Appendix E Habitat Management Plan

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Habitat Management Plan for the Los Osos Wastewater Project, Los Osos, San Luis Obispo County, California

Prepared for:

County of San Luis Obispo

Prepared by:

SWCA Environmental Consultants

November 2011

HABITAT MANAGEMENT PLAN
FOR THE
LOS OSOS WASTEWATER PROJECT
CDP A-3-SLO-09-055/069

Prepared for:

County of San Luis Obispo
Department of Public Works
976 Osos Street, Room 207
San Luis Obispo, CA 93408
Contact: Kate Ballantyne

Prepared by:

SWCA Environmental Consultants
1422 Monterey Street, Suite C200
San Luis Obispo, CA 93401
Contact: Bob Sloan

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1. INTRODUCTION

This Habitat Management Plan (HMP) has been prepared for the Los Osos Wastewater Project (hereinafter "LOWWP") in the community of Los Osos, San Luis Obispo County, California (refer to Figures 1 and 2). The HMP is designed to meet the mitigation requirements set forth by Coastal Development Permit (CDP) Application Number A-3-SLO-09-055/069, in response to the presence of environmentally sensitive habitat areas (ESHA) within the project impact zones. The CDP required preparation of an HMP defining restoration, enhancement, management, and protection of the 80-acre Broderson site, 12-acre Mid-Town site, roughly 8-acre habitat/buffer area at the Giacomazzi site, and approximately 0.55 acre at three pump station sites, for a combined HMP area of about 100 acres at the six sites (refer to Figure 2 and Table 1).

1.1 PROJECT DESCRIPTION

The LOWWP includes construction and operation of a community sewer system, including a treatment plant, collection/disposal/reuse facilities, and all associated development and infrastructure. The proposed treatment plant is sited on approximately 25 acres located at 2198 Los Osos Valley Road, known locally as the Giacomazzi site. Proposed collection, disposal, and reuse infrastructure would be located throughout the community of Los Osos, with the primary effluent disposal leach field proposed for 8 acres at the top of Sea Horse Lane, known locally as the Broderson site. The project would treat wastewater to a tertiary level, and would reuse as much of the treated effluent as possible for urban and agricultural irrigation, with disposal prioritized to reduce seawater intrusion and otherwise improve the health and sustainability of the underlying Los Osos groundwater basin.

Construction of the LOWWP will result in an unavoidable impact to 8.55 acres of Terrestrial Habitat (TH) ESHA. This HMP provides comprehensive revegetation and maintenance strategies for each of the six restoration sites, including a baseline assessment of current conditions, plan goals, planting plans and invasive species control methods, success criteria, and monitoring methodologies and schedules. Implementation, maintenance, and monitoring of the HMP will be conducted by the County of San Luis Obispo (County).

1.1.1 Summary of Actions Proposed Under This HMP

This HMP addresses Special Condition 3 of the CDP and is designed to provide mitigation for impacts to approximately 8.55 acres of ESHA resulting from LOWWP implementation. These project impacts consist of permanent loss of coastal dune scrub/terrestrial habitat ESHA (8 acres at the Broderson leach field site and 0.38 acre at pump station locations). Special Condition 3 lists the following areas as subject to HMP implementation as mitigation for ESHA impacts.

> *Special Condition 3. Habitat Management Plan.*
>
> *PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of a Habitat Management Plan to the Executive Director for review and approval. The Habitat Management Plan shall provide for restoration and enhancement of the following areas to self-sustaining natural habitat states, and for management and protection of such areas as habitat areas in perpetuity:*
>
> *a. Broderson Site. The 80-acre Broderson site, of which up to 8 acres is allowed to be used for the project leach field provided this area too is subject to Plan requirements designed to ensure habitat value in this 8-acre area as much as possible while recognizing the underlying leach field infrastructure and its ongoing use and maintenance requirements.*

b. *Giacomazzi Site. The 8.3 acres of the Giacomazzi site that is located outside of the approved development envelope and that includes identified wetland and related resources and their buffer (see Exhibit 8).*

c. *Midtown Site. The 12.24-acre Midtown site (see Exhibit 2), of which a small area (approximately 0.10 acres, subject to special condition 1 requirements) is allowed to be used for the Midtown pump station and related development, provided this area, too, is subject to Plan requirements designed to ensure habitat value at the pump station location as much as possible while recognizing the underlying pump station infrastructure and its ongoing use and maintenance requirements.*

d. *Pump Station Sites. The roughly 0.15-acre Sunny Oaks site, the 0.4-acre Solano site, and the 0.3-acre East Ysabel site (see Exhibit 2), a total of almost one acre, of which a small area at each site (approximately 0.32 total acres, subject to special condition 1 requirements) is allowed to be used for pump station and related development, provided these areas, too, are subject to Plan requirements designed to ensure habitat value at the pump station locations as much as possible while recognizing the underlying pump station infrastructure and its ongoing use and maintenance requirements.*

Per the requirements of CDP Application Number A-3-SLO-09-055/069, implementation of the HMP will restore and enhance the areas shown in Table 1 below.

Table 1. LOWWP HMP Restoration and Enhancement Areas

Facility	Location	Size (acres)	Habitats Impacted	Restoration and Enhancement Area (acres)
Treatment Plant / Mitigation Site	Giacomazzi	25.5	Agricultural lands	8.3
Pump Station	Sunny Oaks	0.15	Oak Woodland, Ornamental plantings	0.05
Pump Station / Mitigation Site	Mid-town Site	12.2	Disturbed Coastal Dune Scrub	12.1
Leach Field / Mitigation Site	Broderson Site	80	Coastal Dune Scrub, Non-native grassland, Eucalyptus/Cypress windrow	80
Pump Station	Solano Drive	0.4	Ornamental plantings	0.23
Pump Station	Santa Ysabel Avenue	0.3	Ornamental plantings, Non-native grassland	0.19
Total Plan Revegetation Area (approximate)				**100.87**

Figure 1. Project Vicinity Map

1.2 RESPONSIBLE PARTIES AND FINANCIAL ASSURANCES

As the project applicant, the party responsible for implementing and maintaining the areas addressed in this HMP is:

County of San Luis Obispo
Department of Public Works
County Government Center, Room 207
San Luis Obispo, CA 93408

The County Department of Public Works has the financial and technical means to implement this HMP and any required contingency actions. The need to establish a performance bond for the actions outlined in this HMP or any subsequent contingency measure is not anticipated at this time. Per the requirements of Special Condition 3, the County shall ensure that the Broderson site will be acquired prior to construction and granted by June 10, 2012, to an appropriate agency or conservation organization approved by the Executive Director of the Coastal Commission, and that use of the Broderson, Giacomazzi, Midtown, and Pump Station sites each shall be restricted through recordation of a deed restriction or easement, prohibiting all non-resource-dependent development on each site, other than that associated with the approved project and consistent with the approved HMP.

2. BASELINE CONDITIONS

2.1 LOS OSOS AREA GENERAL CONDITIONS

The community of Los Osos occupies gently rolling hills composed of sandy soils on stabilized dunes. The climate is Mediterranean, with rainfall occurring during the winter months. Summers are dry, often with coastal fog. Annual average precipitation in the Los Osos area is 17.61 inches, with highest average rainfall in February and lowest rainfall in July (Morro Bay Fire Department 1971-2000). The mean average temperature is 56 degrees Fahrenheit (°F). Soils consist primarily of Baywood fine sands, ranging from 2 to over 15 percent slopes. The sandy soils and marine climate combine to produce a unique coastal ecosystem that is home to a wide array of plant and animal species. The dune, bluff, dune scrub, and chaparral communities that comprise this unique coastal ecosystem are all considered ESHAs under California Coastal Commission requirements.

2.2 SITE-SPECIFIC BASELINE CONDITIONS

Each of the six restoration sites addressed in the HMP have different baseline conditions, infrastructure requirements, and revegetation potential, and each site has specific issues that will affect plant species selection and implementation methods. Current baseline conditions for each of the six sites, described below, are based on evaluations performed by SWCA Environmental Consultants (SWCA) biologists, Bob Sloan and Travis Belt, in December 2010, April 2011, and October 2011. Site locations are shown on Figure 2, and habitat maps are included as Figures 3 through 8.

2.2.1 Giacomazzi

The Giacomazzi site consists of rolling cultivated agricultural upland areas, eroding uncultivated areas, annual grasslands, and a coastal wetland and tributary channel to the adjacent but off-site Warden Lake. Figure 3 displays the existing conditions on the site. Soils on the site are mapped as Concepcion loam, 2 to 5 and 5 to 9 percent slopes. Concepcion loam soils feature very slow permeability, moderate to high water capacity, and moderate erosion potential.

Figure 2. Project Location Map

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The cultivated portions of the site slope downward toward the northeast into a depressional wetland dominated by arroyo willow (*Salix lasiolepis*) and surrounded by coyote bush (*Baccharis pilularis*). This wetland area also contains several coast live oak trees (*Quercus agrifolia*), along with a variety of understory species, including saltgrass (*Distichlis spicata*), curly dock (*Rumex crispus*), prickly ox-tongue (*Picris echioides*), bermuda grass (*Cynodon dactylon*), Western ragweed (*Ambrosia psilostachya*), and English plantain (*Plantago lanceolata*). The wetland contains saturated soils and small, shallow ponded areas, but does not provide suitable habitat for aquatic or semi-aquatic wildlife species. Uncultivated annual grassland areas are present on both the east and west sides of the wetland area; the western grassland area is highly eroded.

Two eroded drainage channels traverse the cultivated areas and drain into the wetland area. While these drainages may once have been natural features, years of farming and disking have reduced them to erosional scars that rapidly convey runoff to the wetland area at the northeastern corner of the site. The upper portions of the drainage ditches are dominated by non-wetland invasive weeds and non-native annual grasses including wild radish (*Raphanus sativus*), corn spurry (*Spergula arvensis*), scarlet pimpernel (*Anagallis arvensis*), Italian rye-grass (*Lolium multiflorum*), wild oats (*Avena fatua*), ripgut brome (*Bromus diandrus*), and soft chess brome (*Bromus hordeaceus*). The upper, erosional portions of the two drainages were determined to be non- jurisdictional by the U.S. Army Corps of Engineers (USACE) and by the California Coastal Commission. The lower portions of the drainages contain riparian vegetation, and are considered jurisdictional by the above agencies, Regional Water Quality Control Board (RWQCB), and California Department of Fish and Game (CDFG).

