

California's Flood Future

Recommendations for Managing
the State's Flood Risk

Attachment E: Existing Conditions of Flood Management in California (Information Gathering Findings)

FINAL November 2013

California's Flood Future is provided to help inform local, State, and Federal decisions about policies and financial investments to improve public safety, foster environmental stewardship, and support economic stability



PUBLIC SAFETY

ENVIRONMENTAL STEWARDSHIP

ECONOMIC STABILITY



US Army Corps
of Engineers

STATEWIDE FLOOD MANAGEMENT PLANNING PROGRAM



FINAL

Attachment E: Existing Conditions of Flood Management in CA (Information Gathering Findings)

November 2013

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*California Department of Conservation and Los Angeles County Department of
Public Works*

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Acronyms and Abbreviations

AF	acre-feet
CalEMA	California Emergency Management Agency
Caltrans	California Department of Transportation
CEAC	County Engineers Association of California
CIP	capital improvement plan
CLD	California Levee Database
CRS	Community Rating System
CVFPP	Central Valley Flood Protection Plan
CWP	California Water Plan
Delta	Sacramento-San Joaquin River Delta
DSOD	Division of Safety of Dams
DWR	California Department of Water Resources
EAD	expected annual damage
EBMUD	East Bay Municipal Utilities District
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
Flood Future Report	<i>California's Flood Future: Recommendations for Managing the State's Flood Risk</i>
GIS	Geographic Information System
HAZUS	Hazards United States
HMP	Hazard Mitigation Plan
IFM	Integrated Flood Management
IRWM	Integrated Regional Water Management
IWM	Integrated Water Management
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
O&M	operation and maintenance
OMRR&R	operation, maintenance, repair, rehabilitation, and replacement
PG&E	Pacific Gas and Electric Company
RCD	Resource Conservation District
SCE	Southern California Edison
SFHA	Special Flood Hazard Area
SFMP	Statewide Flood Management Planning
SMUD	Sacramento Municipal Utility District

Acronyms and Abbreviations

SPFC	State Plan of Flood Control
SSIA	State Systemwide Investment Approach
TM	technical memorandum
USACE	United States Army Corps of Engineers

1.0 Introduction

1.1 Background

California is at risk for catastrophic flooding. All 58 California counties have experienced at least one flood event with significant consequences in the last 20 years, resulting in loss of life and billions of dollars in damages. This report, *California's Flood Future: Recommendations for Managing the State's Flood Risk* (Flood Future Report), is the first product of the Statewide Flood Management Planning (SFMP) Program. The Program was developed under the FloodSAFE Initiative to expand California's flood management planning statewide. Specifically, the purpose of the SFMP Program is to make recommendations to inform flood management policies and investments in the coming decades by:

- Promoting a clear understanding of flood risks in California
- Garnering active support for partnerships at the local, tribal, State, and Federal levels¹
- Coordinating with other California Department of Water Resources (DWR) planning efforts
- Identifying strategies and feasible next steps to better incorporate flood management into Integrated Water Management (IWM)
- Promoting an IWM approach for flood management solutions

The initial work of the SFMP Program was to collect information in support of the Flood Future Report, as well as to build unique partnerships with local flood management agencies, the County Engineers Association of California (CEAC), Federal Emergency Management Agency (FEMA), and the United States Army Corps of Engineers (USACE). Throughout the Flood Future Report, determinations about specific flood terms were made that may not represent the specific terms used by partner agencies. These terms are described in Textbox 1-1. A description of the Flood Future Report components, organization, and layout is provided in Appendix A.

1.2 Purpose

The purpose of the information gathering effort discussed in this technical memorandum (TM), presented as Attachment E to the Flood Future Report, was to gather flood management information from local, State, and Federal agencies to develop a better understanding of the existing conditions of flood management in the State of California.

In addition to compiling USACE and in-house information, DWR recognized the need to contact local agencies to collect additional information. For the first time, the SFMP Program focused on gathering information from the broad spectrum of local agencies engaged in flood management. The goal of this effort was to:

¹ Hereafter in this document, the mention of governmental agencies is implicit to include tribal entities.

- Build relationships with local flood management agencies
- Assess and document the needs and opportunities for flood management improvements statewide
- Initiate cataloging local flood infrastructure information statewide
- Identify planned/proposed flood management projects

This TM was developed to provide a detailed description of the methodology and results of the information gathering effort and to supplement information presented in the Flood Future Report. The results of the information gathering effort support the following key tasks included in the development of the Flood Future Report:

- Inventory existing infrastructure
- Assess statewide exposure to flood hazard
- Identify IWM opportunities
- Identify challenges and opportunities for flood management
- Identify finance strategies
- Develop recommendations

1.3 Overview of TM Organization

The following sections summarize the methodology and results of the information gathering effort:

- Section 1: Introduction
- Section 2: Information Gathering Methodology
- Section 3: Results of the Information Gathering Process
- Section 4: Existing Conditions of Flood Management in California
- Section 5: References

This attachment is supported by the following technical appendices:

- Appendix A: Flood Future Report Components
- Appendix B: Agency Types and Contacts
- Appendix C: SFMP Metadata Template
- Appendix D: Infrastructure Inventory Supplemental Information
- Appendix E: List of Potential Projects in California
- Appendix F: Beta Test Results
- Appendix G: Information Gathering Meeting Materials and Tools
- Appendix H: Glossary

Textbox 1-1: Agencies Differ in Flood Terminology

One of the challenges in a multi-agency effort is resolving language and culture differences between agencies. Staff from both USACE and DWR who are responsible for developing this report have made a conscious choice to adopt certain terminology throughout the documents.

As an example, USACE has adopted ***flood risk management*** as the term to describe a broad flood program that encompasses planning, construction, and operation, maintenance, repair, rehabilitation, and replacement (***OMRR&R***). DWR executes a similar broad program, largely through its Flood Management Division. As a result, DWR uses the term ***flood management*** in much the same way USACE uses *flood risk management*.

Another term used throughout this document is ***100-year flood*** (or some other x-year flood). Although these terms are commonly used, both USACE and DWR prefer using ***1 percent chance flood*** (or a 1-in-100 chance event) to describe a flood that has a 1 percent chance of occurring in any given year. However, legislative language from 2007 directing DWR to undertake new planning using bond proceeds uses 100-year flood.

For Federally funded projects, the definition of operation and maintenance (***O&M***) includes the local entity's financial obligation for OMRR&R of the implemented project. OMRR&R is a non-Federal responsibility when local, regional and/or State entities partner on a Federal project. DWR typically uses O&M to refer simply to operation and maintenance, although repair and rehabilitation are sometimes included depending on project specifics. References to O&M provided in this report include OMRR&R responsibilities when the project is a Federal/non-Federal partnership.

For this report, both agencies agreed that, although language and cultural differences remain, it is more important to focus on the shared responsibility of performing our flood risk management or flood management missions rather than the use of specific phrases not in each agency's respective culture. A glossary is included to help the reader understand specific terms used by flood professionals and those terms that are used to define specific agency missions.

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2.0 Information Gathering Methodology

2.1 Information Gathering Task Organization

The information gathered throughout the SFMP Program serves to support the development of all the other components of the program, primarily the Flood Future Report, as shown in Figure E-1. The process used for gathering information was critical to ensuring that the types of information collected could be utilized to provide a complete picture of flood management statewide.

The information was used to complete many other components of the SFMP Program, such as developing a list of planned projects that includes IWM projects, identifying risk information statewide, and identifying challenges and opportunities faced by local flood management agencies.

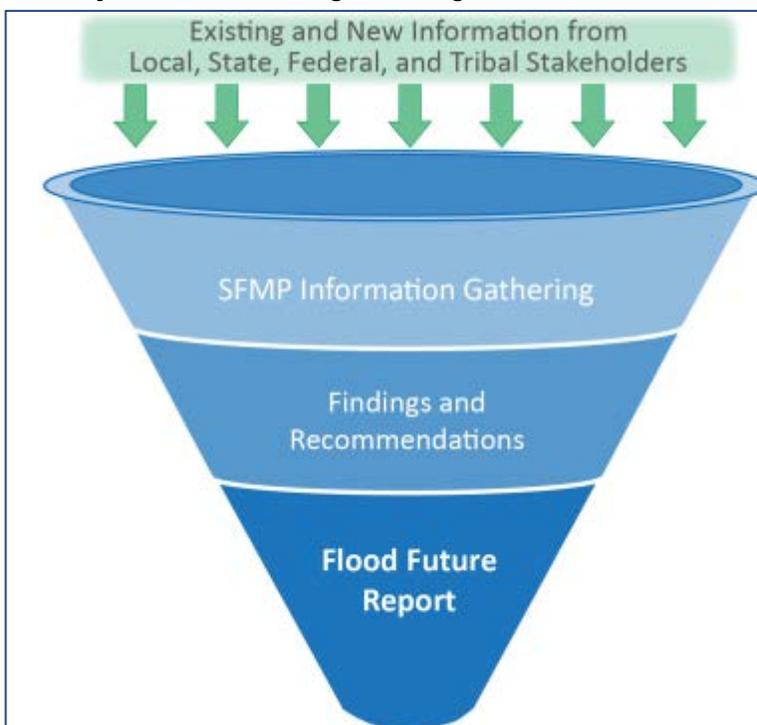


Figure E-1. SFMP Process Flow

Contacting local, State, and Federal agencies, as well as other stakeholders, throughout the state required extensive organization and coordination. This was accomplished by parsing the information gathering effort into three stages, as follows:

- **Stage 1:** Collection and analysis of existing information from DWR and USACE archives
- **Stage 2:** Outreach to targeted local, State, and Federal entities
- **Stage 3:** Statewide information gathering

2.2 Stage 1 – Gathering Existing Information from DWR and USACE

Stage 1 of the information gathering effort involved the collection, inventory, and analysis of information from archives of DWR and USACE. USACE participation included its three California districts (Los Angeles, Sacramento, and San Francisco), as well as the South Pacific Division. The SFMP project team met several times with DWR staff and the USACE district and division staff to identify relevant reports and ongoing (active) projects. In addition, the SFMP project team reviewed Web sites of local agencies identified by DWR and USACE for relevant information and collected information on risk, infrastructure, IWM, and finance, when it was available.

The purpose of Stage 1 was to collect as much existing information as possible prior to outreach to the local agencies during Stages 2 and 3. This ensured that the effort to collect information was not duplicated between the team and local agencies.

During Stage 1, information was solicited from the following programs or groups:

- DWR managers
- DWR Division of Flood Management
- DWR Division of Safety of Dams (DSOD)
- DWR Flood Projects Office
- DWR FloodSAFE Environmental Stewardship and Statewide Resources Offices
- DWR California Water Plan (CWP) Integrated Water Management
- USACE Sacramento, San Francisco, and Los Angeles Districts

In addition, Stage 1 resulted in the compilation of several products for use during Stage 3, including the following:

- **List of dams under the jurisdiction of the DSOD** - The DSOD has jurisdiction over approximately 1,500 dams in the state. A list of dams was compiled to display possible flood-related dams owned by a local agency.
- **Map of levee infrastructure from the California Levee Database** - These data were collected under previous efforts by DWR and compiled in a Geographic Information System (GIS) in the Flood Risk Assessment and Management Office. The data included levee centerline information for the entire state. A map of the California Levee Database (CLD) entries in each respective service area was provided to each agency. The CLD is slated to become available to the public in the future (DWR, 2012a).
- **List of existing USACE reports on flooding and flood projects in California** - USACE has produced hundreds of reports on flooding and flood projects in the state. Many of these reports had been collected previously by DWR and were available in scanned image files for SFMP use.
- **Subventions projects** - The Division of Flood Management, Flood Projects Office, distributes funds to reimburse costs to local agencies for approved flood management projects in the state. DWR provided the SFMP project team with a table of projects that were eligible for subvention funding.

2.3 Stage 2 – Stakeholder Outreach

The purpose of Stage 2 was to involve targeted stakeholders and project partners through their existing committees and organizations. This was the first step in collecting information outside DWR's immediate resources, as described in Stage 1.

The Stage 2 process sought to maximize the initial information gathering effort by contacting multi-agency and/or multi-regional entities with known flood management responsibilities in the state. In addition, Stage 2 provided an opportunity to initiate relationship building between stakeholders and DWR, which created a basis for future interaction and cooperation throughout the SFMP effort. For example, organizations like CEAC, California Emergency Management Agency (CalEMA), and the CWP Tribal Communications Committee were initially identified for Stage 2 stakeholder outreach.

Several strategies were used to reach stakeholders in Stage 2, such as briefings at regularly scheduled stakeholder meetings, presentations for committees involved in statewide flood control, and telephone and email solicitation for information from utilities.

Specific SFMP information gathering efforts in Stage 2 included:

- Briefings at regularly scheduled meetings hosted by CalEMA and FEMA, and the CEAC Flood Control Committee
- Telephone update with the water/flood policy director for California State Association of Counties
- Presentations at the Floodplain Managers Association Annual Conference, the CWP Plenary Meeting, and the CWP Flood Caucus
- Meetings with the CWP Tribal Communications Committee and the CWP Public Policy Committee
- Telephone and e-mail solicitation for information from California utilities, including Southern California Edison (SCE), Pacific Gas and Electric Company (PG&E), East Bay Municipal Utilities District (EBMUD), and Sacramento Municipal Utility District (SMUD)²
- Telephone and e-mail solicitations for information from relevant State agencies, including DWR Integrated Regional Water Management (IRWM) and the California Department of Transportation (Caltrans)
- Telephone and e-mail solicitations for information from relevant Federal agencies, including U.S. Forest Service and U.S. Bureau of Reclamation

² Note: As of this writing, the SFMP project team has not received information from SCE, PG&E, or SMUD.

2.4 Stage 3 – Statewide Information Gathering

The Stage 3 information gathering process started with three beta tests of the proposed approach for information gathering, followed by implementation of the statewide information gathering effort.

2.4.1 Beta Tests

To ensure collection of consistent, useful information during Stage 3, standardized tools, processes, and training materials for information collection were developed. Conducting trial tests (beta tests) with a small sampling of agencies allowed DWR to test the process for information gathering before sending teams to the rest of the counties. Table E-1 lists the three agencies selected for the beta test and the meeting dates.

