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October 24, 2014

Via e-mail
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Randy Fiorini
Chairman
Delta Stewardship Counsel

Re: Delta Levee Investment Strategy

Dear Randy:

Your notes capture the substance of our discussion, however, I have attempted herein to add some clarification and detail. Our discussion and these comments also address the Draft Delta Investment Strategy.

There are basically two types of flood risks affecting the Delta. Delta pool risks where the land surface is near or below the usual water level and the riverine risks resulting from high river flows. Although there is some overlap, the Delta pool risks are always present and the riverine risks relatively infrequently, like once every 10-20 years.

The traditional approach to acceptable risk and level of protection from flooding treated so-called agricultural levees differently than urban levees. The definitions are not clear. FEMA uses a population of 10,000 or more to define an urban or urbanizing area and the issue of desired level of protection remains as to smaller communities where population is significant but less than 10,000.

Levee systems/segments are further categorized for regulatory purposes and disaster responses into project and nonproject levees. Project levees are basically those levees built or improved by the USACE as part of a federally authorized flood control project. For the Delta, most of the project levees are along the main channels of the Sacramento and San Joaquin

Rivers. Some project levees are agricultural levees and some are urban. The standards for construction of project levees by the USACE have varied as to agricultural and urban levees and have varied even within the agricultural and urban grouping.

Project levees are regulated by the Central Valley Flood Protection Board (formerly the Reclamation Board) which is typically the non-federal sponsor on project levees and by the USACE. The USACE role is mixed and confused. Contracts define the relationships involving the USACE, the CVFPB and the LMA and there are operation and maintenance manuals for the various project levee units. The O&M manuals were intended to be the subject of agreement among the parties. The regulation by the Board and USACE has become increasingly inconsistent. In recent years the USACE has transitioned from a positive "can do" and "will help" flood protection orientation to a "will not do" and even obstructive orientation. For project levees and other levees qualifying for PL84-99 coverage, restoration assistance after a disaster or flood is not available from FEMA and must come from the USACE. The USACE has progressively developed policies which reduce their willingness to assist with restoration. Maintenance deficiencies, cost benefits and even artificial definitions of what is a flood could result in no USACE restoration assistance to even major urban areas. This will also result in no FEMA assistance. Although the availability of FEMA restoration assistance has also transitioned, there is currently a more reasonable and helpful approach from FEMA than from the USACE. Reliance on the USACE for rehabilitation assistance to agricultural areas after a flood will more than likely result in no assistance.

As the general desire to reduce the risk of flooding for levee protected areas has increased, the ability to reduce such risk is diminishing due in great part to changes in policy and regulatory restrictions.

Delta Levee Assistance Programs

The historic urban areas are in major part protected by Project levees. The ability to pay towards levee protection is much greater in urban areas than in agricultural areas. State and federal funding for improvement of urban levees has historically been more readily available than for agricultural areas although the interrelationship of impacts has always existed.

For non-project levees in the Delta, State and federal funding was essentially limited to federal disaster assistance until the 1980s when major flooding occurred and State OES and FEMA assistance was provided. Significant Delta levee assistance for other than disasters did not occur until after the 1982 referendum on the peripheral canal. Starting in about 1965, the State commitment to build an isolated connection between the Sacramento River and the export pumping facilities near Tracy was and still is a major factor in the way levees in the Delta are viewed. To some, the isolated facility would facilitate allowing salinity intrusion to be

controlled only for the protection of water quality at the Sacramento River Peripheral Canal/tunnels intakes thus resulting in abandonment of the Delta and the Delta Levee systems.

Priorities For Funding

When the first major Delta levee assistance program funding was secured (Delta Flood Protection Act of 1988), it was directed at non-project levees in the Delta. The priority was achieved by dividing the funding; one-half for non-project levee subventions throughout the Delta and one-half for DWR special projects directed primarily at the western Delta eight islands. The one-half for subventions was to fund a DWR administered program where after a reclamation district expended $1,000.00 per mile, the program would reimburse up to 75% depending upon the availability of funds. For the special projects DWR was particularly interested in protecting the levee systems on eight western Delta islands which they viewed as critical to control of salinity intrusion from the Bay.

The Delta levee programs and requirements changed over the years. Starting in about 1996, special project authority was extended to other locations in the Delta. Habitat objectives were initially intended to achieve an overall no net loss. The plan was to mitigate at the program level rather than mitigate projects by projects. The habitat objective was later changed to provide a net benefit and currently DWR is directing a very significant portion of the funding to require project by project improvement of waterside habitat even below the mean high water mark. This greatly increases the project cost per lineal foot of levee and detracts from the effort to expeditiously upgrade the structural integrity of the levees to adequate minimum standards. Other changes to the programs were made to include the project levees and the agricultural areas in the primary zone established by the Delta Protection Commission and include levees in the Suisun Marsh. Regulatory requirements have also been increasing. In 2008 in response to a suggestion by Joe Grindstaff, we submitted a five (5) year plan to be funded at $100 million per year. At that time it was our understanding that there was $760 million of bond funds earmarked for the Delta levee subvention and Special Projects programs. A copy of the plan was sent to you by e-mail.

The plan proposed priorities through the allocation of funding. One hundred million dollars per year was proposed to be allocated: $12 million to Delta Levee Subventions; $44 million to State Special Projects; and $44 million to Local Special Projects. Subsequent to the submission of the plan, DWR did develop regulations and did provide funding for Delta wide Special Projects. The minimum objective for non-project levees for all reclamation districts is typically the PL 84-99 agricultural levee standard or better.

For many Districts, the minimum crown width objective is 22 to 24 ft. rather than 16 ft. to allow for passage of two way truck traffic during floodfight, additional resistance to beaver den collapse and to provide a base for levee raising to resist future rises in sea level.

A controversy has developed over what should constitute the minimum standard/ objective for levee stability on all Delta levees. The DSC Plan includes the so-called HMP standard as the Delta wide minimum standard to be supported unless specifically justified. The so-called HMP standard is not an engineering standard as does not purpose to represent a stable levee cross-section for Delta levees. The HMP which I participated in developing was not intended to be a levee structural standard but rather a mechanism for measuring good faith progress at the State and local level to satisfy for an interim period FEMA's requirement for flood hazard mitigation. Attached hereto is the Flood Hazard Mitigation Plan for the Sacramento-San Joaquin Delta dated September 15, 1983 (Plan). What is now called the HMP standard is set forth on page 13 as part of the "Short-Term Levee Rehabilitation Plan".

The Long-Term Mitigation Plan which is set forth on page 15 is a System Plan where all islands would be included for stage construction as described in the Corps' Draft Feasibility Report dated October 1982 and in the Department's Bulletin 192-82. The PL 84-99 standard and Bulletin 192-82 standard are comparable engineering standards addressing levee stability. It was recognized that imposition of such standards as a short-term requirement would have disqualified the Delta from FEMA disaster assistance and risk suffering the hazards listed on page 7 of the Plan. The HMP was agreed upon as an interim measure of good faith effort by the State and locals.

