million is authorized in the CALFED Act. The next section explains and presents the priority list of proposals, and Section 6.2 describes how these proposals would be implemented.

6.1 Priority Lists

A multidisciplinary team of USACE and State experts evaluated 68 project proposals and identified 54 for further evaluation. Details on the evaluation are provided in Appendix C, Development of Project Priorities. The 14 project proposals that were not further evaluated are also shown in Appendix C.

The following summarizes the prioritization process:

A priority ranking of High, Medium, or Low was assigned to each proposal relative to the other proposals received. A priority ranking of Medium was used as a starting point. Beneficial and adverse considerations were identified for each proposal. These considerations were subjectively weighed against each other to assign a final ranking. If

beneficial considerations substantially outweighed the adverse considerations, a High ranking was assigned. If adverse considerations substantially outweighed the beneficial considerations, a Low ranking was assigned.

The proposals were further divided according to whether or not a Statement of Intent to cost share the proposed project with USACE was provided. USACE will require a cost-sharing partner for every proposal that is further investigated and implemented, and a letter of intent is evidence of willingness to participate and cost share with the USACE. Table 1 shows the logic of the rankings of the proposal groups.

Table 1. Priority Groups

Priority Group	Statement of Intent	Priority Ranking
A1	Yes	High
A2	Yes	Medium
B1	No	High
B2	No	Medium
C1	Yes	Low
C2	No	Low

The proposals were then screened based on whether the maximum submitted cost estimate was below or above \$11 million per project. For this screening, a 65/35 Federal/non-Federal cost share and the \$7 million Federal maximum contribution specified in the Section 205 authority were assumed to approximate a total project cost of \$11 million. The list of proposals with a total cost of \$11 million or less is known as “List 1,” and is summarized in Table 2. Potential projects from List 1 comprise the short-term strategy for the \$90 million Federal funding. “List 2” is the prioritized list of all submitted proposals, including projects with cost estimates greater than \$11 million. List 2 is presented in the event that the existing authorization is modified or non-Federal implementation is pursued. Details of both List 1 and List 2 are presented in Appendix C.

Proposals in Priority Groups A1 and A2 of List 1 would be given priority by the USACE, subject to the availability of funding. Proposals in Priority Groups B1 and B2 would be given priority if a letter of intent indicating willingness and ability to cost-share each proposal is received from an eligible non-Federal sponsor, subject to the availability of funding. Proposals in Priority Groups C1 and C2 would be given low priority and are not recommended for expedited implementation because of substantial policy issues, project cost and scope, and/or the potential for encouraging additional floodplain development. Additional evaluation is required before these projects can be assigned a higher priority.

Plate 3 is a map that shows the general locations of potential projects and their priorities.

