# San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project - San Francisco Bay to Highway 101

## Year 1 (2018) Mitigation Monitoring Report

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Prepared for:

San Francisquito Creek Joint Powers Authority

**December 2018**

# Executive Summary

Construction of the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project – San Francisco Bay to Highway 101 (Project), which is administered by the San Francisquito Creek Joint Powers Authority (JPA), began in June 2017, and was completed in November 2018. The Project occurs along approximately 1.4 miles of San Francisquito Creek to its confluence with South San Francisco Bay.

The Project's Mitigation and Monitoring Plan (MMP) specifies the required mitigation to off-set Project impacts, monitoring methods, and quantitative performance and final success criteria for determining successful establishment of the mitigation over a 10-year period. The MMP is submitted to comply with Project requirements from the U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), USFWS Don Edwards National Wildlife Refuge (Refuge), National Marine Fisheries Service (NMFS), California Department of Fish and Wildlife (CDFW), San Francisco Bay Conservation and Development Commission (BCDC), and San Francisco Bay Regional Water Quality Control Board (RWQCB).

Project mitigation requirements were initiated in 2017 and, as such, 2018 was Year 1 of mitigation monitoring. Quantitative monitoring of plant survival, health and vigor, and cover was conducted in accordance with the MMP. Qualitative monitoring, including photo-documentation, was conducted periodically during construction, but primarily in November 2018 after construction was completed. Qualified biologists observed marsh plain grading, natural recruitment of vegetation, plant growth on hydroseeded areas, overall plant health, prevalence or particular locations of invasive weeds, berm enhancement, high-tide refuge islands, geomorphic stability, and fish velocity refuge structures to document any significant deviations between the constructed condition and design, as well as any visible problems or damage to the site and potential causes.

Table 1 summarizes the mitigation elements that are required to be monitored, relevant performance or success criteria from the MMP, and whether or not the criteria were achieved in Year 1. These criteria will be used to determine if/when the Project's required mitigation acres of different habitat types have been successfully provided. (Required mitigation acres of different habitat types are listed in Section 1 of this report and progress toward those acres is described in Section 3.) Based on the Year 1 monitoring results, tidal marsh creation, refuge islands, berm enhancement area, riparian mitigation, and velocity refuge structures achieved the relevant performance criteria. Invasive species will be treated in the created tidal marsh and berm enhancement area to help ensure their continued success. Replacement shrub plantings will be installed on the refuge islands and in the berm enhancement area in the winter of 2018/2019 to increase shrub planting percent survival to at least 100% per the MMP. Within the 7.7-acre berm enhancement area, 0.6 acres were left unvegetated in 2018 to allow vehicle access for completion of the Project. This area will be revegetated during the winter of 2018/2019.

## Table 1. Mitigation Performance Criteria

| Mitigation Element | Performance Criteria | | Achieved in Year 1?[1] |
|---|---|---|---|
| **Tidal Marsh Creation** | Percent Cover | Average percent cover of wetland indicator species is at least 90% of that at the reference site and no less than 60% cover. | NA in Year 1 |
| | Health & Vigor | Average health and vigor ratings of tidal marsh plants will be good or better. | Yes |
| | Invasive Species | Plant species categorized as "highly invasive" by the California Invasive Plant Council (Cal-IPC) will not exceed a maximum of 5% cover. | NA in Year 1, but Yes |
| **Refugia Islands** | Percent Cover | • Average foliar cover will be at least 70% provided by native plant species.<br>• Average marsh gumplant (*Grindelia stricta*) canopy cover will be at least 30%. | NA in Year 1, but on track |
| | Invasive Species | Average foliar cover of highly invasive plants will be less than 5%. | NA in Year 1, but Yes |
| | Marsh Gumplant Height | Average marsh gumplant height on island tops will be at least 2.5 feet above mean higher high water (MHHW, or 7.1 feet NAVD88). | NA in Year 1, but on track |
| **Berm Enhancement** | Size and Distance | • Native shrub patches will be 20 to 80 feet long, at least 4 feet wide.<br>• Distance between the outer boundaries of native shrub patches will be 25 to 200 feet. | NA in Year 1, but Yes |
| | Percent Cover | • Native shrub patches will have a minimum of 60% average canopy cover provided by native shrubs.<br>• Forb/grass revegetation areas (between native shrub patches) will have at least 60% average foliar cover by non-invasive, herbaceous vegetation. | NA in Year 1, but on track |
| | Invasive Species | Berm enhancement area (shrub patches and forb/grass areas) will have less than 5% average foliar cover of invasive plant species. | NA in Year 1, but Yes |
| **Riparian Mitigation** | Protected Trees | Protected trees retained on site and adjacent to construction will be replaced if they do not survive due to Project implementation. | Yes |
| | Tree Replacement | A total of 108 oaks and 166 other native trees alive. | NA in Year 1, but on track |
| | Percent Cover | • An increasing trend in percent cover between Years 3 and 5 (San Francisquito Creek planting area only).<br>• 50% average absolute percent cover of native woody and herbaceous species (San Francisquito Creek planting area only). | NA in Year 1 |
| **Velocity Refuge Structures** | Channel and Structures | Channel design elements are stable and functioning as intended. | Yes |
| | Fish Passage | Creek, restored marsh plain, and velocity refuge structures provide adequate fish passage and habitat conditions. | Yes |

[1] NA = not applicable

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# Section 1.0 Introduction

## 1.1 Project Summary

San Francisquito Creek, which forms the boundary between San Mateo County and the City of East Palo Alto to the north and Santa Clara County and the City of Palo Alto to the south (see Figure 1), has a history of flooding. The San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project – San Francisco Bay to Highway 101 (Project) was developed to:

- Protect properties and infrastructure between Highway 101/East Bayshore Road and San Francisco Bay—a 7,450 feet (1.4 mile) reach—from 100-year fluvial flows occurring at the same time as a 10-year tide that includes projected sea level rise through 2067, plus three feet of freeboard.
- Accommodate future flood protection measures that may be constructed upstream of the Project.
- Restore and enhance habitat along the Project reach, particularly tidal marsh habitat for threatened and endangered species.
- Enhance recreational uses on the San Francisco Bay Trail traversing the site.
- Minimize operational and maintenance requirements.

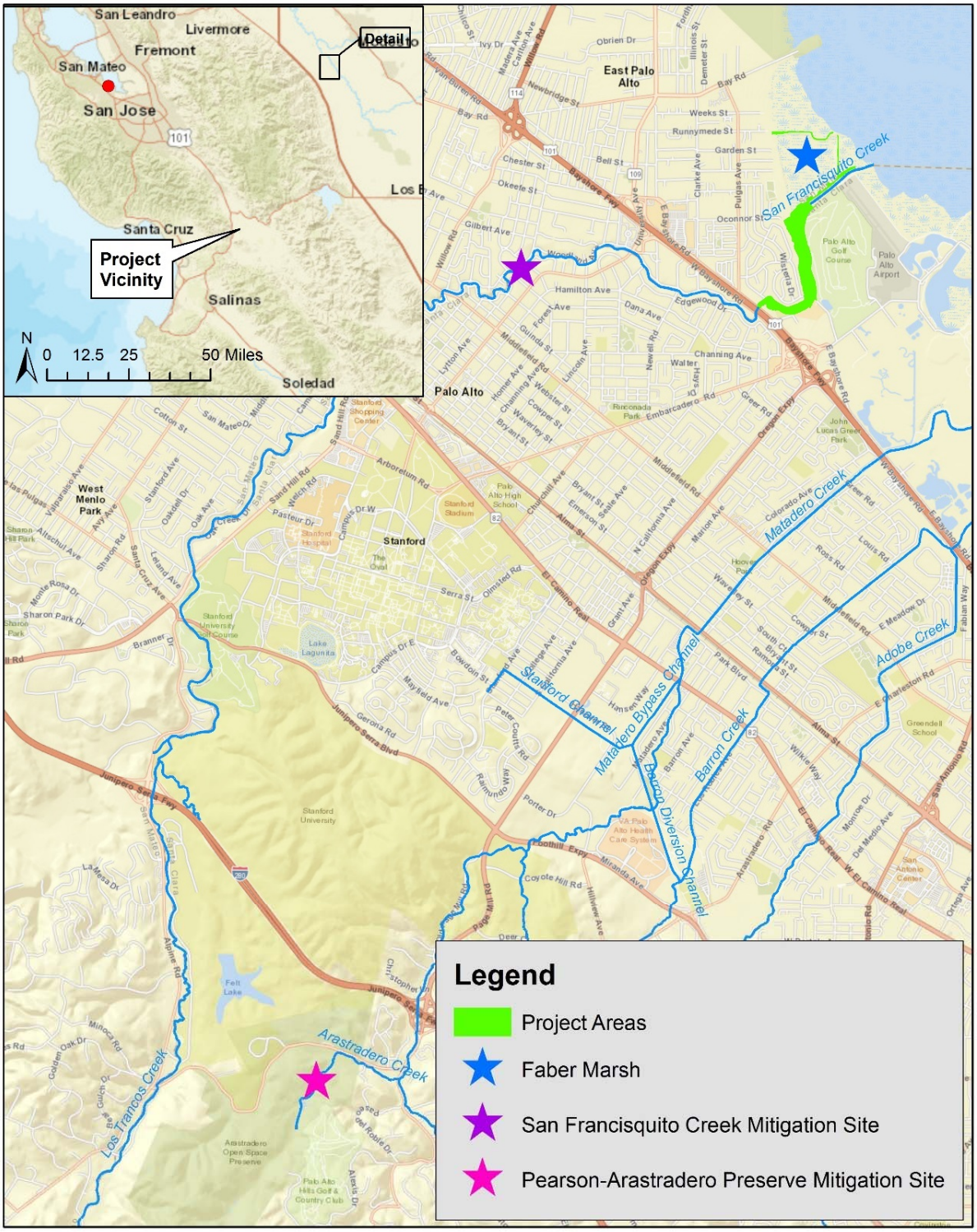
The Project included the following major components (see Figure 2):

- Constructed approximately 5,650 feet of floodwalls (from Highway 101/East Bayshore Road bridge to Daphne Lane/Geng Road) on both banks to increase channel capacity and maintain consistency with the Caltrans enlargement of the Highway 101/East Bayshore Road bridge over San Francisquito Creek.
- Rebuilt approximately 2,250 feet of existing levee on the north bank to improve levee strength and channel capacity.
- Setback approximately 2,730 feet of levee on the south bank to increase channel capacity, provide protection from extreme tides, and facilitate expanded tidal marsh plain habitat.
- Excavated material between the floodwalls and levees to maximize channel capacity and create an expanded tidal marsh plain.
- Relocated electricity transmission towers and poles; removed and replaced gas transmission lines; and realigned sewer lines and storm drains.
- Extended Friendship Bridge via a boardwalk across the widened channel.

The Project is being constructed, operated, and maintained by the San Francisquito Creek Joint Powers Authority (JPA) in partnership with its member agency, the Santa Clara Valley Water District (SCVWD or District). The JPA is a regional government agency whose members include the Cities of Palo Alto, Menlo Park, and East Palo Alto, San Mateo County Flood Control District, and SCVWD.

The floodwall construction and marsh plain creation from the Highway 101/East Bayshore Road bridge to approximately Geng Road was completed October 2017. High tide refuge habitat enhancements in the Faber Marsh were completed in January 2018, with the exception of a small portion of the South Berm to be completed by January 2019. The remaining elements of the Project were completed in late 2018.

**Figure 1. Vicinity of the San Francisquito Creek Project – San Francisco Bay to Highway 101**



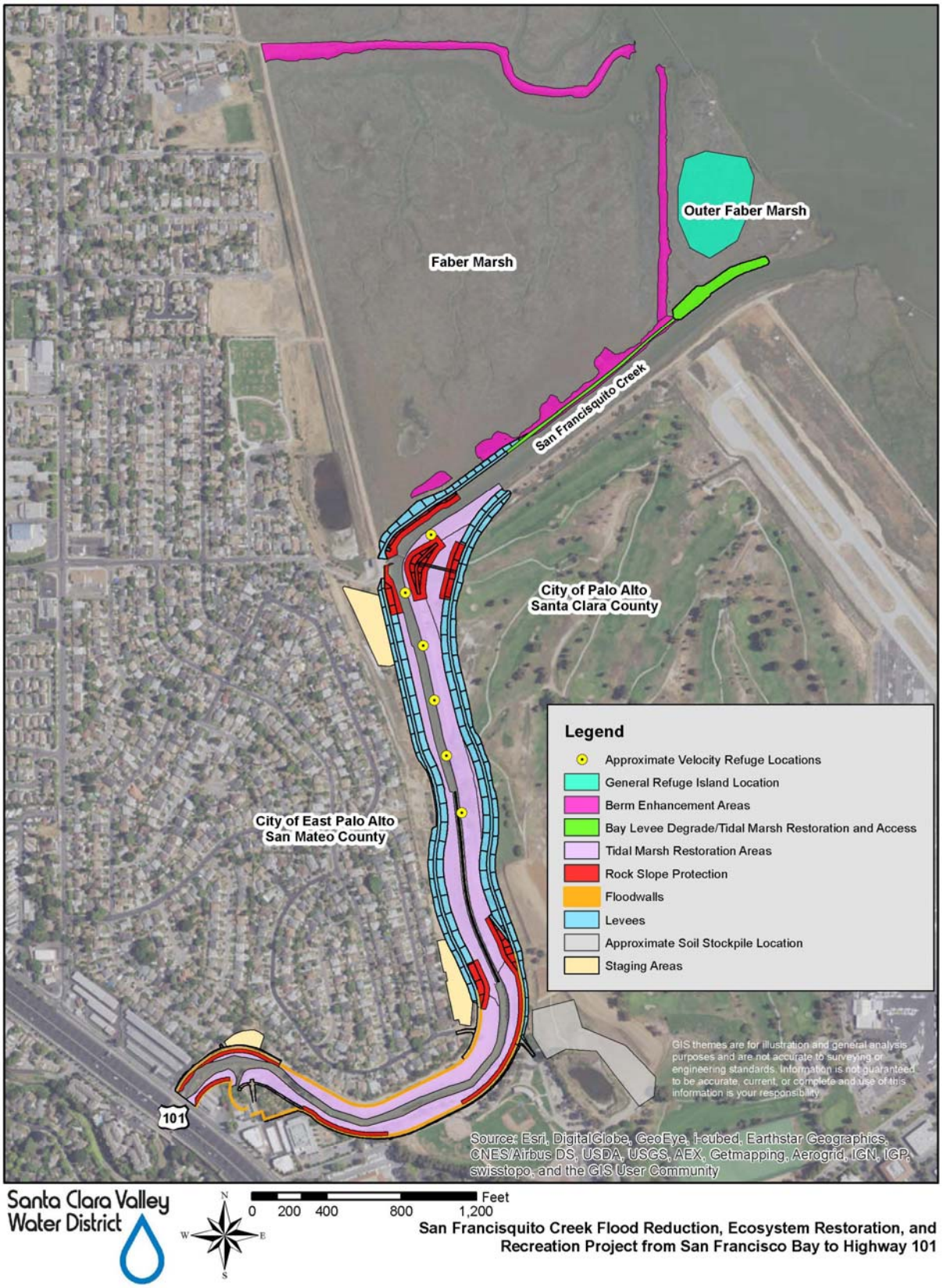

Santa Clara Valley Water District

**San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101**

N W E S

Miles 0 0.4 0.8 1.2 1.6

**Figure 2. Elements of the San Francisquito Creek Project – San Francisco Bay to Highway 101**



## 1.2 Permit Numbers

To construct the Project, the following permits were obtained:

- U.S. Army Corps of Engineers (USACE) Section 404 Permit No. 2013-00030S
- U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) 08ESMF00-2013-F-0401, amendment 08ESMF00-2013-F-0401-R001, and amendment 08ESMF00-2013-F-0401-R034
- National Marine Fisheries Service (NMFS) Endangered Species Act Section 7(a)(2) BO and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response No. SWR-2013-9572
- San Francisco Bay Regional Water Quality Control Board (RWQCB) Section 401 Conditional Water Quality Certification CIWQS Place No. 757384
- San Francisco Bay Conservation and Development Commission (BCDC) Permit No. 2013.007.00
- California Department of Fish and Wildlife (CDFW) Streambed Alteration Agreement (SAA) No. 1600-2013-0092-R3
- USFWS Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) General Activities Special Use Permit (SUP) # 2016-07

In addition, an Environmental Impact Report (EIR) was finalized and certified by the JPA to comply with the California Environmental Quality Act (CEQA) (State Clearinghouse No. 2010092048).

## 1.3 Mitigation Requirements

The Project's EIR, Mitigation Monitoring Plan (MMP; SCVWD 2016), environmental permits, USFWS and NMFS BOs document the Project's impacts and describe the mitigation that will be undertaken to adequately compensate for those impacts. In summary, Project ultimate mitigation requirements are:

1. Create or restore at least 13.81 acres of tidal marsh and high-marsh transition zone (i.e., ecotone) habitat in the creek's floodplain (also referred to as marsh plain);
2. Restore 2.25 acres of the San Francisquito Creek tidal channel;
3. Of the created and restored tidal marsh and channel, 1.04 acre must be within the BCDC Shoreline Band, 2.40 acres must be within the BCDC Bay Jurisdiction, and 6.90 acres must be considered Essential Fish Habitat (EFH) or below Mean Higher High Water (MHHW, or 7.1 feet NAVD88).
4. Restore 0.8 acre of diked marsh habitat outside of the Project levees;
5. Create five high tide refuge islands for salt marsh harvest mouse (SMHM) (*Reithrodontomys raviventris*) and California Ridgway's rail (RIRA) *(Rallus obsoletus obsoletus*) in outer Faber Marsh, which is directly north of the Project;
6. Enhance 5.66 acres of high tide refugia habitat for SMHM and RIRA on the berms surrounding Faber Marsh (i.e., the berm enhancement area);
7. Restore 14.70 acres of SMHM foraging and dispersal habitat;
8. Plant or protect 108 native oak trees and 166 other native trees at an off-site planting area along San Francisquito Creek and in Pearson-Arastradero Preserve;
9. Install six structures in or adjacent to the low flow channel to provide velocity refuge for migrating steelhead (*Oncorhynchus mykiss*); and
10. Contribute funding to SMHM and RIRA predator control efforts.