The setting for the 1983 plan included FEMA disaster assistance related to the flooding on 12 Delta islands starting in 1980. See Figure 3 on page 8 of the Plan. When Webb Tract and Holland Tract flooded in January 1980, the President issued a disaster declaration thereby providing FEMA assistance, which at that time was 100% funding for most of the work. DWR at that time, led by Ronald Robie, opposed the restoration of Webb and Holland Tracts thereby raising the concern and ire of FEMA that the State was not doing enough and was unwilling to help itself. In the interim, between the January 1980 flooding of Webb and Holland Tracts and September 1983 Plan, the Peripheral Canal was rejected by the voters in the June 1982 election. See page 20 of the Plan. There was also a change in the attitude of export contractors and a change in State administration which resulted in a meaningful effort to address Delta levees.

It would appear that we have now come full circle back to 1980 with the State administration failing to recognize the Delta levees as a system and ignoring the need for achieving a meaningful minimum structural stability for all Delta levees. The politics of the Peripheral Tunnels, like the Peripheral Canal, obviously are a factor.

The 20 years for implementation of the long-term mitigation plan in the 1983 Flood Hazard Mitigation Plan has passed. FEMA appears to be moving in the direction of requiring that the PL 84-99 standard be achieved and further that USACE approval be obtained within five (5) years. Such a requirement would be impossible to achieve within the required time frame given the DSC plan and constraint on levee assistance. Additionally substituting USACE restoration assistance for FEMA assistance will likely mean no assistance.

The resulting risk is huge. DWR's Delta Risk Management Study sets the cost of replacement of Delta Infrastructure within the 100 year Flood Limits at $56.3 billion in 2005 dollars. See Table 7-8 attached hereto. Even with the BDCP tunnels, water for export will continue to be moved through the Delta channels with about 3,000 cfs most of the time and entirely during about 40 to 50% of the years.

The Economic Sustainability Plan of the Delta Protection Commission which was subjected to peer review also recognized the Delta levees as system and recommended the PL 84-99 standard as the minimum to be applied through the Delta. It is unfortunate that the DSC ignored the substance of the Plan.

The DSC levee priorities for levee investments should recognize the need for achieving a minimum adequate levee stability throughout the Delta while at the same time providing funding for the best guess at where a higher level of protection should be provided. The interrelationship of the Delta levees is real and the Delta levees are in fact a system.

The 1983 Flood Hazard Mitigation Plan recognized the interrelationship and provided "All islands should be included in the System Plan for stage construction as recommended in the Corps' plan." (Page 15) The plan also listed the islands and tracts considered to have the most urgent need of levee rehabilitation. The urgent need determination was based on a Corps analysis of risk of overtopping and risk of structural failures. Thirty islands and tracts were specifically identified as having an urgent need for rehabilitation. Much good work has been done since that time but there is still more that should be done.

Although perhaps of some value, the hazards related to flooding are not conducive to engineering analysis alone. Levee foundation conditions could vary significantly over very short distances. The cost of geotechnical analysis alone could be higher than the cost of desired rehabilitation.

The 1983 Plan at page 7 set forth the hazards as follows:

"G. <u>Hazards</u>

> Since 1980, levee failures have occurred on 12 of about 60 Delta islands (see Figure 3). Factors that contribute to levee failures include: instability of the levee section and foundation materials; subsidence; rodent burrows; erosion from wind waves and boat wakes; inadequate height (freeboard); seismic activity; and seepage.
>
> Specific locations of levee instability and foundation weakness are difficult to identify because weak areas are not readily apparent from visual inspections. Beaver dens often are not apparent until a portion of the levee collapses. Erosion is more readily apparent and can be corrected if identified. Increased moisture from seepage through and under levees, which reduces the shear strength of the soils and thereby contributes to instability of the levees, may or may not be apparent. It is suspected that, in some areas, dredging soil from the channels as a source of material for bolstering levees has contributed to increased instability, subsidence, and seepage.
>
> Flooding of islands can have several adverse impacts, including temporary detriments to water quality due to ocean water intrusion, increased loss of water by evaporation, increased seepage on islands adjacent to the flooded areas, loss of agricultural land, damage to urban and recreational developments, and fish and wildlife losses."

The history of hazards is still relevant and dredging for levees was discontinued by about 1990. Dredging of ship channels continues and in some cases adversely affects levees. Bay salinity intrusion which impacts local water supply and exports is affected by increased tidal prism, shortening the pathways for intrusion and reducing the resistance to intrusion. As the amount of salty water allowed to intrude increases, the amount of fresh water required to dilute or flush such salts is also increased. Franks Tract and Little Franks Tract are examples where failure to reclaim has resulted in increased difficulty with salinity intrusion and an increase loss of fresh water due to evaporation. The tidal prism is increased, the intrusion path to the export pumps is shortened and the resistance to intrusion is reduced. A similar problem is occurring with the abandonment of levees in the lower end of the Yolo bypass which is intended to, but may not, help fish.

Hazards such as beaver dens and other intrusion from rodents, seismic activity and localized foundation defects are not conducive to meaningful quantification for the purpose of an investment strategy.

The DSC Draft Levee Investment Strategy attempts to quantify risk and benefit in a system where many of the variables are extremely difficult to quantify.

The Delta is a system dependent upon all of its parts. As we have concluded previously and now urge your consideration, the best way to prioritize funding for Delta levee investment is to apply a portion system wide to achieve an adequate minimum engineering standard and take another portion to apply where the threat or risk is thought to be greater.

On the matter of the ability of the local Reclamation Districts to cost effectively accomplish levee work, it is important to recognize that regulatory constrains and program requirements have been increasing. Continuous onsite inspection and progress reporting requirements on projects which are basically moving large volumes of dirt which can be tracked with truck and barge tags adds significantly to the cost. The integration of habitat improvements greatly adds to delay, cost of permitting, right of way impacts and more reporting. As levees are setback or fattened to accommodate habitat, the conflict with adjoining lands and utilities is greatly increased as is the amount of fill required. Movement landward is away from the historic levee foundation which has been consolidated by over 100 years of levee building.

Thank you for including us in your effort to meet with all interested parties.

Very truly yours,

Dante John Nomellini

DJN:db

Table 7-8 Comparison of Total Replacement Costs of Delta Infrastructure - Current and 2050[a]

Inundation Level	Current (2005)[c]	2050	Cost Ratio: 2050/Current
Within Mean Higher High Water (MHHW) Limits [b]	$6.7 billion	$8.5 billion [e]	1.3
Within 100-year Flood Limits [b,c]	$56.3 billion	$67.1 billion [e]	1.2

[a] Costs in this table are for infrastructure assets and their contents that could be damaged as a result of levee breaching and island flooding.
[b] See Section 4.1.2 and Figure 4-1 for limits of inundation.
[c] Flood plain limits were developed from FEMA Flood Insurance Rate Maps.
[d] Costs are in 2005 dollars.
[e] Costs are in 2005 dollars; not escalated to 2050.