Table E-1. Beta Test Agencies and Meeting Dates

County	Agency	Hydrologic Regions	Meeting Dates
San Bernardino	San Bernardino County Department of Public Works	South Lahontan, South Coast, Colorado River	May 18, 2011
Santa Clara	Santa Clara Valley Water District	San Francisco Bay, Central Coast	May 13, 2011
Sonoma	Sonoma County Water Agency	North Coast, San Francisco Bay	May 16, 2011

As a result of lessons learned from the beta tests, the SFMP information gathering teams were trained using the refined process and toolset.

For an overview of the beta tests findings, see Appendix F. A series of TMs were developed to further detail the beta test process, results, and subsequent changes made based on findings. Please refer to the SFMP Beta Test TMs for more information.

2.4.2 Flood Agencies and Governance

In California, more than 1,340 local agencies have responsibility for flood management. Flood management is affected by a complex framework of public agencies with overlapping and, in some cases, conflicting mandates. Local flood agency governance structures are defined by an agency’s enabling legislation, charter, ownership, or agreements with other agencies. Agencies contacted during the SFMP information gathering effort represent a broad spectrum of entities with varying duties and responsibilities depending on jurisdiction size, location, geography, and governance.

Types of Flood Management Agencies

Information gathered from agency interviews demonstrated that a broad spectrum of agencies (more than 42 different types) representing many different types of governance has responsibility for flood management in California. Given the array of agencies that have flood-related responsibilities, the complicated nature of flood management coordination is not surprising.

Responsibilities of local agencies vary with location and facility ownership. The responsibilities of flood management agencies typically include watershed management and stormwater management; management of capital improvement plans (CIPs), flood safety, dam operations and safety, operation and maintenance (O&M) of levees and pump stations, water supply, and protection of water resources. These responsibilities can include coordinating with FEMA’s National Flood Insurance Program (NFIP), involvement in FEMA’s Community Rating System (CRS) program, and assistance with flood emergency response.

The seven primary types of agencies that have flood management responsibility include:

- Flood-control districts
- Levee districts
- Special districts
- Reclamation districts
- Cities
- Counties
- Tribal entities

Typically, counties are responsible for flood management of facilities or systems in unincorporated areas of the county, and cities are responsible for facilities within their jurisdictional boundaries. The table in Appendix B describes each of these primary types of agencies in detail. Table E-2 summarizes the number of different types of agencies identified as having some level of flood management responsibility in each hydrologic region.

This information, however, does not account for every agency that has flood management responsibility in the state; therefore, future efforts should work to identify additional information on flood management agencies.

Flood Management Governance

The large number and complexity of flood management entities and their different responsibilities result in a number of challenges for planning, funding, permitting, constructing, operating, and maintaining flood management facilities. Typically,

Common Types of Agencies with Flood-Related Responsibilities:

- ✓ Cities
- ✓ Counties
- ✓ Reclamation Districts
- ✓ Special Districts
- ✓ Tribal Entities
- ✓ Emergency Services
- ✓ County Service Areas
- ✓ Resource Conservation Districts
- ✓ Public Works Departments
- ✓ Water Districts/Agencies
- ✓ Community Services Districts
- ✓ Flood Control and Water Conservation Districts/Agencies
- ✓ Irrigation Districts
- ✓ Levee Districts
- ✓ Drainage Districts
- ✓ Utilities Departments
- ✓ Municipal Improvement Districts
- ✓ Storage District
- ✓ Planning Departments
- ✓ Sewer/Sanitary Departments
- ✓ Stormwater Departments
- ✓ Agricultural Department
- ✓ Health Districts

...

large urban areas have flood management agencies, and rural counties or those with low exposure to flooding are often handled by emergency responders or a single contact at the county level.

Agency roles and responsibilities are both defined and sometimes limited by how the agency was formed—enabling legislation, charter, memorandum of understanding with other agencies, or ownership. This is notable because agency funding is tied to governance structure. Details regarding the relationship between funding and governance structure are provided in *Attachment I: Finance Strategies*.

Duties of flood management agencies sometimes overlap or must be coordinated with other functions. Examples of overlap include situations such as the following:

- Flood management agencies could be responsible for either managing or coordinating with surface water supply or groundwater management programs, particularly given the emphasis on IWM.
- Some agencies must coordinate with clean water programs under the jurisdiction of the National Pollutant Discharge Elimination System.
- Flood management is also part of land use planning and must be coordinated with emergency services.

Table E-2. Types of Agencies with Flood Related Responsibilities by Hydrologic Region

Hydrologic Region	TOTAL	Flood-Related Special Districts	Cities	Levee District	Reclamation Districts	Tribal Entities Federally Recognized	Tribal Entities Federally Non-Recognized
Central Coast	78	40	34	0	0	1	3
Colorado River	41	8	21	0	0	12	0
North Coast	109	50	24	0	0	28	7
North Lahontan	23	13	3	0	0	5	2
Sacramento River	326	173	49	9	61	28	6
San Francisco Bay	146	46	88	0	9	1	2
San Joaquin River	208	63	37	4	85	12	7
South Coast	265	58	181	0	0	22	4
South Lahontan	29	12	9	0	0	6	2
Tulare Lake	118	57	37	1	12	7	4
TOTAL	1,343	520	483	14	167	122	37

Conclusions

The information gathering process confirmed that counties are an appropriate focal point for geographic flood management information. The county typically understands the duties and roles within its jurisdiction, even when it does not have

primary responsibility for a particular function. The information gathering process revealed that an array of local agencies needs to be included in the planning process to provide a more complete understanding of statewide flood management.

2.4.3 Statewide Information Gathering Process

Organization

Because most counties have some responsibility for flood management, the SFMP team determined that using counties as the main point of contact would facilitate collection of flood information across the state. In addition to the three agencies interviewed during the beta test process, the teams were initially assigned to meet with representatives from each of the 58 counties and from several agencies that have major flood management responsibilities (76 meetings in total).

To achieve the SFMP objective of incorporating input from local agencies across the state, the information gathering effort was divided into 12 regions. One team was assigned to each region, as shown in Figure E-2.

A 2-day training workshop was conducted on July 14 and 15, 2011, to ensure that information was gathered in a consistent manner. Workshop attendees included 38 team members, 14 DWR staff members, and 2 USACE staff representatives.

List by County of Agencies Contacted

To identify agencies to contact for SFMP information gathering, each county was queried regarding flood management operations. Additional agencies were identified in the DWR Directory of Flood Officials. The counties and flood agencies were requested to identify other local agencies with flood management duties. At least one agency in each county was identified as having flood management responsibilities and participated in the SFMP information gathering survey.

These flood management agencies were then asked again if any other entities in their counties should be included in the information gathering process. In many cases, cities, public safety departments, water supply agencies, and other flood management districts also had flood management responsibilities within county service areas. Some counties requested to have tribes and/or IRWM groups participate in the in-person meeting, along with the county's staff. These entities are marked with an asterisk as "additional agencies" in Table E-3.

As a result, more than 140 agencies were contacted and interviewed between August and October of 2011. Table E-3 lists the agencies contacted from each county. Figure E-3 shows the participating flood management agencies.

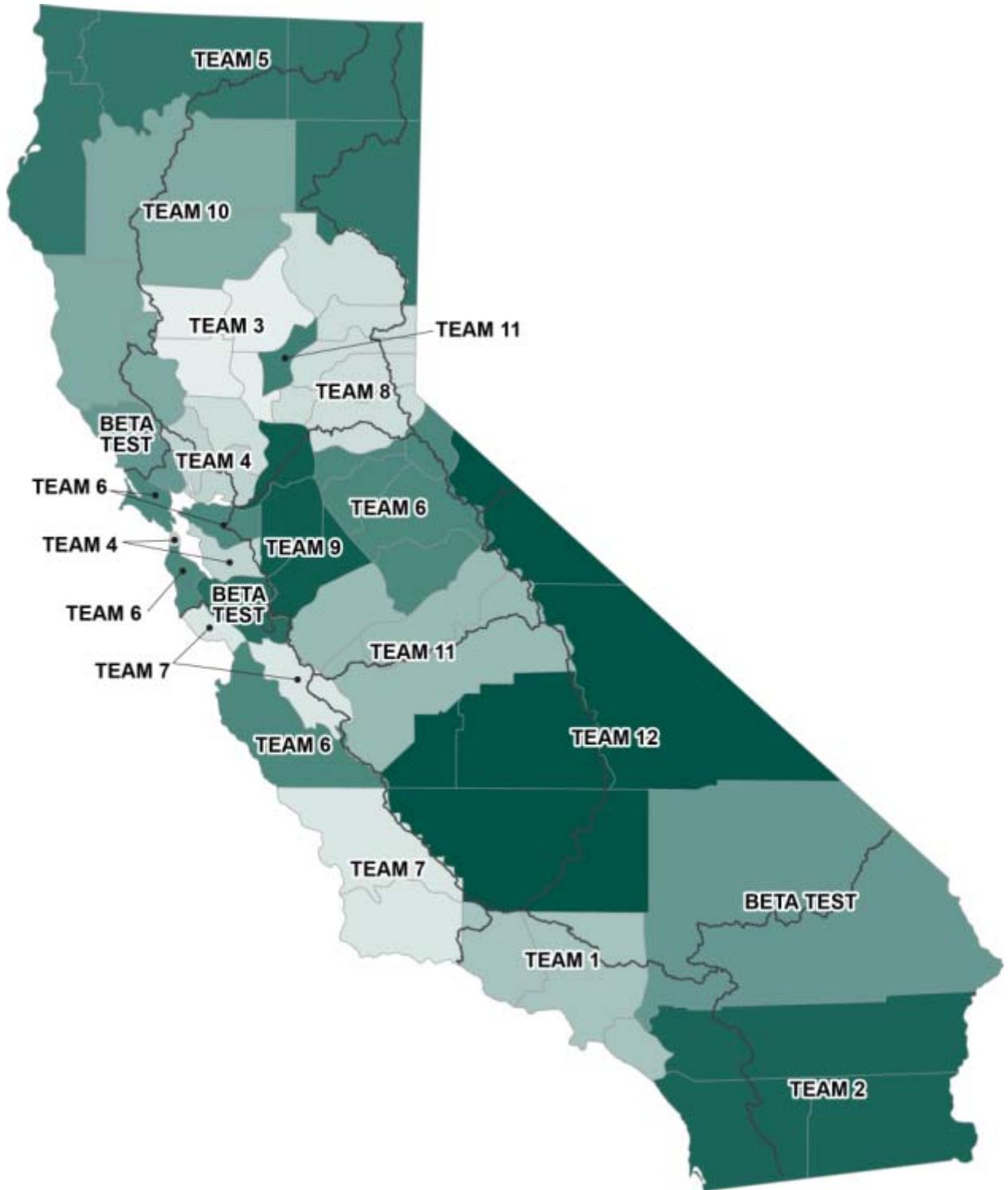


Figure E-2. SFMP Information Gathering Regional Teams

Table E-3. List of Agencies Contacted by County

County	Agency	Hydrologic Region(s)
Alameda	Alameda County Flood Control and Water Conservation District Alameda County – Zone 7	San Francisco Bay, San Joaquin River
Alpine	Alpine County	North Lahontan, San Joaquin River
Amador	Amador County	San Joaquin River
Butte	Butte County Public Works City of Chico M & T Ranch Sutter Butte Flood Control Agency	Sacramento River
Calaveras	Calaveras County Calaveras County Water District*	San Joaquin River
Colusa	Colusa County Public Works Colusa Basin Drainage District Reclamation District 108/Sacramento River West Side Levee District/Knights Landing Irrigation District	Sacramento River
Contra Costa	Contra Costa Flood Control and Water Conservation District Bethel Island Municipal Improvement District	San Francisco Bay, San Joaquin River
Del Norte	Del Norte County Del Norte County Resource Conservation District Del Norte Flood Control District* Caltrans Region 1 5 Counties Program (Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity counties) Crescent City Crescent City Harbor Smith River Rancheria Yurok Tribe	North Coast
El Dorado	El Dorado County	Sacramento River, San Joaquin River, North Lahontan
Fresno	Fresno County Public Works Fresno Irrigation District Fresno Metropolitan Flood Control District Kings River Conservation District**	San Joaquin River, Tulare Lake
Glenn	Glenn County Public Works City of Orland City of Willows Glenn Colusa Irrigation District	Sacramento River
Humboldt	Humboldt County Public Works Department Humboldt County Office of Emergency Services* Humboldt County Planning Department* Yurok Indian Tribe** Trinidad Rancheria Blue Lake Rancheria Hoopa Valley Tribe Office of Emergency Services Caltrans Region 1 Highway Hydraulics and Maintenance** Humboldt Bay Municipal Water District City of Arcata City of Eureka	North Coast

INFORMATION GATHERING METHODOLOGY

Table E-3. List of Agencies Contacted by County

County	Agency	Hydrologic Region(s)
Imperial	Imperial County Imperial Irrigation District	Colorado River
Inyo	Inyo County - Public Works Inyo County - Sheriff* Los Angeles Department of Water and Power**	South Lahontan
Kern	Kern County Water Agency County of Kern City of Bakersfield Semitropic Water Storage District Kern Delta Water District North Kern Water Storage District Indian Wells Valley Watershed Coordinator/Eastern Kern County Resource Conservation District (RCD)	Tulare Lake
Kings	Kings County Kings River Conservation District Kaweah Delta Water Conservation District City of Avenal Lower Tule River Irrigation District	Tulare Lake
Lake	Lake County Watershed Protection District	North Coast, Sacramento River
Lassen	Lassen County City of Susanville Susanville Rancheria	Sacramento River, North Lahontan
Los Angeles	Los Angeles County Department of Public Works City of Lancaster City of Los Angeles City of Palmdale	South Coast, South Lahontan
Madera	Lower San Joaquin Levee District Madera County Flood Control and Water Conservation District Chowchilla Red Top Conservation District	San Joaquin River
Marin	Marin County Flood Control and Water Conservation District City of Corte Madera City of Mill Valley City of San Rafael City of Sausalito City of Tiburon City of Novato	San Francisco Bay, North Coast
Mariposa	Mariposa County	San Joaquin River
Mendocino	Mendocino County Water Agency	North Coast
Merced	Merced County Public Works Merced Irrigation District	San Joaquin River
Modoc	Modoc County City of Alturas Central Modoc Resource Conservation District	North Coast, North Lahontan, Sacramento River
Mono	Mono County Town of Mammoth Lakes Los Angeles Department of Water and Power**	South Lahontan
Monterey	Monterey County Water Resources Agency	Central Coast
Napa	Napa County Flood Control and Water Conservation District	San Francisco Bay, Sacramento River

