

Lower San Joaquin and Delta South Regional Flood Management Plan

Draft Document for Public Review/Comment

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1 Acronyms and Abbreviations

AEP	Annual Exceedance Probability
BDCP	Bay-Delta Conservation Plan
Board	Central Valley Flood Protection Board
BWFS	Basin-Wide Feasibility Study
Cal OES	California Office of Emergency Services
cfs	cubic feet per second
Conservation Strategy	Central Valley Flood System Conservation Strategy
CRS	Community Rating System
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVIFMS	Central Valley Integrated Flood Management Study
DAC	Disadvantaged Community
Delta	Sacramento-San Joaquin Delta
DRMS	Delta Risk Management Strategy
DWR	California Department of Water Resources
EOP	Emergency Operations Plan
ETL	Engineering Technical Letter, USACE
ESA	Endangered Species Act
FCM	Flood Contingency Map
FEMA	Federal Emergency Management Agency
FloodSAFE	FloodSAFE California
GIS	Geographic Information System
IRWMP	Integrated Regional Water Management Plan
LCM	Life Cycle Management
LMA	Levee Maintaining Agency
LMFPD	Lathrop-Manteca Fire Protection District
LSJRFS	Lower San Joaquin River Feasibility Study
MFD	Montezuma Fire District
NFIP	National Flood Insurance Program
NCCPA	Natural Community Conservation Planning Act NCCPA
NULE	Non-Urban Levee Evaluation
NGO	Non-Governmental Organization
PL 84-99	Public Law 84-99 Rehabilitation and Inspection Program
Planning Areas	Lower San Joaquin River Region and Delta South Region (or Regions)
Project Levee	A levee or other flood management system that is part of a Federal project (aka SPFC Facility)
Proposition 1E	Disaster Preparedness and Flood Prevention Bond Act of 2006
Proposition 84	Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006
RAMP	Regional Advance Mitigation Planning
RD	Reclamation District
Regions	Lower San Joaquin River Region and Delta South Region (or Planning Areas)
RFMP	Regional Flood Management Plan
RWQCB	Regional Water Quality Control Board
SB5	Senate Bill 5
SEMS	Standardized Emergency Management System
SJAFC	San Joaquin Area Flood Control Agency
SPFC Facility	State Plan of Flood Control (aka Project) facility
SSIA	State Systemwide Investment Approach
State	State of California

SWIF	System Wide Improvement Framework
SWRCB	State Water Resources Control Board
SWP	State Water Project
TAC	Technical Advisory Committee
TRFD	Tracy Rural Fire District
ULDC	Urban Levee Design Criteria
ULE	Urban Levee Evaluation
ULOP	Urban Level of Protection
USACE	U.S. Army Corps of Engineers
WSE	Water Surface Elevation
WMFD	Waterloo Morada Fire District

2 Executive Summary

To be completed later in the document development

3 Introduction

3.1 Purpose of Report

The San Joaquin Area Flood Control Agency (SJAFCOA) has partnered with local agencies to develop this Regional Flood Management Plan (RFMP) for the Lower San Joaquin River Region and Delta South Region (Collectively referred to as the Planning Areas or the Regions). The RFMP was funded by the State of California Department of Water Resources (DWR) and included in-kind contributions from local agencies within the Regions. Please Figure 1 below for a depiction of the Planning Areas.

This RFMP is intended to provide the framework for the long-term vision for managing flood risk within these two Regions. This RFMP will also be used to inform the San Joaquin River Basin-Wide Feasibility Study, and the 2017 Central Valley Flood Protection Plan (CVFPP) Update being prepared by DWR.

This RFMP provides a reconnaissance-level assessment of flood risks, and presents a prioritized list of short-term and long-term flood risk reduction projects for the Regions. A planning-level financial plan has also been prepared to identify funding needs and sources at the local, State, and Federal level for the ultimate implementation of these projects. Although these two Regions are included in this single RFMP, the prioritized project lists and corresponding Financial Plans will be separate due to the unique characteristics of each Region.

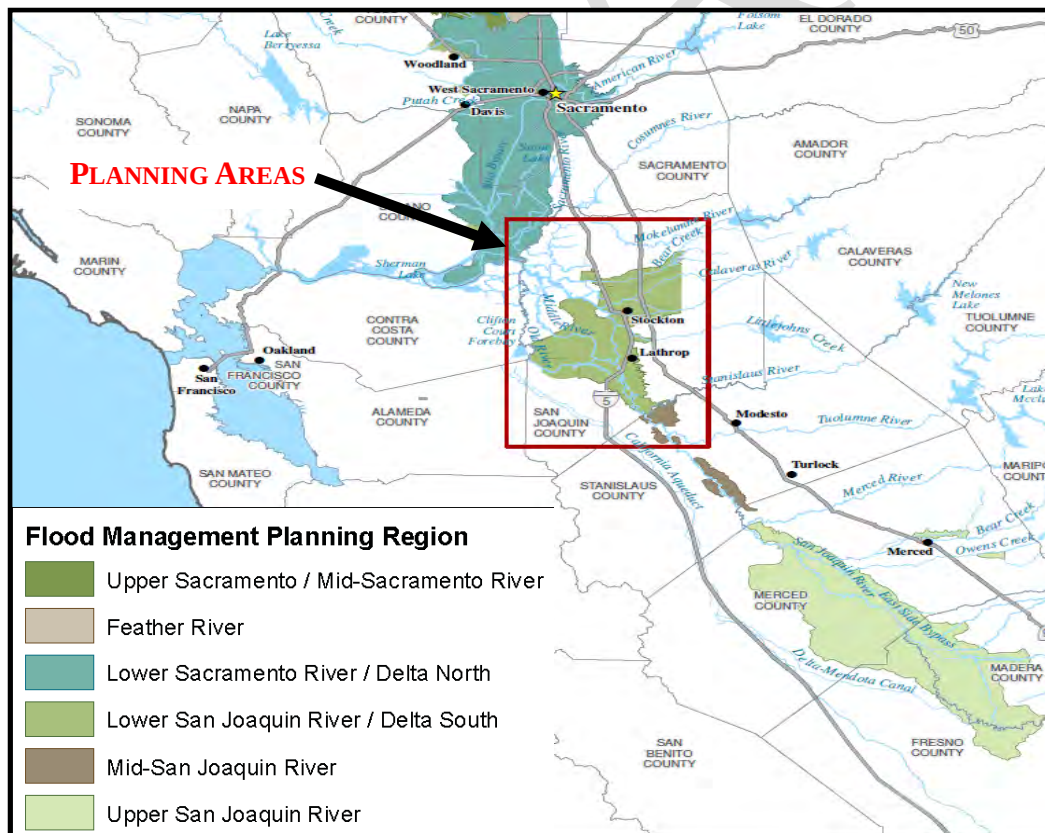


Figure 1 - RFMP Planning Areas

3.2 The Planning Process

SJAFCA was authorized by stakeholders in the Regions to lead the combined RFMP effort for the two Regions. SJAFCA elected to combine the Lower San Joaquin Region and Delta South Region into a single RFMP effort for many reasons. Both Regions share a common boundary – the San Joaquin River – and are both within San Joaquin County. Furthermore, projects in one Region may have an impact on the other Region, and both Regions have members that participate in the San Joaquin County Flood Protection and Technical Advisory Committee (TAC) monthly meetings.

The Regions consist of a portion of San Joaquin County; the cities of Stockton and Lathrop; a portion of the cities of Manteca and Tracy; 26 Reclamation Districts (RDs), and Drexler Tract. The cities of Lodi and Ripon, and RD 2115, RD 2119, and RD 403 were also invited to participate in the RFMP due to their proximity to the Regions. A total of approximately 260 stakeholders and interested parties were identified and included in the RFMP process.

Contact information for the majority of the stakeholders was available from SJAFCA since representatives from the cities and RD's within the Regions have historically participated in the monthly TAC meetings. Direct contact to known RD Board members, legal counsel, and/or District engineers was also performed to ensure contact information for interested parties was obtained. Finally, an RFMP webpage was created on SJAFCA's website (<http://sjafca.com/ljsjrdsrmp.php>), and a telephone hotline (209-475-7688) was established in May 2013 to provide a single point of contact for interested parties. In October 2013, a Project Solicitation Form was put on the RFMP webpage, and distributed to stakeholders. Interested parties that contacted SJAFCA or other RFMP team members and requested to be included in the RFMP planning effort were also included in the stakeholder distribution list.

Due to the large number of stakeholders, a series of Small Group Meetings were developed to reach interested parties on a more focused level. The initial Small Group Meetings presented the background, purpose, and objectives of the RFMP. Input was solicited from attendees on what vulnerabilities existed with their flood control facilities, and to identify and gather previous studies on these systems. Information gathered from these initial meetings was used to develop the Regional Setting and Regional Flood Hazard Assessment portions of the RFMP. The monthly TAC meetings were used to inform the broader group of stakeholders on recently completed and upcoming tasks.

3.3 Relationship with the State Plans and Recent Legislation

Relationship to State Plans

From 2009 through 2011, DWR conducted planning and investigations for the 2012 CVFPP which represented a significant flood evaluation effort. Intended to guide California's participation in managing flood risk along the Sacramento River and San Joaquin River systems, the CVFPP proposes a State Systemwide Investment Approach (SSIA) for sustainable, integrated flood management in areas currently protected by facilities of the State Plan of Flood Control (SPFC). SJAFCA worked with DWR to incorporate some non-SPFC levees into the 2012 CVFPP as well. Figure 3 provides an overview of SPFC and non-SPFC levees in the Lower San Joaquin River Region and Delta South Region included in the 2012 CVFPP. The initial CVFPP was adopted by the Central Valley Flood Protection Board (CVFPB) in June 2012 and will be updated every five years, with each update providing support for subsequent policy, program, and project implementation. The CVFPP has a single Primary Goal, and four Supporting Goals, as indicated below:

CVFPP Primary Goal:

Improve Flood Risk Management – Reduce the chance of flooding, and damages once flooding occurs, and improve public safety, preparedness, and emergency response through the following:

- Identifying, recommending, and implementing structural and nonstructural projects and actions that benefit lands currently receiving protection from facilities of the SPFC.
- Formulating standards, criteria, and guidelines to facilitate implementation of structural and nonstructural actions for protecting urban areas and other lands of the Sacramento and San Joaquin river basins and the Delta.

CVFPP Supporting Goals:

Improve Operations and Maintenance – Reduce systemwide maintenance and repair requirements by modifying the flood management systems in ways that are compatible with natural processes, and adjust, coordinate, and streamline regulatory and institutional standards, funding, and practices for operations and maintenance, including significant repairs.

Promote Ecosystem Functions – Integrate the recovery and restoration of key physical processes, self-sustaining ecological functions, native habitats, and species into flood management system improvements.

Improve Institutional Support – Develop stable institutional structures, coordination protocols, and financial frameworks that enable effective and adaptive integrated flood management (designs, operations and maintenance, permitting, preparedness, response, recovery, and land use and development planning).

Promote Multi-Benefit Projects – Describe flood management projects and actions that also contribute to broader integrated water management objectives identified through other programs.

Given its vast scope, the CVFPP could not incorporate the level of detail needed to delineate refined systemwide improvement alternatives, nor did it include a detailed discussion of local

flood risk reduction priorities. Instead, it provides a broad vision to help guide regional- and State-level financing plans to guide investments which may be in the range of \$14 billion to \$17 billion over the next 20 to 25 years.

The RFMPs will not necessarily advance all the goals of the CVFPP. The RFMP for the Lower San Joaquin and Delta South Regions is being developed by the locals to inform the Basin-Wide Feasibility Study (BWFS) for the San Joaquin River Basin. This BWFS will be used to inform the 2017 CVFPP Update. Figure 2 below provides a graphical description of the relationship between these parallel planning efforts.

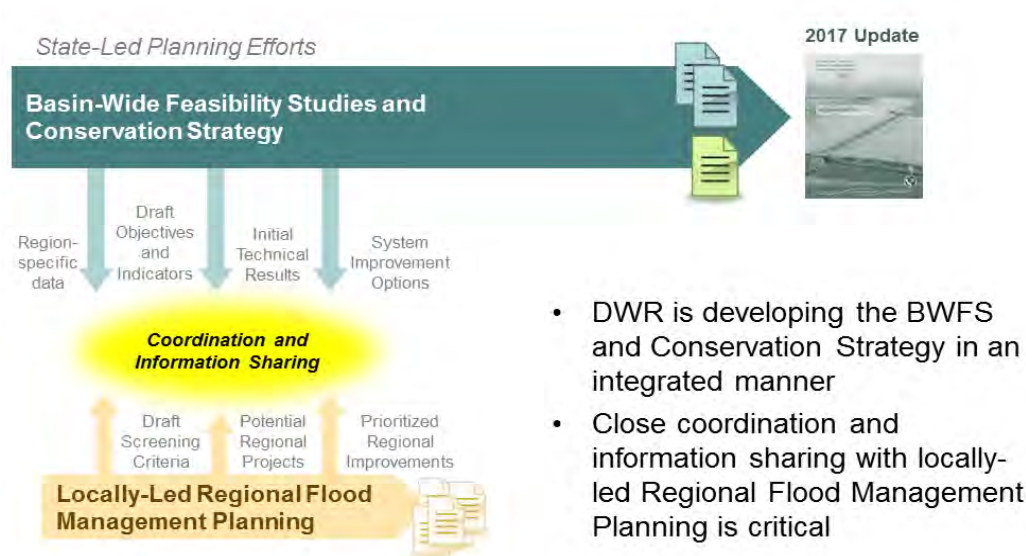


Figure 2 - Relationship between the BWFS and the RFMP

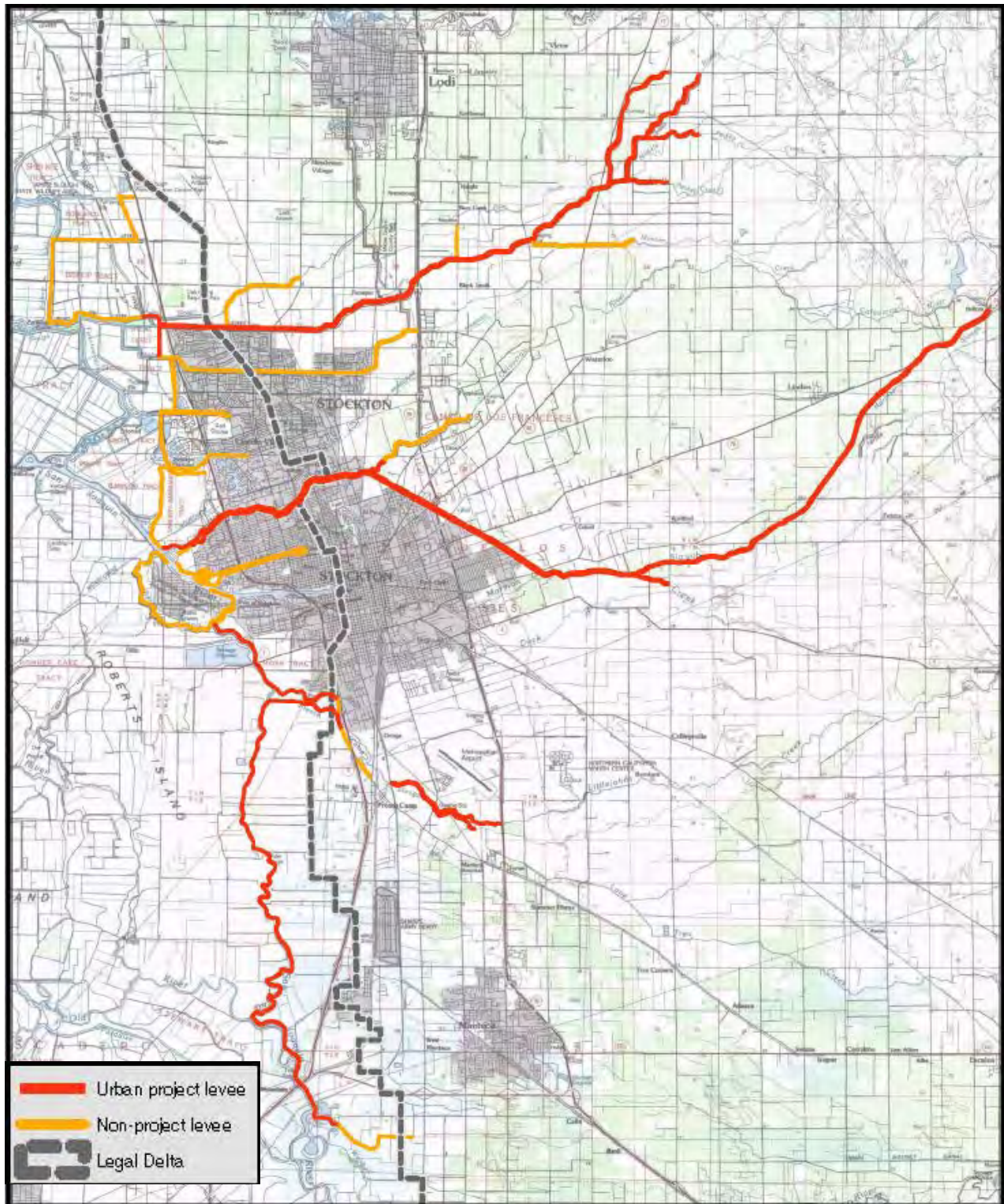


Figure 3 – SPFC and non-SPFC Levees included in the 2012 CVFPP

NOTE: This map does not show all levees in the Regions, only the ones included in the CVFPP. Additional levees are shown in Figure X on page 36.

Relationship to Other Local & Regional Studies

This RFMP has drawn on information in the Integrated Regional Water Management Plans (IRWMPs), the Bay-Delta Conservation Plan (BDCP), The State Water Project, the San Joaquin River Restoration Report, and the Lower San Joaquin River Feasibility Study (LSJRFS). Projects identified in the RFMP were coordinated with the team preparing the San Joaquin IRWMP in the Region.

Relationship to Relevant State Legislation

In 2007, Senate Bill 5 (SB5) was passed which requires a 200-year level of flood protection for urban and urbanizing areas within California's Central Valley. Under SB5, the State was obligated to develop and adopt a comprehensive Central Valley Flood Protection Plan (CVFPP) by 2012 (Cal. Water Code § 9614.). As previously discussed, the CVFPP was approved and adopted in June 2012.

Additionally, SB5 requires all cities and counties in the Central Valley to incorporate the CVFPP into their general plans within 24 months and into their zoning ordinances within 36 months (July 2014 and 2015, respectively) (Cal. Gov't Code §§ 65302.9, 65860.1.).

Furthermore, under SB5, development in moderate or special flood hazard areas (i.e. 500-year and 100-year floodplains, respectively) would only be allowed within the Central Valley if the city or county can find, based on substantial evidence in the record, that the development will be subject to less than 3' of flooding during a 200-year flood event. This is more restrictive than FEMA standards, which only require 100-year flood protection.

SB5 describes an urban area as: "a developed area in which there are 10,000 residents or more" and an urbanizing area as "a developed area or an area outside a developed area that is planned or anticipated to have 10,000 residents or more within the next 10 years" SB5 further describes a developed area "to have the same meaning as that set forth in Section 59.1 of Title 44 of the Code of Federal Regulations".

Section 59.1 of Title 44 describes a developed area as:

"an area of a community that is:

- (a) A primarily urbanized, built-up area that is a minimum of 20 contiguous acres, has basic urban infrastructure, including roads, utilities, communications, and public facilities, to sustain industrial, residential, and commercial activities, and (1) within which 75 percent or more of the parcels, tracts, or lots contain commercial, industrial, or residential structures or uses; or (2) is a single parcel, tract, or lot in which 75 percent of the area contains existing commercial or industrial structures or uses; or (3) is a subdivision developed at a density of at least two residential structures per acre within which 75 percent or more of the lots contain existing residential structures at the time the designation is adopted.
- (b) Undeveloped parcels, tracts, or lots, the combination of which is less than 20 acres and contiguous on at least 3 sides to areas meeting the criteria of paragraph (a) at the time the designation is adopted.
- (c) A subdivision that is a minimum of 20 contiguous acres that has obtained all necessary government approvals, provided that the actual "start of construction" of structures has

occurred on at least 10 percent of the lots or remaining lots of a subdivision or 10 percent of the maximum building coverage or remaining building coverage allowed for a single lot subdivision at the time the designation is adopted and construction of structures is underway. Residential subdivisions must meet the density criteria in paragraph (a)(3).”

SB5 applies to all areas within the FEMA 500-year and 100-year floodplains until the 200-year floodplain is defined, and requires cities and counties to establish substantial evidence in the record that certain development and projects are protected from a 200-year flood event (0.5% annual chance flood) before approvals can be granted.

The requirements for substantial evidence are provided in the Urban Levee Design Criteria (ULDC) and the Urban Level of Protection (ULOP) documents developed by DWR. This also applies to in-fill development.

SB5 was amended in September 2012 by Senate Bill 1278 (SB1278) and Assembly Bill 1965 (AB 1965). SB1278 and AB 1965 extended the requirement for communities to incorporate the CVFPP into their general plans and zoning ordinances by 12 months (July 2015 and 2016, respectively). SB1278 also removed local drainage and shallow flooding from Urban Level of Flood Protection (ULOP) requirements. The final version of the ULOP exempted areas subject to less than 3-feet of flooding from ULOP requirements.

Therefore, as of mid-2016, Central Valley cities and counties will be prevented from entering into development agreements, approving discretionary permits or other discretionary entitlement, or any ministerial permit that would result in the construction of a new residence; or a tentative map, or a parcel map for which a tentative map is not required, that would result in construction, and approving subdivision maps in urban or urbanizing areas without a finding of 200-year-flood-level protection.

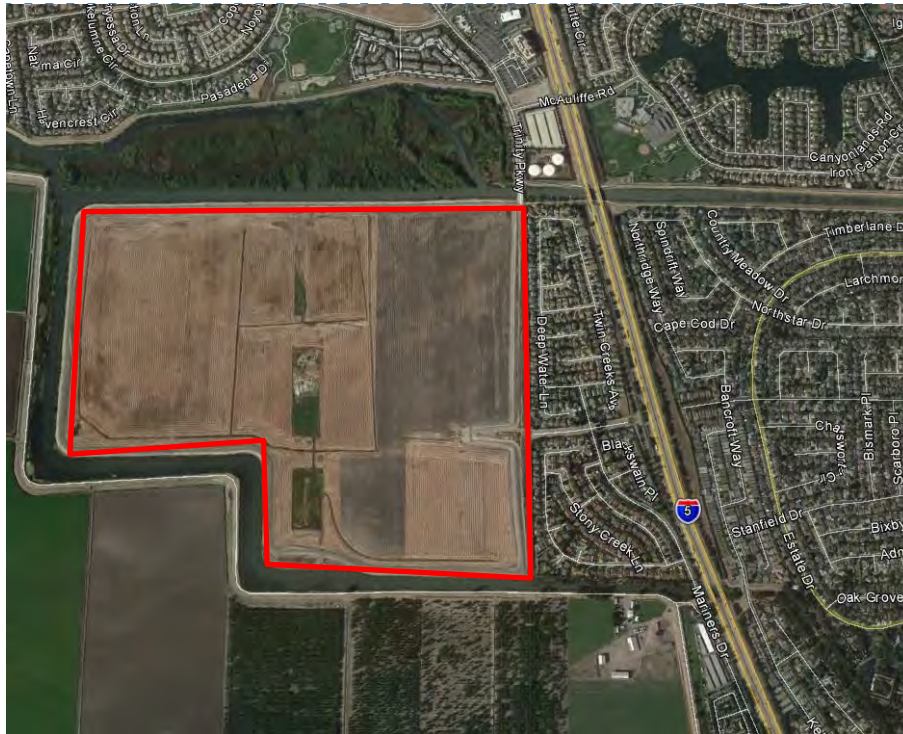
Senate Bill 5 will begin to impact San Joaquin County and its cities, along with the other cities and counties within California’s Central Valley, as early as July 2015. By no later than July 2016, permitting and development restrictions are anticipated to take effect for these cities and counties. The ULDC and ULOP requirements developed pursuant to SB5 pose onerous “findings” requirements on local land-use authorities, which can make achieving an Urban Level of Protection in many developed areas difficult due to the required system improvements necessary to meet increased levels of flood protection. Complying with these requirements will likely require both financial and staff resources, both of which are overburdened already in many agencies.

For these reasons, planning officials and development community representatives were involved and engaged in the RFMP, and encouraged to take the critical next steps to be in compliance with SB5.

Examples of development projects where land use authorities in San Joaquin County will need to determine where a finding of 200-year flood protection is required are shown on the following page.

Example 1

A possible proposed 360-acre site on Atlas Tract with approximately 1,400 lots.



Example 2

A vacant residential lot south of Fourteenmile Slough in Brookside Estates.



3.4 Sources of Existing Information

The RFMP relies primarily on existing sources of information provided by local agencies, property owners, interested individuals, non-governmental organizations, as well as State and Federal agencies. A list of documents used to inform the RFMP includes:

- 2012 Central Valley Flood Protection Plan
- Flood Control System Status Report
- State Plan of Flood Control Descriptive Document
- CVFPP Regional Conditions Report
- Lower San Joaquin River Region Flood Atlas
- Delta South Region Flood Atlas
- California's Flood Future: Recommendations for Managing the State's Flood Risk
- Lower San Joaquin River Feasibility Study
- Delta Risk Management Strategy (DRMS) Report
- ULE/NULE Evaluations
- 5-year plans from various Reclamation Districts
- Other studies/plans prepared by local agencies and Reclamation Districts
- Institutional knowledge from flood control officials and stakeholders

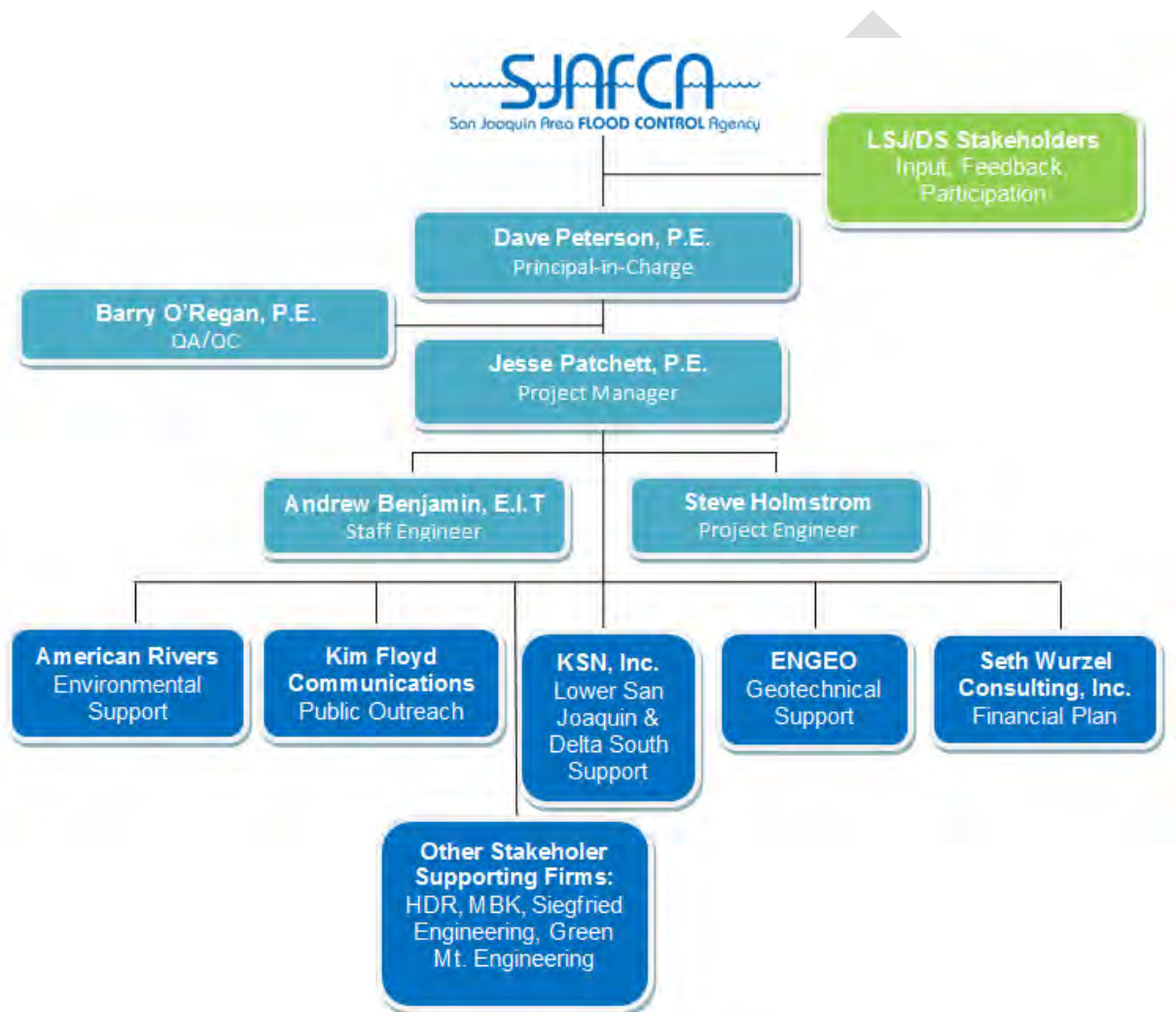
It is noted that some of these sources of information are still in progress. As new information becomes available throughout the RFMP process, facts, figures, and data included in this document will be updated.

3.5 Limitation of Existing Information Sources

The RFMP used the best available information and did not generate new data or perform new modeling. Therefore, data sets from existing sources may not fall entirely within the boundaries of the Regions. The information in this RFMP was compiled from a number of documents, each with differing levels of detail, completeness, and study area. This RFMP represents a first attempt at compiling and synthesizing available information in the Regions.

3.6 Organization of the Planning Team

SJAFCA was the lead agency responsible for preparing the RFMP. SJAFCA led the RFMP with cooperation from the cities of Stockton, Manteca, Lathrop, San Joaquin County, and the RD's within the Regions. SJAFCA retained Peterson Brustad Inc. as the lead consultant to assist in the research, planning, and preparation of the RFMP. Sub-consultants were retained for public outreach, geotechnical support, financial planning support, and engineering support for the RDs within the Regions. The RFMP Team is presented below.



3.7 Organization of this Report

This RFMP is organized to reflect the natural sequence of the planning process. Beginning with an introduction and the regional setting, the report then describes the identified flood control system challenges and associated risks. With this foundation, potential projects, policies, or other actions which may address these challenges are identified. The means and opportunities for financing proposed projects, policies etc. are formulated and presented. Based on all of these elements, a locally determined set of action priorities is formulated and documented.

3.8 Vision and Goals

The long-term vision and goals for this RFMP were developed with input from flood risk management officials in the Planning Areas, while recognizing that reducing exposure to flood risk and implementing significant system improvements throughout the Regions will take decades.

With this as a guide, the vision adopted for the RFMP consists of the following elements:

1. A multi-faceted plan to improve public safety through integrated flood management in order to reduce the chance and consequences of flooding while promoting coincident integrated water management benefits, other multi-benefit components, and sustainable economic growth.
2. Achieve this vision by improving flood management systems, emergency response, O&M, and both public and institutional awareness.

The four primary goals established for the RFMP include:

1. Inform stakeholders about recent state legislation and the importance of flood risk management
2. Engage stakeholders in identifying flood management needs
3. Engage stakeholder on developing a prioritized list of projects
4. Identify funding needs and sources to implement flood management projects over the next 25 years

Projects developed as part of the RFMP will be reviewed against this vision to ensure each project aligns with the vision as part of the project prioritization process discussed later in this RFMP.

The Small Group Meetings proposed as part of the RFMP helped SJAFCA meet the four primary goals established for the RFMP.

4 Regional Setting

4.1 Regional Overview

4.1.1 *Area and Boundaries*

The Planning Areas are in the central portion of the Central Valley of California, a broad, gently sloping valley that drains into the Sacramento-San Joaquin Delta. Located near the mouth of the San Joaquin River, the Planning Areas are subject to runoff from nearly the entire 14,700 square mile San Joaquin River Basin. In general, the Planning Areas are defined as areas that are protected by SPFC and non-SPFC levees and consist of a mixture of urban and agricultural land uses.

The Planning Areas are characterized by the Lower San Joaquin River, the Delta South, and the numerous tributaries which flow through urban areas from the foothills east of the region. Some of the primary tributaries to the Lower San Joaquin River include: Bear Creek, Calaveras River, Mormon Slough, Mosher Slough, Stockton Diverting Canal, and the French Camp Slough. Nearly all of these tributaries have at least one State Plan of Flood Control (SPFC) and non-SPFC levee system protecting existing development.

The primary tributary to the Delta South is the San Joaquin River. There are numerous sloughs and canals traversing the Delta South Region. Some of the prominent waterways include: Paradise Cut, Old River, Middle River, Burns Cutoff, Turner Cut, Whiskey Slough, Trapper Slough, Victoria Canal, and Grant Line Canal. Urban development in the Delta South is focused near Tracy and Lathrop. The Delta South area is characterized predominantly by agricultural land use.

Figure 1 on page 2 of this document provides a graphical depiction of the Planning Areas.

4.1.2 Land Use and Population

Land Uses

Land uses in the Planning Areas generally relate to the Central Valley's agricultural heritage and proximity to effective distribution facilities, namely the Stockton Ship Channel, interstate freeways, and transcontinental railroads.

The Planning Areas consist of actively farmed agricultural land (75%), urban and built-up land (23%) and native vegetation and grazing land (2%). Urban development is generally centered near the cities of Stockton, Lathrop, Manteca, Lodi, Ripon, and Tracy. Lands outside the spheres of influence of these cities are generally agricultural.

It should be noted that most of the farmland in the Regions is classified as Prime Farmland, or Farmland of Statewide Importance, the California Farmland Mapping and Monitoring Program's highest designated tiers. This indicates that every reclamation district in the Regions with any agricultural production protects a portion of the most valuable farmland in the State of California, regardless of the crops planted at any given time. The continued usability of the land for agricultural production is critical to agricultural output of the State. Figure 4 on the following page provides a graphical overview of the land use in the Region.

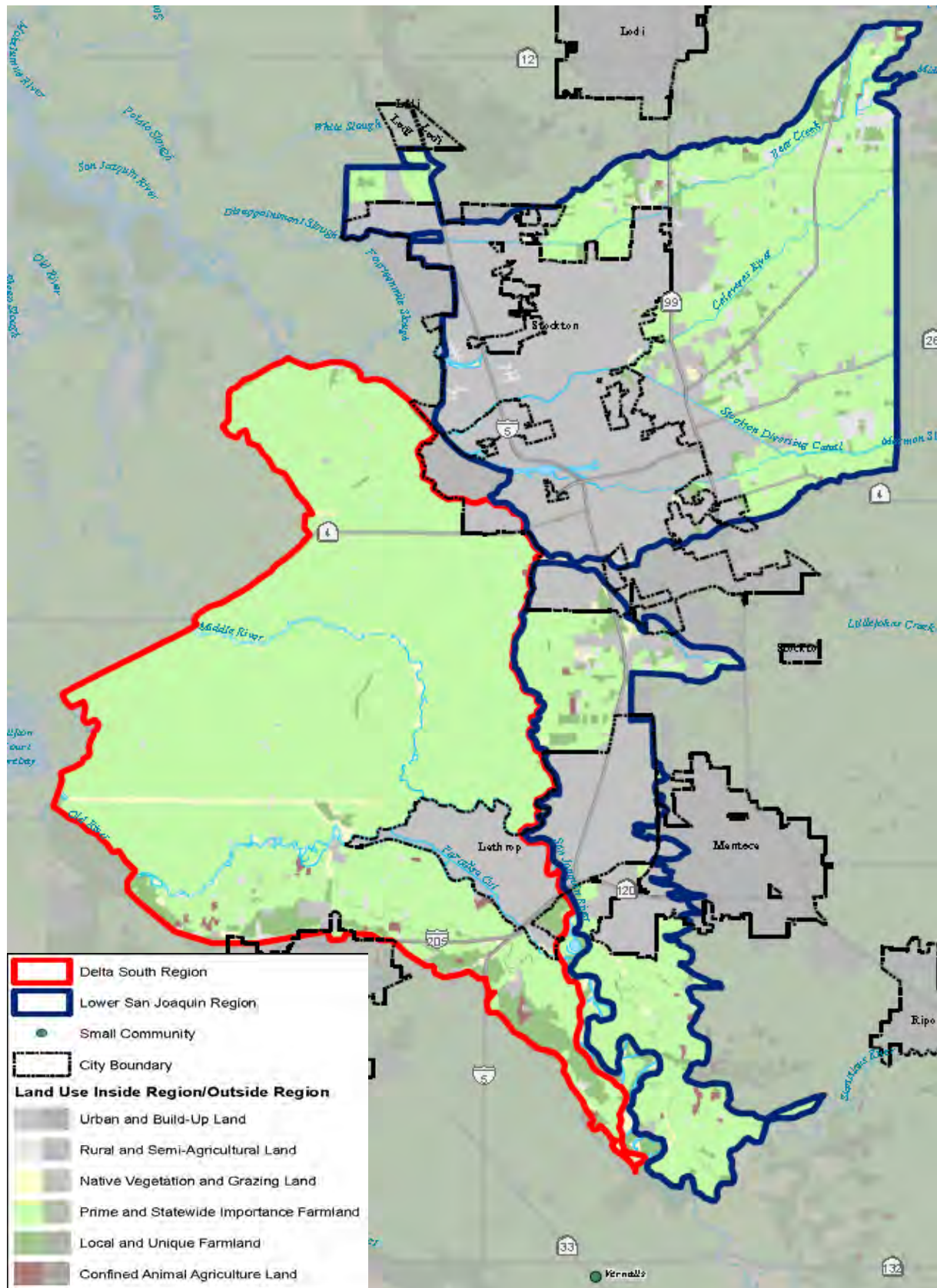


Figure 4 – General Land Uses in the Planning Area

Conservation Areas

San Joaquin County participates in the California Land Conservation Act (commonly known as the Williamson Act) program. The Williamson Act aims to preserve agricultural land and related open space uses by discouraging premature and unnecessary conversion to urban uses. In exchange for agreeing to maintain Williamson Act compatible land uses, landowners receive the benefit of reduced property tax rates from the County. Williamson Act contracts are voluntarily established 10-year agreements between a landowner and the County and the term of the contract is automatically renewed every year, unless a notice of non-renewal is filed by the landowner.

A Williamson Act contract restricts a landowner's ability to use or subdivide any parcel of land under an existing contract. Compatible uses under the Williamson Act generally consist of agricultural (i.e. farming, ranching, grazing, timber) and related uses such as agriculturally-related processing facilities. Generally, one single-family home and agricultural housing is also allowed under the Williamson Act, however the specific terms of the contract itself govern compatible uses. Subdividing the property into small lots, or using property in a manner not compatible with the uses outlined in the contract or the Williamson Act itself can have serious consequences, such as specific performance of the contract (including an enforcement action to stop the offending use) and financial penalties assessed to the property owner.

Similar to Williamson Act lands, conservation easements also aim to set aside lands for non-urban uses. Conservation easements differ from the Williamson Act parcels in that agricultural or conservation easements are legal agreements between a landowner and a government or nonprofit entity such as a land trust, that conserves agricultural, biological habitat, or open space resources by temporarily or permanently limiting future development. Agricultural or conservation easements can be tailor made to meet the needs of an individual landowner and can cover an entire parcel or portions of a property. Tax benefits and/or financial compensation are often available for grantors of these types of easements.

Conservation easements typically restrict development and subdivision to the degree that is necessary to protect the significant habitat, open space, or other conservation values of that particular property. Some conservation easements include "home sites," or areas known as "exclusions" to the easement terms where limited development is allowed. Generally, home sites or exclusions are small in size (1-2 acres) and located on areas low in conservation value. Landowners and land trusts work together to draft conservation easements that reflect both the landowner's desires and the need to protect conservation values.

There are approximately 113,000 acres of Williamson Act and Conservation Easement parcels in the Planning Areas. Figure 5 provides a graphical depiction of Williamson Act parcels and Conservation Easements in the Planning Areas.

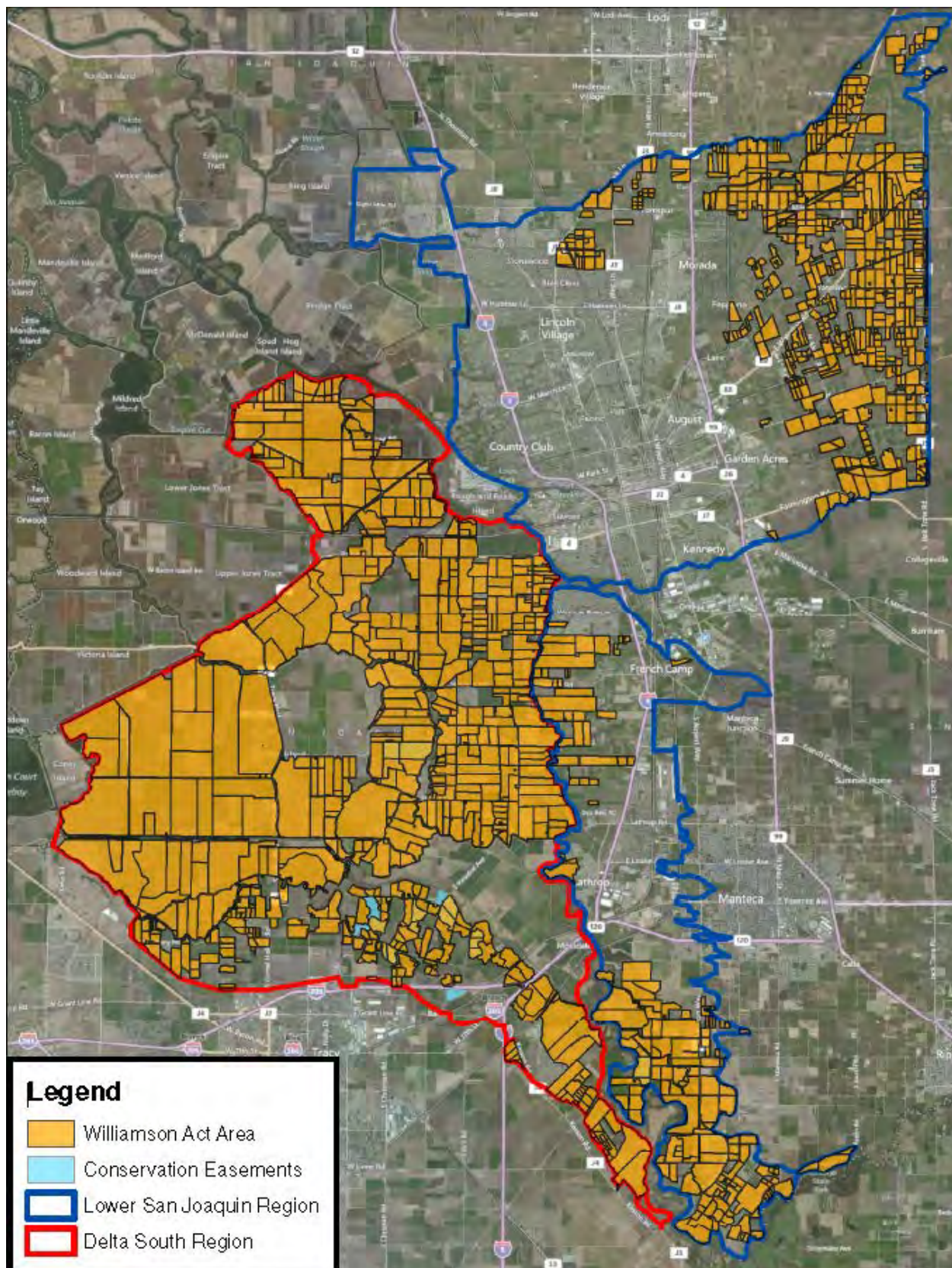


Figure 5 – Williamson Act Lands & Conservation Easements in the Planning Areas

Population & Demographics

Based on the 2013 California Department of Finance data, San Joaquin County has a population of 698,414 with most residents concentrated in the urban areas of the cities of Stockton, Tracy, Lathrop, Manteca, Lodi, and Ripon. Table 1 below shows the populations of the communities in and near the Planning Areas. It should be noted that this data is identified by jurisdiction, some of which extend beyond the planning area boundaries.

Table 1 - Population by Jurisdiction in the Regions

Jurisdiction	Total Population
	January 1st, 2013
San Joaquin County	698,414
Lathrop	19,209
Lodi	62,930
Manteca	71,164
Ripon	14,606
Stockton	296,344
Tracy	84,060
Other Areas	150,101

Source: 2013 Population Estimates, CA Dept. of Finance, Demographics

In addition to the cities noted above, there are 12 RDs within the Lower San Joaquin Region, 14 RD's within the Delta South Region, and 3 additional RDs enveloped by the Planning Areas that were engaged in the RFMP. Drexler Tract is also included in the Delta South Region. Acreage for these RDs is shown in Table 2 below.

Table 2 - Acreage by RD in the Regions

Delta South Region		Lower San Joaquin Region	
Reclamation District	Acreage	Reclamation District	Acreage
RD 1	11354	RD 17	11221
RD 2	12580	RD 404	2551
RD 524	11950	RD 828	1131
RD 544	7574	RD 1608	566
RD 684	10437	RD 1614	1598
RD 773	6900	RD 2042	3100
RD 1007	5933	RD 2064	5888
RD 2058	7386	RD 2074	1186
RD 2062	3962	RD 2075	3481
RD 2085	1460	RD 2094	1970
RD 2089	714	RD 2096	67
RD 2095	3750	RD 2126	360
RD 2107	1031	Other RDs	
RD 2116	131	Reclamation District	Acreage
Drexler Tract	3137	RD 403	1451
		RD 2115	1806
		RD 2119	2097

Table 3 below presents US Census Bureau demographic information for San Joaquin County. Information on the County was used since the Planning Areas span multiple cities and unincorporated areas. It is noted the data in the table below cities 2011 and 2012 data, which is not as current as the data in Table 1.

Table 3 - Demographics

	San Joaquin County	State of California
General Data		
Percentage of population under 5 years old	7.7%	6.7%
Percentage of population under 18 years old	28.6%	24.3%
Percentage of population between the ages of 18 and 65	60.4%	63.6%
Percentage of population over 65 years old	11.0%	12.1%
Ethnicity		
White	68.4%	73.7%
Black or African American	8.2%	6.6%
American Indian and Alaska Native	2.0%	1.7%
Asian	15.7%	13.9%
Native Hawaiian and Other Pacific Islander	0.7%	0.5%
Two or More Races	5.0%	3.6%
Hispanic or Latino*	39.7%	38.2%

* According to the US Census Bureau, people who identify their origin as Spanish, Hispanic, or Latino may be of any race. Thus, the percent Hispanic should not be added to percentages for racial categories.

4.1.3 Economy and Industry

Located along the San Joaquin River, the Regions have a long and rich history of farming. Proximity to transcontinental railroads and the Port of Stockton continue to make San Joaquin County one of the most important areas west of the Rocky Mountains for commerce. Accordingly, agriculture and related industries account for 30%-35% of the total economy of San Joaquin County. In 2011, the farming and agriculture industry accounted for more than \$2.2 billion of the economy in San Joaquin County.



The table below presents data from the US Census Bureau on the different types of industries in San Joaquin County. It is noted this data is not current; however it represents the latest available information on the US Census Bureau website as of the date of the RFMP.