State of California

FLOOD HAZARD MITIGATION PLAN

FOR THE

SACRAMENTO-SAN JOAQUIN DELTA

Covering portions of Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties

---

Disaster Declarations

FEMA-633-DR, FEMA-651-DR, FEMA-669-DR, FEMA-677-DR

Prepared by

Department of Water Resources

for

Office of Emergency Services

September 15, 1983

State of California

FLOOD HAZARD MITIGATION PLAN

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Acting Deputy Director

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PART I. SUMMARY AND RECOMMENDATIONS

A summary of the State Hazard Mitigation Plan for the Sacramento-San Joaquin Delta is as follows:

A. Short-Term Mitigation Plan

1. By February 1, 1984, the State will give the U. S. Army Corps of Engineers a Letter of Intent to sponsor a federal-state flood control project.

2. The Department of Water Resources will request an increase in funding for the Delta Levee Maintenance Subventions Program from Tidelands Oil revenue beginning in 1984-85 and continuing until a major federal levee rehabilitation project can be implemented.

3. The Department of Water Resources, in cooperation with local districts, will use appropriate construction and maintenance standards for nonproject levees to upgrade these levees to the standards described in the "Short-Term Rehabilitation Plan".

4. The local districts will implement a levee inspection program and file a report by June 1 of each year with the Director of the Department of Water Resources for 1983-84 and 1984-85. The Department of Water Resources will develop a state levee inspection program and request funding for the program beginning in 1984-85.

5. The local districts should complete their annual levee maintenance by November 1.

6. The Department of Water Resources will develop a program to reevaluate land subsidence rates in the Delta and request funding to begin the study in the 1984-85 fiscal year.

7. The local districts should develop and file with the Office of Emergency Services (copy to the Department of Water Resources) an emergency response and evacuation plan by June 1, 1984.

8. The State of California should continue to request emergency declarations for federal assistance for serious levee failures and severe storm damage that occur prior to implementation of a federal-state-local flood control project.

B. Long-Term Mitigation Plan

The State intends to develop a comprehensive federal-state-local flood control project that would consider all islands in the Delta and to seek legislation to finance the nonfederal share.

PART II. INTRODUCTION

A. Background

On February 9, 1983, President Reagan determined that damage resulting from severe storms, flooding, high tides, and wave action in certain areas of California warranted a major disaster declaration under provisions of the Federal Disaster Relief Act of 1974 (Public Law 93-288). This declaration included damage resulting from storms and flooding that took place from November 27, 1982, through March 30, 1983. In a letter dated February 16, 1983, the Federal Emergency Management Agency (FEMA) outlined the terms of the FEMA-State Disaster Assistance Agreement for the major disaster designated FEMA-677-DR. This agreement was executed by the FEMA Regional Director and the Governor. By letter dated March 17, 1983, Amendment No. 1 was added to the agreement to include that portion of the Sacramento-San Joaquin Delta (see Figure 1) located within the counties of Contra Costa, Sacramento, and San Joaquin.

B. Requirement for a Plan

Section 406 of Public Law 93-288 requires, as a condition to receiving federal disaster aid, that repairs be done in accordance with applicable codes, specifications, and standards. It also requires the state or local government recipient of federal aid to evaluate the natural hazards of the area in which the aid is to be used and, if appropriate, take mitigating action.

C. Interagency Flood Hazard Mitigation Report

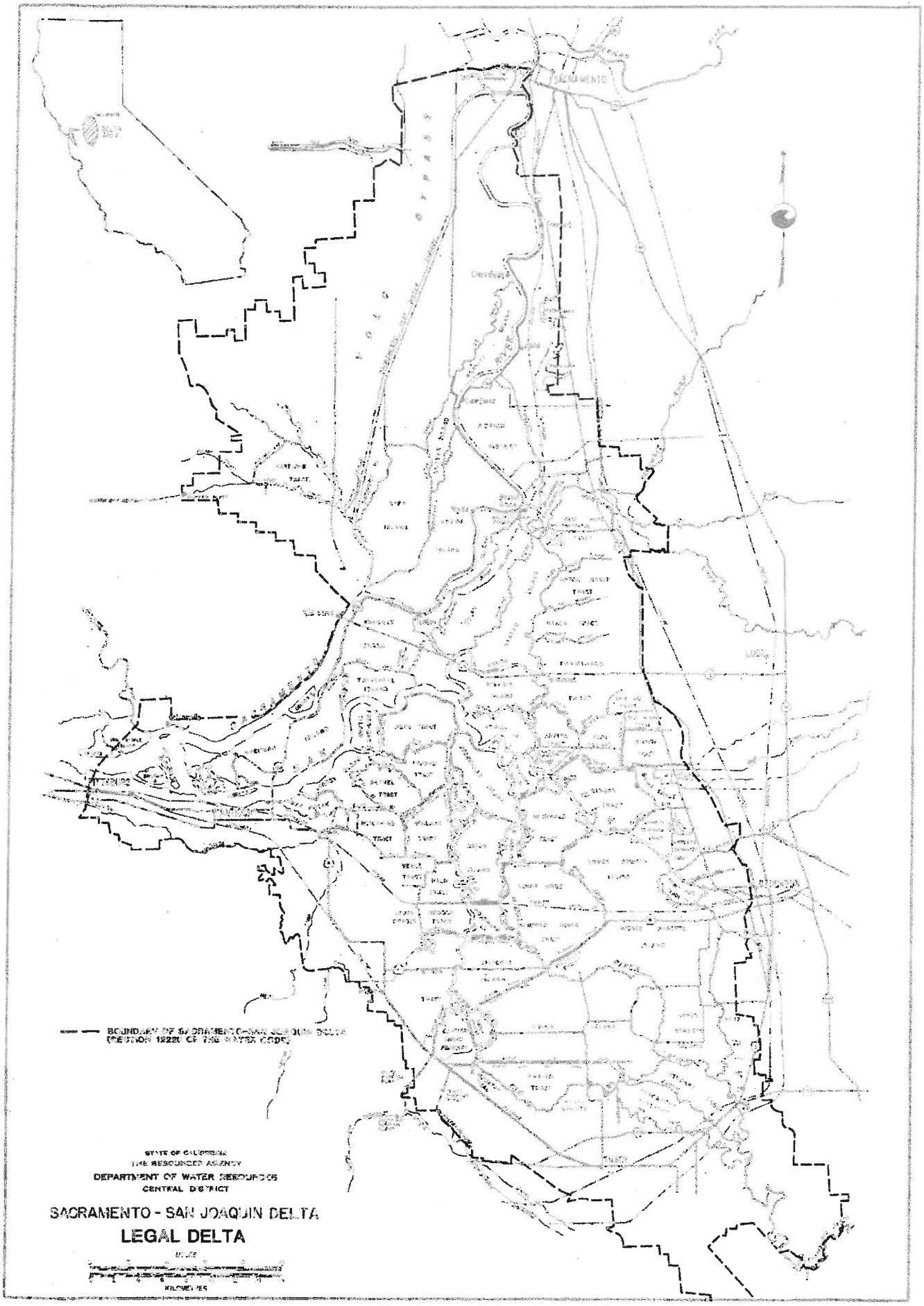
A Federal Interagency Flood Hazard Mitigation Report is prepared by the (federal) Region IX Interagency Flood Hazard Mitigation Team within 15 to 30 days following each presidentially declared major flood disaster. A report covering the recent major disaster, FEMA-677-DR, was dated March 11, 1983. Supplement No. 1 to this report, dated March 24, 1983, made specific recommendations and provided a framework for a State Flood Hazard Mitigation Plan for the Sacramento-San Joaquin Delta.

