

OPERATION & MAINTENANCE MANUAL

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, AND RECREATION PROJECT

San Francisco Bay to Highway 101

September 1, 2015



ACKNOWLEDGEMENTS

This manual was prepared through a collaboration of the San Francisquito Creek Joint Powers Authority (JPA). The members of the JPA are the Cities of East Palo Alto, Menlo Park and Palo Alto; the County of San Mateo; and the Santa Clara Valley Water District.

LIST OF COMMON ACRONYMS AND ABBREVIATIONS

District	Santa Clara Valley Water District
JPA	San Francisquito Creek Joint Powers Authority
LIS	Levee Inspection System
NAVD	North American Vertical Datum
O&M	Operation & Maintenance
RSP	Rock Slope Protection
SCVWD	Santa Clara Valley Water District
SFC	San Francisquito Creek
SMP	SCVWD Stream Maintenance Program
US 101	U.S. Highway 101
USACE	U.S. Army Corps of Engineers
YR	Year

GLOSSARY

100-year flood	A flood that has a 1 percent probability of occurrence in a given year.
bank protection	Bank protection stabilizes a channel bank using rock, rock slope protection, concrete, soft materials, vegetation, or a combination of materials or methods. Bank protection can also include preventative maintenance to ensure that banks do not erode in the future.
bed	The bottom of a body of water, such as a stream, channel, or river.
bench	An area cut into a terrace for riparian zone restoration or for strengthening the design of a water channel.
Best Management Practices (BMPs)	Schedules of activities, use of erosion control measures, operation and maintenance procedures, and other practices to prevent or reduce the pollution of surface and ground water and prevent impacts to species of concern and their habitats.
brush	See woody brush
channel	A natural or human-made feature that conveys water. Channel erosion includes the processes of stream bank erosion, streambed scour, and degradation. Channel geometry is the structure of a waterway, including the force of water currents, the height and content of banks, and other features.
culvert	Any covered structure not classified as a bridge which conveys a waterway under a road or other paved area.
degradation	The lowering of the streambed by erosive processes such as scouring by flowing water, removal of channel bed materials, or downcutting of natural stream channels. Such erosion may initiate degradation of tributary channels, causing damage similar to that due to gully erosion and valley trenching.
design capacity	An engineering term used to describe the amount of water that a modified channel was designed to convey. Generally, the design capacity for improved District facilities is to accommodate the 1 percent or 100-year flood.
design flood	The flood magnitude selected for use as a criterion in designing flood control works. The largest flood that a given

project is designed to pass safely. In this project, the design flood is the 100-year flood.

design flow	The magnitude of stream flow that is used in design of channel improvements and structures across the channels.
downcutting	The erosive effect of water against the river channel and their protective features; incision.
erosion	The wearing away of land surface by running water including rainfall, surface runoff, drainage, or wind.
excessive vegetation	Vegetation growth whose pervasive presence obscures visibility and inhibits access.
flood protection project	A project that affects the flood conveyance capacity or flood management behavior of the system, usually designed to reduce flooding hazards.
flood	The temporary inundation of lands normally dry; any waters escaping from a creek or river.
floodplain	Low-lying areas adjacent to stream or river channel that are flooded during high flows in a channel.
floodwall	A wall constructed adjoining channel to prevent flooding of the surroundings areas.
freeboard	Vertical distance between the top of an embankment adjoining a channel and the water level in the channel.
HEC-RAS	(Hydraulic Engineering Center's River Analysis System) is a software program used to model the water surface profile for this project.
In-channel maintenance	Also designated as in stream maintenance, maintenance that occurs within the areas delineated as "in stream" on Figures 1 & 2.
levee	An embankment constructed to prevent a river or stream from flooding adjacent lands.
low-flow channel	The natural stream that carries the more frequent, periodic streamflows.
mitigation	An action taken to moderate, reduce, alleviate the impacts of a proposed activity by (a) avoiding the impact by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its

implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; (e) compensating for the impact by replacing or providing substitute resources or environments.

reach	The smallest subdivision of a drainage system consisting of a uniform length of channel or a discrete portion of a channel.
revetment	A facing of stones, sandbags, etc., to protect a wall, embankment, or earthworks
riparian	Pertaining to the banks of a river, stream, waterway, or other, typically, flowing body of water, as well as to plant and animal communities along such bodies of water.
rock slope protection	Loose rock or concrete of varying size, typically brought to a site. Used to protect channel banks and drainage outlets from scouring forces.
scour	The clearing and digging action of flowing water, especially the downward erosion caused by stream water in removing material (e.g., soil, rocks) from a channel bed or bank or around in-channel structures.
sediment removal	The act of removing sediment deposited within a stream, channel, or bypass culvert. Typically, sediment is removed when it reduces the carrying capacity.
sediment	Solid material, both mineral and organic, that is carried by the water and settles to the bottom of channels, bypass culverts, drain pipes, or behind dams.
sedimentation	The process by which rock and organic materials settle out of water.
spalling	To break into pieces, esp. concrete.
station	A station is a standard channel location system used by the SCVWD that gives the distance from the downstream limit of jurisdiction (usually San Francisco Bay), or, for a tributary creek, from where it branches off of the main channel. Distance is measured in feet, with each "station" representing 100 feet for the Lower San Francisquito Creek Project levees. For example, station 26+00 would be a point 2,600 feet

upstream from the mouth of the channel from San Francisco Bay along the left or right levee.

