FINAL

VICENTE BLUFFS RESERVE
FISHING ACCESS TRAIL
HABITAT RESTORATION PLAN

Prepared for:

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SECTION 1 – OVERVIEW AND EXISTING CONDITIONS

1.1 INTRODUCTION

This restoration plan has been prepared for the Vicente Bluffs Reserve located on the Palos Verdes Peninsula (Peninsula) in southern Los Angeles County, California. The 10.5 acre Fishing Access property at Vicente Bluffs Reserve is part of the Portuguese Bend Nature Preserve, a 1,200-acre preserve located adjacent to the Pacific Ocean on the Peninsula. The property was designated as a part of the nature preserve by the City of Rancho Palos Verdes in 2005 and is under the management of the Palos Verdes Peninsula Land Conservancy (PVPLC). The restoration project site is situated along the coastal bluff and trail leading to the ocean. The trail allows coastal access from the parking lot on Palos Verdes Drive South to accommodate pedestrian and fishing access. Located on the Palos Verdes Peninsula, the Vicente Bluffs are an important coastal ecological resource for the Los Angeles region. This area supports several habitat types such as coastal bluff scrub and coastal cactus scrub. Recently, the federally endangered El Segundo blue butterfly (*Euphilotes battoides allyni*) was discovered at the site. In the past, there have been drainage problems along the main access trail that have created a deep cut through the center of the slope between the main trail's switchbacks. This habitat restoration project is funded by a grant from the California Coastal Conservancy (07-176) and proposes to remove non-native vegetation and replace it with coastal bluff and cactus scrub species. The project also proposes to revegetate social trails and other bare areas on the slopes that cause erosion. These actions, in conjunction with improvements in public trail access conducted by PVPLC, will reduce soil/sediment runoff due to erosion and provide habitat for the endangered El Segundo Blue Butterfly as well as enhance habitat for two sensitive bird species, the federally threatened California gnatcatcher (*Polioptila californica californica*) and a species of special concern, the coastal cactus wren (*Campylorynchus brunneicapillus*).

1.2 EXISTING CONDITIONS

The Vicente Bluffs Reserve property is comprised mainly of an extremely steep south-facing bluff with a trail to the ocean below. At the top of the property, there is a relatively flat area surrounding city parking and landscaped area. The site is bounded east by a housing development and its native habitat area while to the west is open space. The site is bound to the north by Palos Verdes Drive South, and the Pacific Ocean is immediately south of the project.

1.2.1 Existing Vegetation

The majority of the bluff is native coastal bluff habitat dominated by California encelia (*Encelia californica*) with patches of cholla cactus scrub (*Cylindropuntia prolifera*). Lemonadeberry (*Rhus integrifolia*) is found mainly at the toe of the bluff. The rare plant, wooly sea-blite (*Sueda taxifolia)*, is found at one spot on the lower portion of the bluff. Liveforever (*Dudleya virens)*, another rare plant, is found northeast of the site.

Several species of non-native plants are invading the native vegetation on the bluffs mainly along the top of the bluff and along trails, both the official trail and other social trails made by the public. The exotic species include Russian thistle *(Salsola tragus)*, ice plant *(Carpobrotus edulis)*, and fountain grass *(Pennisetum setaceum)*. A few pampas

grass (*Cortaderia selloana*) individuals are found within the project site while a larger population of this invasive species is located southeast of the project on an inaccessible area of the bluff face. Along the base of the bluff at the edge of the rocky beach, shrubby acacia plants (*Acacia cyclops*) are growing among the lemonadeberry. The city parking lot has been landscaped with drought tolerant non-native species that include fountain grass.

1.2.2 Site Soil

Generally, soil analysis is critical to determine appropriate restoration in the areas that have been disturbed. The proposed restoration and management recommendations are based in large part on the soil and changes in the soil across a site. However, based on the single soil pattern at the site as well as the steep topography of most of the site, limited soil sampling was undertaken for salinity only. Samples were taken at the top of the bluff and at the bottom of the bluff to compare salinities of the soil in both locations. Since the lower bluff slope is directly adjacent to the rocky beach and salt spray, salinity is one soil characteristic that could adversely affect restoration efforts.