Table E-3. List of Agencies Contacted by County

County	Agency	Hydrologic Region(s)
Nevada	Nevada County	Sacramento River, North Lahontan
Orange	Orange County Public Works Santa Ana River Flood Protection Agency	South Coast
Placer	Placer County Flood Control and Water Conservation District	Sacramento River, North Lahontan
Plumas	Plumas County Public Works Feather River Coordinated Resource Management Plumas County Flood Control and Water Conservation District	Sacramento River
Riverside	Riverside County Flood Control and Water Conservation District Coachella Valley Water District	South Coast, Colorado River
Sacramento	Sacramento County Department of Water Resources American River Flood Control District Sacramento Area Flood Control Agency City of Sacramento	Sacramento River, San Joaquin River
San Benito	San Benito Water District	Central Coast, Tule Lake
San Bernardino	San Bernardino County Department of Public Works (Beta Test)	South Lahontan, South Coast, Colorado River
San Diego	San Diego County Flood Control District City of Chula Vista City of Coronado City of El Cajon City of Imperial Beach City of Oceanside City of San Diego City of San Diego Storm Water Division* City of Vista	South Coast, Colorado River
San Francisco	San Francisco City and County San Francisco Department of Public Works	San Francisco Bay
San Joaquin	San Joaquin County Flood Control and Water Conservation District San Joaquin Area Flood Control Agency Stockton-East Water District	San Joaquin River
San Luis Obispo	San Luis Obispo County Flood Control and Water Conservation District	Central Coast, Tule Lake
San Mateo	San Mateo County San Francisquito Creek Joint Powers Authority	San Francisco Bay, Central Coast
Santa Barbara	Santa Barbara Flood Control and Water Conservation District	Central Coast
Santa Clara	Santa Clara Valley Water District (Beta Test) San Francisquito Creek Joint Powers Authority**	San Francisco Bay, Central Coast
Santa Cruz	Santa Cruz County Flood Control and Water Conservation District	Central Coast
Shasta	Shasta County Water Agency	Sacramento River
Sierra	Sierra County	Sacramento River, North Lahontan
Siskiyou	Siskiyou County Town of McCloud	North Coast, Sacramento River
Solano	Solano County Water Agency Reclamation District 2068	San Francisco Bay, Sacramento River
Sonoma	Sonoma County Water Agency (Beta Test)	North Coast, San Francisco Bay

Table E-3. List of Agencies Contacted by County

County	Agency	Hydrologic Region(s)
Stanislaus	Stanislaus County Public Works Turlock Irrigation District	San Joaquin River
Sutter	Sutter County Sutter Butte Flood Control Agency**	Sacramento River Sacramento River
Tehama	Tehama County Flood Control and Water Conservation District City of Corning City of Red Bluff Gerber/Las Flores Community Services District	Sacramento River
Trinity	Trinity County Planning Department Trinity County Department of Transportation* Trinity River Restoration Program 5 Counties Program (Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity counties)**	North Coast
Tulare	Tulare County Flood Control District	Tulare Lake
Tuolumne	Tuolumne County City of Sonora	San Joaquin River
Ventura	Ventura County Watershed Protection District Ventura County Public Works	South Coast, Central Coast, Tulare Lake
Yolo	Yolo County Flood Control and Water Conservation District Yolo County Service Area No. 6* Yolo County City of Woodland City of West Sacramento West Sacramento Flood Control Agency	Sacramento River
Yuba	Yuba County Water Agency Three Rivers Levee Improvement Authority Yuba County Public Works	Sacramento River

* Department or Part of another agency

** Agency attended more than one meeting



Figure E-3. SFMP Participating Flood Management Agencies

Information Gathering Tools

A survey packet containing 18 questions that were developed and refined during the beta tests was used by the SFMP regional teams to gather information from local agencies regarding a range of topics related to flood control. These questions, along with relevant fact sheets, were provided to the agencies for the information gathering meeting. The information gathering tools and tables can be found in Appendix G.

As information was collected, it was listed on a template set up specifically for that purpose. This searchable spreadsheet provided a uniform system for categorizing various types of information from across the state. The template included the following four sections:

1. Agency Contact Record – Provides information for each contact made at an agency
2. Existing Documents Table – Lists documents collected during the information gathering process
3. Financing Strategies – Lists financing strategies used by the agency to fund flood management projects (capital projects and O&M)
4. List of Agency Recommendations – Lists opportunities, challenges, and recommendations for addressing issues related to flood management

The collected documents were reviewed to determine if they were relevant to the SFMP Program. Once the information was collected, it was reviewed in depth and categorized into one of the following groups:

- Information
- Infrastructure
- Proposed flood management projects
- Types of financing
- Risk evaluation
- Local agency recommendations

Documents from these categories were transferred to the metadata template—a searchable database tool enabling the documents to be stored and displayed geographically on DWR’s Flood Risk Document System Web site. See Appendix C for an example of the metadata template. The metadata template consists of two sections:

1. Existing Documents Table – A filtered list of existing documents to be used in the risk, IWM, infrastructure, or finance portions of the SFMP Program. Examples of these documents include feasibility studies and studies performed by other agencies, reconnaissance information, and information about projects that are currently under design or construction, or that have already been built.
2. Integrated Flood Management Table – This list consists of flood management and IWM (termed “integrated flood management” early in this process) projects proposed by agencies, including details such as project purpose, status, funding source, and cost (if available) from the agency interviews, capital improvement plans, and IRWM Plans.

Information Gathering Process

After receiving assignments and training, the information gathering regional teams began contacting the agencies. Once the appropriate staff within the agency was known, a pre-meeting conference call was arranged to explain the SFMP Program, outline what would be discussed in the meeting, and encourage the agency to begin gathering information. The regional team researchers prepared for the meetings by conducting background research from the information collected during Stage 1.

During the in-person meetings, the agencies described their roles and responsibilities with respect to flood management. Most of the meeting was dedicated to the list of 18 questions regarding a range of issues addressed in the SFMP Program (see Appendix G.10). Agencies provided information and shared their concerns and recommendations. Notes from the meeting and the agency’s responses to the worksheet questions were recapped in a meeting summary. Documents and information collected during and after the meeting were added to the information gathering template. Throughout this process, meeting documentation and collected information were uploaded to the DWR LifeRay Web site. LifeRay is a content management system where information for the entire state was stored.

As a final step in the information gathering process, 40 experts on California flood management were interviewed for their insights to improving statewide flood management. Information gathered from all agencies was tabulated and synthesized, then returned to the various agencies for verification and augmentation.

Once the information was reviewed and finalized, the SFMP team summarized the statewide information and provided it to the project team for use in the other components of the Flood Future Report (risk information inventory, finance strategies, IWM, and opportunities and challenges). Section 3 of this TM broadly summarizes this information. Detailed information and analysis are provided in other Flood Future Report attachments. Figure E-4 illustrates the Stage 3 Information Gathering Process, from preparation to processing of gathered information.

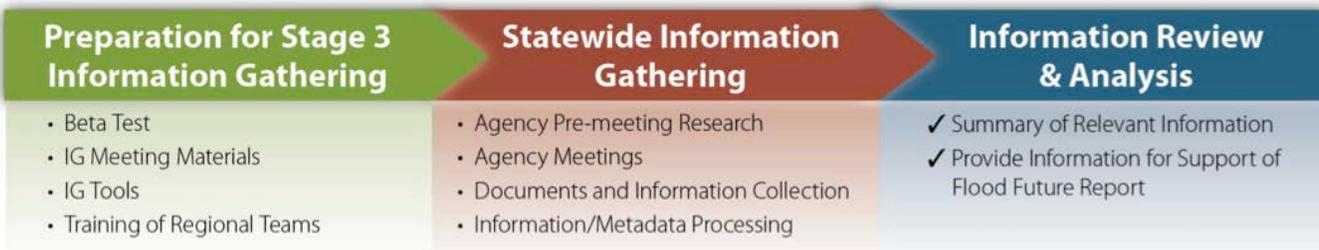


Figure E-4. Stage 3 Information Gathering Process Flow

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3.0 Results of the Information Gathering Process

3.1 Flood Infrastructure

3.1.1 Infrastructure Information Sources

California Levee Database

The initial step in quantifying and identifying existing flood management infrastructure in the state was merging the information held in the CLD into the SFMP information gathering process. Starting in 2005, partnering with FEMA under the auspices of the FEMA Map Modernization Management Support program, DWR started assembling critically needed information on ownership, location, and risk assessment factors for California levees. Recognizing that Federal agencies are engaged in similar work, DWR is actively participating on national committees organized by FEMA and USACE to ensure compatibility and coordination with other efforts. This will help standardize flood management infrastructure mapping in California.

Major features of the CLD include the following:

- Levee centerlines for both Federal/State project levees and nonproject levees. The project levees use surveyed levee centerlines from USACE's National Levee Database. The nonproject levees were identified using U.S. Geological Survey topographic quadrangle maps (Digital Raster Graphics) (USGS, 2012) and FEMA Flood Insurance Rate Map (FIRM) panels (FEMA, 2012).
- Boundaries, such as those of levee districts, State levee maintenance areas, cities, Federal congressional districts, State assembly districts, and hydrologic sub-basins.
- Feature locations, such as those of boreholes, burrow sites, cross sections, encroachments, high-water marks, levee stress, levee failures, and levee relief wells.

These features are refined and populated for all identified levees in California as updated information is available. The levee infrastructure defined in the CLD does not consider the status of accreditation by FEMA. In fact, the CLD includes some agricultural canal levees, railroad grades, and embankments that control water runoff but might not meet the strict definition of "flood control levees." The current status and conditions of the levees were not considered in the initial inventory of statewide infrastructure.

Additional GIS Mapping Information

During the information gathering process, agencies in 15 counties provided flood infrastructure mapping in GIS format. However, in all cases, the GIS data were incomplete and did not represent a comprehensive inventory of existing facilities across the county.

To capture a more comprehensive inventory of infrastructure, the GIS information provided in the CLD and by the local agencies was further supplemented by the National Flood Hazard Layer (NFHL). The NFHL is a computerized database that contains the flood hazard map information from FEMA's Flood Map Modernization program. These map data are from Digital Flood Insurance Rate Map databases and Letters of Map Revision. Infrastructure in the NFHL database includes dams, weirs, levees, flood control structures, and dikes.

Printed Maps

To further supplement the inventory, printed maps of existing infrastructure were compiled and reviewed. These printed maps were either collected directly from the agencies or were extracted from reports and planning documents. More than 200 printed maps were collected from agencies in 43 counties during this effort. Figure E-5 shows which counties contained printed and GIS flood infrastructure mapping provided by the interviewed agencies. From the figure, it is evident that several counties do not have a mapped inventory of flood control infrastructure at this time.

DWR Division of Safety of Dams

Although the inventory of dams shows more than 1,500 dams and reservoirs across the state, few function primarily as flood control structures. These structures vary in type of construction, capacity, and purpose. Many of these structures are multipurpose, serving other functions in addition to flood control, such as debris control and water storage.

3.1.2 Infrastructure Overview

Table E-4 lists the dams and reservoirs that have a flood management function statewide with capacities of more than 100,000 acre-feet (AF). Appendix D provides a full list of infrastructure. The combined total of GIS information from the CLD, individual agencies, and the NFHL for each hydrologic region is shown in Table E-5. Map-based figures showing the infrastructure in each hydrologic region are also included in Appendix D. Figure E-6 shows locations of GIS-mapped infrastructure across the entire state.

Because of the fragmented ownership of infrastructure, no single agency in any county was familiar with all existing infrastructure across their respective county. In many cases, agencies did not even have a complete inventory of infrastructure that they owned and/or maintained. For these reasons, the numbers shown in Table E-5 and on the hydrologic region figures in Appendix D are not necessarily representative of all existing infrastructure.