streambed	The part of a stream over which a column of water moves.
toe	The line of a natural or fill slope where it intersects the natural ground.
vegetation management	Removal or pruning of vegetation for any of a number of purposes including maintenance of infrastructure, fuel management, ecosystem modification or improvement, aesthetic, or purposes that provide desirable benefits in and adjacent to water channels to maintain their ability to function as flood protection facilities. In addition, vegetation is removed to meet local fire code requirements and to reduce combustible weeds and grasses on property adjacent to the streams within the Project. The control of invasive non-native vegetation is another purpose for which vegetation control is undertaken. Vegetation management is also required for maintaining visibility for inspection; ensuring access for maintenance work and flood fighting; and minimizing detrimental effects to levees, embankment, and bank protection. Vegetation management can be accomplished through mechanical or hand mowing, disking, hand clearing, or herbicide applications.
vegetation-free zone	A requirement by the USACE for a 15-wide area adjacent to levee inboard and outboard toes to be kept free of woody vegetation which impairs visual inspection and flood fighting activities. Vegetation located outside of project ROW on private property is not currently subject to Corps jurisdiction or this requirement. Vegetation (mitigation) planted as part of the original project improvements may also be exempt from removal pending Corps review and/or acceptance of a variance.
velocity	Speed with which water should flow in a channel. It depends on several factors, such as slope, smoothness and uniformity of channel, area of flow and wetted perimeter.
watershed	The area of a landscape from which surface runoff flows to a given point; a drainage basin. A ridge or drainage divide separates a watershed from adjacent watersheds.
woody brush	Thick, scrubby vegetation typically 6 feet in height or less. Brush is composed of shrubs and woody perennials usually

growing in dense, impenetrable masses that can affect hydraulic conveyance in a channel.

CONTENTS

ACKNOWLEDGEMENTS	ii
LIST OF COMMON ACRONYMS AND ABBREVIATIONS.....	iii
GLOSSARY.....	iv
1 OVERVIEW AND ACCESS	12
1.1 Purpose of Manual	12
1.2 Changes to the Project or the Manual.....	12
1.3 Project Vehicular Access.....	12
2 OPERATION	13
2.1 Introduction	13
2.2 Removal of Excess Sediment and Vegetation.....	14
2.2.1 Sediment Removal Triggers for Channel	14
2.2.2 Vegetation Removal Triggers for Channel.....	14
3. MAINTENANCE	15
3.1 Vegetation Maintenance	15
3.1.1 Mitigation Plantings during Establishment Period	15
3.1.1.1 Instream benches adjacent to levees and floodwalls to remove undesired and non-native vegetation	15
3.1.1.2 Faber Tract levees.....	15
3.1.2 Erosion Control Plantings.....	15
3.1.3 Protection for Endangered Species.....	16
3.1.4 Other Vegetation Removal.....	18
3.1.4.1 Removal of woody and non-woody invasive vegetation within project right-of-way for inspections at base of levee toes using herbicide application, mechanical mowing, hand mowing and trimming, or hand weeding.....	18
3.1.4.2 Removal or pruning of all vegetation encroaching within project right-of-way using herbicide application, mechanical mowing, hand mowing and trimming, or hand weeding.	18
3.1.4.3 Removal of woody vegetation in channel	18
3.2 Flood Protection Structures.....	18
3.2.1 Levee Maintenance	18
3.2.1.1 Levee repairs.....	18

3.2.1.2	Repair of levee damage caused by flood events (erosion, scour, slumps, and sags)	19
3.2.1.3	Animal Control Program (baiting, trapping, and barriers)	19
3.2.1.4	Repair animal damage on levee slopes and at levee toe	20
3.3	Floodwall Maintenance	20
3.3.1	Repair of floodwall coating	20
3.3.2	Repair of floodwall damage caused by flood events	20
3.4	Creek Channel Maintenance	20
3.4.1	Removal of downed trees in creek channel	20
3.4.2	Sediment removal in low flow channel	20
3.4.3	Fill and repair scour holes in channel	20
3.4.4	Control of unwanted vegetation on benches to maintain conveyance	21
3.4.5	Repair of rock slope protection	21
3.4.6	Trash and debris removal in channels and at bridge piers/columns	21
3.5	Maintenance Access Ramps and Maintenance Roads	21
3.5.1	Repair and maintenance of levee maintenance roads and access ramps	21
3.5.2	Repair and maintenance of floodwall maintenance roads and access ramps	22
3.6	Outfalls, Flap Gates, and Valves	22
3.6.1	Culvert flap gate service and repairs (during annual inspections)	22
3.6.2	Pipe culvert inspection, repairs, and sediment removal (during annual inspections)	22
3.6.3	Periodic video inspection of culvert joints and lining for buckling, spalling, corrosion, damage Interior Drainage System	22
3.6.4	Removal of sediment and woody vegetation at culverts and outfalls (during annual inspections)	23
3.6.5	Repair and maintenance of outfall slope protection (during annual inspections)	23
3.6.7	Positive closure valve (during annual inspections)	23
3.7	San Francisquito Creek Channel	23
3.7.1	Maintenance and repair of flood gate	23
3.7.2	Homeless encampment clean-up	24
3.8	Miscellaneous Maintenance Activities	24
3.8.1	Miscellaneous Repairs and Maintenance	24
3.8.2	Remove unauthorized encroachments on Project (stairs, landscaping, utilities, fences, irrigation, etc.)	24