Table 4 – San Joaquin County Business Data

Private nonfarm establishments, 2011	10,697
Private nonfarm employment, 2011	159,882
Private nonfarm employment, percent change, 2010-2011	-0.5%
Non-employer establishments, 2011	34,053
Manufacturers shipments, 2007 (\$1000)	8,272,476
Merchant wholesaler sales, 2007 (\$1000)	9,001,313
Retail sales, 2007 (\$1000)	7,109,680
Accommodation and food services sales, 2007 (\$1000)	745,809
Building permits issued in 2012	1,006

According to the US Census Bureau, the median household income in San Joaquin County from 2007 – 2011 was approximately \$53,764, and approximate 17% of the County's population was below the poverty level. Additionally, the Planning Areas have areas that meet the definition of a Disadvantaged Community (DAC). According to DWR's guidelines, a DAC is defined as an area with a median household income less than \$48,706. The figure on the following page illustrates the disadvantaged communities within the Planning Areas.

Figure x – Disadvantaged Communities in the Regions

4.1.4 Natural Resource Assets

The rich, productive soils in San Joaquin County represent one of the most important natural resource assets in the Regions. As noted above, agriculture and related services bring in an estimated \$2.2 billion annually.

The numerous rivers, streams, creeks, sloughs, and channels are also a vital resource in the Regions. The Stockton Ship Channel is used as a navigational channel by large commercial ships traveling to and from the Port of Stockton. These waterways support the vast agriculture industry in the Regions, provide drinking water, and recreation opportunities for residents.

Statewide, the Sacramento–San Joaquin Delta provides water for approximately 7 million acres of farmland and drinking water for approximately 25 million people, making it the single largest drinking water source in California. Therefore, the protection and preservation of water quality within the Delta and for the State and Federal Water Projects is a critical. The RDs in the Regions help protect drinking water in the Delta by maintaining the appropriate balance between freshwater and saltwater. Flooding of Delta islands has the potential to negatively affect water quality both locally and statewide.

Maintaining the current configuration of Delta levees and channels is critical to insure Delta salinity standards are met and salt water intrusion from the San Francisco Bay into the Delta does not occur. If the levees along any of the Reclamation Districts in the Regions were breached, particularly during a storm or high water event, several adjacent islands would be threatened by seepage under the levee and higher wind fetch, which could cause levee failures.

If multiple levees were to fail during dry conditions, water quality in the Delta could be greatly degraded by the transportation of tidal salt water through the major Delta channels where fresh and salt waters mix due to the effect of each island filling rapidly with water from the surrounding waterways.

In addition to agriculture and water supply, the Regions provide habitat and riparian areas for wildlife. Riparian vegetation is a habitat type characterized by trees, other vegetation and physical features normally found on the stream banks and flood plains associated with streams, lakes, or other bodies of water. Riparian systems provide several important functions to both the aquatic and terrestrial ecosystems associated with them. These include, but are not limited to, stream bank stabilization, flow moderation and flood control, sediment control, organic matter necessary to support aquatic communities, water quality improvement by filtration, temperature moderation by shading, and stream structural diversity. Riparian habitats support a great diversity of wildlife, including sensitive invertebrates, amphibians, reptiles, birds, and mammals. Riparian vegetation occurs intermittently and concentrated around waterways in the Regions including: Littlejohns Creek, the right bank of the Stanislaus River, and San Joaquin River.

Finally, the Regions have “Designated critical habitat” areas. Designated critical habitat is a term defined in the Endangered Species Act and used by US Fish and Wildlife Service and the National Marine Fisheries Service as an area that is essential for the conservation and recovery of a federally threatened or endangered species that requires special management and protection. It may include an area that is not currently occupied by the species but that will be needed for its recovery. Critical habitats are designated to ensure that actions authorized by federal agencies

will not destroy or adversely modify critical habitat, thereby protecting areas necessary for the conservation of the species. Not all federally listed species have designated critical habitat.

Species with land designated as critical habitat in the Lower San Joaquin River Region and Delta South Region include the Delta smelt (*Hypomesus transpacificus*), Central Valley steelhead (*Anadromous O. mykiss*) and the Green sturgeon (*Oncorhynchus tshawytscha*). It is noted that Endangered and Threatened species data shown are representative of occurrence areas defined by the California Natural Diversity Database. Figure 6 on the following page provides an overview of locations of Riparian Vegetation and Endangered/Threatened Species in the Planning Areas.

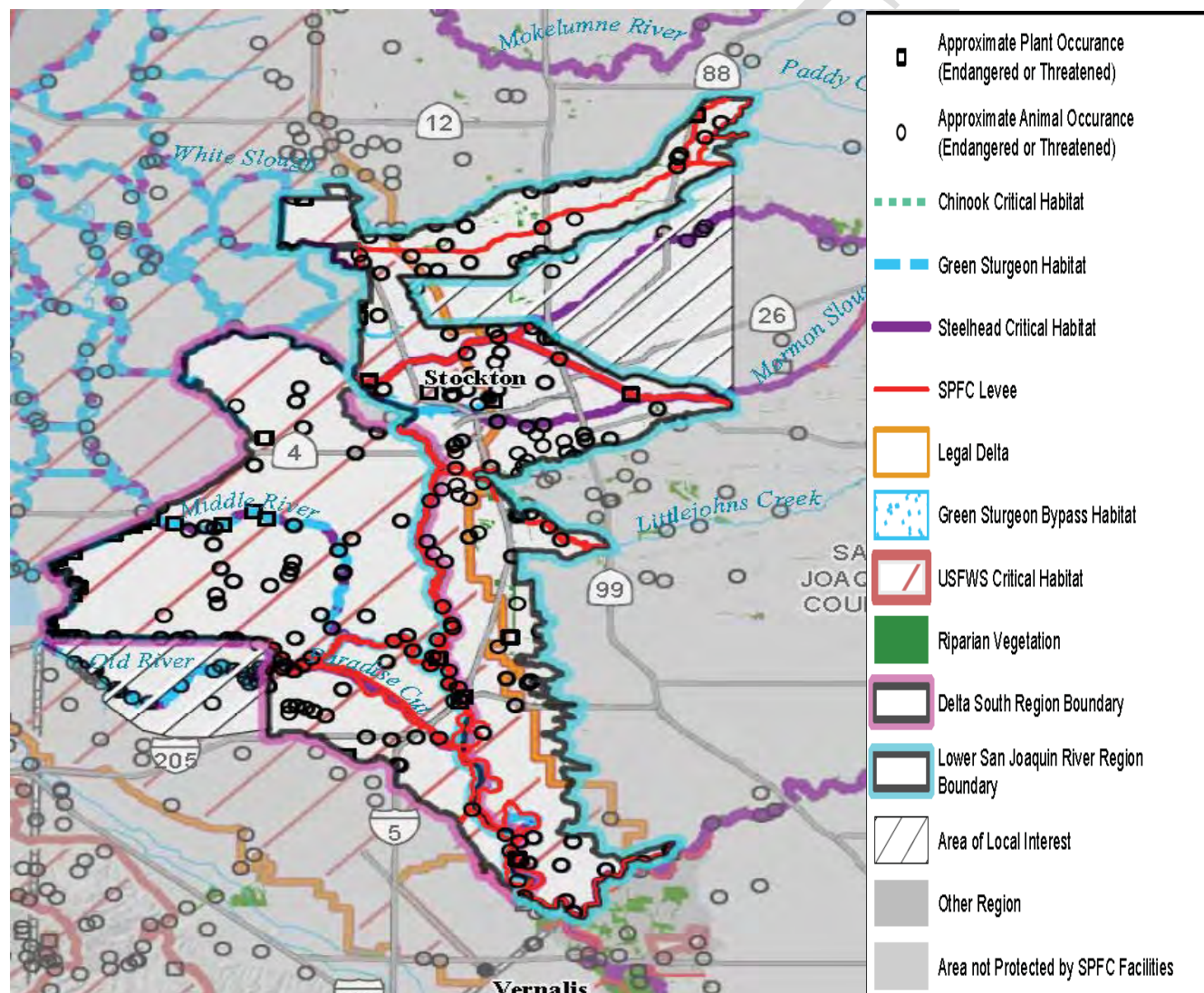


Figure 6 – Riparian Vegetation & Endangered/Threatened Species in the Planning Area

Note: the "Area of Local Interest" was included in the GIS data from DWR. This "area" is part of the LSJ/DS Regions included in the RFMP. This figure cannot be updated/modified since the species data is proprietary. Contact with the California Natural Diversity Database staff is on-going in an attempt to get this data for the RFMP so this figure can be updated to accurately reflect the RFMP boundaries.

Also, stakeholders have noted that the sightings of riparian vegetation and/or endangered/threatened species within/around Stewart Tract (RD 2062) is inaccurate. These sightings have never occurred outside Paradise Cut, according to stakeholders.

4.1.5 Critical Infrastructure

The hundreds of thousands of people who live, work, and play in the Regions depend on a significant amount of infrastructure. Specifically, potable water distribution facilities, treatment facilities, interstate freeways, highways, airports, railroads, and the Port of Stockton are all vital to interstate commerce and the economy in the Regions. Figure 7 on the following page and Regional Atlas Map 8 provides a graphical overview of the key infrastructure facilities described below.

Major north-south highways include: Interstate 5 and State Highway 99. Major east-west highways include: Interstate 205, 580 (just west of the Regions); State Highways 4, 26, and 120.

Other critical infrastructure in the Regions includes:

- The Port of Stockton
- 2 airports including the Stockton Municipal Airport and Wallom Field Airport
- Union Pacific Railroad
- Burlington Northern Santa Fe Railroad
- Central California Traction Railroad
- Lathrop and Stockton City Halls
- 2 San Joaquin County Admin Buildings
- 15 boat launching facilities
- 6 hospitals
- 14 fire stations
- 4 police stations
- Stockton Waste Water Treatment Plant
- Lathrop/Manteca Sewer Treatment Plant
- Mokelumne Aqueduct
- City of Manteca Water Quality Plant
- City of Lathrop Water Recycling Plant

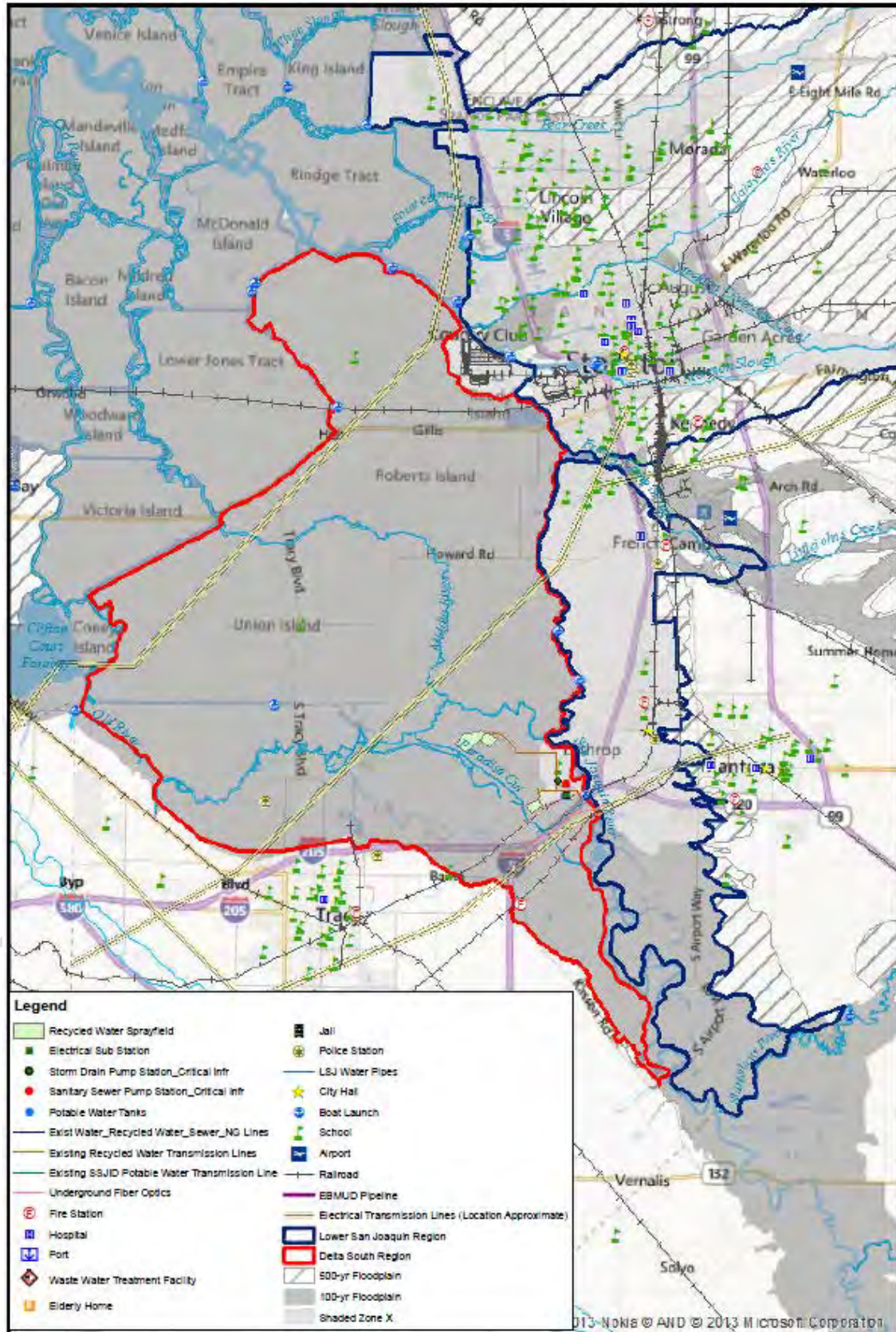


Figure 7 – Critical Facilities and Infrastructure in the Regions

4.1.6 Climate

The Regions are characterized by a well-defined cool, wet season lasting generally from November through April, followed by a hot, dry summer. With the Sierra Nevada Mountains to the east, and the exposure to the influence of storms sweeping in from the Pacific Ocean, the Regions can be subjected to rapid, extreme, and persistent rainfall and subsequent flooding.

Flooding in the Planning Area is typically characterized by infrequent severe winter storms, combined with snowmelt runoff from the Sierra Nevada Mountains east and of Stockton. Runoff from these storm events traverses the Planning Area via numerous creeks and rivers, ultimately draining to the San Joaquin River. This type of rainfall event was formerly referred to as a Pineapple Express since the warm, moist air mass originates near Hawaii in the Pacific Ocean. This phenomena is now referred to as an “atmospheric river”.

4.1.7 Historic Flood Events

The most recent major flood events occurred in the Planning Area along the Lower San Joaquin River in 1955, 1983, 1986, 1995 and 1997. The distribution of flood damages in the region has varied considerably with each storm event. However, the highest magnitude of damages occurred to agricultural crops and developments. The 1997 flood event did, however, damage 1,842 residences, mobile homes, and businesses in San Joaquin and Stanislaus counties. Estimated average annual equivalent damages (year 2000) from floods in the Lower San Joaquin River Basin amount to about \$20 million based on preliminary HEC-FDA model for the USACE Comprehensive Study. Crop damages (\$9 million) account for nearly half of the estimated damages. While it is noted the data included herein represents an area larger than the RFMP Regions, it highlights the history and magnitude of severe flood events basin-wide, and in the Regions in particular. Table 3 entitled “Historical Flooding in the Region” is provided using data from the USACE, USGS and CDEC for 1983 through 2006.

Table 3 - Historic Flood Events in and near the Regions

Date	Location	Flood Type	Description
December 1861-January 1862	Statewide	Slow Rise, Structure Failure	The “Great Flood” was remarkable for the exceptionally high stages reached on most streams, repeated large floods, and prolonged and widespread inundation in the San Joaquin Valley.
1907 & 1909	Statewide	Slow Rise	Flooding from these two events led to revised flood management plans of the time and to development of the State Reclamation Board (late CVFPB)
1938	Pescadero and Stewart Tracts	Structure Failure	Delta levees breached on Mandeville, Quimby, Rhode, and Venice Islands and Pescadero and Stewart Tracts, a total of about 21,000 acres. The 100-acre Rhode Island was never reclaimed. Franks Tract was flooded and never reclaimed.
1950	San Joaquin Valley, Stockton Delta: Mossdale, Pescadero and Stewart Tracts	Slow Rise, Stormwater, Structure Failure	The west levee of Paradise Cut breached, causing Delta flooding on the Pescadero Tract and the Stewart Tract, and washed out the Southern Pacific Railway tracks. Levees breached and flooded 3,220 acres on Venice Island and 5,490 acres on Webb Tract.
December 1955 - January 1956 “1955 Christmas Flood”	Regional	Sudden Rise, Structure Failure	Intense rainfall and snowmelt event during the week before Christmas created flood peaks on December 23 rd and 24 th . Numerous breaches resulted on Mormon Slough and Diverting Canal. In addition, levees breached and flooded 769 acres on Quimby Island, 3,430 acres on Empire Tract, and 9,300 acres on New Hope Tract.
April 1958 Flood	Regional	Slow rise	Unusually wet winter caused highest runoff on the Calaveras River since 1911 and largest flows recorded at that time on the Bear Creek system. Extensive flooding and damage east and north of Stockton. Flood fight operations protected urbanized areas as well as all Delta islands
1980	Regionwide, Delta: Little Mandeville Island, Holland and Webb Tracts	Slow Rise, Structure Failure	Heavy releases into the Delta and high winds created a threatening situation in mid-January requiring extensive flood fight. On January 18 th , Holland and Webb Tracts failed. Later in the same year, on September 26 th the levee on Lower Jones Tract suddenly failed in summer conditions. RR embankment separating Lower from Upper Jones subsequently failed flooding portions of Upper Jones.

Date	Location	Flood Type	Description
November 1982- March 1983	Delta and Lower San Joaquin River; Venice, Mildred, Shima, and RD2064	El Nino Event with prolonged high water in the Delta,	Extended rainfall events beginning in November caused continuing high reservoir releases into the Delta resulting in prolonged high waters over period of weeks with very high Spring Tide peaks. Venice Island subsequently failed on November 30 th and Mildred and Shima Tracts in January. High Lower SJR flows in March from continuing rainfall and snowmelt led to flooding of RD2064 at the confluence of the Stanislaus and San Joaquin Rivers
January 1997	Regionwide, San Joaquin Valley, Delta: Stewart Tract, Pescadero District, Mossdale	Extreme rainfall event caused rapid rise on all river systems in Regions except Calaveras River	Prolonged rain in December resulted in nearly all upstream dams having reservoir water elevations near or slightly encroaching into their flood storage capacity by the end of the month. The extreme rainfall event during December 30th-January 1st subsequently resulted in nearly simultaneous high releases by all reservoirs on the system and uncontrolled emergency releases at Don Pedro and Friant Dams. Reservoir operators made initial release decisions on an individual basis which prevented any control or management of resulting flood elevations in valley waterways and on their levees in the initial days of the flood. Coordinating these outflows may have significantly reduced flooding in the valley. RD 2095, 2058, 2107 & 2062 on the west bank of the San Joaquin River all flooded in 1997. Major flood fight efforts on Mokelumne and Lower San Joaquin Rivers with lesser event in the tidal Delta.
June 2004	Delta: Lower and Upper Jones Tracts	Sudden failure with summer water elevations	Sudden failure of Upper Jones Tract levee during summer water elevations in early June. Flows subsequently flooded that 5,894-acre tract and Lower Jones Tract of similar size. Flood waters threatened to overtop southerly Trapper Slough Levee and flood Highway 4, Drexler and Honker Tracts, and portions of Middle and Lower Roberts Island. Major flood fight prevented failure of Trapper Slough levee.
December 2005- January 2006	Delta and Lower San Joaquin River	High Tide and Spring flood on Lower SJR	Heavy rains and high reservoir releases into Delta caused extreme Spring Tide water elevations on January 1 st requiring a major Delta flood fight. Subsequent severe rainfall event in early April caused rise of Lower San Joaquin River to Danger Stage at Vernalis. Major flood fight required to prevent levee failures on Lower SJR. This flood fight effort was successful in avoiding levee failures in the Regions.

Photos of flooding etc. may be added if available.

4.1.8 Historical Context of Flood Management Activities in the Regions

Early Settlement and Flood Management Facilities in the Regions

Prior to the rapid influx of settlers from the discovery of gold in 1848, the Lower San Joaquin and Delta South Regions were occupied by Native American tribes, which lived by subsistence off of the abundant and diverse resources in the valley and foothills, including various runs of salmon, waterfowl, deer, elk, and acorns. The low-lying portions of the valley were occupied by vast Tule marshes, with riparian forests growing on the low, natural levees lining the meandering channels. At the higher elevations these marshes and riparian forests gave way to grasslands and oak woodlands. In this natural state, large portions of the Regions were often inundated by high tides and heavy rainfall events. The creeks, rivers, sloughs, and canals in the Regions were sources of food for the early inhabitants.

The waterways in the Regions were later modified for shipping. In the mid-nineteenth century, Captain Charles M. Weber was instrumental in developing the City of Stockton as the San Joaquin County seat and as a Port of Entry after California became the 31st state of the union in 1850. Today, ships still deliver cargo to the Port of Stockton by the channel that was created by Captain Weber in the 1800's. In addition to shipping, agriculture in the Stockton area and in the Delta was, and continues to be, a major economic base in the region.

The 1849 California gold rush fueled the economy in the Central Valley as well as the economy statewide. The gold rush attracted people from all over the world, which led to rapid population growth, construction of new transportation structures to enhance trade, and an overall economic boom. As the gold rush subsided, a great effort to control and drain the Delta for agriculture began. The rich, fertile peat soil, ideal trade location, and moderating marine influence made San Joaquin County a prime location for agriculture. The combination of these conditions has resulted in revenues which are nearly 50% higher per acre of agriculture land in the Delta than California's average.

The first levees in the Regions were constructed by early settlers around private lands along the Lower San Joaquin River and the eastside tributaries in an attempt to control floodwaters. The intent of these levees was to reclaim swampland so it could be converted to productive agricultural land. These levees were often very weak and fragile due to the lack of knowledge of subsurface conditions and soil mechanics necessary to design and construct reliable and resilient levees.

In 1861, the Reclamation and Swampland Act established an independent Board of Swampland Commissioners to develop a valley-wide flood control plan which reflected the topography of the valley, not individual land holdings.

The Board of Swampland Commissioners formed reclamation drainage districts to fund and maintain the works within their districts. The Board of Commissioners eventually evolved into the Central Valley Flood Protection Board (CVFPB). In recent years, the CVFPB has cooperated with the US Army Corps of Engineers (USACE) to design, construct, and operate & maintain the completed works of the Sacramento and San Joaquin Flood Control Projects. Finally, the CVFPB has given assurances to USACE that the Federally authorized Project levees will be operated and maintained in accordance with specified criteria.

Modern Flood Management Efforts

State oversight of flood control efforts in the San Joaquin Valley began in 1911, with the creation of the State Reclamation Board (Renamed CVFPB in 2007). Federal participation in California flood management was firmly established with authorization of the San Joaquin River Flood Control Project in 1917. From 1917 to 2006 USACE has played a lead role in planning, authorizing, financing, constructing, and inspecting flood system improvements in the San Joaquin River Valley, incorporating and improving upon the levee system originally constructed by local agencies.

In 1944, the Pick-Sloan Flood Control Act (P.L. 78-534) authorized the modification and construction of dams and levees across the United States. The Lower San Joaquin River and Tributaries Project was authorized by the Flood Control Act of 1944.

The Lower San Joaquin River and Tributaries Project provides flood protection to about 120,000 acres of fertile agricultural lands; to the City of Stockton and neighboring communities; to other areas developed for residential and industrial purposes; and to two major highways. The Lower San Joaquin River and Tributaries Project made possible the reclamation of areas that were developed to a higher degree when protection against flood hazard was assured. The Lower San Joaquin River and Tributaries Project was completed in 1968, except for the west bank levee along the San Joaquin River which was completed in 1972. The Lower San Joaquin River and Tributaries Project provided protection up to the design water surface profile from the 1955 flood profiles. Numerous individual projects were constructed pursuant to the Flood Control Act of 1944 as noted below.

The Bear Creek Levee Project was also authorized by the 1944 Flood Control Act. The improvements were constructed by the USACE in May 1963, and finished in July 1964. The project is located in the San Joaquin Valley halfway between Stockton and Lodi, starting at Disappointment Slough and extends for about 7.5 miles east. This segment along Bear Creek contains prime agricultural land, suburban developments, the Alpine Packing Company, Highway 99, I-5, two railroads, and several county roads. Project details included clearing and excavating a 7.5 mile channel along both levee banks, installing irrigation & drainage structures along the levee, designing a channel flow of 5,500 cubic feet per second.

The New Hogan Dam Project was developed in 1944 by the USACE. This project included construction of the 4,300 acre New Hogan reservoir which essentially replaced the existing Hogan Dam with a new, taller Dam in order to provide adequate irrigation water, municipal and industrial water supply, and flood storage space. The New Hogan Dam and Reservoir are located on the Calaveras River, about 28 miles east of Stockton. The objectives of building the taller dam included limiting flows in the Calaveras River to 7,000 cubic feet per second and increasing the New Hogan reservoir storage to 237,000 acre-feet. Construction of the dam began in November 1960 and was completed by June 1964.

Additionally, in 1948, new studies indicated that the New Hogan Reservoir would need a 325,000 acre-feet capacity and a downstream flow capacity of 12,500 cubic feet per second to meet an increased irrigation demand. The USACE implemented the Mormon Slough Calaveras River project which consisted of channel enlargements & realignments on Mormon Slough and

the Stockton Diverting Canal below New Hogan Dam. The channel enlargements increased flow capacity to 12,500 cubic feet per second. The project was authorized in 1962. Construction began in September 1967, and was finished in September 1968. The Mormon Slough Project is a system designed to convey Calaveras River flood flows safely through the highly productive agricultural lands downstream of New Hogan Dam and through suburban Stockton. The system consists of a diversion of the Calaveras River near Bellota to Mormon Slough, then to the Stockton Diverting Canal to the east side of Stockton, then back to the Calaveras River through Stockton.

The Duck Creek Diversion Works is a project that is a part of a larger flood control effort called the Farmington Plan, which was designed by USACE and authorized by Congress December 22nd 1944. The diversion works are located about 3 miles northwest of Farmington Dam and 15 miles south-west of the City of Stockton. With construction beginning in July 1949 and completing in November 1951, this diversion works was designed to reroute flood waters to a safer flow path, protecting the City of Stockton and the rural towns of French Camp and Farmington. The diversion works is made up of a group of projects, the first of which is a low compacted earth diversion dam across Duck Creek. This dam contains an outlet structure that allows a maximum flow of 500 cfs to Duck Creek downstream of the works, which has a channel capacity of 700 cfs. A concrete lined spillway, designed to divert flows over 500cfs from Duck Creek to a diversion channel was also constructed. This diversion channel extends about a mile south from the diversion works to a point on Littlejohn Creek four miles downstream from Farmington Dam. The diversion channel has a flow capacity of 2000 cfs. Additional downstream improvements include two dikes that block flow from Duck Creek to Mormon Slough and 14 miles of channel enlargements along Duck Creek downstream from the diversion dam.

Finally, improvements to levees protecting RD 17 were authorized under the 1944 Flood Control Act. Levees along the left bank of French Camp Slough, those along the right bank of the San Joaquin River and those along the right bank of Walt Hall Slough were completed as part of this project by USACE in 1963.

In the late 1980's, the RD 17 levees, including those authorized as part of the 1944 Flood Control Act, were improved as a part of the development of Weston Ranch in the City of Stockton. The purpose of the improvement project was to meet FEMA's 100-year flood protection requirements for urban development. FEMA accredited the levee as meeting the requirements for flood protection for urban development during a 100-year flood event in February 1990.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at a number of locations along the RD 17 levees. USACE, DWR, CVFPB, and RD 17 actively and successfully contained the seepage and boils and the levees were not compromised. After the 1997 event, USACE, CVFPB, and RD 17 funded a project to repair the seepage and boil areas under the Public Law (PL) 84-99 Rehabilitation Assistance Program. The project referred to as "Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17" consisted of the installation of landside drainage stability berms. Design and construction was performed by the USACE and was completed in 2001.

In 1995, the San Joaquin Area Flood Control Agency (SJAFCFA) was created as a Joint Powers Authority between the City of Stockton, San Joaquin County and the San Joaquin County Flood Control and Water Conservation District for the purpose of addressing flood protection for the City of Stockton and surrounding County area.

SJAFCFA's first endeavor was to prevent the possible disaccreditation of levees and to improve project levees to meet Federal Emergency Management Agency (FEMA) standards. As a result, SJAFCFA constructed the Flood Protection Restoration Project (FPRP) which consisted of flood wall and levee improvements along 40 miles of existing channel levees, 12 miles of new levees, modifications to 24 bridges and the addition of two major detention basins and pumps. These improvements were constructed along Bear Creek and Calaveras River.

Construction of the FPRP was completed in 1998, merely three and a half years after notification by FEMA that most of the City of Stockton would be remapped into a 100-year flood plain. SJAFCFA formed an assessment district of more than 74,000 parcels to finance the \$70 million project. One-time \$700 assessments (average) per single family home were collected versus the approximately \$350 per home of annual flood insurance premiums. In addition, SJAFCFA established an annual Operations and Maintenance assessment for the upkeep of flood improvements. These levees are maintained by the San Joaquin County Flood Control and Water Conservation District.

Section 211 of the Water Resources Development Act of 1996 authorized SJAFCFA to construct flood control improvements and receive reimbursement for the federal share of project costs. The federal share of the plan approved by the U.S. Army Corps of Engineers and the Office of Management and Budget is estimated at \$33.4 million. In 1998, SJAFCFA received an appropriation of \$12.6 million from the State of California for their share of the non-federal cost of the project. To date, SJAFCFA has received \$22.4 million in reimbursement from the U.S. Army Corps of Engineers and continues to seek the remainder of the approved federal reimbursement through the annual federal appropriations process.

In 2006, FEMA notified the City of Stockton and San Joaquin County that they would be re-evaluating floodplains in light of their MAPMOD program, and in conformance with PMR 34, which required documentation in the record to prove that levees provide 100yr protection. Levees with Federal certification per 44CFR65.10 were still OK. Several other non-Federal levees were given a pass, such as Brookside and Lincoln Village West, evidently because FEMA felt the documentation was there. Also, levees that had a LOMR like Atlas Tract were considered OK. Finally, in 2006, FEMA accredited project and non-project levees on Stewart Tract.

FEMA offered a PAL process in recognition that it would take a while to assemble the documentation. The City and County signed PALs in 2008, which gave them until 2010 to complete the documentation. This was focused on non-project levees that hadn't been documented or certified before. The only system that didn't make it through the PAL process was Smith Canal.

FEMA then issued new FIRMs based on the completed PALs and levees considered OK without PALs. The only new A-zones were in RD1614 and 828.

In 2009, USACE revoked its certification of the Upper Calaveras River, Stockton Diverting Canal, Mormon Slough, and Bear Creek systems. FEMA was not queued up to re-do the FIRMs, so there hasn't been a hard deadline for re-certification. In September of 2013, SJAFCFA awarded a contract to begin the process of accrediting the levees affected by the Corps certification revocation. This should be completed in 2014.

In spite of the USACE policy of revoking Federal certification after 10 years, NRCS has no such policy. Therefore Mosher Slough levees remain accredited under Federal certification.

Additionally, FEMA stated its intention to RD 17 to confirm full accreditation of the RD 17 levees as meeting the 100-year FEMA requirements in 2006. However, on June 19, 2007, DWR wrote the City of Lathrop (and copied FEMA) stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation due to concerns regarding seepage exit gradients. On the basis of DWR's concern, FEMA denied full accreditation and instead granted provisional accredited levee (PAL) status.

In the fall of 2007, in response to the PAL status, RD 17 initiated a seepage repair project and requested State funding through the DWR Early Implementation Program (EIP).

In the fall of 2010, following completion of two phases of planned RD 17 levee improvements, FEMA re-accredited the area protected by the RD 17 levee system for protection of the 100-year (0.01 AEP) Flood event.

Another significant flood management effort in the Regions that is currently underway is the Lower San Joaquin River Feasibility Study (LSJRFS). The LSJRFS was initiated by USACE to study deficiencies in the flood control system for the Lower San Joaquin River from the confluence with the Stanislaus River downstream to the Stockton Ship Channel that remained after the completion of the Lower San Joaquin River and Tributaries Project. The LSJRFS also includes the eastside tributaries to the Lower San Joaquin River. The LSJRFS aims to address deficiencies to this segment of flood control facilities due to settlement, subsidence, sedimentation, and erosion. The LSJRFS is anticipated to be complete in mid-2014 and will fund selected project features that are found to have a positive net benefit and are in the federal interest.

Finally, the Gulf Coast devastation caused by Hurricane Katrina, particularly the flooding of New Orleans, brought into sharp focus the need for improved flood protection in California. Proposition 1E and Proposition 84, approved by California voters in November, 2006, authorized the State to expend \$5 billion in bond funds for improved flood protection. As a result, DWR has been able to substantially accelerate flood risk reduction projects, launch the FloodSAFE initiative, and implement numerous flood risk management projects in California. Table 4 summarizes the significant flood control projects which impact the Region.

Table 4 - Summary of Significant Historical Flood Control Projects on the San Joaquin River

Time Period	Description
Early Development	• Early settlers converted many of the secondary channels to canals that conveyed surface water flows from the San Joaquin River for water supply. • Private diversions from the San Joaquin River for irrigation purposes were constructed • Many secondary channels were filled as floodplain was developed. • Private levees were established along many segments of the San Joaquin River to protect private property from high flows.
Early 1900's (1900 – 1950)	• 1911: State Reclamation Board established • 1930: Hogan Dam Completed by the City of Stockton for Flood Control. • 1944: Pick-Sloan Flood Control Act (Lower San Joaquin River and Tributaries Project Authorized)
Late 1900's (1950 – 2000)	• 1951: The Delta-Mendota Canal was completed and the Exchange Contractors began diverting small quantities of imported Delta water. • 1951: The Duck Creek Project was completed that provided improvements to Duck Creek and the Littlejohn Creek from French Camp Road to Escalon-Bellota Road. • 1952: Farmington Dam and Flood Control Basin were completed. • 1968: New Hogan Dam and Lake was completed providing flood control and water supply to the region. • 1968: The Mormon Slough Project was completed providing protection to farmland and orchards, and to the urban area of Stockton. • 1964: The Bear Creek Project was completed providing protection to agricultural lands adjacent to the channel, to the Lincoln Village, and to industry adjacent to the channel. • 1989: RD17 levees improved to provide 100-yr flood protection for the Weston Ranch development • 1995: SJAFCA created • 1997: SJAFCA improved levees along Bear Creek, Pixley Slough, Mosher Slough, Mosher Creek, Mormon Channel, Potter Creek, and Calaveras River. • 1997: Seepage repairs made to RD17 levees following the 1997 flood event
2000 - Present	• 2006: Proposition 1E and 84 approved \$5B in flood control improvements in the State of California • 2006: FEMA accreditation of Stewart Tract levees • 2007: RD 17 began the EIP for the seepage repair project • 2009: Lower San Joaquin River Feasibility Study initiated to study system deficiencies that remained after the completion of the San Joaquin River and Tributaries Flood Control Project • 2009 – 2010: SJAFCA Submitted PAL Compliance Documents to FEMA for: - o Shima Tract (P375, P378, P379) - o Fourteen Mile Slough (P124) - o Lower Calaveras River (P454, P356, P359, P357, P140, P1401) - o Walker Slough - o Atlas Tract (P459)

4.2 The Regional Flood Management System

The flood management system in the Regions includes levees, channels, bypasses, floodways, pump stations, drainage facilities, reservoirs, and emergency responders. It also includes the multitude of State and federal agencies, programs, policies, and procedures which profoundly affect how future Regional flood management elements are designed, financed, and constructed, how the system is operated and maintained, and how the economic stability and environmental quality of the Regions are improved over time. Each of these elements is discussed in detail in this section.

4.2.1 *Structural Elements*

The flood management system which currently provides protection to the Lower San Joaquin Region and Delta South Region includes reservoirs with active flood control space (upstream of the RFMP boundary), levees along the major flood control channels, and drainage facilities which pump interior runoff and seepage from levee protected areas back into the flood control channels. It is part of a vast system of multi-purpose reservoirs, leveed stream channels, weirs, and overflow structures which has been constructed to reduce flooding in the San Joaquin Valley over the past 60 years.

SPFC levees exist along portions of: Bear Creek, the Calaveras River, Mosher Slough, Mormon Slough, and the Stockton Diverting Canal, Littlejohn Creek, French Camp Slough, Paradise Cut, and the east bank of the Lower San Joaquin River downstream of Vernalis. The Regions also have a bypass facility known as Paradise Cut. Paradise Cut is a diversion structure that diverts water out of the San Joaquin River and into the Grantline Canal, where it ultimately enters Clifton Court Forebay.

Figure **x** on the following page shows these SPFC levees and non-SPFC levees in and near the Regions.

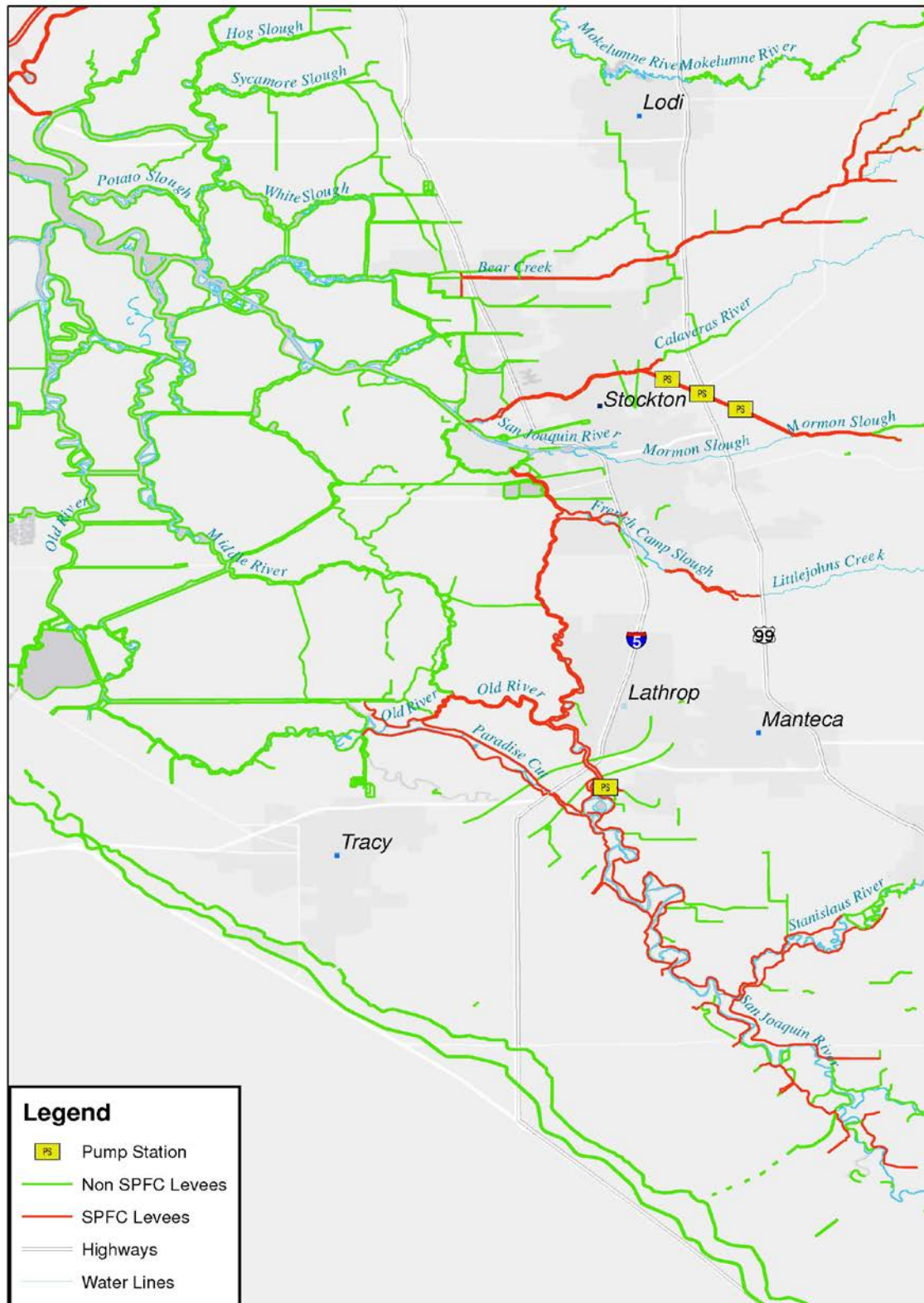


Figure x – SPFC and Non-SPFC Flood Management Facilities in the Planning Areas

4.2.2 Non-Structural Elements

Non-structural flood risk management elements include a wide range of measures which limit the risk of flood damage primarily by avoiding or reducing the exposure to damaging flood waters rather than by confining those flood waters with larger and stronger hydraulic structures. These elements include raising and waterproofing structures so that they will be above anticipated flood levels, limiting development in floodplains through the acquisition of agricultural conservation easements, open space easements, regulatory constraints, and incentive programs. Restoration of floodplains where feasible, to provide additional flood channel storage and conveyance capacity, is often regarded as a non-structural element because it reduces, rather than increases, the confinement of floodwaters in existing channels.

4.2.2.1 Financial Incentive Programs

NFIP & Community Rating System

One of the most significant non-structural flood risk reduction programs is FEMA's National Flood Insurance Program (NFIP), which includes mapping flood hazard areas nationwide, and requiring that homes and other structures with federally backed mortgages must carry flood insurance if the flood risks warrant it. San Joaquin County, the City of Stockton, and other cities within the Planning Area participate in the NFIP program which provides community residents with reduced flood insurance rates, provided the permitting agencies meet certain requirements. If a community does not participate in the NFIP, residents within that community are not able to purchase flood insurance.

The reduction in flood insurance rates depends on the Community Rating System (CRS) rating. The purpose of the CRS is to provide incentives for flood insurance customers in the form of premium discounts if the community meets or exceeds the minimum floodplain protection requirements. The rating system works by dividing discount levels in classes with Class 10 communities receiving the least discount (5%) and Class 1 communities receiving the largest discount (45%). Class level can vary based on numerous flood preparedness measures. A community's class level is determined once an application is reviewed by FEMA. Within the RFMP Planning Areas, the City of Stockton and San Joaquin County participate in the CRS via floodplain building restrictions, and are rated as Class 8 and 6, respectively.

Delta Levee Maintenance Subventions Program

Nearly all LMAs in the Delta South Region participate in the Subventions Program.

The Subvention Program is a State cost sharing program meant to provide technical and financial assistance to LMAs in the Sacramento – San Joaquin Delta. Authorized by the California Water Code Sections 12980 et seq., and managed by DWR, the subvention program is designed to reimburse local agencies for eligible costs. Eligible costs include maintenance and rehabilitation costs, as well as costs associated with disaster. In order to do this, the Central Valley Flood Protection Board reviews and approves DWR's recommendations and enters into reimbursement agreements with the local agencies.

To qualify for assistance under the program local agencies within the Delta must submit an application to the CVFPB each fiscal year. Agencies are then eligible to receive up to 75% reimbursement of eligible costs incurred in excess of \$1,000 per mile for all of its levees. A levee

maintenance and inspection report for these levees is required before reimbursement may take place.

Public Law 84-99 (PL84-99) Program

PL84-99 is another program in the Regions which aims to mitigate flood risk. PL 84-99 gives USACE the authority to provide emergency management services to state and local agencies in need. Acting for the Secretary of the Army, the Chief of Engineers is authorized to undertake activities including the following:

- Disaster preparedness
- Advance measures
- Emergency response operations
- Rehabilitation of flood control works threatened or destroyed by flood

Many of the levees in the Lower San Joaquin River Region are project levees, and therefore participate in the PL 84-99 program. In order to benefit from the Federal funding of rehabilitation, a Federal flood protection system (i.e. project levee) must be enrolled in the PL 84-99 program prior to the flood event. An eligible system would be restored to its pre-disaster status at no cost to the owner (typically the owner of a project levee is the State of California).

In order to remain eligible for PL 84-99 damage assistance, project levees need to receive an Acceptable or Minimally Acceptable rating. If any part of a project receives an Unacceptable rating, the project is put on probation, and if it receives another Unacceptable rating the following year, it is placed on “inactive” status and is ineligible for the PL 84-99 program until the problem is fixed. As discussed later in this report, several LMAs have received Unacceptable ratings for one or more of a variety of reasons, jeopardizing their eligibility in the program.

4.2.2.2 Emergency Response Programs

Flood emergency response programs and systems are intended to address the residual risk of flooding that remains after structural elements of the flood control system are put in place. A general description of this residual risk and the response structure used to address this risk is provided in Section 5.5. This section briefly describes the flood preparedness strategy developed and implemented in San Joaquin County over the past decade that created the current flood response structure in the County.

The San Joaquin County Flood Emergency Response Preparedness Strategy 1998 to 2012

During the period from approximately 1998 to 2012 the San Joaquin County Office of Emergency Services implemented a comprehensive strategy for improving flood emergency response in the County. This “San Joaquin County Flood Emergency Response Preparedness Strategy” was formulated locally from lessons learned in the 1997 and previous floods.

This strategy has been implemented over 13 years as funding allowed. Primary funding came from the San Joaquin County General Fund and a small on-going federal emergency management grant. As of 2012 a significant portion of the strategy had been implemented although some elements remained to be completed.

The key products of this comprehensive flood preparedness strategy included:

- Flood contingency maps
- Urban evacuation maps
- Acquisition of flood fight supplies and key response equipment
- Improved San Joaquin Operational Area logistics policies and procedures
- Improved flood fight command and control

Flood Contingency Maps

A key objective of the improvement strategy was to improve levee flood fight operations conducted by levee maintaining agencies (LMAs). Experience had shown that LMAs either had not committed their knowledge and procedures to paper, or they had their own plans in differing formats and content. Much historical information was not being documented and the knowledge base of the experienced individuals that each district tended to rely upon to organize their efforts remained verbal. While LMAs could organize their levee patrols and basic levee problem remediation efforts adequately, there was a lack of procedures for ensuring proper coordination with outside agencies and neighboring districts during a flood.

For example, RDs had vague ideas of relief cuts and other steps which could address flooding concerns, but never had a formal written plan. DWR had also not thought about these issues in a specific way since this was thought to be the RDs responsibility. When levees ultimately did break, many officials argued over what to do, despite the fact that these relatively straight-forward engineering issues could have been discussed before the flood.

The County emergency management organization subsequently crossed jurisdictional boundaries to help correct this situation by funding the preparation of LMA “flood contingency maps” (FCMs). These maps displayed historic, topographical, and flood fight plans in an experimental format that it was felt would be more easily used in the difficult field environment of flood emergency response. Twenty-six maps, some covering multiple interdependent districts, were planned and 18 were completed by 2012. Maps were made available on a dedicated website for download by users.

Will add an exhibit showing areas with FCMs when GIS data is available.

Urban Evacuation Maps

In the case of extremely rural LMAs some limited information for organizing evacuations was placed on the LMA flood contingency map. However, in the case of urban areas this approach was considered to be inadequate. Therefore, the County funded a second element of the overall strategy, separate evacuation maps for urban areas, that would be developed by public safety agencies responsible for public safety operations.

Completed urban evacuation maps display pre-planned evacuation routes, field command post locations, and other information that public safety agencies would use to organize and conduct evacuations of pre-identified evacuation “zones”. The maps also displayed locations of vulnerable populations and information on specialized equipment available to responders.