2.2.2 Sunny Oaks

The Sunny Oaks site is located at the corner of Los Osos Valley Road and the entrance to the Sunny Oaks Mobile Home Park. Figure 4 displays the existing conditions on the site. Soils on the site are mapped as Baywood fine sand, 2 to 9 percent slopes. Baywood fine sand soils feature rapid permeability, low water capacity, and medium erosion potential. The site slopes to the north, away from Los Osos Valley Road, and contains a large Sunny Oaks Mobile Home Park sign. The site is bordered by several large coast live oak trees along the south and west sides, and a small, densely vegetated drainage channel is present south of the site. The northern and eastern edges of the site are dominated by fig-marigold (*Carpobrotus edulis*), and several ornamental shrubs (*Buddleja* sp.) are present in the middle portion. Remaining areas are regularly mowed and contain common annual weedy species, including Bermuda buttercup (*Oxalis pes-caprae*), and various annual grasses. The oak canopy provides dense shade over the south and western edges, and the adjacent riparian area contains a combination of native understory plants including coffeeberry (*Rhamnus californica*) and bracken fern (*Pteridium aquilinum*), mixed with an infestation of Cape ivy (*Delairea odorata*). Construction of the pump station will require pruning several oak trees and removal of the *Buddleja* and *Carpobrotus*. No impacts to the drainage channel are proposed.

2.2.3 Mid-town

The Mid-town site is located at the corner of Los Osos Valley Road and Palisades Avenue, and occupies approximately 12 acres. Figure 5 displays the existing conditions on the site. Soils on the site are mapped as Baywood fine sand, 2 to 9 percent slopes. Baywood fine sand soils feature rapid permeability, low water capacity, and medium erosion potential. This site is known to contain the federally protected Morro shoulderband snail (*Helminthoglypta walkeriana*).

Much of the site was graded and disturbed in 2005 by a previous project and is currently vacant. A large erosional channel meanders through the site from Los Osos Valley Road to the southwest, ending in a large shallow depressional area. Previously graded portions of the site (including a large area of fill soil stockpiled near the South Bay library) have developed a sparse cover of volunteer native coastal scrub

species, intermixed with veldt grass (*Ehrharta calycina*), other non-native species, and bare ground. Areas of the site that were not graded in 2005 contain relatively intact coastal dune scrub habitat.

Dominant species observed at the Mid-town site include coyote brush, mock heather (*Ericameria ericoides*), deerweed (*Lotus scoparius*), California sage, (*Artemisia californica*), coastal goldenbush (*Isocoma menziesii*), and herbaceous species such as California croton (*Croton californicus*), wild oat (*Avena* spp.), soft chess brome *(Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), annual ryegrass (*Lolium multiflorum*), cheeseweed *(Malva parviflora*), sow thistle (*Sonchus oleraceaus*), filaree (*Erodium cicutarium*), wild radish (*Raphanus sativus*), fennel (*Foeniculum vulgare*), summer mustard (*Hirschfeldia incana*), black mustard (*Brassica nigra*), and fig-marigold. Several volunteer arroyo willows are present in the depressional area.

2.2.4 Broderson

The Broderson site is located above Highland Drive, between Broderson and Doris Avenues. Figure 6 displays the existing conditions on the site. Soils are mapped as Baywood fine sand, 2 to 9 and 9 to 15 percent slopes. Baywood fine sand soils feature rapid permeability, low water capacity, and medium erosion potential. This site is known to contain the federally protected Morro shoulderband snail.

The Broderson site consists of an 80-acre, southerly sloping rectangle overlooking Los Osos. The site contains disturbed coastal scrub and non-native grasses in its lower portion and a dense cover of maritime chaparral in higher elevation areas. The site contains numerous trails and is used for recreational purposes, including hiking and horseback riding. The maritime chaparral habitat on the Broderson property supports the federally threatened Morro manzanita (*Arctostaphylos morroensis*), along with an array of common species, including buckbrush (*Ceanothus cuneatus*), Blochman's leafy daisy (*Erigeron foliosus* var. *blochmaniae*), San Luis Obispo wallflower (*Erysium suffrutescens* var. *lompocense*), sand almond (*Prunus fasciculata* var. *punctata*), coast live oak, monkeyflower, coast buckwheat, coyote brush, mock heather, and California sage.

The coastal scrub habitat present in the lower portion of the site and proposed leach field area has been heavily invaded by veldt grass and exhibits limited species diversity. This area includes several large stands of blue gum eucalyptus (*Eucalyptus globulus*) and scattered coast live oak trees and Monterey cypress (*Cupressus macrocarpus*). The large eucalyptus and cypress trees provide potential nesting habitat for a variety of bird and raptor species, but the eucalyptus leaf litter is also detrimental to establishment and survival of coastal scrub habitat.

2.2.5 Solano

The Solano Pump Station site is located at the corner of Solano Street and Butte Drive, immediately adjacent to the Sea Pines Golf Course. Figure 7 displays the existing habitat conditions on the site. Soils are mapped as Baywood fine sand, 2 to 9 percent slopes. Baywood fine sand soils feature rapid permeability, low water capacity, and medium erosion potential. The pump station site is located within a chain link fence and consists of flat, disturbed areas adjacent to golf course cart paths and equipment sheds. The site is bordered to the north by non-native annual grassland and coastal scrub, and the Pecho Marsh wetland area, which contains a dense canopy of arroyo willow trees with an understory of field sedge (*Carex praegracilis*).

The area proposed for disturbance does not contain any natural habitat and is dominated by annual grasses and weeds. Adjacent ornamental street plantings along Solano Drive consist of the southern California native plant lemonadeberry (*Rhus integrifolia*), with several occurrences of the highly invasive giant reed (*Arundo donax*) also present in the planting strip.

2.2.6 East Ysabel

The East Ysabel site is located at the southwest corner of Santa Ysabel Avenue and South Bay Boulevard. Figure 8 displays the existing conditions on the site. Soils on the site are mapped as Baywood fine sand, 2 to 9 percent slopes. Baywood fine sand soils feature rapid permeability, low water capacity, and medium erosion potential. The site is bordered to the west by residences and to the south by a fenced stormwater detention basin.

The site consists of a depressional area with steep road banks on the northern and eastern sides. Several storm drains and street gutter drains empty into the site, and a faint swale is present in the middle portion. The site appears to have been disturbed by construction and maintenance of the adjacent stormwater detention basin. Vegetation consists primarily of annual grassland and fig-marigold, and a variety of ornamental trees along the western portion of the site. Several clumps of coyote brush present constitute the only native habitat features on the site.

3. GOALS OF THE HABITAT MANAGEMENT PLAN

The primary goal of this HMP is to mitigate for impacts to sensitive habitats by restoring and enhancing native habitat areas, resulting in creation of self-sustaining and diverse native plant communities requiring minimal maintenance inputs. Implementation will replace native habitats removed by project activities, create or enhance native plant communities in suitable project areas, and cause a net gain in native habitat area and quality. This goal will be accomplished through removal of non-native plant species, planting native vegetation suited to the specific conditions of the six sites, and maintaining those sites in perpetuity.

Implementation of the LOWWP HMP will:

- restore, enhance, and protect natural habitat areas;
- increase the abundance and diversity of native plant species and promote the movement of wildlife;
- create and enhance habitat for sensitive species;
- remove non-native and invasive plant species;
- provide screening for project facilities;
- provide recreational and educational benefits for the community; and,
- ensure ongoing stewardship and maintenance of the restored/enhanced sites.