3.8.3	Maintenance of authorized encroachments on Project (Vehicular and pedestrian trails, utilities, etc.)	24
3.9	Friendship Bridge and Boardwalk	25
3.9.1	Vehicular carrying capacity of the Boardwalk is 10,000 lb. (ten thousand pounds).	25
3.9.2	Maintenance Activities at Boardwalk.....	25
3.9.3	Maintenance Activities at Friendship Bridge	25
3.10	Storm Water Pump Stations	25
4	INSPECTION AND REPORTS.....	26
4.1	Introduction	26
4.2	Inspection and Reporting Frequency.....	26
4.3	JPA Inspections of Project Elements.....	26
4.4	Check Lists and Instructions	27
4.5	JPA Project Inspections.....	27
4.5.1	JPA Evaluation of Project Elements.....	27
4.5.2	JPA Rating of Project Elements and Deficiencies	27

List of Appendices

- Appendix A. Design Documentation Report
- Appendix B. Project As-Built Drawings *[to be included when project complete]*
- Appendix C. SCVWD Inspection Guidelines, Rating Guides and Checklists
- Appendix D. Maintenance Best Management Practices
- Appendix E. Environmental Permits *[to be included when received]*
- Appendix F. Floodwall Coating Specifications
- Appendix G. Pesticide Use Procedure and Vegetation Control Work Instruction

List of Figures *[To be included in final]*

- Figure 1a & b. Maintenance Access
- Figure 2. Levee Mowing Areas
- Figure 3. San Francisquito Creek Mitigation Sites
- Figure 4. Faber Tract Levee Mitigation Sites

1 OVERVIEW AND ACCESS

1.1 Purpose of Manual

The manual provides a consolidation of data and requirements needed by the sponsor to perform operation and maintenance (O&M) activities at San Francisquito Creek. The San Francisquito Creek Joint Powers Authority (JPA) is responsible for project O&M. In its Resolution Number 14.11.20 (November 14, 2014), the JPA delegated responsibility for operation and maintenance of the Project to the City of East Palo Alto and the Santa Clara Valley Water District.

The manual has been developed as a “Living Document”. It is expected that the sponsors will update it when changes to the project and O&M occur. Significant changes to the project or procedures that could potentially impact the operation of the project should be addressed by the JPA for review and approval (see Section 1.2).

1.2 Changes to the Project or the Manual

Proposed changes to the project/system and/or its O&M Manual should be addressed by the JPA.

The current name and address is:
San Francisquito Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, CA 94025

1.3 Project Vehicular Access

See Figures 1a&b for vehicular access locations to the San Francisquito Creek levees and floodwalls.

- For normal O&M, vehicular access points to the gravel and paved roads are located at East Bayshore Road, Verbena Drive, Daphine Way, Geng Road, and O’Connor Street. Access from public roadways such as gates and bollards are secured by locks.
- Ramps providing direct channel access are located downstream from the Palo Alto Pump Station (L-Line STA 70+75) and near the overhead utility tower in the channel (L-Line STA 48+00). L-line is stationing in Santa Clara County.
- All access gates and bollards will remain locked when not in use.
- Access is available to pedestrians, bicyclists, and authorized cars and trucks.
- Access across Friendship Bridge and the Boardwalk is limited to pedestrians, and cars and light trucks. Vehicular carrying capacity of the boardwalk is 10,000 lb. Heavier equipment is not allowed.

2 OPERATION

2.1 Introduction

In accordance with U.S. Army Corps of Engineers (USACE) technical guidance (*Levee Owner's Manual for Non-Federal Flood Control Works, the Rehabilitation and Inspection Program, Public Law 84-99*, March 2006), this section covers routine operations and maintenance details required for the proper care and efficient operation of the various project elements, including levee embankments, floodwalls, channels, interior drainage system, and pump stations. Maintenance records will be maintained and available for inspection in SCVWD Watershed Operations and Maintenance Division and East Palo Alto Public Works/Maintenance. For project design information, see Appendix A, Design Documentation Report and Appendix B, Project As-Built Drawings. Maintenance documents to be followed are in Appendix C, SCVWD Inspection Guidelines, Rating Guides and Checklists.