Twenty-two maps were planned (some with a set of smaller-scale sector maps) and 19 were completed as of 2013. These maps were also posted for easy access on a dedicated website that had other functionalities useful for organizing an effective response.

Flood Fight Supplies and Response Equipment

A third element of the preparedness strategy was the acquisition of additional flood fight supplies and specialized equipment to supplement LMA supplies and public safety equipment. Over several years a significant supply of sandbags, polyethylene plastic sheeting, stakes, twine, and other supplies were obtained. Evacuation and rescue equipment was also provided.

Most acquired materials were loaded in seven 20' containers purchased by the County and placed at the California Youth Authority facility at French Camp under agreement with that State agency. Four of these containers are equipped with lights and power outlets. Containers can be moved to the field for easier supply distribution or for use as field offices by responders.

The County also acquired three mobile low power radio transmitters which were deployed with the City of Stockton, City of Manteca, and County OES to improve the ability to provide emergency information to the public in areas threatened by flooding. This equipment supplemented other command and control equipment procured through the Homeland Security Program.

Improved Logistics Policies and Procedures

In the early 1990's a San Joaquin Operational Area Agreement was developed to improve inter-agency coordination. This agreement, signed by local jurisdictions including reclamation districts, allows, among other things, the San Joaquin County Purchasing Agent to make emergency purchases on behalf of other jurisdictions in a proclaimed disaster. This provision had been added specifically to streamline and expedite acquisition of needed supplies in a flood emergency.

This new protocol was first used extensively in the 1997 floods to expedite acquisition and movement of materials, supplies, rented equipment, and other resources on behalf of reclamation districts conducting flood fight operations. The County subsequently funded a new custom computerized logistics tracking system to capture information needed for state and federal disaster reimbursement claims after the emergency.

Improved Flood Fight Command Structure

Command, control and coordination with multiple levee maintaining agencies and the many supporting agencies was identified early on as a difficult challenge in widespread flood events. In order to improve coordination between multiple local agencies and State and federal agencies, the San Joaquin County Office of Emergency Services established as part of its flood preparedness strategy four pre-planned flood fight unified commands. Each command has a pre-established membership and field command post location. A unified flood fight command map showing the boundaries and command posts of these pre-established commands is posted with the flood contingency maps.

The San Joaquin County Enhanced Flood Emergency Response Preparedness Strategy

In 2012 and 2013 several new State flood preparedness initiatives have stimulated revisions to the San Joaquin County Flood Emergency Response Preparedness Strategy and its specific products. Funding from the 2006 flood bonds is also now providing an opportunity for the County to implement this new strategy going forward. These State initiatives, and the enhanced flood preparedness strategy now coming into place, are described below in Section 5.5 as part of the RFMP evaluation of current systems and recommendations for future action.

4.2.2.2 Operations and Maintenance Programs

Flood control facilities are subjected to natural forces that can reduce their effectiveness over time. Operations and maintenance (O&M) helps maintain the original design and reliability of flood control systems and involves activities including: routine inspections of flood control facilities, erosion control, vegetation removal, debris and sediment removal, and control of burrowing animals. Coupled with long-term flood risk reduction projects, O&M strengthens the structural integrity of the levee systems in the Regions. O&M activities are typically performed by the Levee Maintaining Agency (LMA) responsible for specified segments of levee systems. The figure on the following page provides an overview of the LMAs in the Regions.

Wave action and high water events cause erosion on the waterside of levees, thereby altering the levee geometry and reducing a levees overall effectiveness. LMAs work to mitigate these issues by placing rock on the waterside of the levee to reduce the erosive forces. To a lesser extent, slope grading/dragging can be done to repair minor rills in the levee slopes.

Burrowing animals also threaten the structural integrity of levees in the Regions. Burrowing rodents can create extensive networks of tunnels throughout levee systems, creating a path for water to get from the waterside to the landside of the levee. LMAs have employed measures such as grouting, baiting, and hunting to remove burrowing animals from their levees.

Additionally, thick vegetation on levees reduces the ability to visually inspect a levee. Therefore, LMAs trim/remove trees/shrubs and mow grass to meet guidelines established by USACE and DWR. It is noted that vegetation requirements differ between USACE and DWR, and is discussed in detail in Section 5.3.

4.2.2.3 Regulatory Programs

Federal-Level Programs

FEMA oversees floodplains and manages the National Flood Insurance Program (NFIP). FEMA incentivizes cities and counties, through reduced NFIP insurance rates, to restrict development in the floodplain. San Joaquin County and the incorporated cities within the County participate in the NFIP and therefore must meet FEMA standards for floodplain protection facilities and floodplain management.

State Programs

State-level regulatory non-structural flood risk reduction measures include Senate Bill 5 (SB5) and companion legislation passed by the State Legislature in October 2007 as discussed in Section 3.3.

4.2.3 Regional Partners

Major flood management initiatives in California have historically been undertaken by local, State, and Federal agencies in an evolving cooperative relationship. Beginning in the 1850's, levee improvements were initiated as entirely local undertakings, with sporadic efforts to provide State coordination and oversight. Federal participation in flood management in California was first authorized with the Caminetti Act of 1893. State oversight of flood control improvements began in the early 1900's with the creation of the Central Valley Flood Protection Board (formerly the State Reclamation Board).

4.2.3.1 Local Agencies and their Responsibilities

The San Joaquin Flood Control Agency (SJAFCA)

The San Joaquin Area Flood Control Agency (SJAFCA), a joint powers agency formed in May 1995 by San Joaquin County, the City of Stockton, and the San Joaquin County Flood Control and Water Conservation District. SJAFCA has the authority to finance and construct regional flood control improvements. SJAFCA is currently working with USACE on the Lower San Joaquin River Feasibility Study to evaluate and recommend improvements to levees on the Calaveras River, the Delta front, and the San Joaquin River. The figure below illustrates the extents of SJAFCA's jurisdictional boundary.

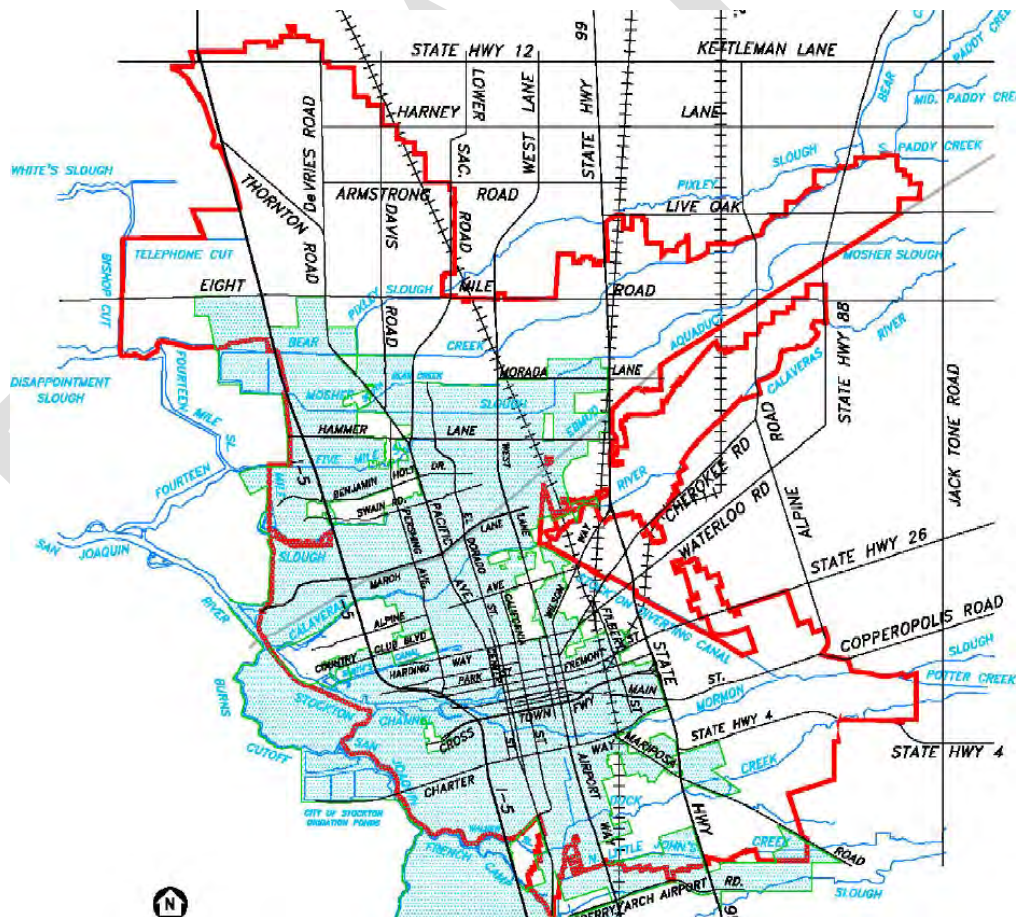


Figure x – SJAFCA's Jurisdictional Boundaries

San Joaquin County Office of Emergency Services Flood Contingency Mapping (SJC OES)

The SJC OES provides planning, mapping standards, and emergency response guides to help mitigate future flood damages through the Delta and surrounding areas. Additionally, the SJC OES provides maps for critical flood zones in the Delta, Cities, and Reclamation Districts. These maps contain the flooding history, locations of critical facilities, locations of levee failures & repairs, evacuation plans, drainage plans, supply delivery points, flood contingency options, and a plan of action for each respective levee in the case of flooding. The SJC OES aims to improve flood control operations to prevent levee failures during floods and to limit flood damages.

San Joaquin County Flood Control and Water Conservation District

The San Joaquin County Flood Control and Water Conservation District was formed in 1956 to construct, operate, maintain and plan flood control, water supply, drainage and groundwater recharge projects in order to protect life, property, and health of San Joaquin County residents and ensure the economic, environmental and social viability of the community. This entity performs maintenance of flood control systems along Bear Creek and the Calaveras River.

Stockton East Water District

The Stockton East Water Agency (SEWD) was created in 1948 to ensure proper management of the underground water basin and provide supplemental water supplies. SEWD provides surface water for both agricultural and urban uses. Since 1978, the SEWD drinking water treatment plant has produced nearly a million acre-feet of water for urban use. The U.S. Army Corps of Engineers owns and operates New Hogan dam which is the major surface water supply to SEWD. The District and the Central San Joaquin County Water Conservation District also have contracts with the U.S. Bureau of Reclamation to buy raw water from New Melones reservoirs which is diverted through the Farmington Flood Control Basin to the Rock Creek outlet and diversion dam for distribution through the area.

Levee Maintaining Agencies (LMAs)

Local levee districts and RDs, known collectively as Levee Maintaining Agencies (LMAs), regularly patrol, maintain, repair, and conduct flood fights as needed on the levees within their jurisdictions. Figure x in the previous section provides an overview of the LMAs in the Region. Table x on the following page provides a summary of the flood management facilities maintained by each respective LMA in the Planning Areas.

Table 6 - Local Maintaining Agencies for Levees in the Regions

Local Maintaining Agency	County	Stream	Miles
San Joaquin County FCD	San Joaquin	Bear Creek Unit 7 Right Bank	7.16
		Bear Creek Unit 8 Left Bank	7.5
San Joaquin County FCD	San Joaquin	Lower Calaveras River, Stockton Diverting Canal, Mormon Slough, Unit 15 Right Bank	25.62
San Joaquin County FCD	San Joaquin	Lower Calaveras River, Stockton Diverting Canal, Mormon Slough, Unit 16 Left Bank	23.7
San Joaquin County FCD	San Joaquin	Potter Creek "A" Right Bank Unit 17	0.98
San Joaquin County FCD	San Joaquin	Potter Creek "A" Left Bank Unit 18	0.92
San Joaquin County FCD	San Joaquin County FCD	Unnamed tributary to Mormon Slough Left Bank near levee mile 7.5, Unit 6	< 1
RD 404	San Joaquin	San Joaquin River Right Bank Unit 1	2.3
RD 404	San Joaquin	French Camp Slough Right Bank Unit 2	1.76
San Joaquin County FCD	San Joaquin	Duck Creek above I-5, and Duck Creek above BNSFRR and Channel Maintenance	< 1 < 1
San Joaquin County FCD	San Joaquin	South Littlejohn Creek between BNSFRR and CA-99 Left Bank Unit 1 and Channel Maintenance	2.87
San Joaquin County FCD	San Joaquin	South Littlejohn Creek between BNSFRR and CA-99 Right Bank Unit 2 and Channel Maintenance	3.47
San Joaquin County FCD	San Joaquin	South Branch South Littlejohn Creek above CA-99 Patrol Road Unit 3 and Channel Maintenance	
San Joaquin County FCD	San Joaquin	North Branch South Littlejohn Creek above CA-99 Patrol Road Unit 4 and Channel Maintenance	
San Joaquin County FCD	San Joaquin	Duck Creek downstream of Duck Creek Diversion Weir Channel Maintenance Area	
San Joaquin County FCD	San Joaquin	Littlejohn Creek and North and South Branches of Littlejohn Creek downstream of Duck Creek Diversion Weir Channel Maintenance Areas	
San Joaquin County FCD	San Joaquin	Duck Creek Diversion Weir, the diversion channel, and RB and LB levees, and channel maintenance	< 1
RD 1	San Joaquin	Old River Right Bank Unit 1 and channel maintenance	1.15
RD 2089	San Joaquin	Old River and Paradise Cut Right Bank Unit 1 and channel maintenance	1.53
RD 2089	San Joaquin	Salmon Slough Unit 2 and channel maintenance	1.37
RD 524	San Joaquin	San Joaquin River Left Bank Unit 1	6.26
RD 544	San Joaquin	San Joaquin River Left Bank Unit 1	6.11
RD 544	San Joaquin	Old River Right Bank Unit 2	4.22
RD 17	San Joaquin	French Camp Slough Left Bank Unit 1	1.81
RD 17	San Joaquin	San Joaquin River Right Bank Unit 2	14.37
RD 2058	San Joaquin	Paradise Cut Left Bank Unit 1	6.72
RD 2095	San Joaquin	Paradise Cut Left Bank Unit 1	1.45
RD 2107	San Joaquin	Paradise Cut Right Bank Unit 2	1.84
RD 2062	San Joaquin	Paradise Cut Right Bank Unit 2	4.03
RD 2062	San Joaquin	San Joaquin River Left Bank Unit 1	2.65
RD 2107	San Joaquin	San Joaquin River Left Bank Unit 1	2.37
RD 2062	San Joaquin	Old River Left Bank Unit 3	5.63
Source: SPFC Mapbook, CA-DWR, 2012.			

4.2.3.2 Relevant State Agencies and their Responsibilities

The local agencies are supported in their flood management missions by key State agencies.

Central Valley Flood Protection Board (CVFPB)

In 1911, the Legislature created the California State Reclamation Board, which was given regulatory authority over the Sacramento Valley's Local Maintaining Agencies (LMAs), with the objectives of (1) assuring a logical, integrated system for controlling flooding along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with USACE, (2) cooperating with various agencies in planning, constructing, operating, and maintaining flood control works, and (3) maintaining the integrity of the flood control system. In 1913 the Reclamation Board was given regulatory authority over the San Joaquin Valley's LMAs. In this same year, the Legislature created the Sacramento-San Joaquin Drainage District to give the Reclamation Board the authority to acquire the necessary property and easements for flood control.

In 2007 the Legislature restructured the Reclamation Board and renamed it the "Central Valley Flood Protection Board." The legislation gave the Board the responsibility to review and adopt the 2012 CVFPP. Legislation approved in 2009 granted new authorities to the CVFPB and reiterated the importance of its encroachment enforcement powers for flood control.

The CVFPB has given assurances to USACE that the Federally authorized Project levees will be operated and maintained in accordance with specified criteria. The CVFPB has the authority to serve as the non-Federal sponsor for capital improvement projects for levees in the Regions, regulates encroachments, and works to assure that the various components function as a system.

California Department of Water Resources (DWR)

DWR, primarily acting through the Division of Flood Management, is responsible for State-level flood management in the Planning Areas, including cooperating with USACE in project planning, design, and funding, cooperating with the National Ocean and Atmospheric Administration in flood and water supply forecasting, operating the Flood Operations Center, providing flood fight assistance, and maintaining portions of the flood management system.

DWR's levee maintenance responsibilities include portions of the system designated for State maintenance in the California Water Code, and operating Maintenance Areas (MAs) when local agencies cannot, or choose not to meet the maintenance obligations established under the assurances given to the CVFPB and USACE. Under these authorities the DWR will assume responsibility for levee maintenance.

California Office of Emergency Services (Cal OES)

The California Office of Emergency Services (Cal OES) has overall State emergency response management authority, which among other things, includes assuring that State and local agencies operate in accordance with the Standardized Emergency Management System (SEMS).

California Department of Fish and Wildlife

The California Department of Fish and Wildlife administers State laws and regulations regarding the protection of fish and wildlife resources, and as such exerts permitting authority over flood

control project construction, operation, and maintenance activities, as well as managing State wildlife areas in the region.

State Water Resources Control Board (SWRCB) & Central Valley Regional Water Quality Control Board (RWQCB)

The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board, Central Valley Region (RWQCB), administer State water rights and water quality laws and regulations. The SWRCB, given its authority over water rights, including stream diversions, may exert regulatory authority over flood control or environmental restoration projects that result in new diversions from existing channels. The RWQCB requires that construction projects, such as levee improvement projects, avoid injurious discharges from worksites to streams by preparing and adhering to Stormwater Management Plans and following Best Management Practices for chemicals, diesel fuel, drilling fluid, and other typical construction fluids. The RWQCB also works closely with USACE when it issues Section 404 permits, which must include a certification by the RWQCB that water quality will not be impaired.

California Department of Conservation

The California Department of Conservation (CDOC) is responsible for administering the California Surface Mining and Reclamation Act of 1975. It assures that local governments, such as cities and counties, adopt and administer ordinances compliant with the law. SMARA is an important consideration for most flood control projects, as it applies to any projects which disturb more than one acre of land or move more than 1,000 cubic yards of material. SMARA compliance involves formulating projects which do not result in injurious discharges from the disturbed area during the mining operation, followed by a reclamation plan which restores the mined land to beneficial use.

The CDOC also administers the Williamson Act, enacted in 1965, designed to help preserve agricultural land through property tax incentives and long-term contracts. It was enhanced in 1998 with the addition of Farmland Security Zone (FSZ) provisions, which offers additional incentives to extend the contract period from the normal ten-year period to twenty years. San Joaquin County participates in the Williamson Act program. San Joaquin County also participates in the FSZ provisions as well.

The CDOC also administers various grant programs for the acquisition of agricultural and open space preservation. Such programs may work synergistically with non-structural flood management projects, which may improve flood system capacity, reduce long-term risks to life and property, and improve resiliency through actions such as agricultural conservation easements, open space easements, levee setbacks and floodplain restoration, where locally supported and feasible.

4.2.3.3 Federal Agencies and their Responsibilities

U.S. Army Corps of Engineers (USACE)

At the federal level, USACE is primarily responsible for planning, designing, and constructing federally authorized flood management facilities, including dams, levees, and other structures. It also develops the operational rules for federally funded flood control reservoirs, which includes most of the major reservoirs on Central Valley streams. Following the Hurricane Katrina Gulf

Coast disaster of 2005 USACE has implemented a National Levee Safety Program, promulgated strict vegetation management guidelines, and strengthened its national levee inspection program.

National Weather Service (NWS)

The National Weather Service (NWS), a part of the National Oceanic and Atmospheric Administration, operates centers throughout the United States which monitor and forecast climate, weather, severe storms, and runoff. In California the NWS weather forecasting centers are supplemented by the California Nevada River Forecast Center which cooperates with DWR to issue flood and water supply forecasts. These forecasts are critically important to the Region, because under winter storm conditions, the Calaveras and San Joaquin rivers and local streams can rapidly generate enormous flows, creating conditions of extreme peril for residents and damageable property in the levee-protected areas of the Region. Accurate and timely flood forecasts are an important component of the Region's flood risk management system.

NOAA Fisheries

NOAA Fisheries is responsible for the protection of anadromous fisheries, including salmon and steelhead, which migrate through, and spawn in channels of the Bear Creek, Mosher Slough, the Calaveras River and Mormon Slough, and Littlejohns, Duck, and the French Camp Slough, as well as some local creeks. NOAA Fisheries regulate Central Valley steelhead, and the Green sturgeon and play an important role in the flood project planning process, providing guidance on ways to design and operate flood control works to minimize impacts and enhance fisheries habitat. USACE and other project proponents must consult with NOAA fisheries in all phases of federal flood management project planning, design, and construction which have the potential for impacting the species of concern which NOAA Fisheries administers. In administering various federal statutes and regulations protecting migratory species of concern, NOAA fisheries may also impose conditions on the operation of multi-purpose dams and reservoirs with federal participation, including the major reservoirs protecting the region.

U.S. Fish and Wildlife Service (USFWS)

The USFWS plays a similar role as that of NOAA Fisheries, with a focus on terrestrial, avian, and resident fish species and their habitats. In the Region some of the key species of concern are the riparian brush rabbit, and the Delta Smelt. Directly south of the Region Boundary designated critical habitat occurs for the Vernal Pool Fairy Shrimp, and the Conservancy Fairy Shrimp. USFWS plays an important role in the flood project planning process, providing guidance on ways to design and operate flood control works to minimize impacts and enhance fish and wildlife habitats. USACE and other project proponents must consult with USFWS in all phases of federal flood management project planning, design, and construction.

The Federal Emergency Management Agency (FEMA)

The Federal Emergency Management Agency plays a multitude of flood management roles, including managing the National Flood Insurance Program (NFIP), which includes mapping of and classification of flood hazards in the Region. FEMA administers the Disaster Mitigation Act of 2000 (DMA 2000), which requires that local communities evaluate the natural hazards within their boundaries and develop mitigation plans for those hazards in order to maintain eligibility for its Pre-Disaster Mitigation (PDM) and Hazard Mitigation Grant Programs (HMGP). FEMA also provides federal disaster recovery assistance in the event of federal emergency declarations or disaster declarations. Federal emergency management efforts are structured in accordance with the National Incident Management System (NIMS).

5 Assessment of Flood Hazards, Challenges, & Risks

The flood management facilities in the Lower San Joaquin River and Delta South Regions consist of many inter-related facilities which collectively work together to reduce the risk of flooding. Some components of the system – such as the levees – have been constructed and improved over the past 150 years. Other elements such as reservoirs, floodplain regulations, flood insurance and environmental regulations are recent additions to the flood management system. Although the Regional flood management system was initially constructed in piecemeal fashion with local resources, the system is now highly regulated, funded from multiple sources, and involves the participation of many agencies.

This chapter presents a brief background on the sources and types of flooding in the Regions, and then summarizes known system deficiencies identified in previous and on-going studies. Non-structural challenges associated with regulatory permitting, funding, operations and maintenance, encroachments, etc. are also presented.

With these deficiencies established, economic assets, critical infrastructure, and populations at risk due to a flood control system failure are identified. The assessment of the flood hazards and challenges presented herein will help to inform the list of prioritized improvement project developed later in the planning process.

5.1 Background on Flooding in the Regions

While it is acknowledged that small, controlled flood events on natural landscapes may be beneficial to ecosystems in the Regions, flooding in urban and agricultural areas poses a significant threat to life-safety and the regional economy. Significant flood events can also have a national impact resulting from crop damages, and Federal aid.

Flood impacts vary greatly with the intensity and duration of a rainfall event, environmental conditions (i.e. rainfall only, rain-on-snow, etc.), distance of the storm from the Regions, tides, and performance of flood management systems. These conditions result in floods that can differ in characteristics such as warning time, duration, depth, and levels of loss, depending on where, when, why, and how the flooding occurs.

Flooding in the Regions can come from many sources, including:

- Flooding from local drainage problems
- Flooding resulting from the failure of flood management systems
- Rain-on-snow events
- Very large, short duration atmospheric river rainfall events
- Prolonged snow melt

Each of these types of floods have different frequencies, risks, impacts, and require different risk mitigation strategies.

Sources of Flooding

The numerous waterways in the Regions that provide recreation opportunities, convey water in the Delta, facilitate transportation of goods, and provide habitat in the Regions are also the primary sources of flooding.

The primary tributaries to the Lower San Joaquin River include: Bear Creek, Calaveras River, Mormon Slough, Mosher Slough, Stockton Diverting Canal, and French Camp Slough. Nearly all of these tributaries have at least one State Plan of Flood Control (SPFC) levee system protecting existing development. Some of the prominent waterways in the Delta South include: Paradise Cut, Old River, Middle River, Burns Cutoff, Turner Cut, Whiskey Slough, Trapper Slough, Victoria Canal, and Grant Line Canal. These waterways are predominantly bordered by locally maintained, non-SPFC facilities.

Figure x in Section 4.2.1 presented an overview of the SPFC and non-SPFC levees protecting the Regions. As can be seen in this figure, the Regions have an extensive network of levees. Deficiencies to one levee segment or feature may have impacts throughout the Regions.

In simplest terms, flooding in the Regions is typically caused when flows in the aforementioned rivers, creeks, sloughs, and canals exceed their capacity, or when critical flood management facilities (i.e. levees, pump stations, etc.) fail.

The figure on the following page illustrates the how the design capacities of the Bear Creek, Calaveras River, Paradise Cut, and San Joaquin River related to estimated current capacities and the estimated 200-year peak storm flows.

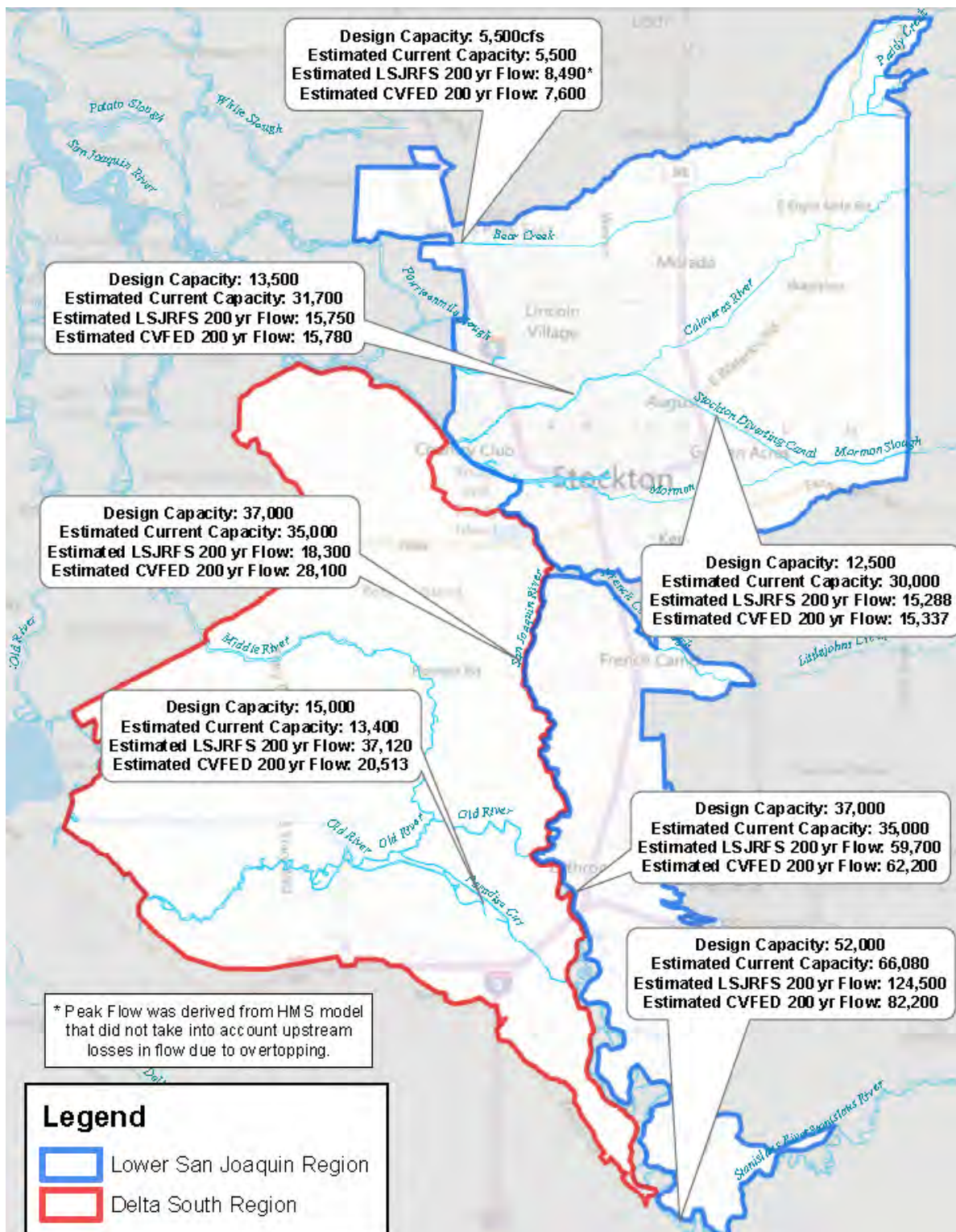


Figure x – Design Capacity vs. Current Capacity & 200-yr Flows

Overview of Exposure to Flood Risk in the Regions

In order to illustrate the level of risk of flooding in the Regions, the FEMA Floodzones are presented in Figure 9 on the following page. This figure on the following page shows the urban

areas of Stockton, Lathrop and Manteca are within levee-protected areas (Shaded Zone X), and a portion of Lathrop is within the 100-year flood plain. Furthermore, nearly the entire Delta South Region is within the 100-year flood plain and nearly the entire Lower San Joaquin River Region is within the 500-year flood plain. This highlights the critical importance of the flood management facilities in the Region.

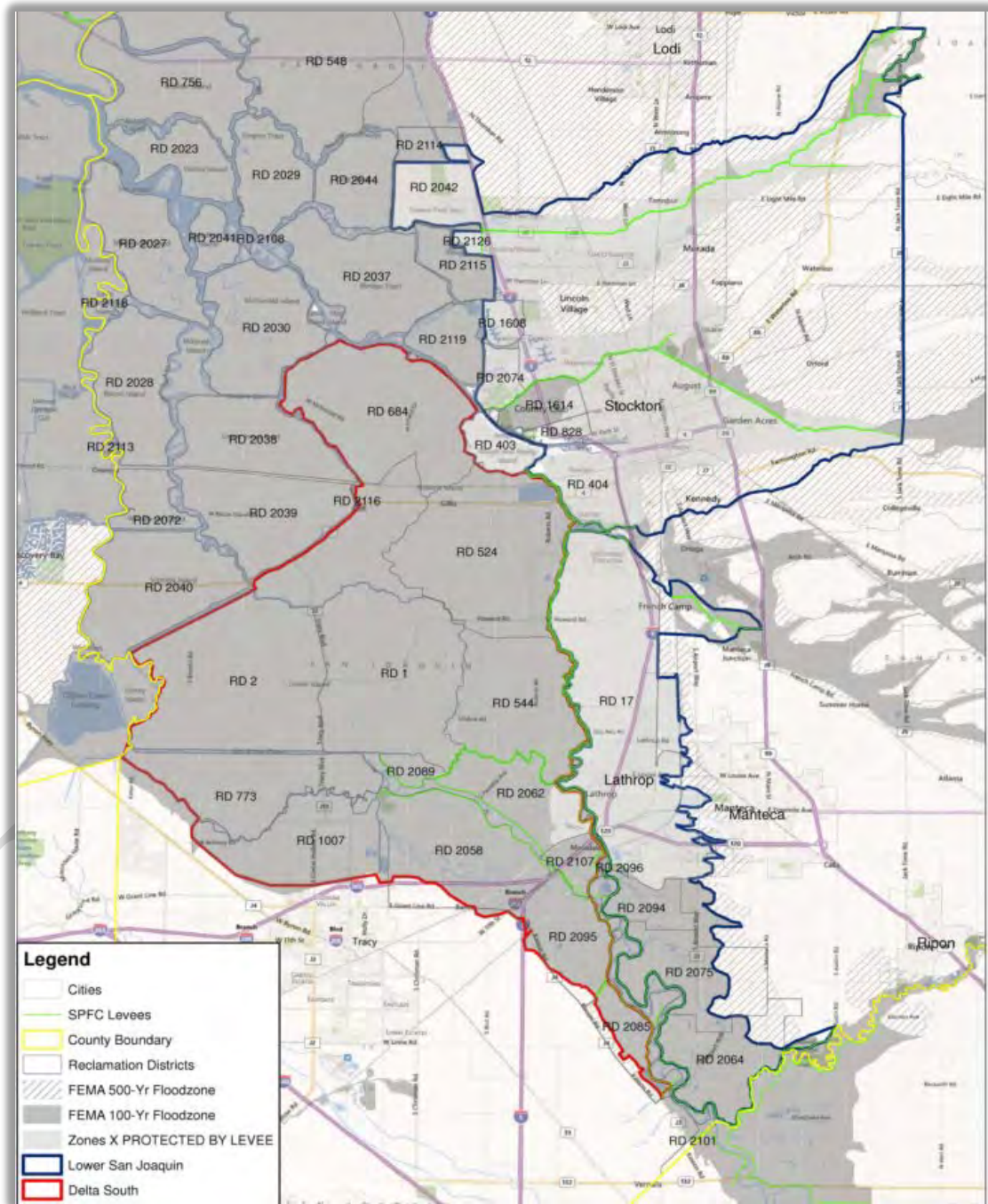


Figure 9 – FEMA Floodzones in the Planning Area

Additionally, 200-year flood depth information prepared by DWR in August 2013 for the local agencies in the Regions is shown on Figure 10 below. Urban and urbanizing areas shown in the figure below with depths of flooding greater than 3' may be subject to Senate Bill 5 and may need to make adequate progress toward completing flood control projects in order to permit new development after July 2016. These areas may not only be at risk for flooding; their economies may be at risk if new development is halted in 2016.

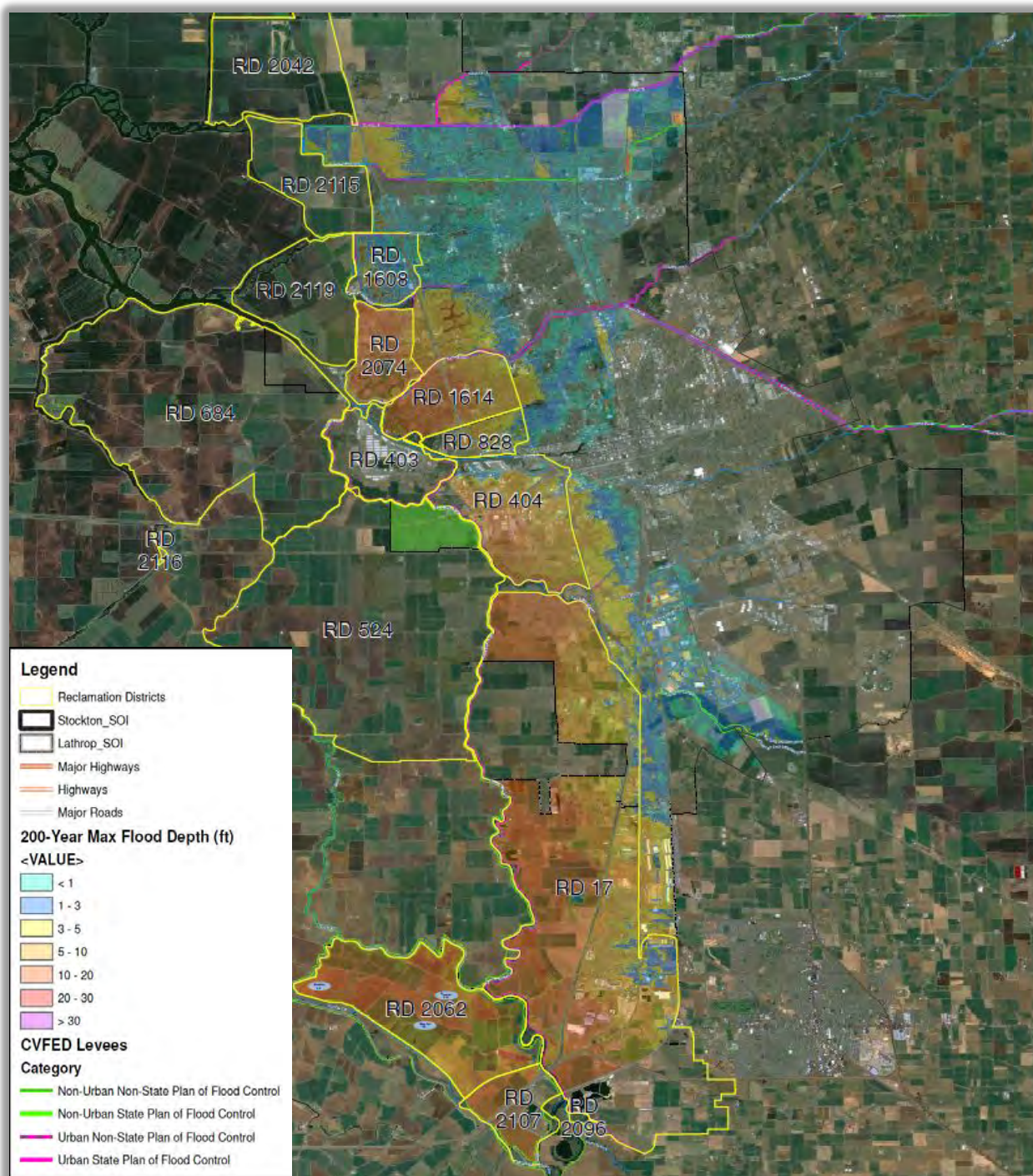


Figure 10 – 200-year Inundation Depths in the Planning Area

5.2 General Overview of Hazards and Challenges in the Regions

Discussions with stakeholders in the Regions have revealed that flood management system problems are primarily associated with either structural system deficiencies, changing hydrology, SB5 compliance, O&M challenges associated with regulatory permitting, funding and staffing, and maintenance of appropriate emergency response capability. Many of these challenges are interrelated. These challenges are discussed below in general below and then in specific detail for each of the local agencies and levee maintaining agencies in Section 5.4.

Hazards associated with structural system deficiencies are due to a myriad of factors including: original design/construction deficiencies, floodway capacity, seepage, geometry, erosion/deterioration, encroachments, vegetation, animal control, sedimentation, and land use practices. These hazards can increase the risk of levee failure during a flood event. Additionally, these hazards can result in levee de-accreditation and jeopardize eligibility in the Public Law 84-99 (PL 84-99) program.

In addition to these physical factors, changing hydrology in the Central Valley has altered the design water surface elevations over the past several decades. Many of the initial levee improvements in the Regions were designed to the 1955 flood elevations. Later improvements have been based on updated hydrologic information developed in the late 1990's. More recently, USACE developed new hydrology as part of their work for the 2002 Comprehensive Study. Finally, DWR is currently developing another updated hydrologic model as part of the Central Valley Hydrology Study (CVHS) which may be used, when completed, by local agencies to design upgrades to meet ULDC criteria. These many hydrological models and corresponding design water surface elevations play a role in levees being found "deficient" if freeboard and seepage exit gradient criteria are not met with the latest updated flood profile.

Some of the structural system problems faced by the Regions are due in part to O&M challenges. O&M activities generally include vegetation management, rodent control, and erosion repair. However, complicated and conflicting regulatory processes and limited allowable maintenance periods make performing routine maintenance nearly impossible. For example, some RDs are prevented from using mechanical means to perform vegetation management and instead have to use goats to remove vegetation due to endangered species concerns. Additionally, permits to place rock on the waterside of a levee are difficult to obtain due to riparian habitat issues. The result is often levees which fail to meet vegetation criteria established by USACE, are rated as Unacceptable in periodic inspections, and ultimately could be ineligible for disaster assistance under the PL 84-99 program due to these deficiencies.

It is important to note that the PL 84-99 program only restores the levee back to the pre-disaster condition. Since project levees are under a Federal Program (PL 84-99) they are not eligible for FEMA disaster assistance. To further exacerbate the situation, if project levees are deemed ineligible for PL 84-99, FEMA will still not participate. Since most project levees are currently deemed ineligible for PL 84-99 Rehab, and ineligible for FEMA, there currently exists a huge potential disaster assistance liability.

Limited funding and staffing can impact the ability of local agencies to perform maintenance or fund the design and construction of necessary flood control system improvements. The most common source of funding for flood control system maintenance and improvement is from assessments paid by property owners in areas protected by flood control facilities. These assessments typically only cover annual O&M costs, which cannot be used for capital improvements. Additional special assessments need to be approved for large-scale levee improvements.

Furthermore, assessments can be difficult to obtain via a Proposition 218 election even for improvements that propose to remove areas from the FEMA 100-year floodplain (and thus will also remove the requirement for property owners to purchase flood insurance). Many areas in the Regions may need to further upgrade flood management facilities in the future to provide a 200-year level of protection. A Proposition 218 election may be difficult or impossible to pass for these improvements, particularly for areas that are currently out of the FEMA 100-year floodplain since there may not be any financial incentive for property owners to assess themselves.

To help local agencies fund capital improvements, the State has made grant programs available. However, limited staff resources often make it difficult for local agencies to identify, apply for, and manage these often complex and administratively challenging grants. Additionally, some grant funds come with very stringent and specific requirements, which often makes funding multi-benefit projects difficult due to the burdensome accounting necessary to comply with these grant programs.

Finally, there is the challenge of implementing appropriate emergency response capability in the Regions and maintaining this capability into the future. San Joaquin County has made significant progress towards initiating communication and increasing OES staff readiness to effectively fight a flood event. Identified challenges in maintaining an optimal flood response capability in the Regions include: standardization of flood safety plan formats & content, Recognition of Additional Physical Opportunities for Containing Floods and Reducing Damage, and Development of Effective Systems for Maintenance of Flood Emergency Response Improvements. This is discussed in further detail in Section 5.5.

5.3 Hazard Criteria Definitions

Before presenting the specific structural system hazards identified in the Regions, the criteria used to determine these hazards are discussed in this section. Structural system hazards are deficiencies with physical flood management facilities (i.e. levees, pumps stations, weirs, etc.). The most common physical flood management facilities in the Regions are levees. There are a variety of criteria which are used to determine if a levee can adequately protect an area from a specified flood event. These criteria are briefly described below.

Levee Geometry. Levee geometry standards have been developed to provide adequate freeboard above the design water surface elevation, promote levee stability, and facilitate access and O&M activities. Levees that do not meet geometry criteria may be prone to overtopping or seepage during flood events. There are varying levee geometry criteria developed by both State and Federal agencies for urban and rural levees. These criteria are presented in Table X below.

Table X – Overview of Various Geometry Standards

	California Urban Levee Design Criteria (ULDC)	FEMA Accreditation	USACE PL 84-99	FEMA Hazard Mitigation Plan (HMP)
100-yr Freeboard	3’*	3’	1.5’	1’
Waterside Slope	3:1	3:1	2H:1V	1.5H:1V
Landside Slope	2 or 3:1	2:1	Varies with height of levee & depth of peat (3H:1V to 5H:1V)	2H:1V
Crown Width	12’ (Minor) 20’ (Major)	20’**	16’	16’

*Note ULDC Freeboard is above the 200-year water surface elevation

**According to stakeholders, some levees may be accredited with less than 20’ of crown width

Through and under-seepage. Seepage problems for levee systems are classified as either under-seepage or through-seepage. Under-seepage occurs when water penetrates a permeable base underneath the levee while through-seepage occurs when water moves from a waterway through a levee. In some cases of under-seepage, the foundation material of the levee will travel with water under the levee and cause the foundation of the levee to fail. Levee seepage is often a result of poor foundation materials like pervious sand and gravel. A number of other factors may increase the potential for seepage, including the presence of erodible fill, rodent burrows, or other penetrations that exit from the landside levee slope or foundation, potentially causing the levee to erode or degrade.

Structural Instability. Structural instability is characterized by slides, sloughs, cracking, slope depressions, or bulges that could pose a threat to levee integrity. Causes for structural instability include soft foundational soil and poor levee design.

Erosion. Levee erosion can be attributed to either rainfall on the levee or erosive river forces, causing the top of the levee to round and the base of the levee to narrow. Levee erosion problems contribute to levee geometry deficiencies, as noted above

Encroachments. Encroachments are defined as a structure near the landside levee toe (distance varies by regulation/criteria used). Encroachments can cause stability issues with levees, and are therefore a key component of levee evaluation criteria.

Penetrations. Penetrations generally consist of utility conduits or transportation (i.e. road or railroad) through the embankment or foundation of the levee. Penetrations have the potential to produce rapid breaching as they can provide a seepage path through a levee when they are located below the water surface.

Animal/Rodent Burrows. Animal and rodent burrows within a levee can pose a serious threat to levee integrity. These burrows can provide additional seepage paths through a levee, which can cause failure of a levee during a flood event.

Vegetation. Maintenance and/or removal of vegetation along the levee is aimed to improve public safety, visibility, and accessibility while preserving the habitat. However, LMAs struggle to comply with differing vegetation criteria as outlined by DWR and USACE. These differing criteria can often result in LMAs receiving acceptable ratings on DWRs O&M inspections, but unacceptable ratings on USACE inspections. A brief summary of the different vegetation standards is provided below.

The USACE's vegetation policy is outlined in an Engineering Technical Letter (ETL) titled "*Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures.*" According to the ETL, a vegetation-free zone must be maintained along all levees. The vegetation-free zone is defined as a three-dimensional corridor surrounding all levees, floodwalls, embankment dams, and critical appurtenant structures in all flood damage reduction systems. The ETL requires removal of all vegetation (except grass) on existing levees, plus vegetation within 15-feet of the waterside and landside levee toes. Tree canopy's extending into this zone must be trimmed 8-feet above the ground.

By contrast, DWR's vegetation policy incorporates a Life Cycle Management (LCM) approach for "legacy" vegetation. This policy is aimed at limiting the financial costs associated with extensive vegetation removal and potentially significant loss of habitat along levees. Under DWRs vegetation management strategy, levees containing legacy trees along the landside or waterside slopes will be managed to allow vegetation and trees to live out their normal life cycles except where they pose a threat, while gradually progressing (over several decades) toward the current USACE policy of "eliminating woody vegetation from the Vegetation Management Zone." The LCM approach protects and improves riparian habitat as long as the vegetation does not impair visibility and accessibility. The crown must be kept free of all vegetation since it serves as a patrol road for levee maintenance.

DWRs policy also permits trees on the waterside slope that are farther than 20' from the crest due to engineering benefits including erosion protection, soil reinforcement, and sediment recruitment, provided visibility requirements are met, and the vegetation does not pose a threat to the integrity of the levee.

In addition to these structural deficiency criteria, a brief overview of the Urban Levee Evaluation (ULE), Non-Urban Levee Evaluation (NULE) and DWR Levee Inspection Report ratings is presented below.

NULE Levee Ratings

Hazard Level A - When water reaches the assessment water surface elevation (typically the 1955/1957 profile), there is a low likelihood of either levee failure or the need to flood-fight to prevent levee failure.

Hazard Level B - When water reaches the assessment water surface elevation (typically the 1955/1957 profile), there is a moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.

Hazard Level C - When water reaches the assessment water surface elevation (typically the 1955/1957 profile), there is a high likelihood of levee failure or the need to flood-fight to prevent levee failure.

Lacking Sufficient Data (Category LD) - Lacking sufficient data regarding levee past performance or hazard indicators to be able to assign a hazard level or there is poor correlation between past performance and hazard indicators.