D. Objective of This Plan

The objectives of this plan are to:

1. Follow up, in detail, recommendations of the Interagency Flood Hazard Mitigation Report.

FIGURE 1


SACRAMENTO
BOUNDARY OF SACRAMENTO-SAN JOAQUIN DELTA
(SECTION 12220 OF THE WATER CODE)
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
SACRAMENTO - SAN JOAQUIN DELTA
LEGAL DELTA
KILOMETERS

2. Recommend hazard mitigation alternatives for local, state, and federal agencies.

3. Establish immediate and long-term planning frameworks for implementation of hazard mitigation efforts.

E. Purpose of This Plan

The purpose of this plan is to implement the requirements of Section 406 and the requirements of Amendment No. 1 to the FEMA-State Agreement. Amendment No. 1, Paragraph 10(b), states in part:

> "The State ... will prepare and submit, not later than August 1, 1983, to the Regional Director for concurrence, a comprehensive hazard mitigation plan for the entire Sacramento-San Joaquin Delta area. This plan shall address state, local, private and federal activities and interests as they currently exist, are currently being developed, or are planned. This plan shall also identify major hazard mitigation measures to be taken for each district (applicant), by whom, sources of funding, and schedules for accomplishment. Such measures shall include: (1) establishment of applicable codes, specifications and standards for new construction, repair, and maintenance; (2) upgrading of levees and other related facilities to applicable codes, specifications, and standards; (3) periodic inspections, reports, and follow-up of all levee and related facilities; and (4) correction of maintenance deficiencies."

Amendment No. 1, Paragraph 10(b), further states:

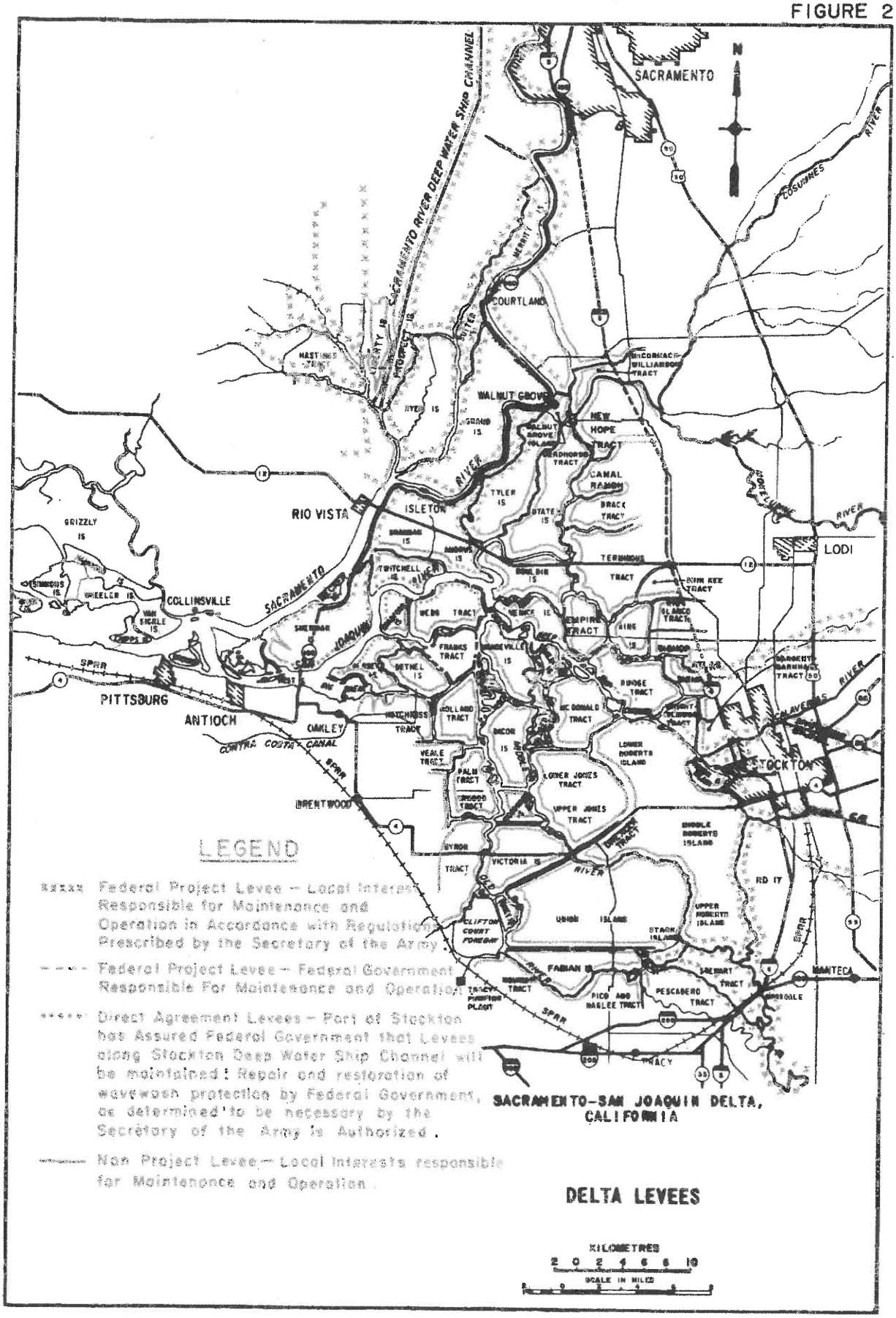
> "It is understood that one plan will be submitted which will incorporate the requirements of Section 406 of the Act and which will also satisfy the requirements for major disaster declarations FEMA-633-DR, FEMA-651-DR, FEMA-669-DR, and FEMA-677-DR."

This mitigation plan fulfills these requirements for both nonproject and direct agreement levees in the Delta (see Figure 2).

F. Flood Hazard Mitigation

Flood hazard mitigation is a management strategy in which current actions and expenditures to reduce the occurrence or severity of potential flood disasters are balanced with potential losses from future floods. Flood hazard mitigation can reduce the severity of the effects of flood emergencies on people and property by reducing the cause or occurrence of the hazard, reducing exposure to the hazard, or reducing the effects through preparedness, response, and recovery measures.