Some maintenance activities require regulatory permits and/or authorization to perform the work. The work activities for specific locations will need to be analyzed for determination of possible significant impacts through the appropriate environmental review and adoption process. O&M activities will be performed in accordance with SCVWD Maintenance Best Management Practices (Appendix D); however, separate permits will be obtained when maintenance is required.

Owners and/or occupants of properties on which maintenance easements exist or which are adjacent to public agency-owned property on which work will be performed should be notified before work is commenced.

Location	Easement/ Adjacent to Fee		Address	APN	Contact(s)
Santa Clara County	Easement	City of Palo Alto			
Santa Clara County	Easement	United States Postal Service			Postmaster
Santa Clara County	Easement and Fee	International School of the Peninsula			François Guedenet
Santa Clara County	Fee	Yeaman Auto Body, Palo Alto Upholstery			Scott Yeaman and Mitch Johnson

San Mateo County	Easement	Public Storage			
San Mateo County	Easement	City of East Palo Alto			Kamal Fallaha
Faber Tract	Permit to Access	Don Edwards San Francisco Bay National Wildlife Refuge			

2.2 Removal of Excess Sediment and Vegetation

The following sections identify the trigger points for the removal of sediment and/or vegetation so that the project complies with the as-built conditions.

2.2.1 Sediment Removal Triggers for Channel

Excess sediment in the channels affects the conveyance capacity of the improvements and impairs the ability of the Project to function as designed.

From Highway 101 to the San Francisco Bay, sediment deposition accumulated to a continuous elevation 8.0' (NAVD88) will reduce the levee/floodwall freeboard by 50% (1.5 feet) which will require sediment removal.

No sediment deposition is anticipated during normal conditions. Upstream bank failure could provide an amount of sediment that the channel could not accommodate, requiring a maintenance need as a result of an unpredictable event. In the event that tidal deposition reaches an equilibrium at a different elevation than designed, a berm or other means of recapturing freeboard will be installed.

2.2.2 Vegetation Removal Triggers for Channel

Vegetation management refers to the removal of vegetation for the purposes of maintaining specific flood control objectives such as passage of flood flows and to maintain flood control access (project inspections, flood fighting, maintenance and repairs).

From Highway 101 to the San Francisco Bay, a maximum roughness coefficient of $n=0.055$ (similar to continuous thickets or rigid woody understory and brush) would result in a reduction of levee/floodwall freeboard of 33% (1.0 foot). This condition is based on brush or excessive vegetation (n -value = 0.055) being present on the terraced benches and levee side slope.

The system has been designed to a maximum roughness coefficient of $n=0.038$ (similar to grasses). Maintenance activities shall occur when woody understory or brush is encountered.

3. MAINTENANCE

3.1 Vegetation Maintenance

The Project site is habitat for the endangered species Salt Marsh Harvest Mouse (SMHM) and Ridgway's Rail (RR), formerly California Clapper Rail. All activities for the Project shall be in accordance with Appendix D, Maintenance Best Management Practices, BMP Numbers GEN-11 and ANI-2, as adapted for the conditions of this Project. SMHM monitor shall be on site for duration of all work except irrigation and hand weeding. Herbicide application shall be done with immediate oversight by a State-certified Qualified Applicator with the appropriate certification categories. Herbicide application by District staff shall be in accordance with QEMS Procedure Q751D02, Control and Oversight of Pesticide Use and QEMS Work Instruction WW75100, Vegetation Control Work Instructions (Appendix G).

3.1.1 Mitigation Plantings during Establishment Period

3.1.1.1 Instream benches adjacent to levees and floodwalls to remove undesired and non-native vegetation

- a. Hand weeding or hand mowing (weed whacker) every 2 weeks, summer and fall (two-day duration).
- b. Herbicide application five days per year
- c. See the restrictions in Sections 3.1.3 and 3.2.1.3 for all activities.

3.1.1.2 Faber Tract levees

- a. Remove unwanted vegetation and control non-natives (hand methods) as needed.
- b. Remove of diseased vegetation as needed.
- c. Implement additional maintenance measures, as needed, to ensure that long term success criteria are met.
- d. Note that Faber Tract levees are within the Don Edwards San Francisco Bay National Wildlife Refuge, and any maintenance requires specific conditions to be included in natural resource agency permits (see Appendix E).

3.1.2 Erosion Control Plantings

- a. Annual mowing of grasses (two-day duration) to 3 to 4 inches high on levee slopes from top of levee to levee toes in summer or fall for inspection of levee integrity, maintaining channel roughness, and fire risk reduction.

- b. Hydroseed with erosion control seed mix on bare spots on levee faces due to fire or slope repairs in fall or early winter months to facilitate germination.
- c. Monitor hydroseeded areas for success.
- d. Repeat hydroseed application, as needed if first attempt was not successful.
- e. See the restrictions in Sections 3.1.3 and 3.2.1.3 for all activities.