The performance and final success criteria that will be used to determine if the mitigation requirements listed above are ultimately achieved are summarized in Tables 1 and 2. Documentation of funding for predator control efforts is provided in Appendix A.

**Table 2. Mitigation Final Success Criteria**

| Mitigation Element | Final Success Criteria | | Schedule |
|---|---|---|---|
| **Tidal Marsh Creation** | Percent Cover | Average percent cover of wetland indicator species[2] is at least 90% of that at the reference site[3] and no less than 60% cover. | Years 5 and 10 |
| | Health & Vigor | Average health and vigor ratings of tidal marsh plants will be good or better. | Years 1-3 and 5 |
| | Invasive Species | Plant species categorized as "highly invasive" by the California Invasive Plant Council (Cal-IPC) will not exceed a maximum of 5% cover. | Years 5 and 10 |
| **Refugia Islands** | Percent Cover | • Average foliar cover will be at least 70% provided by native plant species.<br>• Average marsh gumplant canopy cover will be at least 30%. | Year 10 |
| | Invasive Species | Average foliar cover of highly invasive plants will be less than 5%. | Year 10 |
| | Marsh Gumplant Height | Average marsh gumplant height on island tops will be at least 2.5 feet above MHHW. | Year 10 |
| **Berm Enhancement** | Size and Distance | • Native shrub patches will be 20 to 80 feet long, at least 4 feet wide.<br>• Distance between the outer boundaries of native shrub patches will be 25 to 200 feet. | Year 10 |
| | Percent Cover | • Native shrub patches will have a minimum of 60% average canopy cover provided by native shrubs.<br>• Forb/grass revegetation areas (between native shrub patches) will have at least 60% average foliar cover by non-invasive, herbaceous vegetation. | Year 10 |
| | Invasive Species | Berm enhancement area (shrub patches and forb/grass areas) will have less than 5% average foliar cover of invasive plant species. | Year 10 |
| **Riparian Mitigation** | Protected Trees | Protected trees retained on site and adjacent to construction will be replaced if they do not survive due to Project implementation. | Years 1-5 |
| | Tree Replacement | A total of 108 oaks and 166 other native trees alive. | Year 10 |
| | Percent Cover | • An increasing trend in percent cover between Years 3 and 5 (San Francisquito Creek planting area only).<br>• 50% average absolute percent cover of native woody and herbaceous species (San Francisquito Creek planting area only). | Year 5<br>Year 10 |
| **Velocity Refuge Structures** | Channel and Structures | Channel design elements are stable and functioning as intended. | Years 1-5 |
| | Fish Passage | Creek, restored marsh plain, and velocity refuge structures provide adequate fish passage and habitat conditions. | Years 1-5 |

[2] This includes Obligate, Facultative Wetland, and Facultative species in the most recent USACE National Wetland Plant List for the Arid West Region.
[3] The tidal reach of Stevens Creek in the City of Mountain View, downstream of the Crittenden Lane bridge, is the reference site. It is approximately four miles southeast of the Project.

All mitigation elements were considered to be in Year 1 in 2018, since they were initiated in 2017, then mostly completed in 2018. The establishment of tidal marsh mitigation commenced within 12 months of

when the associated impact first occurred, thus avoiding additional mitigation acreage requirements. (In-channel construction began June 1, 2017 and the first portion of created tidal marsh plain was seeded before the end of 2017.) The following mitigation elements remain to be completed:

- Container planting of the created tidal marsh plain with native high marsh and high marsh transition species grown in local native plant nurseries will occur in March/April 2019. Container planting was intentionally delayed to avoid impacts to the plants from dewatering during construction and to reduce the risk of high flow events from flooding and scouring away new plantings during winter 2018/2019.
- A 0.6-acre portion of the berm enhancement area will be planted in winter 2018/2019 in accordance with the conceptual revegetation plan provided in Appendix B. This area was left unvegetated in 2018 for access to complete the Project.

The Project MMP requires an as-built report be submitted to the permitting agencies within 60 days of construction completion. The as-built report will document any significant deviations between the designs and constructed conditions of the marsh plain grading and revegetation, berm enhancement, refuge islands, and velocity refuge structures. Since parts of the mitigation have not been entirely completed, the as-built report is not provided with this mitigation monitoring report. It will be submitted to the permitting agencies within 60 days of completion.

## 1.4 Monitoring Requirements

To determine if the performance/success criteria in Tables 1 and 2 have been achieved are on track, monitoring of the mitigation will occur over a 10-year period. If the final success criteria are not achieved in that time, monitoring will continue as specified in the MMP. Table 3 summarizes the monitoring requirements and schedule associated with each mitigation element. Monitoring methods are prescribed in the Project's MMP and NMFS BO. The Project's environmental permits and BOs refer to, or for the most part are consistent with the MMP. There are minor inconsistencies in the BO from USFWS and BCDC permit, however, this mitigation monitoring report considers all Project authorizations.

**Table 3. Mitigation Monitoring Requirements**

| Mitigation Element | Monitoring | Schedule |
|---|---|---|
| **Tidal Marsh Creation** | Qualitative assessment and photo documentation from fixed points | Years 1-10 |
| | Percent cover and health and vigor via quadrat sampling | Years 1-5 and 10 |
| | Formal wetland and EFH delineation | Year 5 |
| **Refugia Islands** | Photo documentation from fixed points | Years 1-10 |
| | Elevation monitoring along permanent transects | Years 1, 3, 5 and 10 |
| | Marsh gumplant survival | Years 1 and 2 |
| | Marsh gumplant height | Years 1-5 and 10 |
| | Percent cover via visual assessment of entire island | Years 1-5 and 10 |
| | Qualitative assessment | Years 6-9 |
| **Berm Enhancement** | Percent cover of shrub patches via line-intercept surveys along permanent transects | Years 1-5 and 10 |
| | Percent cover of shrub patches not sampled with transects via visual assessment | Years 1-5 and 10 |
| | Photo documentation from fixed points | Years 1-10 |
| | Percent cover between shrub patches via quadrat sampling | Years 1-5 and 10 |
| | Marsh gumplant survival | Years 1 and 2 |
| | Shrub patch length, width and distance | Years 1-5 and 10 |
| | Qualitative assessment | Years 6-9 |
| **Riparian Mitigation** | Protected trees retained on site and adjacent to construction activities will be monitored and replaced if they do not survive due to Project implementation | Years 1-5 |
| | Quantitative monitoring of tree health and vigor (including survival) | Years 1-3, 5 and 10 |
| | Percent cover via line transects at San Francisquito Creek planting area | Years 3, 5 and 10 |
| **Velocity Refuge Structures** | Qualitative assessment of: channel and velocity refuge structure stability and dimensions; adequacy of flow and depths to provide fish passage; and adequacy of velocity refuge structures to provide cover and resting habitat for fish | Years 1-5 |
| | Location, extent, and severity of any observed fish barriers | Years 1-5 |

# Section 2.0 Methods

Monitoring and data analysis required for Year 1 were conducted in accordance with the Project's MMP and NMFS BO. The BO from NMFS refers to the MMP for success criteria. In this report, plant taxonomy follows the Jepson Manual 2nd edition (Baldwin et al. 2012); wetland indicator status follows the USACE Arid West 2016 Regional Wetland Plant List (Lichvar et al. 2016); and invasive rating follows the Cal-IPC inventory (Cal-IPC 2018) and Marriot et al. (2013).

## 2.1 Tidal Marsh Creation

SCVWD biologists Z. Diggory, O. Townsend, and L. Renshaw conducted tidal marsh monitoring on July 5, October 30, and November 28, 2018. The Project is required to create 13.81 acres of tidal marsh habitat. To restore and create tidal marsh, the Project excavated and graded the floodplain of San Francisquito Creek to elevations that will be inundated approximately daily by the tides of San Francisco Bay. Tidal marsh vegetation and associated habitat for SMHM and RIRA is being established on the new marsh plain through natural recruitment, seeding of native tidal marsh species (conducted in October 2017 and again in November 2018), and container planting (scheduled for March/April 2019).

Nineteen randomly-located one-meter square quadrats were visually surveyed for percent cover and vegetation health and vigor in the marsh plain that had been created up until the date of monitoring (i.e., both sides of the channel from Highway 101/East Bayshore Road bridge to Daphne Lane/Geng Road). Based on a plot of cumulative average percent cover as a function of quadrat number, this was more than enough quadrats to adequately capture the variability in vegetation cover, and fewer quadrats may be surveyed in future monitoring years. Health and vigor ratings were assigned to each species in each quadrat in accordance with the Project's MMP; see Table 4. All necessary qualitative parameters were visually inspected in the field and recorded on a data form. Photographs were taken at six previously established photo-documentation points (see Appendix C). Although not needed for Year 1, two quadrats were also surveyed at the reference site on lower Stevens Creek to better understand the ultimate success criterion for the created tidal marsh.

**Table 4. Marsh Plant Health and Vigor Categories**

| Rating No. | Category | Description |
|---|---|---|
| 5 | Excellent | Less than 5% of the quadrat affected by mortality or cumulative symptoms of poor health, such as disease, insect damage, mechanical damage, and/or poor structure |
| 4 | Very good | 5 to 25% of quadrat affected |
| 3 | Good | 25 to 50% of quadrat affected |
| 2 | Fair | 50 to 75% of quadrat affected |
| 1 | Poor | Greater than 75% of quadrat affected |
| 0 | Dead | No living plants in quadrat |

Wetland indicator and invasiveness ratings were assigned to each species documented in quadrats. Average relative percent cover by wetland species and highly invasive species, average absolute percent cover by each species, and average health and vigor of each species were calculated to compare with the success criteria (Tables 1 and 2).

## 2.2 Refuge Islands

H. T. Harvey & Associates restoration ecologists G. Archbald and M. Pollock collected annual monitoring data on the five high-tide refuge islands at Outer Faber Marsh on November 13, 2018. Refuge islands are small habitat enhancements, approximately 25 feet long by 10 feet wide, designed to mimic the high-tide refuge function of natural marsh gumplant (*Grindelia stricta*) lined slough channels in mature tidal salt marshes. The goal of the refuge islands is to establish habitat at an appropriate elevation with sufficient native salt marsh vegetation cover to protect SMHM and RIRA from flooding and predators during extreme high tides. The locations of the refuge islands are shown on Figure 3.

The measurements listed below were collected for comparison to the Year 1 performance criteria (Table 1). The data collection and analysis methods used are described in the MMP. Required photographs of each refuge island were taken during the survey (Appendix C). Per the MMP, invasive species for the refuge islands are those that have "high" negative ecological impact as rated by Cal-IPC (2018) and weed species with "highest priority" and "high priority" rankings for control by the South San Francisco Bay Weed Management Plan (Marriott et al 2013).

- The average elevation of each refuge island top was measured relative to elevation control stakes situated at MHHW installed at refuge island sites 3, 4 and 5.
- The average height among living marsh gumplant individuals on island tops was measured/calculated and added to the average island top elevation to obtain the average marsh gumplant canopy elevation above MHHW for each island.
- The average absolute percent cover of vegetation by species was visually estimated across each refuge island.
- Percent survival was calculated to inform Year 1 replanting quantities on the islands.

## 2.3 Berm Enhancement Area

H. T. Harvey & Associates restoration ecologists G. Archbald, M. Pollock, and R. Hegstad and SCVWD biologists Z. Diggory and S. Gidre carried out annual monitoring in the berm enhancement area on November 5, 8, 9, 13, and 15, 2018. The berm enhancement area consists of 7.7 aces of high elevation tidal salt marsh (high marsh), tidal salt marsh-upland ecotone (ecotone) and upland habitats (upland) on the levees located to the north, south and east of Faber Marsh (Figure 4). The goal of the revegetation in the berm enhancement area is to establish sufficient suitable vegetation cover to provide protection from flooding and predators for RIRA and SMHM during extreme high-tide events. The vegetation cover should be a scattered patchwork of dense native shrubs within a matrix of non-invasive forb/grass-dominated vegetation. This will provide habitat for the RIRA and SMHM, while avoiding the creation of very large contiguous shrub patches that can benefit mammalian predators (H. T. Harvey & Associates 2015).

The measurements listed below were collected for comparison to the Year 1 performance criteria for the berm enhancement area (Table 1). The collection and analysis methods used are described in the MMP. The locations of the photo-documentation points and shrub patches are shown in Figure 4. Definitions of invasive species in the berm enhancement area are identical to those for the refuge islands.

- Shrub vegetation cover and shrub size/distance metrics were measured by sampling a randomly selected subset (n=18) of the 72 installed shrub patches stratified by habitat type (upland, ecotone, or high marsh) and berm locations (north berm, south berm and east berm). The following shrub patches were sampled: Nu1, Nu2, Nh6, Nh13, Ne7, Ne12, Su1, Su4, Su7, Sh2, Sh9, Sh14, Se4, Se5, Eh6, Eh3, Ee5, and Ee3 (Figure 4). The adequacy of this sample size was

confirmed by plotting cumulative average native shrub cover as a function of sample size (Kershaw 1973).

- At each sampled patch, the following measurements were collected:
    - vegetation cover along a 40-foot-long permanent transect using the line-intercept method (Bonham 1989),
    - the average length and width of the shrub patch using a transect tape,
    - the distance to the nearest planted shrub patch using a transect tape, and
    - photo-documentation.
- To inform recommendations for replanting and invasive plant control within planted shrub patches, all living shrub plantings were counted, and percent vegetation cover was estimated in all shrub patches.
- Percent vegetation cover was measured in one-meter square quadrats randomly located in the berm enhancement area outside of installed shrub patches. A total of 59 quadrats were sampled which equates to 0.2% of the berm enhancement area. Sample locations were stratified among the three habitat types and berm locations. The adequacy of this sample size was confirmed by plotting cumulative average vegetation cover as a function of sample size.

N:\Projects3700\3700-01\Reports\Flood Alterations\Fig 3 Refuge Island Locations.mxd

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**Figure 3. Refuge Island Locations**

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Year 1 (2018) Mitigation Monitoring Report (3700-01)
December 2018

N:\Projects3700\3700-01\Reports\Flood Alterations\Fig 4 As-built Planting Layout.mxd

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**Figure 4. As-built Planting Layout**

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## 2.4 Riparian Mitigation

SCVWD biologists Z. Diggory, N. Tomes-Orlale, and M. Yan conducted riparian mitigation monitoring on July 30, 2018. Native trees and shrubs were planted as mitigation along an approximately 0.25-mile reach of San Francisquito Creek and 0.75-acre floodplain terrace between Seneca Street and Hale Street in Palo Alto, approximately two miles upstream of the Project (see Figure 1). In addition, naturally recruited native oak trees were protected from herbivory along Arastradero Creek in the Pearson-Arastradero Preserve, approximately six miles southwest of the Project, as riparian mitigation (see Figure 1). Mitigation planting in the Project area was not desirable, as trees are not part of native or created tidal marsh habitat, and because they can provide perching and roosting habitat for raptors that prey upon SMHM and RIRA.

All riparian mitigation planting/protection areas along San Francisquito Creek and in the Pearson-Arastradero Preserve were traversed on foot to locate trees that had been planted, protected, tagged, and/or mapped as mitigation for the Project. All trees were rated for health and vigor (see Table 5 from the MMP). Qualitative assessments were recorded on a data form and photographs were taken at photo-documentation points (see Appendix C). Survival of native oaks and other native trees was calculated separately, based on the health and vigor ratings, to facilitate comparison with the performance criteria (Tables 1 and 2).

**Table 5. Tree Health and Vigor Categories**

| Qualitative Value | Numerical Value | Observations |
|---|---|---|
| High | 7–10 | 67–100% of plant is healthy |
| Medium | 4–6 | 34–66% of plant is healthy |
| Low | 1–3 | 1–33% of plant is healthy |
| Dead | 0 | Dead |

Two areas of trees were retained in and along the Project area and protected during construction: on the south side of the upstream end of the Project, along the City of Palo Alto pump station outfall channel; and on the north side of the Project where Daphne Way terminates at San Francisquito Creek. The survival of these protected trees was assessed by analyzing pre-, during-, and post-Project construction aerial imagery, reviewing construction-phase biological monitoring reports, and inspecting the areas for any dead trees in the field.

## 2.5 Velocity Refuge Structures

Six structures were constructed approximately 300 feet apart in the channel bank to provide velocity refuge for migrating adult steelhead, as well as habitat complexities for ground fish and pelagic species (see Figure 2). Five of the structures were constructed from two rootwads and a top log, creating a "constructed log jam". The sixth structure is a rock spur structure extending from the lower tip of the Friendship Bridge island into the low-flow channel. These structures are designed to create velocity breaks and fish resting areas during high flow events and create habitat complexity during tidal swings. A qualitative assessment of channel dimensions, stability, and fish passage was done concurrently with the tidal marsh monitoring on July 5, 2018 in the portion of the Project that had been constructed up until that date (i.e., the channel from Highway 101/East Bayshore Road bridge to Daphne Lane/Geng Road). All necessary qualitative parameters were visually inspected in the field and recorded on a data form. The six velocity refuge structures were installed downstream in October 2018. A qualitative assessment of

structural function and channel bank stability was conducted on November 28, 2018, by District biologists C. Leal and Z. Diggory.