Based on the soil analyses, there does not appear to be any saline conditions that would interfere with establishment of native coastal bluff plant species. The salinity, measured as electrical conductivity (Ec) at the top of the bluff is Ec 1.13 and at the bottom of the bluff is Ec 3.78. Soil salinity under Ec 4.0 generally is not a problem for most plants. Since the specified vegetation is adapted to the coastal bluff environment, no plant-soil problems are anticipated.

SECTION 2 – RESTORATION SPECIFICATIONS

Once a plan is prepared, restoration generally can be divided into four phases: 1) site preparation, 2) seeding/planting, 3) establishment maintenance, and 4) post-establishment, long-term management. For the Vicente Bluffs Reserve restoration, site preparation will be necessary to control the exotic weeds within the restoration areas. Concurrent with the site preparation phase, appropriate seeds will be collected, and container plants will be propagated. Planting and seeding will be implemented in the fall following the control of exotic weed species. Establishment maintenance will likely be required for approximately three years, depending on rainfall and the development of the planted and seeded species versus weedy species. Long-term management should consist of periodic site surveys for exotic invasive plants and appropriate management activities based on results of the surveys.

2.1 PROJECT GOALS

The purpose of this habitat restoration is to restore appropriate native habitats in disturbed trail areas to enhance the ecological functions of the adjacent native habitats within the project site. The following general goals for the California Coastal Conservancy grant and the habitat restoration were determined after evaluating the existing conditions of the site:

- Eliminate social trails by establishing native vegetation in the disturbed areas;
- Remove invasive exotic plant species; and
- Increase native plant cover of bluff vegetation and cactus scrub vegetation.

2.2 SITE PREPARATION

Restoration of the specified habitat requires site preparation consisting of weed control. Site preparation will need to be performed for at least one growing season prior to planting and seeding.

2.2.1 Weed Control

Recommended methods for control of particular species are based on experience, and methods have been cross-referenced using the CalWeed Database of the California Interagency Noxious Weed Coordinating Committee and Invasive Plants of California Wildlands (Bossard et. al. 2000). No herbicides will be used for control of these weed species.

Weed densities will depend on the seasonal rains and temperatures each year. The timing of weed control may be different for each restoration area based on soil moisture, topography, and the growth and development of non-target native plant species. It should be anticipated that monitoring be required for successful weed management. Monitoring is necessary to schedule control methods for the specified time frame according to the phenology of each target weed species.

For efficient control of exotic invasive species, weeds must be controlled before they produce viable seed. Methods of control will depend on the target species, the density of the target species, the area of infestation, and the ecological sensitivity of the existing

habitat. Weed removal will employ mainly hand-pulling as well as mechanical methods, such as chain-sawing.

The amount of site preparation weeding that is required across the restoration area will vary depending on the amount and timing of rainfall, as well as the soil seed bank. Areas should be evaluated after each weeding event to assess the progress of site preparation and to plan the next step. Areas will be released for planting and seeding depending on whether enough progress has been made in management of the weed species.

The following methods are recommended for each of the main weed species or group of species:

- Weed control will be required to remove ice plant along the upper, mid and lower bluff areas of the official trail, and along social trails. Removal of ice plant shall be done by hand, then taking care to wrap the weed in burlap to avoid dropping any segments that can root again. Areas cleared of ice plant shall be maintained weed-free until seeding and planting.
- Russian thistle along the top of the bluff and along the disturbed areas of the official trail and social trails shall be removed by hand-weeding prior to flowering.
- Annual grasses on relatively flat areas (such as the top of the bluff) shall be controlled by weed whipping during the growing season to eliminate seed production. Annual grass growing among other weed-infested areas shall be hand pulled and removed.
- Fountain grass shall be removed by digging the entire root ball of individual plants along the top of the bluff. Fountain grass shall be removed from the landscaped areas to prevent further invasion into the Vicente Bluffs Reserve.
- Pampas grass shall be removed by cutting and digging out the entire root ball except in areas prone to erosion where the cut stump will be covered to prevent re-growth.
- Along the lower bluff, acacia shrubs shall be cut and removed. Acacia stumps shall be cut as low as possible to prevent re-growth, as has been demonstrated at other sites by PVPLC.