3.1.3 Protection for Endangered Species

- a. Within 7 days prior to work within the range of SMHM or RR, as depicted on the SCVWD's GIS layers, the proposed project area will be surveyed by a qualified biologist to identify specific habitat areas. Surveyed areas will include work locations and access routes. If the SCVWD's GIS information is revised, it will be provided to the USFWS for review.
- b. To minimize or avoid the loss of individuals, activities within or adjacent to RR and SMHM habitat will not occur within 2 hours before or after extreme high tides (6.5 feet or above) when the marsh plain is inundated, because protective cover for those species is limited and activities could prevent them from reaching available cover.
- c. Mowing will not occur at night.
- d. Specific habitat areas are vegetated areas of cordgrass (*Spartina* spp.), marsh gumplant (*Grindelia* spp.), pickleweed (*Sarcocornia pacifica*), alkali heath, (*Frankenia* sp.), and other high marsh vegetation, brackish marsh reaches of creek with heavy accumulations of bulrush thatch (old stands), and high water refugia habitat that may include annual grasses, and shrubs immediately adjacent to channels.
- e. Within the habitat areas, vegetation will be removed by hand from areas to be directly impacted by the work activities.
- f. Prior to the initiation of work each day for all vegetation management work, ground or vegetation disturbance, operation of large equipment, grading, sediment removal, and bank stabilization work and prior to expanding the work area, if suitable habitat occurs within the immediate work area, a qualified biologist will conduct a preconstruction survey of all suitable habitat that may be directly or indirectly impacted by the day's activities (work area, access routes, staging areas).
 - i. If during the initial daily survey or during work activities a RR is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until the RR leaves the work area.

- ii. If during the initial daily survey or during work activities a SMHM or similar rodent is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until a *Site Specific Species Protection Form* can be developed and implemented by a qualified biologist to protect the SMHM or similar rodent is developed and implemented by the qualified biologist. Acceptable plan activities may include one or more of the following activities: 1) establishment of a buffer zone at least 50 feet in radius from the rodent; 2) ongoing active monitoring, 3) construction of silt fence barrier between maintenance work and location of the rodent, 4) delay of work activity until the qualified biologist can provide CDFW and the USFWS a suggested course of action and seek concurrence.
- g. If mowing with hand equipment is necessary within 50 feet of habitat areas, an on-site monitor will observe the area in front of the mower from a safe vantage point while it is in operation. If SMHM are detected within the area to be mowed, no mowing will occur in that area. If RR is detected within the area to be mown, the mowing will stop until the individual(s) have left the work area.
- h. See Section 3.2.1.3 for additional restrictions.
- i. If visual observation cannot confirm RR left the work area then it is assumed that the individual(s) remains in the work area and the work will not resume until the area has been thoroughly surveyed (and absence confirmed) or the USFWS has been contacted for guidance.

3.1.4 Other Vegetation Removal

3.1.4.1 Removal of woody and non-woody invasive vegetation within project right-of-way for inspections at base of levee toes using herbicide application, mechanical mowing, hand mowing and trimming, or hand weeding.

- a. Cut and remove woody growth (trees and saplings) within 15 feet of outboard levee toe.

3.1.4.2 Removal or pruning of all vegetation encroaching within project right-of-way using herbicide application, mechanical mowing, hand mowing and trimming, or hand weeding.

- a. Remove ground cover that obscures visual inspections of levee and floodwall structures for damage and for flood fighting activities.
- b. Cut, prune, or remove landscape ground covers, brush, and ornamentals from adjacent private property which encroach onto the right-of-way.

3.1.4.3 Removal of woody vegetation in channel

- a. Cut and remove woody saplings, trees, invasives, and understory.
- b. Follow up with appropriate herbicide treatment as necessary to prevent regrowth.

3.2 Flood Protection Structures

Maintenance measures are necessary to ensure serviceability of the levees and floodwalls to withstand flow events up to the design flood event. Limited vegetation is required to allow for visual inspection of the levee embankments. Vegetation other than shallow rooted grasses shall not be permitted on levee crowns, slopes, or within 15 feet of the outboard levee toe. This is necessary to prevent the development of deep roots within the body of the levee which can create seepage paths. A rodent abatement program shall be employed as soon as evidence of burrowing activity is found on the levee embankment or toe. Shallow scattered holes allow for runoff to infiltrate the levee and can result in seepage flow paths through the levee during flood events. See Figures 1 and 2 for maintenance activity locations.

3.2.1 Levee Maintenance

3.2.1.1 Levee repairs

- a. Excavate, repair, and reconstruct levee embankments due to seepage, slumps, cracks (longitudinal or transverse), loss of grade, sloughs, slides, rodent burrows, scour, or erosion in order to maintain full levee section.

- b. Reconstruct/raise levee crown due to sags, depressions, or groundwater subsidence.
- c. The levee is to be repaired to original design specifications (See Appendix B, Project As-Built Drawings).

3.2.1.2 Repair of levee damage caused by flood events (erosion, scour, slumps, and sags)

- a. Inspect and document cause of levee damage.
- b. Plans for repairs will be prepared by the JPA.
- c. Schedule and complete construction.
- d. Levee fill material shall be placed in maximum uncompacted lifts of 8-inches and moisture conditioned to between 0 and +3% of the optimum moisture content. The fill shall be compacted to a minimum dry density of 92% of the maximum laboratory dry density determined by ASTM Method D1557. The upper 12 inches of levee embankment shall be compacted to a minimum dry density of 95% of the maximum laboratory dry density determined by ASTM Method D1557. Monitor repair site for performance.