Legend

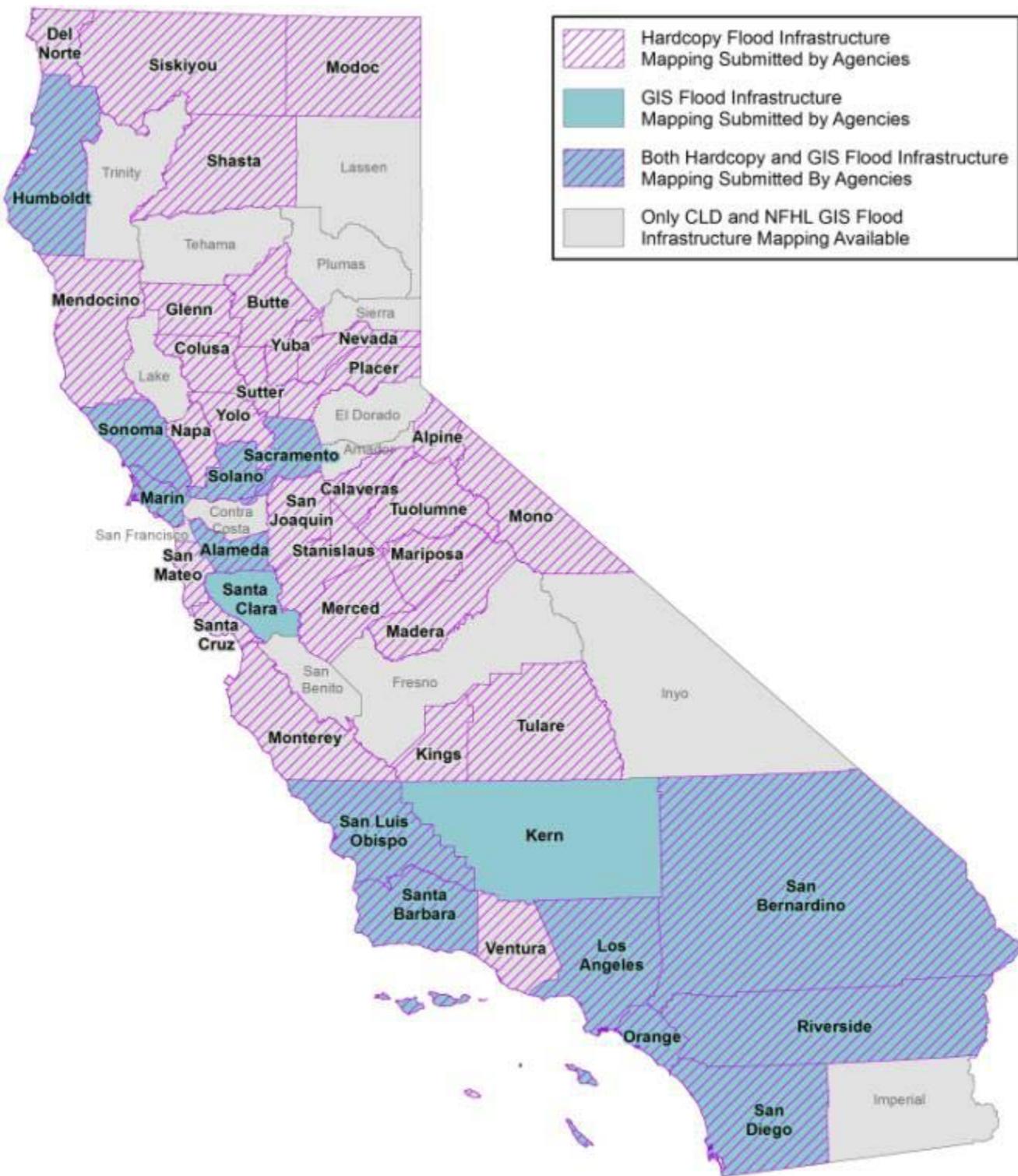
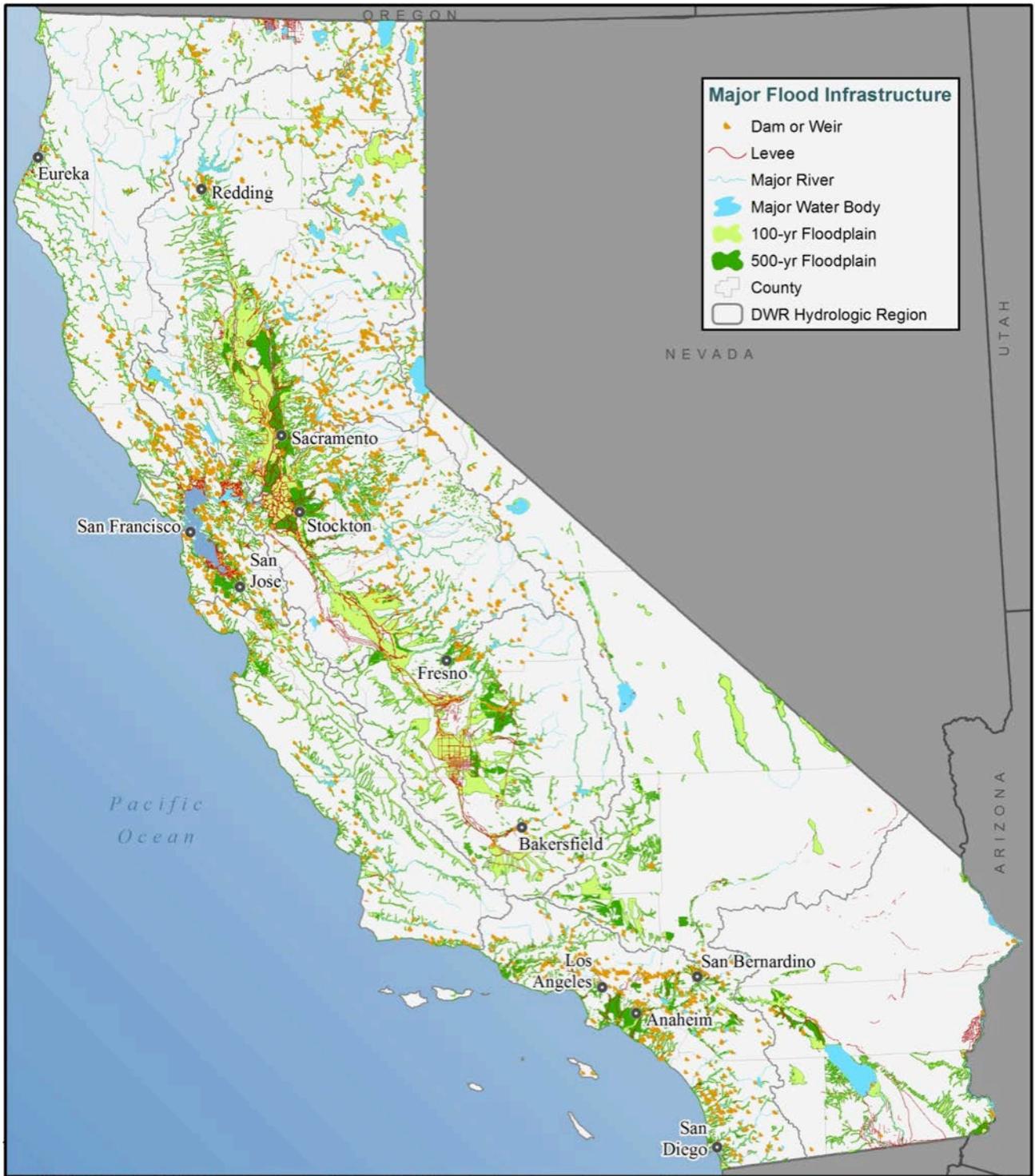


Figure E-5. Flood Infrastructure Data Provided by County



DISCLAIMER: 1) The DWR did not develop the displayed floodplain extents and cannot guarantee their accuracy.
 2) Due to scale of map, not all types of infrastructure are shown. For additional detail, see regional and county maps.

Figure E-6. Statewide Flood Management Infrastructure

Table E-4. List of Reservoirs with Flood Management Function and a Capacity of 100,000 AF or More

Dam Name	Type of Structure	Lake/Reservoir Name	Owner	County	Stream	Year Built	Capacity (AF)	Hydrologic Region
Shasta Dam	Dam	Shasta Lake	Department of Interior, Bureau of Reclamation	Shasta	Sacramento River	1945	4,661,860	Sacramento River
Oroville Dam	Dam	Lake Oroville	California Department of Water Resources	Butte	Feather River	1968	3,537,577	Sacramento River
New Melones Dam	Dam	Melones Lake	Department of Interior, Bureau of Reclamation	Calaveras/Tuolumne	Stanislaus River	1979	2,870,000	San Joaquin River
Trinity Dam	Dam	Trinity Reservoir	Department of Interior, Bureau of Reclamation	Trinity	Trinity River	1962	2,760,870	North Coast
Folsom Dam	Dam	Folsom Lake	Department of Interior, Bureau of Reclamation	Sacramento	American River	1956	1,120,000	Sacramento River
Pine Flat Dam	Dam	Pine Flat Lake	USACE	Fresno	Kings River	1954	1,000,000	Tulare Lake
Isabella Dam	Dam	Isabella Lake	USACE	Kern	Kern River	1953	568,000	Tulare Lake
Friant Dam	Dam	Millerton Lake	Department of Interior, Bureau of Reclamation	Fresno/Madera	San Joaquin River	1942	555,500	San Joaquin River
Camanche Dam	Dam	Camanche Reservoir	East Bay Municipal Utility District	San Joaquin	Mokelumne River	1963	417,120	San Joaquin River
Twitchell Dam	Dam	Twitchell Reservoir	Department of Interior, Bureau of Reclamation	San Luis Obispo, Santa Barbara	Cuyama River	1958	398,120	Central Coast
Castaic Lake Dam	Dam	Castaic Lake	California Department of Water Resources	Los Angeles	Castaic Creek	1973	323,700	South Coast
New Hogan Dam	Dam	New Hogan Lake	USACE	Calaveras	Calaveras River	1963	317,100	San Joaquin River
Cache Creek Dam	Dam	Clear Lake	Yolo County Flood Control & Water Conservation District	Lake	Cache Creek	1914	315,000	Sacramento River
Indian Valley Dam	Dam	Indian Valley Reservoir	Yolo County Flood Control & Water Conservation District	Lake	North Fork Cache Creek	1976	300,000	Sacramento River
Prado Dam	Dam	Prado Reservoir	USACE Los Angeles District	Riverside	Santa Ana River	1941	295,581	South Coast
Casitas Dam	Dam	Lake Casitas	Department of Interior, Bureau of Reclamation	Ventura	Coyote Creek	1959	287,000	South Coast
Stampede Dam	Dam	Stampede Reservoir	Department of Interior, Bureau of Reclamation	Sierra	Little Truckee River	1970	280,250	North Lahontan
Whiskeytown Reservoir	Reservoir	Clair A. Hill Whiskeytown Lake	Department of Interior, Bureau of Reclamation	Shasta	Clear Creek	1963	276,117	Sacramento River
Bradbury Dam	Dam	Cachuma Reservoir	Department of Interior, Bureau of Reclamation	Santa Barbara	Santa Ynez River	1953	239,200	Central Coast
Union Valley Reservoir Dam	Dam	Union Valley Reservoir	Sacramento Municipal Utility Dist	El Dorado	Silver Creek	1963	230,000	Sacramento River
Long Valley Dam	Dam	Lake Crowley	City of Los Angeles	Mono	Owens River	1941	183,465	South Lahontan
Pyramid Dam	Dam	Pyramid Lake	California Department of Water Resources	Los Angeles	Piru Creek	1973	180,000	South Coast
Mojave Dam	Dam	Mojave Reservoir	USACE Los Angeles District	San Bernardino	West Fork Mojave River	1971	179,400	South Lahontan
Coyote Valley Dam	Dam	Lake Mendocino	USACE San Francisco District	Mendocino	East Fork Russian River	1959	155,500	North Coast
Buchanan Dam	Dam	H.V. Eastman Lake	USACE	Madera	Chowchilla River	1975	150,000	San Joaquin River
Shaver Lake Dam	Dam	Shaver Lake	Southern California Edison Company	Fresno	Stevenson Creek	1927	135,283	San Joaquin River
Camp Far West Dam	Dam	Camp Far West Reservoir	South Sutter Water Di	Yuba	Bear River	1963	104,500	Sacramento River
Calaveras Dam	Dam	Calaveras Reservoir	City and County Of San Francisco	Alameda	Calaveras Creek	1925	100,000	San Francisco Bay
Los Vaqueros Dam	Dam	Los Vaqueros Reservoir	Contra Costa Water District	Contra Costa	Kellogg Creek	1997	100,000	San Joaquin River
Santa Felicia Dam	Dam	Lake Piru	United Water Conservation District	Ventura	Piru Creek	1955	100,000	South Coast

Source: DWR, 2013

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Table E-5. Summary of Flood Management Infrastructure Inventory by Hydrologic Region

Hydrologic Region	Inventory of Infrastructure ^a				
	Miles of Levee	Miles of Flood Control Structure	Number of Dams and Reservoirs	Number of Debris Basins	Number of Pump Stations
Central Coast	260	34	80	211	2
Colorado River	1,831	116	20	10	-
North Coast	1,242	15	129	-	-
North Lahontan	25	-	70	-	-
Sacramento River	3,677	206	434	28	156
San Francisco Bay	2,710	594	190	43	20
San Joaquin River	4,758	30	245	-	6
South Coast	1,148	1,912	263	557	172
South Lahontan	244	4	46	270	-
Tulare Lake	4,095	98	52	-	-

^aQuantity of facilities represents only the information gathered from CLD, local agencies, and NFHL; the numbers do not represent all existing flood infrastructure facilities.

Source: DWR, 2012a

3.1.3 Flood Infrastructure Maps by County

Flood infrastructure maps for each county are in *Attachment D: Summary of Exposure and Infrastructure Inventory by County (Mapbook)*. These maps include local agency GIS mapping where it was supplied in addition to the CLD and the FEMA NFHL; therefore these maps do not represent all existing flood infrastructure for the respective county. The information provided in the printed maps is not shown on the flood infrastructure maps. Digitizing and geo-referencing the information in the printed maps was not performed as part of the SFMP effort because of the cost and time requirements associated with verifying infrastructure locations. The countywide maps in Attachment D include information regarding floods of record, types of flooding, floodplain delineation for the 100-year and 500-year events, and county statistics from the 2000 census. Detailed information regarding floods of record is provided in *Attachment C: History of Flood Management in California*.

3.1.4 Infrastructure Information Future Coordination

Between DWR and FEMA, six programs are currently underway to improve the quality of floodplain mapping and flood risk data statewide. These programs include:

- Central Valley Floodplain Evaluation and Delineation
- Alluvial Fan Floodplain Evaluation and Delineation
- Awareness Floodplain Mapping
- Central Valley Flood Protection Plan (CVFPP)
- Mapping Activity Statements
- California Coastal Analysis and Mapping Project

The Federal and State governments plan to share this information with local agencies to assist with understanding flood risk and for land use planning.

3.2 Planned and Ongoing Projects

During the information gathering effort, a number of different sources for planned or proposed projects were identified, including local agencies, USACE, CVFPP, and Sacramento -San Joaquin River Delta (Delta) Programs. The following subsections describe each source for this information.