2.2.2 Soil Amendments

Several soil amendments have been shown to be important tools in native habitat restoration while other amendments are still experimental. Most of these amendments facilitate restoration of the soil ecosystem. The following sections outline the potential use of soil amendments for restoration within the Vicente Bluffs Reserve restoration site.

Arbuscular Mycorrhizal (AM) Fungi

The addition of arbuscular mycorrhizal (AM) fungi aids in the uptake of phosphorus in the establishing native seedlings. Commercially available *Glomus intraradices* is recommended since this is a ubiquitous species and will not impede the development of other native fungal species. The AM fungi can be applied with the seed over the restoration areas. The AM fungi used for the project should be provided by a person or company with experience in AM fungi development. The AM fungi supplied for the

project should be applied at the rate of 60 liters per acre (approximately 3,600,000 live propagules per acre) based on the guarantee of the supplier.

Soil Amendments

General soil amendments and fertilization is not recommended over the site since lower nutrient soils may favor the establishment of native seedlings over weedy exotic species. Native bluff scrub species are adapted to lower nutrient soils, unlike weedy exotic species. Furthermore, the addition of AM fungi should favor the uptake of phosphorous and nitrogen of the seeded native species. However, fertilizer packets delivered to the root zone of container plants installed within the site will benefit the establishment of the plants without also supplying nutrients to the exotic weed species.

For container plants, a fertilizer packet shall be added to the bottom of each planting hole prior to planting. Each packet (10 grams weight) shall contain a blend of 16% total nitrogen, 6% available phosphoric acid, and 8% soluble potash plus minor nutrients. The nitrogen, phosphorous, and potassium shall be coated with a polyurethane coating to provide 15.69% coated slow release nitrogen, 5.09% coated slow release available phosphate, and 6.8% slowly available soluble potash. Bio-pacs® meeting these specifications are available from Reforestation Technologies Inc.

2.3 PLANT SOURCES AND SPECIES

To the extent possible, all plant material for the restoration shall be obtained from native plant communities growing within the Palos Verdes Peninsula. For those species that do not exist in large enough quantities within the specified seed collection area, it will be necessary to either use seed that is commercially grown or extend the collection area on a species-by-species basis. The PVPLC has in-house capabilities for seed collection or may opt to contract with a seed collection contractor specializing in native seed to ensure that seed material will be collected from Palos Verdes Peninsula and other coastal sites ranging north through Malibu and south through Upper Newport Bay. The following sections list the species to be used in restoring the areas adjacent to the trails.

2.4 SEEDING AND PLANTING

As previously described, the restoration of disturbed areas along the trail will focus on coastal bluff vegetation and cactus scrub vegetation located mainly on the bluff slopes within the site (see Figure 1). The coastal bluff seed mix presented in Table 1 is designed to model species occurring on the adjacent slope areas. The species selected for the restoration represent the more common and abundant species observed in the existing adjacent habitat as well as species that are early colonizers in scrub habitats after disturbance such as fires. Some less common species also have been included. Additional species have been included in the seed mix as a nurse crop and for erosion control until the coastal bluff species establish. Container plants will be planted in areas that can be easily accessed for planting and maintenance. Spacing of container plants will follow the specifications in Table 2.