Figure 3. Giacomazzi Habitat Map

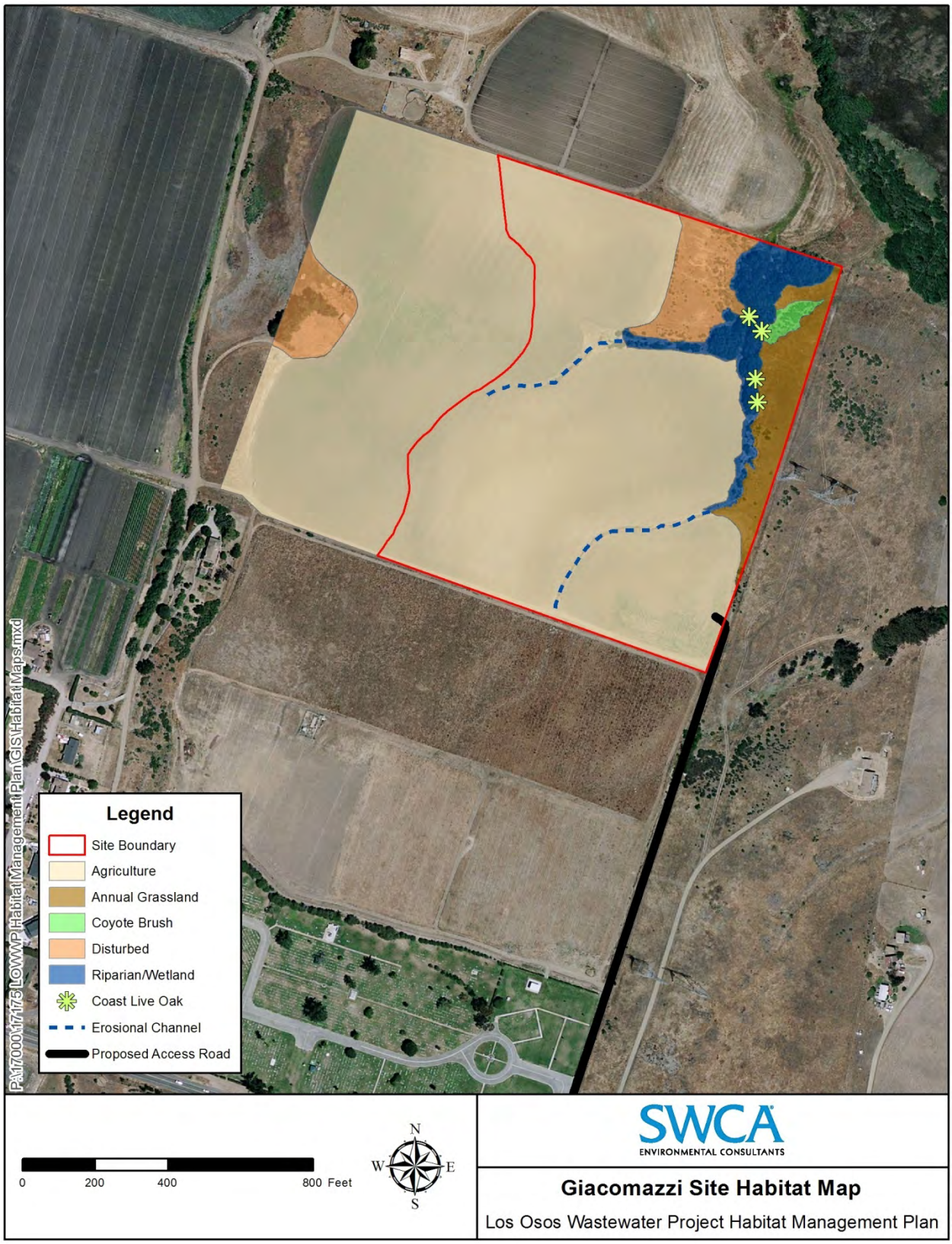

Figure 4. Sunny Oaks Habitat Map

Figure 5. Mid-town Habitat Map

Figure 6. Broderson Habitat Map

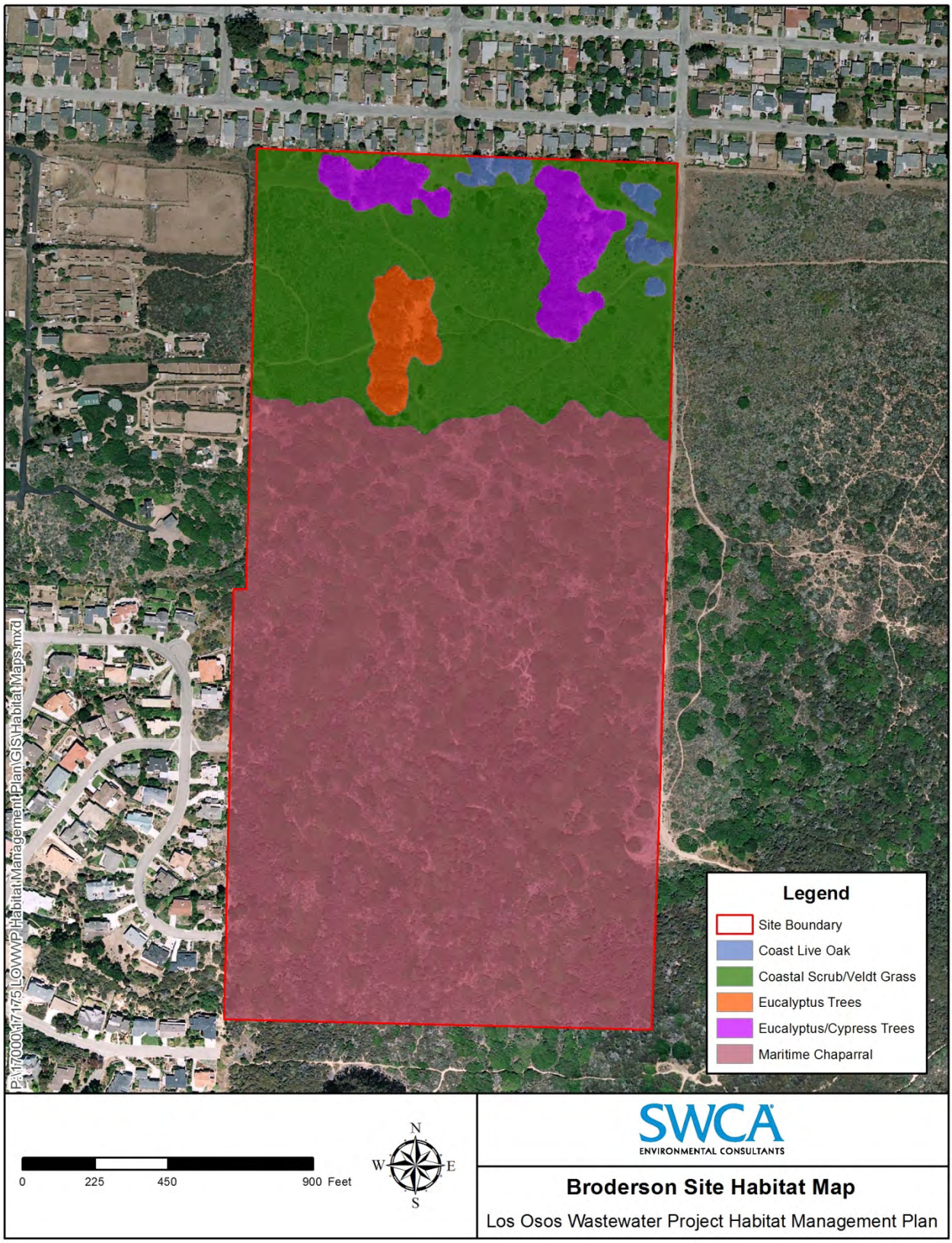

Figure 7. Solano Habitat Map

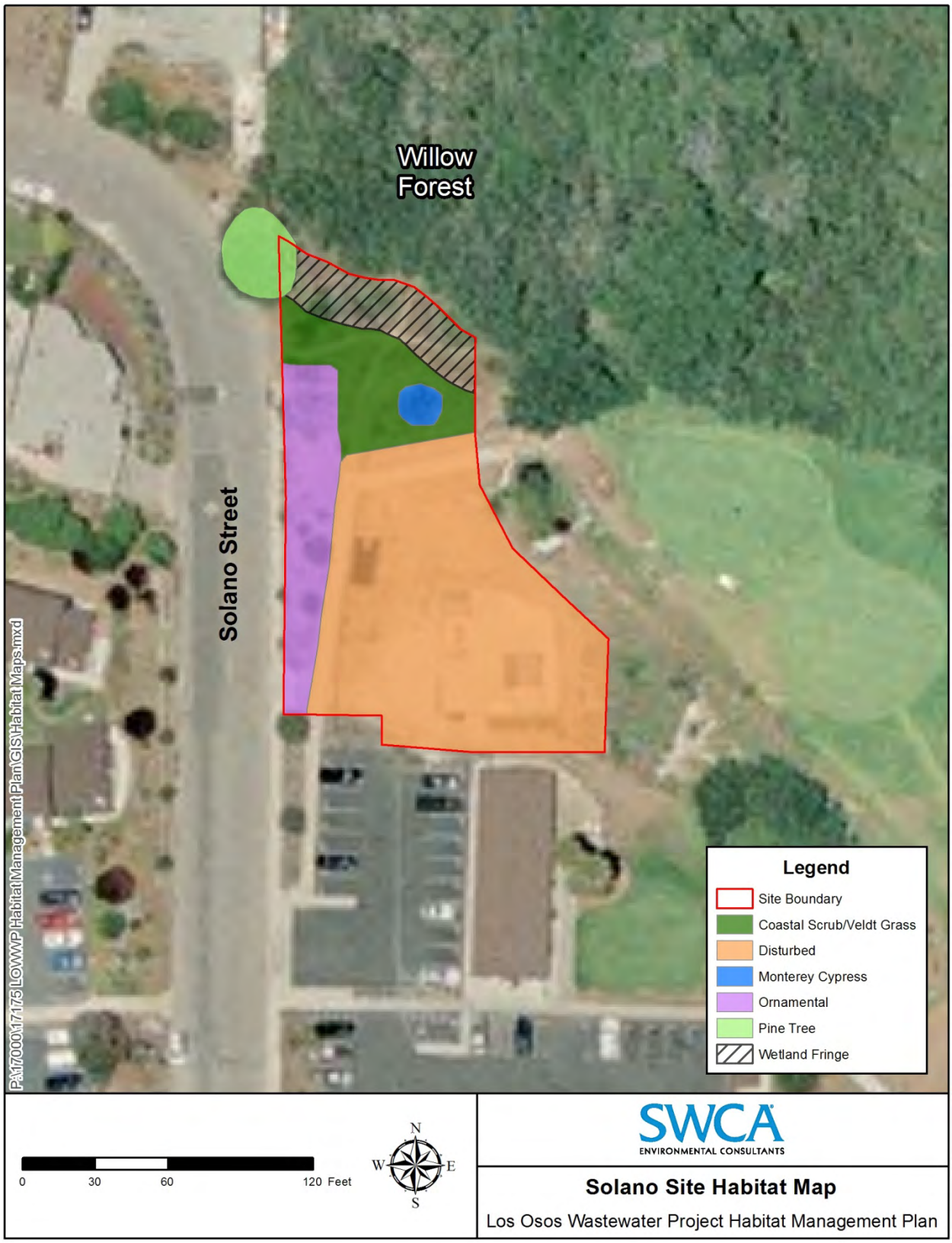

Figure 8. East Ysabel Habitat Map

4. PLANTING MATERIALS AND METHODS

Implementation of the restoration and enhancement activities will be overseen by a County-approved biologist or restoration specialist (Project Biologist). The Project Biologist will utilize this HMP, the attached site-specific Landscape Plan sheets and Specifications (refer to Appendix A), and County-prepared grading plans to direct implementation at each of the six sites. The Project Biologist will oversee site preparation, exotic species removal, irrigation system installation, plant installation, and maintenance activities, and will ensure conformity with this HMP. Seed mix composition and amounts, plant numbers, and plant spacing will follow the landscape plan sheet specifications, unless the Project Biologist determines a need for minor changes based on final site contours, seed or plant availability, or other factors. Restoration planting and irrigation installation shall be performed in accordance with the landscape plan sheets and the methods described in this section.

4.1 GENERAL SITE PREPARATION

The restoration planting sites shall be prepared and protected using the methods described below, as described in the Specifications provided in Appendix A and in the Stormwater Pollution Prevention Plan (SWPPP) prepared for the project.

4.1.1.1 Surface Preparation

Surface preparation is necessary on graded or disturbed areas to provide a rough and uneven soil surface that will provide a rough seedbed for establishing vegetative cover. These preparatory actions should be completed immediately prior to seeding and planting efforts. Surface preparation details are described below.

- All final grade areas should have soil surfaces lightly roughened and loosened to a depth of 1-2 inches (tilling or raking), or by leaving slopes in a roughened condition after grading with tracked equipment prior to planting.

4.1.1.2 Noxious Weed Species

Restoration sites containing noxious weed species shall undergo a grow-and-kill cycle following grading, or disturbance will be implemented where needed to remove weed seed banks in the soil prior to planting. The primary noxious weed that will require chemical treatment during grow-and-kill efforts is *Ehrharta calycina*. Removal of this species will rely on the use of grass specific herbicides, such as Arrow 2EC, Fusilade (Fluazifop-p) or similar, to protect native broad-leaved species. A list of expected weed species and best management practices is included in Appendix D. Grow-and-kill cycle details are described below.

- Following final grading, areas to be planted that are known to contain significant weed seed content (including Broderson, Giacomazzi, and East Ysabel) shall be watered repeatedly to stimulate germination of existing weed seeds. Sprouted weeds should be disked, sprayed with herbicide, or removed by hand to conclude at least one grow-and-kill cycle prior to planting or seeding activities.