FIGURE 2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COURTLAND
WALNUT GROVE
NEW HOPE TRACT
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RIO VISTA
ISLETON
LODI
COLLINSVILLE
PITTSBURG
ANTIOCH
OAKLEY
BRENTWOOD
STOCKTON
MANTECA
CONTRA COSTA CANAL
SPRR
LEGEND
xxxxx Federal Project Levee – Local Interests Responsible for Maintenance and Operation in Accordance with Regulations Prescribed by the Secretary of the Army.
– – – – Federal Project Levee – Federal Government Responsible For Maintenance and Operation.
••••• Direct Agreement Levees – Port of Stockton has Assured Federal Government that Levees along Stockton Deep Water Ship Channel will be maintained! Repair and restoration of wavewash protection by Federal Government, as determined to be necessary by the Secretary of the Army is Authorized.
—— Non Project Levee – Local Interests responsible for Maintenance and Operation.
SACRAMENTO-SAN JOAQUIN DELTA, CALIFORNIA
DELTA LEVEES
KILOMETRES
2 0 2 4 6 8 10
SCALE IN MILES

Flood hazard mitigation includes such actions as:

- Minimizing probability of flood occurrence (e.g., restoration of damaged dams and levees, dam safety measures).
- Improving structures and facilities at risk (e.g., flood-proofing, restoring damaged public facilities to meet applicable codes and specifications).
- Identifying hazard-prone areas and standards for prohibited or restricted use (e.g., flood plain regulations, structural and nonstructural floodproofing, hazard mitigation plans).
- Providing loss recovery and relief (e.g., insurance, disaster grants and housing, low interest loans).
- Providing hazard warning and population protection (e.g., procedures for warning, emergency public information, direction and control, protective measures, shelter, relocation, training).
- Considering opportunities for sharing the cost of levee improvements in connection with water transfer plans (see Appendix A).

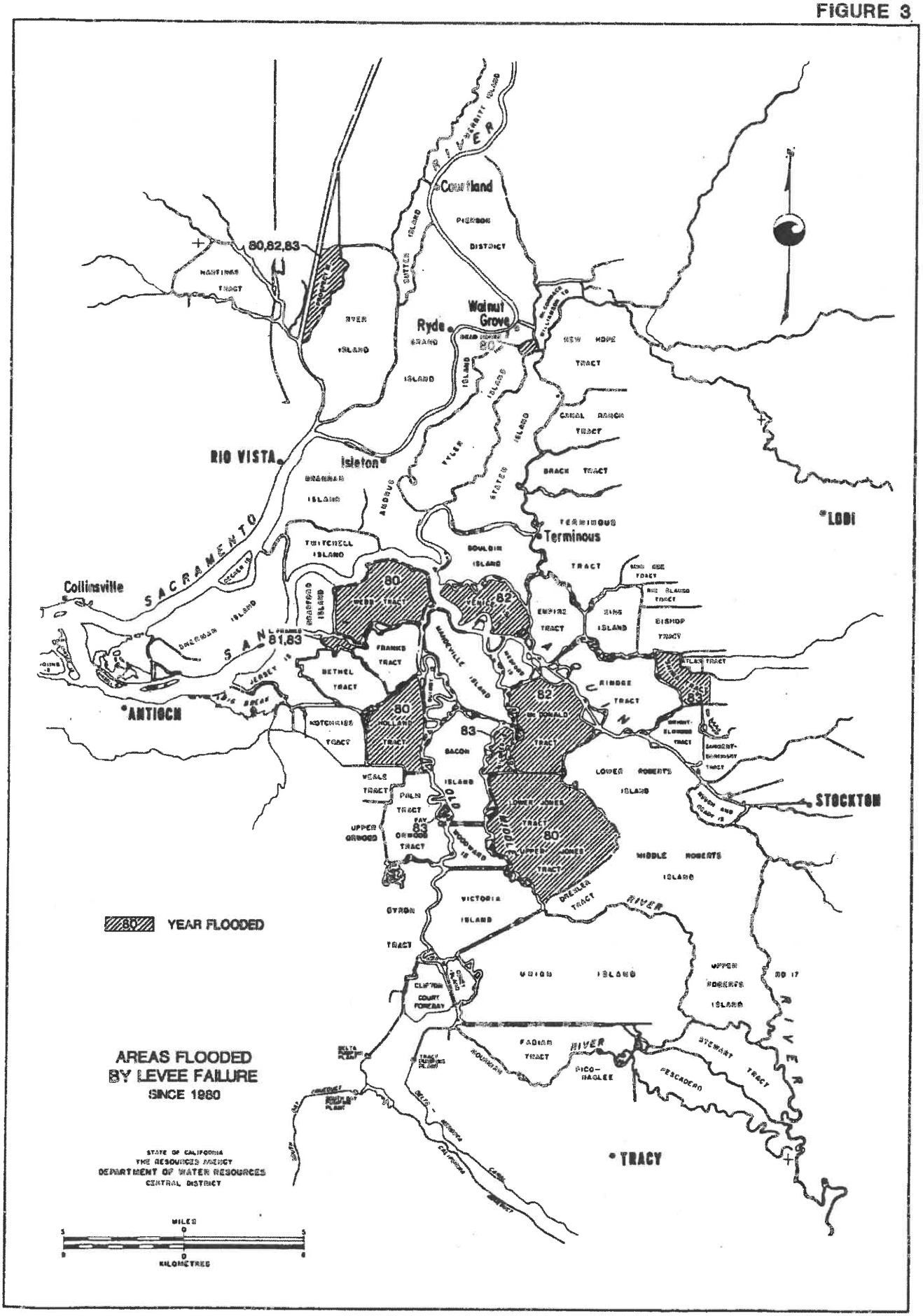
G. Hazards

Since 1980, levee failures have occurred on 12 of about 60 Delta islands (see Figure 3). Factors that contribute to levee failures include: instability of the levee section and foundation materials; subsidence; rodent burrows; erosion from wind waves and boat wakes; inadequate height (freeboard); seismic activity; and seepage.

Specific locations of levee instability and foundation weakness are difficult to identify because weak areas are not readily apparent from visual inspections. Beaver dens often are not apparent until a portion of the levee collapses. Erosion is more readily apparent and can be corrected if identified. Increased moisture from seepage through and under levees, which reduces the shear strength of the soils and thereby contributes to instability of the levees, may or may not be apparent. It is suspected that, in some areas, dredging soil from the channels as a source of material for bolstering levees has contributed to increased instability, subsidence, and seepage.

Flooding of islands can have several adverse impacts, including temporary detriments to water quality due to ocean water intrusion, increased loss of water by evaporation, increased seepage on islands adjacent to the flooded areas, loss of agricultural land, damage to urban and recreational developments, and fish and wildlife losses.

FIGURE 3


Courtland
Walnut Grove
Ryde
RIO VISTA
Isleton
Terminous
LODI
Collinsville
ANTIOCH
STOCKTON
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SAN JOAQUIN
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YEAR FLOODED
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BY LEVEE FAILURE
SINCE 1980
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
MILES
KILOMETRES

PART III. GOVERNMENTAL AND REGULATORY STRUCTURES

A. General

The existing governmental structure could provide necessary assurances to implement a Delta levees mitigation plan, both on a short-term and long-term basis. However, development of a Delta-wide reclamation district with authority to collect revenues, set maintenance standards, provide assurances, set priorities, and carry out maintenance would facilitate completion of a comprehensive Delta levees rehabilitation plan.

B. Local Districts

Essentially all of the islands and tracts in the Delta have an organized district to administer levee maintenance and restoration. Reclamation and levee districts currently have authority to raise funds from three major sources:

1. The districts are empowered under specific Water Code sections to create and update assessment rolls of the lands within their boundaries on which the governing boards can periodically levy assessments.