3.2.1.3 Animal Control Program (baiting, trapping, and barriers)

- a. Control of burrowing animals (gophers, ground squirrels, and similar rodents) with bait stations, fumigants, smoke bombs, rodenticides, and live trapping to prevent damage or colonization of levee embankments.
- b. Control methods shall be evaluated to avoid harm to the SMHM and RR. No rodenticides will be used within 100 m (328 ft) of suitable marsh/brackish marsh habitat for these species.
- c. Methods of rodent control within SMHM or RR habitat will be limited to live trapping. All live traps shall have openings measuring no smaller than 2 inches by 1 inch to allow any SMHM that inadvertently enter the trap to easily escape. All traps will be placed outside of pickleweed areas and above the high tide line.
- d. Captured mammals that are predators shall be disposed of.
- e. Displace or exclude animals constructing and using dens (burrows) in the levee embankments by mechanical means.
- f. See also Appendix D, Maintenance BMPs.

3.2.1.4 Repair animal damage on levee slopes and at levee toe

- a. Excavate burrow locations and reconstruct levee embankment, or
- b. Pressure-fill burrows with bentonite clay, cement grout slurry. Slurry to consist of two parts bentonite clay, one part cement grout and water, as specified by the Project designer, HDR, Inc., or
- c. Mud packing method may be used to backfill burrows.
- d. Additional information on the repair of animal burrows may be found in FEMA Publication 473, "Technical Manual for Dam Owners, Impacts of Animals on Earthen Dams," September 2005.

3.3 Floodwall Maintenance

3.3.1 Repair of floodwall coating

- a. The sheet pile floodwall has been protected from rust by a 15-millimeter thick phenalkamine coating on the floodwall surface.
- b. This coating should be visually inspected during annual inspections to insure a complete coverage.
- c. Any nicks or scrapes in the coating surface should be repaired immediately in accordance with the specifications in Appendix F.

3.3.2 Repair of floodwall damage caused by flood events

- a. Inspect and document cause of floodwall damage.
- b. Plans for repairs will be prepared by the JPA.
- c. Schedule and complete repair.
- d. Monitor repair site for performance.

3.4 Creek Channel Maintenance

3.4.1 Removal of downed trees in creek channel

- a. Cut and remove downed trees within creek channel.

3.4.2 Sediment removal in low flow channel

- a. Sediment removal in channels is necessary if sediment bar and vegetation blocks flow and reduces conveyance.

3.4.3 Fill and repair scour holes in channel

- a. Scour hole repairs are required if conveyance, slope stability, or a utility is affected.
- b. Drain ponded water and reconstruct channel embankment and/or invert.
- c. Fill placed in 8-inch lifts, minimum 90% compaction. Sand Cone method to test relative compaction may be used.

3.4.4 Control of unwanted vegetation on benches to maintain conveyance

- a. Mowing/trimming of herbaceous growth when it is 4 feet or higher.
- b. Cut, remove, and treat trees in channels to control woody growth and maintain conveyance per Section 3.1.3.3.

3.4.5 Repair of rock slope protection

- a. Inspect condition of rock slope protection after flood events.
- b. Replace, repair, and restore rock slope protection to as-constructed conditions.
- c. Remove woody vegetation (brush or trees) growing in rock slope protection. Cut trees or woody vegetation and treat stumps with appropriate herbicide.

3.4.6 Trash and debris removal in channels and at bridge piers/columns

- a. Remove debris that creates blockages or reduces conveyance, as determined by engineering staff.

3.5 Maintenance Access Ramps and Maintenance Roads

3.5.1 Repair and maintenance of levee maintenance roads and access ramps

- a. Levee maintenance roads accessed from O'Connor Street, Daphne Way, and Verbena Drive in East Palo Alto, and the channel maintenance access ramp at the PG & E electric tower in Palo Alto are surfaced with Caltrans Section 26 Class II aggregate base. Fill potholes or ruts with compacted Class 2 aggregate base per Caltrans Specifications.
- b. The levee access road from Geng Road in Palo Alto is surfaced with Caltrans Section 39 asphalt concrete paving (AC). Repair damaged areas with AC per Caltrans specifications.
- c. The channel maintenance access road adjacent to the Palo Alto Pump Station is paved with Portland cement concrete (PCC). Repair damaged areas with suitable PCC.

- d. Apply herbicide on permeable levee crown surfaces to prevent unwanted vegetation.
- e. Remove woody vegetation and overhanging growth which impairs or obstructs maintenance access along the base of levee roads and along the top of levees.