- All herbicide applications will be performed by an individual in possession of a Qualified Applicators License and with experience managing exotic species. Although the Qualified Applicator will determine the appropriate timing for the herbicide applications, it is estimated that at least two applications per year will be necessary to effectively reduce the exotic grass population and soil seed bank prior to planting efforts.

4.1.1.3 Erosion Control

An effective combination of erosion and sedimentation control measures shall be installed by the Contractor prior to start of grading at each site, and maintenance of those measures should be conducted on a daily basis during construction to prevent sedimentation of on-site and adjacent habitats. Suitable erosion and sedimentation control measures should be maintained on-site until plant cover is sufficiently dense to protect the soil from erosion. Measures should include use of straw wattles, silt fence, jute netting, mulch, sand or gravel bags, inlet protection, and temporary detention basins as needed to control sedimentation and erosion on the site, as specified in Appendix A, Sheet 9, and the project SWPPP. All materials used shall be biodegradable; measures incorporating plastic mesh will not be allowed.

4.1.1.4 Irrigation Systems

Irrigation shall be used to ensure container plant survival during installation and establishment of restoration plantings. Irrigation for container plants shall be applied by installation of drip irrigation systems, as specified in Appendix A, prior to or immediately following plant installation. Oak acorn plantings will be watered by hand or by drip irrigation as convenient. Because these native plants must eventually survive in the absence of supplemental irrigation, deep roots are needed to tap into perennial soil moisture. Watering methods and schedules should approximate typical rainfall patterns, with sufficient watering duration to provide wetting of the entire root zone. Water shall be supplied as needed during winter months to supplement rainfall amounts received. Summer watering during establishment shall be at infrequent intervals, but shall address plant needs resulting from sandy soil conditions.

4.2 PLANTING MATERIALS AND PRACTICES

Planting efforts under this HMP will consist of installing container plants in specific areas and several methods of seeding. Container plant installation is best performed in winter months when soil moisture is present within the rooting zone, but can occur at any time of year following installation of an irrigation system that will adequately water planted materials. Planting and seeding shall occur as described in the following sections and in the Landscape Plans and Specifications provided in Appendix A.

4.2.1 Container Stock Condition and Methods

Container stock quality and size shall conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Only contract grown stock shall be used. Plants shall be the species and sizes shown on the plan. No ornamental varieties or cultivars shall be used. No species substitutions will be used without the written approval of the Project Biologist. Container stock shall be: symmetrical; typical for species; sound; healthy; vigorous; free from insect pests or eggs; shall have healthy, normal root systems; and well filling their containers but not to the point of being root bound. Plants shall not be pruned prior to installation. Container plants are listed in the text for each planting area, and a complete list is included in Appendix B.

The Contractor shall excavate planting holes at least 24 inches in diameter. Only native soil backfill shall be used. Do not fertilize. Crowns must be set slightly above the surrounding grade. Space plants as directed by the plans or by the Project Biologist. Completely fill the plant basin with water before mulching and allow percolating. Fill again with water, percolate, and apply weed barrier fabric, pre-emergent herbicide, or mulch over the disturbed soil area. Irrigate again in two weeks, or as needed, due to sandy soils. Following plant establishment, provide deep watering at wide intervals to encourage deep rooting, e.g., 30 to 60 days. Do not overwater.

4.2.2 Seed Collection

Seed collected for use in HMP areas shall be obtained from local natural habitats to preserve the genetic makeup of existing plant populations. The "local" seed collection area for this project consists of all areas within 20 miles of the coast, between Point Conception to the south and Piedras Blancas to the north. To preserve the viability of native plant communities used for collection, no more than 10 percent of available seed per plant will be harvested. Collection activities in areas proposed for disturbance (i.e., Broderson leach field, Mid-town) will harvest all available seed. Collection in areas known to contain the Morro shoulderband snail will be conducted under dry conditions and will avoid trampling vegetation that could contain individuals of the species.

4.2.3 Seeding Methods

Seeding with native species will occur over large areas of the HMP and will require use of several methods due to soil types, site conditions, and specific project needs. Seeding methods to be used during implementation of this HMP are discussed below and in the Landscape Plans and Specifications provided in Appendix A. Seed mixes are listed in the text for each planting area, and a complete list is included in Appendix B.

4.2.3.1 Seed Drill

Seed drilling will be used at the Giacomazzi site to install native grass and shrub seed over the agriculturally disturbed portion of the restoration area. Seed drilling shall occur prior to planting of oak acorns on site. Supplemental irrigation will not be supplied to seeded areas. Drill seed will be applied to the designated area as follows:

1. Drill seed in rows at a maximum distance of 8 inches apart.
2. Drill seed depth setting will be 1 inch.
3. A minimum of three passes in different directions with seeding equipment will be performed to distribute the seed and reduce uniform row appearance.

4.2.3.2 Oak Acorn Planting

Coast live oak acorns will be planted at Giacomazzi in seed drill areas, riparian repair areas, and along the eastern property line. A total of seven approximately 500-square foot oak planting areas will be planted, as specified in Appendix A, Landscape Sheet 1. Each area will contain five separate acorn planting locations, spaced approximately 100 feet apart.

Acorns will be collected from coast live oak trees growing in the Los Osos area. Suitable collection areas include the Sunny Oaks pump station, Broderson site, and Los Osos Oaks State Reserve. Collection shall occur in the fall, and acorns should be taken from trees rather than the ground where possible. The collected acorns shall be processed immediately after collection. Processing will include cleaning, removing the caps, and checking for viability. The viability check requires dropping the acorns into a bucket of water; acorns that float are probably damaged and acorns that sink are most likely viable.

Immediately following processing, a minimum of 250 collected acorns will be placed in a sealed plastic bag and cold stratified for at least one month in a refrigerator. The refrigerator should be kept between 35 and 41°F. Immediately prior to planting, another viability check shall be conducted, and any acorns that float shall be discarded.

The acorn planting effort will occur immediately following completion of seed drilling. Place a wire mesh in-soil basket and surface exclosure in each planting location, per Detail 42, Sheet 8 (refer to Appendix A), with diameter and depth of basket to be 24 inches. Soil at each oak planting location shall

be loosened to a depth of 4 inches over a 24-inch diameter circle, and three to five acorns shall be placed on their sides at a depth of 2-3 inches and covered with soil. A 1-inch cover of mulch shall be placed over each planting location, and each area shall be watered thoroughly.

Supplemental water will be supplied on an as needed basis via a drip irrigation system or by hand watering for three years following planting. All supplemental watering will be performed in a manner that ensures deep penetration of water to the soil around established oak trees.

4.2.3.3 Hydroseeding

Hydroseed application will be used to stabilize drainage layback areas, and steep slopes under jute netting (refer to Landscape Plans and Specifications in Appendix A). Hydroseed applications must adhere to the following specifications.

- The Project Biologist must be present to inspect the seed tags and amounts of materials being mixed and applied, and shall reject any materials or work not conforming to the specifications. Mixing time of materials shall not exceed 45 minutes from the time the seed contacts the water until the entire batch is discharged onto the earth.

- Repair Slopes: Prepare Batch 1 of slurry using wood fiber mulch at 1,000 pounds per acre with seed and water in proportions specified on the plans or herein. Apply this mix to areas designated on plans. Prepare Batch 2 of slurry using wood fiber mulch at 1,000 pounds per acre and tackifier at 80 pounds per acre with no seed and water in proportions specified on the plans or herein. Apply this mix over Batch 1 mix.

- Under Jute Mesh: Prepare slurry using wood fiber mulch at 2,000 pounds per acre and tackifier at 80 pounds per acre with seed and water in proportions specified on the plans or herein.

- All other areas identified on plans: Prepare slurry using wood fiber mulch at 2,000 pounds per acre with seed and water in proportions specified on the plans or herein.

4.2.3.4 Broadcast Seeding

Broadcast seeding methods will be used to spread coastal scrub seed mix at the Broderson, Mid-town, and East Ysabel sites. Broadcast seed application will occur in all graded or disturbed areas, areas where exotic species have been removed, and around container plant installation areas. Following application, the seed should be lightly raked into the soil surface or otherwise covered to minimize losses by predation.

4.3 DO NOT PLANT LIST

No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Exotic Pest Plant Council, or by the State of California shall be employed or allowed to naturalize or persist on the sites. No plant species listed as a 'noxious weed' by the State of California or the U.S. Federal Government shall be utilized or maintained within the restoration sites. The following list contains invasive ornamental species that have potential to escape into and disrupt native habitats in the Los Osos area. These species should not be utilized in landscaped areas of the project, and should not be a component of any seed mix utilized for the project.

Carpobrotus edulis	Fig-marigold
Cortaderia selloana	Pampas grass or jubata grass
Cotoneaster mycrophyllus	Cotoneaster
Cotula coronopifolia	Brass buttons

Cytisus scoparius	Scotch broom
Cytisus striatus	Portuguese broom
Eichhornia crassipes	Water hyacinth
Genista monspessulana	French broom
Hedera canariensis	Algerian ivy
Hedera helix	English ivy
Iris pseudacorus	Yellow water iris
Myoporum laetum	Myoporum
Nassella tenuissima	Mexican feather grass
Olea europaea	Olive
Pennisetum setaceum	Green fountain grass
Robinia pseudoacacia	Black locust
Rubus discolor	Himalayan blackberry
Schinus molle	Peruvian pepper tree
Schinus terebinthifolius	Brazilian pepper
Senecio mikanioides (=Delairea odorata)	Cape ivy, German ivy
Spartium junceum	Spanish broom
Vinca major	Periwinkle

5. SITE-SPECIFIC RESTORATION PLANS

The LOWWP HMP contains separate plans, methods, and materials for each of the six restoration sites. Detailed specifications and landscape plans for each site are included in Appendix A. Habitat restoration and enhancement will occur in the designated planting areas as shown on the site-specific plan sheets.

Plant materials used in the restoration areas will be obtained through seed collection and propagation of local materials. Seed collection efforts may be augmented by native seed mixes purchased from local providers if necessary to meet project goals. Once established, planted natives will be expected to compete successfully against non-native species with minimal maintenance input.

Mitigation will be achieved through removal of non-native plant species, planting of native vegetation suited to specific site conditions, maintenance of hydrologic functions, installation of fencing and educational signage to limit disturbance where appropriate, and scheduled maintenance practices. The restoration area boundaries will be fenced where appropriate, and may include exhibit sensitive habitat signs placed in suitable locations. Sign text shall notify the public that the fenced areas contain sensitive habitats, and that activities or entrance into the fenced area is prohibited except on existing pathways.

The six restoration area locations are shown in Figure 2, and are discussed in detail below. Landscape plans and schematics are included in Appendix A.