2. Water Code sections also allow the governing boards of reclamation districts to establish a schedule of charges and fees for services and benefits provided by the districts.

3. Those districts that use county assessment rolls to levy special taxes for levee maintenance continue to receive an allocation under the post-Proposition 13 tax collection by the county, which includes not only property revenues but also state subventions.

Until 1980, funds made available for levee maintenance and restoration from these sources had been relatively small -- less than $1 million per year. Because of the many levee failures since 1980, the local districts have been assessed up to their capability to pay. In fact, because many districts are in debt for money borrowed to repair and restore their levees, their funding capabilities may not be sufficient to accomplish the flood hazard mitigation obligations requested by FEMA.

C. Counties and Cities

The Delta area includes land in five counties: Contra Costa, Sacramento, San Joaquin, Solano and Yolo. These counties are members of a Delta Advisory Planning Council (DAPC); the

objective is to provide a unified county position with regard to Delta matters. All five counties are participating in the National Flood Insurance Program.

Counties have the necessary authority to control land use. This authority has been exercised to control urban development in the Delta. Under this plan, counties would continue to exercise land use control as part of their general plan.

A number of cities are located on the periphery of the Delta, including Sacramento, Tracy, Rio Vista, Pittsburg, and Antioch. Their involvement with the nonproject levees in the Delta is minimal. Isleton and the western portion of Stockton are within the Delta and are protected by nonproject levees. The cities, like the counties, have authority to control land use, and all are participating in the National Flood Insurance Program.

D. State of California

Many state agencies have regulatory powers covering the Delta area. The two principal agencies involved in flood control activities are The Reclamation Board and the Department of Water Resources. Other state agencies with vested interests in the Delta include, but are not limited to: Department of Boating and Waterways; Department of Fish and Game; Department of Parks and Recreation; State Lands Commission; and the State Water Resources Control Board, including the Central Valley and San Francisco Bay Regional Water Quality Control Boards.

The Office of Emergency Services administers funds made available under the Natural Disaster Assistance Act, which have been used for flood damage repair in the Delta.

E. Federal Government

Many federal agencies are involved and have some regulatory powers concerning the 700 miles of navigable waterways in the Delta. The principal federal interests in the Delta are with the following agencies: U. S. Army Corps of Engineers; U. S. Bureau of Reclamation; U. S. Department of Commerce, including the National Marine Fisheries Service, U. S. Fish and Wildlife Service, and the U. S. Coast Guard.

The Federal Emergency Management Agency (FEMA) administers disaster relief funds, made available under Public Law 93-288, which have been used for repair of flood damage in the Delta.

PART IV. SHORT-TERM MITIGATION PLAN

A. Policy

Water Code Section 12981 declares State policy to preserve the Delta in essentially its current configuration. Many bills (summarized in Appendix B) have been introduced during the current legislative session to reaffirm or modify this policy. Action on these bills will give legislative direction concerning activities in the Delta.

Rehabilitation of levees around individual islands is still the approach desired by most Delta interests. When practical, this course of action should be pursued.

A two-prong program is needed to reduce levee failures: rehabilitation of levees by adding materials; and improved maintenance of existing levees.

B. Maintenance

1. Responsibilities

The local districts are responsible for the expense and the work involved in correcting maintenance deficiencies. Each district should:

a. Prepare a plan of annual levee maintenance by June 1 of each year describing planned maintenance work and a schedule for its accomplishment.

b. Make a profile of the levee crown not less than every fifth year, or more often if determined necessary by the Board of Trustees of the district (i.e. following severe storms).

c. Adopt an emergency response and evacuation plan to be put into effect when flooding is imminent.

d. Complete annual levee maintenance by November 1 of each year.

2. Mitigation Actions

In general, district maintenance includes, but is not limited to:

a. Controlling encroachments on the levee that might endanger the levee or hinder levee construction and maintenance.

b. Exterminating burrowing rodents and filling their burrows with compacted material.

c. Shaping the levee crown for proper drainage.

d. Repairing minor slipouts, erosion, and subsidence of the levee section.

e. Cleaning drain and toe ditches adjacent to the landside levee toe that intercept seepage.

f. Minor repairing of revetment work or riprap that has been displaced, washed out, or removed.

g. Repairing and shaping patrol and access roads.

h. Controlling the weight and speed of vehicles using roads on levee crowns so as to not exceed the strength of the structural section.

i. Cutting, removing or trimming vegetation such as weeds, brush, and trees to the extent necessary to maintain a safe levee.

j. Removing debris and litter from the levee and berm where it interferes with levee maintenance.

k. Inventorying and inspecting pipes and conduits through the levee (and gates on such facilities) to ensure that they are in working condition.

l. Repairing and maintaining gates necessary to control vehicular traffic on the levees.

C. Rehabilitation

1. Policy

Short-term responsibility for levee rehabilitation remains with the local districts. The cost, however, will be shared by the state and federal agencies and possibly by other beneficiaries of the Delta. Until increased funding is available, the local districts will continue to use funds from their own revenues, the Delta Levee Maintenance Subventions Program, and federal and state disaster assistance programs to rehabilitate the Delta levees.

Dredging material for levee repair or restoration will not be permitted within 135 feet of the centerline of any levee below a depth of minus 35 feet mean sea level. (Ship channels will be considered separately.)

Materials used to repair or restore the levees must allow enough consolidation to minimize erosion during wave and tidal action and rain runoff. Districts will take and record soundings before dredging to be sure depths are adequate for the materials required.

2. Short-Term Levee Rehabilitation Plan

a. Local Districts

Local districts should:

(1) Rehabilitate levees as rapidly as possible, considering engineering, fiscal, and environmental restraints, to the following minimum standards:

(a) Levees shall have 1 foot of freeboard above the flood expected once in 100 years. (It is important to recognize that 1 foot of freeboard at a 100-year flood does not mean 100-year flood protection. Common levee design practice calls for 3 feet of freeboard at project design flood. Also, the uncertainties of Delta levee foundations and unpredictability of Delta tide levels suggest that even with 3 feet of freeboard, the degree of protection would be far less than the design flood frequency.)

(b) The minimum crown width shall be at least 16 feet.

(c) Waterside slopes shall be at least 1.5 horizontal to 1 vertical, with revetment in areas where erosion has been a problem. The size of the revetment material shall be appropriate for the slope.

(d) Landside slopes shall be at least 2 horizontal to 1 vertical, with flatter slopes in the lower portion of the levee in areas where soil stability and seepage have been problems.

(e) The levees shall have all-weather access roads.

(2) Prepare a plan for annual rehabilitation work by June 1 of each year describing rehabilitation work and a schedule for its accomplishment.

b. State of California

(1) By February 1, 1984, the State will give the U. S. Army Corps of Engineers a Letter of Intent to sponsor a federal-state flood control project.

(2) The Department of Water Resources will recommend to the State Legislature increased funding of the Delta Levee Maintenance Subventions Program to $10 million per year from Tidelands Oil revenues, to begin in the 1984-85 fiscal year and continue until a federal-state flood control project is implemented. The Department will also recommend to the State Legislature that the cost sharing formula be changed so that the State would pay 75 percent and the local districts 25 percent of the cost of levee rehabilitation work done under the program.

