

4. Operations and Maintenance

4.1. Introduction

Operations and Maintenance (O&M) is the physical operation of the flood control system, as well as the ongoing maintenance of the associated infrastructure. This includes but is not limited to: erosion repair and prevention, crack control resulting from settlement, through seepage and under-seepage, animal burrow control and repair, maintenance, removal and repair of penetrations through the levee, managing encroachments and vegetation, and providing security of the levee system against vandalism and terrorism. O&M must be performed on a regular basis in accordance with the manuals and procedures provided and updated to meet requirements as prescribed by inspection criteria of the various agencies and programs and that have jurisdiction.

During development of the MUSR RFMP one of the most deliberated issues was the growing challenges local levee maintaining agencies (LMAs) must deal with to effectively operate and maintain the current flood control system to provide the flood control benefit it was originally designed to provide. The current flood system of levees, weirs, and bypasses was largely developed as a 'single purpose' system with the goal to reduce flooding and flood damages. Since development of the system new laws such as the Endangered Species Act, and changes in societal aspirations for the preservation of the natural environment, have created challenges and conflicts in managing, and operating the flood control system. This has particularly become an issue for rural levee maintaining agencies as they are not sufficiently funded to manage these emerging challenges.

4.2. Background

The California Central Valley Flood Control Association (Association) was established in 1926 to promote the common interests of its members in maintaining effective flood control and protection in the California Central Valley. The Association has been and continues to be actively involved in advancing and advocating for effective flood management in both rural and urban areas. To support the regional flood management planning effort underway throughout the Central Valley, the Association established the Rural LMA Work Group (Workgroup) in late 2012 with the purpose of identifying and describing problems faced by rural areas and proposing solutions/actions for inclusion in the Regional Flood Management Plans (RFMP). This effort was based on the Workgroup's belief that sustainable, system-wide flood management must consider the role of rural communities and agricultural areas, which provide the opportunity to realize multiple objectives identified in the 2012 Central Valley Flood Protection Plan. While the initial focus was on rural LMA issues, it became clear that urban LMAs are facing many of the same challenges, and the issues discussed here are not exclusively rural issues.

The Workgroup identified a number of O&M related issues including:

1 *Channel, Bank, and Bypass Maintenance* – Insufficient maintenance of channels and banks of
2 the Sacramento flood control system is adversely impacting its carrying capacity and
3 performance and is compromising the ability of LMAs to maintain PL84-99 eligibility for their
4 levee systems. Barriers to performing adequate maintenance include environmental and
5 regulatory restrictions, insufficient funding and resources, and competing maintenance priorities,
6 and completing interests of federal and state regulatory and resource agencies, and flood system
7 maintenance agencies.

8 *Permitting and Maintenance Activities* – Most maintenance activities are exempt from NEPA
9 and CEQA but require compliance with other laws such as State and federal endangered species
10 laws and California's streambed alteration law. Compliance with such laws is usually achieved
11 through a permitting process that is often burdensome, lengthy, and expensive. As such, LMAs
12 typically avoid the permitting process altogether to meet obligations for levee safety, or choose
13 to not undertake certain maintenance activities.

14 *Maintenance of Mitigation and Habitat Enhancement Projects* – The increasing number of
15 mitigation planting and habitat enhancement projects within the channels, bypasses, and other
16 floodways of the Sacramento and San Joaquin River flood systems together with existing
17 'legacy' mitigation projects is compounding the already challenging regulatory environment
18 faced by levee maintainers. Failure to properly plan, maintain and manage mitigation and habitat
19 enhancement projects is resulting in adverse impacts to hydraulic capacity, conveyance, and
20 ability to inspect, monitor, and flood fight. Further, plantings are migrating beyond their original
21 project limits and the lack of "safe harbor" agreements is creating financial and operational
22 constraints for the LMAs.

23 *Rodent and Burrowing Animal Control* – The presence of rodents on levees is a historic and
24 ongoing problem that poses a threat to levee integrity due to increased seepage penetration into
25 the levee and interior and exterior erosion causing voids and levee stability issues via the
26 burrows the rodents create.

27 *Pipe Maintenance and Inspection* – LMAs lack the enforcement authorities for inspection and
28 maintenance of private and certain public pipe penetrations in their levees. The Central Valley
29 Flood Protection Board (CVFPB), as the authorizing agency, has issued the encroachment
30 permits for these facilities and holds the enforcement authority through the encroachment
31 permits. In light of reluctance for pipe owners to properly inspect and maintain their pipes, there
32 is a need to develop clear enforcement action and also develop other cost effective
33 methodologies for performing the inspections that do not solely rely on video and sonar.