ULE Levee Ratings

M – Meets ULDC criteria

MG – Marginally meets ULDC criteria

DNM – Does not meet ULDC criteria

DWR Levee Inspection Summary Table Ratings

Acceptable (A) – No immediate work required, other than routine maintenance. The flood protection project will function as designed and intended with a high degree of reliability, and necessary cyclical maintenance is being performed adequately.

Minimally Acceptable (M) – One or more deficient conditions exist in the flood protection project that needs to be improved or corrected. However, the project will essentially function as designed with a lesser degree of reliability than what the project could provide.

Unacceptable (U) – One or more deficient conditions exist that may prevent the project from functioning as designed, intended, or required.

NOTE: Instances where M* are given, this means that this levee segment would have received an “A” rating, but there were very small portions of levee that received a rating of “U”.

5.4 Specific Structural Hazards and Challenges

This section summarizes the specific flood control system hazards and challenges identified from discussions with stakeholders and from reviewing available information. Operations and Maintenance deficiencies that may result in structural hazards are also presented. The information is presented by type of area (i.e. Major Metropolitan Areas and Rural Areas).

5.4.1 Major Metropolitan Areas

For purposes of this RFMP, major metropolitan areas are defined as areas with populations greater than 10,000, or with plans to have populations greater than 10,000 within 10 years. The majority of the Lower San Joaquin River Region is located in a major metropolitan area. The cities of Stockton, Lathrop, and Manteca are all considered major metropolitan areas under this definition. Although the City of Tracy is a major metropolitan area, only a small agricultural portion of the city is within the Delta South Region (RDs 1007 and 2058). Therefore, these RDs are covered under the Rural Areas section of this chapter.

5.4.1.1 City of Stockton

General Area Information:

The City of Stockton is the largest metropolitan area within the Lower San Joaquin River Region and has a population of nearly 300,000 people. Stockton is located west of the San Joaquin River and is traversed by Bear Creek, Calaveras River, Mosher Slough, French Camp Slough, and many other secondary tributaries.

The primary hazard for the City of Stockton is that levees protect nearly the entire city from flood waters. Due to the high risk associated with a system failure, it is imperative the levees surrounding Stockton area are in good repair.

Additionally, the onerous restrictions associated with SB5 imposed on land use agencies like the City of Stockton threaten the economies of cities in the Central Valley. The current levees protecting Stockton will not likely meet ULDC standards, and therefore the City of Stockton will not be able to issue new building permits in urban and urbanizing areas where the 200-year flood depths exceed 3'. Without the necessary flood risk management projects, the economy of Stockton is in jeopardy.

The City of Stockton encompasses and/or borders several RDs within the Planning Areas. A general overview of the flood hazards & risks identified from larger planning documents (i.e. CVFPB, LSJRFS, etc.) for the Stockton Metropolitan Area as a whole is included in this section first, followed by a discussion of hazards identified in local studies/plans each of the RD's located within/around the City. Although Stockton includes a portion of RD 524, the discussion of RD 524 as a whole is included in the discussion of rural areas.

FEMA Accreditation Status

Figure 11 on the following page illustrates the status of FEMA accreditation for the levees protecting Stockton.

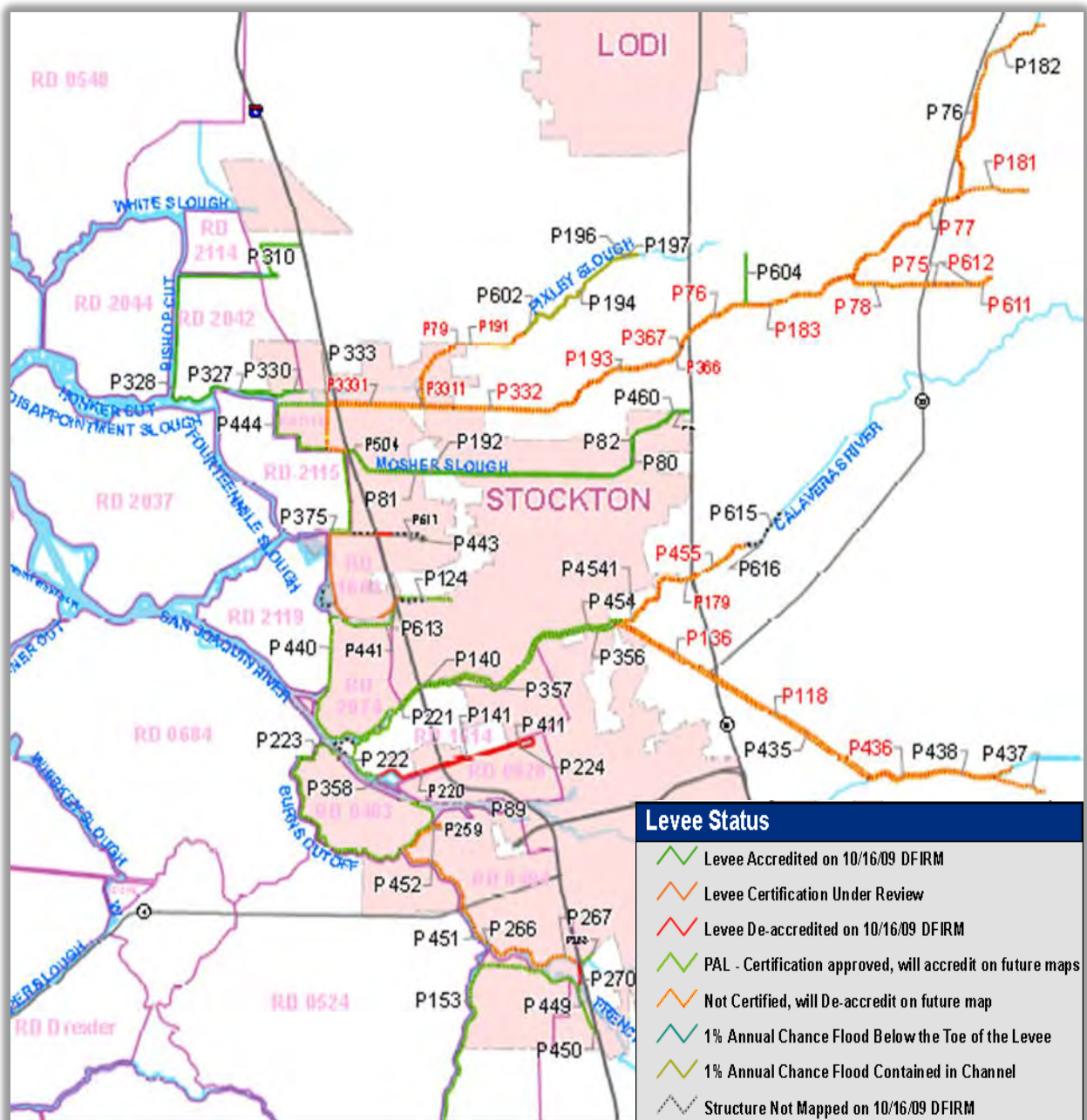


Figure 11 – Stockton Area Levee Accreditation Status

It is noted that most of the levees shown as “not certified, will de-accredit on future map” are the result of USACE’s latest 10-year certification expiring. SJAFCFA is currently in the process of providing the necessary documentation to FEMA in order to maintain the accredited status of these levees.

LSJRFS Preliminary Findings:

Many of the levees protecting Stockton are being evaluated as part of the Lower San Joaquin River Feasibility Study (LSJRFS). A preliminary screening analysis was performed during the early stages of the LSJRFS which evaluated freeboard, geometry, and geotechnical deficiencies of these levees. The results of the preliminary screening analysis are shown in Figures 12, 13, and 14 on the following pages.

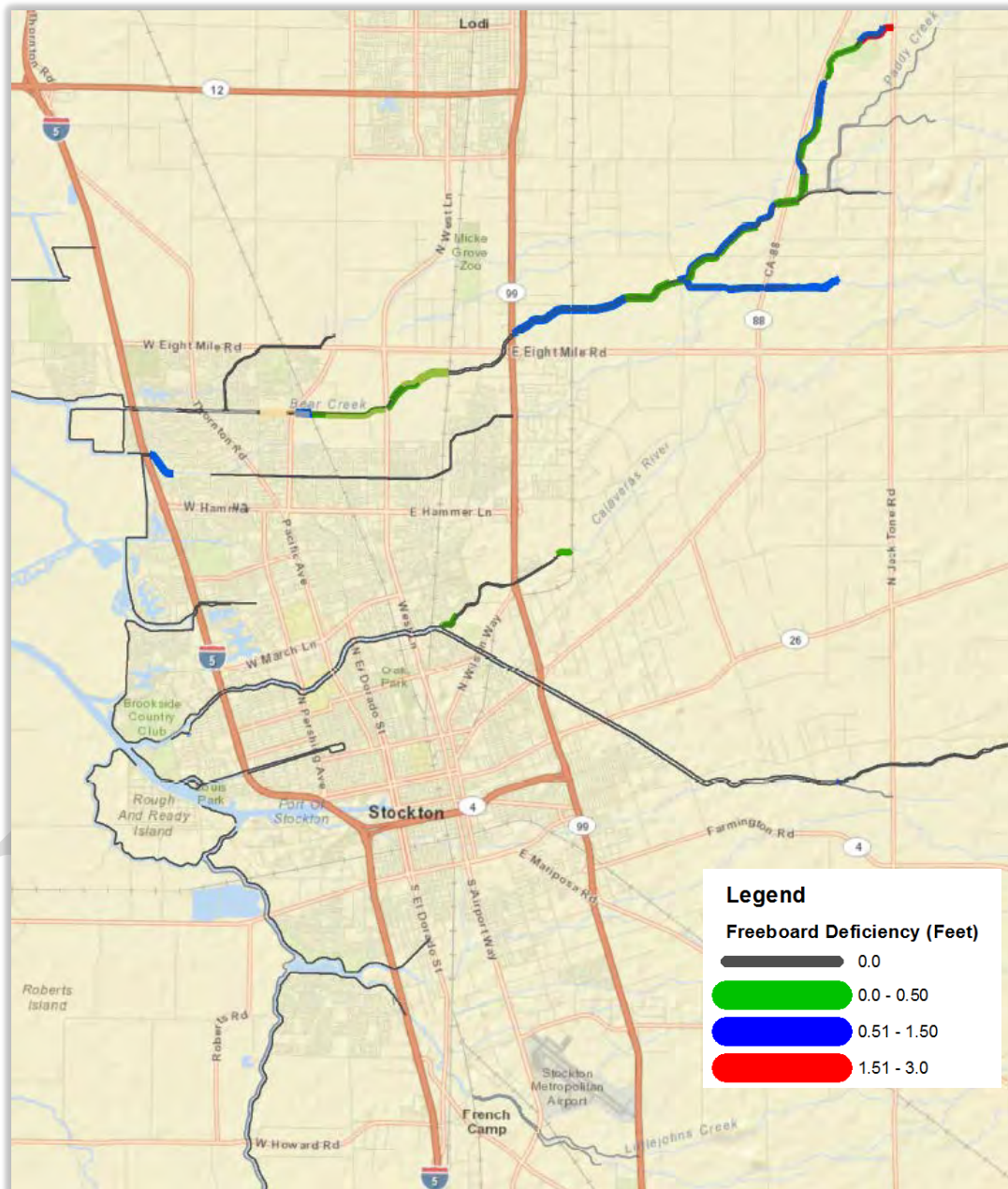


Figure 12 – Stockton Area Freeboard Deficiencies

NOTE: The data from the LSJRFS has recently been updated. This figure will be updated to reflect that information in later drafts.

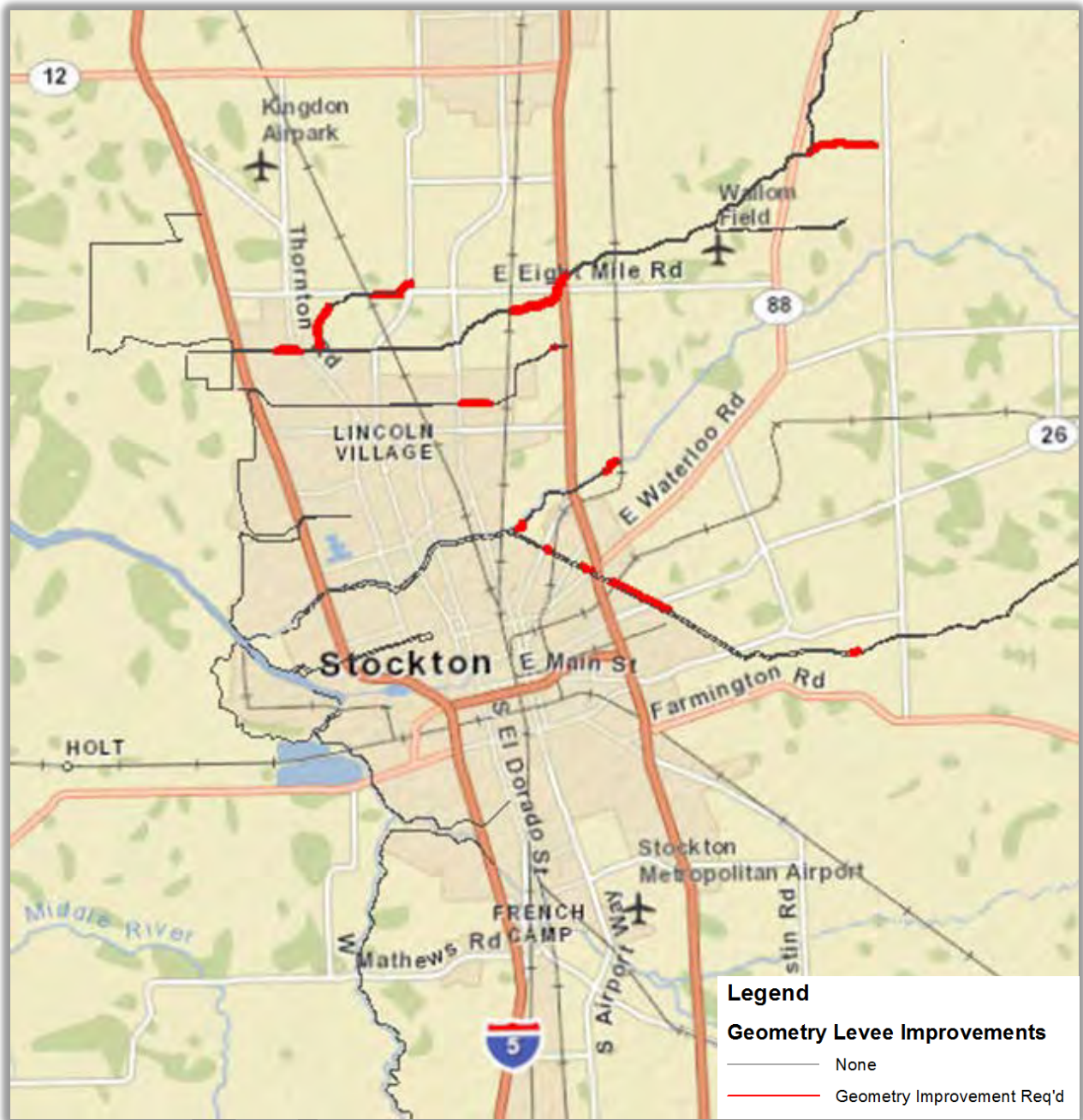


Figure 13 – Stockton Area Geometry Deficiencies (ULDC criteria)

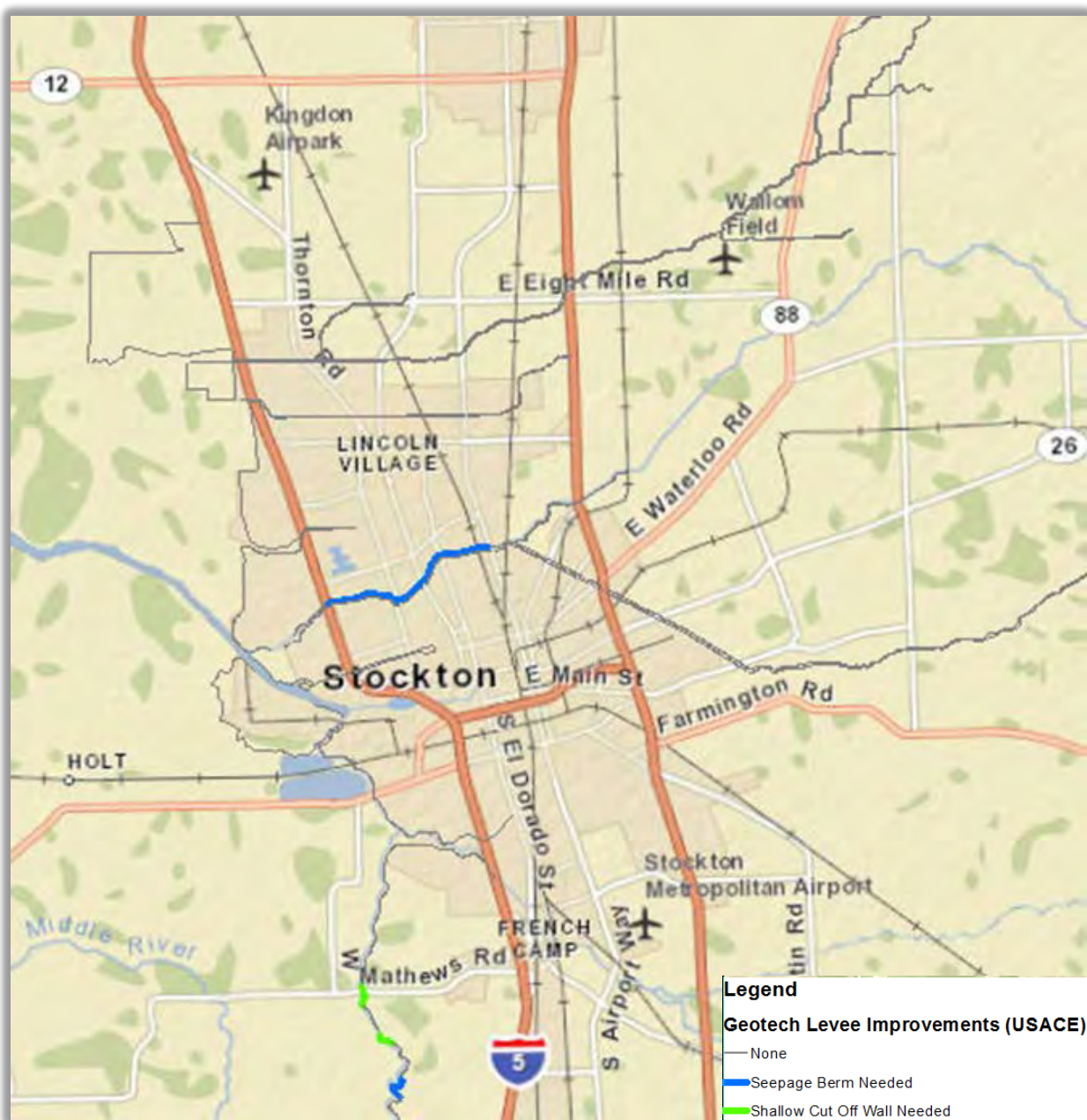


Figure 14 – Stockton Area Geotechnical Deficiencies

The LSJRFS generally indicates that most levees protecting Stockton have adequate freeboard (with the exception of Bear Creek levees), but geometry and geotechnical deficiencies are common on many reaches.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the ULE/NULE evaluations. The figure on the following page presents the Overall Hazard Level of levees in the Stockton area.

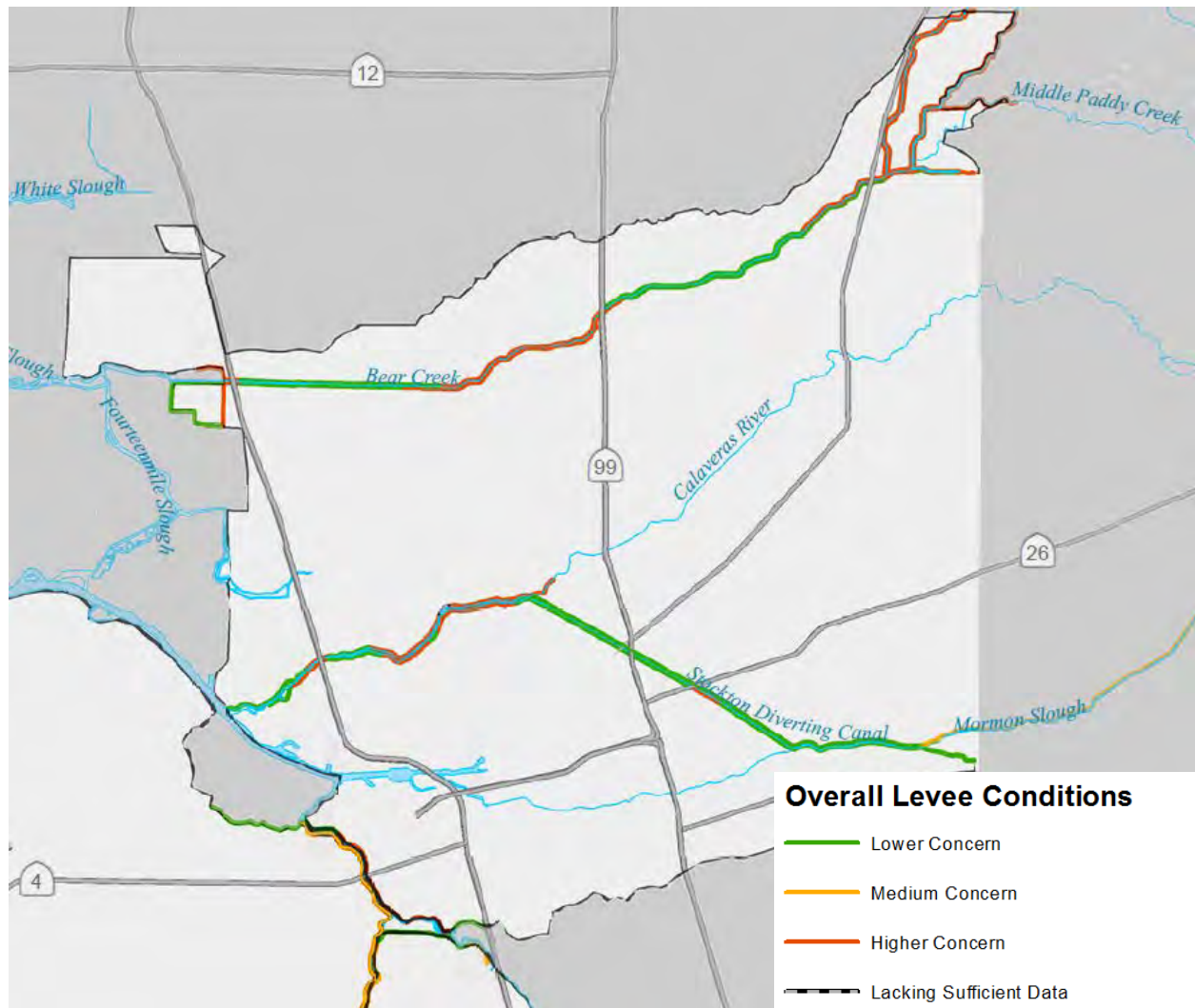


Figure xx – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the ULE/NULE evaluations. Details of these evaluations for levees in and around Stockton are presented in the table on the following pages. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of tables on the following pages.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level
ULE Ratings	
M	Meets ULDC Criteria
MG	Marginally Meets ULDC Criteria
DNM	Does Not Meet ULDC Criteria

Table X – ULE Results – City of Stockton and Surrounding Areas

ULE RESULTS - CITY OF STOCKTON AND SURROUNDING AREAS							
RD #	Name	Reach ID	Freeboard	Geometry	Seepage	Stability	Overall
-	Bear Creek Right Bank	A	DNM	M	M	M	DNM
		B	M	M	M	M	M
		C	M	M	M	M	M
		D	DNM	M	M	M	DNM
		E	DNM	M	M	M	DNM
		F	M	DNM	M	M	M
		G	M	DNM	M	M	M
		H	DNM	DNM	M	M	DNM
		I	DNM	DNM	M	M	DNM
-	Bear Creek Left Bank	J	M	M	DNM*	DNM*	DNM
		K	M	M	M	M	M
		L	M	M	M	M	M
		M	M	M	DNM*	M	DNM
		N	DNM	M	M	M	DNM
		O	M	MG	M	M	M
		P	M	MG	M	M	M
		Q	DNM	DNM	M	M	DNM
-	Paddy Creek W.	R	DNM	DNM	M	M	DNM
-	Paddy Creek E.	S	DNM	DNM	M	M	DNM

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

Table X – ULE Results – City of Stockton and Surrounding Areas (Con't)

ULE RESULTS - CITY OF STOCKTON AND SURROUNDING AREAS							
RD #	Name	Reach ID	Freeboard	Geometry	Seepage	Stability	Overall
-	Middle Paddy Creek South	T	DNM	M	M	M	DNM
-	South Paddy Creek North	U	DNM	DNM	M	M	DNM
-	South Paddy Creek South	V	M	MG	M	M	M
-	Calaveras River Right Bank	A	M	M	M	M	M
		B	M	M	M	M	M
		C	M	DNM	M	M	M
		D	M	DNM	DNM*	M	DNM
		E	M	M	M	M	M
		F	DNM	M	M	M	DNM
		G	DNM	M	M	M	DNM
		H	DNM	M	M	M	DNM
		H1	M	M	M	M	DNM
		H2	M	M	M	M	M
		H3	M	M	LD	LD	LD
		J	M	DNM	M	M	DNM

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

Table X – ULE Results – City of Stockton and Surrounding Areas (Con't)

ULE RESULTS - CITY OF STOCKTON AND SURROUNDING AREAS							
RD #	Name	Reach ID	Freeboard	Geometry	Seepage	Stability	Overall
-	Calaveras River Left Bank	K	M	M	M	M	M
		L	M	DNM	DNM*	MG	DNM
		M	M	MG	M	M	M
		N	DNM	DNM	DNM*	M	DNM
		O	M	M	M	M	M
		P	DNM	M	M	M	DNM
		Q	M	M	DNM*	M	DNM
		R	M	M	DNM*	M	DNM
		S	M	M	M	M	M
		T	-	-	-	-	-
-	Diverting Canal North	U	-	-	-	-	-
		V	-	-	-	-	-

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

Table X – ULE Results – City of Stockton and Surrounding Areas (Con't)

ULE RESULTS - CITY OF STOCKTON AND SURROUNDING AREAS							
RD #	Name	Reach ID	Freeboard	Geometry	Seepage	Stability	Overall
-	Diverting Canal South	W	M	M	M	M	M
		X	M	M	M	M	M
		Y	M	M	M	M	M
		Z	M	M	M	M	M
		AA	M	M	M	M	M
		AB	DNM	M	M	M	M
		AC	M	M	DNM*	M	DNM
		AD	M	M	M	M	M
		AE	M	M	M	DNM*	DNM
		AF	M	M	M	M	M
		AG	M	M	M	M	M
		AH	M	M	M	M	M
-	Mormon Slough Left Bank	AI	M	M	M	M	M

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

Table X – ULE Results – City of Stockton and Surrounding Areas (Con't)

ULE RESULTS - CITY OF STOCKTON AND SURROUNDING AREAS							
RD #	Name	Reach ID	Freeboard	Geometry	Seepage	Stability	Overall
17	Mossdale	A	M	M	MG	M	MG
		B	M	M	M	M	M
		C	M	M	M	M	M
		D	M	M	MG	M	MG
		Other ULE reaches are included in the City of Lathrop Section					
404	Boggs Tract	A	M	M	M	M	M
		B1	M	DNM	DNM*	M	DNM
		C	M	DNM	DNM	M	DNM
		D1	M	DNM	DNM	M	DNM
		D2	M	DNM	DNM	M	DNM
		E	M	DNM	DNM	M	DNM
		F	M	M	M	M	M

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

Table X – NULE Results – City of Stockton and Surrounding Areas

NULE RESULTS - CITY OF STOCKTON AND SURROUNDING AREAS								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
-	Diverting Canal Right Bank	-	1	A	A	A	A	A
-	Mormon Slough Right Bank	-	1	A	A	A	A	A
2126	Atlas Tract	NA	5004	A	A	A	A	A
		NA	5005	A	A	A	A	A

PL84-99 Status

As noted previously, PL 84-99 provides guidelines that levee must meet in order to be eligible for disaster assistance in the event of a levee failure. The Bear Creek and Mormon Slough levees protecting portions of the City of Stockton are in various stages within the PL 84-99 program (i.e. Active, Inactive, Re-instatement). The figures on the following pages illustrate the status of the various levee segments.

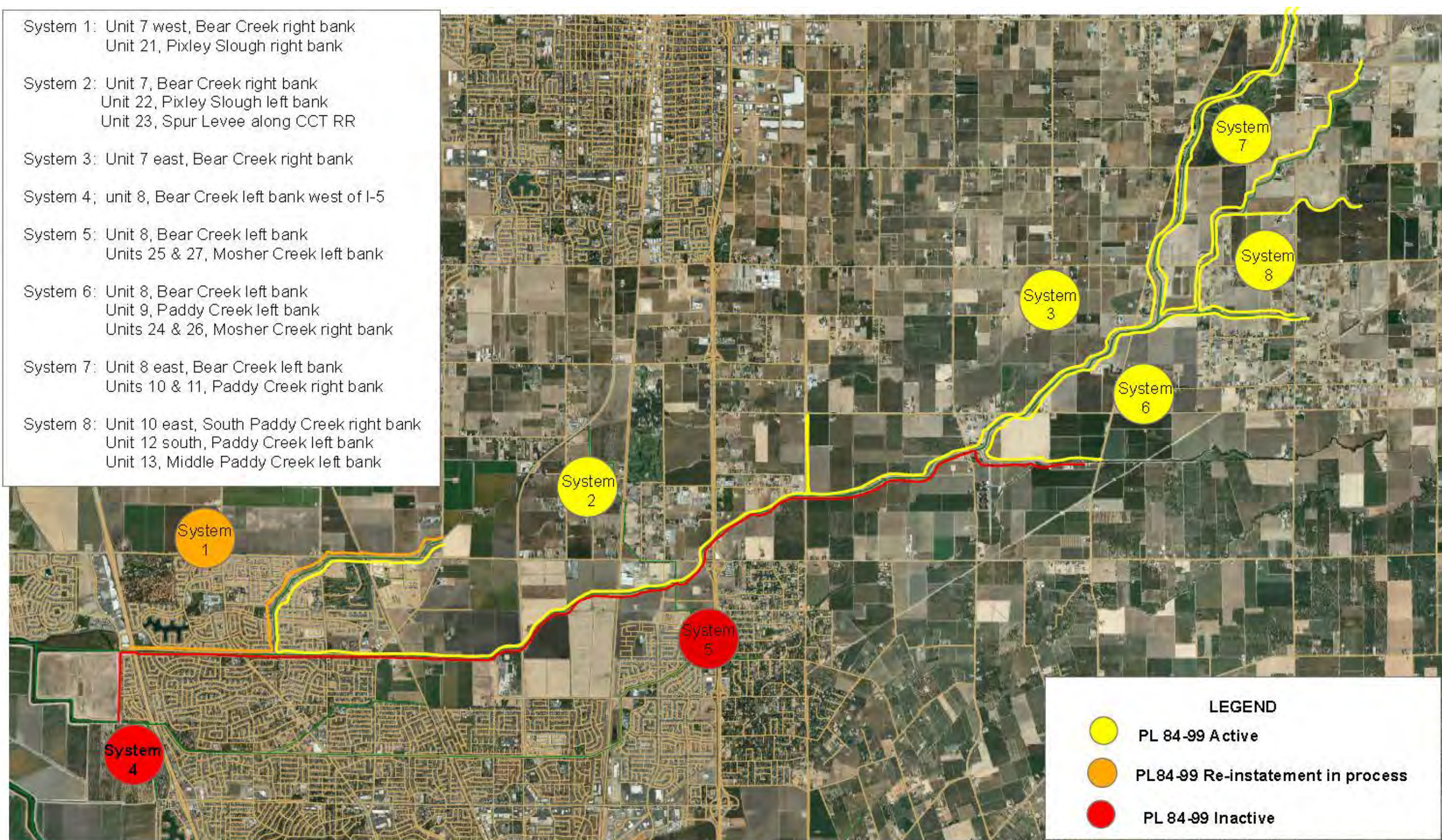


Figure 15 – Bear Creek System PL 84-99 Eligibility

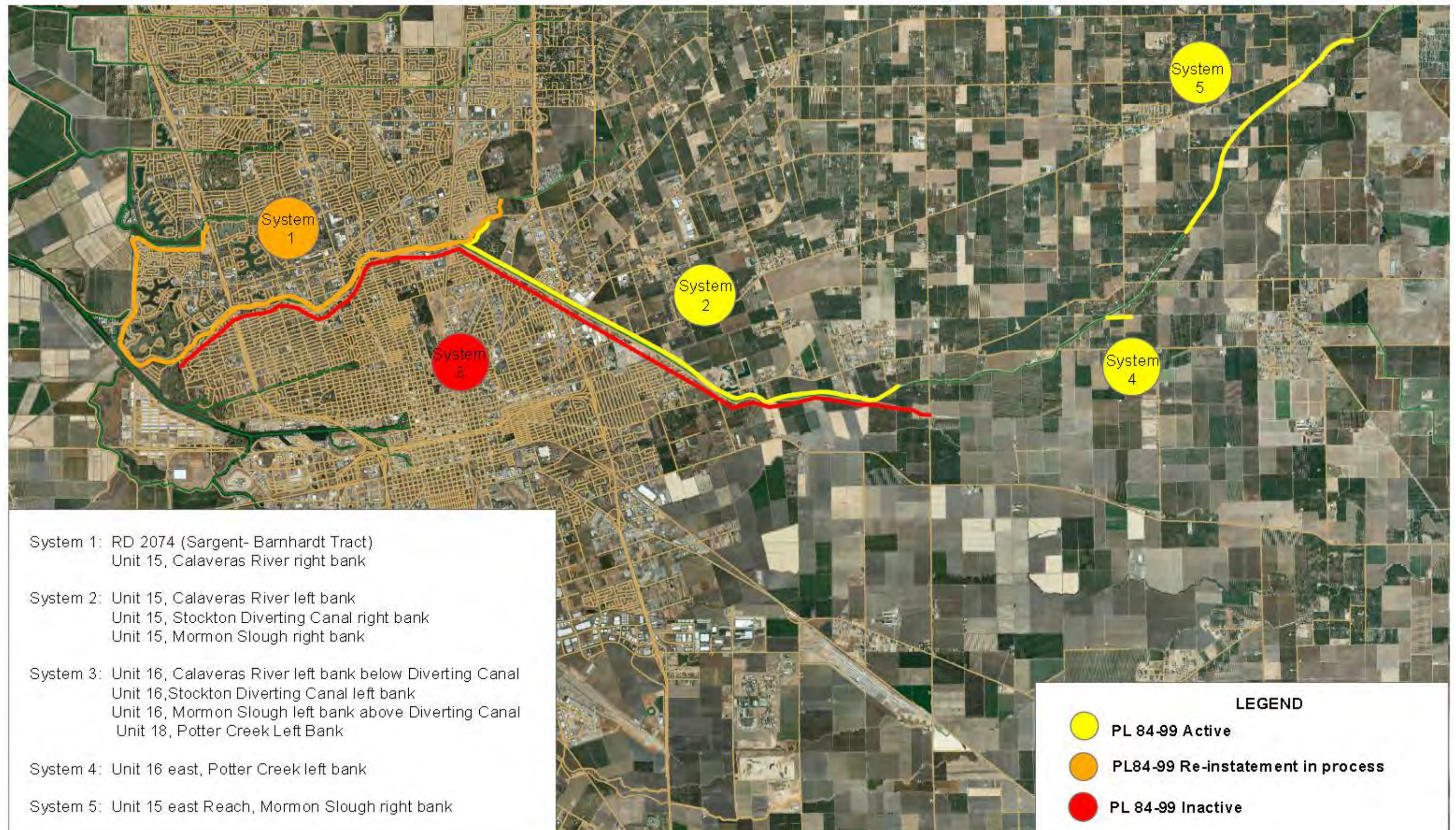


Figure 16 – Mormon Slough System PL 84-99 Eligibility

As shown in the previous figures, the levees along the south banks of Bear Creek, Calaveras River, Stockton Diverting Canal and Mormon Slough are all inactive in the PL 84-99 program.

This is a concern since many of these levee segments have been found to have deficiencies in the 2012 CVFPP and LSJRFS. If these levees failed during a flood event, SJCFCWCD would not receive any assistance for repairs.

O&M Ratings

The City of Stockton encompasses nearly a dozen RDs. Maintenance of levees in and around Stockton is performed by individual RDs and the San Joaquin County Flood Control and Water Conservation District (SJCFCWCD). The City of Stockton does not directly maintain levees in the Regions.

RD 17 and 404 were the only specific LMA's within the City of Stockton included in the 2012 LMA Report. Project levees along Bear Creek, Mormon Slough, and the Calaveras River are lumped into a composite rating for SJCFCWCD in the 2012 LMA report.

A rating of Minimally Acceptable* was given for RD 17 due to small portions of unacceptable erosion and encroachment issues. RD 404 was given an Unacceptable rating due to many issues, the largest being crown roadway, erosion, tree trimming/thinning, and vegetation. Animal control, encroachments, and slope stability were also cited as issues, but were not as prevalent.

It should be noted, however, that RD 404 is in the process of re-establishing 100-year flood protection. It is in the process of finishing the first of two seepage related projects by the installation of 1,600 lineal feet of cut-off wall just upstream of Highway 4.

Table X – LMA Ratings for the City of Stockton & Surrounding Areas

CITY OF STOCKTON LMA Ratings			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
-	San Joaquin County Flood Control & Water Conservation District	Minimally Acceptable	Minimally Acceptable
17	Mossdale	Acceptable	Minimally Acceptable*
404	Boggs Tract	Minimally Acceptable	Unacceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

The challenges noted up to this point for the City of Stockton have been focused on the big-picture for Stockton as a whole. Below are Reclamation District specific challenges identified in the small group meetings and in local studies/plans.

RD 17

Reclamation District 17 encompasses approximately 1,550 acres (within the City of Stockton jurisdiction) and is responsible for O&M for approximately 3.4 miles of project levee along the San Joaquin River and 0.7 miles of non-project levee along French Camp Slough.

Additional information will be added when available.

RD 403

Reclamation District 403 encompasses approximately 1,451 acres and is responsible for O&M for approximately 5.5 miles of non-project levee.

The levee around RD 403 is a non-project levee and is accredited by FEMA as providing protection against a 100-yr flood event. The long-term plan for RD 403 is to maintain this accreditation, but not to seek ULOP. One of the drivers for this decision is the fact that RD 403 does not have any residents. Additionally, as a condition of the Navy's transfer of land in RD 403 to the Port of Stockton, conditions were set forth prohibiting any future development of residences, schools, or hospitals.

RD 403 has experienced minor seepage along Burns Cutoff, and focuses annual O&M activities on riprap projects (\$25K/yr), rodent control, and weed control. Total annual O&M expenditures are range from \$25K - \$100K, and are funded by the port. There are currently no flood project assessments.

Future projects for RD 403 include bridge improvements at Navy Drive and Dagget. Dredging of the SJR to accommodate larger ships is also planned.

RD 404

Reclamation District 404 encompasses approximately 2,130 acres and is responsible for O&M for approximately 4.1 miles of project levee and 0.7 miles of non-project levee.

All levees along RD 404 have an expired PAL and will be remapped into the floodzone with the next FEMA map revision (date currently unknown). RD 404 is currently undertaking a 1600-foot long, \$1.1M slurry wall project starting at Hwy 4 and extending upstream. A future project is a 1200-foot long cutoff wall along French Camp Slough, just upstream of the SJR to address seepage issues. Another future project is the placement of approximately 7000-feet of rock slope protection to address erosion on the waterside slope. Completion of these three projects, and after submitting a Letter of Map Revision (LOMR), RD 404 will meet FEMA 100-year flood protection standards. RD 404 will then pursue reaccreditation with the U.S. Army Corps of Engineers (USACE) requirements to be active in the PL 84-99 Program for the project levee (except maybe addressing closures). The ultimate goal of RD 404 is to seek ULOP. RD 404

currently has approximately 5000 residents and is 60-65% developed. RD 404 recently passed a Prop 218 and brings in approximately \$600K in annual assessments.

The RD 404 levee system not only protects residents, but also schools, industrial facilities, the Port of Stockton, and very importantly the Stockton wastewater treatment plan. In the event of a flood, the District has a Flood Contingency Map that was last updated in April 2013.

RD 828

Reclamation District 828 encompasses approximately 1,131 acres and is responsible for O&M for approximately 1.8 miles of non-project levee along Smith Canal.

Flood system challenges identified for RD 828 include highly-encroached levees along Smith Canal, non-accredited levees along Smith Canal, and lack of a 5-year plan.

RD 1614

Reclamation District 1614 encompasses approximately 1,600 acres and is responsible for O&M for approximately 2.8 miles of non-project levee along Smith Canal. San Joaquin County provides O&M for the approximate 3.2 miles of project levee along the Calaveras River.

Stormwater runoff within RD 1614 is collected and conveyed via an extensive network of inlets and pipes owned and operated by the City of Stockton and San Joaquin County. It is then ultimately discharged into the Calaveras River and Smith Canal by one of eleven storm drain pump stations owned and operated by RD 1614. RD 1614 is in the process of designing and obtaining funding for the replacement of one of these pump stations – the Wisconsin Pump Station. The current pumping capacity is only about 1/3 of what is necessary to provide protection against runoff from a 100-year storm event, which results in residual flooding of a portion of the approximately 1,700 parcels that is served by the Wisconsin Pump Station. To further complicate the situation, the existing pump station structure is severely antiquated and in danger of detrimental collapse. The sheet pile sump is reinforced with wood timber whalers that have rotted. The steel sheet piles themselves have rotted and are collapsing inward. After assessing the condition of the pump station and consulting with a structural engineer, RD 1614 has determined that the structural integrity of the facility's sump has diminished to a point where there is now great concern that the pump house is in danger of collapsing into the sump. This means that the pump station cannot simply be upgraded – the entire pump station needs to be replaced. The figures on the following page provide an overview of RD 1614 and the Wisconsin Pump Station.

Additional flood system challenges for RD 1614 include highly-encroached levees along Smith Canal and the left bank of the Calaveras River, and de-accredited levees along Smith Canal. Levees along the Calaveras River are accredited by FEMA.

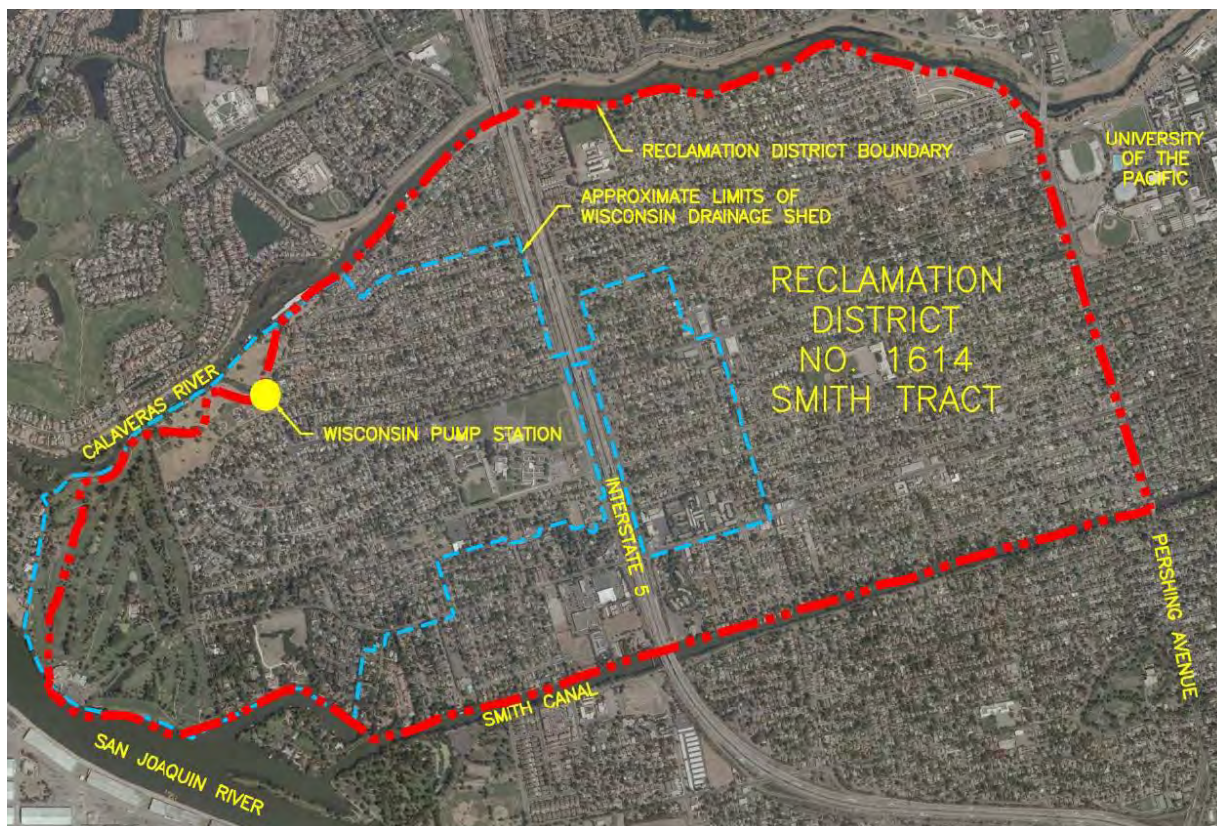


Figure XX – RD 1614

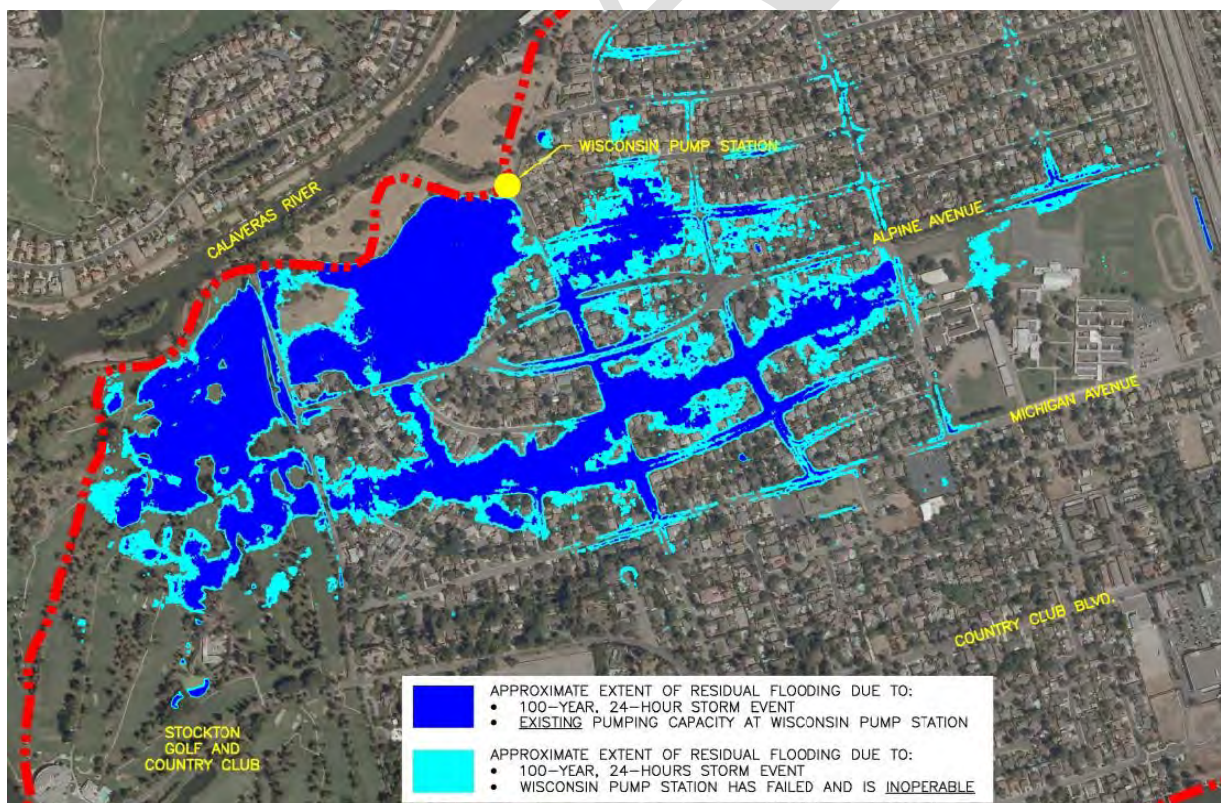


Figure XX – Approximate Extents of Residual Flooding Due to Pump Station Deficiencies

RD 1608

Reclamation District 1608 encompasses approximately 566 acres and is responsible for O&M for approximately 3.6 miles of non-project levee.