(3) The Department of Water Resources will request funding for an annual Delta levee inspection program to begin in the 1984-85 fiscal year. Until funds are made available for a state inspection program, the local district's engineer should make a joint inspection with district representatives and submit a summary of work to be completed for the year, present condition of the levees, mitigation measures to be performed the following year, and a reevaluation of natural hazards affecting the district. This summary report should be submitted to the Director of the Department of Water Resources by June 1 of each year.

(4) By April 1984, the Department of Water Resources, working with representatives of local districts, will develop criteria for using soils from the channels as a source of material for bolstering levees. These criteria will reduce the hazard to levees due to this practice.

(5) The Department of Water Resources will request funds in the 1984-85 fiscal year to initiate a program to reevaluate the rate of subsidence in the Delta.

PART V. LONG-TERM MITIGATION PLAN

A. Policy

The long-term mitigation plan is to implement a major levee rehabilitation project within 20 years. The State supports the concept of a System Plan as described in the Corps' Draft Feasibility Report, dated October 1982, and in the Department's Bulletin 192-82, Delta Levees Investigation, dated December 1982, with the understanding that the local districts may complete construction necessary to comply with federal flood control standards on some islands before a federal flood control project is implemented. All islands should be included in the System Plan for stage construction, as recommended in the Corps' plan.

B. Long-Term Levee Rehabilitation Plan

Based on current information, the following islands and tracts are considered to have the most urgent need of levee rehabilitation:

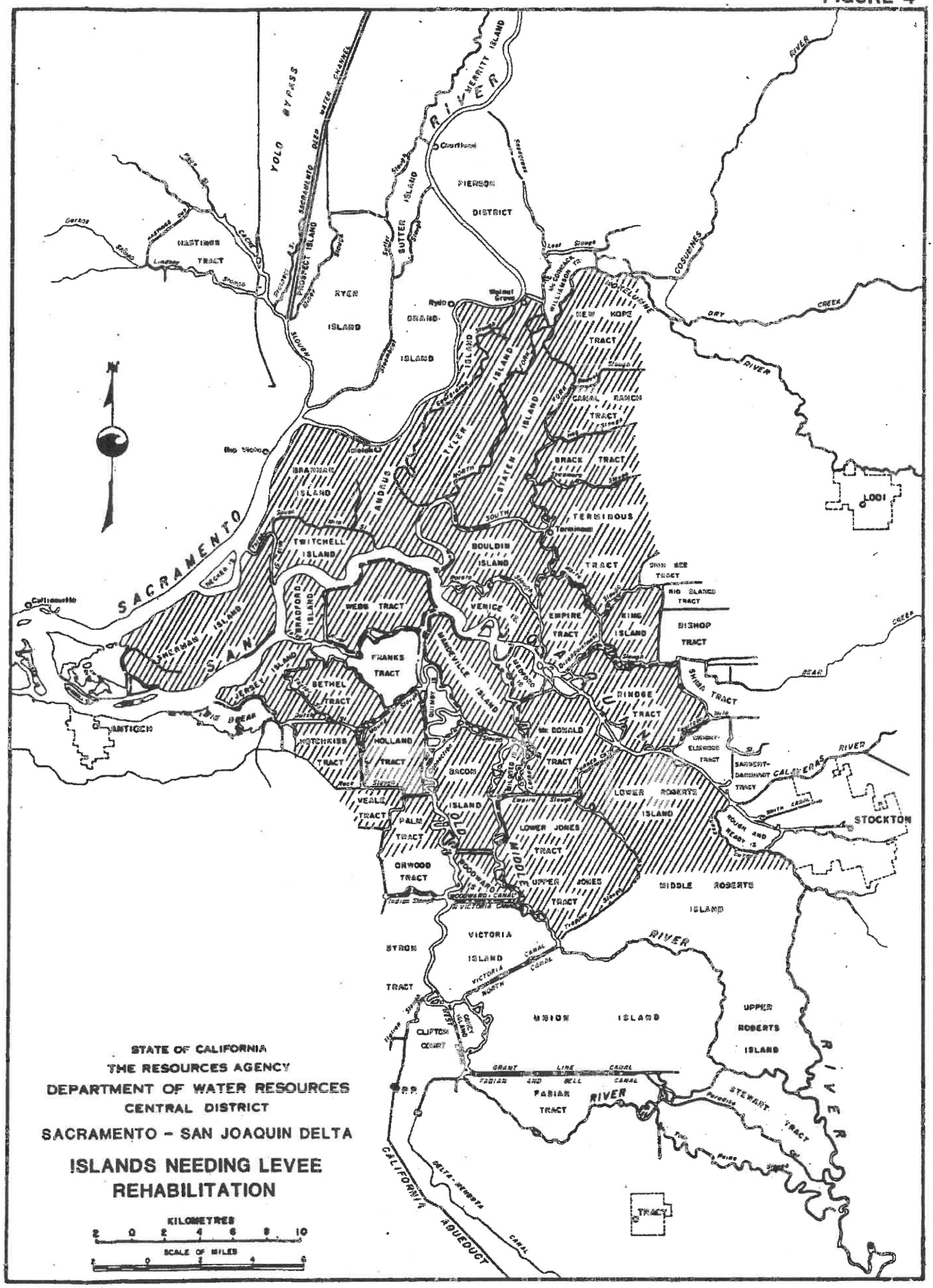
Andrus-Brannan	Hotchkiss	Rindge
Bacon	Jersey	Roberts, Lower
Bethel	Jones, Lower/Upper	Sherman
Bouldin	King	Staten
Brack	Mandeville	Terminous
Bradford	McDonald	Twitchell
Canal Ranch	Medford	Tyler
Dead Horse	Mildred	Venice
Empire	New Hope	Webb
Holland	Palm	Woodward

This list will probably change during the advanced planning stages of the project. (These tracts are shown in Figure 4.)

A joint state-federal levee rehabilitation project requires state legislative and congressional authorizations, funding for detailed planning, and funding for construction. Completion of these actions is expected to take from six to ten years. It is assumed that the funding would be at least 65 percent federal and that the nonfederal funding requirements would be shared 50 percent state and 50 percent local.