3.5.2 Repair and maintenance of floodwall maintenance roads and access ramps

- a. Floodwall maintenance roads in East Palo and above L-line Sta 54+00 are surfaced with Caltrans Section 26 Class II aggregate base. Fill potholes or ruts with compacted Class 2 aggregate base per Caltrans Specifications.
- b. The floodwall maintenance road in Palo Alto below L-line Sta 54+00 is surfaced with Caltrans Section 39 asphalt concrete paving (AC). Repair damaged areas with AC per Caltrans specifications.
- c. Apply herbicide on permeable roadway surfaces to exclude unwanted vegetation.
- d. Remove woody vegetation and overhanging growth which impairs or obstructs maintenance access.

3.6 Outfalls, Flap Gates, and Valves

Outfalls which penetrate the floodwall must be maintained and repaired as necessary to ensure that they continue to operate as intended and at full design capacity. Outfalls which have failed, including flap gates that are not operating properly, culverts that are operating below full capacity or positive closure valves that are inoperable, may create flooding.

3.6.1 Culvert flap gate service and repairs (during annual inspections)

- a. Check for damage.
- b. Check for rust.
- c. Confirm proper seating and sealing of flap gate on culvert.
- d. Service frame and lubricate pivots.

3.6.2 Pipe culvert inspection, repairs, and sediment removal (during annual inspections)

- a. Evaluate culvert for sediment and/or blockages.
- b. Check pipe interior.

3.6.3 Periodic video inspection of culvert joints and lining for buckling, spalling, corrosion, damage Interior Drainage System

- a. Outfalls which penetrate the floodwall must be maintained and repaired as necessary to ensure that they continue to operate as intended and at full design capacity, or separation.
- b. Remove sediment in culvert.
- c. Replace damaged or degraded pipes and culvert sections.

3.6.4 Removal of sediment and woody vegetation at culverts and outfalls (during annual inspections)

- a. Cut and remove vegetation that could affect flap gate or discharge.
- b. Remove sediment that could affect flap gate or discharge.

3.6.5 Repair and maintenance of outfall slope protection (during annual inspections)

- a. Remove any woody vegetation (brush or trees) in rock slope protection.
- b. Repair or replace rock slope protection.
- c. Repair foundation or apron of outfalls to prevent undermining, scour, and/or slope failures.

3.6.7 Positive closure valve (during annual inspections)

- a. Positive closure valves located at the outboard side of the flood walls shall be tested to insure proper sealing.
- b. Positive closure valves that do not seal properly shall be repaired or replaced to ensure protection from flooding backflow.

3.7 San Francisquito Creek Channel

Maintenance measures shall be performed to ensure serviceability of the creek to safely pass all flows up to the design flood event. Maintenance of the low flow creek channel and terraced benches shall consist of the removal of sediment deposition, debris accumulation and vegetative growth. The JPA will periodically re-assess facilities to evaluate conveyance to verify maintenance practices (see Section 3).

The channel shall be thoroughly inspected annually and immediately following each major high water period after water levels are reduced to the low flow.

3.7.1 Maintenance and repair of flood gate

- a. Inspect and verify operation, identify and document any damage annually.
- b. Grease, lubricate, and exercise mechanical appurtenances as needed based on inspection. Gates are removed and reinstalled or twice per year.
- c. Determine if the condition is undesirable, or affects operations.

- d. Prepare plans and complete repairs if necessary.
- e. Monitor for performance.

3.7.2 Homeless encampment clean-up

- a. Remove homeless encampments with assistance from local authorities.
- b. Monitor, evaluate, and repair impacts from homeless encampments (brush clearance, tree trimming, creation of trails and paths, debris and wastes) as needed.

3.8 Miscellaneous Maintenance Activities

Maintenance on the following project elements is required to provide security in areas where access is not intended, and to ensure access at the proper locations for maintenance staff as needed, and to the general public for recreational use. Encroachments into the project ROW must be maintained when authorized, and removed when not authorized.

3.8.1 Miscellaneous Repairs and Maintenance

- a. Repair fence sections and replace damaged fence gates and bollards.
- b. Replace and install public signage for Project as necessary.
- c. Paint defaced structures located in the channel (floodwalls, drop structures, etc.) as part of the neighborhood clean-up work.

3.8.2 Remove unauthorized encroachments on Project (stairs, landscaping, utilities, fences, irrigation, etc.)

- a. Coordinate removal of unauthorized private encroachments with local jurisdictions (parks, police, public works, building departments).
- b. Notify adjacent property owners to remove unauthorized encroachments if they are the responsible party.
- c. Provide neighborhood notice if work is necessary to remove encroachments.
- d. Coordinate removal of unauthorized encroachments or utility encroachments with owners.

3.8.3 Maintenance of authorized encroachments on Project (Vehicular and pedestrian trails, utilities, etc.)

- a. Encroachment owner identifies needed repairs or modifications.
- b. Repairs are identified and project is defined.
- c. Owner applies for a permit from the appropriate governing entity to perform work.
- d. Coordinate with local jurisdictions (city, parks, or private party).
- e. Owner sends neighborhood notices to the surrounding property owners/community.

- f. Complete repairs.
- g. Monitor for performance.