# Section 3.0 Results and Discussion

## 3.1 Tidal Marsh Creation

During the 2017 construction period, the Project excavated tidal marsh plain on both sides of the San Francisquito Creek channel from Highway 101/East Bayshore Road bridge to Daphne Lane/Geng Road, and hydroseeded the new marsh plain with a "high marsh transition" seed mix (Table 6)[1]. As such, tidal marsh mitigation was commenced within 12 months of the first impact, and no additional mitigation area is necessary. The remaining marsh plain was constructed during the 2018 construction period, which was completed in November 2018. Installation of nursery container stock was intentionally delayed until the entire Project was completed to avoid plant mortality during the second season of construction, channel dewatering, and to reduce the risk of high flow events flooding and scouring away new plantings during winter 2018/2019. The revised planting schedule was discussed with the relevant permitting agencies.

**Table 6. High Marsh Transition Zone Seed Mix**

| Common Name | Scientific Name | Percent of Application |
|---|---|---|
| Regreen sterile wheatgrass | *Elymus* X *Triticum* | 81 |
| Marsh gumplant | *Grindelia stricta* | 9 |
| California marsh rosemary | *Limonium californicum* | 4 |
| Alkali sea heath | *Frankenia salina* | 2 |
| Salt heliotrope | *Heliotropium curassavicum* | 2 |
| Pacific pickleweed | *Salicornia pacifica* | 2 |

### 3.1.1 Percent Cover

Average absolute percent cover in the monitored tidal marsh plain is summarized by species in Table 7. All plants observed were wetland species, with USACE indicator statuses of obligate (OBL), facultative-wetland (FACW) or facultative (FAC). Total vegetation cover averaged 32%. Prostrate fat-hen (*Atriplex prostrata*), a nonnative species with no Cal-IPC rating, made up most of the vegetation cover (21%). Pacific pickleweed (*Salicornia pacifica*), a native species, made up 10% of the vegetation cover. Alkali sea heath (*Frankenia salina*), marsh jaumea (*Jaumea carnosa*), and nonnative common brass-buttons (*Cotula coronopifolia*) were also documented in monitoring plots.

[1] The applied seed mix listed in Table 6 differed somewhat from that specified in the MMP. Locally sourced seed of sufficient quantity was not available for five of the seed mix species in the MMP: spear orach (*Atriplex patula*), marsh baccharis (*Baccharis glutinosa*), spreading alkali weed (*Cressa truxillensis*), northern meadow barley (*Hordeum brachyantherum*), and alkali low barley (*Hordeum depressum*). The application rate of the available species was increased to provide the same density of applied seed specified in the MMP.

**Table 7. Average Absolute Percent Cover Health and Vigor by Species in Created Tidal Marsh**

| Common Name | Scientific Name | Wetland Indicator Status | Native? (Cal-IPC Rating) | Average Absolute % Cover | Average Health and Vigor |
|---|---|---|---|---|---|
| Prostrate fat-hen | *Atriplex prostrata* | FACW | No (None) | 21 | 4 |
| Pacific pickleweed | *Salicornia pacifica* | OBL | Yes | 10 | 4 |
| Alkali sea heath | *Frankenia salina* | FACW | Yes | 2 | 4 |
| Common brass-buttons | *Cotula coronopifolia* | OBL | No (Limited) | <1 | 5 |
| Marsh jaumea | *Jaumea carnosa* | OBL | Yes | <1 | 4 |
| **Total** | | | | **32** | **4** |

Vegetation cover was much higher—70–80% in some plots—closest to the low-flow channel, where the channel bank and some vegetation—including prostrate fat-hen and Pacific pickleweed—had been retained during construction. Farther from the channel, vegetation cover varied (1–57%) in "bands" that appeared to be associated with different tidal inundation patterns across the newly construction marsh plain. Based on the species present, vegetation cover was likely provided by a combination of natural recruitment, and the high marsh transition seed mix. There is still four years before the created marsh plain is required to achieve at least 60% cover.

At the reference site there was an average of 100% cover. There is still four years before the created marsh plain is required to achieve at least 90% of the cover at the reference site.

### 3.1.2 Health and Vigor

Average health and vigor of species documented in monitoring plots is summarized in Table 7. All species observed had health and vigor ratings of 3 (good) or better, and average health and vigor was 4 (very good) or 5 (excellent). With an overall health and vigor rating of 4 (very good), the created tidal marsh achieved the performance criterion for Year 1 (see Table 1).

At the time of monitoring, most plants of all species in the approximately 4.25 acres of tidal marsh plain created and hydroseeded were growing vigorously (see Appendix C). Some insect damage to prostrate fat-hen was the only observable symptom of disease, insect damage, mechanical damage, or poor growth structure. There was a fine film of silt on most plants from tidal inundation. This, as well as deposited wrack and observations during high tide events, indicate that tides are inundating about half of the created marsh plain approximately daily, almost all of the created marsh plain during higher high tides, and all of the created marsh plain during the highest tides. These inundation patterns are consistent with the intent of the tidal marsh plain design, which is encouraging in terms of long-term vegetation success, and habitat function.

### 3.1.3 Invasive Species

There were no highly invasive plant species documented in monitoring plots (see Table 7). Of the nonnative species in monitoring plots, common brass-buttons has a limited Cal-IPC rating, and prostrate fat-hen has no Cal-IPC rating. As such, the created tidal marsh achieved the invasive species performance criterion of less than 5% cover by highly rated species for Year 1.

Outside of monitoring plots, broad-leaved pepperweed (*Lepidium latifolium*), which has a high Cal-IPC rating, was observed at low cover in the vegetation that had been retained during construction along the

low-flow channel, and as seedlings on the created marsh plain. Seedlings of opposite-leaved Russian-thistle (*Salsola soda*), which has a moderate Cal-IPC rating, but was specifically mentioned in the MMP as a detrimental nonnative species, were also observed on the created marsh plain. While the cover and frequency of these species is currently low, their presence suggests that, as expected in the MMP, treatment of these and other nonnative species will be necessary over time.

## 3.2 Refuge Islands

The five refuge islands were constructed in outer Faber Marsh on January 24–25, 2018 (Figure 3). Islands were constructed using terrestrial fill approved for use in wetlands by the Project's Wetland Reuse Criteria (JPA 2016). The imported soil was sampled and tested for horticultural soil properties, and met the horticultural screening criteria in the Project's construction documents, except that the proportion of gravel (19.4%) was higher than the criteria. The monitoring ecologists judged that the soil was suitable, because the percent gravel content was only slightly higher than the criteria, and all other criteria were met. The soil imported was classified as a gravelly loam. During construction, the fill imported for each refuge island was covered with living marsh sod salvaged from the construction footprint of the refuge island. The marsh sod was comprised of the native halophytes and was primarily Pacific pickleweed, marsh jaumea, and saltgrass (*Distichlis spicata*). Per the Project's MMP, the refuge islands were constructed with island tops situated at approximately 1.7 feet above MHHW, and each island top was planted with 70 marsh gumplant container plants and 70 saltgrass container plants.

### 3.2.1 Percent Cover and Invasive Species

Installation of native marsh sod on refuge islands resulted in rapid establishment of native marsh vegetation cover on the five refuge islands. Total average percent cover of native vegetation among the islands was approximately 95% (Table 8), exceeding the final success criterion of 70% cover. No invasive species were observed on any of the refuge islands. As expected, marsh gumplant cover in Year 1 was below the final success criterion of 30%. Marsh gumplant cover on the islands is expected to increase as the installed plantings grow larger in size in future years and with natural recruitment of marsh gumplant seedlings.

**Table 8. Percent Vegetation Cover on Refuge Islands**

| Common Name | Scientific Name | Native? | Wetland Indicator Status | Average Cover |
|---|---|---|---|---|
| Saltgrass | *Distichlis spicata* | Yes | FAC | 13% |
| Marsh gumplant | *Grindelia stricta* | Yes | FACW | 22% |
| Marsh jaumea | *Jaumea carnosa* | Yes | OBL | 11% |
| Pacific pickleweed | *Salicornia pacifica* | Yes | OBL | 50% |
| **Total Native Cover** | | | | **95%** |
| **Total Invasive Cover** | | | | **0%** |

The MMP requires replacement plantings be installed to restore marsh gumplant plantings to 100% survival. Replacement plant quantities needed to restore islands to 100% survival are shown in Table 9.

**Table 9. Marsh Gumplant Survival, Cover and Replant Quantities**

| Island | Plants Installed | Number Alive in Year 1 | Percent Survival | Percent Cover | Replacement Plants Required |
|---|---|---|---|---|---|
| 1 | 70 | 67 | 96% | 28% | 3 |
| 2 | 70 | 67 | 96% | 20% | 3 |
| 3 | 70 | 70 | 100% | 25% | 0 |
| 4 | 70 | 49 | 70% | 10% | 21 |
| 5 | 70 | 48 | 69% | 15% | 22 |
| **Total** | **350** | **302** | **NA** | **NA** | **48** |

### 3.2.2 Marsh Gumplant Height

Refuge island elevations in Year 1 were situated slightly above the target design elevation of 1.3 feet above MHHW almost 11 months after construction in accordance with the intent of the design. Marsh gumplant on the island tops have grown on average to slightly taller than 1 foot. Combined with the height of the islands, refuge islands were on average providing the final cover height required in the MMP (Table 10).

**Table 10. Refuge Island Elevation and Marsh Gumplant Height**

| Island | Average Elevation of Island Top (Feet above MHHW) | Average Marsh Gumplant Height (Feet) | Average Height of Refuge Cover (Feet above MHHW) |
|---|---|---|---|
| 1 | 1.3 | 1.2 | 2.5 |
| 2 | 1.5 | 1.4 | 2.8 |
| 3 | 1.3 | 1.4 | 2.7 |
| 4 | 1.3 | 1.1 | 2.5 |
| 5 | 1.4 | 1.0 | 2.4 |
| **Average** | **1.4** | **1.2** | **2.6** |

## 3.3 Berm Enhancement Area

Prior to revegetation activities, large sections of the berm enhancement area were dominated by invasive plants and lacked high tide refuge habitat (H. T. Harvey & Associates 2015). The upland was dominated primarily by annual black mustard (*Brassica nigra,* FACU) and nonnative grasses. The ecotone was dominated by slender-leaved iceplant (*Mesembryanthemum nodiflorum,* FACU), New Zealand spinach (*Tetragonia tetragonioides,* UPL), and freeway iceplant (*Carpobrotus edulis,* UPL) interspersed with native halophytes, primarily saltgrass and alkali sea heath. By contrast, the high marsh was dominated by native Pacific pickleweed with scattered marsh gumplant but invaded by patches of opposite-leaved Russian-thistle and broad-leaved pepperweed (H. T. Harvey & Associates 2015).

In accordance with the MMP, berm enhancement was conducted in December 2017–January 2018. The enhancement actions involved a combination of invasive plant removal and strategic plant installation to establish the target habitat. Invasive plants were removed from the berm enhancement area by mechanical methods including manual removal of roots and shoots of perennial species, and weed whacking of annual species. A rudimentary irrigation system was installed on the three berms to allow temporary irrigation of native plantings via hose watering from a water truck. The system consists of a water truck stand pipe hook up attached to a main line with quick couplers. A total of approximately 23,000 native container plants were installed across the three berms. Approximately 3,000 plants were used to establish 72 shrub patches. Approximately 20,000 plantings were installed outside of shrub patches in the upland and ecotone habitats in the berm enhancement area (Figure 4). Shrub patches and berm areas between the shrub patches were planted with the species, quantities, and spacing in Tables 11–15. A soil study determined that plantings would benefit from horticultural amendments in the ecotone and upland (H. T. Harvey & Associates 2015). All planting holes in the upland and ecotone were amended with a combination of compost, lime and gypsum to increase soil fertility, increase pH and improve soil drainage. High marsh plantings were not amended.

**Table 11. Upland Shrub Patch Plant Composition**

| Common Name | Scientific Name | Wetland Indicator Status | Container Size | On Center Spacing (feet) | Quantity Per Patch |
|---|---|---|---|---|---|
| California sagebrush | *Artemisia californica* | UPL | D40 | 3 | 9 |
| Douglas's mugwort | *Artemisia douglasiana* | FAC | D16 | 3 | 1 |
| Marsh baccharis | *Baccharis glutinosa* | FACW | D40 | 3 | 9 |
| California buckwheat | *Eriogonum fasciculatum* | UPL | D40 | 3 | 3 |
| Lizard tail eriophyllum | *Eriophyllum staechadifolium* | UPL | D40 | 3 | 9 |
| Marsh gumplant | *Grindelia stricta* | FACW | D40 | 2 | 25 |

**Table 12. Ecotone Shrub Patch Plant Composition**

| Common Name | Scientific Name | Wetland Indicator Status | Small Container Size | On Center Spacing (feet) | Quantity Per Patch |
|---|---|---|---|---|---|
| California sagebrush | *Artemisia californica* | UPL | D40 | 3 | 4 |
| Douglas's mugwort | *Artemisia douglasiana* | FACW | D40 | 3 | 1 |
| Lizard tail eriophyllum | *Eriophyllum staechadifolium* | UPL | D40 | 3 | 4 |
| Marsh baccharis | *Baccharis glutinosa* | FACW | D40 | 3 | 4 |
| Marsh gumplant | *Grindelia stricta* | FACW | D40 | 3 | 27 |

**Table 13. High Marsh Shrub Patch Plant Composition**

| Common Name | Botanical Name | Wetland Indicator Status | Container Size | On Center Spacing (feet) | Quantity Per Patch |
|---|---|---|---|---|---|
| Marsh gumplant | *Grindelia stricta* | FACW | D40 | 3 | 37 |

**Table 14. Upland Planting Zone**

| Common Name | Scientific Name | Wetland Indicator Status | Container Size | On Center Spacing (feet) |
|---|---|---|---|---|
| Western ragweed | *Ambrosia psilostachya* | FACU | D16 | 3 |
| Saltgrass | *Distichlis spicata* | FAC | TB2 | 3 |
| Creeping wild rye-grass | *Elymus triticoides* | FAC | SC | 3 |
| Western goldenrod | *Euthamia occidentalis* | FACW | D16 | 3 |
| California bee-plant | *Scrophularia californica* | FAC | D16 | 3 |
| Common pacific aster | *Symphyotrichum chilense* | FAC | D16 | 3 |

**Table 15. Ecotone Planting Zone**

| Common Name | Scientific Name | Wetland Indicator Status | Container Size | On Center Spacing (feet) |
|---|---|---|---|---|
| Western ragweed | *Ambrosia psilostachya* | FACU | D16 | 3 |
| Saltgrass | *Distichlis spicata* | FAC | TB2 | 4 |
| Creeping wild rye-grass | *Elymus triticoides* | FAC | SC | 3 |
| Alkali sea heath | *Frankenia salina* | FACW | TB2 | 3 |
| Pacific pickleweed | *Salicornia pacifica* | OBL | TB2 | 3 |

The detailed results of Year 1 monitoring in the berm enhancement area are provided below. Results relative to the Year 1 performance criteria are provided in Table 1.

### 3.3.1 Size and Distance

Shrub patches are meeting their target size and distance metrics. On average, the planted native shrub patches are between 20 and 80 feet long and at least 4 feet wide (Table 16). Overall, the results indicate that the shrub plantings are on track to provide the target shrub habitat: dense shrub patches interspersed within a matrix of grasses and forbs.

**Table 16. Shrub Size and Distance Metrics [1]**

| Average shrub patch length (feet) | Average shrub patch width (feet) | Average distance between nearest shrub patch (feet) |
|---|---|---|
| 40.2 | 7.8 | 45.8 |

[1] Shrub patches on average are required to be 20–80 feet long, at least 4 feet wide, and spaced 25–200 feet apart.

### 3.3.2 Percent Cover

Native shrub vegetation cover in Year 1 among the sampled shrub patches was 25% (Table 17), below the final success criterion of 60% (Table 2). Shrub cover was highest in the upland and ecotone, and relatively low in the high marsh. Marsh gumplant accounted for most of the shrub cover followed by lizard tail eriophyllum (*Eriophyllum staechadifolium*) and California sagebrush (*Artemisia californica*). Shrub planting survival was high with nearly 82% of planted shrubs alive in Year 1 (Table 18); 533 shrubs died, and per the MMP will be replanted in Year 1 to increase shrub survival to 100%. Shrub cover is expected to increase in future years as plantings mature and reproduce.

The lower shrub cover in the high marsh shrub patches relative to the upland and ecotone shrub patches (Table 17) may be attributed to several factors: (1) no soil amendments or mulch were provided for plantings installed in the high marsh, (2) competition with existing vegetation is greater in the high marsh than in the upland and ecotone, and (3) high marsh plantings did not receive irrigation in Year 1 since these plantings were expected to receive occasional tidal inundation.