TABLE 2

Summary of List 1 - Proposals with Submitted Costs of \$11 Million or Less

Priority Group	Potential Sponsor	Description	Statement of Intent?	Positive Factors	Negative Factors	Priority
A1	Bethel Island Municipal Improvement District (BIMID)	Levee improvements at Horseshoe Bend	Y	Western island, Existing population and development		H
	Brannan-Andrus Levee Maintenance District	Levee improvements		Existing population and development (Isleton), State Highway 12		
	California Department of Water Resources and The Nature Conservancy	McCormack-Williamson Tract flood control and ecosystem restoration improvements		Innovative solution, Interstate 5, Environmental benefits		
	RD 830 - Jersey Island	Levee improvements		Western island, Utility infrastructure, Adjacent to developed islands		
	RD 1607 - Van Sickle Island	Levee improvements		Environmental benefits, Important habitat, Salinity gates		
	RD 2059 - Bradford Island	Levee improvements		Western island, Important habitat, Agricultural benefits		
	San Joaquin County Office of Emergency Services (flood contingency)	Flood contingency and evacuation engineering		Non-structural floodplain management alternative		
A2	RD 2025 - Holland Tract	Levee improvements	N	Western island, Cost-effective		M
	RD 2026 - Webb Tract #1&2	Levee improvements		Western island		
	RD 2028 - Bacon Island	Levee improvements		Water quality importance		
	South Delta Water Agency	Dredging and Stark Tract levee improvements		Water conveyance, Agricultural benefits		
	RD 2033 - Brack Tract	Levee improvements		Important habitat, Ecological reserve		
	San Joaquin County Office of Emergency Services (wastewater facility)	Stockton Regional Wastewater Control Facility flood protection		Non-structural floodproofing alternative	Would not eliminate need for levees	
B1	RD 369 - Town of Locke	Levee improvements	N	Historic significance, At-risk population		H
	RD 2040 - Victoria Island	Levee improvements		Water Q/S importance, Infrastructure, Cost-effective		
	RD 2072 - Woodward Island	Levee improvements		Water conveyance, EBMUD aqueduct		
B2	Drexler Tract	Levee improvements	N	State Highway 4, Agricultural benefits		M
	RD 684 - Lower Roberts Island	Levee improvements		Utility infrastructure, Cost-effective		
	RD 2023 - Venice Island	Levee improvements		Water Q/S importance, Infrastructure, Cost-effective		
	RD 2038 - Lower Jones Tract	Levee improvements		Agricultural benefits		
	RD 2090 - Quimby Island	Levee improvements		Agricultural benefits		
	RD 2111 - Dead Horse Island	Levee improvements		Agricultural benefits		
	RD 2117 - Coney Island	Levee improvements		Water conveyance, Agricultural benefits		
C1	RD 554 - Walnut Grove	Levee improvements	Y	Natl Reg historic site, Existing population and development	Estimated cost is too low to be efficient as a Corps project	L
	RD 1608 - Lincoln Village West	Dredging for maintenance and emergency access to levee		Existing population and development	Temporary measure primarily for purposes of maintenance	
	RD 2026 - Webb Tract #3	Restore dredge cut		Environmental benefits	High cost for env. benefit, Stability benefit uncertain	
	RD 2065 - Veale Tract	Levee improvements		Agricultural benefits	Potential floodplain development	
	RD 2074 - Brookside Estates	Rock bank protection on existing levees		Existing population and development	Need for rock on backup levee not substantiated.	
	RD 2139 - Can Can/Greenhead	Levee improvements		Important habitat	Estimated cost is too low to be efficient as a Corps project	
C2	Association of Bay Area Governments (ABAG)	Investigation of: flood risks to Bay Area infrastructure; use of dredged material for levee repairs; mitigation areas for levee repairs; and non-structural flood control remedies	N		Study only	
	RD 307 - Lisbon	Sacramento River bank protection			Outer fringe of Delta	
	RD 2024 - Orwood Palm Tract	Levee improvements			Potential floodplain development	
	RD 2113 - Fay Island	Levee improvements		Agricultural benefits	Single primary beneficiary/owner	
	RD 2119 - Wright Elmwood Tract	Levee improvements		Agricultural benefits	Potential floodplain development	
	Shin Kee Tract	Levee improvements			Single primary beneficiary/owner	

6.2 Implementation of Short-Term Projects

Using USACE's expedited process for continuing authority projects, feasibility and design analyses would be conducted for levee stability projects prior to construction. The continuing authority process would generally consist of the following major steps:

Upon request of a potential non-Federal project sponsor, the USACE would conduct a reconnaissance-level evaluation in a 6 to 12-month time frame to determine whether there is a Federal interest in the proposed project. Factors to be evaluated would include whether the cost of the project would likely be justified by monetary and non-monetary benefits, and whether the project would meet other USACE policies for Federal participation. The cost of this initial evaluation would be entirely funded by the USACE and limited to \$100,000. With this funding, the USACE would also develop a project management plan (including a scope, schedule and budget) and a draft cost-sharing agreement for a feasibility-level analysis called a Detailed Project Report (DPR).

The DPR would be cost-shared 50% Federal and 50% non-Federal with each project sponsor. That report would include an evaluation of project alternatives, completion of an environmental assessment and other environmental compliance requirements, and preparation of preliminary plans, a detailed cost estimate, and a quantitative evaluation of project benefits. To address the cumulative environmental impacts associated with implementing the short-term projects, the existing CALFED EIS/EIR would serve as the programmatic EIS/EIR. Completion of the DPR may require 12 to 24 months or more, depending upon the size and complexity of the proposed project and the environmental or other issues that may need to be resolved. The cost of the DPR would also vary accordingly.