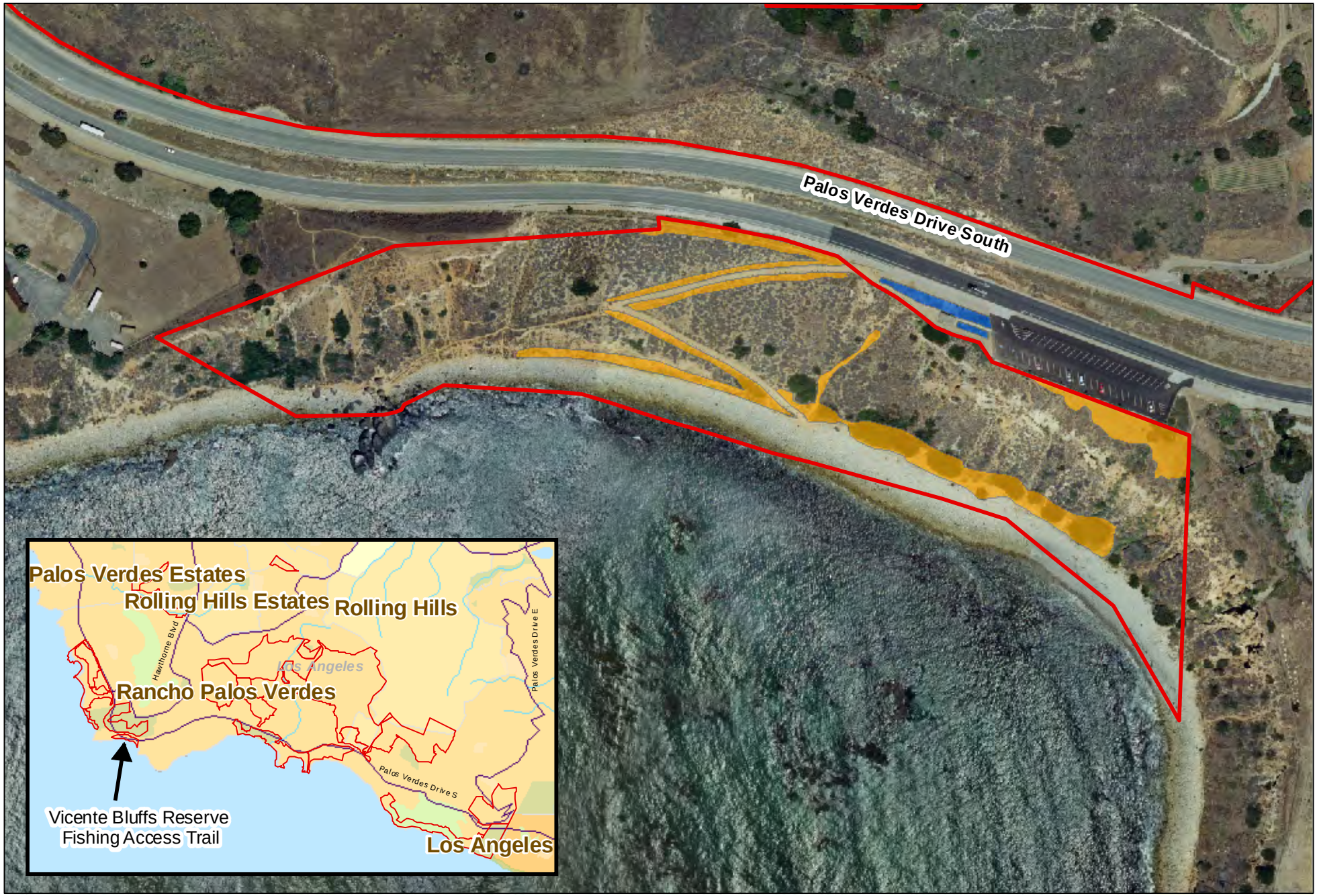

FIGURE 1
Vicente Bluffs Reserve Fishing Access Trail
Palos Verdes Nature Preserve