5.1 GIACOMAZZI

Restoration of the Giacomazzi site will consist of planting native grasses, shrubs, and coast live oak acorns on upland areas; layback, stabilization, and planting of eroded drainage channels; and removal of non-native plants from riparian and wetland areas. Due to the presence of wild pigs in the area, temporary fencing may be required to protect restoration plantings.

5.1.1 Upland Areas

Upland areas at Giacomazzi consist of agriculturally disturbed areas, a severely eroded east-facing slope, and a narrow northerly sloping area along the eastern property line. Upland areas will be seeded using a seed drill. The intent will be to create a mixed grassland/coastal scrub/oak savanna community of vigorous colonizer species on the disturbed site, and provide the basis for future successional community development. Following seeding with the mix below, a total of seven approximately 500-square foot oak planting zones containing five separate acorn planting locations will be established to add habitat diversity to the site. Seeding will occur over an approximately 5.75-acre area. The upland seed mix (Seed Mix 1) for this area contains the following native grass and forbs. Seed specifications are listed in Appendix A on Sheet 1.

Seed Mix 1 (Coastal Scrub/Grasses)	
Artemisia californica	California sage
Baccharis pilularis	Coyote brush
Bromus carinatus	California brome
Leymus condensatus	Giant rye
Lotus scoparius	Deerweed
Mimulus aurantiacus	Bush monkey flower
Nassella pulchra	Purple needlegrass
Salvia mellifera	Black sage

5.1.2 Drainage Channel Repair and Setback Areas

Portions of the two drainage channels above the willow wetland area contain steep, severely eroded banks, trash dumps, and non-native plants. Implementation of this portion of the HMP will stabilize disturbed bank areas, restore native vegetation in disturbed bank areas, and remove exotic species from channel and setback areas. Work in the two channels may also require construction of minor grade control structures to reduce potential for headcutting erosion to occur.

Steep, eroded banks will be scraped back to a stable configuration, jute netting will be installed to assist bank stabilization, and all repaired areas will be hydroseeded with Seed Mix 2. Remnant areas of coastal scrub present in this area will be avoided where possible during the repair effort. Container plants will be planted along the repaired banks, and a temporary drip irrigation system will be installed to provide water during establishment. The total repair area covers approximately 2 acres. The container and seed mix plant palette for the drainage repair areas consists of the native grass and forb species listed below. Plant counts, location, spacing details, and seed specifications are listed in Appendix A on Sheet 1, and bank layback and grade control structure details are presented on Sheet 9.

Container Plant List	
Artemisia californica	California sage
Artemisia douglasiana	Mugwort
Baccharis pilularis	Coyote brush
Rubus ursinus	California blackberry
Salvia mellifera	Black sage

Seed Mix 2 (Coastal Scrub/Drainage)

Artemisia californica	California sage
Artemisia douglasiana	Mugwort
Baccharis pilularis	Coyote brush
Distichlis spicata	Saltgrass
Leymus condensatus	Giant rye
Leymus triticoides	Beardless wildrye
Lotus scoparius	Deerweed
Mimulus aurantiacus	Bush monkey flower
Salvia mellifera	Black sage

5.2 SUNNY OAKS

Restoration plantings on the Sunny Oaks site will consist of removal of non-native species, and installing screen plantings to limit visibility of the Pump Station from Los Osos Valley Road. Planting will occur on road banks and open areas in the middle of the site and immediately adjacent to pump station structures. All planting will consist of container plants, watered by drip irrigation. No seeding will occur, and bare ground areas around plantings will be covered with mulch. The screen plantings will consist of the species listed below. Plant counts, location, spacing, and irrigation details are provided on Sheets 4 and 5 in Appendix A.

Container Plant List

Baccharis pilularis	Coyote brush
Mimulus aurantiacus	Bush monkey flower
Myrica californica	Pacific wax-leaf myrtle
Prunus ilicifolia	Hollyleaf cherry
Rhamnus californica	Coffeeberry
Rosa californica	California rose

5.3 MID-TOWN

Restoration of the Mid-town site will consist of removing non-native plant species, planting and seeding restored areas with native coastal scrub species, and stabilizing the proposed swale. This site is known to contain the federally protected Morro shoulderband snail, and all restoration work must meet the requirements of the U.S. Fish and Wildlife Service (USFWS) Biological Opinion for the project. Restoration efforts at the Mid-town site will occur in several phases as project construction and staging area uses allow.

5.3.1 Coastal Scrub Restoration

Coastal scrub habitat present on the site ranges from highly degraded to relatively pristine. Following removal of stockpiled soil, repair of the large erosional feature, and grading for basin and swale construction, large portions of the site are expected to have little vegetative cover remaining. Restoration will focus on removal of remaining non-native species and seeding disturbed areas (including around the Pump Station) with a native seed mix. The post-construction site to be restored will consist of undisturbed areas with existing good condition coastal scrub, disturbed upland areas, and an approximately 2-acre percolation basin that will receive stormwater runoff from the surrounding developed areas. This basin is not expected to pond water, but will be seasonally wetter than surrounding higher elevation areas. Therefore, two seed mixes have been designed to meet the two hydrologic

regimes expected on the site. The two seed mixes for Mid-town coastal scrub areas consists of the native grass and forb species listed below. Required seed amounts are listed on Sheet 3 in Appendix A.

Seed Mix 4 (Upland Areas)

Achillea millefolium	Yarrow
Artemisia californica	California sage
Baccharis pilularis	Coyote brush
Ericameria ericoides	Mock heather
Eriogonum parvifolium	Sea-cliff buckwheat
Eriophylum staechadifolium	Coastal golden yarrow
Lotus scoparius	Deerweed
Lupinus chamissonis	Dune bush lupine
Salvia mellifera	Black sage

Seed Mix 5 (Percolation Basin)

Artemisia douglasiana	Mugwort
Baccharis pilularis	Coyote brush
Eriophylum staechadifolium	Coastal golden yarrow
Isocoma menziesii	Coast goldenbush
Lotus scoparius	Deerweed

5.3.2 Swale Plantings

The new swale will convey storm runoff to the percolation basin, and will need to contain stable, deep rooted plants to prevent erosion during storm events. This area will be planted with both containers and a specific seed mix. Container plantings will consist of deep-rooted, mat-forming species intended to create a stable channel feature, and shrubs to stabilize upper bank areas. The seed mix will complement the container plants and provide additional cover and protection for the channel. The container and seed mix plant palette for the swale area consists of the native grass and forb species listed below. Plant counts, location, spacing details, and seed specifications are listed on Sheet 3 in Appendix A.

Container Plant List

Artemisia douglasiana	Mugwort
Carex praegracilis	Field sedge
Prunus fasciculata punctata	Sand almond
Rosa californica	California rose
Rhamnus californicus	Coffeeberry

Seed Mix 5 (Swale)

Artemisia douglasiana	Mugwort
Baccharis pilularis	Coyote brush
Eriophylum staechadifolium	Coastal golden yarrow
Isocoma menziesii	Coast goldenbush
Lotus scoparius	Deerweed

5.3.3 Pump Station Plantings

The Mid-town Pump Station will be visible from Los Osos Valley Road, but will consist of an unfenced concrete pad with several low equipment access structures. No buildings or fences will be installed, and formal screen plantings are inappropriate. Areas immediately surrounding the Pump Station will be seeded with Seed Mix 4. Seed specifications are listed on Sheet 3 in Appendix A.

5.4 BRODERSON

Restoration of the Broderson site will consist of removing eucalyptus and cypress trees within and upslope of the leach field, planting and seeding the leach field area with native coastal scrub species, eliminating veldt grass from infested areas, re-establishing dominant coastal scrub habitat in infested areas, and hand removal of weeds in maritime chaparral habitat areas. This site is known to contain the federally protected Morro shoulderband snail, and all restoration work must meet the requirements of the USFWS Biological Opinion for the project. Construction of the leach field and temporary fencing to protect plantings will block several existing trails in the area; connector trails will be established to link active pathways during construction and revegetation.

The eucalyptus and cypress trees present within the leach field area will be removed to make room for leach field installation. Although out of the leach field site, eucalyptus trees immediately adjacent to and upslope of the site are negatively impacting coastal scrub habitat, and are spreading into adjacent maritime chaparral habitats. These trees should also be removed to improve success of coastal scrub restoration efforts, halt the current invasion of maritime chaparral, and reduce the potential for root intrusion and associated maintenance actions at the leach field. All trees removed shall be chipped and piled on-site or at Mid-town for use during planting efforts at all restoration sites that require installation of mulch as part of the planting process. Grow-and-kill activities at this site shall use only grass-specific herbicides: broadleaf herbicides shall not be used during grow-and-kill cycles without the approval of the Project Biologist.

5.4.1 Leach Field Coastal Scrub Restoration

Following grading and installation of the leach field, the leach field area will be planted and seeded with a mix of vigorous, early colonizer species intended to quickly occupy the bare area. This area will be planted with both containers and a specific seed mix. Container plants will be watered by drip irrigation. This area contains and is adjacent to various non-native grass species, including veldt grass, and will require use of grass-specific herbicide to keep weed growth under control during establishment. The seed mix for this site does not contain any grass species due to the need for ongoing control of invasive grass species. Plant counts, location, spacing details, and seed specifications are listed on Sheet 2 in Appendix A.

Container Plant List	
Artemisia californica	California sage
Baccharis pilularis	Coyote brush
Ceanothus cuneatus var. cuneatus	Buckbrush
Lupinus chamissonis	Dune bush lupine
Salvia mellifera	Black sage

Seed Mix 3 (No grass species)

Achillea millefolium	Yarrow
Artemisia californica	California sage
Baccharis pilularis	Coyote brush
Ericameria ericoides	Mock heather
Eriogonum parvifolium	Sea-cliff buckwheat
Eriophylum staechadifolium	Coastal golden yarrow
Helianthemum scoparium	Rushrose
Isocoma menziesii	Coast goldenbush
Lotus scoparius	Deerweed
Lupinus chamissonis	Dune bush lupine
Mimulus aurantiacus	Bush monkey flower
Salvia mellifera	Black sage

5.4.2 Veldt Removal/Coastal Scrub Restoration

The northern portion of the site below the leach field area contains remnant occurrences of coastal scrub species, but is dominated by veldt grass. Removal of veldt grass is necessary to re-establish dominant coastal scrub vegetation on the site. Veldt grass removal will be accomplished through repeated applications of grass-specific herbicide, timed to have maximum effect on mature plants and newly sprouted seedlings. The removal process is expected to take several years of diligent application to expose the soil and reduce the seed bank to a point where seeding of native species can occur. No container plants or irrigation will be installed in this area. Seed Mix 3, as listed above, will be used in this area. Seed specifications are provided on Sheet 2 in Appendix A.