34 *Encroachments* – Undocumented encroachments and non-compliant encroachments present
35 safety and legal challenges for LMAs.

36 *Eligibility in the PL84-99 RIP* – Inactive status in the Rehabilitation and Inspection Program
37 (RIP) results in a loss of eligibility for Federal PL 84-99 rehabilitation assistance (i.e., funding)
38 following an emergency event and Sponsors and LMAs would therefore be faced with
39 rehabilitating damaged levees using all non-federal funds. It is difficult for Rural LMAs to
40 design, implement, and fund rehabilitation of levees following an emergency event without
41 federal assistance. If LMAs are unable to fund or otherwise implement repairs, it is unclear who

1 would make the repairs and if this responsibility would fall on the State as the non-federal
2 sponsor.

3 *Flood Structure Protection Area* – Flood protection structures can be adversely impacted by land
4 use decisions which do not fully consider how the activity is integrated into a region’s flood
5 protection requirements and systems. Creation of a consistent process is needed to allow LMAs
6 the ability to review land-use activities in the vicinity of flood protection structures so that the
7 activities do not conflict with the design, construction, maintenance, operation of the LMA’s
8 facilities, and do not compromise or impair the system’s integrity.

9 *Funding* - Some LMAs are responsible for maintenance of system-wide improvements but
10 receive no funding assistance from the system-wide beneficiaries. The burden of maintaining
11 and operating the system falls on a relatively small number of local landowners. Funding
12 programs need to be developed and implemented that include all beneficiaries.

13 Following below is a more detailed discussion of the identified O&M issues and potential
14 solutions which should be considered.

15 **4.3. Issues & Solutions**

16 **4.3.1. Channel Bank and Bypass Maintenance**

17 Insufficient maintenance of channels, banks, and bypasses of the flood control system is
18 adversely impacting its carrying capacity and performance and is compromising the ability of
19 LMAs to maintain PL84-99 eligibility for their levee systems. Barriers to performing adequate
20 maintenance include environmental and regulatory restrictions, insufficient funding and
21 resources, competing maintenance priorities, and the competing interests of federal and state
22 regulatory and resource agencies and flood system maintenance agencies.

23 Water Code section 8361 indicates that the California Department of Water Resources must
24 maintain specific enumerated project features, including the “channels and overflow channels” of
25 the Sacramento River and tributaries, while the local maintaining agencies are responsible for
26 other features, including levees. However, the DWR’s Channel Evaluation and Rehabilitation
27 program for the Sacramento system has been hindered at times by budget and environmental
28 constraints. This has resulted in banks that have eroded into levees, channels that have become
29 overgrown with vegetation, and overflow channels that have aggradated resulting in decreased
30 carrying capacities of the system and as a result are negatively affecting levee inspection ratings.

31 As part of assuming maintenance responsibility for the Sacramento River Flood Control System,
32 the State agreed to comply with the regulations of the United States Army Corps of Engineers
33 (USACE) as defined in the Standard Operation and Maintenance Manuals for the Projects¹. In
34 the manual, Section VI, Channels, describes “The channels of the project constitute that part of

¹ Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project, prepared by the Sacramento District, Corps of Engineers, US Army, Sacramento, California dated May 1955

1 the waterway which lies between the levees of the Sacramento River...and all tributary and
2 distributary streams.” The manuals go on to describe the maintenance requirements of the
3 channels and floodways in Section 6-02, paragraph a.1, which includes “(i) The channel or
4 floodway is clear of debris, weeds, and wild growth;” as well as “(iv) Banks are not being
5 damaged by rain or wave wash, and that no sloughing of banks has occurred.” Finally, paragraph
6 b of the same section requires that “(1) Weeds and other vegetal growth in the channel shall be
7 cut in advance of the flood season and, together with all debris, removed from the channel;
8 and... (4) Dumped rock or other suitable types of protection should be placed at locations found
9 by experience to be critical trouble points, with a view to stabilizing the channel alignment and
10 preserving the general uniformity of the bank lines.”