**Table 17. Shrub Patch Percent Vegetation Cover**

| Common Name | Scientific Name | Wetland Indicator Status | Growth Form | Average Percent Cover | | | |
|---|---|---|---|---|---|---|---|
| | | | | Upland | Ecotone | High Marsh | All Habitats |
| Western ragweed | *Ambrosia psilostachya* | FACU | Forb | 0.2% | 0.0% | 0.0% | 0.0% |
| Alkali sea heath | *Frankenia salina* | FACW | Forb | 0.0% | 23.1% | 19.5% | 15.3% |
| Marsh jaumea | *Jaumea carnosa* | OBL | Forb | 0.0% | 0.0% | 0.9% | 0.4% |
| Pacific pickleweed | *Salicornia pacifica* | OBL | Forb | 0.0% | 0.0% | 18.8% | 7.3% |
| Opposite-leaved Russian-thistle [1] | *Salsola soda* [1] | FACW | Forb | 0.0% | 0.0% | 7.8% | 3.0% |
| Common Pacific aster | *Symphyotrichum chilense* | FAC | Forb | 0.2% | 0.0% | 0.0% | 0.0% |
| Ripgut brome | *Bromus diandrus* | UPL | Graminoid | 0.0% | 0.2% | 0.0% | 0.1% |
| Saltgrass | *Distichlis spicata* | FAC | Graminoid | 5.2% | 0.0% | 22.2% | 10.1% |
| Creeping wild rye-grass | *Elymus triticoides* | FAC | Graminoid | 0.6% | 0.0% | 0.0% | 0.2% |
| Perennial rye-grass | *Festuca perennis* | FAC | Graminoid | 0.0% | 0.3% | 0.0% | 0.1% |
| California sagebrush | *Artemisia californica* | UPL | Shrub | 5.2% | 1.0% | 0.0% | 1.8% |
| Douglas's mugwort | *Artemisia douglasiana* | FACW | Shrub | 0.9% | 0.0% | 0.0% | 0.3% |

| Common Name | Scientific Name | Wetland Indicator Status | Growth Form | Average Percent Cover | | | |
|---|---|---|---|---|---|---|---|
| | | | | Upland | Ecotone | High Marsh | All Habitats |
| Marsh baccharis | *Baccharis glutinosa* | FACW | Shrub | 2.1% | 1.6% | 0.0% | 1.1% |
| California buckwheat | *Eriogonum fasciculatum* | UPL | Shrub | 0.8% | 0.0% | 0.0% | 0.2% |
| Lizard tail eriophyllum | *Eriophyllum staechadifolium* | UPL | Shrub | 7.1% | 5.4% | 0.0% | 3.8% |
| Mash gumplant | *Grindelia stricta* | FACW | Shrub | 23.6% | 20.9% | 10.1% | 17.4% |
| **Total** | | | | **45.7%** | **52.6%** | **79.3%** | **61.0%** |
| **Total shrub cover** | | | | **39.6%** | **28.9%** | **10.1%** | **24.6%** |
| **Total graminoid/forb cover** | | | | **6.1%** | **23.7%** | **69.2%** | **36.5%** |
| **Total invasive plant cover** | | | | **0.0%** | **0.0%** | **7.8%** | **3.0%** |

[1]Invasive plant

**Table 18. Shrub Planting Survival**

| Common Name | Scientific Name | Percent Survival (Year 1) |
|---|---|---|
| California sagebrush | *Artemisia californica* | 74.7% |
| Douglas's mugwort | *Artemisia douglasiana* | 62.2% |
| Marsh baccharis | *Baccharis glutinosa* | 63.1% |
| California buckwheat | *Eriogonum fasciculatum* | 56.7% |
| Lizard tail eriophyllum | *Eriophyllum staechadifolium* | 79.3% |
| Marsh gumplant | *Grindelia stricta* | 84.4% |
| **All Species** | | **81.8%** |

The percent cover of vegetation in the berm enhancement area outside of shrub patches (Figure 4) is provided in Table 19. Average cover of non-invasive herbaceous vegetation was approximately 40%. After only a single growing season, the percent cover is two thirds of the final success criterion of 60%. About 9% cover was provided by graminoids, 32% by non-invasive forbs, 2% by invasive forbs, and 3% by shrubs. Native Pacific pickleweed was the most abundant plant outside of the shrub patches, followed by alkali sea heath, marsh gumplant and saltgrass (Table 19). Many of the installed native plantings have significant cover, including Pacific pickleweed, saltgrass, alkali sea heath, creeping wild rye-grass (*Elymus triticoides*) Western goldenrod (*Euthamia occidentalis*). Other native plantings, while less abundant, produced ample seed and were observed spreading vegetatively onsite, such as Common Pacific aster (*Symphyotricum chilense*) and western ragweed (*Ambrosia psilostachya*), respectively. Based on site observations, percent cover was lowest in the upland and ecotone. This is likely due to the removal of a large surface area of invasive species resulting in substantial bare ground that will take more than a single growing season for native plantings and non-invasive plant recruits to occupy. By comparison, substantial native forb cover was present in the high marsh prior to the enhancement work.

**Table 19. Vegetation Cover between Shrub Patches (High Marsh, Ecotone, and Upland Combined)**

| Common Name | Scientific Name | Growth Form | Percent Cover (Year 1) |
|---|---|---|---|
| Western ragweed | *Ambrosia psilostachya* | Forb | 0.2% |
| Prostrate fat-hen | *Atriplex postrata* | Forb | 0.1% |
| Western goldenrod | *Euthamia occidentalis* | Forb | 1.3% |
| Alkali sea heath | *Frankenia salina* | Forb | 8.5% |
| Broad-leaved pepperweed [1] | *Lepidium latifolium* [1] | Forb | 0.1% |
| Slender-leaved ice plant [1] | *Mesembrantheum nodiflorum* [1] | Forb | 1.0% |
| Prostrate knotweed | *Polygonum aviculare* | Forb | 0.7% |
| California ladies' tobacco | *Pseudognaphalium californicum* | Forb | 0.1% |
| Pacific pickleweed | *Salicornia pacifica* | Forb | 21.2% |
| Opposite-leaved Russian-thistle [1] | *Salsola soda* [1] | Forb | 0.5% |
| California bee-plant | *Scrophularia californica* | Forb | 0.1% |
| Salt marsh sand spurry | *Spergularia marina* | Forb | 0.9% |
| Common Pacific aster | *Symphyotricum chilense* | Forb | 0.3% |
| Australian saltbush | *Atriplex semibaccata* | Forb | 0.2% |
| Fat wild oat | *Avena fatua* | Graminoid | 1.2% |
| Ripgut brome | *Bromus diandrus* | Graminoid | 1.3% |
| Saltgrass | *Distichlis spicata* | Graminoid | 2.3% |
| Creeping wild rye-grass | *Elymus triticoides* | Graminoid | 1.6% |
| Perennial rye-grass | *Festuca perennis* | Graminoid | 0.5% |
| Seaside barley | *Hordeum marinum* | Graminoid | 1.6% |
| Marsh gumplant | *Grindelia sticta* | Shrub | 3.1% |
| **Total** | | | **46.5%** |
| **Total non-invasive, herbaceous vegetation cover** | | | **41.9%** |
| **Total invasive plant cover** | | | **1.6%** |
| **Total shrub cover** | | | **3.1%** |

[1] Invasive plant

## 3.4 Riparian Mitigation

### 3.4.1 Protected Trees

Based on analysis of pre-, during-, and post-Project construction aerial imagery and review of construction-phase biological monitoring reports, the two areas of trees that were retained in and along

the Project area were adequately protected throughout construction. No dead or dying trees were noted in biological monitoring reports, visible in aerial imagery, or observed during field inspection.

### 3.4.2 Tree Replacement

To mitigate for removed trees, native trees were planted at an off-site planting area along San Francisquito Creek in Winter 2016-2017 and Winter 2017-2018, and naturally recruited native oak trees were protected from herbivory at the Pearson-Arastradero Preserve in 2017. Tables 20 and 21 summarize the tree species planted and/or protected for riparian mitigation. Native shrubs and grasses were also planted at the off-site area, including California fescue (*Festuca californica*), California hairy honeysuckle (*Lonicera hispidula*), red flowering currant (*Ribes sanguineum*), California rose (*Rosa californica*), California blackberry (*Rubus ursinus*), blue witch (*Solanum umbelliferum*), and white snowberry (*Symphoricarpos albus*).

**Table 20. Species Planted for Riparian Mitigation**

| Common Name | Scientific Name | Quantity Planted | Average Health and Vigor | No. Alive | Percent Survival |
|---|---|---|---|---|---|
| Western white alder | *Alnus rhombifolia* | 5 | 0 | 0 | 0% |
| Big leaf maple | *Acer macrophyllum* | 9 | 3 | 6 | 67% |
| California buckeye | *Aesculus californica* | 7 | 8 | 7 | 100% |
| Pacific madrone | *Arbutus menziesii* | 1 | 10 | 1 | 100% |
| Oso berry | *Oemleria cerasiformis* | 2 | 6 | 2 | 100% |
| Holly-leaf cherry | *Prunus ilicifolia* | 3 | 7 | 3 | 100% |
| Coast live oak | *Quercus agrifolia* | 18 | 5 | 16 | 89% |
| California blue oak | *Quercus douglasii* | 4 | 5 | 4 | 100% |
| Valley oak | *Quercus lobata* | 24 | 3 | 13 | 54% |
| Willows | *Salix laevigata, S. lasiandra, S. lasiolepis* | 281 | 6 | 237 | 84% |
| Blue elderberry | *Sambucus nigra* var. *caerulea* | 8 | 6 | 2 | 25% |
| **Total** | | **362** | **5** | **291** | **80%** |

**Table 21. Species Protected for Riparian Mitigation**

| Common Name | Scientific Name | Quantity Protected | Average Health and Vigor | No. Alive | Percent Survival |
|---|---|---|---|---|---|
| Coast live oak | *Quercus agrifolia* | 61 | 6 | 53 | 87% |
| California blue oak | *Quercus douglasii* | 4 | 7 | 4 | 100% |
| Valley oak | *Quercus lobata* | 34 | 6 | 33 | 97% |
| California bay laurel | *Umbellularia californica* | 1 | 0 | 0 | 0% |
| **Total** | | **100** | **5** | **90** | **90%** |

The number of trees alive in Tables 20 and 21 are those that had a health and vigor rating greater than zero. At the time of monitoring, it was difficult to determine the exact number of planted willows. Trees were counted as planted and assessed for health and vigor only if it was obvious that they were planted as a cutting (e.g., a cut surface was observable near the base of the tree).

There were 123 native oak trees and 258 other native trees alive at Year 1. Survival was particularly low for western white alder (*Alnus rhombifolia*), big leaf maple (*Acer macrophyllum*), valley oak (*Quercus lobata*), and blue elderberry (*Sambucus nigra* var. *caerulea*), suggesting that these species were not well suited to the planting site. Additional mortality will likely occur, particularly for those species with low average health and vigor, such as big leaf maple and valley oak. Still, the riparian mitigation appears to be on track to achieve the success criteria of 108 native oaks and 166 other native trees alive at Year 10. Photographs from the riparian mitigation sites are provided in Appendix C.

### 3.4.3 Percent Cover

Percent cover monitoring of riparian mitigation at the San Francisquito Creek planting area will begin in Year 3, as specified in the MMP.

## 3.5 Velocity Refuge Structures

The six required velocity refuge structures were assembled and installed in the low-flow channel in October 2018. Shortly after installation, the structures appeared stable and functional, and adjacent channel banks were stable (see photographs in Appendix C). The structures were partially buried with two rootwads protruding into the low flow channel. The rock spur extended into the low flow channel and up the floodplain. Both structure types would provide a velocity shadow and habitat complexity in the reach. In the portion of the channel that had been constructed at the time of Year 1 monitoring, the low-flow channel was stable, and there was evidence of tidal sediment deposition across most of the created marsh plain, but not excessively so. There was no evidence of any fish passage barriers in any portion of the Project.

## 3.6 Mitigation Progress

As described previously, monitoring and achievement of performance/success criteria will be used to determine if/when the Project's required mitigation acres of different habitat types have been successfully established. Table 22 tabulates the mitigation acres of different habitat types and provides an assessment of progress toward the required acres based on the Year 1 qualitative and quantitative monitoring.

**Table 22. Year 1 Progress Toward Required Mitigation**

| Required Mitigation | Required Units | Year 1 Progress |
|---|---|---|
| Tidal marsh/ high-marsh transition | 13.81 acres | Approximately 4.25 acres of tidal marsh plain was created and hydroseeded with high marsh transition seed mix in 2017. The remaining tidal marsh plain shaped in November 2018 will be planted with high marsh and high marsh transition plants in March/April 2019. Monitoring and inspections of the marsh plain indicate that tidal inundation patterns are consistent with the intent of the tidal design: suggesting good potential for long-term vegetation success and habitat function. As-built plans will document construction elevations and topography. |
| Restored creek tidal channel | 2.25 acres | Construction of the creek tidal channel was completed in November 2018. The as-built drawings and qualitive mitigation monitoring results will be used to assess progress toward the required acres of restored creek tidal channel in Year 2. |
| BCDC Shoreline Band | 1.04 acre | As-built drawings and mitigation monitoring results will be used to assess the acres of created/restored tidal marsh and channel in the BCDC Shoreline Band. |
| BCDC Bay Jurisdiction | 2.40 acres | As-built drawings and mitigation monitoring results will be used to assess the acres of created/restored tidal marsh and channel in BCDC Bay Jurisdiction. |
| Essential Fish Habitat (EFH) | 6.90 acres | As-built drawings and mitigation monitoring results will be used to assess the acres of created/restored tidal marsh and channel that are below MHHW. |
| Restored diked marsh | 0.80 acre | The 0.8-acre diked marsh that was predicted to be temporarily disturbed was fenced and protected during construction. The diked marsh will be re-delineated in Year 5. Analysis of pre-, during-, and post-Project construction aerial imagery and review of construction-phase biological monitoring reports indicates that the diked marsh was adequately protected throughout construction. |
| High tide refuge islands | 5 islands | Five refuge islands were constructed in outer Faber Marsh in January 2018. Mitigation monitoring results will be used to assess performance and ultimate success. |
| Enhanced berm high tide refuge habitat | 5.66 acres | Approximately 7.1 acres of berm was enhanced in Faber Marsh in 2017 and 2018. An additional 0.6 acre of enhancement will occur in 2019. Mitigation monitoring results will be used to assess performance and ultimate success. |
| Restored SMHM foraging and dispersal habitat | 14.70 | As-built drawings and monitoring of vegetation cover will measure acres of inboard and outboard levee slopes that provide SMHM foraging and dispersal habitat. |
| Planted or protected native trees | 108 native oaks, 166 other native trees | There were 123 native oak trees and 258 other native trees alive at Year 1. The riparian mitigation appears to be on track to achieve the success criteria. |
| Velocity refuge structures | 6 structures | Six velocity refuge structures were assembled and installed in the channel in October 2018. As-built drawings and qualitive mitigation monitoring will assess performance and ultimate success. |
| Funding for SMHM and RIRA predator control efforts | $8,000 per year + 5% annual increase for 10 years | Documentation of the first year of funding is provided in Appendix A. |

# Section 4.0 Remedial Measures and Management Actions

Based on the Year 1 monitoring results, tidal marsh creation, riparian mitigation, and velocity refuge structures achieved the relevant performance criteria. As such, no remedial measures or management actions are necessary at this time. Invasive plant species will be treated in the created tidal marsh in 2019 to help ensure continued success. Invasive plant control needs to be timed on the species most vulnerable annual stage and before they can reproduce by seed or spread vegetatively.

The following management recommendations apply to the refuge islands and berm enhancement areas:

- Per the MMP, replacement plants will be installed on the refuge islands and in the berm enhancement area to increase shrub survival to 100%.
    - All shrub plantings on the islands will be installed with an organic amendment to improve soil fertility and marsh gumplant growth. Planting holes will be dug to the following dimensions: one foot wide by 1.5 foot deep. Organic compost will be evenly mixed into the soil backfill in the upper one foot of each planting hole at a rate by volume of one-part organic compost to five parts soil.
    - Shrub replacement plantings in all habitat types in the berm enhancement area (upland, ecotone, and high marsh) will be installed with the soil amendments specified by in the project plans and specifications (H. T. Harvey & Associates 2018).
- A native grass seed mix will be applied to bare ground areas in the upland and ecotone habitats in the berm enhancement area. This will help native grasses establish in bare areas and, thereby, help increase competition with non-native plants that are being actively controlled. The recommended seed mix, origin and rate is provided in Appendix A. Seeds will be sourced from among the nine San Francisco Bay Area counties and preferentially selected from locations as close to the Project area as possible.
- Continue irrigation and invasive plant control per the Project's plans and specifications.

# Section 5.0 Pesticide Use Report

The MMP requires submittal of a pesticide use report to the USFWS by January 31 following each year that pesticides were used in the berm enhancement area. Approval by USFWS is required prior to pesticide use in the berm enhancement area. This report documents pesticides used during Year 1 (2018).

On April 16, 2018, H. T. Harvey & Associates submitted a pesticide use plan to USFWS (H. T. Harvey & Associates 2018) proposing use of the following chemicals at their label/U. S. Environmental Protection Agency-approved concentrations for target weeds: Garlon 4 Ultra (triclopyr); Capstone (formerly Milestone, aminopyralid); and Habitat (imazapyr). The plan was approved by USFWS via email on April 30, 2018 (Strong 2018).

On May 15-16, 2018, Hanford ARC applied 133.12 fluid ounces of Habitat (imazapyr) during spot treatment of broad-leaved pepperweed in the 7.7-acre berm enhancement area. Herbicide was applied via a backpack sprayer by a California Department of Pesticide Regulation certified pesticide applicator (Johnson 2018).

# Section 6.0 Literature Cited


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SCVWD (Santa Clara Valley Water District). 2016. San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101 – Mitigation and Monitoring Plan. Santa Clara Valley Water District, San Jose, California.

Strong, C. 2018. Email communication between Cheryl Strong, U.S. Fish and Wildlife Service biologist, and Gavin Archbald, H. T. Harvey & Associate's restoration ecologist, regarding the Pesticide

Use Pesticide Use Proposal for the Transition Zone Habitat Enhancement along the Faber Marsh Levees. April 30, 2018.