Table 1
Coastal Bluff Seed Mix

Scientific Name	Common Name	Guidelines For Minimum Purity/Germination[1]	Pounds of Seed Per Acre[2]
Artemisia californica	California sagebrush	15/50	1.5
Encelia californica	California encelia	40/60	2.5
Eriogonum parvifolium	bluff buckwheat	TBD	2.0
Deinandra fasciculata	fascicled tarweed	10/25	1.5
Isocoma menziesii	coast goldenbush	20/40	1.0
Lotus salsuginosus	alkali lotus	98/70	1.5
Lotus scoparius	deerweed	90/60	6.0
Lupinus bicolor	miniature lupine	98/80	3.0
Lupinus succulentus	arroyo lupine	80/80	0.5
Nassella lepida[3]	foothill needlegrass	70/60	2.5
Plantago insularis[4]	wooly plantain	98/75	20.0
Vulpia microstachys[4]	small fescue	70/70	6.0

[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending on results of tests for germination.
[3] Seed of *Nassella* spp. shall be de-awned.
[4] Erosion control and nurse crop species.

Table 2
Coastal Bluff and Cactus Scrub Container Plant Palette

Scientific Name	Common Name	Spacing From Another Container Plant (feet)	Plants Per Acre
Encelia californica	California encelia	3	30
Baccharis pilularis	coyote bush	5	25
Eriogonum parvifolium	bluff buckwheat	3	100
Isomeris arborea	bladderpod	5	25
Opuntia littoralis[1]	prickly pear cactus	2	120
Cylindropuntia prolifera[1]	coastal cholla	2	90
Rhus integrifolia	lemonadeberry	15	15

[1] Cactus species shall be planted in groups of 30 cactus of only one species in each group mainly along social trail areas to prevent future use of these unofficial trails.

2.5 SEEDING AND PLANTING SPECIFICATIONS

The following methods will be used to seed and plant during the restoration of native grassland and coastal sage scrub habitats within the Vicente Bluff Reserve Fishing Access Trail site. Seeds shall be collected during 2009 and 2010. Seeds collected in 2009 should be dried and stored in airtight containers in a cool, low humidity environment. Seeding and planting should be implemented in October 2010 to take advantage of the entire rain season.

2.5.1 Seeding

Seed shall be applied by hand with a bellyginder in the areas between container plants in all restoration areas where weeding has been implemented. Prior to seeding the soil will be lightly raked to provide a rough surface for the seed to find safe sites. Specified AM fungi will be spread by hand with a belly grinder over the seeding area prior to seeding. The seed will be mixed together as specified for the seed mix. The seed shall be broadcast and raked, where practical, into the ground to no more than a quarter of an inch to incorporate the seed into the soil to increase germination success.

2.5.2 Planting

Container plants will be planted in groups of mixed species throughout the restoration area. However, cactus species will be planted in groups of 30 with no other species planted within the group. Cactus planting will be located mainly up social trails to discourage further use of these unofficial trails. The layout for container plants will be determined along trails and in areas where weed removal was implemented based on micro topographic features and planting sites will be marked on the site using different colored pin flags under the supervision of the restoration ecologist or PVPLC biologist. Spacing of plants within the groups will follow the specifications presented in the tables for container plant palettes. Groups of container plants will be spaced in a natural looking mosaic along the trails.

All container plants are to be planted to the following specifications:

- Planting holes shall be made with the minimum disturbance to accommodate the containers.
- Prior to planting, the planting hole shall be filled with water, and allowed to drain.
- A fertilizer packet shall be added to each planting hole just prior to planting.
- Plants shall be set in the planting hole so that the crown of the root ball is approximately 0.25 inch above finish grade. Under no circumstance should the plant crown be buried.
- A watering basin shall be provided around each plant from 18 – 24 inches in diameter.
- Watering basins shall be filled with water after planting, at least twice.
- The drip irrigation system should be tested to ensure that all emitters are functioning.
- Plant basins shall be mulched with approximately 4 – 6 inches of approved wood mulch after planting and testing of the drip system.