In some instances, individual districts have an insufficient economic base to provide even 15 to 20 percent of the cost of modernizing and protecting the island system. In these situations, consideration will be given to a greater State share of such costs, to be reimbursed from subsequent sale or transfer of property rights or value to the State. As an example, public acquisition of land for use in a wildlife management or

FIGURE 4


STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
SACRAMENTO - SAN JOAQUIN DELTA
ISLANDS NEEDING LEVEE REHABILITATION
KILOMETRES
SCALE OF MILES
SACRAMENTO
SAN JOAQUIN
RIVER
YOLO BYPASS
SACRAMENTO DEEP WATER CHANNEL
MERRITT ISLAND
PIERSON DISTRICT
SUTTER ISLAND
PROSPECT ISLAND
HASTINGS TRACT
RYER ISLAND
GRAND ISLAND
NEW HOPE TRACT
CANAL RANCH TRACT
BRACK TRACT
TERMINOUS TRACT
BOULDIN ISLAND
TYLER ISLAND
STATEN ISLAND
ANDRUS
BRANNAN ISLAND
TWITCHELL ISLAND
BRADFORD ISLAND
WEBB TRACT
VENICE
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
SHIMA TRACT
RINDGE TRACT
FRANKS TRACT
BETHEL TRACT
JERSEY ISLAND
SHERMAN ISLAND
MANDEVILLE ISLAND
HOTCHKISS TRACT
HOLLAND TRACT
BACON ISLAND
McDONALD TRACT
LOWER ROBERTS ISLAND
LOWER JONES TRACT
UPPER JONES TRACT
MIDDLE ROBERTS ISLAND
VEALE TRACT
PALM TRACT
ORWOOD TRACT
VICTORIA ISLAND
BYRON TRACT
UNION ISLAND
UPPER ROBERTS ISLAND
FABIAN TRACT
STEWART TRACT
CLIFTON COURT
LODI
STOCKTON
ANTIOCH
CALIFORNIA AQUEDUCT
DELTA-MENDOTA CANAL
GRANT LINE CANAL
FABIAN AND BELL CANAL
VICTORIA CANAL
NORTH CANAL
WOODWARD CANAL
CALAVERAS RIVER
MOKELUMNE RIVER
COSUMNES RIVER
DRY CREEK
BEAR CREEK
BEAR RIVER
SOUTH FORK
NORTH FORK
SOUTH FORK
Courtland
Walnut Grove
Rio Vista
Terminous
Collinsville
Rio Blanco
Rio Bravo
Rock Slough
Indian Slough
Empire Slough
Tracy

recreational program or acquisition of a flooded area for use as a reservoir as part of the State Water Project and Central Valley Project.

Cost sharing and funding must be resolved by the Congress and the State Legislature. The local share would be assigned to the individual districts in proportion to the cost to provide flood control to the island represented by the particular district.

PART VI. FUNDING SOURCES

A. General

All plans to preserve the Delta will require large increases in funding for levee rehabilitation.

B. Short-Term Levee Rehabilitation Plan

1. Local Districts

For the 1983-84 fiscal year, the local districts will continue to use their own revenues, supplemented by State contributions under the Delta Levee Maintenance Subventions Program (presently budgeted at $1.5 million per year), and funds made available under the federal and state disaster assistance programs.

2. State of California

A number of legislative bills under consideration include proposals for increases in funding for the Delta Levee Maintenance Subventions Program. Pending action on these bills, the Department of Water Resources will recommend to the Legislature:

a. An increase in funding for this program, beginning with the 1984-85 fiscal year, to a level of $10 million per year from Tidelands Oil revenues; and

b. A change in the formula for State participation to allow 75 percent State funds with 25 percent local matching funds to upgrade existing Delta levees.

3. Department of Water Resources

The Department of Water Resources will also request special language in a federal-state flood control project authorization that would allow credit to the State and to local districts for work done toward upgrading levees to federal standards before implementation of a federal-state-local flood control project.

C. Long-Term Levee Rehabilitation Plan

A U. S. Army Corps of Engineers report, "Draft Feasibility Report and Draft Environmental Impact Statement, Sacramento-San Joaquin Delta, California", October 1982, indicates federal interest in a Delta flood control project. Although the percentage of federal participation must be determined by the

Congress, the long-term mitigation plan for the Delta contemplates a federal-state-local sharing of costs for levee rehabilitation.

California has traditionally shared in the costs of federal flood control projects. The State is now contributing 75 percent and local flood control agencies are required to contribute 25 percent of the land, easement, and right-of-way costs of federal projects.

The federal government has traditionally paid 100 percent of the construction costs for flood control. Local agencies have been responsible for 100 percent of the cost of operating and maintaining flood control facilities. The Corps of Engineers' Draft Feasibility Report assumes the traditional federal-nonfederal cost sharing relationships.

Chapter 5 of the Emergency Delta Task Force report, dated January 12, 1983, also recommends a cost sharing plan that follows the traditional relationships, but it suggests that boating and commercial shipping should share in the nonfederal flood control costs. The report found that local districts are capable of raising from 15 to 20 percent of the necessary funds for levee rehabilitation projects. It is planned that the State and the local districts will equally share the nonfederal cost of a federal flood control project.

D. Nonfederal Funding

Without federal participation in a Delta levees flood control project, the state would be the logical level of government to implement a levee rehabilitation program. Special bond issues might be necessary to supplement the available Tidelands Oil and other State revenues to finance a long-term Delta levees rehabilitation project.

APPENDIX A

RELATIONSHIP OF DELTA LEVEES PLAN TO A WATER TRANSFER PLAN

The Delta is a point of diversion for both the Federal Central Valley Project and the State Water Project for exporting water to areas in California south and west of the Delta. The State's proposal for a Peripheral Canal to move water in an isolated channel across the Delta was rejected by the voters in June 1982. The State must now develop alternative methods for transferring water across the Delta. Some alternative Delta water transfer plans would require channel enlargements and levee setbacks in the South Fork Mokelumne River and channel enlargements near Clifton Court Forebay. To the extent that these enlargements and levee setbacks coincide with plans for levee rehabilitation, there would be an opportunity for cost sharing between the two projects.

In some areas, levee failures could be detrimental to water transfer operations. In these situations, cost sharing among various beneficiaries should be considered, up to an equitable amount of the benefits derived from the levee improvements.

APPENDIX B

LEGISLATIVE BILLS

Bill and Author	Subject
AB484 - Isenberg	Approve plan set forth in Bulletin 192-82
AB758 - Costa	Include New Hope Cross Channel in State Water Project Facilities
AB857 - Bradley	Immune State from liability in repairing Delta levees
AB1300 - Isenberg	Require exporters of water to enter into contracts with public agencies in Delta
AB1325 - Bradley	Prohibit expenditure for levee repair until cross-Delta water facilities are authorized
AB1607 - Waters	Approve Corps' System Flood Control Plan and authorize DWR to undertake work in advance of federal authorization
AB1612 - Waters	Require DWR to be project sponsor of federal flood control plan; request adoption of Modified System Plan
AB1712 - Johnson	Require plans compatible with Emergency Delta Task Force plan; appropriate $10 million from ERF funds to DWR for program
AB1731 - Costa	Nonsubstantive change in Central Valley Project Act
AB2112 - Isenberg	Require DWR to develop and submit to Reclamation Board recommended levee reconstruction standards and establish a yearly levee inspection program
AB2124 - Campbell	Create Delta Levee Maintenance Fund and deposit a percentage of fishing and hunting license fees, vessel registration fees, and motor vehicle fuel license taxes attributable to vessels
SB15 - Ayala	Authorize additional State Water Project facilities; create a Delta Levee Maintenance Fund; allocate $25 million from Long Beach Oil and Dry Gas revenues to the fund
SB834 - Nielson	Convey title to swamp and overflow lands to purchaser of land including berms and borrow pits