5.4.3 Maritime Chaparral Restoration

The southern, higher elevation areas of the site are densely vegetated with maritime chaparral habitat, but veldt grass and other non-native species are present in some areas. The restoration effort will consist of manual removal of exotic species throughout the area. If determined to be necessary by the Project Biologist, grass-specific herbicide can be used in limited areas for control of severe veldt grass infestations. Large areas disturbed by hand or chemical weed removal will be broadcast seeded with Seed Mix 3. No container planting or irrigation will occur in this area. Seed specifications are provided on Sheet 2 in Appendix A.

5.5 SOLANO

Restoration of the Solano site will consist of removal of non-native species, seeding and planting to restore native habitats, and plantings to screen the facility. Planting will occur in natural areas located in the northern portion of the site, along the sidewalk, and within the existing fenced area disturbed by golf course activities. Restoration in natural areas will consist of planting scattered Pacific wax-leaf myrtle trees irrigated by drip lines, and seeding with Seed Mix 3 following removal of veldt grass. No planting or seeding will occur in natural areas dominated by field sedge: the only treatment in these areas will be weed removal conducted by hand.

Planting within the disturbed portions of the pump station site will occur in narrow beds between sidewalk and golf course cart paths, and will consist of container plants irrigated by drip lines. Bare ground areas around plantings along the sidewalk and inside the fence will be covered with mulch. The screen plantings will consist of the species listed below. Plant counts, location, spacing, and irrigation details are provided on Sheets 4 and 5 in Appendix A.

Container Plant List

Mimulus aurantiacus	Bush monkey flower
Myrica californica	Pacific wax-leaf myrtle
Prunus ilicifolia	Hollyleaf cherry
Rhamnus californica	Coffeeberry
Rosa californica	California rose

The Solano site contains non-native grass species, including veldt grass, and may require use of grass-specific herbicide to keep weed growth under control during establishment. If herbicides are used, care must be taken to avoid spraying the naturally occurring field sedge present along the northern edge of the restoration area. Required seed amounts are provided on Sheet 4 in Appendix A.

Seed Mix 3 (No grass species)

Achillea millefolium	Yarrow
Artemisia californica	California sage
Baccharis pilularis	Coyote brush
Ericameria ericoides	Mock heather
Eriogonum parvifolium	Sea-cliff buckwheat
Eriophylum staechadifolium	Coastal golden yarrow
Helianthemum scoparium	Rushrose
Isocoma menziesii	Coast goldenbush
Lotus scoparius	Deerweed
Lupinus chamissonis	Dune bush lupine
Mimulus aurantiacus	Bush monkey flower
Salvia mellifera	Black sage

5.6 EAST YSABEL

Restoration of the East Ysabel site will consist of removal of non-native species and ornamental trees and installation of bank stabilization and screen plantings. This area will be planted with container plants irrigated by drip lines and a specific seed mix. Planting will occur on steep road banks, depressional areas in the middle of the site, and immediately adjacent to pump station structures. The screen plantings will consist of the species listed below. Plant counts, location, spacing, and irrigation details are provided on Sheets 6 and 7 in Appendix A.

Container Plant List

Mimulus aurantiacus	Bush monkey flower
Myrica californica	Pacific wax-leaf myrtle
Prunus ilicifolia	Hollyleaf cherry
Rhamnus californica	Coffeeberry
Rosa californica	California rose

The East Ysabel site contains and is adjacent to various non-native grass species, including veldt grass, and will require use of grass-specific herbicide to keep weed growth under control during establishment. The seed mix for this site does not contain any grass species due to the need for repeated control of invasive grass species. Required seed amounts are provided on Sheet 6 in Appendix A.

Seed Mix 3 (No grass species)

Achillea millefolium	Yarrow
Artemisia californica	California sage
Baccharis pilularis	Coyote brush
Ericameria ericoides	Mock heather
Eriogonum parvifolium	Sea-cliff buckwheat
Eriophylum staechadifolium	Coastal golden yarrow
Helianthemum scoparium	Rushrose
Isocoma menziesii	Coast goldenbush
Lotus scoparius	Deerweed
Lupinus chamissonis	Dune bush lupine
Mimulus aurantiacus	Bush monkey flower
Salvia mellifera	Black sage

5.7 PERMANENT FENCING AND SIGNAGE

Permanent fencing and signage will be installed where appropriate to protect restoration areas and provide information for the public. Fencing will be designed to restrict or guide human access without affecting wildlife passage. Fencing shall be repaired and/or replaced when necessary.

Informational signs will be placed in suitable locations along perimeter fencing and existing and proposed trails at the Broderson and Mid-town sites. Sign text will notify the public that the area contains a sensitive habitat restoration area, discuss the biological value of the protected habitats and the purpose and goals of the restoration efforts, and state that activities or entrance other than use of the foot path is restricted.

6. CONSTRUCTION MONITORING

The County will provide a qualified biologist or restoration specialist to monitor implementation of the HMP. Duties include directing protective fencing installation, conducting training for grading contractors, monitoring grading activities, directing weed eradication and planting efforts, irrigation system approval, and documentation of construction, planting, and maintenance activities.

7. MAINTENANCE

Following establishment, County maintenance staff will be responsible for care and maintenance of the restoration areas. Maintenance activities necessary to ensure that the project objectives are achieved include:

- regular removal of invasive or exotic plants before seed is set;
- revegetation of areas where damage has occurred or plant cover deficiencies are identified;
- prevention of damage to plants from herbivores and human activities;
- apply irrigation as appropriate for prevailing weather conditions;
- maintain the irrigation system in good repair;
- regular removal of trash and debris;
- repair of erosion or vandalism damage; and,
- repair fencing and signage as necessary.

7.1 WEED CONTROL AFTER ESTABLISHMENT

Exotic species removal will occur during site preparation; however, periodic weed abatement will be required throughout the life of the project. The restoration areas are subject to introduction of weed species from soil seed banks and from surrounding residential and open space areas. Noxious weeds expected to require ongoing attention consist primarily of *Ehrharta calycina*, and may also include *Picris echiodes*, *Silybum marianum*, *Carduus pycnocepahlus*, *Centaurea solstitialis*, or any other species listed on the California Invasive Plant Council's Invasive Plant Inventory that is found in numbers sufficient to require control through herbicide. A list of expected weed species and best management practices is included in Appendix D. Weed control efforts shall follow the requirements below:

- All weeding and herbicide application shall be performed under the direction of the Project Biologist.
- Weed control should focus on removal before weed plants set seed.
- All seed heads present during weeding activities should be removed by carefully clipping and bagging seed heads and disposing of them off-site.
- Maintenance staff performing weeding must have training in plant identification and low impact weed removal techniques.
- Care must be taken to identify and avoid removal of volunteer native species during maintenance activities.

Both manual and chemical methods will be used to remove weeds following establishment. Manual weed control methods will be implemented within a 3-foot diameter plot around any native plant species present. Chemical weed control efforts will be implemented to combat noxious weed species in areas located outside of the 3-foot boundary. Weeding activities will be coordinated with target species' seasonal germination and growth patterns; therefore, the schedule will depend on the target species. Typically, weed abatement intensity will be highest in the spring and less in the summer and fall (refer to Appendix D).

7.2 SUPPLEMENTAL WATERING

Water will be supplied to container plantings and oak acorn planting locations on an as-needed basis determined by the County. Supplemental water will be supplied by a drip irrigation system, or by hand via a water truck. Watering should be controlled so only enough is used to initially establish the plantings and reduced to zero over the life of the program. All supplemental watering will be performed in a manner that ensures deep penetration of water to the soil around the rootball (not on the foliage). To avoid over watering in the winter months, irrigation systems should be turned off prior to December 1 of each year.

7.3 DEBRIS REMOVAL AND VANDALISM REPAIR

The restoration sites will be subject to varied degrees of human encroachment from trails, roads, and nearby private lands. Dumping and vandalism are not expected to be significant problems, but windblown trash may accumulate in planted areas. Trash removal and vandalism repair will occur as needed during scheduled maintenance visits to restoration sites.

7.4 REPLANTING

If during the initial five-year interim monitoring period the survival rate of the plantings falls below 75 percent, the County will replant the needed number of containers to obtain the required 75 percent survival rate. All supplemental plantings will be maintained and monitored until they are determined to be self-sustaining. Additional seed collection and hand seeding can also be performed if deemed appropriate by the County as a measure to increase the total plant coverage. No planting shall be conducted once long-term/final success criteria have been met, unless a catastrophic occurrence removes a large percentage of plantings on a site.

8. SUCCESS CRITERIA

The HMP includes overall interim and long-term/final success criteria for the combined restoration areas covered by the Plan, and general criteria specific to each habitat type restored. Success of the restoration effort will be determined through analysis of monitoring data and comparison with the criteria listed below. If it becomes evident that HMP areas are not achieving the success criteria, the County will determine the reasons for the deficiencies and adjust management actions as necessary.

8.1 INTERIM SUCCESS CRITERIA

Interim success will be determined annually for each site following implementation of the HMP and establishment of all plantings. The interim period will continue for five years or until all interim criteria are met.

Table 2. Interim Success Criteria

Attribute	Year 1	Year 2	Year 3	Year 4	Year 5
Total Percent of Native Cover Present	20%	30%	40%	55%	65%
Average Vigor Rating*	2	2	2	2	2
Plant Survival	90%	85%	80%	80%	75%
Percent of Non-Native Cover	15%	15%	10%	10%	5%

*Plant health and vigor will be measured as follows:

1 = excellent – vigorous healthy plant (no necrotic or chlorotic leaves)
2 = good – plant healthy with limited signs of vigorous growth
3 = adequate – plant healthy, but with no signs of vigorous growth, and some necrosis or other damage present
4 = poor – low vitality, or main stem dead but basal sprouts emerging
5 = dead – no evidence of recovery

Notes:

- Nursery stock plant survivorship may include original plantings, remedial plantings, or native volunteer species.
- Any remedial plantings will be monitored until the restoration specialist determines that they are self-sustaining.
- Percent non-native cover calculations exclude non-native annual grasses considered part of the California Annual Grassland Series.

8.2 LONG-TERM/FINAL SUCCESS CRITERIA

Achievement of the interim success criteria will indicate that the site has developed into a self-sustaining pattern that should continue over the long term with minimal maintenance inputs. Achievement of long-term/final success will be determined following three years of no maintenance inputs to the restoration sites other than removal of non-native species. Long-term/final success will consist of establishment of stable natural habitat conditions over the restoration sites that are visibly more diverse and contain significantly fewer exotic species that surrounding similar habitats. All areas restored under the HMP will be required to maintain the conditions specified by the long-term/final success criteria in perpetuity.