2.6 IRRIGATION

The container plants will require at least one season of supplemental irrigation. It is recommended that irrigation be provided through a temporary, gravity system rather than using a polymer gel system. A temporary, above-ground gravity drip irrigation system is specified for the groups of container plants along the trails. The irrigation system will be used, as necessary to supplement the annual rainfall during the establishment period. The temporary irrigation system will be installed after soil preparation and after seeding and planting. The system will have to be managed by one or more personnel during each irrigation event to avoid erosion problems.

The temporary, above-ground gravity drip irrigation system will be used in the early fall and late spring seasons. The irrigation system will slightly lengthen the growing season to maximize the development of the habitat. Irrigation likely will be required for the first two growing seasons for establishment.

The point of connection (POC) and water used for irrigation will be provided by the closest source at the edge of the site from the connection to the City's landscaping. Alternatively, water could be provided to the site from a water truck for each irrigation event. The drip system must be composed of heavy enough gage material to withstand an assault by wildlife such as squirrels and human vandalism. Since the water source will only be turned on for the irrigation system when a maintenance personnel is onsite, there will be no accidental erosion events from a broken sprinkler line. The intent of the irrigation system is to deliver water only to the planted container species without irrigating either the target seeded species or, more importantly, the weedy species. The seeded species will germinate and establish based on natural rainfall.

The temporary irrigation system should have the following general characteristics:

- PVC mainline from the POC;
- ¾-inch PVC from the mainline to each container plant group;
- ¾-inch heavy gauge drip tube within each container plant group;
- Individual drip tube and emitters to each container plant within a group.

2.7 SITE MAINTENANCE

One of the goals for the restoration is to provide self-sustaining habitats. However, initially, maintenance of the restoration area will be necessary to establish the newly planted and seeded areas. Maintenance will include any activities required to establish the specified plants, in the estimation of the restoration specialist or PVPLC biologist. These activities include the following:

- Weed control, at a minimum for ice plant, acacia, fountain grass, pampas grass, Russian thistle, and annual grasses;
- Irrigation for the container plants;
- Replacement hand-seeding in areas of more than 200 square feet where target seed germination failed after one good season of rainfall;
- Replacement of container plants in areas with less than 80 percent survival in year two and if the seed mix has not provided adequate vegetation in the same area.

The establishment maintenance period is generally three years duration with the most intense maintenance in the first and second year, and only seasonal weeding activities in the third year. The amount of maintenance each year will depend on weather conditions and how well the site develops. The following specifications for maintenance may require adjustments as determined by the restoration specialist or PVPLC biologist over the three-year maintenance period.

2.7.1 Weed Control

During the active maintenance period, the target cover from exotic weed species will be generally 10 percent or less. Weeds will be controlled during late winter through early summer, as necessary, before they set seed and/or before they reach approximately 12 inches in height. Three weeding events should be estimated for a normal rainfall season, with more or less as dictated by rainfall. Weeds such as ice plant will be removed from the site. Since removal of weeded material is expensive, other weeded material other than ice plant may be left on site as organic mulch material if seeds have not yet set. Weed control will mainly employ hand pulling and mechanical methods as described in Section 3.2.1.

2.7.2 Irrigation of Container Plants

Temporary irrigation will only be used in the areas where groups of container plants are to be planted. Irrigation will be used in the first and possibly second season from planting to extend the rainy season and establish the shrubs, as necessary. The timing of irrigation events will depend on evapotranspiration between irrigation events and soil moisture. The following management scheme is anticipated as a guideline for water management of native trees and shrubs:

- Irrigate soil to full field capacity to the desired depth (approximately 18 inches after planting; and 18–24 inches during plant establishment).
- Allow soil to dry down to approximately 50-60 percent of field capacity in the top 6-12 inches before the next irrigation cycle. Depth of soil dry down between irrigation events will depend on development of container plants.

Wetting of the full root zone and drying of the soil between irrigation events is essential to the maintenance of the plants and the promotion of a deep root zone that will support the vegetation in the years after establishment. A soil probe or shovel should be used to examine soil moisture and rooting depth directly.