3.2.1 Local Agency Planned Projects

836 projects, totaling approximately **\$12 billion** in project costs were identified

As part of the Stage 3 information gathering effort, local agencies were asked to identify planned or proposed flood management projects in California. These projects include projects focused on both flood management- and IWM. The list of Local Planned Projects was compiled from numerous sources. Agencies identified projects in their long-term plans during meetings with the Information Gathering teams. IRWM Plan reports and IWM planning documents were used as primary references for planned and ongoing flood projects in each county. Because the intent was to approximate remaining flood infrastructure funding needs, county and city CIP budget reports and Web sites were also reviewed. Other sources for planned flood and conjunctive use projects were Proposition 1E (2006) and 84 (2006) project application lists, and the American Society of Civil Engineers report cards.

As shown in Table E-6, 836 projects, totaling approximately \$12 billion in project costs, are identified in the planned projects list.

Table E-6. Local Planned Projects by Hydrologic Region

Hydrologic Region	Total Local Planned Projects	IWM Projects	Projects with Cost	Number of Projects without Cost	Total Cost (\$ million)
Central Coast	42	29	25	17	280
Colorado River	24	1	21	3	70
North Coast	26	15	15	11	110
North Lahontan	14	5	4	10	20
Sacramento River	159	66	80	79	2,320
San Francisco Bay	118	43	101	17	1,970
San Joaquin River	55	25	47	8	730
South Coast	335	63	325	10	5,740
South Lahontan	33	21	29	4	170
Tulare Lake	30	18	27	3	240
TOTAL	836	286	674	162	11,610

Note: All projects were identified as of January 2012.

As shown, the need for investing in flood infrastructure is high. However, the sum of the project costs shown in the table represent the total cost of the planned or proposed projects because approximately 20 percent of the projects listed do not have cost estimates.

For most agencies, an estimate of the full cost of infrastructure deficiencies or project needs is not known. However, in Orange County, approximately \$2 billion in improvements have been identified to provide 100-year flood protection. The Santa Clara Valley Water District is another example of an agency that has done a comprehensive assessment of flood management needs. As reported in the Santa Clara Valley Water District *2010 Draft Flood Protection and Stream Stewardship Master Plan*, 20 projects plan for and/or construct improvements on 46 miles of creeks to protect homes, schools, businesses, and roadways from flooding. Combined, these projects protect more than 30,000 parcels from potential flood risks. The estimated total cost of these projects is \$1.4 billion, although the designated funding for these projects totals \$1 billion. The balance of needed funds is expected to be funded by a parcel tax that was approved by the community in a two-thirds-approval vote in the 2012 elections. In addition, other agencies have identified costs for miscellaneous needs (e.g., Riverside and San Bernardino counties report \$150 million in miscellaneous projects).

Cost Estimate Limitations

Projects listed without an associated cost estimate are either lacking sufficient detail to develop a reliable cost estimate at this point in the planning process, or no estimate was provided by the responsible agency.

In addition, the project list does not capture the full picture of flood infrastructure needs to meet increased potential flood exposure (i.e., new capital projects) or rehabilitation and replacement of aging infrastructure. This is partially due to current regulatory and financial circumstances and the changing nature of flood risk over time.

In some cases, flood management may represent only a portion of the total project cost. For example, Colusa County has one large proposed project for Sites Reservoir; however, only part of the purpose of this project is for flood management. No attempt has been made to prorate the portion of costs attributable to flood management. USACE and CVFPP projects are not included in this list to avoid double counting.

Also, some agencies reported a USACE or other cost-shared project in their CIP and included the total project cost, without identifying their share of the cost or that of other sponsors. In other instances, agencies reported the total cost of a project, including phases that were already constructed. For many projects, only the planning costs have been estimated and not total project costs (including construction).

Local Planned Project Information Summary

Table E-6 provides a summary of the total cost for projects identified by hydrologic region. Figure E-7 presents a summary of total estimated costs by hydrologic region for local planned projects. The complete list of identified local planned projects is provided in Appendix E.

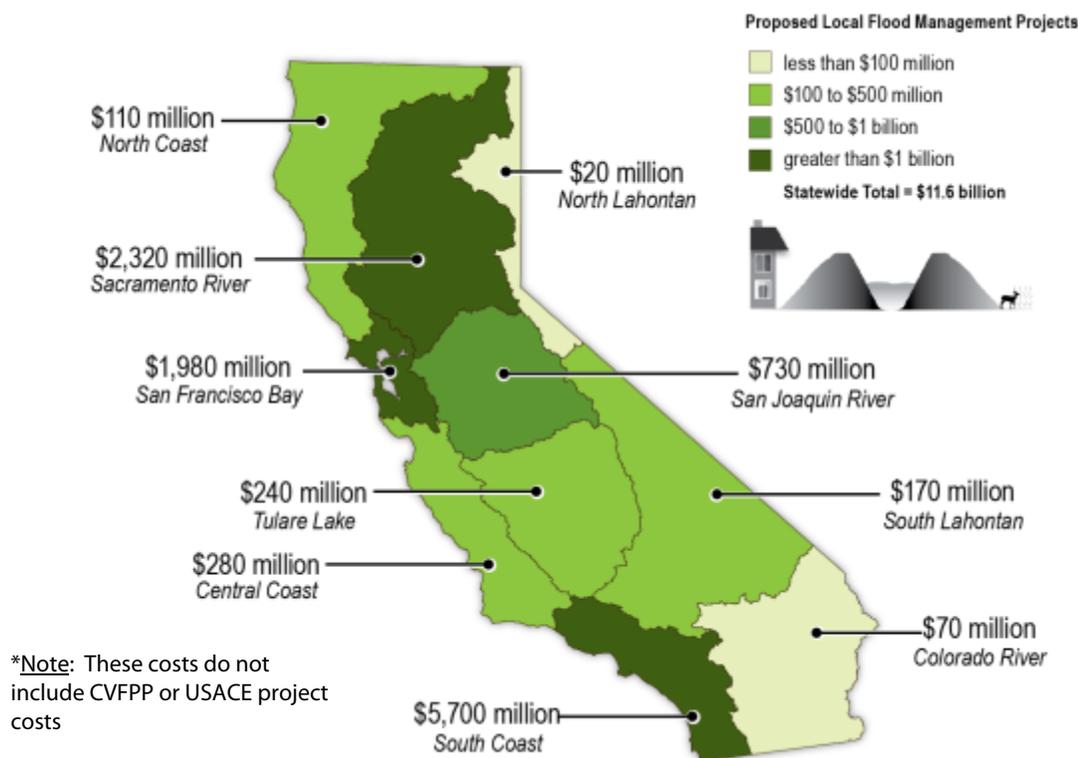


Figure E-7. Map of Costs by Hydrologic Region for Local Planned Projects

3.2.2 USACE Potential and Ongoing Flood Projects

USACE recommends that funding appropriations for flood management projects be included in the President’s budget; however, this recommendation does not imply that any project will receive appropriations. Each request may or may not be included in the Energy and Water Appropriations for any given year. For the 2012 fiscal year, 60 USACE projects in California were identified for a total of approximately \$6 billion (see Table E-7) that USACE will consider recommending. This list comprises new and ongoing general investigation projects, including planning studies and construction projects. The costs listed include Federal and local costs for the full project. Projects from other programs, such as Flood Plain Management Services and Planning Assistance to States, are not captured here. A complete list of USACE potential and ongoing flood projects is included in Appendix E.

Table E-7. USACE Potential and Ongoing Flood Projects by Hydrologic Region

Hydrologic Region	Total Number of USACE Projects	Number of Projects Funded	Total Cost (\$ million)	Number of Projects Funded in FY 2012	Funding Appropriated In FY 2012 (\$ million)
Central Coast	6	6	500	1	6
Colorado River	1	0	0	0	0
North Coast	2	1	150	0	0
North Lahontan	1	1	20	1	2
Sacramento River	3	3	230	1	10
San Francisco Bay	17	17	1,400	5	3
San Joaquin River	4	4	50	1	0.2
South Coast	19	18	2,700	7	41
South Lahontan	0	0	0	0	0
Tulare Lake	7	7	1,030	3	18
Total	60	57	\$ 6,080	19	80

Notes: Potential projects listed are current as of January 2012.

FY = fiscal year

Source: USACE, 2012 and USACE, 2013

3.2.3 CVFPP Proposed Investments

The CVFPP has identified additional flood improvements as part of its State Systemwide Investment Approach (SSIA). The SSIA is the State’s preferred approach for modernizing the State Plan of Flood Control (SPFC) to address current challenges and affordably to meet the CVFPP goals of improving flood management, improving O&M, promoting ecosystem functions, improving institutional support, and promoting multibenefit projects. The SSIA provides guidance for future State participation in flood-related projects and programs in the Central Valley.

- The SSIA, as proposed in the CVFPP, consists of the following elements:
 - Urban improvements
 - Reconstruction, rehabilitation, or improvement of existing urban levees to achieve protection from the 200-year (0.5 percent annual chance) flood
 - Rural-agricultural improvements
 - Levee improvements (such as constructing setback levees, maintaining levee crown elevations, and providing all-weather access roads to facilitate inspection and fighting floods)
 - Hydraulic structure upgrades to combat facility age or operational problems
 - Removal of rock revetment, levees, and other facilities that are no longer functioning
 - Systemwide improvements
 - Large system improvements, such as new bypasses or bypass expansions (and related hydraulic structure modifications)
 - New reservoir storage
 - Operational changes of reservoirs, weirs, and bypasses

RESULTS OF THE INFORMATION GATHERING PROCESS

- Residual risk management
 - Enhanced flood emergency response: All-weather roads on levee crown, flood information collection and sharing, local flood emergency response planning, forecasting and notification, and rural post-flood recovery assistance program
 - Enhanced O&M: Erosion repairs, developing and implementing enhanced O&M programs and regional O&M organizations, and Sacramento channel and levee management and bank protection
 - Enhanced floodplain management: Raising and waterproofing structures and building berms, purchasing and relocating homes in floodplains, managing land use and floodplains, and obtaining agricultural conservation easements

Table E-8 provides a preliminary cost estimate for the SSIA. Areas receiving protection by SPFC facilities were divided into nine implementation regions, as shown in Figure E-8. The costs represent total combined investments for local, State, and Federal agencies for capital improvements and 25 years of ongoing annual work to maintain the system.

Table E-8. Estimated Costs of CVFPP and SSIA by CVFPP Implementation Region

	Urban Improvements	Rural-Agricultural Improvements	System Improvements	Residual Risk Management	Total Cost (\$ million)
Upper Sacramento	120 to 140	150 to 170	110 to 180	100 to 110	480 to 610
Mid-Sacramento	0 to 0	360 to 380	230 to 340	260 to 330	850 to 1050
Feather River	890 to 1,050	280 to 290	1,700 to 2,140	170 to 210	3,040 to 3,690
Lower Sacramento	3,550 to 4,280	80 to 90	1,630 to 1,960	140 to 170	5,400 to 6,500
Delta North	140 to 190	600 to 630	750 to 920	270 to 310	1,760 to 2,050
Delta South	0 to 0	50 to 50	430 to 550	110 to 140	590 to 740
Lower San Joaquin	630 to 810	20 to 20	10 to 10	80 to 100	740 to 940
Mid to San Joaquin	0 to 0	50 to 60	60 to 100	80 to 100	190 to 260
Upper San Joaquin	170 to 200	180 to 190	230 to 300	310 to 400	890 to 1,090
Total	\$5,500 to 6,670	\$1,770 to 1,880	\$5,150 to 6,500	\$1,520 to 1,870	\$13,940 to 16,920

Notes:

The cost estimates include SPFC flood management investments that have already been expended or committed during the 2007 to 2011 period.

Some elements of locally identified projects included in the IWM Project List may be included in the CVFPP overall cost estimates.

All costs are planning-level estimates (in millions) and based on 2011 price levels. Actual costs will vary because of a wide range of factors, including project justification by feasibility studies, project configuration, implementation time, future economic and contractor bidding conditions, and many others.

Source, DWR, 2012b

Planned projects based on the CVFPP will ultimately depend on regional flood management plans and detailed feasibility studies that will refine and define specific improvements, quantitative costs for planned CVFPP projects cannot be provided at this time.³

³Specific project features ultimately implemented for the SSIA will depend on a host of factors. These factors include detailed project feasibility studies; designs and costs; environmental benefits and impacts; interaction with other local projects and system improvements; Federal, State, and local agency participation in project implementation; and changing physical, institutional, and economic conditions.