RD1608 is one of the initial Reclamation Districts to be evaluated under the DWR Urban Levee Evaluation (ULE) program. Preliminary levee through and under seepage and stability analyses have been completed based on historic and recently acquired geotechnical data. Approximately 92% of RD1608's levees were found to be in good condition and meet current ULDC and USACE stability and seepage criteria. However, a small segment of levee adjacent to the Grupe Park area (currently estimated at 1,500 feet long) did not meet seepage and stability criteria. A boring at the Southwest corner of Grupe Park contained a layer of Peat Soil. Considering the historic geomorphology of the area, the analyses showed that a Peat layer likely extends along this reach in the levee foundation. Considering the reduced strength and higher seepage rate of Peat soil, the preliminary calculations show that the stability and seepage values fall a little below the factors of safety required by criteria in this segment.

RD1608 representatives requested DWR perform additional explorations, lab testing, and analyses in order to better define the spatial extent of the peat problem and thus the resulting size and cost of any required levee remediation project. Due to funding constraints, DWR was unable to perform the locally requested additional exploration and lab testing effort. Considering DWR's inability to fund the effort, the RD1608 Board recently approved \$20,000 to obtain additional exploration & lab testing information. This will be provided to DWR / Kleinfelder to enhance the final ULE Program analysis of the RD1608 levees. Additional explorations are anticipated in mid-December 2013. It is anticipated that the additional information will help to significantly reduce the length of RD1608 levee that may not meet ULDC & USACE levee stability / seepage criteria. As noted above, an item of concern is extent of possible sand and/or peat layer in the southern corner of the Grupe Park area.

Additionally, sedimentation has significantly impacted the navigability of 14 Mile Slough. RD1608 approved a Sediment Removal Project from Village Marina to the Feather River Road Bridge. This project would allow for continuity of operations for levee maintenance, minor repair, major rehabilitation, and emergency flood fight activities in this reach. It will also resolve the very limited landside levee access issue along the SW Levee portion of this reach.

Design, environmental studies, and required permit activities are currently ongoing. When this project was initiated, the USACE was indicating it would qualify for inclusion in the CALFED Levee Integrity Program. Based on this understanding, RD1608 passed a Prop 218 election in 2010 that included sufficient funds to cover the RD1608 portion of the cost (approximately \$1,000,000).

After several years of positive input regarding inclusion in the CALFED Levee Integrity Program, the USACE, late in 2011, notified the District that the project did not meet criteria for inclusion in the CALFED program. The RD1608 Board of Trustees believes this project needs to move forward. However, the District's limited fiscal resources will likely be insufficient to move the project into construction.



Figure XX – RD 1608 Flood System Hazards

RD 2042

Reclamation District 2042 encompasses approximately 3,100 acres and is responsible for O&M for approximately 8.0 miles of non-project levee. The levees around RD 2042 are accredited by FEMA. There were no significant flood system deficiencies identified by the district. As development takes place in the district, RD 2042 will pursue 200-year protection in accordance with the ULDC. It is noted that RD 2042 did not participate in DWR's ULE program. RD 2042 will fund future geotechnical evaluation of its levees.

RD 2074

Reclamation District 2074 encompasses approximately 1,186 acres and is responsible for O&M for approximately 1.4 miles of project levee and 6.6 miles of non-project levee.

The levees around RD 2074 are accredited by FEMA. RD 2074 is nearly 100% developed (2850 lots; 7500 population) and has a project levee along the Calaveras River, and non-project levee along the SJR, North and South Buckley Coves, Ten Mile Levee and Fourteen Mile Slough.

The non-project levee along Fourteen Mile Slough is "double wide" starting at a point 1300' feet west of the eastern RD boundary. PG&E owns a section of the north-south levee along the east end of Fourteen Mile Slough and is considered a potential weak point in the system. The GIS map of RD 2074 included some levees along the east boundary of the RD, also known as Smith's Levee, which has been degraded and are no longer a part of the flood protection system.

There is a dryland levee (10-mile Levee) on the west side of RD 2074 that protects RD 2074 (and Stockton) in the event RD 2119 floods. This levee has never been loaded or studied, so it is unclear whether this would protect RD 2074 in the event of a flood of RD 2119. A long fetch across RD 2119 producing wind/wave action is a concern for 10-mile levee. Some of this levee (west slope) is on RD 2119. RD 2074 would like to have the west face of this levee protected with rip rap but does not have the financial resources to attempt this \$5,000,000 project. This project is an important goal for the District to accomplish.

RD 2074 believe their levees meet ULDC, although at this time they are only interested in pursuing ULOP if it is economical, or if it is funded by SJAFCA/City of Stockton/DWR etc.

The levee along the Calaveras River and Fourteen Mile Slough are adjacent to existing homes with a 10 foot setback from the levee toe to homeowner improvements. In 96/97 floods, there was some seepage along the Calaveras River and Fourteen Mile Slough.

Annual assessments are \$650K. RD 2074 has a 5-yr plan, and is currently rocking along the Calaveras and San Joaquin Rivers.

RD 2115

Reclamation District 2115 encompasses approximately 1,806 acres and is responsible for O&M for approximately 6.8 miles of non-project levee.

The only levee along RD 2115 that is accredited by FEMA is the levee at the southeast side of the district adjacent to Fivemile slough. The other levees currently do not meet HMP standards

(don't have 1' of freeboard), but RD 2115 recently received a grant to upgrade the levees to meet HMP criteria. The graphic below provides an overview of the sections of levee that do not meet HMP and/or PL 84-99 standards.



Figure XX – RD 2115 Flood System Hazards

The interim goal is for RD 2115 to meet PL 84-99 standards while it remains rural, but to meet ULDC standards when development takes place. A development agreement is currently in place for future development. A CLOMR exists for RD 2115, but will be re-evaluated if development starts and ULDC requirements are pursued.

The levee along Fourteenmile Slough broke and flooded RD 2115 in 1983. There is some concern of flood risk for RD 2115 if RD 2037 flooded. Stumps from Walnut Trees previously removed are in the process of being removed since the decaying remains weaken these levees.

O&M is performed by the sole owner (Jack Kelly), but typically only consists of rock placement (\$25K - \$100K per year). A 5-yr plan exists for RD 2115. Finally, the Fivemile Slough levee at the southeast corner of the RD may eventually be degraded to provide 3' of freeboard (Currently provides 8'+).

Other than these issues, the levees along RD 2115 are well maintained. As development takes place in the district, RD 2115 will pursue 200-year protection.

RD 2119

RD 2119 is surrounded by a non-project levee. RD 2119 has a \$2M grant to upgrade the levee to meet HMP standards. The long-term plan for RD 2119 is to upgrade the levee to meet PL 84-99 standards. RD 2119 is a rural district, but if development ever does occur, the levees will need to be completely overhauled. This is not currently planned or projected to occur. Over time, the

levee crest has crept over rock on the waterside slope of the levee, essentially making the levee have a rock core. Rodent holes in the levee expose the rock core to water during high-water events.

RD 2119 generates approximately \$250K - \$300K in annual assessments, and does a significant amount of rock/erosion placement. Two recent Proposition 218 elections have been passed to raise assessments to pay down an estimated \$2M in debt.

It should also be noted that RD 1608 has an interest in RD 2119 levees, so RD 1608 pays RD 2119 approximately \$30K per year to maintain the levee along Fourteenmile Slough. This levee currently performs well, according to the District.

Assets at risk in RD 2119 include a City sewer pump station near along Fourteenmile Slough. The levee here has been improved, but not to 100-yr standards. Some habitat mitigation has been funded on RD 2119 for the Brookside development.

RD 2126

Reclamation District 2126 encompasses an area of 360 acres, and is responsible for O&M for approximately 0.81 miles of project levee along its eastern boundary, and approximately 2.27 miles of non-project levee. The levees around RD 2126 are currently accredited by FEMA. As development takes place in the district, RD 2126 will pursue 200-year protection in accordance with the ULDC.

Flood system challenges identified for RD 2126 include continued placement of riprap to address erosion caused by wave action in the adjacent waterways. Additionally, a permanent power supply for the only pump station on the district is needed. Finally, RD 2126 does not have a flood contingency map which puts the district at increased risk in the event of a flood event requiring evacuation.

Risks Associated With Deficiencies:

The deficiencies identified in each Reclamation District, and in the City of Stockton as a whole represent areas where flood control systems have a higher likelihood of failure. Since nearly the entire City of Stockton is within areas protected by levees, that means that nearly the entire population of the City, as well as all the infrastructure within the City is potentially at risk in the event of a flood system failure.

As illustrated in Figure 7 in Section 4.1.5, hospitals, police and fire stations, boat launch facilities, airports, and the City of Stockton's wastewater treatment plant are located in areas protected by levees. Services provided by these institutions may be vulnerable to being shut down in the event of a flood.

In addition to the critical infrastructure noted above, Interstate 5 and Highway 99 traverse the City. If Interstate 5 was rendered unusable due to a flood control system failure, this would result in a significant disruption to one of the primary north-south transport routes in the State of California. According to the State of California Department of Transportation's Annual Average Daily Traffic for 2010, approximately 224,000 vehicles used Interstate 5 to traverse the City;

approximately 52,000 of which were trucks. According to the Delta Risk Management System (DRMS) report, a closure of Interstate 5 would result in an estimated cost of \$3,000,000 per day in business losses.

Furthermore, the Stockton Ship Channel is a significant commercial marine transportation route and is used extensively by recreational boaters, as well as by marine contractors that perform levee maintenance, flood fight response and other construction activities. Reclamation Districts 403 and 404 are adjacent to the Stockton Ship Channel and provide nautical access to the Port of Stockton. According to the DRMS report, approximately 2,900,000 million metric tons of cargo is shipped from the Port of Stockton each year. The cost of an outage at the Port of Stockton is \$10,157 per day, given this rate of cargo moving through the Port

The Stockton Regional Waste Water Treatment Plant is located on RD 404 with its ponds on RD 524. The ponds on RD 524 are within the FEMA 100-yr floodplain. If levees along RD 524 levees broke, water could mix directly into the sewage water at the treatment plant and then traverse into the channel to Clifton Court Forebay. This would leave many areas in central and southern California without fresh drinking water.

Flooding of western Stockton would also potentially disrupt water service to thousands of customers in the City of Stockton metropolitan area due to an interruption to the City of Stockton's water infrastructure facilities on Bishop Tract (RD 2042). The City currently pumps water from the San Joaquin River on RD 2029 and conveys it across RD 2029, RD 2044, and RD 2042 to its water treatment plant.

Pacific Gas and Electric Company (PG&E) operates and maintains a high-voltage electrical transmission line and an electrical substation within Bishop Tract. In addition, the Western Area Power Administration (WAPA) operates and maintains several high-voltage electrical transmission lines that traverse Bishop Tract. These lines carry power that supply approximately 10% of the summer electrical demand for all of California according to the Delta Protection Commission's Economic Sustainability Plan for the Sacramento-San Joaquin Delta. If these lines were to be out of service due to a flood, it would have impacts beyond the Region.

Finally, in order to fully appreciate the hazards associated with identified system deficiencies, breach floodplains prepared as part of the LSJRFS for deficient segments was analyzed.

The breach floodplains were compared against land uses in each respective floodplain. The land use categories used are outlined below:

- Urban: Areas with high population densities such as areas within Stockton and surrounding areas.
- Veg/Graze: Lands used predominantly for natural vegetation and grazing purposes.
- Farmland: Land used predominantly for farming.

The right bank of Bear Creek near the UPRR (Index Point BR2) was found to have minor freeboard deficiencies in the LSJRFS, and a higher overall concern in the 2012 CVFPP. In the event of a breach at this location, floodwaters would back up behind the railroad and the east levee of Pixley Slough as illustrated in the figure below.

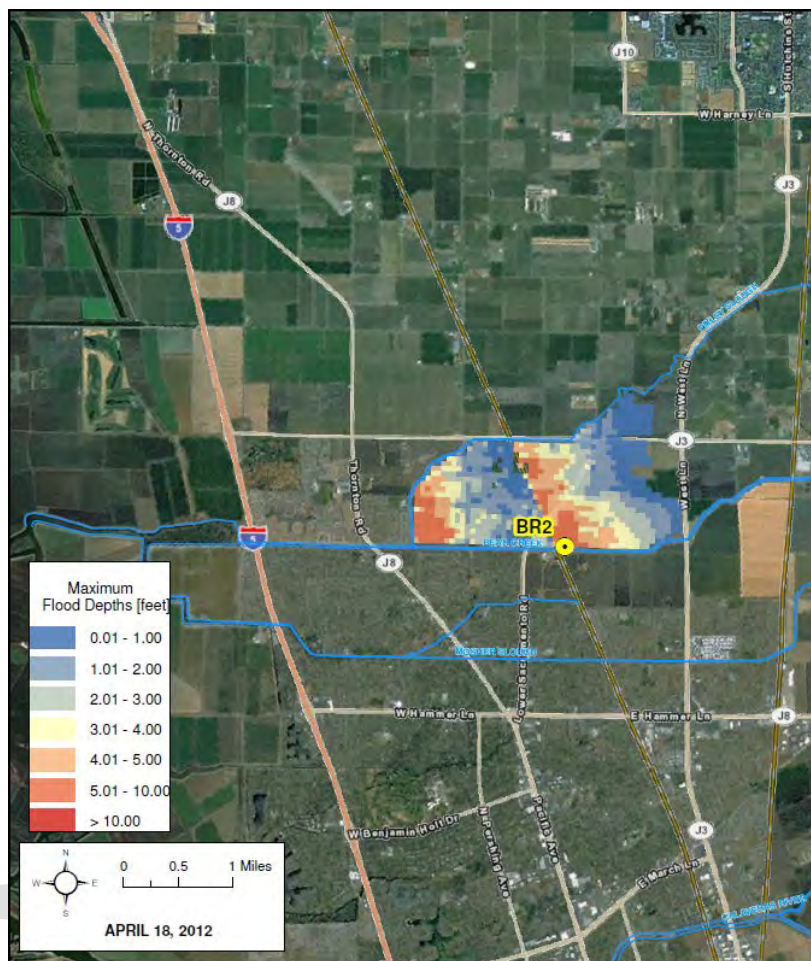


Figure XX – 200 Year Inundation Map for Levee Breach Scenario at Index Point BR2

The breach shown above would result in the flooding of nearly 1,300 acres of land. The majority of the land affected would be important farmland and urban areas, with a small portion of natural vegetation/grazing land also lying within the flood plain. The table below describes the affected number of parcels and area of each land use type.

Areas within BR2 Breach Floodplain				
Land Use	Parcels	Parcel Percentage	Area (acres)	Area Percentage
Urban	1870	71%	483	37%
Veg/Graze	613	23%	102	8%
Farmland	160	6%	706	55%
Total	2643	100%	1291	100%

The left bank of Bear Creek just downstream of Highway 99 (Index Point BL2) was found to have moderate freeboard deficiencies and geometry deficiencies in the LSJRFS, and a higher overall concern in the 2012 CVFPP. In the event of a breach at this location, floodwaters would inundate approximately 1,400 acres of land between Bear Creek and Mosher Slough as illustrated in the figure below.

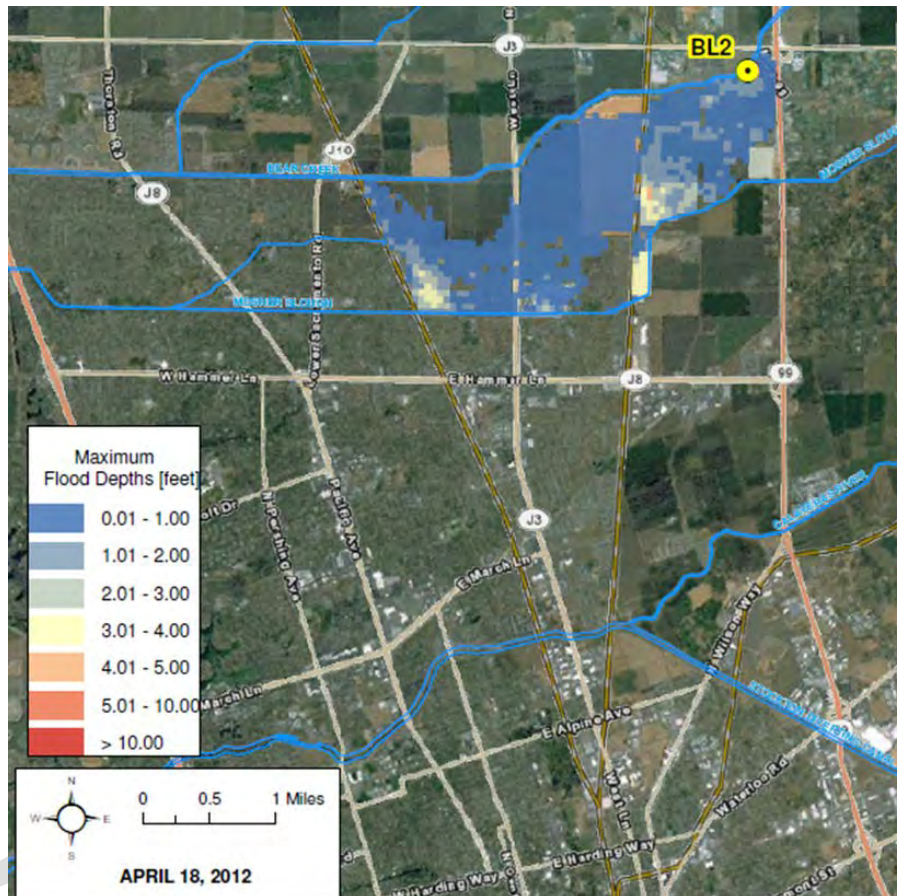


Figure XX – 200 Year Inundation Map for Levee Breach Scenario at Index Point BL2

The figure above shows that most of this affected acreage would be less than one foot deep. The majority of the land affected would be farmland and urban areas, with a small portion of natural vegetation/grazing land also lying within the flood plain. The table below describes the affected number of parcels and area of each land use type.

Areas within BL2 Breach Floodplain				
Land Use	Parcels	Parcel Percentage	Area (acres)	Area Percentage
Urban	2641	88%	597	41%
Veg/Graze	183	6%	36	2%
Farmland	168	6%	834	57%
Total	2992	100%	1467	100%

The right bank of Bear Creek just downstream of Highway 99 (Index Point BR3) was found to have moderate freeboard deficiencies and geometry deficiencies in the LSJRFS, and a higher overall concern in the 2012 CVFPP. In the event of a breach at this location, floodwaters would inundate approximately 1,800 acres of land between Bear Creek and Pixley Slough as illustrated in the figure below.

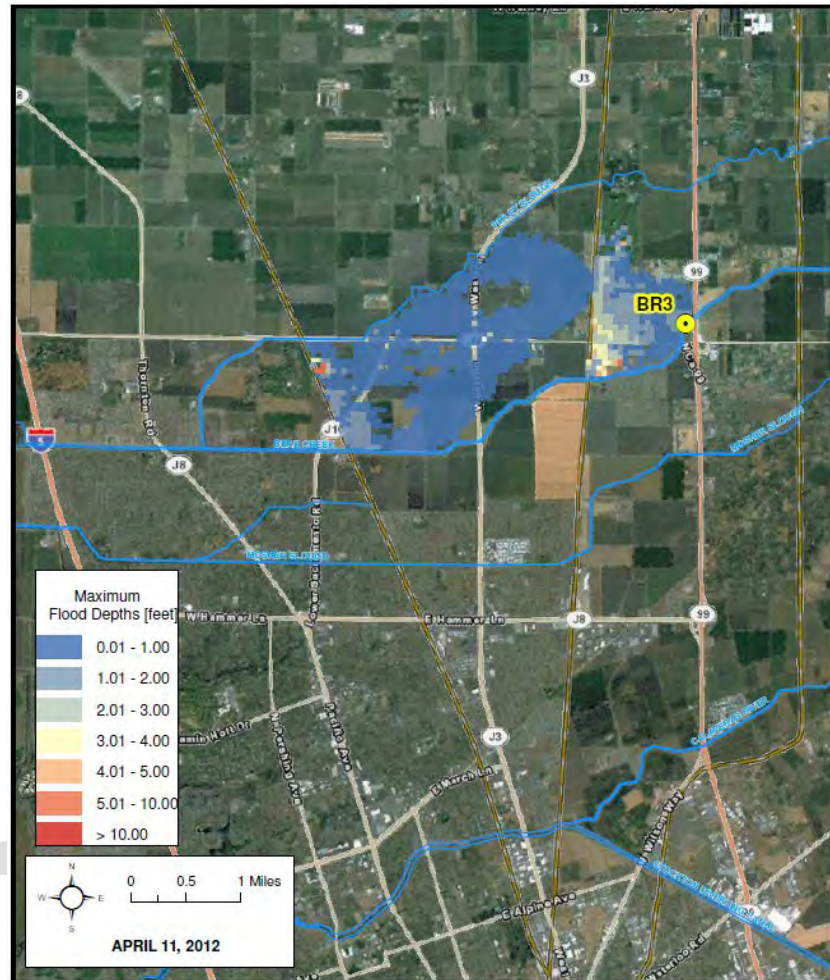


Figure XX – 200 Year Inundation Map for Levee Breach Scenario at Index Point BR3

The map shows that most of this affected acreage would be less than one foot deep. A large majority of the land affected would be important farmland and urban area. The table below describes the affected number of parcels and area of each land use type.

Areas within BR3 Breach Floodplain				
Land Use	Parcels	Parcel Percentage	Area (acres)	Area Percentage
Urban	359	30%	260	14%
Veg/Graze	557	46%	85	5%
Farmland	295	24%	1527	82%
Total	1211	100%	1872	100%

Maximum Flood Depths (feet)

0.0 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 10.0
> 10.0

0 0.5 1 Miles

APRIL 23, 2012

The map shows flood depths of one foot or less for most of the affected area, with significantly higher depths east of the levee along RD2074. Virtually all of the land affected would be urban, with one percent of the affected acreage being farmland. The table below describes the affected number of parcels and area of each land use type.

Lower San Joaquin River and Delta South Regional Flood Management Plan
January 2014 87 DRAFT

The left bank of the Lower Calaveras River just downstream of the confluence with the Stockton Diverting Canal (Index Point CL2) was found to have geotechnical deficiencies in the LSJRFS, and a higher overall concern in the 2012 CVFPP. In the event of a breach at this location, floodwaters would inundate approximately 1,300 acres of land.

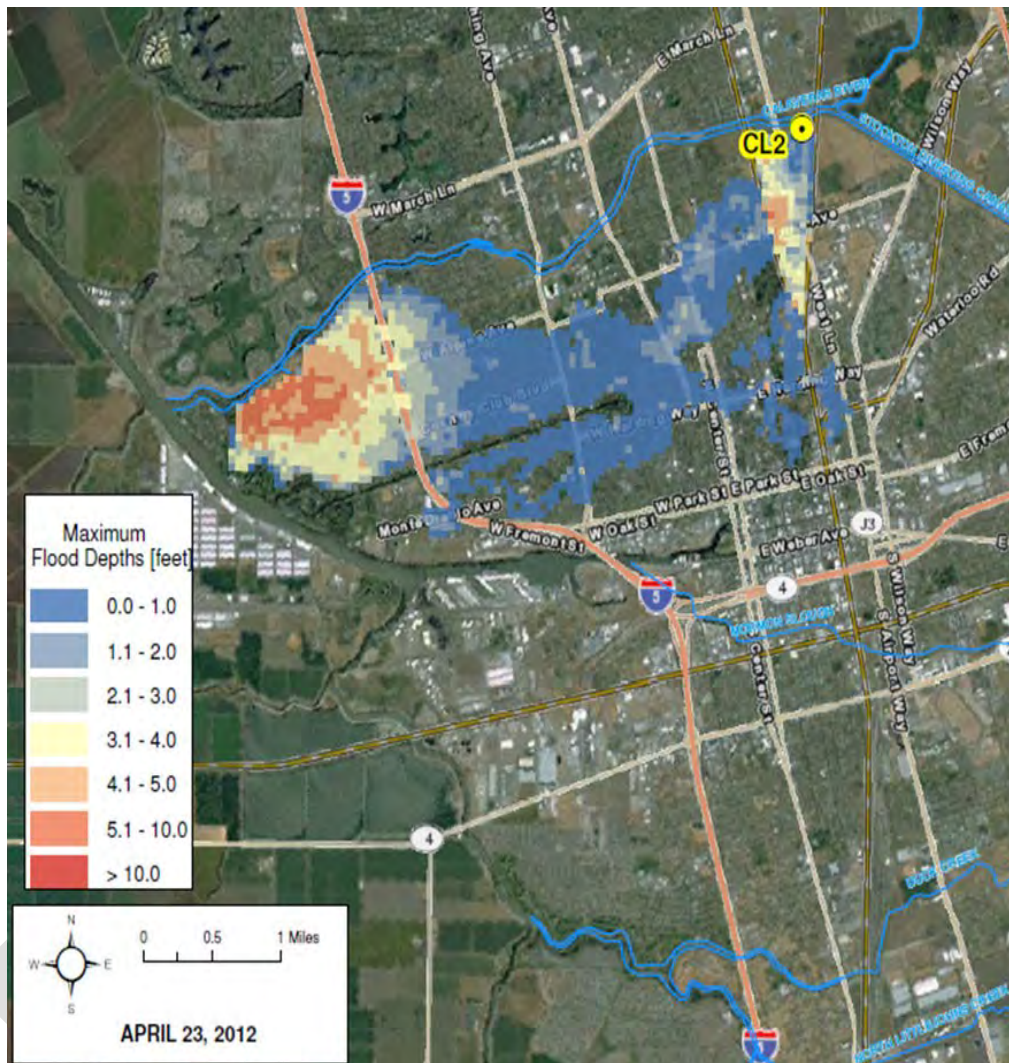


Figure XX – 200 Year Inundation Map for Levee Breach Scenario at Index Point CL2

The figure above shows that most flood depths less than 1-foot deep, with areas of deeper ponding behind the levees along RD 1614 and between the railroads. All of the land in this breach floodplain is urban land. The table below describes the affected number of parcels and area of each land use type.

Areas within CL2 Breach Floodplain				
Land Use	Parcels	Parcel Percentage	Area (acres)	Area Percentage
Urban	6166	100%	1301	100%
Total	6168	100%	1301	100%

The right bank of the Stockton Diverting Canal (Index Point SR1) was found to have geometry deficiencies in the LSJRFS. In the event of a breach at this location, floodwaters would inundate approximately 2,000 acres of land.

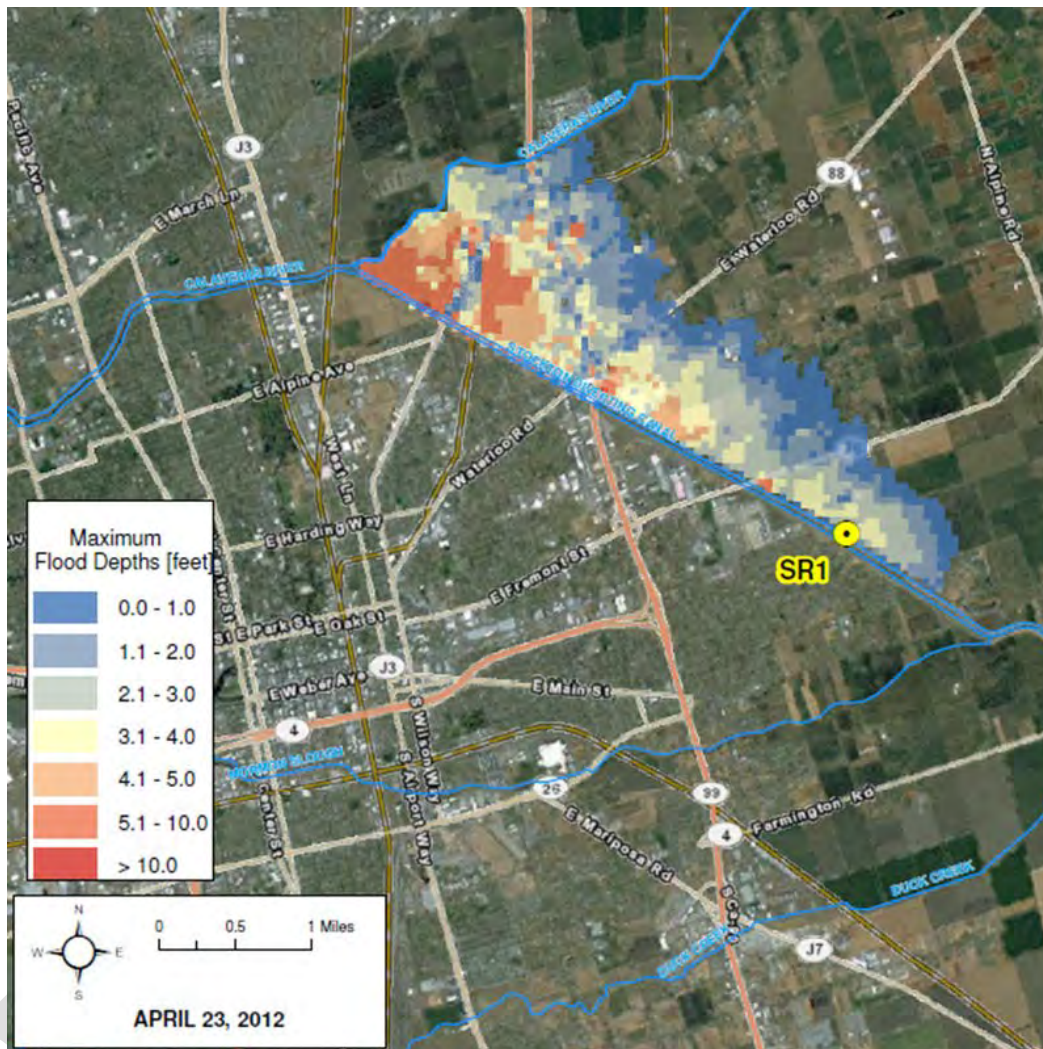


Figure XX – 200 Year Inundation Map for Levee Breach Scenario at Index Point SR1

The majority of the land affected by a breach in this location would be farmland of statewide importance, as well as a significant amount of urban area. The table below describes the affected number of parcels and area of each land use type.

Areas within SR1 Breach Floodplain				
Land Use	Parcels	Parcel Percentage	Area (acres)	Area Percentage
Urban	483	65%	715	37%
Veg/Graze	50	7%	85	4%
Farmland	207	28%	1148	59%
Total	740	100%	1948	100%

The left bank of the Stockton Diverting (Index Point SL1) was found to have an overall higher level of concern in the 2012 CVFPP. In the event of a breach at along this reach, floodwaters would inundate approximately 9,500 acres of land.

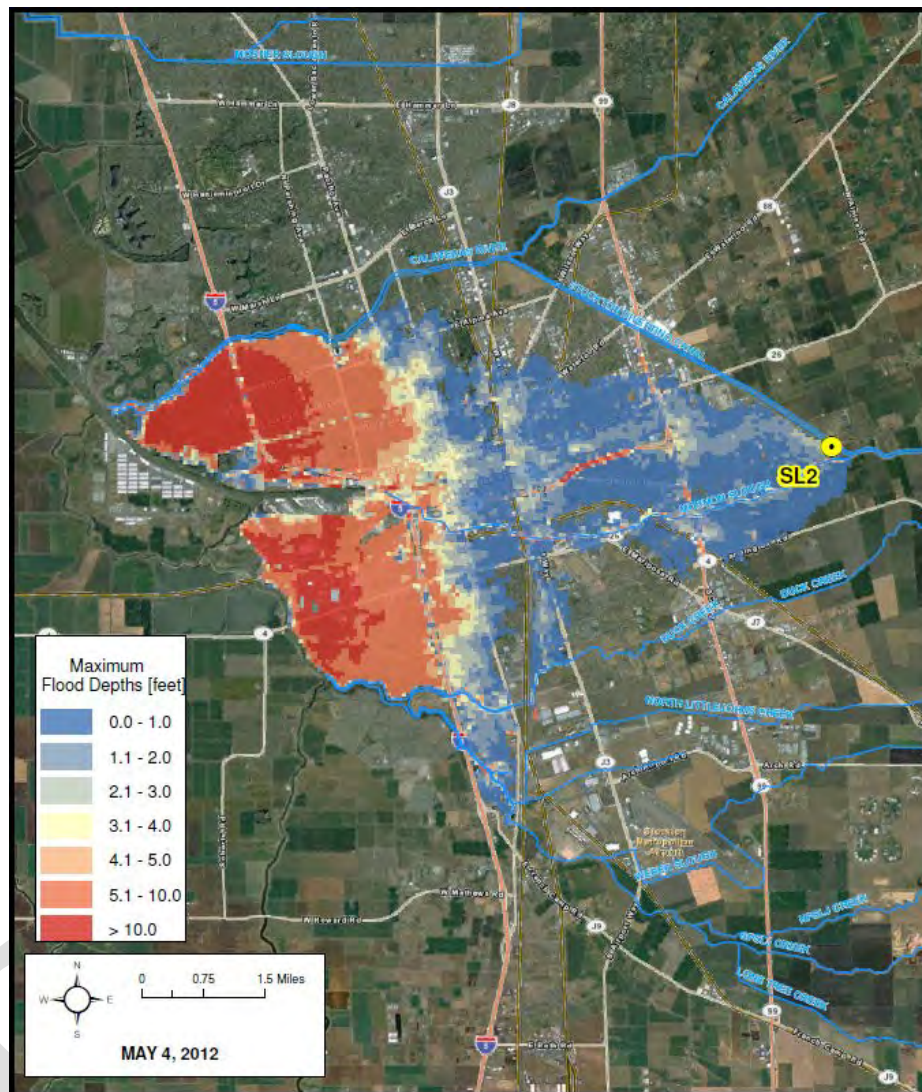


Figure XX – 200 Year Inundation Map for Levee Breach Scenario at Index Point SL2

The majority of the land affected by a breach in this location would be urban land. The table below describes the affected number of parcels and area of each land use type.

Areas within SL2 Breach Floodplain				
Land Use	Parcels	Parcel Percentage	Area (acres)	Area Percentage
Urban	30891	99%	8749	92%
Veg/Graze	57	0%	32	0%
Farmland	293	1%	733	8%
Total	31241	100%	9515	100%

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of the City of Stockton and the RDs within the City of Stockton:

- Some levees are highly encroached which may threaten future levee accreditation & ULDC certification
- Some levees may not meet ULDC criteria, which may make a ULOP finding difficult after July 2016
- The local economy will be impacted if some development cannot be permitted after July 2016 pursuant to SB5
- Flow on the main stem of the SJR needs to be reduced or routed through a bypass before affecting urban properties
- Deficiencies along the Lower Calaveras River threaten a large urban area
- Many levees don't meet USACE ETL 1110-2-571 vegetation standards
- Many levees protecting Stockton are inactive in the PL 84-99 program
- The levees along the Smith Canal are no longer FEMA accredited
- The Wisconsin pump station needs to be improved
- Flood Contingency Maps are needed for North Stockton, RD 2126, RD 2115, RD 2119 and RD 403
- Funding for updating the Flood Contingency Maps developed by San Joaquin County Office of Emergency Services (OES) is no longer available
- Improved flood alert system
- Stability, seepage, and sedimentation issues along Fourteenmile Slough
- Erosion and seepage concerns along levees around RD 2119
- Seepage, erosion, and internal drainage issues on RD 404
- The City of Stockton Wastewater Treatment Ponds are not protected from a 100-year storm event, which could impact water quality in the Delta in the event of a breach of levees around RD404 or RD 524
- Recreational opportunities along levees (i.e. bike path along Calaveras River)
- Water recreation (i.e. jet skis, water skiing, etc.) causes excessive erosion on levees within the City
- The ability of the dryland levee along the west side of RD2074 to protect the City of Stockton in the event of a flood of RD 2119 is unknown.

5.4.1.2 City of Lathrop

General Area Information:

The City of Lathrop is located in both Regions, is bisected by the San Joaquin River, and is bordered by Paradise Cut and Old River. Lathrop is the largest metropolitan area in the Delta South region with a population of nearly 20,000. Upcoming developments include the River Islands development – an 11,000 home master-planned community on RD 2062. The city surrounded on almost all sides by levees and therefore shares similar flood risks to Stockton. Due to the high risk associated with a system failure, it is imperative the levees surrounding Lathrop provide 200-yr protection and are in good repair.

FEMA Accreditation:

Figure 17 below presents the status of FEMA accreditation for the levees protecting Lathrop.

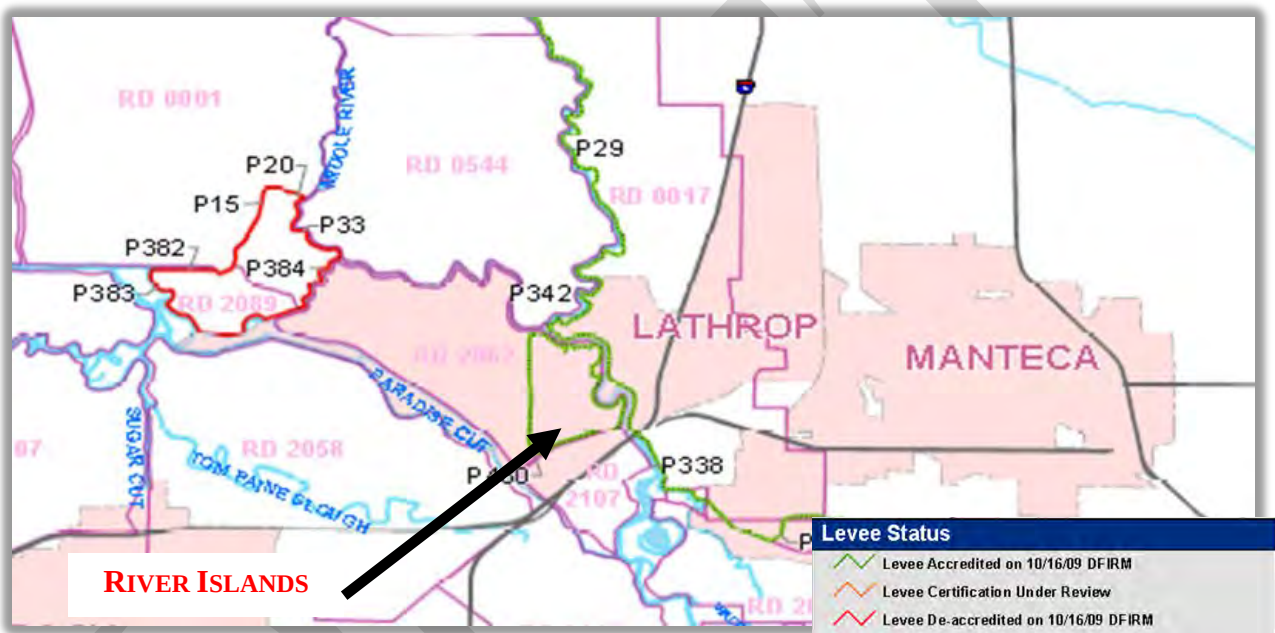


Figure 17 – Lathrop Area Levee Accreditation Status

The western portion of Lathrop is within the FEMA 100-year flood zone and the remainder of the City is within a Shaded Zone X flood zone. The ultimate goal for the City is to be fully developed, so the primary focus for the City will likely be to implement the necessary projects to remove the City from the FEMA 100-year flood, and to meet ULDC criteria. This will likely have to be done in partnership with RD 17, and RD 2062. Furthermore, the City of Lathrop is counting on future development to fuel growth of its economy. Without the necessary flood risk management projects, the economy of Lathrop is in jeopardy.

River Islands recently completed more than \$70 million in levee upgrades to remove a portion of the City of Lathrop from the 100-year flood plain in 2006. These levees were designed and built to be approximately 300-feet wide to provide an increased level of flood protection. Construction on new homes is expected to begin in late 2013.

Additional work by River Islands will include:

- Improve the existing levees along Old River
- Setback levee northeast of Paradise Cut between the railroad and I-5 on RD 2062;
- Get Paradise Cut to be able to pass flow nearer the design flow;
- Setback levee along RD 2062 along Paradise Cut;
- Remove the bench behind the weir.

LSJRFS Preliminary Findings:

As noted previously, levees along the right bank of the San Joaquin River in RD 17 also provide flood protection for a portion of the City of Lathrop. The RD 17 levees providing flood protection for the City of Lathrop were evaluated as part of the LSJRFS. A preliminary screening analysis was performed during the early stages of the LSJRFS which evaluated freeboard and geotechnical deficiencies. Levee geometry was evaluated, and didn't indicate any deficiencies along RD 17. The results of the preliminary screening analysis are shown in Figures 18 and 19.

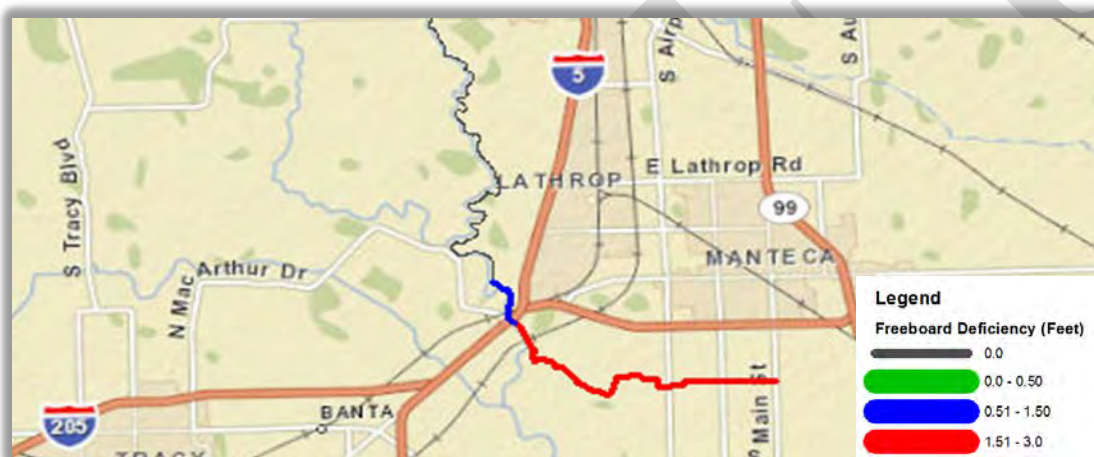


Figure 18 – RD 17 Freeboard Deficiencies

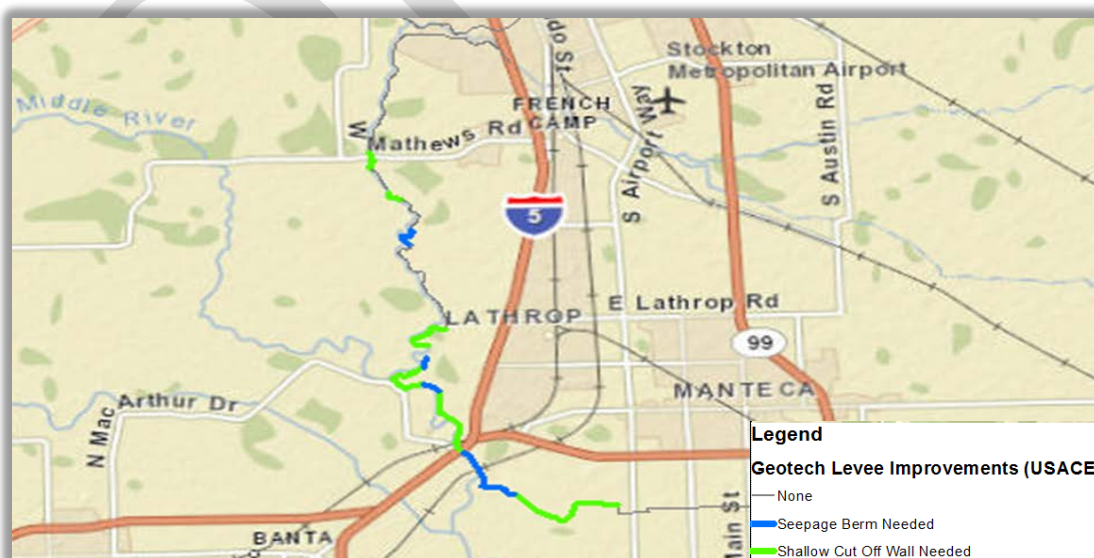


Figure 19 – RD 17 Geotechnical Deficiencies

The LSJRFS generally indicates that the levees along the west side of RD 17 have minor freeboard deficiencies and significant seepage issues. The dryland levee south of RD 17 has significant freeboard deficiencies.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the ULE/NULE evaluations. The figure below presents the Overall Hazard Level of levees in the Lathrop area.