Table 3. Long-Term/Final Success Criteria

Attribute	Criteria
Total Percent of Native Cover Present	70+
Plant Survival Percent	70+
Average Vigor Rating	2
Percent of Non-Native Cover	5

8.3 HABITAT-SPECIFIC SUCCESS CRITERIA

In addition to the specific interim and long-term/final criteria listed above, the following general standards will also be assessed for each habitat type to be restored.

8.3.1 Oak Plantings

Each area planted with oak acorns at the Giacomazzi site shall have at least one live oak tree (vigor rating of 2 or better) in each planting zone five years after planting. All container planted oaks shall be alive and have a vigor rating of 2 or better five years after planting. No non-native species shall be present within the dripline of oak trees planted for this HMP.

8.3.2 Drainage Repair Areas

Riparian areas repaired and restored at Giacomazzi shall maintain a dominant, multi-level cover of native riparian and coastal scrub plant species, with exotic weed percentages constituting no more than five percent of the total plant coverage. These areas should exhibit evidence of native plant recruitment and wildlife usage. No erosion should be evident in these areas.

8.3.3 Coastal Scrub Areas

All non-screen areas planted or seeded with coastal scrub species shall maintain a dominant, multi-level cover of native shrub, forb, and perennial and annual grass species, with exotic weed percentages constituting no more than five percent of the total plant coverage. These areas should exhibit evidence of native plant recruitment and wildlife usage, including presence of Morro shoulderband snail.

8.3.4 Maritime Chaparral Areas

Maritime chaparral areas at the Broderson site shall maintain a dominant, multi-level cover of native tree, shrub, forb, and perennial and annual grass species, with exotic weed percentages constituting no more than five percent of the total plant coverage. These areas should exhibit evidence of native plant recruitment and wildlife usage.

9. MONITORING

The County will monitor and maintain the restoration areas per the schedules presented in this HMP to ensure success of the restoration effort. Monitoring shall document overall site conditions, and will note species diversity, total ground cover of vegetation, vegetative cover of dominant species, wildlife usage, hydrology, and presence and abundance of sensitive species or other individual "target" species, and weed occurrences within the restoration areas. The scheduled monitoring program will provide qualitative and quantitative data for use in determining the success of the restoration program, based on the relationship between observed site conditions and the established success criteria.

Qualitative assessments will include evaluations of plant vigor, damage, exotic species competition, and erosion, and will be documented by photos taken from established photo points. These attributes will be evaluated to determine the need to adjust management actions such as increasing or decreasing supplemental water, applying pesticides, the need for ungulate exclusion, or increasing weed abatement efforts.

Quantitative assessments will include calculating planting survivorship, evaluating the percent cover of each habitat type, and evaluating the percent cover of exotic species. The number of surviving plantings will be divided by the number of plantings installed to determine survivorship percentage. Volunteer plants will also be counted if it is reasonable to assume they are viable.

9.1 MONITORING AND MAINTENANCE SCHEDULES

Monitoring and maintenance schedules for both the five-year Interim period and the Long-Term/Final period are presented below.

Table 4. LOWWP Restoration Areas Five-Year Interim Schedule

YEAR: 1-5	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ANNUAL TASKS												
Weeding/Maintenance		X	X	X		X			X			X
Revegetation Monitoring					X							
Annual Report												X

Table 5. LOWWP Restoration Areas Long-Term Schedule

YEAR: 10, 15, 20…	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TASKS												
Annual Weeding (every year as needed)		X		X			X					
Qualitative & Quantitative Monitoring Assessment (every 5 years)					X							X
Monitoring Report (every 5 years)												X

9.2 MONITORING METHODS

The monitoring program will provide qualitative and quantitative data to be used in determining the successes of the enhancement program. The restoration specialist will collect and evaluate data indicating the relationship between actual site conditions and the established success criteria.

9.2.1 Qualitative Assessments

Qualitative assessments will be conducted annually in the spring and will include evaluations of the plantings vigor, damage, and exotic species competition, and photo documentation. These attributes will be evaluated to determine the need to adjust management actions, such as increasing or decreasing supplemental water, applying pesticides, the need for ungulate exclusion, and increasing weed abatement.

Planting vigor will be rated from 1 (excellent) to 5 (dead) pursuant to the ratings provided in Table 2. On average the plantings should exhibit vigor ratings of 1 or 2 throughout the seasons. If the vigor rating for individuals or portions of the plantings on a site falls below 2, remedial actions will be necessary.

Permanent photo points will be established at each restoration site to assist in tracking the success of the HMP, and to provide meaningful photo documentation in monitoring reports. Permanent photo points will be established during the preparation of each site, and ground view photos will be taken during each monitoring year from the same vantage points.

9.2.2 Quantitative Assessments

Quantitative assessments will be conducted annually in the spring, during the Interim Monitoring period, and will include calculating planting survivorship, evaluating the percent cover in each habitat area, and evaluating the percent cover of exotic species. Percent cover shall be documented in spring of each year, and percent cover calculations will be used to document plant cover over planted and seeded areas. A planting will be considered “surviving” if at least half of the foliage or stem (if deciduous) is green and flexible (Vigor of 1 to 4). Due to the size of the planting areas at Giacomazzi, Mid-town, and Broderson, plant survival shall be estimated through visual observation instead of counting. The number of estimated surviving plantings will be divided by the number of plantings installed. Volunteer plants will be counted if it is reasonable to assume they are offspring of the plantings or if they are present in an area where a native plant was planted. Percent cover must be determined by a documented method. Several methods are available; however, this HMP recommends utilizing the Daubenmire or Line Intercept Methods as describe by *Sampling Vegetation Attributes* (Natural Resources Conservation Service [NRCS] 1996). Examples and data sheets for the recommended methods are provided in Appendix C.

9.3 ANALYSIS OF MONITORING RESULTS

Data obtained during transect analysis and qualitative monitoring observations will be documented in annual reports. Quantitative data collected using the methods recommended above will be suitable for statistical analysis, in case such analysis is warranted. Evaluation of documented results over the monitoring period will expose any patterns or trends in vegetative condition, and will identify areas and actions needed. Identified problem areas will be addressed through adaptive management analysis to identify suitable remedial action.

9.4 REMEDIAL ACTIONS

Identified problem areas (e.g., weed infestations, erosion damage, plant loss, vandalism) will be corrected as needed through normal maintenance actions. If the site trends indicate that the success criteria will eventually be established in a longer time frame than anticipated, maintenance and monitoring will continue until success is established. If a total site failure is evident, the County will, in consultation with

the California Coastal Commission, determine what corrective action(s) should be taken and will subsequently implement those action(s).

10. MONITORING REPORTS

The reporting schedule includes an as-built report to be submitted within 30 days of implementation, an annual report cycle during the interim monitoring period, and an every five-year reporting cycle once long-term/final success criteria have been achieved. The County will ensure that all reports are submitted to the Coastal Commission and interested agencies.

10.1 AS-BUILT REPORTING

An "as built" report documenting site conditions shall be prepared and submitted to the Coastal Commission Executive Director within 30 days of completion of the initial restoration activities. The report shall describe the field implementation of the approved restoration program in narrative and photographs, and report any problems in the implementation and their resolution.

10.2 ANNUAL REPORTING

An annual monitoring report shall be prepared by December 31 of each year during the five-year interim monitoring period. Annual monitoring reports will summarize site conditions, maintenance practices, and results documented during regular maintenance and field sampling visits, and include a discussion of success or failure, based on collected data. Photo documentation will be included in all annual reports. Two copies of each annual report shall be submitted to the California Coastal Commission Executive Director in December of each year of interim period monitoring.

10.3 FIVE-YEAR REPORTING

Following achievement of the Interim Success Criteria, monitoring and reporting will occur on a five-year schedule. Five-year reports will follow the format and include all information normally presented in the annual reports, and shall be submitted to the Executive Director in December following monitoring. Five-year reports will specifically discuss any significant successional changes observed in the restoration areas, and will provide long-term maintenance and management recommendations for the site.

11. REFERENCES

California Native Plant Society (CNPS). 2011. Inventory of Rare and Endangered Plants (online edition). California Native Plant Society. Sacramento, CA. Accessed on Wed., Mar. 16, 2011 from http://www.cnps.org/inventory

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Hickman, J. C. (ed.) 1993. *The Jepson Manual. Higher Plants of California*. Univ. of California Press, Berkeley, Los Angeles, and London.

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Howald, Ann M. 1990. *Mitigation Plan Annotated Outline for Endangered Plants of California*. California Department of Fish and Game Endangered Plant Program. Sacramento, California.