DPR's are usually approved at the USACE Division (regional) level. After approval of a DPR, detailed plans and specifications would be prepared in approximately 6 to 12 months. Prior to construction, a project cooperation agreement would be prepared and signed by the USACE and each project sponsor. After the project sponsor acquired any necessary lands or easements, the project would be constructed under contract to the USACE, with the sponsor participating in the management of the project. Cost-sharing requirements for design and construction could vary depending upon the project purpose(s). Single-purpose flood damage reduction projects would require a minimum non-Federal share of 35%.

After construction, the completed project would be turned over to the sponsor for operations, maintenance, repair, replacement and rehabilitation (OMRR&R). The completed project may be periodically inspected by the USACE to ensure that OMRR&R requirements are met by the sponsor.

7.0 LONG-TERM STRATEGY

While \$90 million in authorized Federal funding for this short-term strategy is an important first step, it does not fully address the urgent needs in the Delta levee system. As USACE and Delta stakeholders continue to work to improve Delta levees to reduce the threat of catastrophic failure, the development of a long-term plan for the Delta is critical.

The long-term plan for the Delta needs to be based on future land-use decisions related to development, agriculture, habitat, recreation, and other land uses, as well as the determination of which levees are essential for water conveyance. DWR has begun several initiatives to help develop the long-term plan; the DRMS, and a Delta Vision process. The DRMS is a technical study that will evaluate current and future risk to the Delta levees, identify impacts to beneficiaries, and develop management strategies and potential projects and priorities. Completion of this study is scheduled for late 2007. The DRMS study forms the basis for developing the USACE long-term strategy in the Delta, the Delta Islands and Levees Feasibility Study.

The Delta Islands and Levees Feasibility Study will address all CALFED Act project categories cited in Section 2.1 of this report, and will assess existing and future flood risks in the Delta as well as water supply, ecosystem restoration, and recreation needs. The Study will develop a multi-purpose system-wide plan including the Levee System Integrity Program (LSIP) and ecosystem restoration; address seismicity, economics, water quality, and other issues; develop an adaptive management plan; develop an emergency response and evacuation plan with State and local agencies; and use collaborative procedures. Scheduled to begin in June 2006, this study will provide a comprehensive vision and roadmap for future USACE participation in the Delta.

The USACE Pinole Shoal Management (Delta Long-Term Management Strategy [LTMS]) study is also part of the long term strategy presented in this report. CALFED estimates that up to 5 million cubic yards of material may be needed to fortify Delta levees, and the beneficial reuse of dredge material from Federal and non-Federal dredging activities in the Delta would provide an important building block for this purpose. The Pinole Shoal Management (Delta LTMS) study will plan and implement a long-term management strategy for dredged material placement in the Delta region in order to 1) conduct dredging activities in the Delta in an environmentally sound manner to assure regional economic viability, 2) promote beneficial reuse of dredged material specifically for levee reconstruction and environmental restoration, and 3) promote regulatory cooperation and coordination for dredging activities in the Delta.

8.0 SCHEDULE AND BUDGET FOR FY 2006 - FY 2010

The proposed funding and activities for FY 2006 through 2010 are discussed below and summarized in Tables 3 and 4. Table 3 shows proposed USACE funding for the CALFED Act, which includes the CALFED Levee Stability Program and CALFED Act program management, oversight, and coordination. Table 4 shows USACE funding for ongoing/proposed USACE activities under other authorities, which includes the Delta Islands and Levees Feasibility Study and the Pinole Shoal Management Study (Delta LTMS). Integral to Federal funding, the California Governor's proposed budget plan for the Delta is included in Appendix D. This budget indicates the level of support for the Delta levees by the Governor's office.

**Table 3 - Proposed USACE Funding for CALFED
Levee Stability Program⁹ (\$ millions)**

Activity	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	Total
Prepare Report to Congress	0.5	0	0	0	0	0.5
Levee Stability Program per Sec103(f)(3)(D)	0	6.0	18.0	32.0	44.0	90.0
Coordination per Sec 103(f)(4)(A)	0	1.0	1.0	1.0	1.0	4.0

**Table 4 - USACE Funding for Ongoing/Proposed USACE Activities
under Other Authorities¹⁰ (\$ millions)**

Activity	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011+ 2012	Total
Delta Islands and Levees Feas Study (includes Delta Risk Mgmt Strategy)	0.25	2.0	2.75	1.0	-	-	6.0
Pinole Shoal Mgmt Study(Delta LTMS)	0.476 ¹¹	1.0	1.0	1.05	1.103	2.374	7.0