11 The above requirements of the O&M manuals for the Sacramento River system have not
12 consistently been met. This may be the result of State funding constraints, difficulty in meeting
13 regulatory requirements for sensitive resources, or simply a lack of prioritization. As a result,
14 LMAs are encountering issues with overgrown channel vegetation encroaching onto levees
15 resulting in decreased channel capacity and non-compliance with levee vegetation standards;
16 bank erosion that has encroached into the levee section and resulting in compromised levee
17 stability; and an increase in unacceptable levee inspections resulting from these State
18 responsibilities that may impact the ability of the State to receive federal assistance following a
19 flood event.

20 Potential solutions which should be considered include:

- 21 • That the State recognize and accept the definition of channels as clearly described in
22 Section VI of the Standard Operation and Maintenance manual as “The channels of the
23 project constitute that part of the waterway which lies between the levees of the
24 Sacramento River ... and all tributary and distributary streams.”.
- 25 • That the State should work with the USACE to update the standard Operation and
26 Maintenance manuals for both the Sacramento River System to establish appropriate
27 channel maintenance measures that both preserve the design capacity with consideration
28 for the ecosystem function of the river channels and floodways. Current O&M standards
29 are outdated and no longer feasible.
- 30 • That the State and LMAs should work with Regulatory Agencies on long-term
31 maintenance plans to avoid the need for mitigation. These plans could limit the areas for
32 sediment removal, vegetation thinning or removal, or slope protection in areas where the
33 channel is encroaching within 35 feet of the levee. Maintenance measures and standards
34 would include best management practices and be covered in maintenance agreements to
35 avoid lengthy and costly environmental consultation.
- 36 • That the State develop a dedicated and reliable Statewide funding mechanism to provide
37 a minimum annual revenue stream to support channel and bank maintenance. This
38 program could include end user fees for the State Water Project and other water delivery
39 systems.

1 **4.3.2. *Permitting and Maintenance Activities***

2 Most maintenance activities are exempt from NEPA and CEQA but require compliance with
3 other laws such as State and Federal endangered species laws and California’s streambed
4 alteration law. Compliance with such laws is usually achieved through a permitting process that
5 is often burdensome, lengthy, and expensive. As such, LMAs sometimes avoid the permitting
6 process altogether to meet obligations for levee safety, or choose to not conduct certain
7 maintenance activities.

8 Compliance with the State and Federal endangered species acts (ESA) presents a difficult
9 challenge primarily because mitigation requirements for activities impacting listed species are
10 changing and the process to obtain permits is burdensome and lengthy often times delaying
11 maintenance or forcing LMAs to conduct their maintenance without consultation or risk
12 eligibility in federal rehabilitation programs. This dilemma is particularly concerning for rural
13 LMAs because they lack the financial resources to rehabilitate the levees following any event
14 without federal assistance. Further, LMAs lack the resources to implement costly mitigation
15 measures.

16 In addition to ESA issues, notification to California Department of Fish and Wildlife (DFW) for
17 a streambed alteration permit is required for any activity that will substantially divert or obstruct
18 the natural flow of the river; substantially change or use any material from the bed, channel, or
19 bank of a river; or deposit or dispose of debris, waste or other material where it may pass into a
20 river. DFW contends that Section 1600 applies to areas from the waterside levee crown to and
21 the water and wetted channel. While there is disagreement between the LMAs and DFW on
22 what actions constitute substantial, both parties have been relatively successful in moving
23 forward with streambed alteration agreements enabling maintenance activities to proceed.

24 Levee maintenance requirements were prescribed by USACE decades prior to ESA laws upon
25 turnover of the Sacramento River flood control system. LMAs have adjusted their maintenance
26 methodologies to accommodate these laws and the listings of species but common maintenance
27 practices that in the past were not considered to affect listed species now are making it difficult
28 to meet obligations for levee maintenance. Potential solutions which should be considered
29 include:

- 30 • A regional programmatic agreement or framework for permits with the resource agencies
31 could provide an effective avenue for permitting that enables the LMAs to conduct their
32 maintenance activities while considering the interests of listed species and resources.
33 Agreements could be tailored for the species, timelines, etc.
- 34 • Incentives for using certain maintenance methodologies (e.g., type of management
35 activity such as cutting versus burning versus spraying or grouting versus, etc.), which if
36 used, would alleviate mitigation requirements.
- 37 • Setting aside designated mitigation areas or providing pre-mitigation (advance
38 mitigation).
- 39 • Reaching agreement on timing and/or phasing of maintenance activities at a regional
40 level to avoid “adverse impact” finding by resources agencies.