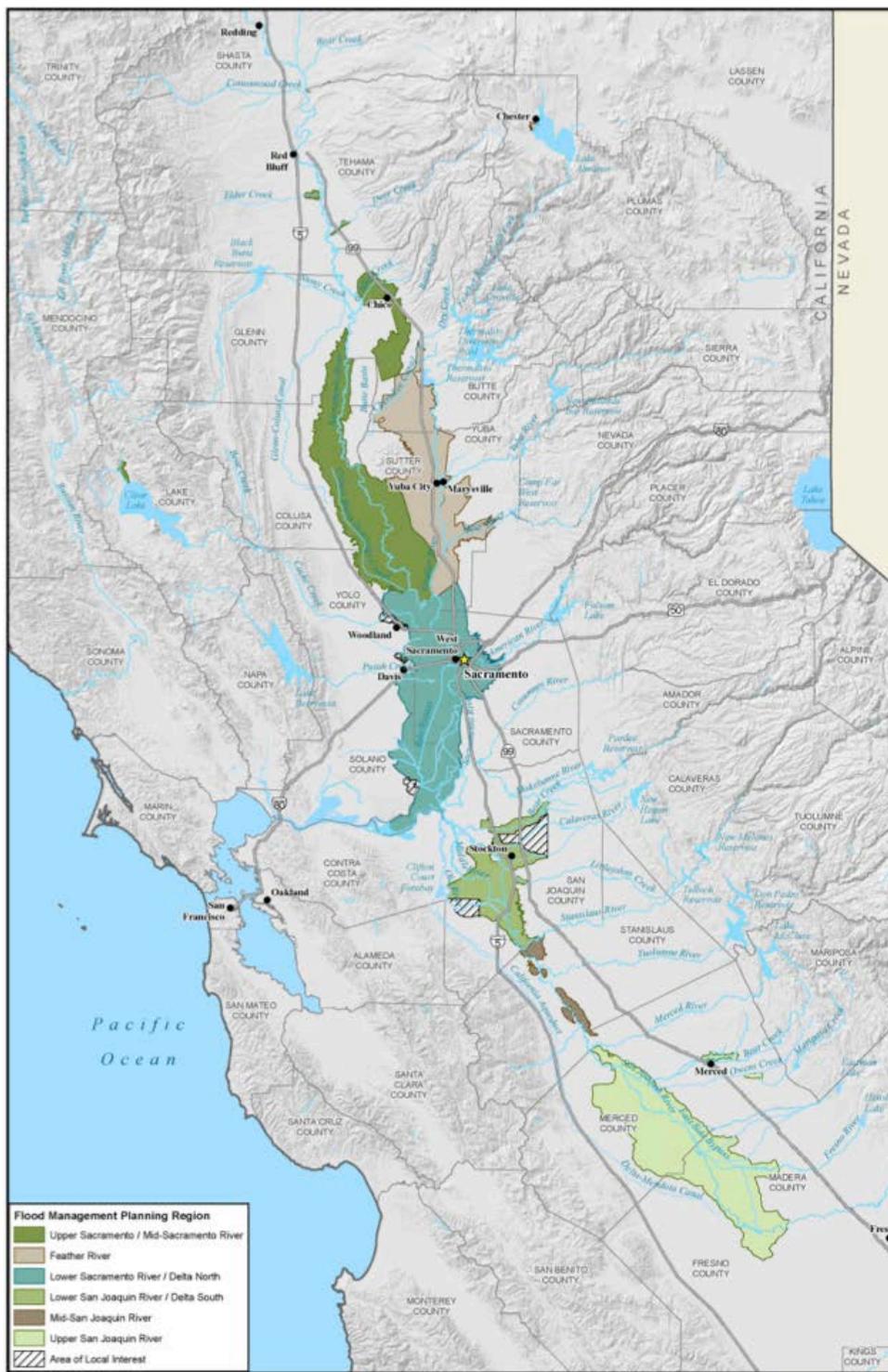


Figure E-8. Central Valley Flood Protection Plan Implementation Regions

3.2.4 Delta Improvement Investments

Currently, no comprehensive flood risk reduction plan exists for the Delta, and no associated cost estimates are available. Costs for future levee improvements will depend on what level of protection is shown to be cost effective for each individual island/tract and for the network of islands/tracts. Levees for individual islands/tracts not only provide direct benefit to the areas they protect but also provide benefit as part of the network of levees that define the water channels and the configuration of the Delta. As a result, the level of protection provided by levees will vary.

Ongoing programs and investigation will influence future plans for the Delta but will not produce a comprehensive flood risk reduction plan for the Delta. Therefore, past studies were used to show a range of potential costs to improve Delta levees to achieve different levels of flood protection.

The estimates from past studies show a wide range of potential improvements with estimated costs ranging from \$0.1 billion to over \$17 billion. With the lower estimate, which accepts more levee failures, responsible agencies will need to place more effort on future recovery from flooded islands/tracts, or make decisions not to recover certain areas after flooding. Considering that these are the available extremes, the likely cost will fall somewhere between these estimates.

3.2.5 Summary of Potential Projects in California

Figure E-9 presents the locations of potential and proposed projects for both local agencies and USACE as of November 2011. Many of the USACE projects could become inactive or be deferred in the near future. Table E-9 shows the estimated costs of all known flood-related projects in California.

These project lists—local, regional and USACE—do not capture the complete extent of flood management needs in California. The lists showcase a full range of flood project needs from planning through construction and O&M at local, State and, Federal levels.

Table E-9. Estimated Cost of Known Projects/Investments

Projects	Cost (\$ billion)
Local Projects	12
CVFPP Investment Needs	14 to 17
USACE Partnered Projects	6
Delta Investments	0.1 to 17
Total	\$ 32 to 52

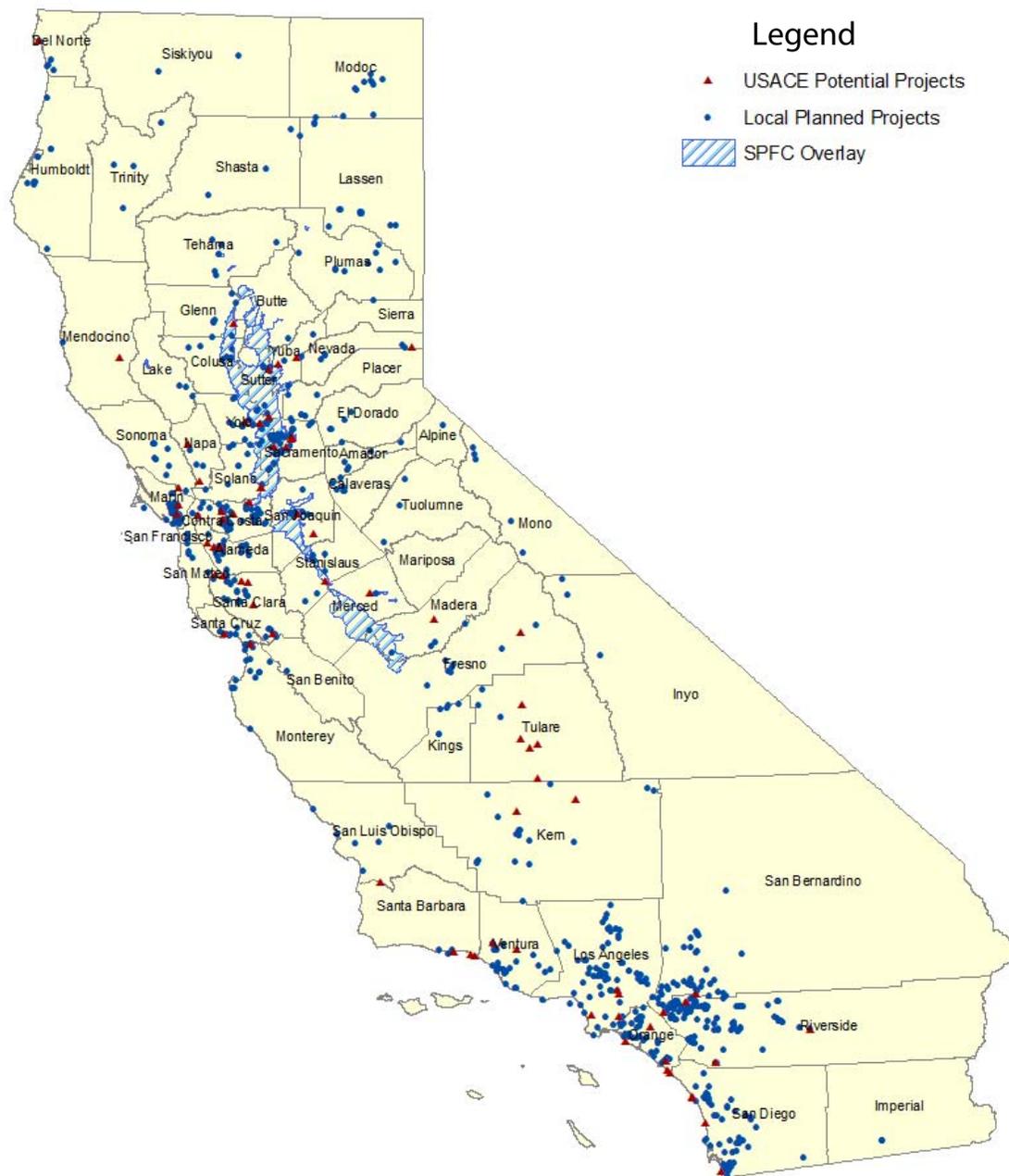


Figure E-9. Location Map of Potential USACE and Local Planned Flood Projects

3.3 Flood Risk Information

A primary goal of the information gathering process was to collect and review local agency documents related to flood risk. To understand how agencies prioritize flood management projects, assess flood risk, and monitor residual risk, agencies were asked who was susceptible to flooding (i.e., who was in harm's way of the hazard) and how historical and projected damages are documented.

3.3.1 Risk Information Assessment

Five categories, based on USACE best practices for determining risk, were used to filter what type of risk information was available in the gathered risk-related documents. This information was then used to develop a statewide flood risk information inventory.

The steps below describe the approach used to identify documents as containing flood risk information:

1. Identify and collect all USACE risk studies for the counties. Review to make sure that the latest version released was obtained.
2. Review all documents and reports that the agencies identified as having risk-relevant information.
3. Catalog the documents and reports by the level of information they contain (i.e., full risk analysis; partial risk analysis; and information related to loading, performance, exposure, and vulnerability).
4. Review documents with potential for full or partial risk information.

Collected risk information was reviewed to ensure that it complied with minimum standards prior to synthesis. To be considered risk relevant, the information had to include at least one of the following components:

- Studies defined components of risk, consistent with components identified herein. The study must identify the hazard (hydrology and hydraulics), performance (likelihood of flooding due to breach of levees, for example), exposure (people or property harmed), vulnerability (susceptibility to loss or damage), and/or consequence (damage and loss of life).
- Studies followed standard practice for computing economic risk, such as using an expected annual damage (EAD) approach. Risk, ideally, would be computed considering a range of events, not simply a single event, such as might be done for a dam-breach study or certain specific design studies.
- Studies had to provide dates of and sources for information (e.g., the dates of structure inventories and hydrology studies upon which the risk analysis is based).

After the technical review, documents were organized by the level of risk assessment completed and/or the available components of risk assessment.

Table E-10 outlines the categories of different levels of risk assessment, depending on the type of information/data available.

Table E-10. Summary of Risk Information Assessment Strategy

Category	Subcategory	Example
Adequate risk assessment (following our definition of risk equaling the function of loading, exposure, consequence)	Recent loading (hazard), exposure, consequence information	Recent USACE feasibility study available
	Dated (old) consequence information	Older USACE feasibility study available
Study with components of risk assessment (as defined), but some components missing	Missing or inadequate consequence information	Local or regional stormwater management study available
	Missing or inadequate hazard or exposure information	Incomplete planning study available (prepared for a different purpose, such as design with specified level of protection without regard to benefit-to-cost ratio)
Components of risk assessment available, but incomplete in context of definition	Incomplete hazard or exposure information	Dam break study with only probable maximum flood considered; FEMA floodplain mapping study
	Incomplete consequence information	Report of damage from single historical flood
No assessment available or assessment components seriously out of date or do not apply minimum standards	N/A	N/A

Notes:

N/A = Not applicable

3.3.2 Gathered Risk Information

Once the available information was gathered from local agencies, the SFMP team developed an inventory of risk-relevant information, in conjunction with a risk exposure analysis using the FEMA “Hazards United States “ (HAZUS) approach, to best characterize flood risk in California.

Further review of the documents revealed that, of the more than 140 agencies participating in the SFMP Program, only a few agencies had specific risk information on consequences and likelihood. Typically, these agencies were partnering with USACE or were seeking funding and, therefore, were following the USACE process for assessing risk. This exercise also revealed that the majority of the agencies referred to FIRMs and Hazard Mitigation Plans (HMPs), which contained the only risk information available for the agency. HMPs identify potential hazards within a jurisdiction, primarily using FIRM and NFIP damage claims, which does not constitute a full risk assessment as defined by USACE.

Further review of the documents revealed that, of the more than 140 agencies participating in the SFMP Program, only a few agencies had specific risk information on consequences and likelihood.

To understand how agencies prioritize flood management projects, assess flood risk, and monitor residual risk, agencies were asked who was flooded (i.e., who was in harm's way of the hazard) and how that information was documented. Agencies typically referred to local hydrologic and hydraulic studies prepared in support of a specific project or FEMA FIRM map. Local agencies did not report flood risk in terms of potential loss of lives. Local agencies have funding limitations and, typically, do not undertake USACE risk assessments due to the cost of data required to complete these studies.

Of the 1,850 documents posted to the DWR database, approximately 700 documents were initially identified as potentially containing risk information and were reviewed for risk-relevant information as described in Section 3.3.1. Of the 700 documents originally identified, a subset of these was included in the SFMP Risk Information Inventory (see *Attachment G: Risk Information Inventory* for further details). Mapping-related documents were used in the SFMP Exposure Analysis (see *Attachment F: Flood Hazard Exposure Analysis* for further details).

3.3.3 Recent USACE Risk Assessment Studies

The USACE recently has worked with local agencies in 23 California counties to develop documents that include a risk assessment. These studies were performed primarily in areas where significant deficiencies were identified by local agencies. Such areas include major streams (e.g., Sacramento and Santa Ana rivers), high-risk population areas (e.g., Los Angeles area), and areas with recurring flood events (e.g., Napa and Santa Clara counties). Figure E-10 shows the locations of recent USACE risk studies throughout California.