# Appendix A: Predator Management Documentation

United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Wildlife
Services

California State
Office

3419A Arden Way
Sacramento, CA
95825
(916) 979-2675

February 27, 2017

San Francisquito Creek Joint Powers Authority
615-B Menlo Avenue
Menlo Park, CA 94025

Dear County Cooperator,

Enclosed is your signed original FY17 Work and Financial Plan (WFP) and Cooperative Service Agreement (CSA) between USDA-APHIS-Wildlife Services and San Francisquito Creek Joint Powers Authority.

If you have any questions, please feel free to call me at (916) 979-2028.

Respectfully,

Krista Dupre'

Krista Dupre'
Budget Analyst
California State Office

Enclosure

APHIS-WS Agreement Number: 17-73-06-6814-RA
APHIS-WS Account Code (WBS): AP.RA.RX06.73.0239

**ANNUAL WORK and FINANCIAL PLAN**
**Between**
**SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY (Cooperator)**
**And**
**UNITED STATES DEPARTMENT OF AGRICULTURE**
**ANIMAL AND PLANT HEALTH INSPECTION SERVICE**
**WILDLIFE SERVICES (APHIS-WS)**
**01/01/17-09/30/17**

## A. OBJECTIVE

The purpose of this plan is to conduct wildlife damage management (WDM) activities to control predators, mainly red fox, striped skunk, raccoons, Virginia opossums, feral cats, American Crows, Common Ravens and other potential mammalian and avian predators to protect the Federally Listed Ridgeway's Rail (*Rallus obsoletus*) and Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*) within the Faber-Laumeister Tract and San Francisquito Creek Mouth in San Mateo and Santa Clara Counties, California.

## B. RESULTS OR BENEFITS EXPECTED

Efforts will be made by assigned personnel to manage predator populations to protect the above listed resources within the Faber-Laumeister Tract and San Francisquito Creek Mouth. The work performed by a Wildlife Services Specialist (WSS) will be in accordance with the terms of the Cooperative Service Agreement 17-73-06-6814-RA. WSS work duties will be conducted as outlined in the San Francisco Bay National Wildlife Refuge's Comprehensive Conservation Plan.

## C. APPROACH AND RESOURCES REQUIRED

The work will be accomplished using Wildlife Services Specialists (WSS) as assigned to work this project by utilizing non-lethal recommendations, installing, operating and maintaining traps. All methods are highly selective and will be performed by trained WSS. This project will be coordinated with Pacific Gas and Electric personnel.

## D. PROCUREMENT

Purchase of supplies, equipment and miscellaneous needs including salaries will be made by APHIS-WS. All expenditures will be processed through APHIS's administrative system and charged to the Cooperator as described in the Financial Plan below.

APHIS-WS Agreement Number: 17-73-06-6814-RA
APHIS-WS Account Code (WBS): AP.RA.RX06.73.0239

**FINANCIAL PLAN**
**01/01/17-09/30/17**

| Cost Element | Full Cost | | |
|---|---|---|---|
| Personnel Compensation | $ | | 3,977.28 |
| Travel | $ | | - |
| Vehicles | $ | | 1,176.00 |
| Other Services | $ | | - |
| Supplies and Materials | $ | | 178.50 |
| Equipment | $ | | 960.00 |
| | | | |
| Subtotal (Direct Charges) | $ | | 6,291.78 |
| | | | |
| Pooled Job Costs | 11.00% | $ | 692.10 |
| Indirect Costs | 16.15% | $ | 1,016.12 |
| Aviation Flat Rate Collection | | $ | - |
| Agreement Total | $ | | 8,000.00 |

WS will bill San Francisquito Creek Joint Powers on a quarterly basis. Funds may be moved one category to another as needed so long as the aggregate total does not exceed $8,000.00.

In accordance with the Debt Collection Improvement Act (DCIA) of 1996, bills issued by WS are due and payable within 30 days of receipt. The DCIA requires that all debts older than 120 days be forwarded to debt collection centers or commercial collection agencies for more aggressive action. Debtors have the option to verify, challenge and compromise claims, and have access to administrative appeals procedures which are both reasonable and protect the interests of the United States.

**AUTHORIZATION:**

San Francisquito Creek Joint Powers Authority
Address: 615-B Menlo Avenue
Menlo Park, CA 94025
Tax Identification Number: 94-3401348

Len Materman, Executive Director

February 1, 2017
Date

APHIS-WS Agreement Number: 17-73-06-6814-RA
APHIS-WS Account Code (WBS): AP.RA.RX06.73.0239

United States Department of Agriculture
Animal and Plant Health Inspection Service, Wildlife Services
Dennis Orthmeyer, Acting California State Director
3419 A Arden Way
Sacramento, CA 95825
Phone: (916)979-2675
Tax Identification Number: 41-0696271

Dennis Orthmeyer, California State Director — Date: 2-13-17

Director, Western Region — Date: 2/22/17

APHIS-WS Agreement Number: 17-73-06-6814-RA
APHIS-WS Account Code (WBS): AP.RA.RX06.73.0239

# COOPERATIVE SERVICE AGREEMENT
**Between**
**SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY (COOPERATOR)**
**And**
**UNITED STATES DEPARTMENT OF AGRICULTURE**
**ANIMAL AND PLANT HEALTH INSPECTION SERVICE**
**WILDLIFE SERVICES (APHIS-WS)**

## ARTICLE 1 – PURPOSE

The purpose of this Agreement is to conduct wildlife damage management (WDM) activities to manage predators, mainly red fox, striped skunk, raccoons, Virginia opossums, feral cate, American Crows, Common Ravens and other potential mammalian and avian predators to protect the Federally Listed Ridgeway's Rail (*Rallus obsoletus*) and Salt Marsh Harvest Mouse (*Reithroadontomys raviventris*) within the Faber-Laumeister Tract and San Francisquito Creek Mouth in San Mateo and Santa Clara Counties, California.

## ARTICLE 2 - AUTHORITY

APHIS-WS has statutory authority under the Act of March 2, 1931, as amended (7 USC 426), and the Act of December 22, 1987 (7 USC 426c), the Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. Additionally, the Secretary of Agriculture, except for management of urban rodents, is authorized to conduct activities to manage nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases. In carrying out a program of wildlife services involving injurious and/or nuisance animal species or involving mammal and bird species that are reservoirs for zoonotic diseases, the Secretary is authorized to cooperate with States, local jurisdictions, individuals, public and private agencies, organizations, and institutions.

## ARTICLE 3 - MUTUAL RESPONSIBILITIES

The cooperating parties mutually understand and agree to/that:

a. Confer and plan a WDM program that addresses the need for managing predator populations to protect the above listed resources within the Faber-Laumeister Tract and San Francisquito Creek Mouth. Based on this consultation, WS will formulate, in writing, the program work plan and associated budget and present them to the Cooperator for approval.

b. Develop a mutually agreed upon Work Plan and Financial Plan which are incorporated into this Agreement by reference. It is understood and agreed that any monies allocated for the purpose of this Agreement shall be expended only towards the activities and related expenses outlined therein.

c. When either of the Cooperating parties address the media or incorporate information into reports and/or publications, both Cooperating parties must agree, in writing, to have their identities disclosed when receiving due credit related to the activities covered by this agreement.

d. APHIS-WS has advised the Cooperator that other private sector service providers may be available to provide wildlife management services and notwithstanding these other options, Cooperator requests that APHIS-WS provide wildlife management services as stated under the terms of this Agreement.

e. All equipment with a purchase price of $5,000 or more per unit, purchased directly with funds from the cooperator for use solely on this project shall be subject to disposal according to APHIS policy, and shall be specifically listed in the Work and Financial Plan. Property title/disposal shall be determined when the project (including all continuations and revisions of this agreement) terminates, or when the equipment is otherwise directed to other projects, whichever comes first. If the equipment is sold prior to the project end, the proceeds should be allocated according to APHIS Policy. Continuations and revisions to this agreement shall list any equipment with a purchase price of $5,000 or more per unit, carried over from a purchase directly with funds from the cooperator for use solely for this project. All other equipment purchased for the program is and remain the property of APHIS-WS.

f. APHIS-WS will provide overall direction and control of the program.

## ARTICLE 4 - COOPERATOR RESPONSIBILITIES

The Cooperator agrees to/that:

a. Designate Kevin Murray, 615-B Menlo Avenue, Menlo Park, CA 94025, Phone: (650) 324-1972 as the authorized representative who shall be responsible for collaboratively administering the activities conducted under this Agreement;

b. Reimburse APHIS-WS for costs, not to exceed the annually approved amount specified in the Work and Financial Plan. If costs are projected to exceed the amount specified in the Work and Financial Plan, the Work and Financial Plan shall be formally revised and signed by both parties before services resulting in additional costs are performed. The Cooperator agrees to pay all costs of service submitted via an invoice within 30 days of the date of the submitted invoice or invoices as submitted by APHIS-WS. Late payments are subject to interest, penalties, and administrative charges and costs as set forth under the Debt Collection Improvement Act of 1996. If the Cooperator is delinquent in paying the full amount of the due service costs submitted by APHIS-WS, and/or is delinquent in paying the due late payments, and/or is delinquent in paying the interest, penalties, and/or administrative costs on any delinquent due service costs, APHIS-WS will immediately cease to provide the respective service associated with the submitted service costs. APHIS-WS will not reinstate or provide the respective service until all due service costs, and/or due late payments, and/or due interest, penalty, and/or administrative costs are first paid in full.

c. To provide a Tax Identification Number or Social Security Number in compliance with the Debt Collection Improvement Act of 1996.

d. As a condition of this Agreement, The Cooperator ensures and certifies that it is not currently debarred or suspended and is free of delinquent Federal debt.

## ARTICLE 5 – WS RESPONSIBILITIES

WS agrees:

a. To designate Dennis Orthmeyer, California State Director, 3419A Arden Way, Sacramento, CA 95825, Phone: (916) 979-2675 as the authorized representative who shall be responsible for collaboratively administering the activities conducted in this Agreement.

b. The performance of wildlife damage management actions by WS under this agreement is contingent upon a determination by WS that such actions are in compliance with the National Environmental Policy Act, Endangered Species Act, and any other applicable federal statutes. WS will not make a final decision to conduct requested wildlife damage management actions until it has made the determination of such compliance.

c. To provide qualified personnel and other resources necessary to implement the approved WDM activities delineated in the Work and Financial Plan referenced in 3.a of this Agreement.

d. To bill the Cooperator for costs incurred in performing WDM activities as authorized in the approved annual Work and Financial Plan as may be amended.

e. To notify the Cooperator if costs are projected to exceed the amounts estimated and agreed upon in the Work and Financial Plan. WS will cease providing goods or services until a revision to the Work and Financial Plan, as appropriate, have been agreed to and signed by both parties to this Agreement.

f. Authorized auditing representatives of the Cooperator shall be accorded reasonable opportunity to inspect the accounts and records of WS pertaining to such claims for reimbursement to the extent permitted by Federal law and regulations.

## ARTICLE 6 – CONTINGENCY STATEMENT

For costs borne by WS, this agreement is contingent upon the passage of the Agriculture, Rural Development, and Related Agencies Appropriation Act for the current fiscal year from which expenditures may be legally met and shall not obligate APHIS upon failure of Congress to so appropriate. This Agreement also may be reduced or terminated if Congress provides APHIS funds only for a finite period under a Continuing Resolution.

## ARTICLE 7 – NON-EXCLUSIVE SERVICE CLAUSE

Nothing in this agreement shall prevent any other country, State government or its political subdivisions, local government, university, or college, organization, association, or individual from entering into separate agreements with WS for same or similar activities provided under the terms of this Agreement.

## ARTICLE 8 – CONGRESSIONAL RESTRICTIONS

Pursuant to Section 22, Title 41, United States Code, no member of or delegate to Congress shall be admitted to any share or part of this agreement or to any benefit to arise therefrom.

## ARTICLE 9 – APPLICABLE REGULATIONS

All WDM activities will be conducted in accordance with applicable Federal, State, and local laws and regulations.

This agreement is not a procurement contract (31 U.S.C. 6303), nor is it considered a grant (31 U.S.C. 6304). In this agreement, APHIS provides goods or services on a cost recovery basis to nonfederal recipients.

## ARTICLE 10 – LIABILITY

APHIS assumes no liability for any actions or activities conducted under this agreement except to the extent the recourse or remedies are provided by Congress under the Federal Tort Claims Act (28 USC 1346(b), 2401(b), 2671-2680).

## ARTICLE 11 – NON-DISCRIMINATION CLAUSE

The United States Department of Agriculture prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. Not all prohibited bases apply to all programs.

## ARTICLE 12 – FAILURE TO PAY FEES

The cooperator is liable for fees assessed for services performed under this agreement, if applicable. APHIS will assess a late payment penalty for failure to pay fees when due. In addition, the overdue fees shall accrue interest as required by 31 U.S.C. 3717.

## ARTICLE 13 – AGREEMENT EFFECTIVE DATE

This Agreement shall become effective January 1, 2017, and shall continue to December 31, 2021. Further, this Agreement may be amended or extended at any time by mutual agreement of the parties in writing. The Cooperator must submit a written request to extend at least 30 days prior to expiration of the agreement. It may be terminated by either party upon 60 days' notice in writing to the other party.

**AUTHORIZATION:**

San Francisquito Creek Joint Powers Authority
Address: 615-B Menlo Avenue
Menlo Park, CA 94025
Tax Identification Number: 94-3401348

Len Materman, Executive Director — February 1, 2017
Date

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES
Tax Identification Number: 41-0696271

Dennis Orthmeyer, California State Director — 2-13-17
Date

Director, Western Region — 2/22/17
Date

United States Department of Agriculture

Animal and Plant Health Inspection Service

Wildlife Services

3419A Arden Way
Sacramento, CA 95825
Voice 916.979.2675
Fax 916.979.2680

Subject: San Francisquito creek Predator Management Annual Report (October 1, 2016 - September 30, 2017)

Date: 05/29/2018

To: Kevin Murray
Senior Project Manager
San Francisquito creek Joint Powers Authority
650-324-1972

Predator management activities were conducted at San Francisquito creek. The main objective of this project was to protect the endangered California Ridgway's rail (*Rallus obsoletus obsoletus*) (formerly known as the California clapper rail (*Rallus longirostis obsoletus*)) and endangered salt marsh harvest mouse *(Reithrodontomys raviventris raviventris)* from mammalian predators. Predator removal was conducted by USDA Wildlife Service's Biologist Mark Bigelow and Specialists Amber Haywood, Anthony Jennings, and Dylan Bowman. Due to limited access and the agreement being signed late in the year, few site visits were made. With our access agreement in place, the site can be visited more once a new funding agreement is signed.

Control methods used were cage traps and shooting. Shooting and sodium pentobarbital were used as the methods of euthanasia. One feral cats *(Felis catus)*, one Virginia opossums (*Didelphis virginiana*), three raccoons *(Procyon lotor)*, and five striped skunks *(Mephitis mephitis)* were removed (Table 1).

**Table 1. Animals captured, and removed.**

| Method | Cat | Gray Fox | Opossum | Raccoon | Red Fox | Skunk | Total |
|---|---|---|---|---|---|---|---|
| **Cage** | 1 | 0 | 1 | 3 | 0 | 4 | **9** |
| **Firearms** | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| **Total** | **1** | **0** | **1** | **3** | **0** | **5** | **10** |

**Recommendations to improve future management of predators at San Francisquito creek for the protection of threatened and endangered species are as follows:**

1. Continue using Wildlife Services to maintain the current removal program.
2. Provide WS with Site Change Updates. If WS is provided updates of major changes to the site and areas that are under construction, WS can plan control actions that compensate for those activities.
3. Eliminate wildlife / feral animal feeding and food sources (feeding stations, pet food dishes, etc.).
4. Eliminate mammal dens in areas near important T&E species habitat.
5. Remove predators in and around important T&E species habitat.

Mark Bigelow
Wildlife Biologist
San Luis District
California Wildlife Services
Animal and Plant Health Inspection Service
U.S. Department of Agriculture

An Equal Opportunity Provider and Employer

# Appendix B: Faber Marsh South Berm Conceptual Revegetation Plan

H. T. HARVEY & ASSOCIATES

Ecological Consultants

# Memorandum

**Project No. 3029-04**

**December 12, 2018**

**To:** Kevin Murray, Senior Project Manager
San Francisquito Creek Joint Powers Authority

**From:** Gavin Archbald, M.S., Senior Restoration Ecologist

**CC:** Max Busnardo (H. T. Harvey & Associates),
Zooey Diggory (Santa Clara Valley Water District)

**Subject:** **San Francisquito Creek Flood Protection Project—Faber Marsh South Berm Conceptual Revegetation Plan and Guidance to Implement the Recommended Year 1 Maintenance Tasks**

## Introduction

H. T. Harvey & Associates' (H. T. Harvey) restoration ecologists prepared this Conceptual Revegetation Plan to guide completion of revegetation on the south berm of Faber Marsh in accordance with the *San Francisquito Creek Flood Protection Project's High Tide Refuge Enhancement Plan* (Enhancement Plan) (H. T. Harvey & Associates 2015, 2017). The Enhancement Plan was folded into the project's mitigation and monitoring plan and is a project permit requirement (Santa Clara Valley Water District 2016). In addition, this plan provides guidance to implement the Year 1 maintenance recommendations provided by H. T. Harvey in the *San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project— San Francisco Bay to Highway 101 Year 1 (2018) Mitigation Monitoring Report* (Year 1 Monitoring Report; Santa Clara Valley Water District and H. T. Harvey & Associates 2018).

### South Berm Conceptual Revegetation Plan

The San Francisquito Creek Joint Powers Authority (JPA) retained Hanford ARC (Hanford) to construct the habitat enhancement work in accordance with the project's *60% Design Plans for High Tide Refuge Habitat Enhancement* (Design Plans) (H. T. Harvey & Associates 2017). Hanford completed most of the revegetation construction in January 2018, with the exception of the South Berm Revegetation Area (SBRA). Figure 1 provides the location and surface area of the SBRA. Construction at this location was postponed until Teichert's completion of flood protection improvements; Teichert completed work in this area in fall 2018. Revegetation of the SBRA should be completed by January 31, 2019, in accordance with the project's biological opinion in order to avoid disturbance of California Ridgway's rail (*Rallus obsoletus obsoletus*) during the breeding season (U.S. Fish and Wildlife Service 2016).