1 **4.3.3. Maintenance of Mitigation and Habitat Enhancement Projects**

2 The increasing number of mitigation planting and habitat enhancement projects within the
3 channels, bypasses, and other floodways of the Sacramento River flood system together with
4 existing ‘legacy’ mitigation projects is compounding the already challenging regulatory
5 environment faced by levee maintainers. Failure on the part of some ‘habitat implementers’ to
6 properly plan, maintain and manage mitigation and habitat enhancement projects is resulting in
7 adverse impacts to hydraulic capacity, conveyance, and ability to inspect, monitor, and flood
8 fight. These impacts combine to reduce the flood system’s resilience and robustness. Further,
9 plantings are migrating beyond their original project limits and the lack of “safe harbor”
10 agreements is creating financial and operational constraints for the LMAs.

11 Rural LMAs recognize that when trying to accomplish specific goals, such as species recovery
12 for example, there is value in implementing mitigation and enhancement projects within the
13 flood control system. However, LMAs are being adversely affected both financially and
14 operationally as they cannot perform proper levee maintenance due to increased costs,
15 permitting, or inability to access, inspect and perform repairs within those sites. This in turn can
16 impact the status of the levee system in the PL 84-99 Rehabilitation and Inspection Program.
17 Potential solutions which should be considered include:

- 18 • Identity which types or habitat/mitigation creation are the most problematic for flood
19 control system operations;
- 20 • Examine in a comprehensive regional manner, the goals, objectives and necessity for
21 mitigation planting and habitat enhancement within the flood control system;
- 22 • Identify and securing sustainable funding for long term maintenance;
- 23 • Define maintenance roles and responsibilities;
- 24 • Obtain long-term (programmatic) regulatory permissions to perform levee maintenance
25 without the need for additional mitigation;
- 26 • CVFPB more actively monitor and enforce permits issued for habitat/mitigation; and
- 27 • Provide safeguards to neighboring landowners and levee maintaining agencies when the
28 projects migrate beyond their original project limits.

29 **4.3.4. Eligibility in the PL84-99 Rehabilitation and Inspection Program**

30 Inactive status in the Rehabilitation and Inspection Program (RIP) results in a loss of eligibility
31 for Federal PL 84-99 rehabilitation assistance (i.e., funding) following an emergency event and
32 Sponsors and LMAs would therefore be faced with rehabilitating damaged levees using all non-
33 federal funds. It is difficult for Rural LMAs to design, implement, and fund rehabilitation of
34 levees following an emergency event without federal assistance. If LMAs are unable to fund or
35 otherwise implement repairs, it is unclear who would make the repairs and if this responsibility
36 would fall on the State as the non-federal sponsor.

37 Levee systems are inspected through the USACE RIP. Systems that receive unacceptable ratings
38 through either routine or periodic continuing eligibility inspections are placed on inactive status

1 in the RIP, which affects the amount and type of federal funding assistance for which a non-
2 federal sponsor may be eligible following a flood event.

3 A system status of inactive in the RIP results in a loss of PL 84-99 rehabilitation assistance
4 following a flood event. It does not necessarily result in a loss of FEMA NFIP certification or
5 accreditation nor does it result in a loss of federal assistance for emergency flood fighting. A
6 system status of active in the RIP does not guarantee rehabilitation assistance will be provided,
7 only that it is eligible. Rural LMAs may have difficulty meeting the benefit cost ratio
8 requirements in order to receive the rehabilitation assistance.

9 Flood control works that are eligible for USACE's RIP program, either Active or Inactive, are
10 ineligible for assistance from FEMA for emergency repairs and permanent restoration.
11 Although, FEMA may provide assistance for the placement and removal of flood fighting
12 measures (e.g., sandbags, buttresses) on flood control works that are eligible for USACE's RIP
13 program if such activity is necessary to eliminate an immediate threat to life, public health and
14 safety, or improved property.

15 Loss of eligibility in the PL 84-99 RIP would mean that the LMAs and the State of California
16 would have to fully fund rehabilitation following a high water event. Neither the State nor the
17 Rural LMAs have sufficient budgets to fund the increased rehabilitation costs.

18 The State now requires a local partnership agreement for many new projects including those
19 funded under Propositions 1E and 84. Clauses in this agreement, also referred to as a “local
20 O&M agreement”, include a requirement for the LMA “to continue to participate in and comply
21 with the policies and procedures of the USACE Rehabilitation and Inspection Program” as well
22 as Section 208.10. It is unclear how this requirement and the inability to meet this requirement
23 affect rural LMAs.