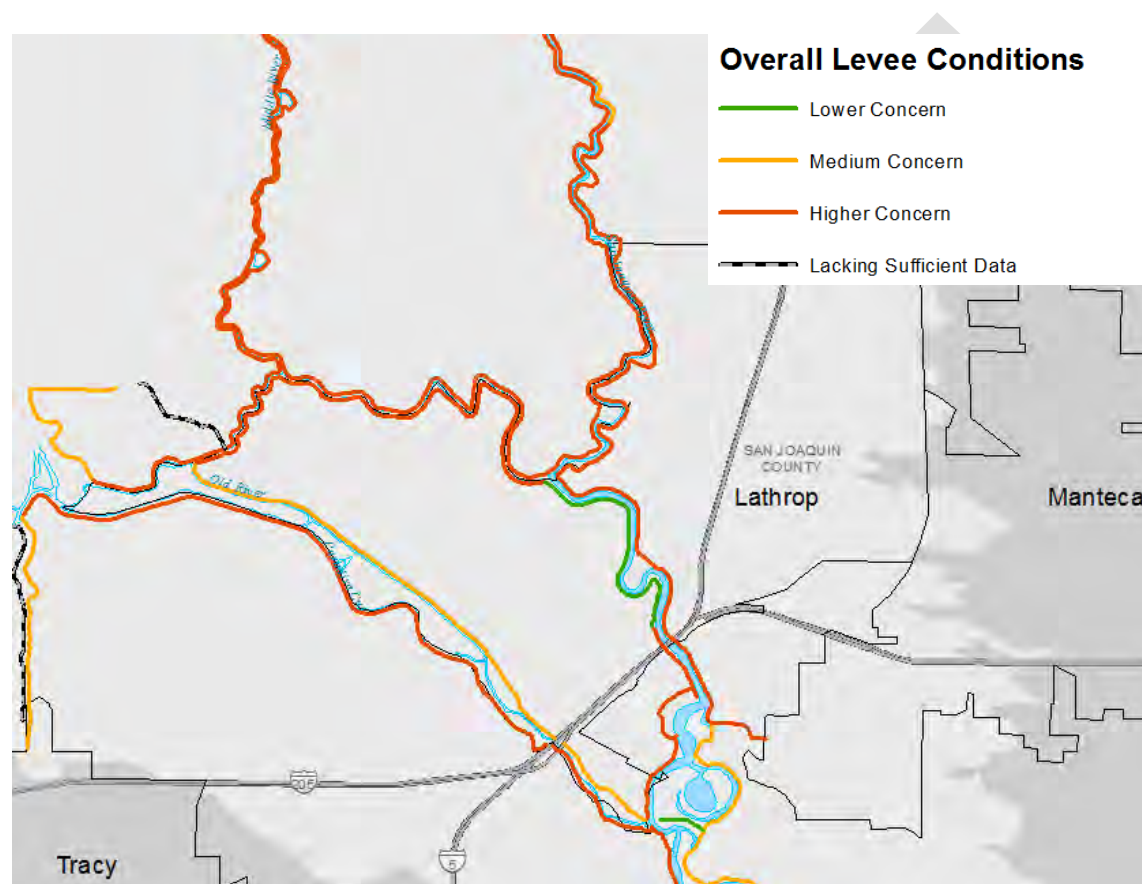


Figure XX – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the ULE/NULE evaluations. Details of these evaluations for levees in and around Lathrop are presented in the table on the following pages. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

ULE Ratings	
M	Meets ULDC Criteria
MG	Marginally Meets ULDC Criteria
DNM	Does Not Meet ULDC Criteria

Table x ULE Results - City of Lathrop

ULE RESULTS - CITY OF LATHROP							
RD #	Name	Reach ID	Freeboard	Geometry	Seepage	Stability	Overall
17	Mossdale	A	Included in the City of Stockton Section				
		B					
		C					
		D					
		E	M	M	MG	M	MG
		F	M	M	DNM*	M	DNM
		G	M	M	DNM*	M	DNM
		H	M	M	MG	M	MG
		I	M	M	DNM	M	DNM
		J	M	M	DNM	M	DNM
		K	M	M	DNM*	DNM	DNM
		L	DNM	M	MG	M	DNM
		M1	DNM	MG	M	M	DNM
		N1	DNM	M	MG	M	DNM

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

Table x NULE Results - City of Lathrop

NULE RESULTS - CITY OF LATHROP								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2062	Stewart	1	193	A*	A	A*	A	A
		2	336	B	A	A	A	B
		3	256	C	C	C	B	C
2107	Mossdale Island	1	208	C	B*	C	A	C
		2	259	B	B	B	A	B

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

The information in the tables above provide an indication of the nature of deficiencies used by DWR to determine the overall levee hazard level. This can be used as a measure of the overall reliability of each levee segment.

FSRP:

The Flood System Repair Project has identified the number of past critical and serious performance incidents for RD 2062. These were primarily related to seepage and erosion as shown in the table below.

Table x FSRP Results - City of Lathrop

FSRP RESULTS - CITY OF LATHROP									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
2062	Stewart	2	6	-	-	-	2	-	-

PL84-99 Status

As noted previously, PL 84-99 provides guidelines that levee must meet in order to be eligible for disaster assistance in the event of a levee failure. The levees protecting RD 2062 and RD 2107 are inactive in the PL 84-99 program; the RD 17 levees have requested re-inspection.

Both RD 2062 and RD 2107 feel they were inadequately notified of their PL 84-99 status. Nevertheless, both districts are correcting deficiencies and will be requesting reinstatement in 2014.

O&M Ratings

The City of Lathrop encompasses three RDs and a portion of RD 17. Maintenance of levees in Lathrop is performed by the individual RDs. The 2012 LMA report cited vegetation and encroachment issues for RD 17; rutting, erosion, and vegetation were noted for RD 2062; and slope stability was a concern for RD 2107. The table below provides a summary of the overall maintenance rating for each RD within the City of Lathrop.

Table x – City of Lathrop O&M Ratings

CITY OF LATHROP O&M RATINGS			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
17	Mossdale	Acceptable	Minimally Acceptable*
2062	Stewart	Unacceptable	Unacceptable
2107	Mossdale Island	Acceptable	Acceptable

A rating of “Minimally Acceptable*” was given for RD 17 due to small portions of unacceptable erosion and encroachment issues. RD2062 received a U rating due to vegetation, encroachment, and depressions/rutting issues.

As stated above, RD 2062 has corrected, and will continue to correct deficiencies as identified by DWR and USACE.

Condition of Flood Risk Management Facilities Identified in Local Studies:

The challenges noted up to this point for the City of Lathrop have been focused on the big-picture for Lathrop as a whole. Below are Reclamation District specific challenges identified in the small group meetings and in local studies/plans.

RD 17

Reclamation District 17 encompasses approximately 11,221 acres and is responsible for O&M for approximately 16.2 miles of project levee, and 2.8 miles of non-project levee. Of these lengths, only about 4.25 miles of project levee, and 6.0 miles of non-project levee are within the City of Lathrop.

RD 2062

RD 2062 is part of the Lower San Joaquin River Flood Control Project as authorized by the Flood Control Act of December 22, 1944 and defined in the Unit No. 9 Supplement to the Standard Operation and Maintenance Manual. The District maintains approximately 12.31 miles of Project Levees; 4.03 miles along the right bank of Paradise Cut, 5.63 miles along the left bank of Old River, and 2.65 miles along the left bank of the San Joaquin River. The District and

Reclamation District 2107, to the south, are divided by the Union Pacific Railroad alignment. The District currently maintains their levees to meet DWR maintenance standards. The District completed multiple repairs since their Fall 2012 levee inspection to improve their maintenance rating with DWR to minimally acceptable. This rating will be finalized in December 2013. Within the next year the District will continue to repair maintenance deficiencies to further improve the integrity of their levee system. The District is progressively working to regain active status in the USACE PL 84-99 RIP program, in conjunction with support from the CVFPB and Reclamation District 2107.

RD 2107

Reclamation District 2107 encompasses approximately 1,031 acres and is responsible for O&M for approximately 4.0 miles of project levee and 2.4 miles of non-project levee.

Risks Associated With Deficiencies:

The deficiencies identified above represent areas where flood control systems have a higher likelihood of failure. Since nearly the entire City of Lathrop is completely protected by levee systems that means the entire population of the City, as well as the entire infrastructure within the City is potentially at risk in the event of a flood system failure.

A review of infrastructure at risk within the City of Lathrop indicates a fire station and police station, community buildings, schools, wastewater treatment facilities, pump stations, and domestic water wells. In addition to this infrastructure, major “big-box” stores, and industrial facilities impacted by a flood could have a significant impact on the local economy. Additionally, the I-5 and State Route 120, as well as two UPRR railroads traverse the City, and are at risk due to a system failure. Risks associated with outages of these facilities are similar to the risks described for the City of Stockton.

The City of Lathrop is contained within FEMA 100-yr and Shaded Zone X floodplains, meaning that the entire population and assets are within the 100-yr floodplain, or are outside the 100-yr floodplain due to levees. The table below presents the acreage and number of parcels for different land use types within the FEMA 100-yr floodplain, and Shaded Zone X areas.

Table x – Property at Risk in the City of Lathrop

PROPERTY AT RISK IN THE CITY OF LATHROP							
100 Year Flood Zone				Shaded Zone X			
Land Use	Parcels	Area (acres)	Area Percentage	Land Use	Parcels	Area (acres)	Area Percentage
Urban	17	44	1%	Urban	5922	3318	52%
Veg/Graze	44	146	3%	Veg/Graze	159	157	2%
Farmland	203	4270	96%	Farmland	444	2936	46%
Total	264	4460	100%	Total	6525	6411	100%

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of the City of Lathrop and the RDs within the City of Lathrop:

- Address FSRP seepage and erosion issues
- Reinstate levees around RD 2062 and RD 2107 active in the PL 84-99 program
- Some levees may not meet ULDC criteria, which may make a ULOP finding difficult after July 2016
- The local economy will be impacted if some development cannot be permitted after July 2016 pursuant to SB5
- Flows on the main stem of the San Joaquin River may threaten levees protecting Lathrop. Some options to reduce this flow were suggested including a combination of one or more of the following:
 - Increasing the capacity of Paradise Cut
 - Raising/Strengthening levees surrounding Lathrop
 - Transitory storage upstream on the San Joaquin River (outside RFMP boundary)
 - Reservoir re-operation
- A Flood Contingency Map is needed for RD 2062 & RD 2107 as required by AB 156 (currently in-progress)

5.4.1.3 City of Manteca

General Area Information:

The City of Manteca is located east of the City of Lathrop and is the second largest metropolitan area within the Lower San Joaquin River Region with a population of approximately 70,000. Manteca is not directly bordered by levees, although the levees on the west side of RD 17 along the San Joaquin River, and the dryland levee on the south end of RD 17 provide flood protection for the City. The dryland levee along the south boundary of RD 2094 is not intended to hold floodwaters from the south (upstream), instead it is intended to contain flows on RD 2094 and RD 2096 in the event of a levee breach of levees along RD 2094, RD 2096, or RD 17.

Therefore, the City of Manteca has a vested interest in the integrity of the RD 2094 and RD 17 levees. Additionally, the City of Manteca shares similar concerns to other metropolitan areas in the Regions regarding SB5. The City does not directly control levee improvements made by the RDs, but land use decisions at the City are dependent upon these districts to make progress toward completing necessary upgrades to meet ULDC criteria. To complicate matters, the 200-year inundation maps prepared by DWR in July 2013 did not include the City of Manteca, so it is difficult to predict what area(s) within the City are within the 200 year floodplain with depths of flooding greater than 3 feet and therefore subject to SB5.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the ULE/NULE evaluations. The figure below presents the Overall Hazard Level of levees in the Lathrop area.

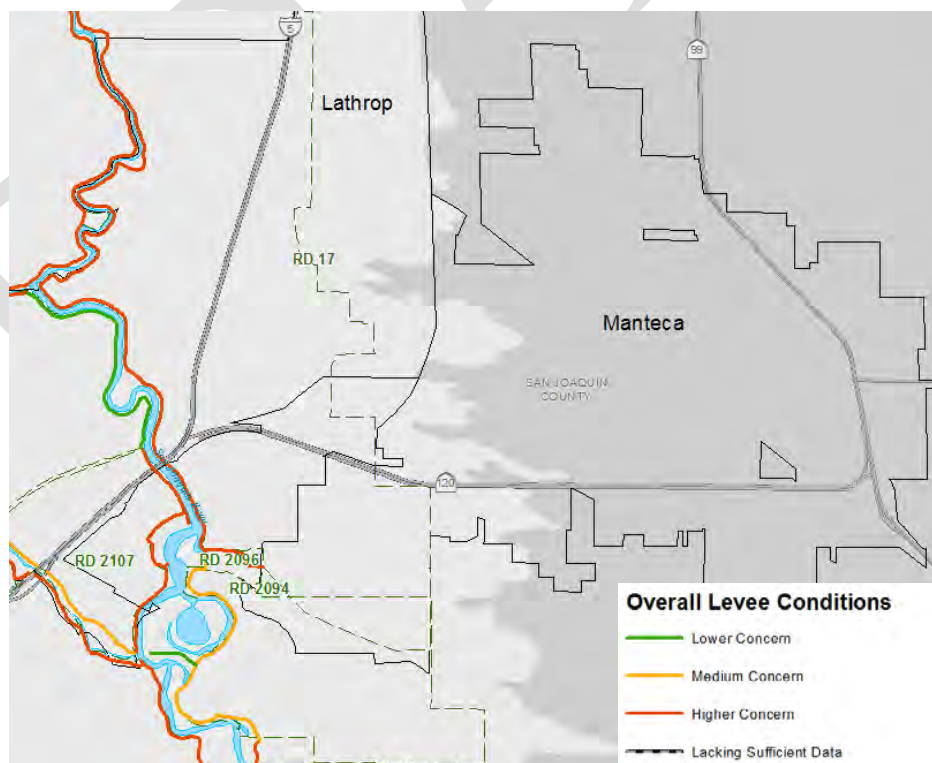


Figure xx – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees near Manteca are presented below. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of table below.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table X – NULE Results for the City of Manteca

NULE RESULTS - CITY OF MANTECA								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2094	Walt Hall	1	201	B*	A*	B*	A*	B
		2	337	-	-	-	A	A
2096	Weatherbee Lake	1	203	B	B	B	A	B

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

O&M Ratings

Maintenance of levees in and around Manteca are performed by the individual RDs. The table below provides a summary of the overall maintenance rating for each RD within the City of Manteca (RD 17 included with Lathrop). As noted below, RD 2096 received a U rating. This was due to major encroachment and animal control issues.

Table X – City of Manteca O&M Ratings

CITY OF MANTECA O&M RATINGS			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
2094	Walt Hall	Acceptable	Acceptable
2096	Weatherbee Lake	Acceptable	Unacceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

Info will be added when available.

Risks Associated With Deficiencies:

The deficiencies identified above represent areas where flood control systems have a higher likelihood of failure. The western portion of the City of Manteca is within a FEMA Shaded Zone X floodzone. This is primarily due to flood protection provided by RD 17 levees.

Levee breach floodplains are not available for the Manteca area, but the portion of the City within the Lower San Joaquin River Region is contained within FEMA 100-yr and FEMA Shaded Zone X floodplains, meaning that the population in these areas are either within the 100-yr floodplain, or are outside the 100-yr floodplain due to levees. The table below presents the acreage and number of parcels for different land use types within the FEMA 100-yr floodplain, and Shaded Zone X areas.

Table x – Property at Risk in the City of Manteca

PROPERTY AT RISK IN THE CITY OF MANTECA (WITHIN PLANNING AREA)							
100 Year Flood Zone				Protected by Levees			
Land Use	Parcels	Area (acres)	Area Percentage	Land Use	Parcels	Area (acres)	Area Percentage
Urban	15	1	0%	Urban	1186	433	24%
Veg/Graze	2	2	0%	Veg/Graze	58	86	5%
Farmland	38	433	99%	Farmland	137	1273	71%
Total	55	436	100%	Total	1381	1791	100%

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of the City of Manteca and the RDs near the City of Manteca:

- Some levees may not meet ULDC criteria, which may make a ULOP finding difficult after July 2016
- The local economy may be impacted if some development cannot be permitted after July 2016 pursuant to SB5
- Flows on the main stem of the San Joaquin River may threaten levees protecting Manteca. Some options to reduce this flow were suggested including a combination of one or more of the following:
 - Increasing the capacity of Paradise Cut
 - Raising/Strengthening levees surrounding Lathrop
 - Transitory storage upstream on the San Joaquin River (outside RFMP boundary)
 - Reservoir re-operation
- The non-project cross levees are on the north and south boundary of RD 2094 are lower than and less reliable than the project levees along the San Joaquin River.
- Several feet of silt build-up in the San Joaquin River has impacted the capacity of the San Joaquin River.

5.4.2 Rural Areas

Rural areas make up the majority of the Delta South Region, although a few RDs in the Lower San Joaquin River Region are also considered rural. These areas are mostly reclaimed islands that are used for farming and other agricultural purposes.

5.4.2.1 RD 1

General Area Information:

RD 1 is located along the south and west banks of the Middle River in the Delta South Region. The District encompasses an area of approximately 11,354 acres and is protected by approximately 13.0 miles of non-project levee; 1.4 miles of a dry levee which serves as the boundary between RD 2089 and RD 1; 1.1 miles of project levee; and another 4.4 miles of an interior dry levee which as the boundary between RD 1 and RD 2. The District is bordered by RD 2 to the west, RD 2089 to the south, and Middle River to the north and east.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. The figure below presents the Overall Hazard Level of levees around RD1.

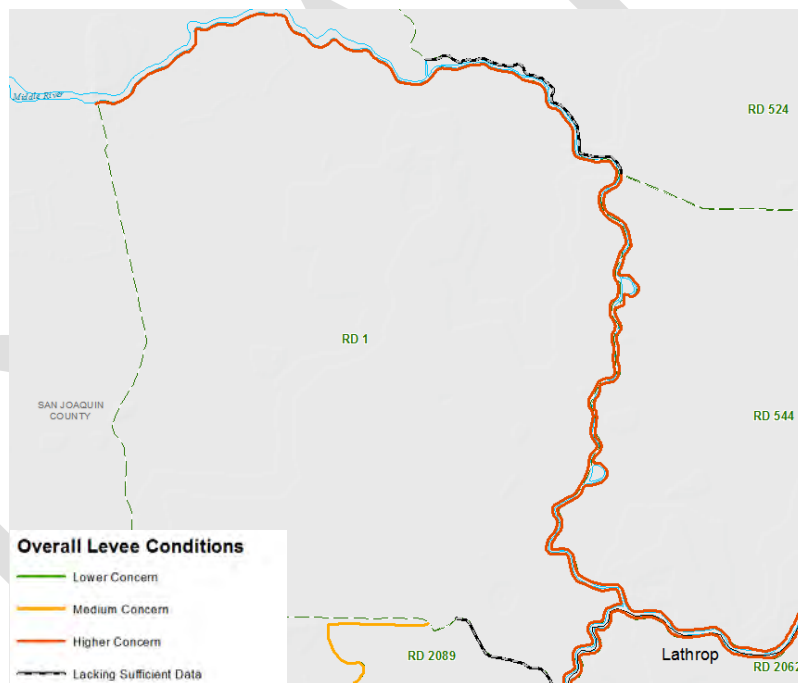


Figure xx – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 1 are presented in the table on the following page. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of tables on the following pages.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD1

NULE RESULTS – RD1								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
1	Union Island	1	185	B*	LD (A/B)	B*	C	C
		NA	5010	C	A*	C	B	C
		NA	5012	LD (B/C)	LD (A/B)	LD (B/C)	A	LD (B/C)

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

The table above indicates the higher levels of concern of the levees around RD 1 are related to erosion and seepage.

O&M Ratings

Maintenance of levees around RD1 is performed by the District. The table below provides a summary of the overall maintenance rating for the levee. As shown in the table, RD1 was given a rating of M*, which was due to unacceptable erosion survey results. If these unacceptable portions are repaired, the district would earn an A rating.

Table x – O&M Results for RD1

O&M RESULTS – RD1			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
1	Union Island	Acceptable	Minimally Acceptable*

Condition of Flood Risk Management Facilities Identified in Local Studies:

The entire 79,438 foot length of levee along the perimeter of RD 1 (not including the dryland levee) currently meets FEMA Hazard Mitigation Plan (HMP) and PL 84-99 standards. However, segments of the internal dryland levee between RD 1 and RD 2 does not meet HMP standards, as shown in the figure below.

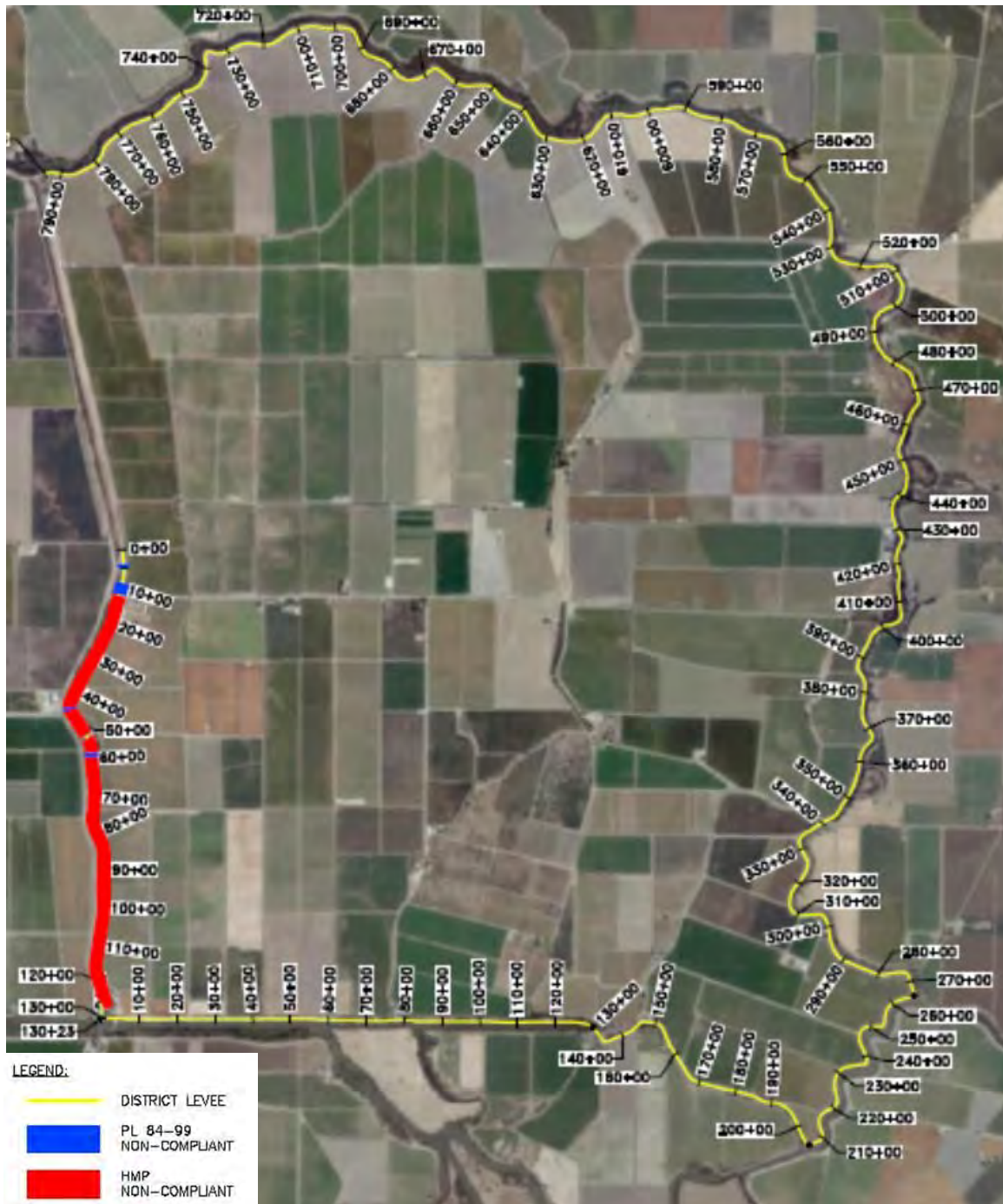


Figure X – RD 1 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 1 levee system protects more than 11,354 acres of prime farmland, containing 11 pump stations, approximately 41 residences and farm worker dwellings, 3 large barns and another 4 large shops or packing shed areas.

A failure or breach of the RD 1 levee system could result in flooding of the District to depths of approximately 7 feet on average. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. The estimated cost of a flood event resulting from a single levee failure would be approximately \$22.6M.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within Union Island as a whole to be \$141 million. Prorating that figure based on acreage, Reclamation District No. 1 is estimated to be around \$66,846,000 and does not include the value of the land.

The Public Policy Institute (PPIC) estimates the land value of Union Island as a whole to be \$80,673,000, and the asset value as a whole to be \$156,763,000. Prorating those figures based on acreage, Reclamation District No. 1 is estimated to have a land value of \$38,270,000 and an asset value of \$74,366,000. Recent land sales of similar properties and soil types in the region indicate the current land values are approximately \$96 million.

The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$9.6 million. Therefore, the total estimated value of land and assets is approximately \$105.6 million.

RD 1 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 1 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 1 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Additionally, Reclamation District No. 1 is one of the islands that are included as part of the Armored Pathway proposed in Section Eight of the Phase II DRMS Study. The objective of the armored pathway is the ability to quickly reestablish freshwater conveyance to the State and Federal Water Project pumps in the event of a major disruption to the Delta levees and the resulting salinity impacts. The Armored Pathway concept reduces the time required to restore the water export capability. In order to protect the Armored Pathway corridor, it is important for all Reclamation District No. 1 levees to remain intact, and be improved. It is also important to note that flooding of an adjacent island could also pose a threat to an armored pathway levee by virtue of underseepage and wind driven wave wash that could cause instability of the armored pathway levee.

Furthermore, Reclamation District No. 1 is located in the proposed BDCP conveyance facility eastern canal or tunnel alignment. In order to implement the proposed BDCP project, maintaining and improving the integrity of the levees around RD 1 is critical.

Finally, RD 1 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 1:

- The primary flood threat for RD 1 is from Old River, and from the flooding of RD 2089.
- Improve the dryland levees between RD 2089 (Stark Tract) and RD 1 (Union Island East)
- Improve wing levee road dryland levee in RD 1 and improve dryland levee between RD 1 (Union Island East) and RD 2 (Union Island West), to protect District from the flooding of adjacent Districts.
- Improve levee erosion protection with supplemental rock slope protection on all of the RD 1 project and non-project levees where needed.
- Improve levee crown with all-weather road where needed.
- Increase the levee crown widths where necessary and identify areas that would benefit from setback levees.
- RD 1's, Union Island - East, goal is to achieve and maintain compliance with PL 84-99 levee standards on all District levees.
- Implement an aggressive vegetation control plan.
- Implement an aggressive rodent control and damage repair plan.
- Update the Flood Contingency Map (FCM) for the Union Island Flood Control System to bring it up to current mapping standards. The current FCM for Union Island Flood Control System was created in August 2008.
- The dryland levee on the west side of RD1 from Middle River to the Grant Line Canal has been lowered significantly due to DWR construction traffic, related to the low flow barriers in Middle River and Grant Line Canal and needs to be repaired.

5.4.2.2 RD 2

General Area Information:

RD 2 is located along the south bank of Middle River in the Delta South Region. The District encompasses an area of approximately 12,580 acres and is protected by approximately 16.2 miles of non-project levee and another 4.4 miles of an interior dry levee which serves as the boundary between Reclamation District No. 1 and Reclamation District No. 2. The District is bordered by North Canal and Middle River on the north, Old River on the west, Grant Line Canal on the south, and an interior dry levee adjacent to Tracy Boulevard on the east.

2012 CVFPP and O&M Inspections:

The 2012 CVFPP did not include an evaluation of the levees around RD 2. Additionally, the levees around RD 2 are not regularly inspected by DWR or USACE.

Condition of Flood Risk Management Facilities Identified in Local Studies:

The entire 85,715 foot length of levee along the perimeter of RD2 (not including the dryland levee) currently meets HMP and PL 84-99 standards. However, segments of the internal dryland levee between RD 1 and RD 2 does not meet HMP or PL 84-99 standards, as shown in the figure below.

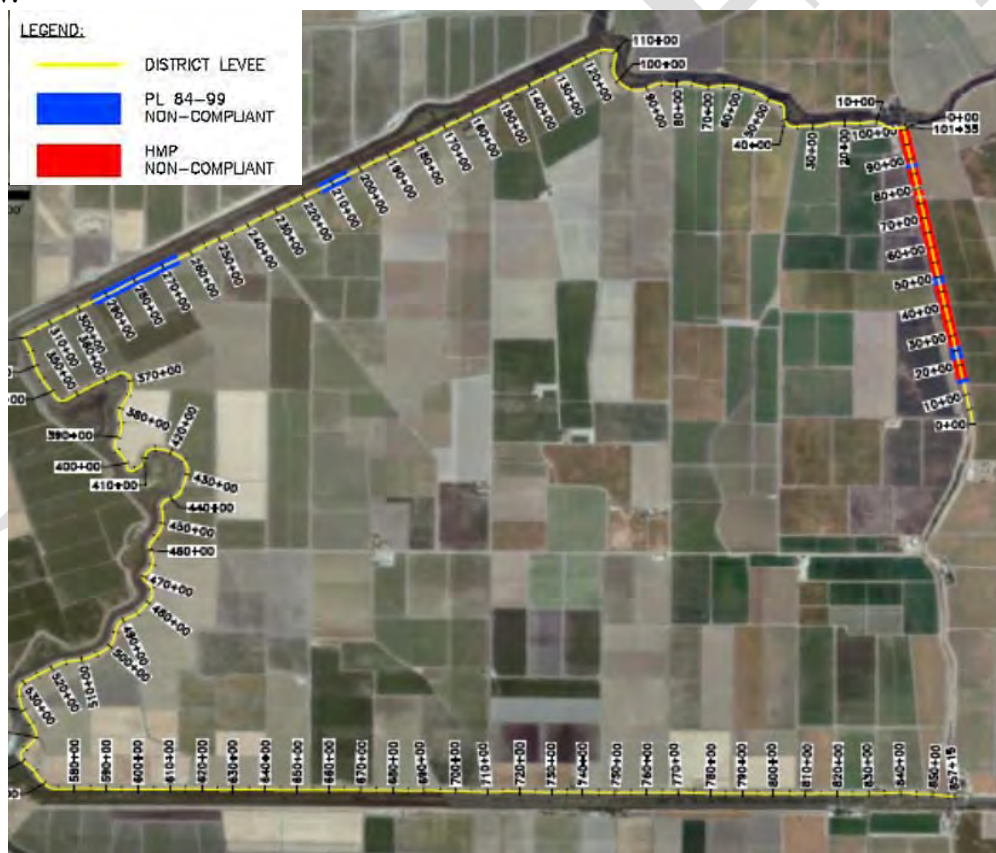


Figure X – RD 2 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 2 levee system protects over 12,580 acres of prime farmland, containing 17 pump stations, around 23 residences and farm worker dwellings, 3 large barns and another 3 large shops or packing shed areas.

A failure or breach of the District's levee system could result in flooding of the District to depths of approximately 13 feet on average. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. The estimated cost of a flood event resulting from a single levee failure would be approximately \$27.2M.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within Union Island as a whole to be \$141 million. Prorating that figure based on acreage, Reclamation District No. 2 is estimated to be around \$74,063,000, and does not include the value of the land.

The Public Policy Institute (PPIC) estimates the land value of Union Island as a whole to be \$80,673,000, and the asset value as a whole to be \$156,763,000. Prorating those figures based on acreage, Reclamation District No. 2 is estimated to have a land value of \$42,402,500 and an asset value of \$82,397,000. Recent land sales of similar properties and soil types in the region indicate the current land values are approximately \$110 million.

The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$11 million. Therefore, the total estimated value of land and assets is approximately \$121 million.

RD 2 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 2 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 2 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Additionally, Reclamation District No. 2 is one of the islands that are included as part of the Armored Pathway proposed in Section Eight of the Phase II DRMS Study. The objective of the Armored Pathway is the ability to quickly reestablish freshwater conveyance to the State and Federal Water Project pumps in the event of a major disruption to the Delta levees and the resulting salinity impacts. The Armored Pathway concept reduces the time required to restore the water export capability. In order to protect the Armored Pathway corridor, it is important for all Reclamation District No. 2 levees to remain intact, and be improved. It is also important to note that flooding of an adjacent island could also pose a threat to an Armored Pathway levee by virtue of underseepage and wind driven wave wash that could cause instability of the Armored Pathway levee.

Furthermore, Reclamation District No. 2 is located in the proposed BDCP conveyance facility eastern canal or tunnel alignment. In order to implement the proposed BDCP project, maintaining and improving the integrity of the levees around RD 2 is critical.

Finally, RD 2 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2:

- 1) Improve levee erosion protection with supplemental rock slope protection on all of the RD 2 non-project levees where needed. Specific sites discussed - North Canal and Grant Line Canal.
- 2) Improve the dryland levee between RD 1 (Union Island East) and RD 2 (Union Island West), to protect District from the flooding of adjacent Districts.
- 3) Implement an aggressive vegetation control plan.
- 4) Implement an aggressive rodent control and damage repair plan.
- 5) Design and construct seepage control berms or cut-off walls where needed. North levee along Victoria Canal and west levee along Old River were discussed.
- 6) Improve levee crown with 20 foot wide all-weather road and wider turnouts where needed.
- 7) Increase the levee crown widths where necessary and identify areas that would benefit from setback levees.
- 8) RD 2's, Union Island - West, long term goal is to improve levees to, and maintain compliance with PL 84-99 levee standards on all District levees.
- 9) Update the Flood Contingency Map (FCM) for the Union Island Flood Control System to bring it up to current mapping standards. The current FCM for Union Island Flood Control System was created in August 2008.
- 10) Locate and remove abandoned floodgates and pipes through levee foundation.
- 11) Improve levee access ramps by flattening slopes and widening roadway.
- 12) Develop existing/historical conditions GIS mapping of Reclamation District No. 2, that will be accessible in the field using tablets.
- 13) Remove encroachments on the levee section that hinder inspection, maintenance and improvement projects.

5.4.2.3 RD 524

General Area Information:

RD 524 is responsible for maintaining the levees that provide flood protection for primarily agricultural land, infrastructure, and residences.

RD 524 is located along the west bank of the San Joaquin River in the Delta South Region. The District encompasses an area of 11,950 acres and is bordered by 18.8 miles of levees. The 12.6 miles of levees located along Middle River, the dryland levee located on the west and south side of the District, and Burns Cutoff located to the north are non-SPFC levees. The 6.2 miles of levee located along the San Joaquin River are SPFC levees. The District is bordered by Burns Cutoff to the north, the San Joaquin River to the east, a dryland levee and Middle River to the south, and a dryland levee to the west.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. The figure below presents the Overall Hazard Level of levees around RD524.

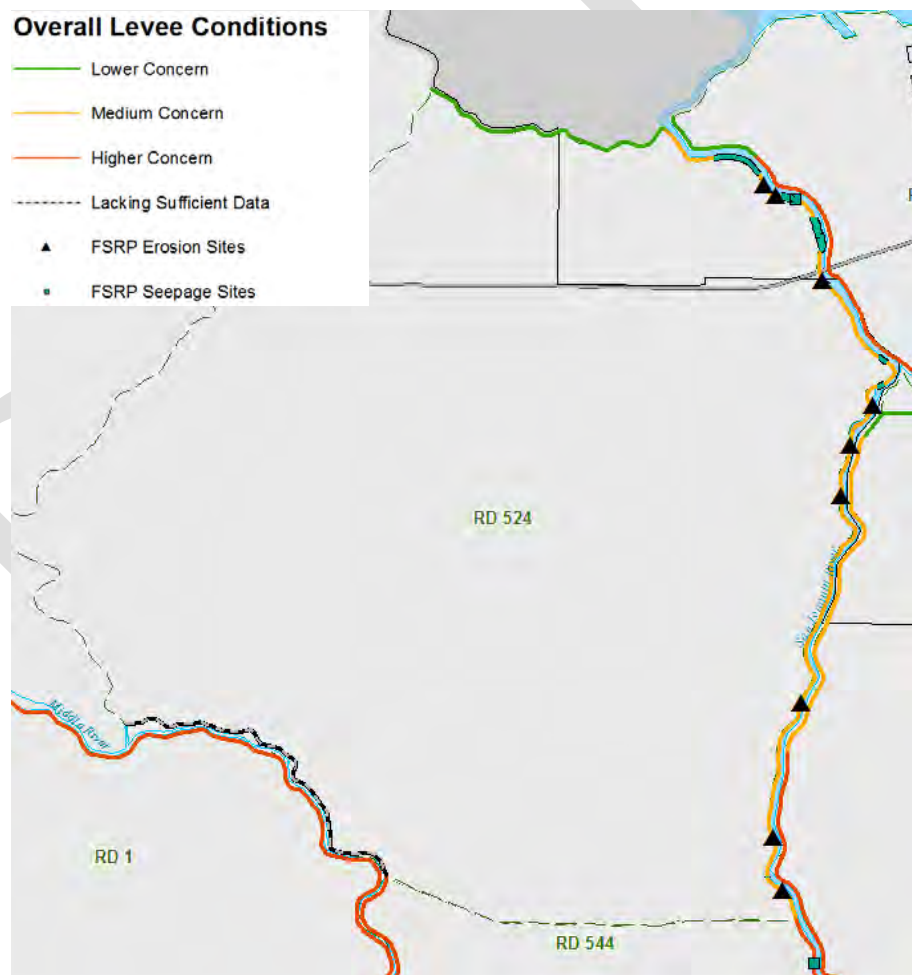


Figure xx – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 524 are presented in the table on the following page. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 524

NULE RESULTS – RD 524								
RD #	RD Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
524	Middle Roberts Island	1	188	B*	A*	B*	B	B
		NA	5007	A	A	A	A	A
		NA	5009	LD (A/B)	A	LD (A/B)	A	LD (A/B)

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

FSRP:

RD 524 and RD 544 were grouped together for the FSRP. It was found that numerous seepage incidents have occurred in these districts in the past, along with some less numerous erosion issues. The results of the FSRP are shown in the table below.

Table x – FSRP Results for RD 524

FSRP RESULTS – RD 524									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
524 544	Middle Roberts Island & Upper Roberts Island	12	9	-	-	3	1	-	-

O&M Ratings

Maintenance of levees around RD 524 is performed by the District. RD 524 was given a rating of Unacceptable, which was due to vegetation, tree trimming/thinning, and erosion/bank caving. Other issues include encroachments, animal control, and slope stability. The table below provides a summary of the overall maintenance rating for the levee.

Table x – O&M Results for RD 524

O&M RESULTS – RD 524			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
524	Middle Roberts Island	Unacceptable	Unacceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

The entire 99,388 foot length of levee along the perimeter of RD 524 currently meets HMP standards. However, approximately 4,068' of the levee system does not meet PL 84-99 standards. This deficiency is due to approximately 4,000' of deficient geometry, and 68' of deficient crown elevations. The figure below provides a graphical depiction of the deficiencies identified on RD 524.



Figure X – RD 524 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 524 levee system protects over 11,950 acres of prime farmland, 95 residences, and non-residential, agriculture related structures.

A failure or breach of the RD 524 levee system could result in flooding of the District to depths of approximately 7.5 feet on average north of Mueller Road. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. The estimated cost of a flood event resulting from a single levee failure would be approximately \$16,500,900.

The Public Policy Institute lists the asset value and land value of Lower Roberts Island, Middle Roberts Island, and Upper Roberts Island as one total value. However, recent land sales of similar properties and soil types in the region indicate the current land values within the District total approximately \$83,650,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$8,365,000. Therefore, the total estimated value of land and assets is approximately \$92,015,000.

RD 524 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 524 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 524 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta. Reclamation District No. 524 is located in the proposed BDCP conveyance facility eastern canal or tunnel alignment. In order to implement the proposed BDCP project, maintaining and improving the integrity of the levees around RD 524 is critical.

Additionally, a portion of City of Stockton's Regional Wastewater Treatment facility is located in the northeast region RD 524 and is a vital facility for serving the city. The facility receives partially treated water from the primary and secondary portion of the plant, located on RD 404, and then provides tertiary treatment before being pumped in the San Joaquin River. If flooding of RD 524 were to occur, floodwaters would impact and damage the treatment plant. Flooding would adversely affect not only water quality but would also impact the ability to treat wastewater for the City of Stockton. The DRMS report does not have an estimated economic cost for the closure of the wastewater treatment facility, but the entire City of Stockton population and population of incorporated San Joaquin County would be affected if the plant were to be impacted.

Furthermore, State Highway Route 4 is an east-west route that crosses through RD 524. If flooding at RD 524 were to occur, an important interregional corridor linking San Joaquin County with Contra Costa County and the rest of the Bay Area would be rendered unusable. According to the State of California Department of Transportation's Annual Average Daily Traffic data for 2010, approximately 18,800 vehicles per day utilized State Route 4 across Middle Roberts Island, 2,396 of which were trucks. According to the DRMS report, a closure of State Highway Route 4 would result in an estimated economic closure cost of \$500,000 per day.

The Burlington Northern Santa Fe Railroad (BNSF) is an east-west route that also crosses through RD 524. If flooding at RD 524 were to occur, a major railroad used for the transportation of freight would be rendered unusable. According to the DRMS report, data for 2005 shows a disruption of the BNSF railroad would result in an estimate economic closure cost of approximately \$23.5 million per month.

Finally, RD 524 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 524:

- RD 524, Middle Roberts Island, goal is to achieve and maintain compliance with PL 84-99 levee standards on all District levees.
- Provide improved flood protection for and reduce seepage into the City of Stockton waste water treatment ponds.
- Survey, evaluate and improve the levees along the southerly, westerly, and northerly district boundaries of RD 524 to meet current flood system requirements.
- Reinstall a railroad crossing road over the railroad tracks on the levee crown near the Waste Water Treatment Plant ponds
- Improve levee erosion protection on all of the RD 524 levees.
- Increase the levee crown widths.
- Identify and address levee seepage issues District wide.
- Implement an aggressive vegetation control plan and implementation for the Burns Cutoff surrounding area.
- Update the Flood Contingency Map (FCM) for the Roberts Island Flood Control System to bring it up to current mapping standards.

5.4.2.4 RD 544

General Area Information:

RD 544 is located on the north bank of Old River and along the west bank of the San Joaquin River in the Delta South Region. The District encompasses an area of 7,574 acres and is bordered by 17.78 miles of levee. The 7.18 miles of levee located along Middle River and the northern dryland levee are non-project levees, and 10.60 miles of levee along Old River and the San Joaquin River are project levees. RD 544 is bordered by Middle River to the west, Old River to the south, the San Joaquin River to the east, and a dryland levee to the north.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. The figure below presents the Overall Hazard Level of levees around RD544.

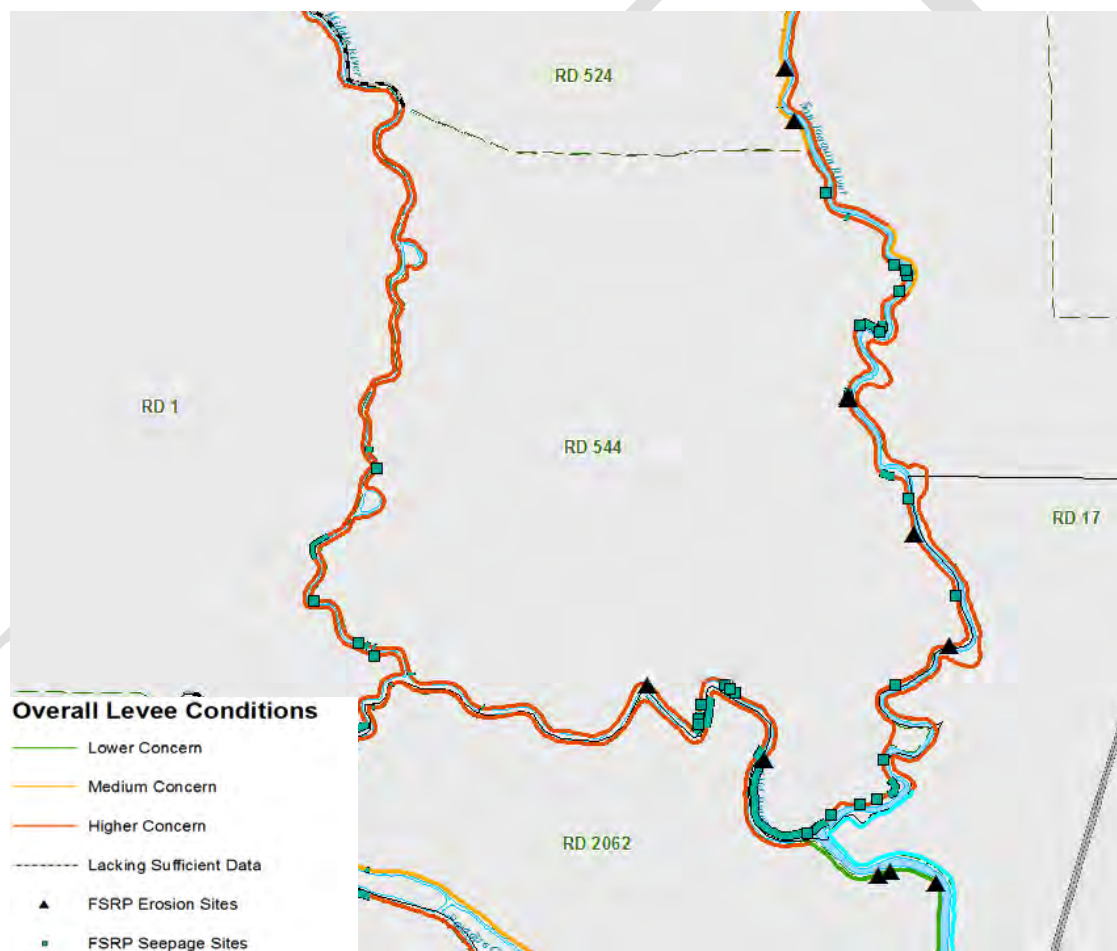


Figure xx – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 544 are presented in the table on the following page. Abbreviated definitions from Section 5.3 are included on the following page to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 544

NULE RESULTS – RD 544								
RD #	RD Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
544	Upper Roberts Island	1	189	C	A*	B	B	C
		2	334	C	A*	C	B	C
		NA	5008	C	A*	C	B	C

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

As shown in the table above, the levees around RD 544 are an overall high level of concern, primarily due to seepage issues.

FSRP:

RD 524 and RD 544 were grouped together for the FSRP. It was found that numerous seepage incidents have occurred in these districts in the past, along with some less numerous erosion issues. The results of the FSRP are shown in the table below.

Table x – FSRP Results for RD 544

FSRP RESULTS – RD 544									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
524 544	Middle Roberts Island Upper Roberts Island	12	9	-	-	3	1	-	-

O&M Ratings

Maintenance of levees around RD 544 is performed by the District. RD 544 was given a rating of Unacceptable, which was due to serious vegetation issues, as well as erosion, animal control, encroachments, and slope stability issues. The table below provides a summary of the overall maintenance rating for the levee.

Table x – O&M Results for RD 544

O&M RESULTS – RD 544			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
544	Upper Roberts Island	Unacceptable	Unacceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

Approximately 95.5% of the levee system around RD 544 meets HMP standards, while only 79.5% of the levee system meets PL 84-99 standards. This deficiency is due to crown elevation and geometric cross section deficiencies. The figure below provides a graphical depiction of the deficiencies identified on RD 544.



Figure X – RD 544 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 544 levee system protects over 7,574 acres of prime farmland, 75 residences, and non-residential, agriculture related structures.

A failure or breach of the RD 544 levee system could result in flooding of the District to depths of approximately 7.5 feet on average. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. The estimated cost of a flood event resulting from a single levee failure would be approximately \$11,634,300.

The Public Policy Institute (PPIC) lists the asset value and land value of Lower Roberts Island, Middle Roberts Island, and Upper Roberts Island as one total value. Recent land sales of similar properties and soil types in the region indicate the current land values within the District total approximately \$59,768,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$5,976,800. Therefore, the total estimated value of land and assets is approximately \$65,744,800.

RD 544 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 544 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 544 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta. Reclamation District No. 544 is located in the proposed BDCP conveyance facility eastern canal or tunnel alignment. In order to implement the proposed BDCP project, maintaining and improving the integrity of the levees around RD 544 is critical.

In addition to protecting the public water supply, RD 544's levees protect approximately 3.7 miles of three high-voltage electrical transmission lines that cross the Delta which transmit roughly 10 percent of California's summer electricity load. In the event of a levee failure, if the transmission lines were to become non-operational, this would result in significant power outages in and around the Delta. The asset value of the portion of transmission lines protected by Upper Roberts Island is estimated to be approximately \$5,200,000. Finally, a PG&E natural gas pipeline runs across RD 544 is an important asset for the transportation of gas. A flood on RD 544 could potentially disrupt and shut down the gas pipeline.