8.1 FY 2006

USACE ongoing activities for FY 2006 include:

- \$250,000 for Sacramento-San Joaquin Delta Islands and Levees, CA, to execute a Feasibility Cost Share Study Agreement (FCSA), initiate the feasibility study, and to coordinate with DWR's DRMS.
- \$100,000 for Sacramento-San Joaquin Delta, CA, Special Study, which is currently on hold.
- \$94,000 for ongoing oversight and coordination efforts related to CALFED.
- \$222,000 to the Pinole Shoal Management (Delta LTMS) Study to develop the long term management strategy for dredged material in the Delta in coordination with other agencies.
- \$500,000 was appropriated to the U.S. Bureau of Reclamation by the Energy and Water Development Appropriations Act of 2006 to give to the USACE to initiate and complete this report to Congress to prioritize levee stability reconstruction projects that would be carried out under PL 108-361.

9.0 VIEWS OF PARTNERS AND STAKEHOLDERS

Partners, Stakeholders, and the Paterno Lawsuit - Two recent California court decisions have dramatically increased the fiscal liability of public agencies for flood damages. In *Arreola vs. Monterey County*, the Sixth Circuit Court of Appeal ruled that local

⁹ Consistent with Public Law 108-361.

¹⁰ Consistent with Public Law 108-361, CALFED Program, and Record of Decision.

¹¹ Includes \$253,531 carryover.

flood control agencies can be held liable for project failures attributable to a deliberate failure to maintain the system.

In *Paterno vs. State of California*, the Third District Court of Appeal held the State liable for damages from a 1986 Yuba County levee failure attributed to defects in a levee foundation that existed when the levee was built by local agricultural interests in 1905, and which had not been corrected when the levee was modified by USACE in 1934 and 1940, or when the State incorporated it within its flood control system in 1953. The court concluded that the State was aware of a risk of failure from the levee, or could have learned of such a risk, through inspection.

Based on the current rulings in the *Paterno* case, the State faces an unknown, but potentially substantial liability in the event of future floods. The result is the State's reluctance to sign agreements as the non-Federal partner for projects, and further assume responsibility for long-term operation and maintenance. The State has, however, expressed willingness to cost-share under sub-agreements with local entities or reclamation districts.

In response to the USACE's request for potential Delta levee proposals for the federally authorized \$90 million, some potential sponsors mentioned their reservations in providing a letter of intent and submitting proposals. In addition, Delta stakeholders expressed the following views:

- Based on the lack of prior Federal/USACE funding commitments to the Delta, they doubt Federal/USACE follow-through.
- Local funds for maintaining the levees are often limited, and the cost of maintenance increases as levees continue to deteriorate.
- Reclamation districts indicate that they could repair their levees themselves at less cost than their 35 percent cost share requirement with the USACE.
- Reclamation districts are concerned that they cannot even afford the 35 percent cost share.
- They prefer to have Federal funding as a grant without engineering evaluations and studies.
- The Federal/USACE processes take too long.
- The minimum level of flood reduction indicated in the CALFED ROD does not even meet the FEMA 100-year level of flood protection.
- They do not want the liability for future levee breaches and repairs.
- They prefer a 200-year level of flood protection so they can build homes and generate revenues for the reclamation district.
- They prefer to have the Federal Government, all Delta water users, and environmental groups pay for levee rehabilitation and annual levee maintenance.

- Clear and accurate conditions of the levee system and related hydrodynamics are unknown as are related risks to public safety, water supply reliability, and water quality. Updated information on hydrology, improved hydrodynamic models, and geotechnical investigations is needed as a basis for defining practical objectives and standards for levee improvements.

The draft of this report was released to the public on 24 March 2006, and comments were accepted until 17 April 2006. USACE also held a public meeting in the Delta (Walnut Grove) on 11 April 2006. Overall, comments received were favorable regarding USACE assistance in the Delta. Some comment letters offered additional information in response to the priority ranking that a specific proposal received in the Draft, and USACE reconvened the proposal evaluation team to consider any new information. Some letters simply expressed support of specific proposals, but most letters suggested changes or additions to the report itself. Comment letters are included in Appendix E, along with general responses. Some comments received during the public comment period are summarized below.