24 System-Wide Improvement Frameworks (SWIFs) provide one avenue to maintain eligibility in
25 the RIP and thus receive rehabilitation assistance while addressing long-term maintenance or
26 repair deficiencies. Several LMAs in the Regions wish to pursue SWIFs but questions remain as
27 to how their development and implementation will be funded. Development of SWIFs as part of
28 the regional planning process is ineligible under the current guidelines, but DWR wish to
29 reconsider this as loss of PL84-99 eligibility may have cost implication for the State. Also
30 development and implementation of SWIFs can help optimize system performance, resiliency
31 and robustness, which are key aspects of the 2012 CVFPP and the SSIA.

32 **4.3.5. *Rodent and Burrowing Animal Control***

33 The presence of rodents on levees is a historic and ongoing problem that poses a threat to levee
34 integrity due to increased seepage penetration into the levee and interior and exterior erosion
35 causing voids and levee stability issues via the burrows the rodents create.

36 It is imperative that every LMA has an aggressive rodent abatement and damage repair program.
37 Diligent efforts to eradicate burrowing animals are a necessity, and eliminating them from an

1 infested levee is extremely difficult. Control of these animals must be pursued frequently and
2 persistently to ensure safety of the levee during both normal conditions and high water events.

3 Adequate rodent control is a two-part maintenance process of eradicating the rodents and
4 properly filling their burrows. The more rodents in an area and the longer they have been there,
5 the greater the threat due to greater loss of levee material and further increase in populations.
6 Voids within the levees cannot be easily detected, and therefore, pose a significant risk to levee
7 integrity and stability. Interpretation of environmental laws and regulations by various resource
8 agencies can limit the periods during which poison bait can be utilized and other methods can be
9 employed to control rodents. The implementation of these regulations may be in conflict with
10 the approved and allowed proper use of the compounds being applied and often conflict with the
11 optimal timing for successful control. Complete eradication of rodents is difficult. However, a
12 well-managed eradication program vigorously applied throughout the year can keep populations
13 and concentrations of rodents under reasonable control.

14 Coupled with aggressive rodent abatement, thorough repair of levees damaged by burrowing
15 rodents is essential to minimize risks posed to levee integrity. Damage repair can be achieved by
16 excavation and re-compaction of burrows, filling holes with grout slurry, and other comparable
17 methods. Regardless of the method of rodent burrow damage repair, voids must be filled to
18 minimize risk to levees. Past practices of simply dragging over the rodent holes to cover them is
19 inadequate, and does not fill the voids left by rodent infestation. Potential endangered species
20 act (both CESA and ESA) impacts during rodent burrow repair activities have been expressed as
21 a concern by resource agencies. Potential solutions which should be considered include:

- 22 • Facilitation through environmental regulatory processes and relief from some limitations
23 of how and when eradication actions can be performed.
- 24 • Funding to assist in the purchase and use of specialized equipment and services such as
25 grouting machines, hiring licensed trappers and performing biological assessments to
26 determine potential impacts to other desirable species as well as provide options for more
27 effective control programs.
- 28 • Establish guidelines for habitat projects that could become a source of rodents. An
29 example of this might be the development of habitat that could create a breeding area for
30 beaver and muskrats that will migrate and take up residence in a levee.
- 31 • Establish procedures and guidelines for removal of rodent habitat and food sources.
- 32 • Establish funding and programs to work with local property owners, the farming
33 community, and agricultural commissioners to coordinate rodent abatement activities on
34 properties near the flood protection system, to minimize threats to levee integrity.

35 **4.3.6. *Pipe Maintenance and Inspection***

36 LMAs lack the enforcement authorities for inspection and maintenance of private and certain
37 public pipe penetrations in their levees. The Central Valley Flood Protection Board (CVFPB), as
38 the authorizing agency, has issued the encroachment permits for these facilities and holds the
39 enforcement authority through the encroachment permits. In light of reluctance for pipe owners
40 to properly inspect and maintain their pipes, there is a need to develop clear enforcement action

1 and also develop other cost effective methodologies for performing the inspections that do not
2 solely rely on video and sonar.

3 Gravity or pressurized pipes that penetrate the levee are required to be inspected and maintained
4 pursuant to the Code of Federal Regulations (CFR) Section 208.10 and the Standard Operations
5 and Maintenance Manual. Those documents only provide general requirements. Current
6 USACE guidance documents require inspection utilizing video or sonar inspection every five (5)
7 years. Maintenance is performed as appropriate to repair or replace pipe penetrations in order to
8 bring them into compliance with the USACE and CVFPB standards. Permitted repairs and
9 installations must also be compliant with current California Code of Regulations, Title 23.
10 Waters, Division 1. Central Valley Flood Protection Board.