There are no highways that run across RD 544, but the levees act as the last line of defense against waters from the Delta encroaching against the northern dryland levee that protect residential homes and State Highway Route 4 located on RD 524 and the Sante Fe Railroad. If State Highway Route 4 or the BNSF was rendered unusable due to a levee failure, this would result in a relatively major transportation problem as discussed in the RD 524 section.

Finally, RD 544 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 544:

- Implement an aggressive vegetation control plan.
- Achieve and maintain compliance with PL 84-99 levee standards on all District levees.
- Survey, evaluate and improve RD 544 levees to meet current flood system requirements.
- Identify all encroachments and address those that are not properly permitted or may not be in compliance.
- Improve levee erosion protection with supplemental rock slope protection on all of the RD 544 levees.
- Implement an aggressive rodent control and damage repair plan.
- Increase the levee crown widths where necessary and identify areas that would benefit from setback levees.
- Identify areas prone to excessive seepage and boils during high water events and develop strategy to mitigate the impacts.
- Implement an aggressive vegetation control plan.
- The Flood Contingency Map (FCM) for the Roberts Island Flood Control System was updated in August 2012.

5.4.2.5 RD 684

General Area Information:

RD 684 is located along the south and west banks of the San Joaquin River in the Delta South Region. The District encompasses an area of approximately 10,437 acres and is protected by approximately 20 miles of non-project levee. The District is bordered by RD 2038 to the west, RD 2116 to the south, and the San Joaquin River on the north and east sides.

2012 CVFPP and O&M Inspections:

The 2012 CVFPP did not include an evaluation of the levees around RD 2. Additionally, the levees around RD 2 are not regularly inspected by DWR or USACE.

Condition of Flood Risk Management Facilities Identified in Local Studies:

There is not much existing information available for the RD 684 levees. These levees have not been studied by any of the State, or Federal plans, and have not been evaluated in detail on a local level.

Some information was obtained during the initial small group meetings with stakeholders at the beginning of the RFMP process. According to the District engineer, the levees currently do not meet HMP standards and the levee along the northern boundary of RD 684 along the San Joaquin River has waterside erosion and seepage issues. The District is currently working to improve their levees to meet HMP, with the ultimate goal of achieving PL 84-99 status. The levee near the confluence of Turner Cut and the San Joaquin River is currently too narrow for access during a flood, and should be widened. The figure below presents these issues graphically.

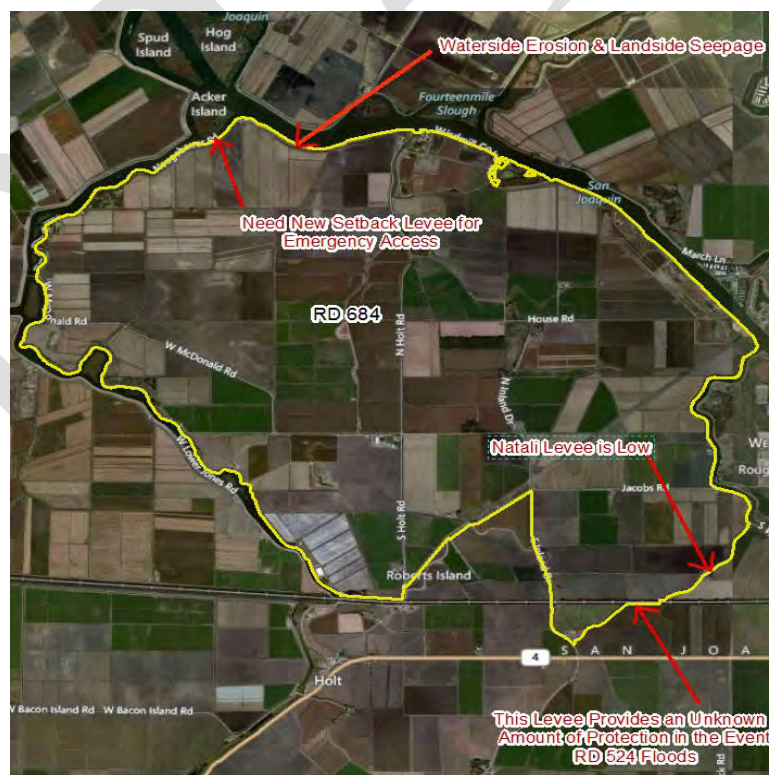


Figure X – RD 684 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 684 levee system protects more than 10,437 acres of prime farmland, containing several dozen residences, farm worker dwellings, barns and packing shed areas.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within RD 684 as a whole to be about \$1 million and does not include the value of the land. The Public Policy Institute (PPIC) estimates the land value of Roberts Island as a whole to be about \$164M, and the asset value as a whole to be about \$64M. Prorating those figures based on acreage, Reclamation District No. 684 is estimated to have a land value of \$56M and an asset value of about \$22M.

RD 684 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 684 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 684 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Finally, RD 684 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 684:

- Address seepage and erosion issues along the San Joaquin River
- Widen the levee/install a setback levee near the confluence of Turner Cut and the San Joaquin River for emergency access
- Ultimately, the RD would like to upgrade their levees to meet PL 84-99 standards.
- Study the effectiveness of the Natali Levee in the event RD 524 floods; raising the Natali Levee; widening & lowering of the levee along Burns Cutoff.

5.4.2.6 RD 773

General Area Information:

RD 773 is located along the north bank of Old River in the Delta South Region. The District encompasses an area of approximately 6,900 acres and is protected by approximately 18.7 miles of non-project levee. The District is bordered by Fabian and Bell Canal to the north, Old River to the west and south, and Salmon Slough to the east.

2012 CVFPP and O&M Inspections:

The 2012 CVFPP did not include an evaluation of the levees around RD 773. Additionally, the levees around RD 773 are not regularly inspected by DWR or USACE.

Condition of Flood Risk Management Facilities Identified in Local Studies:

The entire 98,995 foot length of levee along the perimeter of RD 773 currently meets HMP standards. However, approximately 2,597' of the levee system does not meet PL 84-99 geometry requirements. The figure below provides a graphical depiction of the deficiencies identified on RD 773.

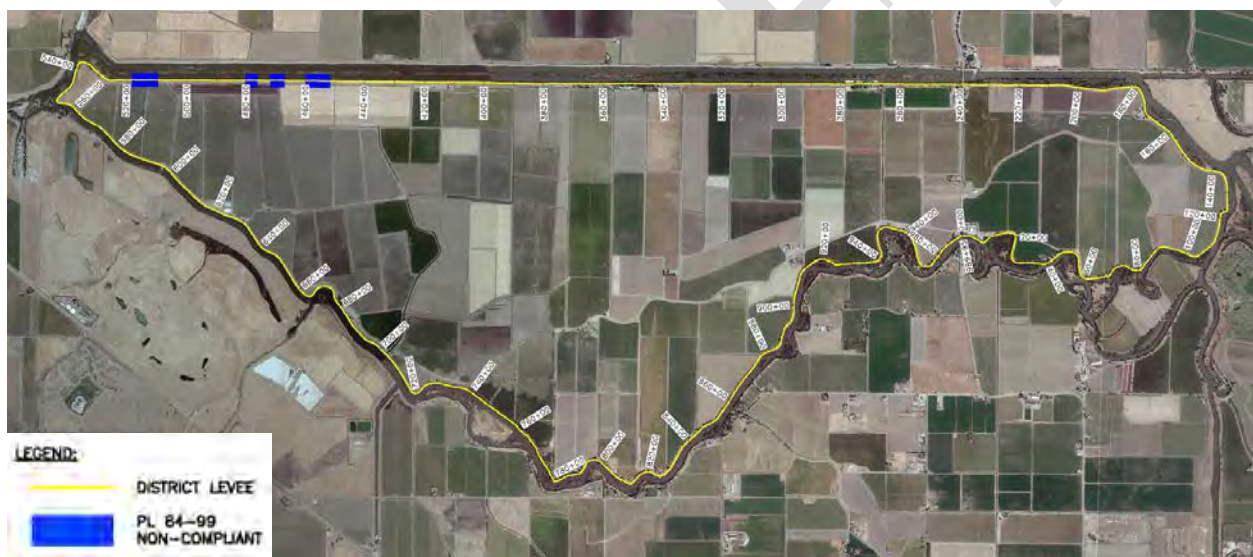


Figure X – RD 773 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 773 levee system protects nearly 6,900 acres of prime farmland, nearly 20 residences and several non-residential, agriculture related structures.

A failure or breach of the RD 773 levee system could result in flooding of the District to depths of approximately 9 feet on average. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. The estimated cost of a flood event resulting from a single levee failure would be approximately \$23.3M.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within Reclamation District No. 773 to be \$33,364,000, and does not include the value of the land. Recent land sales of similar properties and soil types in the region indicate the current land

values are approximately \$48 million. The estimated value of other assets including homes, buildings, and appurtenant structures is approximately \$5 million. Therefore, the total estimated value of land and assets is approximately \$53 million.

RD 773 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 773 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 773 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Furthermore, the integrity of the RD 773 levee system is critical to the proper functioning of the DWR's South Delta Temporary Barriers Project which helps increase water levels, circulation patterns, and water quality in the southern Delta area for local agricultural diversions.

Flooding of RD 773 could also impact regional transportation and emergency access. For example, Tracy Blvd. provides access from Tracy to State Highway Route 4 and serves as a key emergency access route into and out of the Delta. Similarly, flooding of RD 773 could impact a high-voltage electrical transmission line operated by PG&E on Fabian Tract.

Finally, RD 773 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 773:

- Improve levees along Grant Line canal (highest priority) and along Old River (next highest priority).
- Streamline permitting requirements to facilitate maintenance of existing levees.
- The primary concern of RD 773 on a project at Paradise Cut to divert water from the SJR is increased erosion along the northern boundary of RD 773.
- Improve levee erosion protection with supplemental rock slope protection on all of the RD 773 district levees where needed. Specific sites discussed - South Bank Grant Line Canal and Old River.
- Continue with an aggressive vegetation control plan that complies with the environmental permitting requirements.
- Continue with an aggressive rodent control and damage repair plan.
- Maintain the levee crown with all-weather road where needed.
- Increase the levee crown widths where necessary and identify areas that would benefit from setback levees.
- Develop a Flood Contingency Map (FCM) for the "Old River" Flood Control System.

5.4.2.7 RD 1007

General Area Information:

RD 1007 is located along the south bank of Old River in the Delta South Region. The District encompasses an area of approximately 5,933 acres and is protected by approximately 21.9 miles of non-project levee. The District is bordered by unincorporated San Joaquin County to the west, Old River to the south, Grant Line Canal to the north, and RD 2058 to the east.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. Although the NULE evaluations reviewed the levees along the northern boundary of RD 1007 (along Old River), the overall category was shown as LD for lacking data. The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 1007 are presented in the table below. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 1007

NULE RESULTS – RD 1007								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
1007	Pico & Nagle	NA	5014	A	A	A	LD (A/B)	LD (A/B)
		NA	5015	LD (A/B)	A	A	LD (A/B)	LD (A/B)

O&M Inspections:

This district was not included in the 2012 LMA report and district levees are not inspected by USACE.

Condition of Flood Risk Management Facilities Identified in Local Studies:

There is not much existing information available for the RD 1007 levees. These levees have not been studied by any of the State, or Federal plans, and have not been evaluated in detail on a local level.

Some information was obtained during the initial small group meetings with stakeholders at the beginning of the RFMP process. According to the District engineer, it is believed the levees currently meet PL 84-99 standards, although a thorough evaluation has not been performed. The waterside slopes of the levees along Old River are steeper than 3:1, and siltation in Old River is believed to have decreased the capacity of Old River adjacent to RD 1007. Finally, the levees at the northeast corner of the District are sandy and need to be improved in order to provide access during a flood.

Risks Associated With Deficiencies:

The Reclamation District No. 1007 levee system protects more than 5,993 acres of prime farmland, containing several residences, farm worker dwellings, barns, packing shed areas and the wastewater treatment plant for the City of Tracy.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within Pico & Nagle as a whole to be approximately \$242,000,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$24,200,000. Therefore, the total value of land and assets is estimated to be approximately \$266,200,000.

RD 1007 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 1007 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 1007 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Additionally, a portion of City of Tracy's Wastewater Treatment facility is located on RD 1007 and is a vital facility for serving the city. If flooding of RD 1007 were to occur, floodwaters could impact and damage the treatment plant. Flooding would adversely affect not only water quality but would also impact the ability to treat wastewater for the City of Tracy.

Finally, RD 1007 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 1007:

- Perform a detailed study of the levees to see if they meet HMP and/or PL 84-99 standards
- Address steep waterside slopes along Old River
- Remove siltation along Old River
- Improve levee near Sugar Cut and Old River to provide access during floods.

5.4.2.8 RD 2058

General Area Information:

RD 2058 is located along the south (left) bank of Paradise Cut in the Delta South Region. The District encompasses an area of 8,338 acres, is surrounded by approximately 6.8 miles of project levee along Paradise Cut and approximately 2.2 miles of non-project levee around the remainder of the District. RD 2058 is bordered by Paradise Cut on the north, RD1007 to the west, RD 2095 to the east, and the City of Tracy to the south. A portion of the City of Tracy is within RD 2058.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. RD 2058 was found to have generally moderate risk of failure due in most part to erosion concerns. One segment was found to have a high risk of failure due to critical seepage and erosion ratings. The figure below presents the Overall Hazard Level of levees around RD 2058.

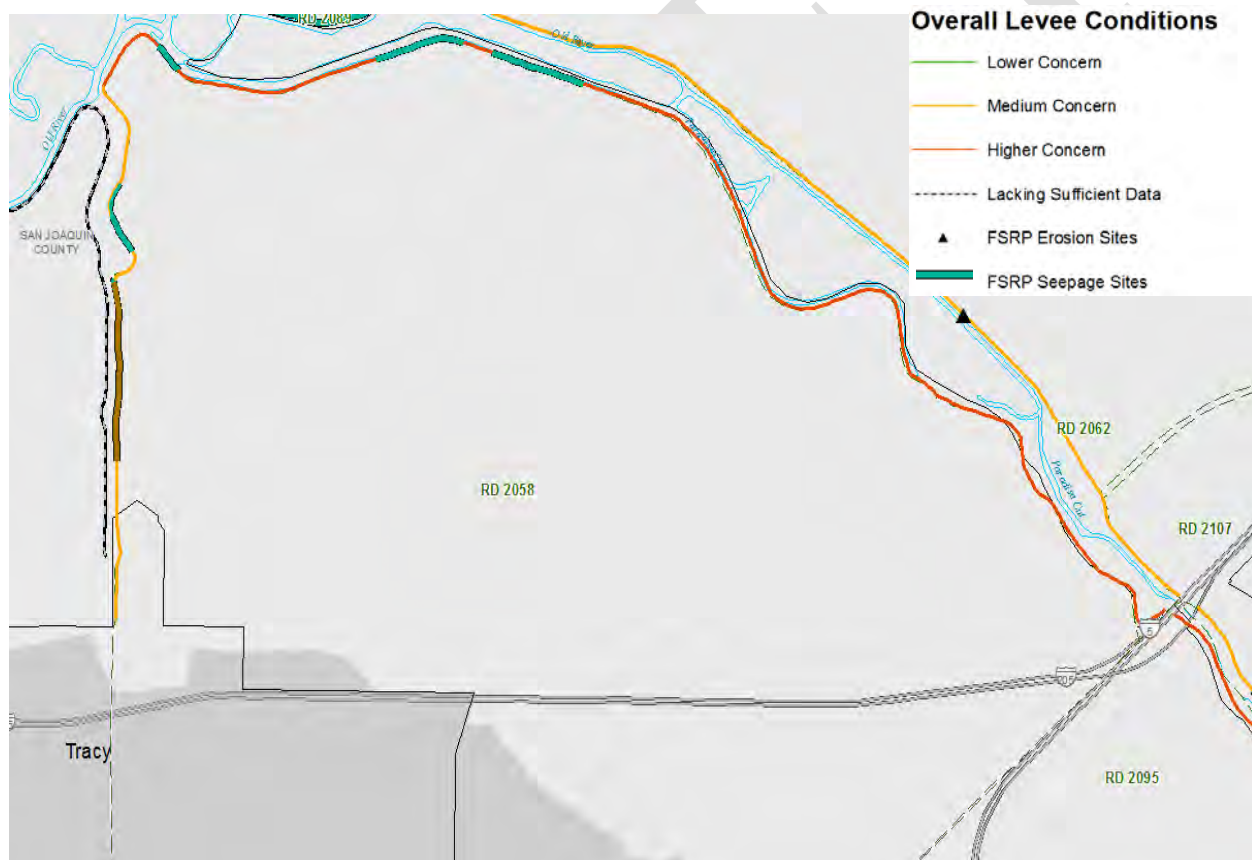


Figure X – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 2058 are presented in the table on the following page. Abbreviated definitions from Section 5.3 are included to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 2058

NULE RESULTS – RD 2058								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2058	Pescadaro	1	192	C	A*	C	C	C
		NA	5016	A*	A	A*	B	B
		NA	5017	B	A*	A*	B	B

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

FSRP:

RD 2058 is shown to have had three serious seepage events in the past, as well as one critical erosion issue. The results of the FSRP are shown in the table below.

Table x – FSRP Results for RD 2058

FSRP RESULTS – RD 2058									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
2058	Pescadaro	-	3	-	-	1	-	-	-

O&M Inspections:

Maintenance of levees around RD 2058 is performed by the District. RD 2058 was given a rating of Acceptable. Vegetation issues were cited but were minor. The table below provides a summary of the overall maintenance rating for the levee.

Table x – O&M Results for RD 2058

O&M RESULTS – RD 2058			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
2058	Pescadaro	Unacceptable	Acceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

A recent field survey found locations throughout the left bank of the Paradise Cut levee system to be below HMP standards. Based on this survey, it was discovered that approximately 2,400 feet of the levee provides less than 1-foot of freeboard for a 100-year flood event.

Furthermore, field data and inspections along Paradise Cut show that levee crown widths, between mile marker 330+00 & 390+00, are below HMP standards. The levee crown between Alder Avenue and Cedar Avenue poses vehicular access limitations due to narrow levee crown. This section is approximately 6,000' long and would require placing engineered fill on the landside of the levee to widen the crown approximately 5-6 feet.

Additionally, Tom Paine Slough runs through the district and is used for irrigation water conveyance in the growing season and as the main collection facility for flood waters in the storm season. Tom Paine Slough is in extreme need of dredging to improve its function as a conveyance facility for both irrigation and flood control purposes. Silt and other material buildup are causing problems with irrigation and are reducing the carrying capacity of the channel for flood control purposes. The District estimates that environmental permitting fees to dredge the slough will exceed \$150,000. Cost estimates for the dredging itself are in the range of \$10.25 per cubic yard of dredged material.

Furthermore, district maintenance activities often trigger permitting requirements with state and federal agencies, such as the US Fish and Wildlife Service and California Department of Fish and Game. The Service has notified the District of the potential presence of the Riparian Brush Rabbit, Giant Garter Snake and Swanson Hawk within the District Levees.

The Riparian Brush Rabbit was listed as endangered in 2000 and the Giant Garter Snake in 1993, consequently, extensive modifications to maintenance practices have been required. Much of the vegetation that was routinely controlled in the past could not be controlled due to habitat concerns, resulting in an “unacceptable” rating from Department of Water Resources in 2009 inspections. Negotiations for a mitigated management plan are currently underway. It is anticipated that future allowable maintenance practices will pose an increased financial burden

on the district. Consequently, the district's budget takes into account the costs associated with acquiring the necessary permits to perform future work as well as the increased costs associated with that work.

The District's base map shows little to no habitat information/location and the California Department of Fish and Game Habitat Map, dated 2000, that only shows inspection data on Sugar Cut. The District needs to be aware of the location and extent of habitat that could contain Riparian Brush Rabbit, Giant Garter Snake, Elderberry, etc. A habitat survey could provide this information. The figure below provides an overview of the deficiencies noted by stakeholders as part of the RFMP.



Figure X – RD 2058 Deficiencies

Risks Associated With Deficiencies:

The Reclamation District No. 2058 levee system protects more than 7,386 acres of prime farmland, containing several residences, farm worker dwellings, barns, and packing shed areas.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within the District as a whole to be approximately \$208,000,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$20,800,000 million. Therefore, the total value of land and assets is estimated to be approximately \$228,800,000.

RD 2058 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 2058 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 2058 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Additionally, a portion of the Interstate 5 and Interstate 205 highways are located in RD 2058 and is a vital facility for serving the local cities and state. If flooding of RD 2058 were to occur, floodwaters could impact and damage the highway infrastructure. Flooding would adversely affect not only local mobility and transportation but could interfere with safety measures and evacuations.

Finally, RD 2058 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2058:

- Develop a streamlined permitting process to facilitate vegetation maintenance on District levees
- Sedimentation in Tom Paine Slough needs dredging
- Some sections of levee along Paradise Cut do not meet HMP standards

5.4.2.9 RD 2064

General Information:

RD 2064 is located along the west bank of the San Joaquin River and north bank of the Stanislaus River in the Lower San Joaquin River Region. The District encompasses an area of approximately 5,888 acres and is protected by approximately 12 miles of project levee. The District is bordered by the San Joaquin River to the west, by the Stanislaus River to the south, RD 2075 to the north, and by unincorporated San Joaquin County to the east.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. RD 2064 was found to have generally moderate risk of failure due in most part to seepage and erosion concerns. The figure below presents the Overall Hazard Level of levees around RD 2064.

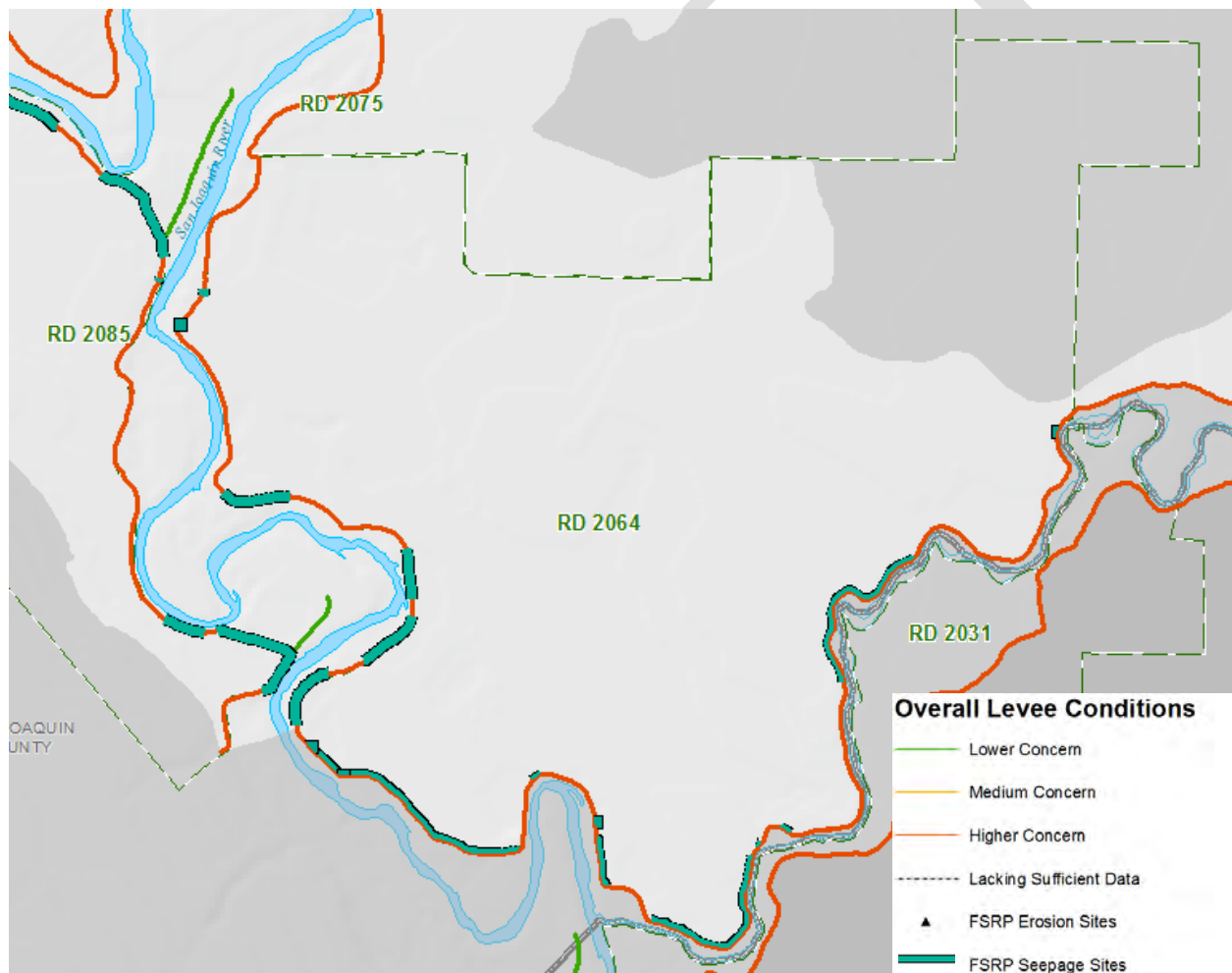


Figure X – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 2064 are

presented in the table on the following page. Abbreviated definitions from Section 5.3 are included to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 2064

NULE RESULTS – RD 2064								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2064	River Junction	-	195	C	A*	C	C	C
		-	257	C	A*	C	A	C

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

FSRP:

RD 2064 was grouped with RD's 2075 and 2094 for this data. It is reported that the group has had four critical and 15 serious seepage events in the past, as well as one critical stability issue.

Table x – FSRP Results for RD 2064

FSRP RESULTS – RD 2064									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
2064 2075 2094	River Junction McMullen Wathal	4	15	1	-	-	-	-	-

O&M Inspections:

Maintenance of levees is performed by RD 2064. An Acceptable rating was given to RD 2064, with crown surface/depressions/rutting being the only problem cited. Additionally, seepage issues were reported within the report during high flows in San Joaquin and Stanislaus Rivers, as well as rodent and encroachment issues, but were not included in the report. The table below provides a summary of the overall maintenance rating for the district.

Table x – O&M Results for RD 2064

O&M INSPECTION RESULTS – RD 2064			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
2064	River Junction	Unacceptable	Acceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

There is not much existing information available for the RD 2064 levees. These levees have not been studied by any of the State, or Federal plans, and have not been evaluated in detail on a local level.

Some information was obtained during the initial small group meetings with stakeholders at the beginning of the RFMP process. According to the District engineer, many of the levees are too narrow to facilitate all-weather access. Additionally, vegetation, rodent, and erosion issues are the main concern for the District.

Risks Associated With Deficiencies:

The Reclamation District No. 2064 levee system protects more than 5,888 acres of prime farmland, containing several residences, farm worker dwellings, barns, packing shed areas, and a winery.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within the District as a whole to be approximately \$37.1 million. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$3.7 million. Therefore, the total value of land and assets is estimated to be approximately \$40.8 million.

RD 2064 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 2064 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 2064 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Finally, RD 2064 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2064:

- The levee crown widths are too narrow for all weather access
- Historical bank erosion at the boundary with RD 2075
- Erosion maintenance is an expensive ongoing problem that is complicated by the requirement for permits to place rock on the riverside of the levees.
- Bank sloughing add to sedimentation in the San Joaquin River which is not addressed by state or federal agencies.
- There was a breakout upstream of the Airport Way Bridge during the 1997 flood. Subsequently repairs were made with additional piers and shoulder berms that may make the situation worse in the RD.

5.4.2.10 RD 2075

General Area Information:

RD 2075 is located along the east bank of the San Joaquin River in the Lower San Joaquin River Region. The District encompasses an area of approximately 6,000 acres and is protected by approximately 7.5 miles of project levee. The District is bordered by the San Joaquin River to the west, by RD 2064 to the south, RD 2094 to the north, and unincorporated San Joaquin County to the east.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. RD 2075 was found to have generally moderate risk of failure due in most part to seepage and erosion concerns. The figure below presents the Overall Hazard Level of levees around RD 2075.

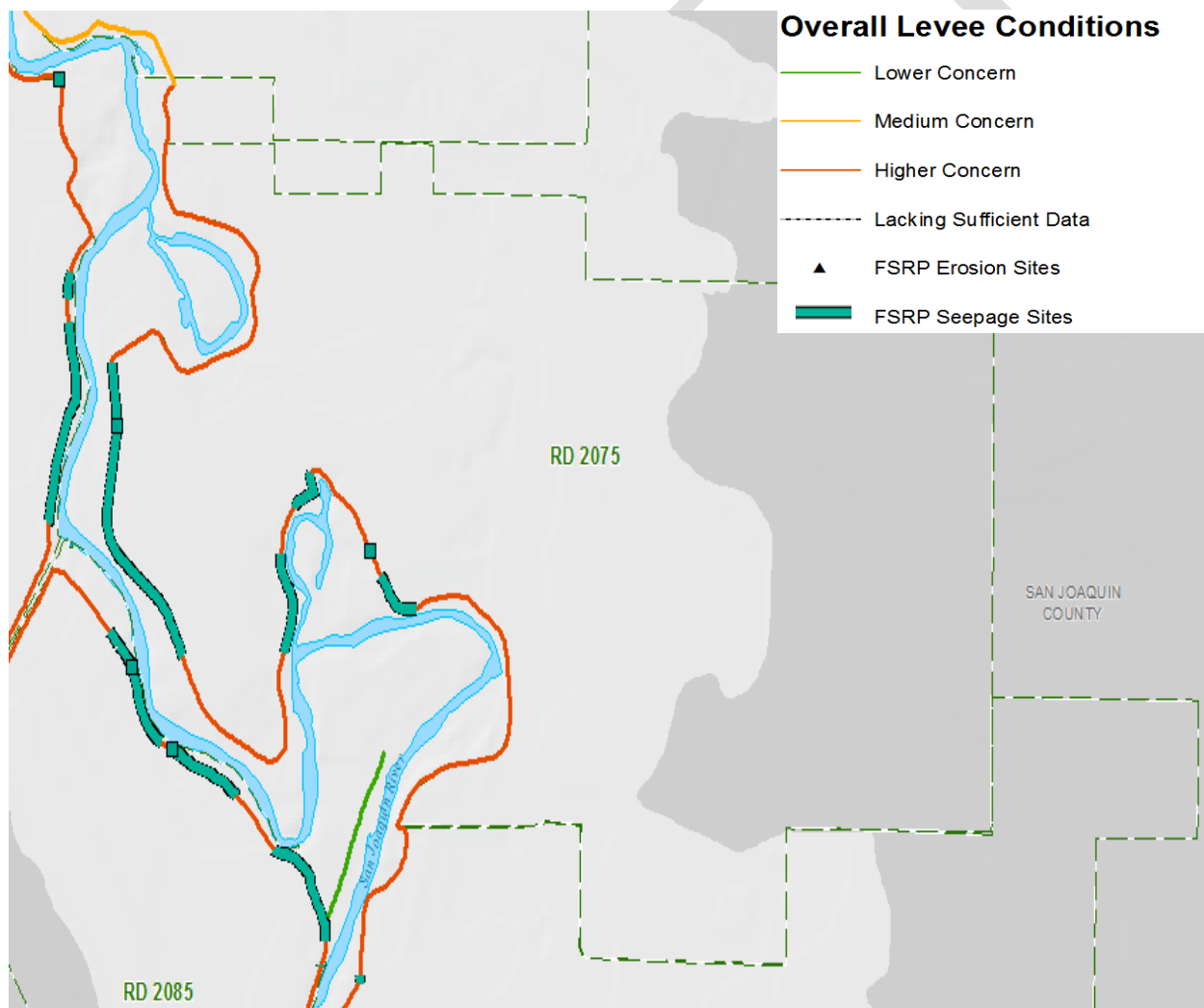


Figure X – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 2075 are presented in the table below. Abbreviated definitions from Section 5.3 are included to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level
M	Meets ULDC Criteria
MG	Marginally Meets ULDC Criteria
DNM	Does Not Meet ULDC Criteria

Table x – NULE Results for RD 2075

NULE RESULTS – RD 2075								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2075	McMullin	1	196	C	A*	C	A*	C

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

FSRP:

RD 2075 was grouped with RD's 2064 and 2094 for this data. It is reported that the group has had four critical and 15 serious seepage events in the past, as well as one critical stability issue.

Table x – FSRP Results for RD 2075

FSRP RESULTS – RD 2075									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
2064 2075 2094	River Junction McMullen Wathal	4	15	1	-	-	-	-	-

O&M Inspections:

Maintenance of levees is performed by RD 2075. An Unacceptable rating was given to RD 2075, due to serious vegetation issues. The table below provides a summary of the overall maintenance rating for the district.

Table x – O&M Results for RD 2075

O&M INSPECTION RESULTS – RD 2075			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
2075	McMullin	Minimally Acceptable	Unacceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

There is not much existing information available for the RD 2075 levees. There are, however, inspection reports performed by DWR, the latest having been done in Fall of 2012. Also, a Periodic Inspection Report prepared for the U.S. Army Corps of Engineers was prepared in April 2010.

Some information was obtained during the initial small group meetings with stakeholders at the beginning of the RFMP process. According to the District engineer, many of the levees are too narrow to facilitate all-weather access, and have steep slopes. The primary risk of flooding for the District is from seepage along the San Joaquin River due to the sandy soils RD 2075 is built upon. The stakeholders for RD 2075 feel sedimentation into the river has significantly decreased its capacity. Additionally, vegetation, rodent, and erosion issues are a main concern for the District.

Several levee breaches have occurred on the RD 2075 levee system. In 1950 there was a levee breach at approximate levee mile 5.5 and another break in 1952, 300 feet wide, at approximate levee mile 5.25. In 1955 a 300' wide levee breach occurred at about levee mile 4.0. In 1997 a levee breach occurred at approximate levee mile 4.75, a 1,000 foot wide break.

RD 2075 has a Flood Contingency Map, last updated April 2011. The District's annual assessment is approximately \$60,000.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2075:

- The project levees along the San Joaquin River are generally too steep and too narrow.
- The reach of the San Joaquin River adjacent to RD 2075 is supposed to pass 52,000 cfs however, it is doubtful that that capacity remains because of siltation.
- Vegetation management, erosion control, and rodent control are ongoing maintenance issues.

- The RD supports dredging of the San Joaquin River with fill placed on the levees.
- The RD support decreasing flow in the San Joaquin River via upstream storage, dam reoperation, and widening of Paradise Cut.

DRAFT

5.4.2.11 RD 2085

General Area Information:

RD 2085 is located along the west bank of the San Joaquin River in the Delta South region. The District encompasses an area of approximately 2,779 acres, and is protected by 5.1 miles of project levee along the San Joaquin River. The District is bordered by RD 2095 on the west, the San Joaquin River on the north, and unincorporated San Joaquin County to the south and east.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. RD 2085 levee segments 338 and 339 were found to have a low risk of failure due to erosion, which was the only category they were assessed on. Segment 197 was assessed on all categories but was found to have a high risk of failure due to seepage and erosions concerns. The figure below presents the Overall Hazard Level of levees around RD 2085.

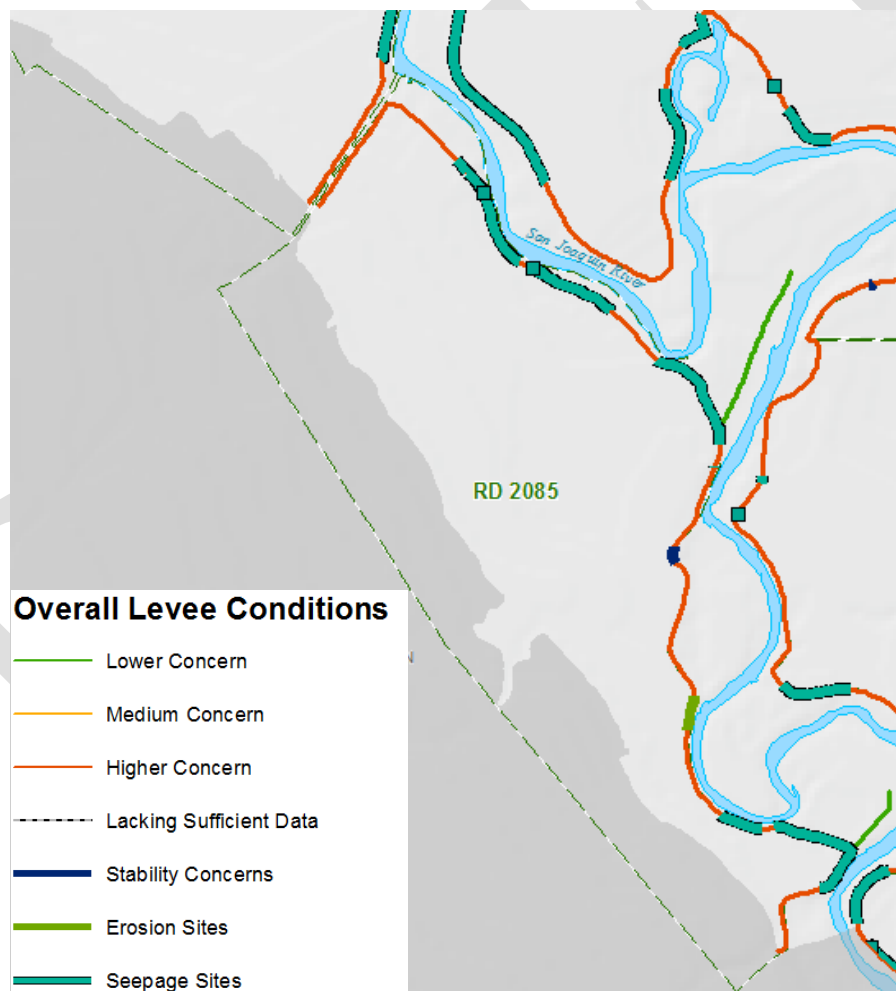


Figure X – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 2085 are

presented in the table on the following page. Abbreviated definitions from Section 5.3 are included below to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 2085

NULE RESULTS – RD 2085								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2085	Kasson District	1	197	C	A	B	C	C
		2	338	Not Assessed	Not Assessed	Not Assessed	A	A
		3	339	Not Assessed	Not Assessed	Not Assessed	A	A

O&M Inspections:

The District levees are not regularly inspected by DWR or USACE.

Risks Associated With Deficiencies:

The Reclamation District No. 2085 levee system protects more than 1,460 acres of prime farmland, containing several residences, farm worker dwellings, barns, and packing shed areas.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within the District as a whole to be approximately \$5.1 million. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$500,000. Therefore, the total value of land and assets is estimated to be approximately \$5.6 million.

RD 2085 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 2085 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 2085 would increase the rate and area of mixing and would allow the saline water from the San

Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Finally, RD 2085 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2085:

- Limited funding for maintenance activities
- Ongoing seepage and erosion control repairs

5.4.2.12 RD 2089

General Area Information:

RD 2089 is located on the north (right) bank of Old River in the Delta South Region. The District encompasses an area of approximately 714 acres, is surrounded by 3.5 miles of levee along the adjacent waterways and 1.4 miles of dryland levee. The length of project levees is 2.8 miles, and the length of non-project levees is 0.7 miles. RD 2089 is bordered by Old River on the south, Salmon Slough on the west, Grant Line Canal on the north, and RD1 on the east.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. RD 2089 was found to have generally moderate risk of failure due in most part to seepage and erosion concerns. The figure below presents the Overall Hazard Level of levees around RD 2064.

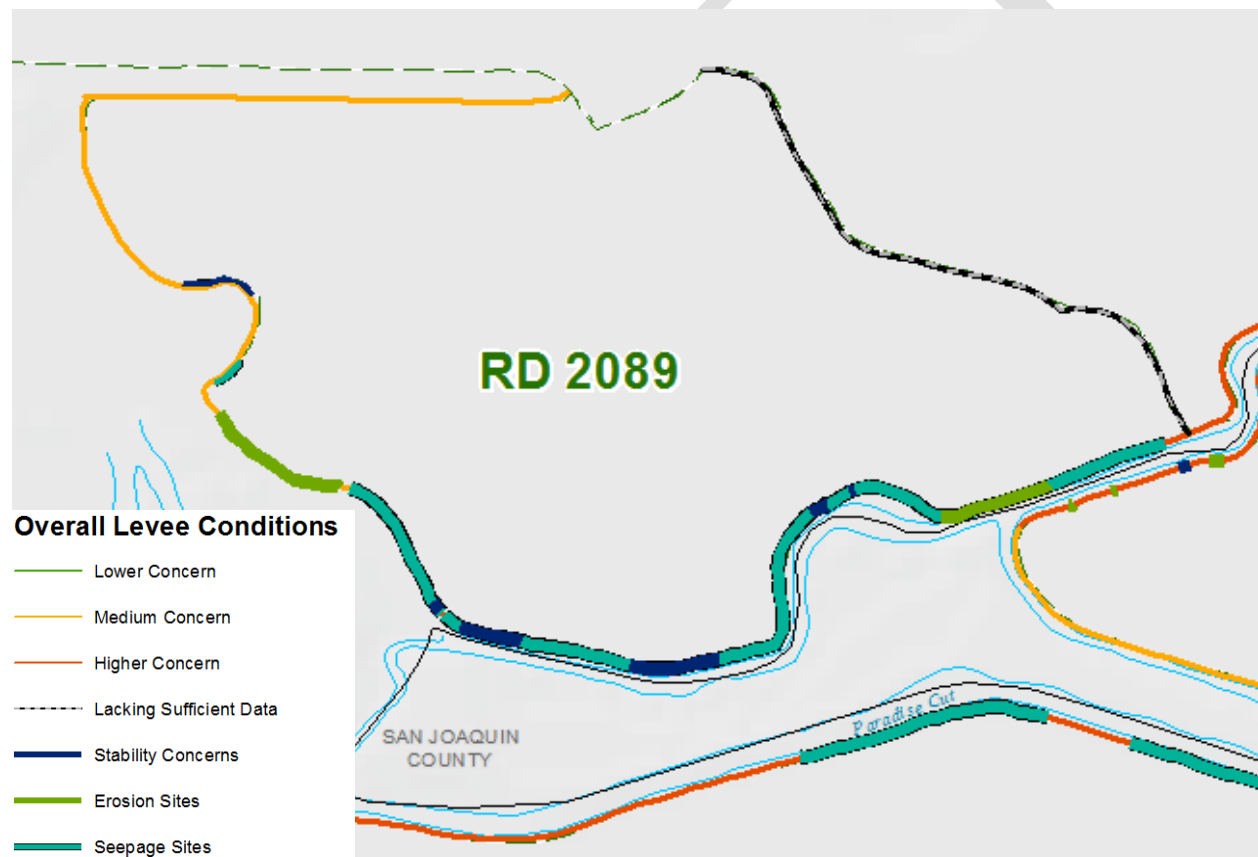


Figure X – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. RD 2089 was found to have moderate to high likelihood of failure. Erosion was a concern in all segments, as well as seepage. Details of these evaluations for levees around RD 2089 are presented in the table on the following page. Abbreviated definitions from Section 5.3 are included to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 2089

NULE RESULTS – RD 2089								
RD #	RD Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2089	Stark	1	198	C	LD (A/B)	C	C	C
		2	335	B	A	B	B	B
		NA	5013	LD (A/B)	A*	A	B*	B

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

FSRP:

RD 2089 has had both critical and serious instances of seepage and erosion in the past as shown in the table below.

Table x – FSRP Results for RD 2089

FSRP RESULTS – RD 2089									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
2089	Stark	1	1	-	-	1	1	-	-

O&M Inspections:

Maintenance of levees along the District are performed by RD 2089. A rating of Unacceptable was given, due mostly to crown surface/depressions/rutting issues. Erosion and vegetation were also cited but were deemed minor. The table below provides a summary of the overall maintenance rating for RD 2089.

O&M INSPECTION RESULTS – RD 2089			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
2089	Stark	Unacceptable	Unacceptable

Condition of Flood Risk Management Facilities Identified in Local Studies:

The entire 19,418 foot length of levee along the perimeter of RD 2089 currently meets HMP standards. However, approximately 500' of the levee system does not meet PL 84-99 geometry requirements. The figure below provides a graphical depiction of the deficiencies identified on RD 2089.



Figure X – RD 2089 Deficiencies

Risks Associated With Deficiencies:

A failure or breach of the RD 2089 levee system could result in flooding of the District to depths of approximately 7.5 feet on average. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. The estimated cost of a flood event resulting from a single levee failure would be nearly \$3M.

The cost analysis above does not include damage to privately owned property and improvements. The actual financial impact to those properties and facilities would depend greatly on the replacement costs, the amount of insurance those properties might have, and where they are located relative to the location of the levee breach and depth of water at those locations. Flooding could potentially eliminate a cropping season and affect natural gas well production.

The RD 2089 levees also provides a public benefit by maintaining water quality and water supply reliability for cities and farms in the San Joaquin Valley, San Francisco Bay area, and Southern California. A levee break would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta for the Central Valley Project water supply, the State Water Project, and the Contra Costa intakes that are in close proximity to the District. Costs for a levee breach on RD 2089 which impact water quality are similar to those discussed for RD 1.

In addition to protecting the States water supply, electrical and natural gas transmission lines traverse RD 2089 which provide a significant amount of power to Central California. Damage to these transmission lines could severely affect the region's power supply, and would require repairs as soon as feasibly possible.

Finally, RD 2089 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2089:

- Implement an aggressive vegetation control plan.
- Salmon Slough is silted up which negatively impacts water flow.
- Improve levee erosion protection with supplemental rock slope protection on all of the RD 2089 levees.
- Improve levee crown with all-weather road.
- Increase the levee crown widths where necessary and identify areas that would benefit from setback levees.
- Maintain compliance with PL 84-99 levee standards on all District levees.
- Survey, evaluate and improve RD 2089 levees to meet current flood system requirements.
- Implement an aggressive rodent control and damage repair plan.
- RD 2089 has many levee miles to maintain with a relatively small assessment base with high assessments per acre.
- Update the Flood Contingency Map (FCM) for the Stark Tract Flood Control System to bring it up to current mapping standards. The current FCM for Stark Tract Flood Control System was created in August 2008.

5.4.2.13 RD 2095

General Area Information:

RD 2095 is located on the west bank of the San Joaquin River in the Delta South Region. The District encompasses an area of 4,020 acres and is protected by 4.7 miles of project levee along the San Joaquin River. The District is bordered by RD 2058 on the west, Paradise Cut and the San Joaquin River on the north, RD2085 to the southeast and unincorporated San Joaquin County to the south.

2012 CVFPP:

The 2012 CVFPP identified seepage, erosion, and slope stability concerns with levees in the Regions based on the NULE evaluations. RD 2095 was found to have a high risk of failure due to seepage concerns. The figure below presents the Overall Hazard Level of levees around RD 2095.