3.9 Friendship Bridge and Boardwalk

3.9.1 Vehicular carrying capacity of the Boardwalk is 10,000 lb. (ten thousand pounds).

3.9.2 Maintenance Activities at Boardwalk

- a. Cut and remove vegetation or debris that may accumulate at boardwalk piers.
- b. Inspect for scour and erosion at boardwalk piers and abutments.
- c. Reconstruct channel sags, depressions, or ground subsidence to original design specifications (See Appendix B – Project As-Constructed Drawings).

3.9.3 Maintenance Activities at Friendship Bridge

- a. Inspect for scour and erosion at bridge abutments.
- b. Remove debris at bridge abutments and Friendship Island.

3.10 Storm Water Pump Stations

There are two municipal storm water pump stations located within the project limits: the O'Connor Street Pump Station located near R-Line Station 30+00 and the Palo Alto Pump Station located near L-Line Station 71+00. Neither pump station was constructed as part of the flood control works. The pump stations were operational prior to the construction of the levees and floodwalls. The Cities of East Palo Alto and Palo Alto are responsible for their operation and maintenance, including the Palo Alto Pump Station channel and the O'Connor Street Pump Station outfalls.

4 INSPECTION AND REPORTS

4.1 Introduction

This section details the inspection required for proper care and efficient operation of the various project elements. Completed projects must be adequately maintained if they are to function as intended. The JPA is responsible for preserving maintenance and inspection records for its area of responsibility and making them available for government inspection. Government inspections will be performed in consultation with JPA. The inspection requirements included herein apply to all items constructed by and necessary for the operation of the Federal Project.

4.2 Inspection and Reporting Frequency

Semiannual inspections performed by JPA shall occur by May 1 and November 1.

In addition to the semiannual inspection and reporting cycle, the following events require immediate inspection.

- a. Immediately following each major flood,
- b. Immediately following each earthquake based upon the following criteria:
 - i. Earthquakes measuring less than 5.0 on the Richter scale, inspection shall be performed when the epicenter is within 3 miles of the project,
 - ii. Earthquakes measuring 5.0 to 6.0 on the Richter scale, inspections shall be performed when the epicenter is less than 30 miles from the project,
 - iii. For earthquakes measuring 6.0 or higher on the Richter scale, inspections shall be performed when the epicenter is less than 50 miles from the project,
 - iv. Inspections shall also be performed after any earthquakes in which specific reports of damage to the project are received.

4.3 JPA Inspections of Project Elements

- a. Channels checked for sediment, scour, fallen trees, debris and other blockages.
- b. In-stream refugia structures checked for stability and scour.
- c. Levee embankments.
- d. Interior drainage (culverts, flap gates, isolation gates, valves).
- e. Levee penetrations are visually inspected annually, and by video or walkthrough every 5 years. Frequency will be increased if deficiencies are noted.
- f. Biannual reports documenting project conditions.
- g. Levee elevations on both sides will be inspected by survey two years after completion of construction and four years after completion of construction to verify forecast elevations following settlement. If settlement exceeds predictions, repair options will be evaluated and implemented.

4.4 Check Lists and Instructions

The SCVWD check lists and instructions shown in Appendix C are to be explicitly followed in each inspection to ensure that no features of the protective system are overlooked. A copy of the inspector's original field notes as recorded on the check list shall be transmitted to the District Engineer as an enclosure to the annual report. Completed inspection check lists are located at the direction of the JPA. The following documents are included in "Appendix C - SCVWD Inspection Rating Guides and Checklists":

- SCVWD WW 75161 Field Operations Levee Inspection Guidelines
- SCVWD WF 75161 Levee Field Inspection Rating Guide
- SCVWD WW 75165 Field Operations Inspection Guidelines
- SCVWD WF 75165 Field Inspection Checklist
- SCVWD WF 75166 Facilities Inspection Rating Guide

4.5 JPA Project Inspections

The JPA completes annual inspections of the Project by November of each year. During these inspections the Project elements (levees, channels, maintenance roads, culverts, revetment, etc.) are evaluated and rated following the SCVWD guidelines for inspections. Evaluations will identify and document any deficiency (e.g., erosion, scour, sediment, rodent control problems, animal damage, in-stream vegetation, levee maintenance, trash build up, homeless encampments, large woody debris blockages, etc.) on the Project.

4.5.1 JPA Evaluation of Project Elements

The SCVWD has developed specific Inspection Guidelines for watershed facilities and levees throughout the county. These Guidelines identify the inspection category (routine or event driven) and frequency of inspection (annual, event, or semiannual) for each project and system. The Guidelines contain information on the inspection and work flow so that deficiencies identified during the inspections are corrected. Appendix D contains the SCVWD descriptions of the facility and levee maintenance practices.

4.5.2 JPA Rating of Project Elements and Deficiencies

During inspections, project elements are assigned a rating (A=New, B=Good, C=Monitor, D=Corrective Action, E=Immediate Action). Deficiencies or items of concern found during the inspections are documented by the JPA.

Based on the severity of the deficiency, available budget, right-of-way, and existing permits, the JPA then schedules corrective maintenance to remedy the problem. If it is determined that maintenance is required, a project plan is prepared, the repairs are scheduled, and funds are budgeted as necessary.