11 The intent of the USACE's video inspection program is to monitor the interior of pipes through
12 the levee every five (5) years so that pipes can be rehabilitated or replaced before damage occurs
13 that could threaten the integrity of the levee. The inspection also provides a record of the
14 previous condition of each pipe for comparison over time, allows an inspector to examine parts
15 of the pipe that cannot be inspected visually from the pipe exterior or levee surface, and allows
16 the pipe owner, DWR and /or the LMA to determine whether the condition of a pipe requires
17 action to protect the levee. Additionally, by identifying pipes that need attention prior to failure,
18 the repairs can be scheduled to occur outside of the typical flood season, and at a time when the
19 pipe owner could find them more cost-effective than an emergency repair.

20 Video inspections are costly, and some pipe owners are resisting or refusing to perform them.
21 This is problematic for LMAs as failure to perform and report the inspection results could result
22 in unacceptable ratings by USACE and/or CVFPB. Other effective methods of inspection, such
23 as pressure testing, may provide an acceptable level of analysis and be more cost effective and
24 practical, and might allow for a higher level of compliance. Also, most pipes are steel, and video
25 inspection may be limited in identifying problems as most of the corrosion occurs from the
26 exterior of the pipe. Access to the video equipment is limited and use generally requires cutting
27 access entrances for insertion of the devices. These access entrances can cause additional sites
28 for corrosion to start and can be difficult and expensive to install properly. These pipes present a
29 very minor threat for flooding, when they cross above the floodplain or have positive closure
30 structures on the waterside of the levee since these measures generally prevent or limit
31 conveyance of flood waters.

32 While there is little or no disagreement for the inspection requirements on pipes that are located
33 below the design water surface elevation, there are instances, where pipes are installed on the
34 levee slope surfaces and only penetrate the levee just below the crown above the design water
35 surface elevation. Additionally, once the pipe inspections have been performed, and
36 maintenance/rehabilitation actions are identified, there exist various issues regarding the
37 necessity and expense associated with obtaining permits and the permit requirements for
38 maintenance/rehabilitation. Many routine maintenance actions should not require costly permit
39 application processes or expensive upgrades to the existing facility. There are also instances
40 where a "one size fits all" regulation may not provide the most cost effective or best practice for
41 a given situation. An example of this is positive closure devices on pipes that are located above
42 the design water surface elevation.

1 In addition to the issues listed above, a majority of pipes are permitted encroachments in the
2 flood control systems. The encroachment permits are issued through the CVFPB and only
3 require an endorsement by the LMA. Although the existing permits themselves do not typically
4 include requirements for video inspections, they do include a standard condition that would
5 require the encroachment owner to remove, alter, or relocate the encroachment at their sole
6 expense for any reasons upon written notice from the CVFPB. Because the CVFPB is the
7 permitting agency, they hold the enforcement authority. However, they have rarely used their
8 authority and have only recently been given legal authority to develop an enforcement process to
9 bring encroachments into compliance with current standards.

10 The primary issue for LMA's is that they do not own or operate many of the pipes that penetrate
11 their levees, and therefore lack the ability to access those pipes for inspection and maintenance.
12 Furthermore, the LMAs cannot afford to be held financially responsible for those inspections or
13 the maintenance of the pipelines. Enforcement of the inspection and maintenance requirements
14 is difficult and costly for the LMAs and is the responsibility of the CVFPB.

15 Potential solutions which should be considered include:

- 16 • CVFPB adopt a standard noticing procedure to remind pipe owners that they must
17 maintain their pipes in accordance with the permit terms and current standards, including
18 video inspections of pipes crossing under or through levees;
- 19 • Require pipe owners provide annual records of maintenance, inspection, repair, and
20 replacement demonstrating compliance with permit terms and current standards to the
21 LMA;
- 22 • Where pipes were installed as part of the system and the LMA is responsible for
23 maintenance of that facility, the State should consider a funding program to assist LMAs
24 with bringing the system facilities into compliance;
- 25 • Streamlined permitting for simple repairs and rehabilitation of pipelines;
- 26 • Outreach and education of utility owners to help them understand why compliance with
27 the standards is important so they become willing and proactive participants; and
- 28 • Add flexibility to the regulations to avoid "one size fits all" policies for construction,
29 repair and inspection so that more cost effective solutions can be implemented that retain
30 the overall protection desired.