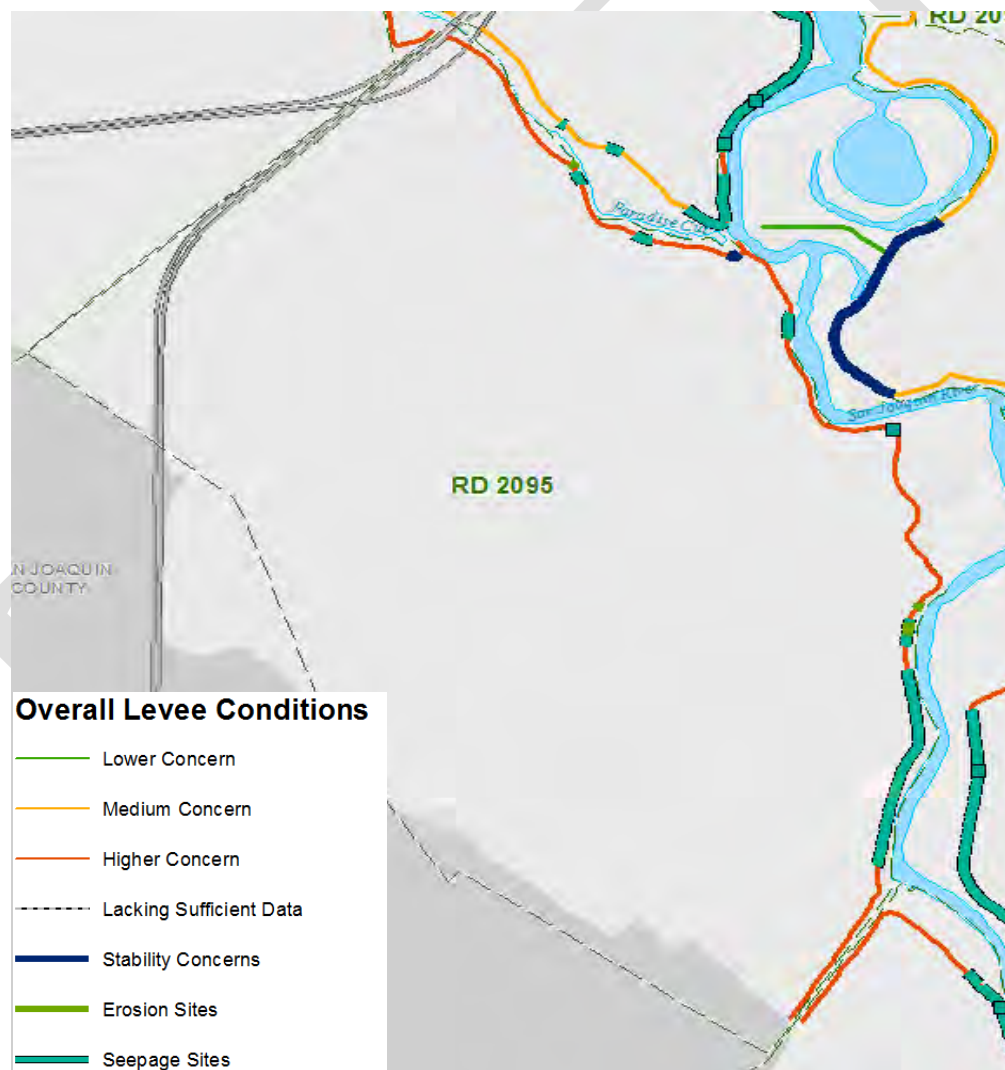


Figure X – CVFPP Overall Levee Conditions

The Overall Hazard Levels are a composite of the seepage, stability, and erosion concerns identified in the NULE evaluations. Details of these evaluations for levees around RD 2095 are

presented in the table below. Abbreviated definitions from Section 5.3 are included to facilitate understanding of the following tables.

NULE Ratings	
Hazard Level A	Low likelihood of either levee failure or the need to flood-fight to prevent levee failure
Hazard Level B	Moderate likelihood of levee failure or the need to flood-fight to prevent levee failure.
Hazard Level C	High likelihood of levee failure or the need to flood-fight to prevent levee failure.
Lacking Data (LD)	Lacking sufficient to be able to assign a hazard level

Table x – NULE Results for RD 2095

NULE RESULTS – RD 2095								
RD #	Name	Unit #	Segment #	Under-seepage	Slope Stability	Through Seepage	Erosion	Overall
2095	Paradise Cut	1	202	C	A*	C	A*	C
		2	258	C	A	B	B	C

* = Denotes Independent Geotechnical Review Does Not Concur with DWR Findings

FSRP:

RD 2095 was found to have had both critical and serious instances of seepage and erosion in the past, with seepage issues being more numerous.

Table x – FSRP Results for RD 2095

FSRP RESULTS – RD 2095									
RD #	Name	Seepage Critical	Seepage Serious	Stability Critical	Stability Serious	Erosion Critical	Erosion Serious	Freeboard Critical	Freeboard Serious
2095	Paradise Junction	1	4	-	-	1	1	-	-

O&M Inspections:

Maintenance of levees along the District are performed by RD 2095. RD 2095 received a Minimally Acceptable rating due to crown surface, erosion, and vegetation issues. The table below provides a summary of the overall maintenance rating for RD 2095.

Table x – O&M Results for RD 2095

O&M INSPECTION RESULTS – RD 2095			
RD No.	Name	Overall O&M Rating	
		Fall 2011	Fall 2012
2095	Paradise Junction	Minimally Acceptable	Minimally Acceptable

Risks Associated With Deficiencies:

The Reclamation District No. 2095 levee system protects more than 3,750 acres of prime farmland, containing several residences, farm worker dwellings, barns, and packing shed areas.

The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within the District as a whole to be approximately \$104,400,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately \$10,400,000. Therefore, the total value of land and assets is estimated to be approximately \$114,800,000.

RD 2095 also provides many unique benefits to the State of California and the public. The protection and preservation of water quality within the Delta as well as water quality for the State and Federal Water Projects is a critical function of the RD 2095 levees by displacing water and thereby maintaining favorable freshwater gradients within the Delta. A levee break on RD 2095 would increase the rate and area of mixing and would allow the saline water from the San Francisco Bay to move further upstream, jeopardizing the fresh water supply exported from the Delta.

Additionally, a portion of the Interstate 5 and Interstate 205 highways are located in RD 2095 and are vital facilities for serving the local cities and state. If flooding of RD 2095 were to occur, floodwaters could impact and damage the highway infrastructure. Flooding would adversely affect not only local mobility and transportation but could interfere with safety measures and evacuations.

Finally, RD 2095 provides multiple types of habitat and harbors a variety of species that would be severely impacted by flooding. If these impacts required mitigation, the current cost to replace those habitat values would range from \$65,000 to \$145,000 per acre.

Primary Concerns:

Based on the information above and discussions with stakeholders in the Regions, the list below was developed to present some of the primary concerns of RD 2095:

- Critical seepage and erosion control repairs are primary concerns for the District.

- Stakeholders are concerned the Paradise Cut widening may exacerbate seepage, erosion, and the risk of flooding during high water events.
- Siltation in Paradise Cut should be removed to restore the original design capacity

DRAFT

5.5 Non-Structural System Challenges

Physical flood risk management facilities are complimented with non-structural flood risk management programs and systems. Non-structural flood risk management systems include emergency response, flood warning systems, land use policies and regulations, and operation & maintenance (including funding, staffing, and regulatory challenges). While the structural hazards identified in the previous section were typically specific to each City or RD, the emergency response, O&M, and ecosystem challenges are generally represented within both Regions.

5.5.1 *Emergency Response Deficiencies*

This section provides an overview of the current flood response system and the challenges faced by emergency responders in the Regions. This section also briefly describes the new State initiatives that are driving modification of the San Joaquin County Flood Emergency Response Preparedness Strategy which guided flood planning in the past, as noted in Section 4.2. Finally, this section outlines the new San Joaquin County Enhanced Flood Preparedness Strategy as the basis for an evaluation of the current situation and the development of recommendations for future action.

5.5.1.1 Overview of Emergency Response and Local Agency Responsibilities in California

In the State of California, initial emergency response is the responsibility of local government entities (counties, cities, special districts) and, in some cases, locally-based State agencies (e.g. California Highway Patrol). These local entities provide emergency response within their respective jurisdictions, which are defined by geography and specific mandated response functions. From beginning to end, local entities and locally-based State agencies retain command of all subsequent emergency response and recovery activities occurring within their jurisdiction. Response to disasters that cross multiple jurisdictions must be coordinated through established unified command protocols.

In order to assist field agencies attempting to carry out their jurisdictional responsibilities and to ensure effective multi-agency coordination, counties and many cities maintain a specialized emergency management function within their organization. This emergency management function is responsible for coordinating the response of the departments of its jurisdiction, assisting those internal departments with disaster readiness activities, and providing executive management control of the overall response.

In addition, Counties by law also administer the operational area organization. This special purpose organization is composed of all local public jurisdictions within the county for the purpose of joint management of response resources and information. This special purpose operational area organization is a key communications and coordination link between local agencies as well as between local agencies of the County and the State.

In general, the role of State and federal agencies is to provide resources and support for the local agencies responsible for commanding the response. This assistance is acquired under protocols laid out in the mutual aid and other systems of the California Standardized Emergency Management System (SEMS). That system has been modified to conform to the National

Incident Management System (NIMS) that has been established by Presidential directive as the national system for organizing disaster response. CalEMA is responsible for the coordination of State response in support of impacted local agencies while FEMA coordinates federal response in support of the State. CalEMA does not have a direct role in incident command and control.

Local agencies having jurisdictional “incident command” authority are responsible for maintaining a readiness to meet their responsibilities in a disaster. Such readiness may take the form of preparing written plans or protocols, conducting training and exercise programs, and acquiring specialized equipment, supplies, and facilities. Whether current readiness actions are adequate, sufficient or otherwise of an acceptable nature remains a largely subjective judgment.

5.5.1.2 The Flood Emergency Response Structure

The response to floods has a unique characteristic that makes multi-agency coordination more complex than other types of disaster response. This difference arises from the historic reliance on special-purpose districts (Reclamation Districts) to maintain flood control levees. This additional jurisdictional layer to local government was put in place in the 19th Century primarily to facilitate reclamation activities by multiple landowners in distinct overflow areas.

This separation of the traditional county and city local governments from responsibility of the levees adds complexity to flood emergency response by creating two separate and distinct components to the overall response. These components are *levee flood fight operations* and *general public safety operations*. Recognition of this dichotomy in response jurisdiction is important to any evaluation of the overall response system since each component is performed by a different group of jurisdictions/agencies, has very different response issues and challenges, and is organized at distinctly different geographical scales.

The levee flood fight operations component includes emergency activities aimed at preventing failure of a levee during a flood or containing flood waters in the event a levee does fail. Such activities include levee patrol, basic remedial actions involving the placement of sandbags and plastic visquine, and the acquisition of private vendors or bulk materials for more substantive remedial actions on a levee. Reclamation Districts have the primary jurisdiction for performing these operations as part of their day-to-day levee maintenance responsibility. DWR and USACE have clear authority to assist with these operations.

The general public safety operations component includes response activities such as public warning, evacuation, rescue, fire suppression, and recovery that are may be conducted in the area protected by a levee. Traditional law, fire, and emergency medical agencies with jurisdiction within the areas protected by the levees perform these operations separately, but parallel to, the flood fight activities.

In a large flood, the geographic scale at which these different groups of agencies establish command and control or organize their response often varies due to differences in agency jurisdictional boundaries and internal protocols, which makes ensuring efficient coordination of the two response components a major challenge. The jurisdictional situation also creates policy issues concerning the provision of assistance between jurisdictions responsible for each component, particularly direct financial assistance needed for many flood fight activities. The

San Joaquin County Flood Emergency Response Preparedness Strategy put in place in the late 1990's was consciously developed to address this unique inter-agency coordination challenge as well as to help improve the response capability of specific agencies or jurisdictions.

5.5.1.3 Recent State Flood Preparedness Initiatives

The passage of flood-related bonds in 2006 initiated an expanded State planning process for improving flood protection in the State and Central Valley that has continued to the present. This State-managed planning process has led to the development of specific new State priorities, requirements, and funding mechanisms specific to local flood emergency response planning. The need to address new State requirements prompted San Joaquin County and its cities in 2012 to revise elements of the current flood preparedness strategy to comply with specific mandates and the overall State preparedness strategy coming into place. Two key State actions specific to emergency response planning was the passage of AB156 in 2008 and the issuance of the first grants to local governments for flood preparedness activities in 2013.

California Water Code Section 9650-51

The passage of AB156 in 2008 established a new section in the Water Code (Sec. 9650-51) which requires LMAs maintaining project levees protecting 1,000 or more residents to develop a flood safety plan. The new statute, along with identifying general required content of these plans, requires a LMA and jurisdictions whose residents are protected by the LMA levee to adopt the plan within two years. The statute does not identify a specific format or structure for these safety plans.

In 2011, DWR issued compliance guidance indicating that one option to meeting the AB156 standards was to modify existing response plans as needed. DWR provided a sample plan for jurisdictions that had no previous plan or elected to prepare a new plan from scratch, but it did not mandate a specific plan format or structure.

Department of Water Resources Flood Emergency Response Projects Grants

In 2013 the Department of Water Resources issued the first grants to local jurisdictions for local flood emergency response projects funded by the Propositions 1E and 84 bonds. One grant was released for local projects outside of the legal Delta and one grant was released specifically for projects within the legal Delta. State application guidance established clear State priorities and proposed local projects for the methodology for implementing such projects.

DWR priorities in the Delta grant are shown as preparedness "steps". The first "step" is planning and coordination which must be completed before funding for the next preparedness steps (training, supplies, equipment) is provided. The State guidance indicates that "planning and coordination" includes "preparing or updating the local flood emergency plan, levee safety plan, and incorporating the plan into the local multi-hazard functional plan" as a preparedness priority.

5.5.1.4 The San Joaquin County Enhanced Flood Emergency Response Preparedness Strategy

In early 2012, the County and cities issued a draft AB156 Compliance Package outlining the process for updating existing flood emergency response products to meet the new AB156 standards. Future preparedness activities by San Joaquin County jurisdictions were to conform to these new standards. In 2013, San Joaquin County and affected cities approved a written agreement that institutionalized these new standards and streamlined the process for meeting the plan adoption requirement of the law. LMAs join this agreement through approval of an exhibit to the Agreement by their boards.

These actions and the specific proposed projects of a joint application to a new DWR flood preparedness grant has resulted in the development of a new San Joaquin County “Enhanced” Flood Emergency Response Preparedness Strategy based on the pre-existing strategy revised to conform to the new State requirements.

In order to begin implementation of this new strategy, the San Joaquin County Office of Emergency Services submitted a joint application in September 2013 for the first DWR flood preparedness grant for the Delta to be issued from the 2006 bonds. Thirty-eight LMAs and most cities submitted letters of commitment to participate in the implementation of this joint flood preparedness project. The application was structured to meet specific DWR priorities and requirements laid out in the grant guidance and the AB156 requirements.

The key changes to the existing flood preparedness products created under the previous San Joaquin County Flood Emergency Response Preparedness Strategy are itemized below:

Flood Safety Plans

Flood contingency maps and evacuation maps for urban areas had been implemented previously as complementary but separate products in the previous program. In addition, under the previous strategy separate evacuation maps had been prepared only for urban areas. In the enhanced strategy these products will be integrated into a single “flood safety plan” template meeting AB156 standards. A new written element, LMA emergency operations plans, is also added. This new template will be applied throughout the County even though technically only urban areas must comply with AB156. This new “flood safety plan” template is designed to meet both AB156 and DWR requirements.

Regional Flood Fight Supply System

In the previous preparedness strategy, the San Joaquin County Office of Emergency Services only took action to acquire additional supplies and equipment to supplement supplies maintained by the LMAs or cities. OES did not attempt to determine sufficiency of the supplies for first response maintained by other jurisdictions and only preliminary attempts were made to develop a regional perspective for placement of supplies.

In response to the DWR grant guidance encouraging development of regional response systems, the new enhanced emergency response preparedness strategy calls for development of a single comprehensive regional supply and equipment system. Funding from the first Delta grant will allow San Joaquin County and its jurisdictions to jointly develop a multi-layered supply and depot system to better support flood fight activities at

any specific location. This regional system will be integrated with improved logistics tracking and mutual aid systems put in place through the previous preparedness strategy.

Training and Exercises

A new element was added to the enhanced flood improvement strategy as a result of DWR initiatives. There is now an objective of developing a consistent and comprehensive training and exercise program for LMAs and agencies that would work with those jurisdictions. In addition, as part of the new LMA flood safety plan, each district will produce a training policy laying out a reasonable approach to meeting NIMS training requirements in line with district staffing, structure and resources. A single regional exercise program will also be developed through the grant program to ensure effective testing and maintenance of response systems.

In early 2013, two San Joaquin County LMAs revised their existing plans to conform to the new structure required by the AB156 Compliance Package. Those new plans were submitted to the Department of Water Resources and the Central Valley Flood Protection Board as required by law for review. In August 2013 the Department of Water Resources indicated that the new flood safety plan template that forms the core of the enhanced San Joaquin County flood preparedness strategy met AB156 requirements and was, in fact, a preferred model for meeting the “local tactical flood plans” step identified in their grant guidance.

5.5.1.5 Evaluation of Emergency Response Readiness in the Regions

San Joaquin County has been a leader within the Central Valley in flood response readiness. The County is one of the few agencies that has actively engaged Reclamation Districts within its boundary to improve communication and lines of authority/responsibility in the event of a flood event. The information below provides an overview of residual risk, the readiness of the Regions to address this risk, and opportunities to increase this readiness.

Flood Residual Risk

Project and non-project levees were constructed in the Lower San Joaquin/South Delta Regions to prevent damage from a flood of a specified magnitude. Since one of the levees may not perform this function in the future due to a design, construction, or maintenance flaw, there is a “residual risk” that flood waters at, or below, design criteria will degrade and fail the levee. In addition, because levees are designed to control floods of a specified magnitude there is also a “residual risk” to the protected area that a flood exceeding the design criteria of the levee will occur and either overtop or otherwise fail the levee.

This residual risk is addressed by developing the capacity to 1) effectively respond to the appearance of a flaw in a levee to prevent complete failure, 2) effectively respond to physically limit the extent, depth, or duration of floodwaters if a levee fails, 3) remove people and property from the area subject to flooding, and 4) provide additional physical protection to specific assets in place that cannot be removed. The level of organizational, resource, and procedural capacity needed to perform these actions depends, in part, on the potential response complexity of an area (for example, it is generally a more complex matter to evacuate an urban area than a rural area).

Lower San Joaquin/South Delta Regions Flood Safety Plan Status

The heart of the Enhanced San Joaquin County Flood Emergency Response Preparedness Strategy is the conversion of existing flood contingency maps and evacuation map products into integrated flood safety plans meeting AB156 standards. In some cases these products must be created from scratch since previous maps were never done. In most cases, it will involve updating existing products to the new standards and adding needed additional items (LMA emergency operations plans, separate evacuation maps for rural areas, etc.). The table below indicates the status of the Lower San Joaquin/South Delta Regions in regard to meeting these new flood safety plan standards. The figure x on the following page presents this information graphically.

Table x – LSJ/DS Flood Contingency Maps

Flood Contingency Map Name	LMAs Covered by Map	Public Safety Agencies w/jurisdiction	Flood Plans in Place	Actions Needed to meet AB156 Standards
Eight-Mile Corridor	RD2042 RD2029 RD2044	City of Stockton Sheriff	FCM Evacuation Map (RD2042)	Update FCM Rural Evacuation Map(s) LMA EOPs
North Stockton	RD2115 RD2126 Bear Creek (Zone 9)	City of Stockton Sheriff WMFD	None	FCM and LMA EOPs Evacuation Map(s)
Central Stockton	Calaveras River (Zone 9)	City of Stockton SJC FCD	CS FCM CS Evacuation Maps	Update FCM LMA EOP
Wright-Elmwood	RD2119	City of Stockton Sheriff	None	FCM and LMA EOP WE Evacuation Map
Lincoln Village West	RD1608	City of Stockton	FCM Evacuation Map	Update FCM LMA EOP
Sargent Barnhart	RD2074	City of Stockton	FCM Evacuation Map	Update FCM LMA EOP
Smith Weber Tract	RD828 RD1614	City of Stockton Sheriff	FCM Evacuation Maps	Inactive; removed levees from system
South Stockton	French Camp Creek System (Zone 9)	City of Stockton Sheriff MFD	None	FCM and LMA EOP Evacuation Map(s)
Rough and Ready	RD403	City of Stockton	None	FCM LMA EOP Evacuation Map
Boggs Tract	RD404	City of Stockton Sheriff	FCM and LMA EOP Evacuation Map	In Compliance with AB156
Roberts Island	RD524 RD544 RD684	City of Stockton Sheriff	FCM	Update FCM LMA EOPs Evacuation Map(s)

Flood Contingency Map Name	LMAs Covered by Map	Public Safety Agencies w/jurisdiction	Flood Plans in Place	Actions Needed to meet AB156 Standards
RD17	RD17	City of Stockton City of Lathrop City of Manteca Sheriff LMFD	FCM LMA EOP Evacuation Map	In Compliance with AB156
Stewart Tract	RD2062 RD2107	City of Lathrop Sheriff LMFD	None	FCM and EOPs Evacuation Map(s)
East Bank SJ River	RD2064 RD2075 RD2094 RD2096	Sheriff LMFD	FCM	Update FCM LMA EOPs Evacuation Map(s)
West Bank SJ River	RD2058 RD2085 RD2094	Sheriff TRFD	FCM	Update FCM LMA EOPs Evacuation Map(s)
Union Island	RD1 RD2 RD2089	Sheriff	FCM	Update FCM LMA EOPs Evacuation Map(s)
Old River	RD773 RD1007	Sheriff TRFD	None	FCM LMA EOPs Evacuation Map(s)

Figure to be added showing which areas have FCMs (awaiting GIS data)

Implementation of the San Joaquin County Enhanced Flood Preparedness Strategy will also involve addressing several other issues as noted below:

Rural Evacuation Maps. The Enhanced Flood Preparedness Strategy requires that separate evacuation maps also be developed for rural areas. The previous strategy only required separate maps for urban areas and placed limited evacuation information on LMA flood contingency maps. Completing this expanded evacuation planning process will allow the County to more fully address two key evacuation issues for rural, agricultural, areas. These issues are evacuation of dairies and bulk hazardous materials prior to the arrival of flood waters.

Regional Flood Fight Supply System. Current supply inventories maintained by all jurisdictions must be determined. Locations and inventories of second level supply depots must also be determined and pre-planned supply delivery points also re-confirmed. The logistics system must be enhanced to allow responders to determine the best placement of supply staging areas and the fastest manner to meet emergency requests. This new system must be integrated with existing logistics tracking and mutual aid systems put in place through the initial San Joaquin County Flood Emergency Response Preparedness Strategy.

Flood Fight Mutual Aid Policies. As part of the DWR regional grant, the County and its cities must further clarify policies for providing mutual aid to LMAs for flood fight operations. In particular, policies for providing direct funding for private contractors, bulk materials, and flood fight equipment needed to minimize flood damage will be clarified and incorporated into the operational area logistics system.

Training Program. As part of the DWR regional grant, a comprehensive training and exercise program will be developed for implementation by all jurisdictions with flood response functions.

Opportunities

As mentioned previously, San Joaquin County has made significant progress toward mitigating residual flood risk via the flood contingency maps. However, several beneficial actions have occurred in the past year that provide opportunities for the County and its cities and districts to implement the Enhanced Flood Preparedness Strategy. These actions include: standardizing the local flood response plans, applying for the 2013 DWR Delta ER Grant, and developing sustainable mechanisms to continually update flood fight documents. These activities are described below.

Standard Local Flood Response Plan Templates

The issuance AB156 compliance guidance and grant guidance by DWR for local flood emergency response projects has stimulated discussion on the need for “local tactical flood response plans” and the proper format, content, and characteristics for such plans. Such plans would obviously have a levee flood fight component and a public safety warning/evacuation/rescue component that contained all required content mandated by AB156. San Joaquin County had over the past decade developed such a local tactical flood response plan (called a flood safety plan within Section 9650) template using a mapping format and addressing both components. The maps and procedures developed under this concept display flood emergency response information, plans, and protocols in a user friendly format. FEMA subsequently provided funds for the development of guides for implementing a similar program. In 2012, San Joaquin County adapted this concept and existing products to fully conform to the requirements of Water Code Section 9650. This new “flood safety plan” template became the heart of the new Enhanced Flood Preparedness Strategy for San Joaquin County.

During the summer of 2013, local tactical flood response plans (or flood safety plans) in line with this latest standard were completed for two San Joaquin County reclamation districts and submitted to DWR and the Central Valley Flood Protection Board for review. Subsequently, DWR indicated that this format met Section 9650 requirements and that the Department considered this format the preferred methodology for completing local tactical flood response plans required by their grant guidance.

This situation provides an opportunity for the Lower San Joaquin River/South Delta Regions to move ahead with more confidence with the Enhanced Flood Preparedness Strategy. Resulting products will not only now be considered compliant by the State, but will also serve as a preferred template for other areas of the Central Valley.

Funding Opportunities to Implement the Enhanced Flood Preparedness Strategy

Propositions 1E and 84 passed by the voters in 2006 provided, among other things, for \$135 million in funding for enhancing flood emergency response in the State. In 2013, DWR issued the first grants to locals from these funds for local flood emergency response projects. A “statewide” grant with total funding of \$5 million was issued in March 2013, and a “Delta specific” grant with total funding of \$5 million was issued in August 2013. Funds for a second round of the Delta specific grant in 2014 have already been identified which provides some assurance of continued funding.

This situation provides a possible opportunity for the Lower San Joaquin River/South Delta Regions to begin to implement the San Joaquin County Enhanced Flood Preparedness Strategy over the next few years. This funding opportunity should be integrated into the final plan with a long term plan for strategy implementation showing specific funding needs. In this way, County jurisdictions will be prepared to submit a joint, well-planned, applications in the future.

Joint Planning and Plan Maintenance Mechanisms

The RFMP process provides an opportunity for local jurisdictions to form mechanisms and procedures for ensuring completion and maintenance of emergency response products. Procedures and protocols used to jointly develop the regional plan should be adjusted for use after the completion of the RFMP to perform joint planning.

5.5.2 O&M Challenges (Funding, Staffing, Regulatory)

Operations and maintenance (O&M) deficiencies can lead to structural deficiencies. The LMAs responsible for maintaining levees in the Regions are genuinely concerned about keeping levees protecting their communities. However, oftentimes a combination of funding and staffing shortages make it difficult to perform necessary repairs. Furthermore, regulatory challenges can make some maintenance activities impossible.

Some of the LMAs have relatively small or no assessments compared to the length of levee-miles they are responsible for maintaining. The assessments typically only cover routine maintenance activities associated with rock placement, vegetation management, and rodent control. The Subventions Program helps RDs with maintenance activities, although applications to stay in the program are required on an annual basis, which taxes available staff resources.

Maintenance of levees for many of the RDs in the Delta South Region is performed by landowners who live within the respective Districts. In most cases, this means levee maintenance is performed by the farmers who work their land on a daily basis. In order to ensure all maintenance issues are addressed, many of the RDs in the Regions need a full-time staff member to maintain the levees. This is not possible with the current funding available to most LMAs.

Additionally, even with adequate funding and staffing, O&M activities are often blocked by regulatory constraints. Maintenance activities often trigger permitting requirements with state and federal agencies, such as the US Fish and Wildlife Service and California Department of Fish and Wildlife. Many Districts in the Regions have the potential for the presence of the Riparian Brush Rabbit, Giant Garter Snake and Swainson’s Hawk.

The Riparian Brush Rabbit was listed as endangered in 2000 and the Giant Garter Snake in 1993, consequently, extensive modifications to maintenance practices have been required. Much of the vegetation that was routinely controlled in the past can no longer be controlled due to habitat concerns. Without adequate vegetation management, DWR often rates offending levees as “unacceptable” on annual inspections. As previously discussed, these unacceptable rating threaten District eligibility in the USACE PL 84-99 program.

Table x – O&M Funding by RD

RD #	Approx. Annual Assessments	Approx. Annual O&M Expenditure	Primary O&M Activity
1	\$97k	\$170k	Erosion control (rock); veg. removal
2	\$93.5k	\$240k	Rodent control; veg. removal
17	\$2.9M	\$550k	Erosion control; veg. control; encroachment control; rodent control; AWR
403	None, self funded	\$25k - \$100K	Erosion control (25k); Rodent and weed control (\$25k-75k)
404	\$600k	\$150k	Erosion control; veg. control; encroachment control; rodent control; AWR
524	\$44.7k	\$51.4k	Erosion control (rock)
544	\$76k	\$121k	Rodent and veg. control
684	\$491k	TBD	TBD
773	\$106k	\$225k	Erosion control (rock); veg. control; AWR; Rodent control
828	TBD	TBD	TBD
1007	TBD	TBD	TBD
1608	\$300k	TBD	TBD
1614	\$380k	\$100k to \$150k	Erosion control (rock)
2042	\$590k	\$125k	Erosion; veg. control; AWR; rodent control
2058	TBD	TBD	Veg. control
2062	TBD	TBD	TBD
2064	TBD	TBD	TBD
2074	\$650k	TBD	TBD
2075	\$60k	\$30k-\$40k	Veg. control; erosion control
2085	TBD	TBD	Seepage and Erosion control (rock)
2089	\$21.4k	\$25.2k	Veg. control; erosion control
2094	TBD	TBD	TBD
2095	TBD	TBD	Seepage and Erosion control (rock)
2096	TBD	TBD	TBD
2107	TBD	TBD	TBD
2115	None	25k - 100k	Erosion control (rock); AWR; veg. control
2116	TBD	TBD	TBD
2119	\$250k to \$300k	\$230k	Erosion control (rock); pay down \$2M in debt
2126	None	\$42k	Erosion control (rock); AWR; veg. & rodent control

5.6 Ecological Flood Management Challenges

Historic habitat loss and the presence of several threatened and endangered species, although not solely the result of historic and present flood management activities, is a major challenge for flood managers attempting to manage or improve flood control infrastructure (channels, levees, diversion and grade control structures, detention basins, and dams) in the Regions. State and federal laws and policies prohibit destruction of endangered species habitat and encourage restoration of wetlands and habitat for a variety of species. Flood system improvements that impact endangered species may be precluded by State and Federal law or require expensive mitigation requirements. Conversely, flood system improvements that also improve habitat for endangered species may be prioritized for State and Federal flood management funding and eligible for a variety of funding sources reserved for habitat restoration.

5.6.1 *Endangered and Declining Species Challenges and Risks*

Most of the native riparian and aquatic species in the Regions are extirpated, extinct, listed as threatened or endangered by the state or federal government, or significantly diminished from historical levels. Consequently, legal requirements to protect steelhead, Chinook salmon, Delta smelt, riparian brush rabbit, green and white sturgeon, and Swainson's hawk habitat during flood system construction projects is a major permitting challenge. In addition to these species, there are several other species that are or have been affected by the loss of riverine, floodplain, and riparian habitat as shown in the table below (table to be added in later draft). All of these remaining species may be at risk of further decline or extinction without significant habitat improvements in the Regions. Moreover, loss of these species - particularly commercially important species like Chinook salmon - could have significant impacts recreation, quality of life, and the local and regional economy.

INSERT DRAFT TABLE OF HISTORIC SPECIES and STATUS

The severe species decline in the Regions is due to a number of interrelated flood and water management factors including: reduced stream flows due to upstream water diversions, very large water diversions and associated species entrainment from the state and federal water project in the South Delta, the elimination of floodplain habitat due levees, channelization, and reduced seasonal peak flows that are now captured in upstream reservoirs, degraded water quality due to agricultural drainage, and invasive species. Although flood management activities are only one of several factors contributing to species decline, the loss of floodplain and riparian habitat is a major factor that also exacerbates other factors such as degraded water quality and the dominance of exotic species. For example, floodplain wetlands filter degraded water, and fish that rear on floodplains grow to larger sizes and are thus better able to avoid mortality associated with predation and entrainment.

Although restoring floodplain and riparian habitat is necessary to reverse the decline of several species, major changes in operations of upstream reservoirs and the State-Federal water project may also be necessary to prevent extinction. In summary, flood managers face the challenge of managing flood system improvements around the needs of endangered species, but they do not have the ability to make all the changes that are necessary to recover endangered species. Thus, flood managers in the Regions will be constrained indefinitely by the need to protect endangered

species and habitats under several state and federal laws or until other water managers also take complementary actions to protect and recover endangered species populations.

5.6.2 The Role of Habitat Restoration

Multi-benefit flood management projects that restore seasonally inundated floodplains illustrate a prime opportunity for restoring endangered species, but obtaining the local support and financial resources to implement these projects may be a challenge for flood managers in the region. Multi-benefit projects are often more expensive to build than conventional flood management projects, yet they provide more benefits including a more sustainable and resilient flood management system. Obtaining the cooperation and support of other water management and resource agencies to finance and build multi-benefit project will thus be an important part of the effort to improve flood management and remove the constraints currently associated with requirements to protect wetlands, endangered species, and their habitats.

5.6.2.1 The Value of Riparian and Floodplain Habitats

The value of floodplain and riparian and seasonally inundated floodplain habitat for a variety of aquatic and terrestrial species is well documented in the Central Valley. The systematic diminishment of naturally inundated floodplain over the last century is one of the most significant causative factors in the decline in many of the aquatic and terrestrial native species of the Central Valley. The annual cycle of flooding and drying of extensive acreage adjacent to the rivers and streams was the foundation of the ecosystem that these species evolved in and thrived in. Seasonal floodplain inundation was an essential driver of the nutrient, carbon and hydrological cycles that transformed the raw inorganic productivity of the region into the large flocks of waterfowl and seemingly endless runs of salmon that were found here when the settlers first arrived. The levees that were built to permit human development and agriculture cut off these crucibles of native biological productivity and had a major hand in their gradual diminishment.

Floodplain connectivity (i.e. the magnitude, frequency, duration, and timing of a natural or artificial hydraulic connection between a river channel and its floodplain) is a critical element of a healthy river ecosystem. The ability of a river channel to overflow its banks and inundate its adjacent floodplain is essential to maintaining channel and complexity and habitat. Reduced floodplain connectivity results in increased velocities and scour which ultimately lead to reduced hydraulic and habitat diversity. For example, channel confinement by levees increases bed shear stresses and velocities of high flows, thereby increasing the frequency of channel bed mobilization and bank erosion and potentially reducing complexity of the river channel.

Floodplain and channel complexity can influence water temperature dynamics in several ways. Riparian vegetation shading reduces rates of water temperature warming while inundation of complex channel and floodplain features increases hyporheic exchange. High inflows drive hyporheic exchange directly by forcing water into alluvial features such as side channels and sand bars, and indirectly facilitate hyporheic exchange by creating and maintaining complex channel and floodplain morphology.

Floodplains can potentially export biologically available carbon to downstream food webs. Central Valley floodplains can produce high levels of phytoplankton and other algae, particularly

during long-duration flooding that occurs in the spring. Downstream of Central Valley floodplains, the Delta contains several fish species with declining populations, such as the Delta smelt (*Hypomesus transpacificus*), and food limitation is likely one of the factors contributing to these declines. Algae provide the most important food source for zooplankton in the Delta and these zooplankton are a primary food source for numerous Delta fish species. Consequently, a potential benefit of floodplain restoration is an increase in the productivity of food webs that support Delta fish species.

Seasonally inundated habitat is particularly valuable to Chinook salmon (*Oncorhynchus tshawytscha*). Juvenile Chinook have significantly higher growth rates on floodplains than in main-stem river channels, which allows them to better survive on their journey to the ocean and back. Juvenile Chinook can enter and rear on floodplains during their downstream migrations in the winter and early to mid-spring. The juveniles have access to a diverse and dense prey base on floodplains—zooplankton density can be 10-100 times greater in a floodplain compared to the river—along with generally more favorable habitat conditions (warmer, slower water, fewer predators). These conditions translate to faster growth compared to juveniles rearing in rivers. Faster growth rates allow juveniles to attain larger sizes when they enter the estuary and ocean, and body size has been found to be positively associated with survival to adulthood for salmonids.

Sacramento splittail require inundated floodplain habitat for reproduction. Recruitment of splittail is strongly correlated with the duration inundation events in the Yolo Bypass as well as the mainstem San Joaquin; inundation of at least a month appears to be necessary for a strong year class of splittail. Splittail benefit from inundated floodplain in numerous ways. Flooded annual vegetation is the preferred spawning substrate and floodplains may provide abundant food resources for adults prior to spawning and for larva after hatching. Flooded areas may also reduce predation on both eggs and larval fish. Extensive spawning of splittail has also been observed in the Cosumnes River Preserve and splittail rearing in these floodplain habitats generally had higher condition factors than fish rearing in the river or ditch habitats.

5.6.2.2 Challenges of Measuring and Designing Multi-Benefit Floodplain Management Projects

Multi-benefit flood management projects can be designed to increase the quantity and quality of riparian and floodplain habitat, but measuring these attributes, which is a prerequisite to effectively designing and restoring it, has been a significant challenge toward restoration planning and design. However, new tools developed in the last decade are now available to guide floodplain managers. Although counter intuitive, the value of floodplain habitat is largely due to the fact that it is dry most of the year. Seasonal inundation creates a spike in food web productivity exactly when native resident and migratory species need it, often during the juvenile life stage of aquatic species. This allows both aquatic and avian species to move onto food-rich and relatively predator free environment at key periods during their life cycle.

Measuring the quantity of floodplain habitat is far more complicated than simply measuring the area of floodplain. As discussed in the table on the following page, the value of floodplain habitat for a particular species depends on the timing, frequency, and duration of flooding, and the needs of individual species. The expected annual habitat (EAH) method is a new approach for measuring these combination of factors, but practitioners must first specify the timing,

duration, and frequency of flood inundation requirements of a particular species in order to determine how much habitat would be provided by a specific floodplain project.

Table X. Important characteristics of flow events such as floods

Flow characteristic	Definition	Importance
Magnitude	The flow rate, or the amount of water moving past a point during an interval of time (e.g., cubic feet per second). Also referred to as discharge.	The magnitude of flow is directly related to the <i>stage</i> or surface water elevation of water in a river channel. For river water to enter a floodplain a given stage, and thus a given magnitude, must be exceeded. For example, flows begin to crest over Fremont Weir and enter the Yolo Bypass floodplain when the magnitude of Sacramento River flow exceeds 56,000 cfs.
Duration	The length of time that a flow event occurs, or that a specific flow magnitude is exceeded, defined in hours, days, weeks, etc.	The biological benefits of floodplain inundation generally require a certain minimum duration of flooding. For example, splittail spawn on floodplains, so the duration of inundation must be sufficient for adults to enter and spawn and for eggs to hatch. Juvenile Chinook benefit from the high productivity of floodplains and thus would benefit more from two weeks of floodplain access than two days.
Timing	The season or period of the year that a flow event occurs. For example, winter floods, or floods that occur between March 15 and May 15.	River species, such as fish, often use specific habitats at specific times of the year and so the timing, or seasonality, of hydrological conditions can be very important. For example, splittail require floodplains for spawning and only spawn in the Spring, so a flood that inundates floodplain in April directly benefits splittail spawning while the same flood (in terms of magnitude or duration) in December has no direct value.
Frequency	The rate of occurrence of a flow event. Generally discussed in terms of the “expected rate of occurrence” or the probability that an event will occur. Can be expressed as recurrence interval (e.g., a ten-year flood is a flood magnitude expected to happen about once in a ten-year period, on average) or exceedance probability, which is the annual probability that a certain flow magnitude will be exceeded (e.g., a “ten-year flood” has an exceedance probability of 10%).	The frequency of floodplain inundation will determine the frequency that a biological resource, such as a fish population, benefits from floodplain inundation. For example, floodplain benefits produced only rarely (e.g., once every ten years) will provide little population-scale benefits to short-lived fish species.

An analysis of floodplain habitat restoration opportunities in the lower San Joaquin (BDCP South Delta Corridors Analysis) identified two weeks duration every two years during late winter and early spring as a minimum habitat threshold for chinook salmon. The two week duration is based on study from the Consumnes River that measured phytoplankton and zooplankton production on an inundated floodplain over a period of several weeks and found that floodplains must be inundated for approximately 2 weeks before zooplankton production peaks. The two year recurrence requirement for salmon is based on the fact that most salmon have a three year life cycle and thus need inundated habitat roughly every other year to maintain habitat suitability. Additional analysis found that there is virtually no existing floodplain habitat for chinook salmon that meets this minimum threshold in the lower San Joaquin River between Vernalis and Mossdale due to levees and hydrologic alteration by upstream reservoirs.

Similarly, measuring the quantity and quality of riparian *habitat* is more complicated than simply measuring aerial extent and length. Different species require different types of riparian habitat. Fish species, such as Chinook salmon, benefit from shaded riverine aquatic (SRA) habitat along the bank. The quality of the habitat varies depending on the slope and substrate of the bank as well as the density and cover of the vegetation. The Standard Assessment Methodology (SAM) developed by Stillwater Sciences for the USACE's analysis of bank protection on the Sacramento River may be a useful tool for characterizing the quality of SRA and other riparian bank attributes for salmon and other species.

5.6.2.3 The Value of Agricultural Conservation and Habitat

Simply preserving agricultural lands could serve as a multi-benefit flood management project, because agricultural lands, particularly pasture, silage, and field crops, can provide habitat for a variety of terrestrial, avian, and aquatic species while also reducing flood risk for urban areas. Keeping floodplains in agriculture, rather than urban development, is a key opportunity for reducing flood risk over time because the consequences of flooding agricultural areas, particularly during the winter months, are so much lower than the consequences of flooding in urban areas.

Agricultural lands can provide important habitat and flood management benefits whether they are within a floodway or outside a floodway and protected by rural project levees. Agricultural lands within Paradise Cut are prime examples of agricultural lands within floodways and demonstrate that periodic flooding is compatible with continued agricultural production. Several studies have demonstrated the critical value of bypass structures for Chinook salmon, Sacramento splittail, and a host of avian species. Similarly, Paradise Cut provides some of the most important remaining habitat for the endangered riparian brush rabbit. The EAH method described above could be used to determine the suitability of land within a floodway for a particular agricultural crop in exactly the same manner it determines the suitability of a floodplain for a particular species.

Agricultural lands that are protected by levees can also provide important habitat for a variety of species, but does not provide habitat for fish species. Levee protected field crops near riparian areas in the planning area are particularly important for Swainson's hawk. Agricultural fields along the lower San Joaquin River and throughout the Delta also provide important habitat for

shorebirds and waterfowl, particularly during the rainy season or when they are intentionally flooded by farmers.

5.6.3 Challenges of Implementing and Funding Multi-Benefit Flood Management Projects

As discussed above, flood management projects that also restore floodplain and riparian habitat or preserve agricultural lands are necessary to support the recovery of endangered species and may be necessary to expedite flood system improvements under the constraints of state and Federal laws. There are however, a number of constraints to actually building multi-benefit flood management projects that expand floodplain and riparian habitat. These constraints, which vary by sub-region within the Regions, are discussed below. The next chapter of the RFMP will provide an analysis of opportunities for multi-benefit flood management project to address these constraints.

5.6.3.1 Land Use, Topographic, and Hydrologic Constraints

Floodplain and riparian habitat restoration requires a specific set of topographic, hydrologic, and land use conditions in order to provide substantial benefits for species. Creation of frequently inundated floodplain habitat requires relatively low elevation floodplains combined with sufficient flows to frequently inundated floodplain. In addition, is incompatible with urban and certain agricultural land uses and therefore is not economically realistic in many cases.

The nature of these constraints varies substantially across the planning area. The Floodplain Restoration Opportunity Analysis prepared by DWR as part of the Central Valley Flood Protection Plan provides maps that help identify floodplain restoration opportunities in most of the planning areas, but it does not provide an assessment of the drainages in the eastern portion of the planning area. Large areas of the south Delta are too subsided to provide seasonally inundated floodplain. Levee removal in these areas would simply result in large expanses of perennial open water or tidal marsh that do not offer the same kind of benefits to native species that floodplains offer. Urban areas particularly in the Stockton metropolitan area are not suitable for floodplain restoration. Rural areas along the drainages on the eastern side of the planning could be suitable for floodplain restoration, but the flashy hydrology associated with these low elevation watersheds is not likely to result in the duration of inundation required to provide food web or habitat benefits to species like Chinook salmon and Sacramento splittail. Floodplain or riparian restoration along the Calaveras River, however, may have very significant benefits for steelhead.

The best opportunities for floodplain restoration are along the mainstem of the San Joaquin River between Vernalis and Mossdale and along portions of downstream distributaries including Paradise Cut and Old River. Restoration along the lower San Joaquin would provide benefits to the full range of aquatic species including Chinook salmon, steelhead, Sacramento splittail, riparian brush rabbit, and Swainson's hawk. The existing levee configuration combined with the lack of frequent, long duration high flows in late winter and spring is the primary constraint to effective floodplain restoration in the lower San Joaquin River. Under current, upstream reservoir operations, flows are sufficient in approximately ¼ of years to create large inundated areas for two weeks or longer. Thus, even if levees are setback in these reaches, the frequency of

inundation and thus the species benefit will be limited by existing hydrology and reservoir operations.

5.6.3.2 Hydraulic and Hydrologic Limitations

Floodway conveyance capacity in the Regions is already very limited, making it very difficult to create floodplain habitat in the existing floodway without compromising flood conveyance or costly levee setbacks. Set-backs are expensive, and as discussed above, would only increase the area of inundated habitat, not the frequency, which is currently very limited due to upstream reservoir operations. Excavation of floodplains and side channels within the floodway is one way to create *frequently* inundated floodplains without reducing flood conveyance or changing reservoir operations, but it is very difficult and expensive to permit and implement excavation within the floodway. Another way to increase the area of *frequently* inundated floodplain without substantially changing reservoir operations is raising the channel invert so that floodplains are wetted during lower magnitude flows. Raising the channel invert, however, would by design reduce conveyance capacity in the project floodway and would thus be nearly impossible to permit unless adjacent levees were removed or set-back.

As discussed above, there are essentially four ways to create frequently inundated floodplain habitat: 1) set-back levees, 2) grade down floodplains and secondary channels; 3) increase flows, floodplains and secondary channels and 4) constrain the conveyance capacity of the low flow channel by raising the channel invert or depositing large woody debris in the channel. The first two options are very expensive and would have limited benefits in either area or frequency of inundated habitat. The third option would require reservoir reoperation and significant quantities of water, which would be very difficult. The fourth option would create far more floodplain habitat with less water, but would require removing levees or setting them back.

5.6.3.3 Integration with Other Water Management Activities

Other state and regional planning efforts have identified floodplain restoration along the lower San Joaquin River and in the south Delta as a high priority. These efforts include the Delta Stewardship Council's Delta Plan, the Bay Delta Conservation Plan, the State Water Resources Control Board's Bay-Delta Water Quality Control Plan, and the San Joaquin Tributaries Association settlement process. These later two efforts are contemplating changing reservoir operations and stream flows to increase the frequency of floodplain restoration while the former two efforts entail setting-back levees to create floodplain habitat.

Integrating the Lower San Joaquin River Regional Flood Management Plan with these other efforts is a major challenge for a number of reasons. None of these other efforts have both the funding and final approvals necessary to implement floodplain restoration in the planning area. All of these agencies are governed by different boards with different jurisdictions, but none of these boards appears to have the authority to require both changes in flow and floodway geometry that will be necessary to restore frequently inundated floodplain. Given these gaps and uncertainties, it is extremely difficult for this RFMP process to base its planning effort on the stated intention of these other efforts. Without integrating flood management projects in the Regions with these other processes, however, it will probably not be possible to resolve the environmental constraints on flood system improvements in the planning area.

5.6.3.4 Funding Constraints

Finally, most state and Federal grant guidelines are for specific purposes (i.e. they are for flood protection, or water supply, etc.). Multi-benefit projects typically receive more than one grant or funding source, which are required to be applied toward a specific part of the project. This in turn creates a cumbersome accounting process for project sponsors who have to show that money from one grant was used for the “flood” protection of the project, and other funds were used for the “other” benefits.