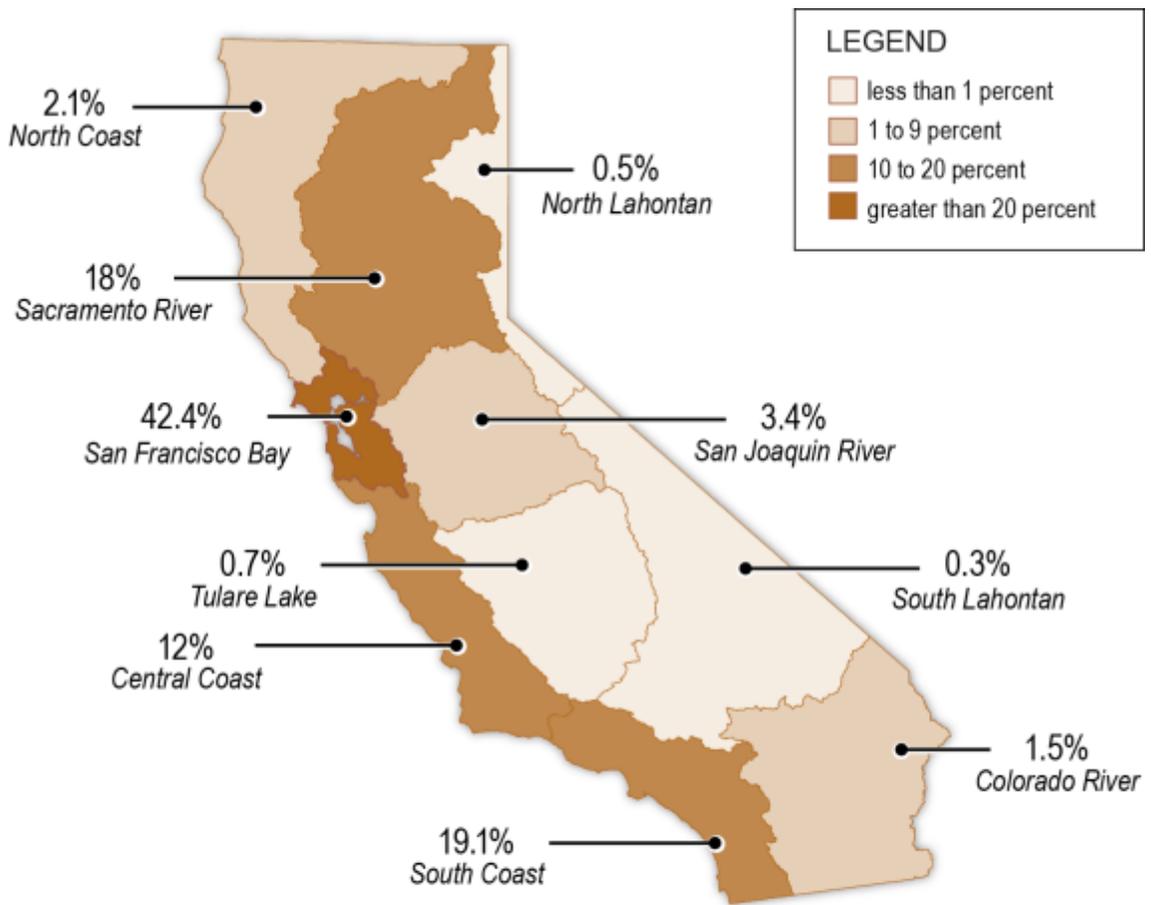
3.3.4 NFIP Claims Information

The database of NFIP claims was reviewed as part of the information gathering effort. The NFIP provides flood insurance to exposed communities. Participation in the NFIP requires a community to adopt and enforce a floodplain management ordinance to reduce future flood risks due to new construction in Special Flood Hazard Areas (SFHAs). The SFHAs and other risk-premium zones applicable to each participating community are depicted in FIRMs. All counties in California participate in the NFIP except Mariposa County, where the steep terrain makes flooding less frequent.

Flooding events occur across the state, and Figure E-11 indicates the distribution of residential costs incurred by hydrologic region. The counties with the largest financial impacts documented are Sonoma, Los Angeles, Marin, Sacramento, Napa, and Monterey counties. The NFIP has paid nearly \$500 million for claims in California since 1978 (FEMA, 2011). These trends in flood damage match the high levels of exposure to flood hazards found in these counties, which are described in *Attachment F: Flood Hazard Exposure Analysis*. See *Attachment G: Risk Information Inventory* for further details on NFIP claims.



Figure E-10. Recent USACE Risk Studies in California



Notes:

1. NFIP claims cover residential structures only. Commercial structures are not covered in this program.
2. Mariposa County is not a participant in the NFIP.

Figure E-11. NFIP Percentage of Claims by Hydrologic Region Since 1978

3.4 Integrated Water Management

3.4.1 What is IWM?

Integrated Water Management is both a philosophy and an approach to promote the coordinated development and management of water-related resources to maximize public safety, economic stability, and environmental stewardship. IWM includes water supply, flood management, and ecosystem activities at all scales—catchment, regional, system, and statewide.

Effective IWM approaches the complex challenges of water management through transparent and collaborative stakeholder processes to align water planning and policies, use funding sources efficiently and effectively, and implement projects that deliver multiple benefits to achieve long-term water sustainability.

Multiple-benefit flood management solutions using the IWM approach provide efficient use of public resources by delivering more benefits at a faster pace, using fewer resources than what is possible from single-benefit projects. Localized, narrowly focused projects are not the best use of public resources and might have negative unintended consequences in nearby regions.

Effective flood management is enhanced by collaboration and partnerships among public agencies at all levels (local, State, Federal) and across geographic boundaries. Coordination among diverse agencies is effective in addressing

jurisdictional and facility ownership issues and restrictions commonly encountered in complex flood and water management projects or in emergency management. Using an IWM approach can provide broader stakeholder support, faster project completion, increased transparency, and access to additional funding sources that might not be available to narrowly focused projects. The use of an IWM approach is particularly useful for achievement of sufficient and stable funding for long-term flood management.

In general, most of the local agencies that were contacted during the information gathering process have a good understanding of IWM. In fact, most agencies have considered an IWM project, and many have incorporated IWM into their agency's mission statement. A few, mostly larger-sized agencies, are actively pursuing funding for IWM projects and have included IWM projects in their CIPs. In contrast, smaller or more rural agencies often struggle with developing IWM projects.



The need to implement flood management using an IWM approach will become even more apparent with increased competition for limited water and financial resources. The value of using an IWM approach is in the results—improved public safety, enhanced environmental stewardship, and statewide economic stability. IWM is examined in depth in *Attachment H: Practicing Flood Management Using an Integrated Water Management Approach*.

3.4.2 IWM Information Gathered

Local IRWM Participation

Changes to the DWR IRWM process, which requires flood management to be included in the plan, provided an opportunity in many regions of the state for local flood management agencies to actively participate in the IRWM process. In some regions, this has enabled projects not only to be incorporated into an IRWM Plan but also to receive high-priority ranking (if projects were IWM in nature). For example, two planned IWM projects scored in the top 10 for the Santa Ana IRWM Plan that was sponsored by the San Bernardino Flood Control District. The two projects each incorporated flood management and groundwater recharge.

Local flood agencies are eager to participate in the IRWM process and are looking forward to the potential for receiving grant funding. Some concerns remain about whether flood agencies have been incorporated as full partners in the process, and other concerns exist regarding some of the criteria that local IRWM groups have used to prioritize projects.

IWM Projects

The IWM information collected shows that flood-related projects have been incorporated with a wide range of other projects to produce integrated or multipurpose projects. Local agencies and USACE provided project information for 320 planned and ongoing IWM projects. Table E-11 shows the numbers of IWM projects for each resource management strategy that are integrated with flood management by hydrologic region. The most common resource management strategies that are integrated with flood management include ecosystem restoration and water supply/groundwater recharge. Projects contained in the CVFPP are not included in this tabulation. See Appendix E for complete descriptions of these IWM projects. More funding is being allocated to IWM projects. Thus, the number, types, and prioritization of projects within the IRWM program will change with funding available through Proposition 84 (2006). All projects were identified as of January 2012.

Table E-11. Number of IWM Projects by Resource Management Strategy

Hydrologic Region	IWM Categories						Total IWM Projects
	Agriculture	Ecosystem	Water Supply	Recreation	Water Quality	Transportation	
Central Coast	1	13	2	1	11	1	29
Colorado River	0	0	1	0	0	0	1
North Coast	0	6	4	1	4	1	15
North Lahontan	0	3	1	1	0	0	5
Sacramento River	0	38	14	3	9	2	66
San Francisco Bay	0	32	2	4	3	2	43
San Joaquin River	0	10	13	0	2	0	25
South Coast	0	28	17	1	13	4	63
South Lahontan	0	6	10	2	3	0	21
Tulare Lake	0	5	10	1	2	0	18
Total IWM Projects by Category	1	141	74	13	47	10	286

All projects were identified as of January 2012.

3.5 Financing Strategies

Funding for flood management projects in California comes from all levels of government. Flood management projects are typically funded by local agencies or groups of local agencies; local agencies and the USACE; State and local agencies; or local, State, and Federal agencies. These funding combinations usually are determined for projects on a project-specific basis to take advantage of available funding sources. In many cases, this approach lacks a systemwide perspective and could result in a reduction of other water-related benefits. This approach could also induce unintended consequences, such as shifting of flood risks to other areas and/or creating negative impacts to the environment.

3.5.1 Information Sources

Local agencies provided their financial information via CIPs, annual budget documents, or in discussions during the information gathering meetings. Information was collected for California city expenditures on flood management from the California State Controller's Office (SCO, 2013). State and Federal information was collected directly from entities or via publicly available records. Sets of data were available for different periods as well; therefore, this information gathering effort focused on data over the 10 years from 2000 through 2009.

Due to the number and different types of agencies that fund flood management in California, identifying and homogenizing funding data were difficult tasks. Different

types of agencies report financial information in different ways. For example, some agencies include planning as part of project capital cost, whereas other agencies include it with O&M expenses.

It was difficult within cities to differentiate between expenditures for flood management and storm drainage, so both are included where available. Most Federal and State agencies are more focused on flooding events as opposed to local drainage issues. Local agencies fund stormwater or local drainage projects; however, these projects are often accounted for in local agency budgets under the transportation department.

3.5.2 Statewide Overview of Flood Management Funding

Increased funding occurred in a number of years due to specific events such as new legislation and bond funding. Funding of flood management projects during this period was highest in the years after September 1, 2001, and in 2009 due to the infusion of Federal funding from the American Recovery and Reinvestment Act. During these two timeframes, there were significant short-term infusions of funding for specific projects within the state. In California, flood management funding began increasing when more than \$5 billion in funding was authorized by the passage of Propositions 1E and 84 in 2006. O&M funding also benefited from these initiatives

Local agency funding statewide ranged from approximately \$1.2 billion to almost \$1.7 billion. However, the funding has been slowly declining since 2008, along with the U.S. economy. This decrease in flood management funding is a result of declining development fees, property taxes, and impact fees, as well as competition for agency general funds. Most of the funding for local agencies went to operating expenses, with little available for construction and rehabilitation of facilities.

For most local agencies, revenue is generated by a type of property tax assessment. Unlike other states, California's ability to invest in its infrastructure is limited by voter-approved initiatives, such as Proposition 13 (1978) (limiting property tax increases) and Proposition 218 (1996) (requiring voter approval for new assessments). Some agencies were able to supplement local revenue with USACE Civil Works funding or DWR grants. Table E-12 provides a summary of the local financing mechanisms used by the agencies that were contacted

Table E-12. Financing Mechanisms Observed in Information Gathered from More than 140 Agencies across California

Mechanism	Used for Capital (C) and Maintenance (M)	Comment
Local Financing Mechanisms		
Property assessments	C, M	Typically in place before Proposition 13 (1978) and Proposition 218 (1996) Impacted by Proposition 13 (1978) and lower property values
Assessment/Improvement/Community Facility Districts	C, M	Many put in place for newer developments
Storm drainage charges	C, M	Typically put in place before Proposition 218 (1996)
Surcharge on sewer bill	C, M	Only in combined sewer areas
General fund	C, M	Typically seen in smaller communities
Impact fees	C	Dependent on growth
Partner with irrigation district	M	Use irrigation district canals for drainage
Countywide sales tax	C	Requires a vote only for a defined period
Federal and State Assistance		
Projects funded by USACE and FEMA	C	Need matching funds, difficult for some agencies to raise
Subvention funds	C	Local agencies need approved USACE project prior to receiving funds from DWR. Local agencies would like to see additional funding for subventions.
Propositions 50 (2004), 84 (2006), and 1E (2006)	C, M	Depends on bond passage
State Transportation Improvement Program	C	Used for drainage-related portions of transportation projects

3.5.3 Flood Management Funding Issues

The information gathered revealed a few key funding issues that will help direct future financing strategies. These funding issues are not related geographically but could be considered systemwide issues, as described below.

Inconsistent and Insufficient Funding

- **Flood management funding is historically inconsistent.** Funding for flood management projects is especially susceptible to reductions in dry-weather years and economic downturns. Flood management funding varies year-to-year due to a variety of factors.
- **Smaller agencies might not have the resources to complete funding applications.** Because some of the information requested on many of the grant or loan applications is information not typically collected by the agency and not quickly developed, smaller agencies might not have the resources to prepare an application. Approximately one-fourth of the

agency interviews resulted in a request that the State provide resources to help with applications.

Declining Local Resources

- **Agencies that have impact fees are affected by the slowdown in growth.** Although storm drainage or flood management impact fees are a good option for growing communities, this source of revenue dries up when growth is stagnant. Approximately one-third of the agencies interviewed discussed the impact of reduced development and the associated impact on fees and the agency's funding ability.
- **Restrictions to increasing property assessments from Proposition 13 (1978) and Proposition 218 (1996).** The majority of flood management agencies depend on some type of property assessment as a revenue source; however, the ability to increase or initiate property assessments to meet revenue requirements has been restricted for some time. More than half of the agencies interviewed suggested that flood management and storm drainage agencies become exempt from the requirements of Proposition 218 (1996), as are water and wastewater utilities.

Reduced Federal Cost Shares

- **Agencies have difficulty raising matching funds for Federal programs.** Many of the agencies are somewhat dependent on Federal or State funds for major capital improvements; however, with limited local revenue generation, many agencies cannot access those Federal funds because they cannot raise the required matching funds. Approximately one-fourth of the interviewees mentioned that agencies were "leaving money on the table."
- **Agencies recognize that Federal funds are becoming scarcer.** With the fiscal problems facing the Federal government, most agencies recognize that Federal funding programs will be reduced, if not eliminated, except in the case of disaster relief. This reduction, coupled with restrictions on the ability to raise local funds, creates a challenging funding environment. Roughly one-tenth of the agency interviews involved discussions about the issue of reduction in Federal funding for projects.

Attachment I: Finance Strategies provides a complete discussion of finance strategies developed as part of the SFMP Program.

4.0 Existing Conditions of Flood Management in California

4.1 Opportunities and Challenges Identified by Local Flood Management Agencies

A major component of the assessment of flood management in California was to gather information from the agencies on opportunities and challenges related to infrastructure, financing, flood management policy, and IWM. More than 350 opportunities and challenges were identified and tabulated from agency meeting summaries. These opportunities and challenges are being used to help develop recommendations. The process for developing recommendations is discussed in *Attachment J: Recommendations to Improve Flood Management in California*.