N:\Projects3000\3029-04\Reports\Vegetation Plan\Fig 1 As-built Planting Layout Nov2018.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

**Figure 1. South Berm Revegetation Area Location and Planting/Seeding Layout**
San Francisquito Creek Flood Protection Project
South Berm Conceptual Vegetation Plan (3029-01)
December 2018

The project's Enhancement Plan includes habitat revegetation objectives and long-term vegetation success criteria for the entire berm enhancement area (north berm, south berm, and east berm combined) (H. T. Harvey & Associates 2015). The target habitat for the SBRA is dense herbaceous vegetation cover with at least 60% cover of non-invasive forbs/grasses and less than 5% cover of invasive plant species. Although the Design Plans included the SBRA, H. T. Harvey recommends implementation of the revised revegetation plan provided herein. Our revised approach is tailored to meet the project's target habitat objective and involves testing two different revegetation methods for establishing tidal marsh-upland transition zone habitat (T-zone habitat). Implementing field tests of these methods in combination with the project's long-term monitoring enable us to determine the effect of seeding only versus seeding and rhizome planting on herbaceous plant community cover and species composition within the T-zone on a constructed levee. Our design for the field test is readily constructible and easily integrated into the project's long-term vegetation monitoring. The results obtained during long-term monitoring will inform vegetation replanting/reseeding recommendations during the 5-year monitoring period. Moreover, implementing the JPA's Strategy to Advance Flood protection, Ecosystems and Recreation along San Francisco Bay project (SAFER Bay), which targets restoration of a large surface area of T-zone habitat and dense planting throughout a large area, would be costly. Information on the relative effectiveness of seeding only versus seeding with rhizome planting will provide valuable knowledge for the JPA's SAFER Bay revegetation planning.

### Guidance to Implement the Recommended Year 1 Maintenance Tasks

The Year 1 Monitoring Report recommends the following maintenance actions:

- Install shrub plantings (contract grown by The Watershed Nursery) to replace all dead shrub plantings on the berms and refuge islands. This task is required by the project's Enhancement Plan.
- Install shrub plantings (contract grown by The Watershed Nursery) in excess of the quantity needed to replace dead shrubs in a subset of the existing shrub patches.
- Seed bare ground areas on the north, south and east berm levee tops with a native seed mix to assist with weed control and native plant establishment.

This plan, in conjunction with the Design Plans, provides the conceptual guidance needed to implement the Year 1 maintenance recommendations.

## Schedule

All revegetation work will be completed by January 31, 2019, in accordance with the project's biological opinion (U.S. Fish and Wildlife Service 2016).

# 1. Revegetate the South Berm Restoration Area

## 1.1. Prepare Surface Soil

Surface soils is the SBRA were left in a heavily compacted condition and approximately 0.5 inch of the upper levee surface was covered with baserock following completion of Teichert's levee construction work. Moreover, the imported levee soils consist of terrestrial subsoils (gravely clay loam texture) and have low percent organic matter (0.5% organic matter by dry weight). The existing degree of compaction and lack of organic matter inhibits water infiltration, root penetration, and target vegetation establishment. Therefore, surface soils will be decompacted and amended with composted organic matter as follows:

- Remove baserock (approximately 0.5 inch) from levee surface and dispose of this material at an appropriate off-site location, at Hanford's discretion.
- Disc or till the soil to a minimum depth of 1 foot to relieve compaction.
- Evenly incorporate 116 cubic yards of composted organic matter into the upper 1 vertical foot of soil to raise soil organic matter content from 0.5% to 3% (dry weight basis). This equates to approximately 1.5 vertical inches of compost incorporated into 12 inches of soil across the 0.6 acres site. This step can be combined with discing/tilling.
- Lightly track-walk the decompaction area. Relative compaction will be less than 85% following track walking.
- Protect work from ruts and compaction until seeding and planting occurs.

## 1.2. Install Seed and Rhizomes

**Spatial Layout of Seeding and Rhizome Planting Areas—**The entire SBRA will be seeded. Following seed application, native grass/forb rhizomes will be planted in the five seeding and rhizome planting plots. The location of the seeding and rhizome planting plots is shown in Figure 1. Each plot is approximately 100 feet long.

**Seed Installation Methods—**The entire SBRA will be broadcast seeded with the seed mix and rates shown in Table 1. Hanford will purchase the seed from Hedgerow Farms in Winters, California. Seed will originate from locations listed in Table 1. Seed will be raked into the upper ¼ inch of the soil surface. Broadcast seeding results in good seed-to-soil contact and reduces seed predation, thereby reducing the amount of seed required for revegetation relative to other seeding methods.

**Rhizome Plant Installation Methods—**Rhizome ramets will be installed within the seed and rhizome planting plots shown in Figure 1. Table 2 lists the rhizome plant palette. H. T. Harvey will provide the plants to Hanford via our contract with The Watershed Nursery. The nursery will deliver the plants to the site in 1-gallon containers along with the shrubs listed in Table 3. Hanford will divide the plants within each container

into the approximate number of ramets shown in Table 1 using a method that minimizes damage to the plant material. Ramets will subsequently be planted into the replicate plots.

**Table 1. SBRA Seed Mix (0.6 acres)**

| Scientific Name | Common Name | Source Location | Application Rate (pounds pure live seed/acre)[1] |
|---|---|---|---|
| *Bromus carinatus* | California brome | Santa Clara Co., Arastradero Preserve | 5.0 |
| *Elymus glaucus* | blue wildrye | Santa Clara Co., Arastradero Preserve | 5.0 |
| *Elymus triticoides* | creeping wildrye | Contra Costa Co., Martinez Marsh | 4.5 |
| *Festuca microstachys* | small fescue | San Mateo Co., Woodside | 1.5 |
| *Festuca rubra* var. *molate* | red molate fescue | Contra Costa Co., Point Molate | 5.0 |
| *Hordeum brachyantherum* var. *salt* | meadow barley | Napa Co., Napa Sonoma Marsh | 4.0 |
| *Lupinus bicolor* | miniature lupine | Napa Co., Napa River | 4.0 |
| *Stipa pulchra* | purple needlegrass | Napa Ca., Napa-Sonoma Marsh | 10.0 |

[1] Pure Live Seed = [% purity of seed lot x % germination rate of species)/100]. Divide recommended application rate (lbs) above by the % PLS for each species to find total lbs. required to provide the application rate shown in the table.

**Table 2. SBRA Plant Palette (0.3 acres)**

| Scientific Name | Common Name | Number of 1-Gallon Containers | Ramets per 1-Gallon Container | Number of Ramets to Plant in SBRA | Number of Ramets to Plant in Each of the 5 Planting Plots |
|---|---|---|---|---|---|
| *Ambrosia psilostachya* | western ragweed | 133 | 15 | 1,995 | 399 |
| *Distichlis spicata* | Saltgrass | 72 | 10 | 720 | 144 |
| *Elymus triticoides* | creeping wildrye | 248 | 6 | 1,488 | 297 |
| | **Total** | | | **4,203** | |

**Table 3. SBRA Shrub Plant Palette per Shrub Patch**

| Scientific Name | Common Name | Container Size | Quantity |
|---|---|---|---|
| *Artemisia californica* | California sage | D40 | 8 |
| *Artemisia douglasiana* | mugwort | D40 | 20 |
| *Baccharis glutinosa* | marsh baccharis | D40 | 12 |
| *Eriogonum fasiculatum* | buckwheat | D40 | 8 |
| *Eriophyllum staechadifolium* | lizard tail | D40 | 8 |
| *Grindelia stricta* | marsh gumplant | D40 | 25 |
| | **Total** | | **81*** |

* Two shrub patches will be installed for a total for 162 shrub plantings.

H. T. Harvey's restoration ecologist will flag the boundaries of each planting plot prior to installation. The restoration ecologist will also flag the ramet planting locations by species in an example area within a plot to create relatively large species-specific patches. Hanford will replicate H. T. Harvey's example planting layout across all plots. Ramets will be planted on approximately 2-foot, on-center spacing. Planting holes will be approximately 4 inches wide by 2 inches deep. Ramets will be installed such that the root crown is flush with the soil surface after site soil is lightly compacted around them.

### 1.3. Install Two Shrub Patches

Two additional upland shrub patches will be installed in the SBRA following the seeding and planting described above. The plant palette for each shrub patch is provided in Table 3. H. T. Harvey's restoration ecologist will flag the boundary of each shrub patch planting area prior to installation. Shrub patches will be 8 feet wide by 40 feet long. Shrubs will be installed on 2-foot centers. Each shrub patch will be mulched using wood bark much, as specified in the Design Plans.

H. T. Harvey will provide the plants to Hanford via our contract with The Watershed Nursery during one delivery combined with the ramets in Table 2. The nursery will deliver the plants to the public road nearest the site.

## 2. Install Replacement Shrub Plantings

The project's Enhancement Plan includes a requirement to replace all shrub plantings that die in Year 1. Approximately 756 shrub plantings died in the berm enhancement area shrub patches and on the refuge islands in Year 1. H. T. Harvey established a contract with The Watershed Nursery for 984 replacement shrub plantings in Year 1, which is 228 plantings more than the quantity required to achieve 100% replanting. Therefore, the additional 228 plantings in the plant order have been allocated to shrub patches on the berm enhancement area in portions of the north and east berm that have the least amount of high tide refuge. If the JPA wishes to forgo planting the extra plants, Hanford can provide a bid on the reduced quantity of 756 plants. However, the guidance provided below regarding plant installation assumes the JPA wishes to install all 984 plantings.

The number of plantings by species to install on the berms is provided in Tables 4–6. The numbers of plantings by species to install on islands are provided in Table 7. The locations of the shrub patches listed in Tables 4–6 are shown in Figure 2. The locations of islands listed in Table 6 are depicted in Figure 3.

The nursery will deliver the plants to the public road nearest to the site during a single delivery. All plants will be installed by Hanford with the location-specific soil amendments indicated in the Design Plans. Additionally, all replacement plants on the refuge islands will be amended with composted organic matter at a rate of 1 part organic amendment to 4 parts soil. Refuge islands will be accessed for replanting using methods described in the Design Plans. Plantings will be installed on berms and islands using the methods described in the Design Plans.

N:\Projects3700\3700-01\Reports\Flood Alterations\Fig 4 As-built Planting Layout.mxd

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Ecological Consultants

**Figure 2. Shrub Patch Locations**

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project
South Berm Conceptual Revegetation Plan (3029-01)
December 2018

N:\Projects3700\3700-01\Reports\Flood Alterations\Fig 3 Refuge Island Locations.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

**Figure 3. Refuge Island Locations**

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project
South Berm Conceptual Revegetation Plan (3029-01)
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**Table 4. Shrub Plants to Install by Patch on the East Berm**

| | Quantity by Species (Scientific Name) | | | | |
|---|---|---|---|---|---|
| **Shrub Patch** | ***Grindelia stricta*** | ***Artemisia californica)*** | ***Artemisia douglasiana)*** | ***Baccharis glutinosa*** | ***Eriophyllum staechadifolium*** |
| EE1 | 16 | 4 | 4 | 3 | 4 |
| EE2 | 5 | 0 | 1 | 1 | 1 |
| EE3 | 0 | 0 | 1 | 1 | 0 |
| EE4 | 11 | 0 | 4 | 2 | 2 |
| EE5 | 11 | 1 | 4 | 0 | 0 |
| EE6 | 0 | 0 | 1 | 0 | 2 |
| EE7 | 0 | 1 | 0 | 0 | 0 |
| EH1 | 0 | | | | |
| EH2 | 18 | | | | |
| EH3 | 33 | | | | |
| EH4 | 28 | | | | |
| EH5 | 25 | | | | |
| EH6 | 27 | | | | |
| **Total** | **174** | **6** | **15** | **7** | **9** |

**Table 5. Shrub Plants to Install by Patch on the North Berm**

| | Quantity by Species (Scientific Name) | | | | | |
|---|---|---|---|---|---|---|
| **Shrub Patch** | ***Grindelia stricta*** | ***Artemisia californica*** | ***Artemisia douglasiana*** | ***Baccharis glutinosa*** | ***Eriogonum fasciculatum*** | ***Eriophyllum staechadifolium*** |
| NE1 | 1 | 1 | 0 | 1 | | 1 |
| NE10 | 20 | 2 | 7 | 4 | | 4 |
| NE11 | 20 | 2 | 6 | 3 | | 3 |
| NE12 | 15 | 4 | 5 | 4 | | 0 |
| NE13 | 10 | 0 | 4 | 3 | | 3 |
| NE2 | 1 | 3 | 1 | 0 | | 3 |
| NE3 | 2 | 4 | 1 | 4 | | 4 |
| NE4 | 0 | 0 | 1 | 0 | | 0 |
| NE5 | 1 | 1 | 1 | 1 | | 0 |
| NE6 | 0 | 0 | 0 | 2 | | 1 |
| NE7 | 3 | 1 | 1 | 3 | | 1 |
| NE8 | 4 | 1 | 0 | 0 | | 0 |
| NE9 | 2 | 1 | 1 | 0 | | 4 |
| NH1 | 6 | | | | | |
| NH10 | 6 | | | | | |
| NH11 | 10 | | 3 | | | 3 |
| NH12 | 30 | | | | | |
| NH13 | 20 | | | | | |
| NH2 | 2 | | | | | |

| Shrub Patch | Quantity by Species (Scientific Name) | | | | | |
|---|---|---|---|---|---|---|
| | *Grindelia stricta* | *Artemisia californica* | *Artemisia douglasiana* | *Baccharis glutinosa* | *Eriogonum fasciculatum* | *Eriophyllum staechadifolium* |
| NH3 | 3 | | | | | |
| NH4 | 5 | | | | | |
| NH5 | 2 | | | | | |
| NH6 | 5 | | | | | |
| NH7 | 3 | | | | | |
| NH8 | 10 | | | | | |
| NH9 | 11 | | | | | |
| NU1 | 1 | 5 | 0 | 4 | 3 | 0 |
| NU2 | 2 | 1 | 0 | 1 | 4 | 1 |
| **Total** | **195** | **26** | **31** | **30** | **7** | **28** |

**Table 6. Shrub Plants to Install by Patch on the South Berm**

| Shrub Patch | Quantity by Species (Scientific Name) | | | | | |
|---|---|---|---|---|---|---|
| | *Grindelia stricta* | *Artemisia californica* | *Artemisia douglasiana* | *Baccharis glutinosa* | *Eriogonum fasciculatum* | *Eriophyllum staechadifolium* |
| SE1 | 10 | 0 | 0 | 2 | | 0 |
| SE2 | 0 | 3 | 1 | 3 | | 1 |
| SE3 | 0 | 0 | 1 | 0 | | 0 |
| SE4 | 0 | 0 | 1 | 0 | | 0 |
| SE5 | 0 | 2 | 1 | 0 | | 3 |
| SE6 | 0 | 0 | 1 | 0 | | 0 |
| SE7 | 0 | 4 | 1 | 0 | | 1 |
| SH1 | 36 | | | | | |
| SH10 | 21 | | | | | |
| SH11 | 22 | | | | | |
| SH12 | 19 | | | | | |
| SH13 | 30 | | | | | |
| SH14 | 12 | | | | | |
| SH15 | 24 | | | | | |
| SH16 | 6 | | | | | |
| SH2 | 0 | | | | | |
| SH3 | 15 | | | | | |
| SH4 | 17 | | | | | |
| SH5 | 0 | | | | | |
| SH6 | 28 | | | | | |
| SH7 | 10 | | | | | |
| SH8 | 0 | | | | | |
| SH9 | 0 | | | | | |
| SU1 | 5 | 2 | 0 | 2 | 0 | 6 |
| SU2 | 14 | 4 | 1 | 3 | 8 | 1 |

| Shrub Patch | Quantity by Species (Scientific Name) | | | | | |
|---|---|---|---|---|---|---|
| | *Grindelia stricta* | *Artemisia californica* | *Artemisia douglasiana* | *Baccharis glutinosa* | *Eriogonum fasciculatum* | *Eriophyllum staechadifolium* |
| SU3 | 5 | 0 | 0 | 2 | 7 | 1 |
| SU4 | 0 | 0 | 0 | 3 | 7 | 0 |
| SU5 | 0 | 1 | 1 | 0 | 7 | 0 |
| SU6 | 2 | 0 | 1 | 2 | 7 | 1 |
| SU7 | 0 | 5 | 1 | 1 | 7 | 2 |
| SU8 | 4 | 4 | 1 | 2 | 7 | 4 |
| **Total** | **280** | **25** | **11** | **20** | **50** | **20** |