2.7.3 Seeding and Plant Replacement

Target values for relative cover of the native vegetation, including nurse and erosion control species, will be as follows with at least 20 percent cover in Year 1, 30 percent in Year 2, and 40 percent in Year 3. Actual cover values will depend mainly on weather conditions (seasonal rainfall and temperature) during the establishment period.

Areas of significant erosion shall be repaired and re-seeded in the first fall season after damage. Re-seeding will occur in areas if coverage is less than 20 percent of native species over any contiguous area of 200 square feet.
Survival of the container plants within the first growing season should be 80 percent. Plants shall be replaced if survivorship falls below 80 percent in the first season.

Replacements will be planted as previously specified and maintained for one growing season, as necessary. As sites develop, it is impractical to implement direct counts of all the container plants. Replacement planting after the first season shall only be specified if the visual estimate indicates substantial mortality and the function of these species has not been replaced by seeded material and natural recruitment.

2.7.4 Pest Management

Local wildlife such as pocket gophers and ground squirrels may be expected to browse on the plantings. If the restoration specialist or PVPLC biologist determines that the plantings are being jeopardized by wildlife, corrective measures such as organic, non-toxic deterrents and fencing/plant cages maybe used. Invertebrate pests are rarely a serious problem in perennial grassland or coastal sage scrub restoration.

2.7.5 Summary of Implementation, Maintenance, and Monitoring

Table 3 summarizes the timing and activities for the implementation, maintenance, and monitoring of the habitat restoration. The timing is described in general terms by season. Exact dates for each phase of implementation and maintenance will depend on the onset and duration of seasonal rainfall as well as other factors such as the temperatures prior to, during, and following rain events. However, it is important to plan for the site to be ready to seed by early fall. Rainfall and temperature will define the type and the density of weed species as well as native species that will germinate in any given year and season.

Horticultural monitoring will guide weeding and irrigation schedules for the project, and there should be a close coordination between the maintenance supervisor and the restoration ecologist if they are not the same person. Horticultural monitoring should take place daily during seeding, then weekly until seed germinates and plants establish, followed by monthly monitoring during the remainder of the first year. Quarterly monitoring should suffice after the first year through the third year.

Table 3
Summary of Implementation and Maintenance Schedule

Restoration Tasks	Year 1				Year 2				Year 3 - 5			
	F	W	S	S	F	W	S	S	F	W	S	S
Seed Collection		X	X	X	*	*	*	*				
Site Preparation: Weeding		X	X		X							
Final Site Preparation: Mowing & Weed Thatch Removal					X							
Initial Site Seeding and Planting					X							
Irrigation of Container Plants					X	*	X	*	X	*	*	*
Maintenance Weeding						X	X	X	*	X	X	*
Remedial Seeding									*			
Horticultural Monitoring		Qt	Qt	Qt	W	BW	M	Qt	Qt	M	M	
Performance Monitoring											X	

* = if necessary
Qt = once per quarter unless conditions require more oversight
W = weekly oversight
BW = bi-weekly (every other week) oversight
M = monthly oversight unless conditions require more oversight

SECTION 3 - RESTORATION REPORTING

The restoration site should be monitored annually after installation for three years. Photo-documentation at permanent points conducted with a qualitative description of the species developing over the site, the maintenance that was performed, and recommendations for future maintenance should be included in an annual letter report. Because of the general steepness of the site and linear nature of the trails, estimates of cover at each of the photo documentation points and general survival of planted species will adequately describe the development of the site.

Annual performance monitoring should take place each year in mid-spring or as close to mid-spring as each year's rainy season permits to capture the majority of annual as well as perennial species. Results from the annual performance monitoring will be used to evaluate the progress of each habitat toward the ultimate goals of the project.

SECTION 4 - REFERENCES

Bossard, C.C. et.al. 2000. *Invasive Plants of California's Wildlands.* University of California Press, Berkeley and Los Angeles, CA and London, England.

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