31 **4.3.7. Encroachments**

32 Undocumented encroachments, permitted or not, and documented, non-compliant encroachments
33 present safety and legal challenges for LMAs. If an LMA or the State cannot produce
34 documentation of an encroachment, that encroachment is flagged during inspections as an
35 unpermitted encroachment and therefore unacceptable. If an encroachment is not in compliance
36 with its permit, it is also flagged as unacceptable. Depending on the type of encroachment,
37 either can cause an entire levee system to lose eligibility under PL 84-99. Of particular concern
38 are encroachments representing a risk to levee integrity.

39 Encroachment scenarios currently presenting challenges include:

- 1 • Non-permitted encroachments;
- 2 • Legacy encroachments lacking documentation (i.e., not specifically or thoroughly
- 3 documented in as-builts)
- 4 • Encroachments permitted by CVFPB, no concurrence from USACE;
- 5 • Encroachments permitted by CVFPB with concurrence from USACE, but now not in
- 6 compliance with permit terms;
- 7 • Encroachments permitted by CVFPB with concurrence from USACE, in compliance with
- 8 permit terms but compliance is not documented; and
- 9 • Encroachments not permitted, but constructed by the USACE as documented in the as-
- 10 builts and/or O&M manual.

11 In addition to typical encroachments owned by an individual or company, there are some
12 encroachments that exist as a result of the levee system itself. These encroachments, primarily
13 interior drainage ditches adjacent to the landside levee toe, retaining walls, rip-rap, and pipes,
14 present a unique set of problems as they often pre-date permits, and documentation can be
15 inconclusive. Some of these encroachments may be found in as-builts, but others are not seen in
16 as-builts or the as-builts cannot be found. These encroachments are typically maintained by the
17 LMA, but many have either exceeded their lifespan and/or need improvements to meet current
18 standards.

- 19 • Establish a process, agreed to by the CVFPB and USACE, for retroactive permitting of
- 20 encroachments determined not to impair or threaten system integrity;
- 21 • USACE and CVFPB research historical and current files to build a database of
- 22 encroachments and provide LMAs with access the database.
- 23 • Provide funding to remove unnecessary facilities;
- 24 • CVFPB adopt a standard noticing procedure to remind encroachment owners that they
- 25 must maintain their encroachments in accordance with the permit terms and current
- 26 standards.
- 27 • Require encroachment owners provide annual records of maintenance, inspection, repair,
- 28 and replacement demonstrating compliance with permit terms and current standards to
- 29 the LMA.
- 30 • Develop a funding program to address required upgrades, improvements, and/or
- 31 documentation of the facilities included in the original project and are still necessary for
- 32 the functioning of the system (i.e., landside drainage ditches, erosion protection, or other
- 33 facilities).

34 **4.3.8. Flood Structure Protection Areas**

35 Flood protection structures can be adversely impacted by land use decisions (“land-use
36 activities”) which do not fully consider how the activity is integrated into a region’s flood
37 protection requirements and systems. These adverse impacts can be minor, requiring recurring,
38 unbudgeted maintenance effort; significant, creating a need for major levee repair projects; or

1 even catastrophic, causing failure of the levee during a high-water event, leading to a major flood
2 event. In addition, un-integrated land-use activities can be cited by flood protection authorities
3 as reason for decertification of a flood protection structure and/or removal of flood protection
4 systems from aid programs such as PL84-99.

5 "Land-use activity" could mean any ministerial, discretionary, or other regulatory permit
6 approvals that are likely to lead to a change to improved or unimproved land, including but not
7 limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or
8 drilling operations or storage of equipment or materials. These approvals include, but are not
9 necessarily limited to:

- General Plan amendments;
- Zoning Map changes;
- Conditional Use Permits;
- Design Review Permits;
- Parcel Mergers and Lot Line Adjustments;
- Sign Permits;
- Encroachment Permits;
- Public & Private Utilities;
- Specific Plans & amendments;
- Zoning Text amendments;
- Planned Development Permits;
- Subdivision Maps and Parcel Maps;
- Building Permits;
- Grading Permits;
- On-site Development Permits;
- Underground Pipelines.