A review of these recommendations revealed several recurring themes. Some of the same issues that plagued the larger urban counties also affected some of the smaller counties. For example, regardless of the size or land use category, counties expressed frustration with trying to achieve contradictory objectives from multiple environmental stakeholders while complying with permit requirements. Another example of issues challenging large and small counties, both urban and rural, is the common concern about funding O&M for construction projects that were co-sponsored by a Federal or State agency.

4.1.1 Statewide Coordination

- **Improve coordination with and within local, State, and Federal agencies involved in flood management.** More than 80 percent of the information gathering interviews involved discussions about the need for improved coordination between agencies that have responsibilities related to flood management. These discussions covered a number of different issues including:
 - Ø Local agencies encouraged DWR to take a proactive approach in helping agencies communicate their needs to Federal agencies. For example, communication between Federal and State agencies could have prevented the funding dilemma that occurred for one local agency when it was identified as a recipient of Federal funding but was unable to locate a resource for the local cost-share responsibility.
 - Ø Generally, agencies seemed frustrated with the lack of coordination between regulatory and resource agencies. The environmental regulatory process has become so costly that agencies, large and small, have encountered the following difficulties:
 - Build projects due to regulatory changes during project development process.

- Permit projects because during the approval process (i.e., design and permitting process), new flora (wetlands, for example) have established, which change mitigation requirements and potentially increase project costs.
- Comply or come to terms with multiple regulatory agencies that have contradicting objectives and requirements (such as the Regional Water Quality Control Board, California Department of Fish and Wildlife, USACE).
- Local agencies think that many statewide mandates are disjointed, uncoordinated, and not applicable. Most Federal and State policies and regulations are intended for large urban areas and some are applied in a “one-size-fits-all” fashion.

4.1.2 Sustainable Financing

- **Achieve sustainable IWM financing.** More than 80 percent of the information gathering interviews included discussions about the need for sustainable financing for both projects and the follow-on O&M. These discussions covered a number of issues, including the following:
 - DWR should take a proactive approach in helping small, rural, and agricultural communities to participate in the grant application process. For example:
 - Small agencies with limited staff and small jurisdictional populations have large areas to cover but do not have the tax base or funding mechanism to be able to participate in the grant process.
 - Some of these smaller agencies stated that they were not even aware that their county was assigned a regional DWR representative with whom they could talk about these programs.
 - Maintenance is a large part of flood agency operations, and yet agencies have found that maintenance funding and regulatory support are often difficult to obtain. Projects that are built by Federal, State, and local partnerships can underestimate the true cost of O&M because costs are estimated early in the project development process. Agencies, large and small, appreciate having flood infrastructure designed and built in their communities by the partnerships among Federal, State, and local governments, but then the local agencies must take on the responsibility of maintaining those projects. Oftentimes, the local agencies do not have enough funding for O&M, resulting in many projects losing hydraulic capacity over time. In some cases, the agencies have lost their permit to maintain the facilities.
 - Because of the many concerns reported by agencies regarding budgeting and funding for O&M, the SFMP team asked follow-up questions of the counties during the information gathering process. Agencies were asked how much was currently budgeted for O&M, and what budget would be required in the future if all of their ongoing and planned projects were built. Of the 45 counties that responded,

EXISTING CONDITIONS OF FLOOD MANAGEMENT IN CALIFORNIA

77 percent submitted their O&M costs. Table E-13 shows the response results of those questions. Agencies are listed only if they provided budget information. Many agencies reported being underfunded for O&M for existing projects, and most agencies will need a significant increase in O&M budgets to sustain their planned projects. Nine agencies currently have less than \$40,000 budgeted for O&M, with six agencies reporting \$0 for their budget. The reported range of O&M budgets varies greatly from \$5,000 (Del Norte) to \$26,000,000 (Sacramento).

Table E-13. Current and Projected O&M Budgets by County

County ^a	Current Annual O&M Budget ^b (\$1,000s)	Projected Annual O&M Budget Needed ^c (\$1,000s)
Alameda	5,000	8,250
Butte	100	2,000
Contra Costa	3,000	10,000
Del Norte	5	25
Fresno-Kings River Conservation District	1,000	25,000
Fresno-Flood Control and Water Conservation District	797	845
Humboldt	114	660
Inyo	-	18,000
Kern-Irrigation District 1	129	129
Kern-Irrigation District 3	40	40
Lassen	-	-
Los Angeles-City of Lancaster	2,000	20,000
Los Angeles-City of Palmdale	92	920
Madera	230	1,200
Marin	3,000	5,000
Modoc	-	400
Mono	20	60
Monterey	2,000	-
Napa	1,000	-
Orange	14,000	15,250
Riverside	14,300	20,000
Sacramento	26,000	-
Sacramento- American River Flood Control District	2,300	-
Sacramento- Sacramento Area Flood Control Agency	1,800	-
San Benito	-	-
San Bernardino	7,000	-
San Francisco	-	414,000
San Joaquin	2,000	2,000
San Luis Obispo	11,000	16,000
Santa Barbara	3,000	5,000
Santa Cruz	650	1,000
Siskiyou	-	-
Solano	700	4,000
Sonoma	7,000	15,000
Tehama	55	-
Ventura	17,000	60,000

Notes:

^aIf a county is not listed, it did not provide O&M budget information during the verification process.

^bWhere ranges were provided, the high end of the range is listed.

^cThis represents the estimated annual budget needed if all ongoing and planned projects were built.

- The levee accreditation program has put a huge financial burden on many communities that do not have the funding mechanism to build new or to improve existing flood infrastructure. Local agencies want DWR to work with Federal agencies to develop a systematic approach to helping communities identify ways to plan for, construct, and finance improvements needed to attain and maintain levee accreditation.
- Local agencies often cannot qualify for project funding under existing USACE benefit/cost ratio computations. They want to see adjustments to the USACE benefit/cost ratio analysis for rural and disadvantaged areas to include other benefits not currently captured. For example, projects impacting an area in need of flood protection can be developed to more fully account for the benefits of additional project elements such as roadway elements, environmental, trail, and irrigation components.
- Local agencies cannot raise property tax revenue due to the restrictions of Propositions 13 (1978) and 218 (1996). They want to see a legislative change to allow Flood Control Districts to operate as a utility with rate payers as opposed to relying exclusively upon land-based assessments. Agencies operate at the mercy of bond cycles and grants for funding. The result is that the average household spending for drinking water and wastewater services is four to eight times the amount spent for flood management.

4.1.3 Multipurpose FM Approaches

Implement regional integrated multipurpose approaches that promote achievement of the FloodSAFE goals. More than half of the information gathering interviews supported the need for integrated approaches to flood management issues. Several participants recommended improving IRWM Plan and grant processes to specifically support rural communities while including them in regional planning and solutions. Comprehensive, regional, multipurpose approaches will include affected communities and ensure that a full breadth of purposes and possible approaches are considered.

4.1.4 Technological and Data Needs

Improve and implement science and tools to enhance IWM in California. Almost one-half of the information gathering interviews had discussions regarding the need to improve and implement science and tools to enhance IWM. These tools include increased gauging and monitoring of meteorological data for flood forecasting, tools to forecast sea level rise, improved hydraulic models, advanced mapping technologies, and enhancements to risk assessment solutions.

4.1.5 Public Outreach

Increase public awareness of flood management and flood risk. One-fourth of the information gathering interviews had discussions regarding the need for assistance to increase awareness about flood exposure and residual flood risk. Local agencies encourage DWR to improve IWM awareness among all agencies. IWM

enables sharing the cost of projects, but some agencies do not know how IWM works or how it can serve counties. Some agencies are wary of IWM due to perceptions that it may result in yet more environmental restrictions, longer permitting processes, shorter windows for maintenance operations, and increased mitigation requirements.

4.1.6 Emergency Management

Improve flood emergency management programs and planning statewide.

One-tenth of the information gathering interviews included discussions about the need for assistance with emergency preparedness and response. In several areas of the state, flood infrastructure is maintained or improved only after a major flood results in significant damage. Agencies want to see a proactive and preventive approach to flood management for environmental and cost-saving reasons. In addition, some rural communities suggested that the NFIP needs modifications for non-urban areas.

The opportunities and challenges identified by local agencies are included in *Attachment J: Recommendations to Improve Flood Management in California*. These opportunities and challenges will be used to develop the overall recommendations for the Flood Future Report.

4.2 Summary of Findings

The results of the information gathering effort support the following key objectives included in the development of the Flood Future Report:

- Inventory existing infrastructure
- Assess exposure to flood hazard statewide
- Identify IWM opportunities
- Identify challenges and opportunities
- Identify finance strategies
- Develop recommendations

4.2.1 Infrastructure

Flood infrastructure maps compiled from gathered information for each county are included in *Attachment D: Summary of Exposure and Infrastructure Inventory by County (Mapbook)*. These maps do not represent all existing flood infrastructure for the respective county. No single agency in any county was familiar with all existing infrastructure across their respective county. In many cases, agencies did not have a complete inventory of infrastructure that they owned or maintained. Between DWR and FEMA, six programs are currently underway to improve the quality of floodplain mapping and flood risk data statewide.

More than 835 flood management projects, planned or proposed by local agencies in California and totaling approximately \$12 billion dollars in project costs, were identified. Including USACE, CVFPP, and Delta projects, the total cost of potential flood management infrastructure projects could be as high as \$52 billion. For many

counties, the full cost of flood infrastructure deficiencies or future project needs is not known.

4.2.2 Flood Risk

Further review of the accumulated documents revealed that, of the more than 140 agencies participating in the SFMP Program, only a few agencies had specific risk information on consequences and likelihood of flooding in their jurisdiction. Typically, these agencies were partnering with USACE or were seeking funding and, therefore, were following the USACE process for assessing risk. This exercise also revealed that most of the agencies referred to FIRMs and HMPs, which contained the only risk information available for the agency.

Of the 700 documents originally identified, a subset of these was included in the SFMP Risk Information Inventory (see *Attachment G: Risk Information Inventory* for further details). Those that were mapping related were used in the SFMP Exposure Analysis (see *Attachment F: Flood Hazard Exposure Analysis* for further details).

4.2.3 Integrated Water Management

The need to implement flood management using an IWM approach will become even more apparent with increased competition for limited water and financial resources. Changes to the DWR IRWM process, which requires flood management to be included in the plan, provided an opportunity in many regions of the state for local flood management agencies to actively participate in the IRWM process. In some regions, this has enabled flood projects not only to be incorporated into an IRWM Plan but also to receive high-priority ranking (if projects were IWM in nature). Local flood agencies are eager to participate in the IRWM process and are looking forward to the potential for receiving grant funding. Some concerns remain about whether the flood agencies have been incorporated as full partners in the process, and other concerns exist regarding some of the criteria that local IRWM groups have used to prioritize projects.

Agencies provided project information for 320 planned and ongoing IWM projects. The most common resource management strategies that are integrated with flood management include ecosystem restoration and recharge of water supplies and groundwater. More detailed information on planned and ongoing IWM projects can be found in *Attachment H: Practicing Flood Management Using an Integrated Water Management Approach*.

4.2.4 Finance

The information gathered found several key funding issues that will help direct future financing strategies. These funding issues are not related geographically, but they could be considered systemwide issues, as described below.

- Flood management funding is historically inconsistent.
- Smaller agencies might not have the resources to complete funding applications.
- Agencies that have impact fees are affected by a slowdown in growth.

- Restrictions to increasing property assessments from Proposition 13 (1978) and Proposition 218 (1996).
- Agencies have difficulty raising matching funds for Federal programs.
- Agencies believe Federal funds are becoming scarcer.

Attachment I: Financing Strategies provides a complete discussion of the Finance Strategies developed as part of the SFMP Program.

4.2.5 Opportunities and Challenges Identified by Local Agencies

A major component of the process was to gather information from the agencies on opportunities and challenges related to infrastructure, financing, flood management policy, and IWM. A review of these findings revealed several recurring themes:

- Statewide coordination
- Sustainable financing
- Multipurpose flood management approaches
- Technological and data needs
- Public outreach
- Emergency management
- Land use practices

The input from local agency interviews, along with the information gathered, serves as a foundation for the development of the Flood Future Report. Additional information on recommendations can be found in *Attachment J: Recommendations to Improve Flood Management in California*.

Findings

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5.0 References

- California Department of Water Resources (DWR). 2012a. California Levee Database. Web site: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/levee_database.cfm. Accessed February 2012.
- California Department of Water Resources (DWR). 2012b. Central Valley Flood Protection Plan, Attachment 8J Cost Estimates. June. Web site: http://www.water.ca.gov/cvfmp/docs/2012CVFPP_Att8J_June.pdf. Accessed January 2012.
- California Department of Water Resources (DWR). 2013. *Division of Safety of Dams*. Web site: <http://www.damsafety.water.ca.gov/>. Accessed January 2012.
- California State Controller's Office (SCO). 2013. *Cities Annual Report*. Data are from the summary section Table 4, "Statement of Expenditures," for the respective fiscal year. Web site: http://www.sco.ca.gov/ard_locrep_cities.html. Accessed January 2103.
- Federal Emergency Management Agency (FEMA). 2011. *FEMA Community Status Book Report California*.
- Federal Emergency Management Agency (FEMA). 2012. *Map Service Center*. Used for Flood Insurance Rate Map (FIRM) panels. Web site: <https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1>. Accessed January 2012.
- Santa Clara Valley Water District. 2010. *2010 Draft Flood Protection and Stream Stewardship Master Plan*.
- United States Army Corps of Engineers (USACE). 2012. E-mail from Kim Carsell/USACE to Erika Powell/CH2M HILL. January 11. (Original data.)
- United States Army Corps of Engineers (USACE). 2013. E-mail from Stu Townsley/USACE to Kim Carsell/USACE. March 20. (Updated data.)
- United States Geological Survey (USGS). 2012. *Topographic Quadrangle Maps—Maps for America* (Digital Raster Graphics). Web site <http://topomaps.usgs.gov/>. Accessed January 2012.

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The complete report, *California's Flood Future: Recommendations for Managing the State's Flood Risk*, including technical attachments and other supporting information is available for review at:

<http://www.water.ca.gov/SFMP>