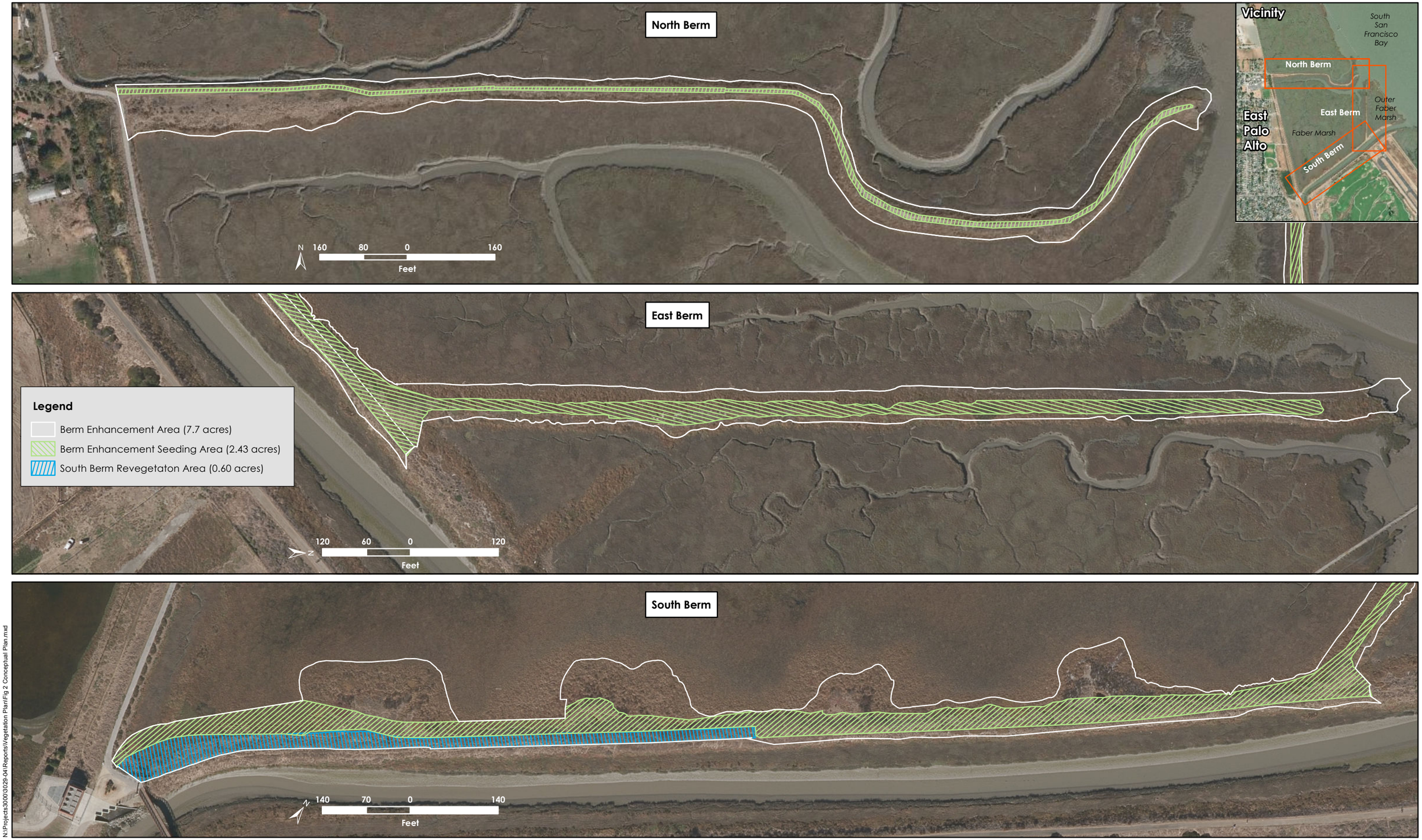
**Table 7. Replacement Plants on Refuge Islands**

| Refuge Island | Quantity by Species (Scientific Name) |
|---|---|
| | *Grindelia stricta* |
| 1 | 3 |
| 2 | 3 |
| 3 | 0 |
| 4 | 21 |
| 5 | 22 |
| **Total** | **49** |

## 3. Seed Bare Ground on the South, North and East Berms

The Year 1 Monitoring Report recommends seeding bare ground with native grasses on the south, north, and east berm. Seeding will help increase competition between desirable native grasses and nonnative plants and potentially reduce the level of effort required for nonnative plant control over the 10-year monitoring period.

The native grass seed mix in Table 8 will be applied via broadcast seeding to bare ground areas in the upland and ecotone habitats in the berm enhancement area outside the SBRA (Figure 4). The seed mix contains grass species with some salt tolerance that are suitable for establishment in the ecotone (Table 8). Seed will be raked into the upper ¼ inch of the soil surface. Hanford will purchase the seed from Hedgerow Farms. Seed will originate from the locations listed in Table 8.




N:\Projects3000\3029-04\Reports\Vegetation Plan\Fig 2 Conceptual Plan.mxd

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**Figure 4. Berm Enhancement Seeding Area**

San Francisquito Creek Flood Protection Project
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**Table 8. Seed Mix in the Berm Enhancement Seeding Area (2.43 acres)**

| Scientific Name | Common Name | Source Location | Application Rate (pounds pure live seed/acre)[1] |
|---|---|---|---|
| *Elymus triticoides* | creeping wildrye | Contra Costa Co., Martinez Marsh | 5.0 |
| *Festuca microstachys* | small fescue | San Mateo Co., Woodside | 5.0 |
| *Festuca rubra* var. *molate* | red molate fescue | Contra Costa Co., Point Molate | 6.0 |
| *Hordeum brachyantherum* var. *salt* | meadow barley | Napa Co., Napa Sonoma Marsh | 5.0 |
| *Stipa pulchra* | purple needlegrass | Napa Ca., Napa-Sonoma Marsh | 10.0 |

[1] Pure Live Seed = [% purity of seed lot x % germination rate of species)/100]. Divide recommended application rate (lbs) above by the % PLS for each species to find total lbs. required to provide the application rate shown in the table.

# References


H. T. Harvey & Associates. 2015. San Francisquito Creek Flood Protection Project: Conceptual High Tide Refuge Habitat Enhancement Plan. December 18. Prepared for Santa Clara Valley Water District.

H. T. Harvey & Associates. 2017. 60% Design Plans for San Francisquito Creek Flood Protection Project High Tide Refuge Habitat Enhancement Plan. August 30. Prepared for San Francisquito Creek Joint Powers Authority.

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Santa Clara Valley Water District and H. T. Harvey & Associates. 2018. San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project - San Francisco Bay to Highway 101. Year 1 (2018) Mitigation Monitoring Report. San Jose, California.

U. S. Fish and Wildlife Service. 2016. Formal Consultation on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California. Biological Opinion. January 15.

# Appendix C. Photo-documentation

## C-1. Tidal Marsh Creation

**Photo-point 1. Created marsh plain, looking upstream from end of Laura Lane**

October 30, 2017; immediately after construction

July 5, 2018; during Year 1 monitoring

**Photo-point 2. Created marsh plain, looking downstream from end of Laura Lane**

October 30, 2017; immediately after construction

July 5, 2018; during Year 1 monitoring

**Photo-point 3. Created marsh plain, looking upstream from Geng Road entrance**

October 30, 2017; immediately after construction

July 5, 2018; during Year 1 monitoring

**Photo-point 4. Created marsh plain, looking downstream from Geng Road entrance**

The reach of the Project from approximately the Geng Road entrance downstream to San Francisco Bay was completed in 2018, after the Year 1 monitoring was conducted. As such, photo-points 4 through 6 are considered pre-Project for the purposes of mitigation monitoring.

July 5, 2018; prior to construction

**Photo-point 5. Created marsh plain, looking upstream from Friendship Bridge**

July 5, 2018; prior to construction

November 28, 2018; immediately after construction

**Photo-point 6. Created marsh plain, looking downstream from Friendship Bridge**

July 5, 2018; prior to construction

November 28, 2018; immediately after construction

## C-2. Refuge Islands

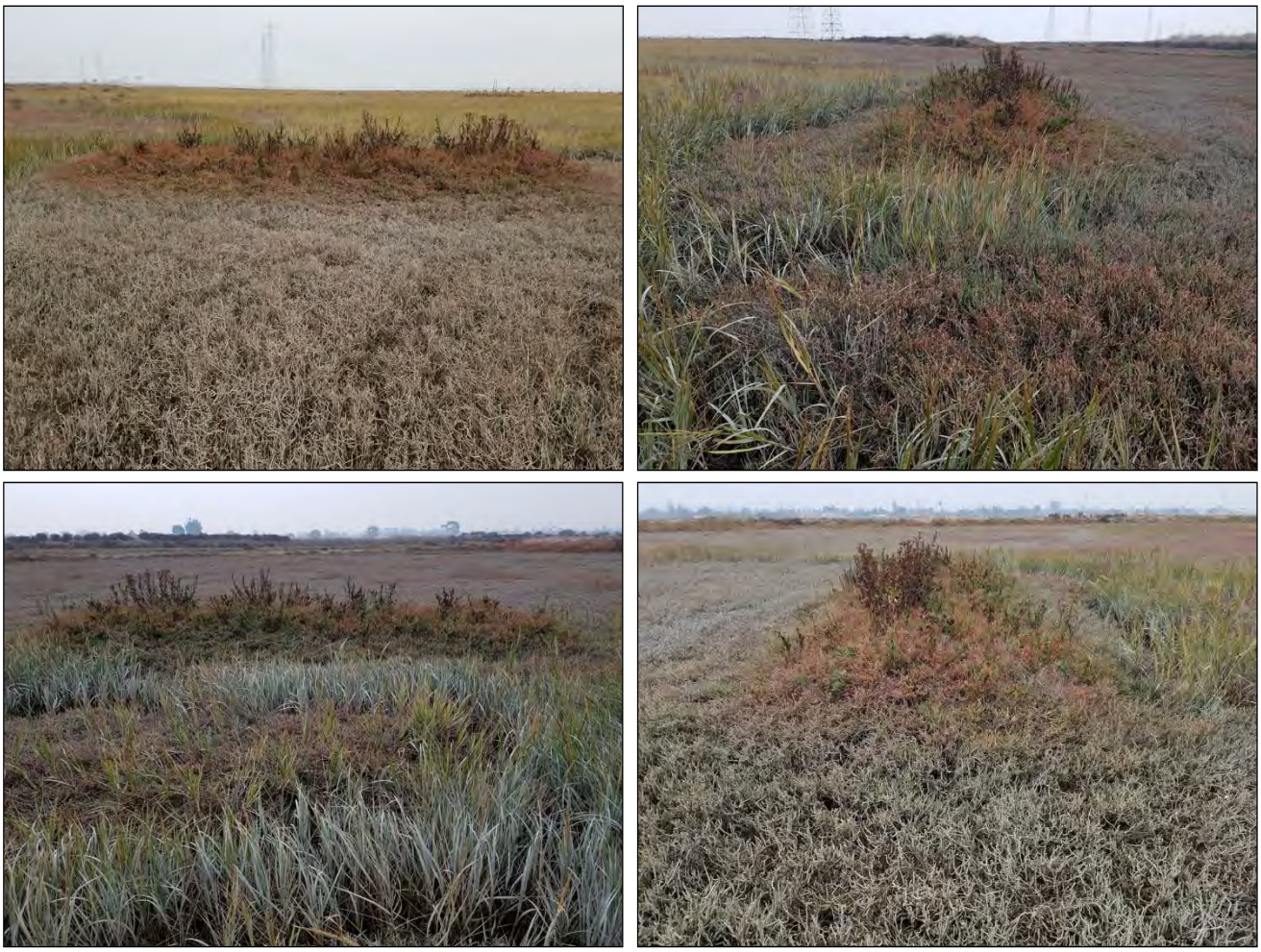

**Photo 1. Island 1 facing North (Top-Left), East (Top-Right), South (Bottom-Left), and West (Bottom-Right). November 13, 2018.**

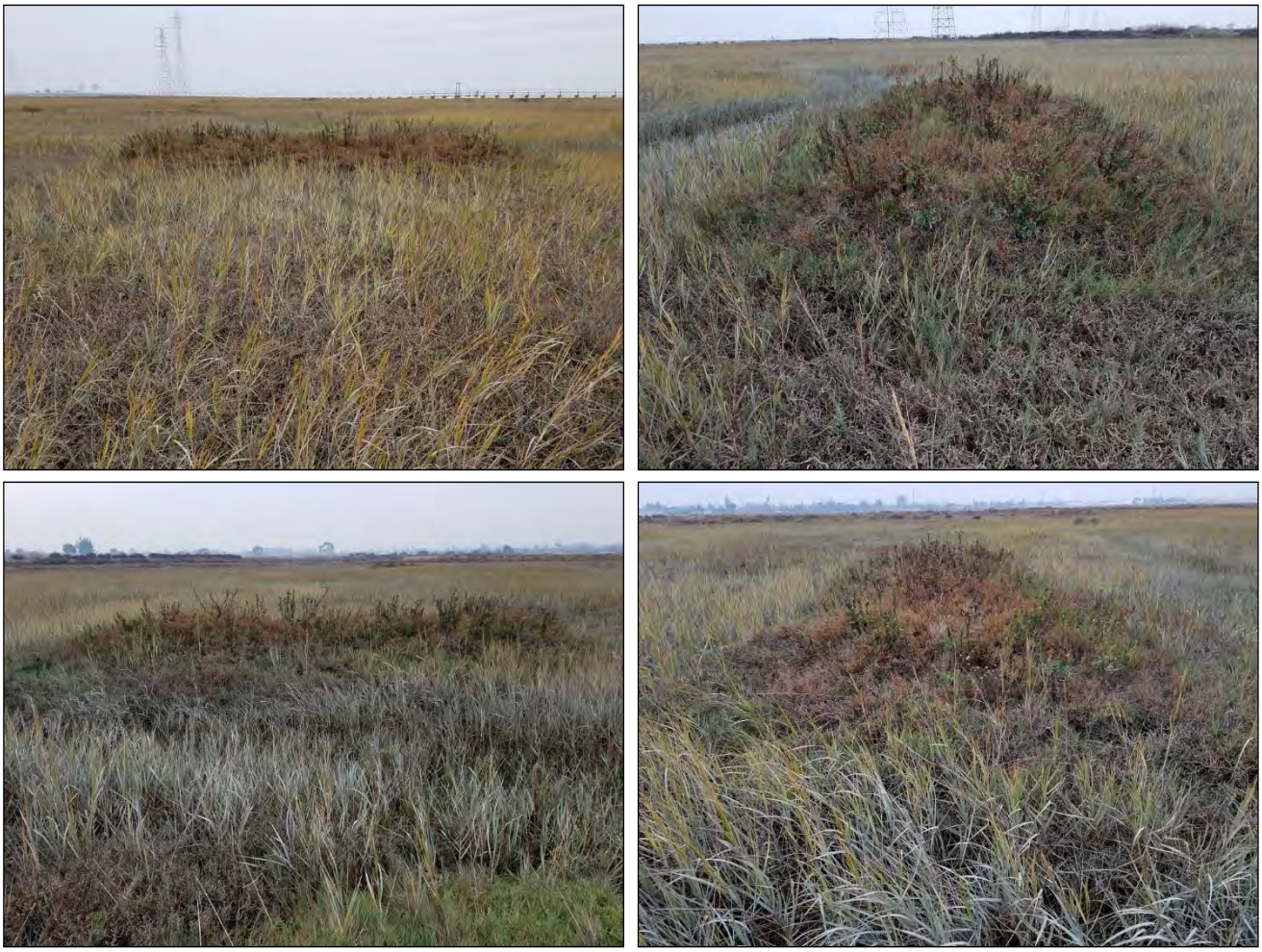

**Photo 2. Island 2 facing North (Top-Left), East (Top-Right), South (Bottom-Left), and West (Bottom-Right). November 13, 2018.**

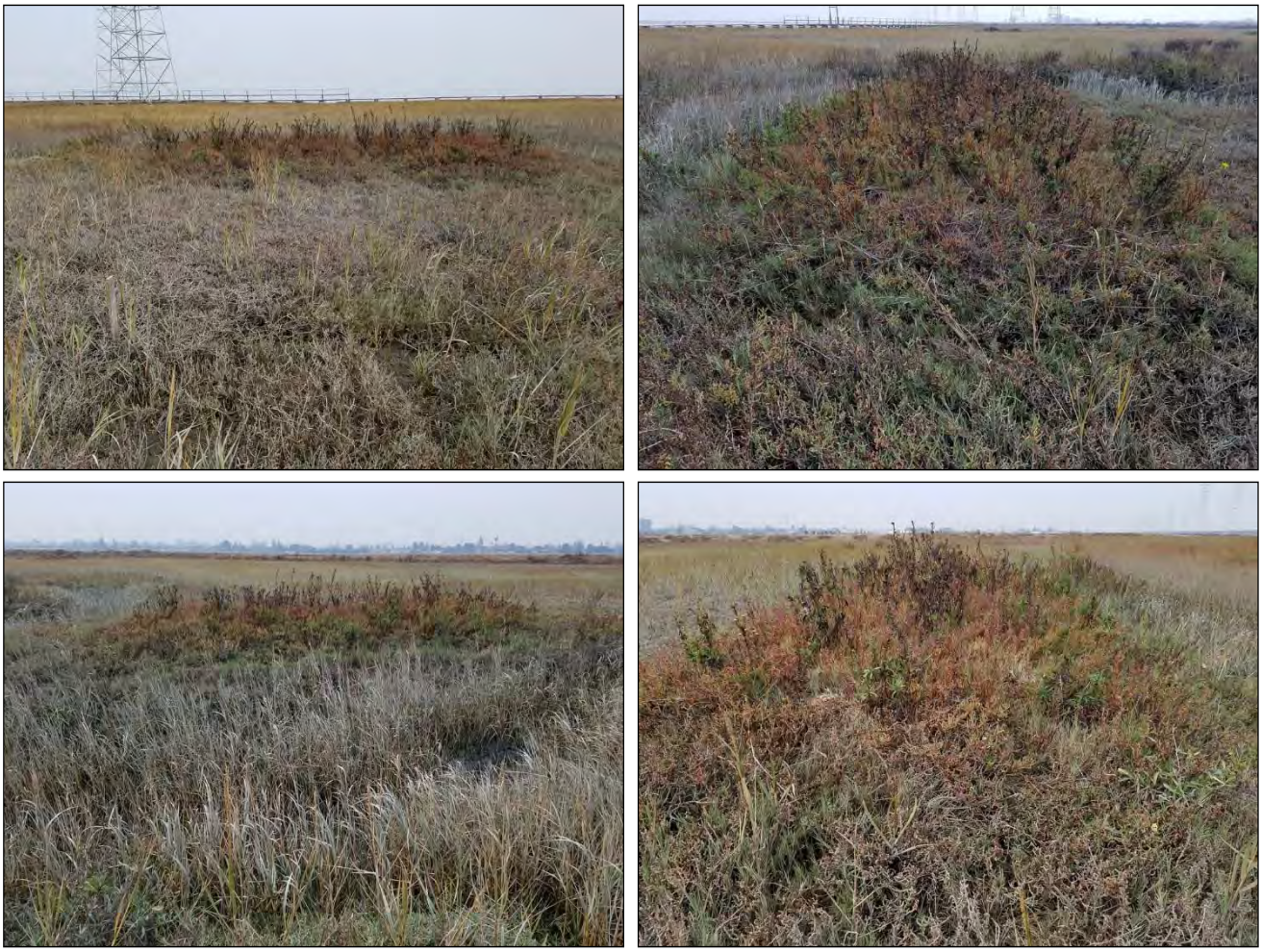

**Photo 3. Island 3 facing North (Top-Left), East (Top-Right), South (Bottom-Left), and West (Bottom-Right). November 13, 2018.**