- They didn't know about the \$7 million Federal cost limit in Section 205, the assumed \$11 million total project cost, and how the \$11 million was used in prioritizing the project proposals.
- They didn't know that induced development was against USACE policy.
- Appreciation that USACE will not improve levees just to allow new development.
- They questioned the USACE proposal priorities.
- The Delta is not a homogeneous region – while some levees are founded on soft peat soils and have island interiors below sea level, the southern and perimeter areas of the Delta have levees that are founded on more stable mineral soils and have island interiors that are not below sea level.
- Agricultural interests were not adequately represented on the USACE proposal evaluation team.
- Suisun Marsh should be described in more detail.

10.0 CONCLUSIONS

The major conclusions of this report are:

- There is a serious need for short-term actions and a long-term strategy to improve levee stability in the Delta because people's lives, properties, and vital resources of statewide and national importance are threatened.
- Concurrent with short-term actions, a long-term vision for the Delta must be developed in concert with all Delta stakeholders.
- The authorized \$90 million in Federal funds provides an essential first step toward addressing Delta-wide levee system needs.

- Projects selected from the prioritized list would require site-specific design, environmental compliance work, and a determination of Federal interest in accordance with the USACE water resources policies and regulations before construction.
- Only a small portion of the identified levee needs would be addressed under the Section 205 authority funding limit.
- The Delta Islands and Levees Feasibility Study will define the long-term strategy for Delta levee system improvement.
- As requested in the CALFED Act, a list of levee stability reconstruction projects and priorities has been developed. Table 2 is presented again to summarize the prioritized project proposals with submitted costs of \$11 million or less.

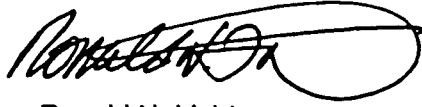
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	RD 2033 - Brack Tract	Levee improvements		Important habitat, Ecological reserve		
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	RD 2072 - Woodward Island	Levee improvements		Water conveyance, EBMUD aqueduct		
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	RD 2023 - Venice Island	Levee improvements		Water Q/S importance, Infrastructure, Cost-effective		
	RD 2038 - Lower Jones Tract	Levee improvements		Agricultural benefits		
	RD 2090 - Quimby Island	Levee improvements		Agricultural benefits		
	RD 2111 - Dead Horse Island	Levee improvements		Agricultural benefits		
	RD 2117 - Coney Island	Levee improvements		Water conveyance, Agricultural benefits		
C1	RD 554 - Walnut Grove	Levee improvements	Y	Natl Reg historic site, Existing population and development	Estimated cost is too low to be efficient as a Corps project	L
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	RD 2026 - Webb Tract #3	Restore dredge cut		Environmental benefits	High cost for env. benefit, Stability benefit uncertain	
	RD 2065 - Veale Tract	Levee improvements		Agricultural benefits	Potential floodplain development	
	RD 2074 - Brookside Estates	Rock bank protection on existing levees		Existing population and development	Need for rock on backup levee not substantiated.	
	RD 2139 - Can Can/Greenhead	Levee improvements		Important habitat	Estimated cost is too low to be efficient as a Corps project	
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	RD 307 - Lisbon	Sacramento River bank protection			Outer fringe of Delta	
	RD 2024 - Orwood Palm Tract	Levee improvements			Potential floodplain development	
	RD 2113 - Fay Island	Levee improvements		Agricultural benefits	Single primary beneficiary/owner	
	RD 2119 - Wright Elmwood Tract	Levee improvements		Agricultural benefits	Potential floodplain development	
	Shin Kee Tract	Levee improvements			Single primary beneficiary/owner	

11.0 RECOMMENDATION

In response to the CALFED Act, the results in this report indicate a strong potential to implement levee stability projects in the Delta under the Section 205 authority, as applied by the Act. Given the serious need for levee reconstruction in the Delta where public safety, critical infrastructure, and other property are at risk, I recommend that this report be forwarded to Congress in response to Section 103(f)(3)(B) of the Act.

A handwritten signature in black ink, appearing to read "Ronald N. Light", with a large, sweeping flourish at the end.

Ronald N. Light
Colonel, Corps of Engineers
District Engineer