10 To ensure LMAs have an opportunity to review and comment on land-use activities which could
11 impact their systems, improved communication and interaction between LMAs and land-use
12 authorities is needed. Creation of "Flood Structure Protection Areas" directly adjacent to levees
13 and other flood control structures would provide LMAs an opportunity for input on land-use
14 decisions occurring in the vicinity of their facilities. These areas would be identified in county
15 and city floodplain management ordinances and/or general plans as zones in which input is
16 required from LMAs before land-use decisions are finalized.

17 The RFMP process could be used to identify areas within the region of applicability of Flood
18 Structure Protection Areas. The RFMP process could also help develop model floodplain
19 ordinances and general plan amendments for adoption by local land-use authorities detailing how
20 Flood Structure Protection Areas should be developed, implemented, and administered.

21 **4.3.9. *Levee Vegetation Management***

22 The 2012 CVFPP describes the State's approach to levee vegetation management in light of
23 USACE's Engineering Technical Letter 1110-2-571, which emphasizes the need to establish a

1 vegetation-free zone on and adjacent to project levees. The 2012 CVFPP Levee Vegetation
2 Management Strategy is intended to reflect a flexible and adaptive management strategy that
3 meets public safety goals, and protects and enhances sensitive habitats. Based on the current
4 understanding of levee failure mechanisms, properly trimmed and spaced levee vegetation poses
5 a low threat to levee integrity as compared to many indisputable risk factors, such as under-
6 seepage, through-seepage, slope instability, erosion, and rodents. Under the State’s Levee
7 Vegetation Management strategy,

- 8 • New levees will be constructed and managed in consistency with the guidelines in U.S.
9 Army Corps of Engineers Engineering Technical Letter 1110-2-571 with a vegetation-
10 free zone.
- 11 • Levees with “legacy” trees will be managed to allow the existing large trees and woody
12 vegetation to live out their normal life cycles unless they pose an unacceptable threat,
13 while maintaining visibility for inspection and access for maintenance and flood-fight.
14 This strategy allows for the retention of lower waterside vegetation below the
15 “Vegetation Management Zone.”

16 The Vegetation Management Zone is the area on and near a levee in which vegetation is
17 managed for visibility and accessibility using a life-cycle management strategy. For typical
18 sized levees the Vegetation Management Zone would include the entire landside levee slope plus
19 15 feet beyond the landside toe (or less if the existing easement is less than 15 feet), the levee
20 crown, and the top 20 feet (slope length) of the waterside levee slope.

21 The Life Cycle Management approach achieves “visibility and accessibility” criteria while
22 progressing gradually (over many decades) toward the USACE vegetation policy goal of
23 eventually eliminating woody vegetation from the Vegetation Management Zone on the landside
24 slope, crown, and upper waterside slope of levees. Existing trees and brush larger than 4” should
25 be allowed to remain on the levee slope to live out their normal life cycles. Trees (alive or dead)
26 will be removed if they posed an unacceptable threat to levee integrity. Removal would be
27 accomplished in consultation with appropriate resource agencies.

28 This approach would protect waterside vegetation, which acts to stabilize the bank and provide
29 erosion protection, while also providing habitat for sensitive species. In order to sustain this
30 critical habitat, the CVFPP levee management strategy retains waterside vegetation (below the
31 Vegetation Management Zone).

32 Under the State’s strategy, vegetation that was introduced, allowed, required as mitigation, or
33 endorsed by a previous USACE action to comply with environmental requirements, or was
34 present when the levee system was transferred from the USACE to a non-federal sponsor, would
35 not be removed.

36 LMA’s within the Region should evaluate their systems to determine if the 2012 CVFPP Levee
37 Vegetation Management Strategy is a workable strategy for them. This or other vegetation
38 management strategies could be implement through the SWIF process many of the LMAs are
39 about to embark upon.

1 **4.3.10. Funding**

2 The Sacramento River flood control system provides system-wide benefits but its operation and
3 maintenance is subdivided and delegated to individual entities, and is not funded, executed or
4 coordinated in a system-wide manner. Some LMAs are responsible for maintenance of system-
5 wide improvements but receive no funding assistance from the system-wide beneficiaries. The
6 burden of maintaining and operating the system falls on a relatively small number of local
7 landowners. As one of the near-term actions identified in the State System-wide Investment
8 Approach (SSIA), DWR has developed the Flood System Repair Program (FSRP) to help LMAs
9 repair documented critical problems with flood control facilities of the SPFC in non-urban areas
10 To address longer-term systemic maintenance issues, DWR should expand the FSRP to develop
11 and implement a maintenance subventions cost share program that provides technical and
12 financial assistance to LMAs for long-term system maintenance and rehabilitation.

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