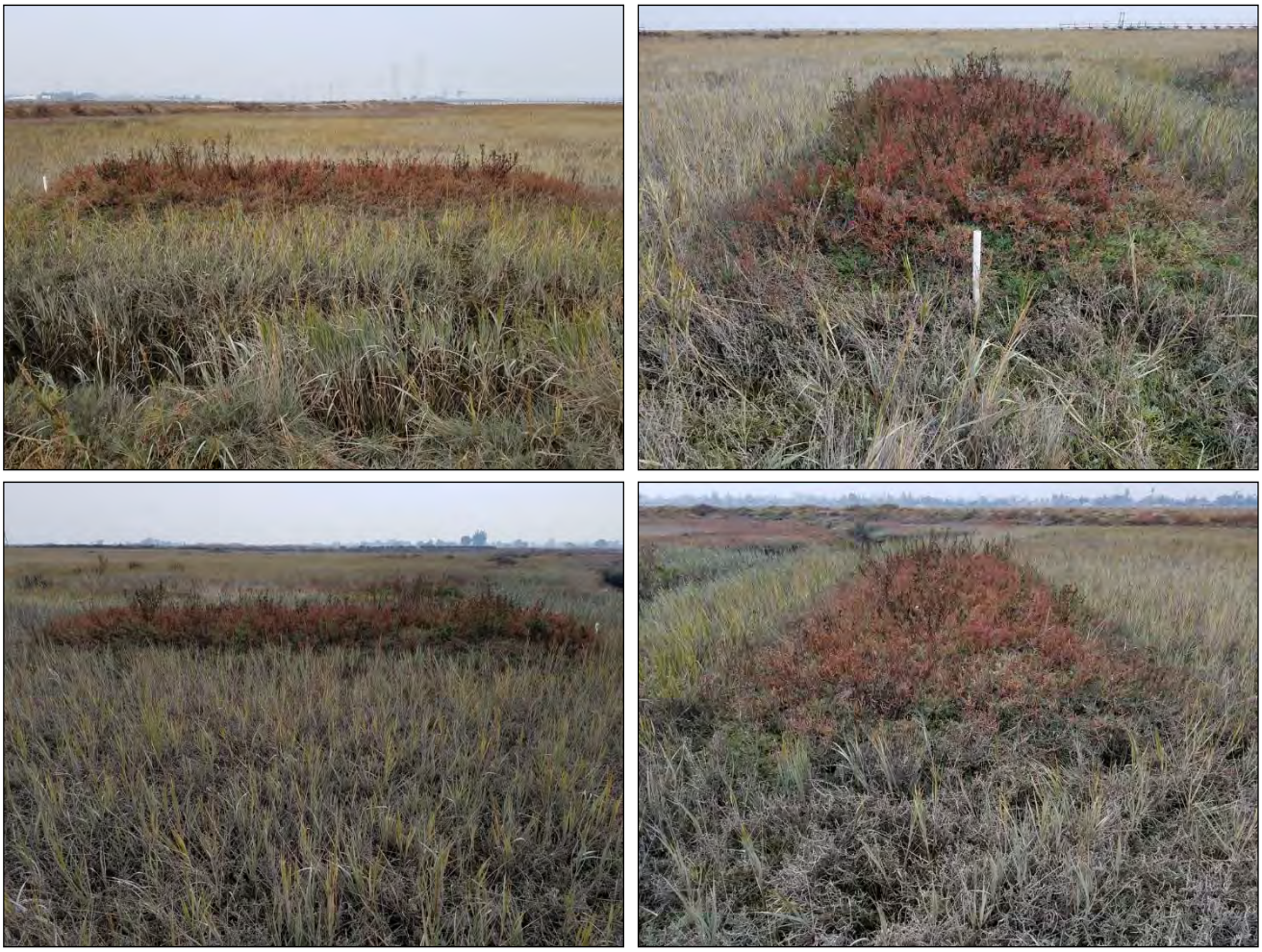

**Photo 4. Island 4 facing North (Top-Left), East (Top-Right), South (Bottom-Left), and West (Bottom-Right). November 13, 2018.**

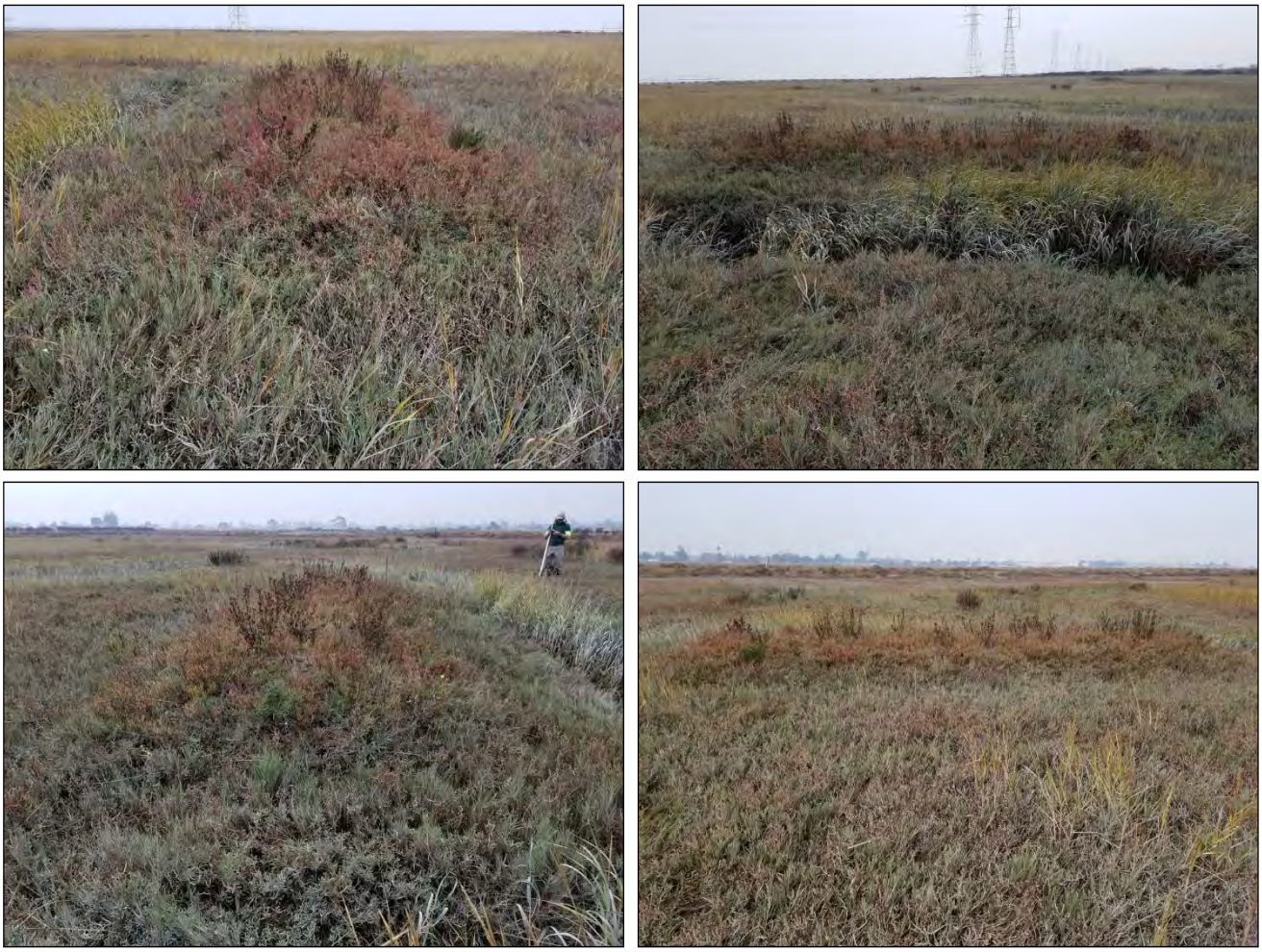

**Photo 5. Island 5 facing North (Top-Left), East (Top-Right), South (Bottom-Left), and West (Bottom-Right). November 13, 2018.**

## C-3. Berm Enhancement Areas

**Photo 6. North Berm from Photodocumentation Point 1, Facing East. November 5, 2018.**

**Photo 7. North Berm from Photodocumentation Point 2, Facing East (Top) and West (Bottom). November 5, 2018.**

**Photo 8. North Berm from Photodocumentation Point 3, Facing South (Top) and West (Bottom). November 5, 2018.**

**Photo 9. North Berm from Photodocumentation Point 4, Facing East (Top) and West (Bottom). November 5, 2018.**

**Photo 10. North Berm from Photodocumentation Point 5, Facing East (Top) and South (Bottom). November 5, 2018.**

**Photo 11. East Berm from Photodocumentation Point 6, Facing North (Top) and South (Bottom). November 8, 2018.**

**Photo 12. East Berm from Photodocumentation Point 7, Facing North (Top) and South (Bottom). November 8, 2018.**

**Photo 13. East and South Berms from Photodocumentation Point 8, Facing North looking at East Berm (Top) and West looking at South Berm (Bottom). November 8, 2018.**

**Photo 14. South Berm from Photodocumentation Point 9, Facing East (Top) and West (Bottom). November 8, 2018.**

**Photo 15. South Berm from Photodocumentation Point 10, Facing East (Top) and West (Bottom). November 8, 2018.**

**Photo 16. South Berm from Photodocumentation Point 11, Facing East (Top) and West (Bottom). November 8, 2018.**

**Photo 17. South Berm from Photodocumentation Point 12, Facing East. November 8, 2018.**

**Photo 18. Shrub Patch Nu1, Facing East (Top) and West (Bottom). November 15, 2018.**

**Photo 19. Shrub Patch Nu2, Facing East (Top) and West (Bottom). November 15, 2018.**

**Photo 20. Shrub Patch Nh6, Facing East (Top) and West (Bottom). November 15, 2018.**

**Photo 21. Shrub Patch Ne7, Facing East (Top) and West (Bottom). November 15, 2018.**

**Photo 22. Shrub Patch Su1, Facing East (Top) and West (Bottom). November 9, 2018.**

**Photo 23. Shrub Patch Su4, Facing East (Top) and West (Bottom). November 15, 2018.**

**Photo 24. Shrub Patch Su7, Facing East (Top) and West (Bottom). November 9, 2018 (construction activities had been completed in the area at the time photo was taken).**

**Photo 25. Shrub Patch Sh2, Facing East (Top) and West (Bottom). November 9, 2018.**

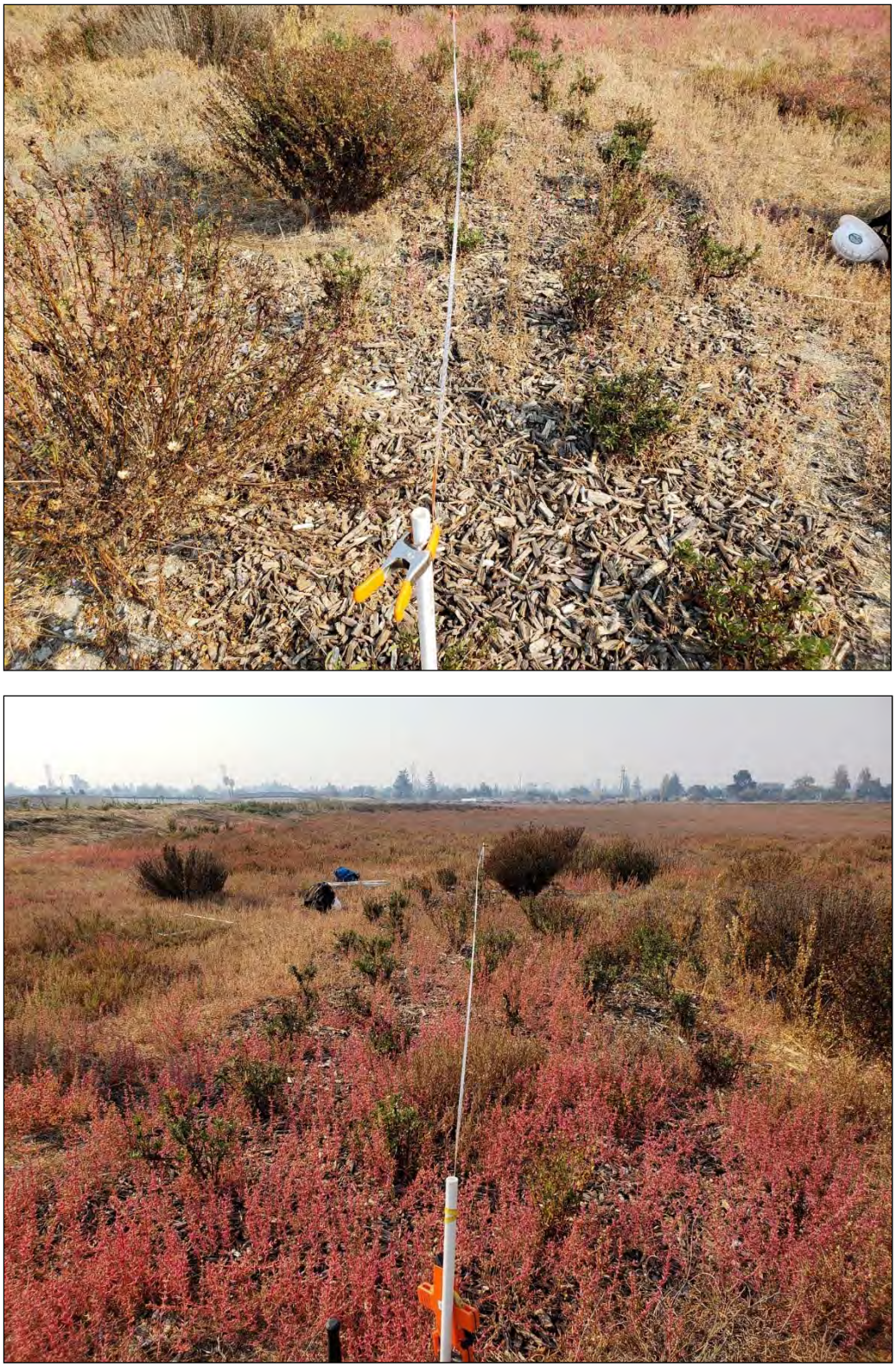

**Photo 26. Shrub Patch Sh9, Facing East (Top) and West (Bottom). November 9, 2018.**

**Photo 27. Shrub Patch Sh14, Facing North (Top) and South (Bottom). November 15, 2018.**

**Photo 28. Shrub Patch Se4, Facing East (Top) and West (Bottom). November 9, 2018.**

**Photo 29. Shrub Patch Se5, Facing East (Top) and West (Bottom). November 9, 2018.**

**Photo 30. Shrub Patch Eh6, Facing North (Top) and South (Bottom). November 15, 2018.**

**Photo 31. Shrub Patch Eh3, Facing North (Top) and South (Bottom). November 15, 2018.**

**Photo 32. Shrub Patch Ee5, Facing North (Top) and South (Bottom). November 15, 2018.**

**Photo 33. Shrub Patch Ee3, Facing North (Top) and South (Bottom). November 15, 2018.**

## C-4. Riparian Mitigation

**Photo-point 1. Riparian mitigation on San Francisquito Creek, looking north (upstream) across primary planting area**

November 28, 2018; after Year 1 monitoring

**Photo-point 2. Riparian mitigation on San Francisquito Creek, looking south (downstream) at upper bank plantings**

November 28, 2018; after Year 1 monitoring

**Photo-point 3. Riparian mitigation on San Francisquito Creek, looking west (upstream) at terrace plantings**

November 28, 2018; after Year 1 monitoring

**Photo-point 4. Riparian mitigation on San Francisquito Creek, looking upstream at planted willow stakes**

November 28, 2018; after Year 1 monitoring

**Photo-point 5. Riparian mitigation on San Francisquito Creek, looking downstream at planted willow stakes**

November 28, 2018; after Year 1 monitoring

**Photo-point 6. Example of tree protection for riparian mitigation at Pearson-Arastradero Preserve**

July 30, 2018; during Year 1 monitoring

## C-5. Velocity Refuge Structures

November 28, 2018; downstream-most rootwad structure approximately only month after installation

November 28, 2018; close-up of downstream-most rootwad structure approximately only month after installation

November 28, 2018; upstream-most rootwad structure approximately only month after installation

November 28, 2018; rock spur structure approximately only month after installation