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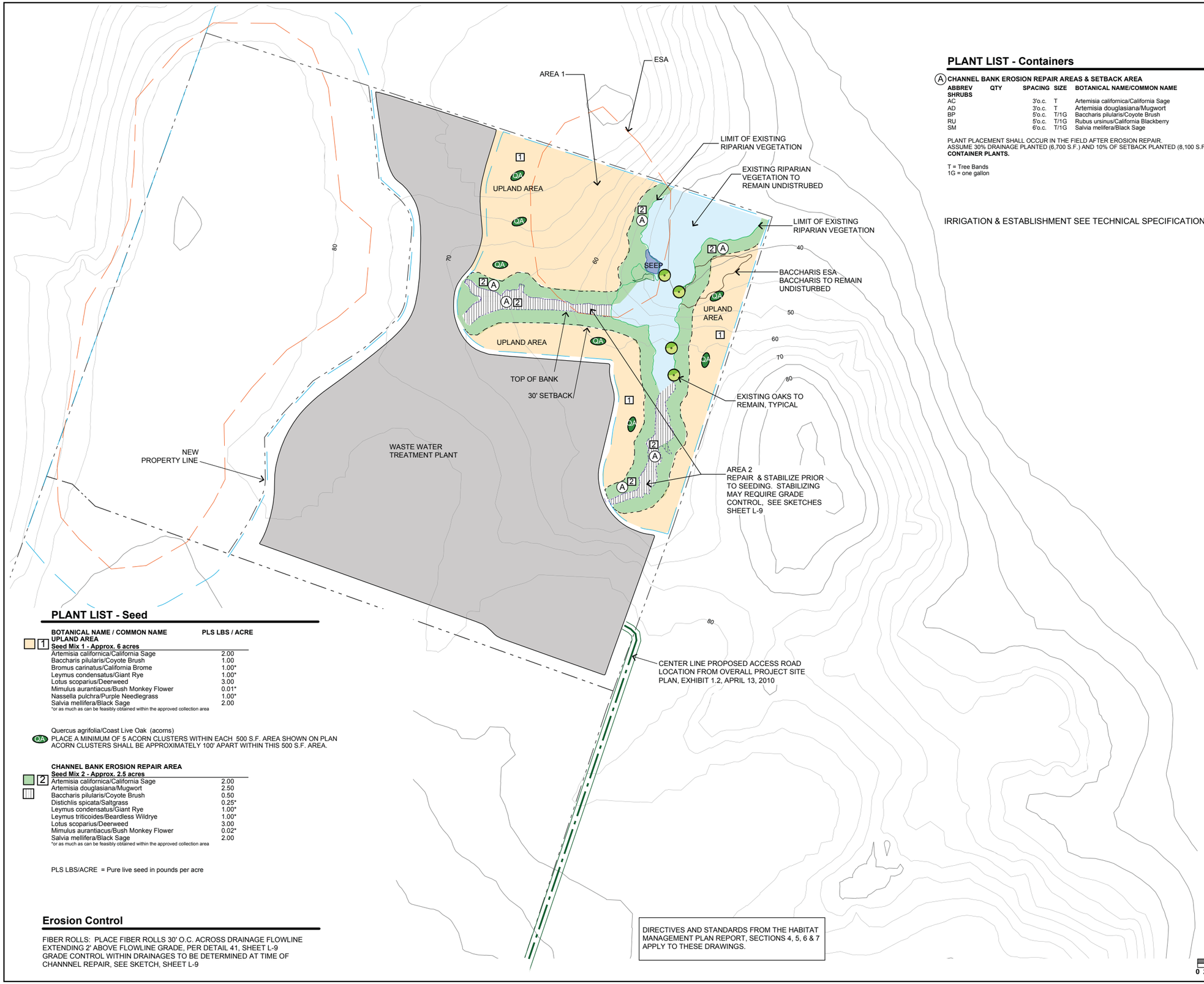
U.S. Department of Agriculture Natural Resource Conservation District (NRCS). 1984. Soil Conservation Service. Soil Survey of San Luis Obispo County, California, Coastal Part.

APPENDIX A:
Landscape Plans and Specifications



PLANT LIST - Containers

(A) CHANNEL BANK EROSION REPAIR AREAS & SETBACK AREA

ABBREV	QTY	SPACING	SIZE	BOTANICAL NAME/COMMON NAME	SOURCE
SHRUBS					
AC		3'o.c.	T	Artemisia californica/California Sage	Seed:collected
AD		3'o.c.	T	Artemisia douglasiana/Mugwort	Cutting:collected
BP		5'o.c.	T/1G	Baccharis pilularis/Coyote Brush	Seed/cutting:collected
RU		5'o.c.	T/1G	Rubus ursinus/California Blackberry	Cutting:collected
SM		6'o.c.	T/1G	Salvia melifera/Black Sage	Seed/cutting:collected

PLANT PLACEMENT SHALL OCCUR IN THE FIELD AFTER EROSION REPAIR.
ASSUME 30% DRAINAGE PLANTED (6,700 S.F.) AND 10% OF SETBACK PLANTED (8,100 S.F.). **INSTALL A MINMUM OF 870 CONTAINER PLANTS.**

T = Tree Bands
1G = one gallon

IRRIGATION & ESTABLISHMENT SEE TECHNICAL SPECIFICATIONS

PLANT LIST - Seed

BOTANICAL NAME / COMMON NAME	PLS LBS / ACRE
UPLAND AREA	
1 Seed Mix 1 - Approx. 6 acres	
Artemisia californica/California Sage	2.00
Baccharis pilularis/Coyote Brush	1.00
Bromus carinatus/California Brome	1.00*
Leymus condensatus/Giant Rye	1.00*
Lotus scoparius/Deerweed	3.00
Mimulus aurantiacus/Bush Monkey Flower	0.01*
Nassella pulchra/Purple Needlegrass	1.00*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

Quercus agrifolia/Coast Live Oak (acorns)
QA PLACE A MINIMUM OF 5 ACORN CLUSTERS WITHIN EACH 500 S.F. AREA SHOWN ON PLAN ACORN CLUSTERS SHALL BE APPROXIMATELY 100' APART WITHIN THIS 500 S.F. AREA.

CHANNEL BANK EROSION REPAIR AREA	
2 Seed Mix 2 - Approx. 2.5 acres	
Artemisia californica/California Sage	2.00
Artemisia douglasiana/Mugwort	2.50
Baccharis pilularis/Coyote Brush	0.50
Distichlis spicata/Saltgrass	0.25*
Leymus condensatus/Giant Rye	1.00*
Leymus triticoides/Beardless Wildrye	1.00*
Lotus scoparius/Deerweed	3.00
Mimulus aurantiacus/Bush Monkey Flower	0.02*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

PLS LBS/ACRE = Pure live seed in pounds per acre

Erosion Control

FIBER ROLLS: PLACE FIBER ROLLS 30' O.C. ACROSS DRAINAGE FLOWLINE EXTENDING 2' ABOVE FLOWLINE GRADE, PER DETAIL 41, SHEET L-9
GRADE CONTROL WITHIN DRAINAGES TO BE DETERMINED AT TIME OF CHANNNEL REPAIR, SEE SKETCH, SHEET L-9

DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

revision

Owner: County of San Luis Obispo
Department of General Services
1087 Santa Rosa Street
San Luis Obispo, California

Project: Los Osos Wastewater Project
Habitat Management Plan

Sheet Title: Giacommazi Site
Planting Plan

firma
landscape architecture
planning
environmental studies
ecological restoration
Principal: David W. Foote ASLA
Registration No. 2117
187 Tank Farm Road,Suite 230
San Luis Obispo, CA 93401
805. 781. 5900 fax 805. 781. 5903

job no. 21035
plan check issue date: 5/12/11
bid set issue date:

SHEET 1 OF SHEETS

PLANT LIST - Seed

1 2 3

BOTANICAL NAME / COMMON NAME	PLS LBS / ACRE
DISPOSAL SITE & VELDT GRASS REMOVAL	
Seed Mix 3 - Approx. 19 AC	
Achillea millefolium/Yarrow	2.00
Artemisia californica/California Sage	0.50
Baccharis pilularis/Coyote Brush	0.05
Ericameria ericoides/Mock Heather	1.50
Eriogonum parvifolium/Sea-cliff Buckwheat	1.50
Eriophylum staechadifolium/Coastal Golden Yarrow	1.50
Helianthemum scoparium/Rushrose	0.50*
Isocoma menziesii/Coast Goldenbush	2.00
Lotus scoparius/Deerweed	3.00
Lupinus chamissonis/Dune Bush Lupine	2.50
Mimulus aurantiacus/Bush Monkey Flower	0.02*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

3 **UPLAND AREA SEEDING & WEED REMOVAL PROGRAM**
Species listed above shall be hand scattered in areas where invasives will be removed. Exact location and extent of seeding to be determined in the field at time of disposal site construction. Contractor to provide unit price per square foot to implement this program.

PLS LBS/ACRE = Pure live seed in pounds per acre

DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

PLANT LIST - Containers

1 C **DISPOSAL SITE**

ABBREV	SPACING	SIZE	BOTANICAL NAME/COMMON NAME	SOURCE
SHRUBS				
AC	3'o.c.	T	Artemisia californica/California Sage	Seed:collected/vendor
BP	5'o.c.	T/1G	Baccharis pilularis/Coyote Brush	Seed/cutting:collected/vendor
CC	6'o.c.	T/1G	Ceanothus cuneatus var. cuneatus/Buckbrush	Cutting:collected
LC	6'o.c.	T	Lupinus chamissonis/Dune Bush Lupine	Seed: collected/vendor
SM	5'o.c.	T	Salvia mellifera/Black Sage	Seed/Cutting: collected/vendor

T = Tree Band
1G = one gallon

INSIDE FENCED DISPOSAL SITE **INSTALL 1,500 CONTAINER PLANTS**: INSTALL APPROXIMATELY FIFTY GROUPS WITH APPROXIMATELY 30 PLANTS IN EACH GROUP. EACH GROUP OF 30 PLANTS SHALL HAVE APPROXIMATELY SIX OF EACH SPECIES. LOCATE EACH GROUP OF PLANTS GREATER THAN 100' FROM ADJACENT GROUPS.

● LINK EXISITNG PATH TO NEW PATH

ALL MATERIAL FROM TREE REMOVALS SHALL BE CHIPPED AND STOCKPILED ON SITE FOR USE AS MULCH WHERE DESIGNATED ON HMP SITES.

IRRIGATION & ESTABLISHMENT SEE TECHNICAL SPECIFICATIONS

North

Scale: 1" = 100'-0"

0 25' 50' 100' 200' 300' 400'

revision

Owner: County of San Luis Obispo Department of General Services 1087 Santa Rosa Street San Luis Obispo, California

Project: Los Osos Wastewater Project Habitat Management Plan

Sheet Title: Broderson Site Planting Plan

firma
Principal David W. Forte ASLA Registration No. 2117
187 Tank Farm Road, Suite 230 San Luis Obispo, CA 93401 805. 781. 9800 fax 805. 781. 9803
landscape architecture planning environmental studies ecological restoration

job no. 21035
plan check issue date: 5/12/11
bid set issue date:

SHEET 2 OF SHEETS

PLANT LIST - Seed

BOTANICAL NAME / COMMON NAME	PLS LBS / ACRE
DISTURBED UPLAND AREA	
4 **Seed Mix 4 - Approx. 7 acres**	
Achillea millefolium/Yarrow	2.50
Artemisia californica/California Sage	2.75
Baccharis pilularis/Coyote Brush	0.75
Ericameria ericoides/Mock Heather	3.75
Eriogonum parvifolium/Sea-cliff Buckwheat	3.25
Eriophylum staechadifolium/Coastal Golden Yarrow	1.75
Lotus scoparius/Deerweed	7.50
Lupinus chamissonis/Dune Bush Lupine	3.50
Salvia mellifera/Black Sage	3.00
PERCOLATION BASIN & SWALE	
5 **Seed Mix 5 - Approx. 2.8 acres**	
Artemisia douglasiana/Mugwort	3.50
Baccharis pilularis/Coyote Brush	0.75
Eriophylum staechadifolium/Coastal Golden Yarrow	1.75
Isocoma menziesii/Coast Goldenbush	4.25
Lotus scoparius/Deerweed	7.50

PLS LBS/ACRE = Pure live seed in pounds per acre

Irrigation:

COUNTY OF SAN LUIS OBISPO SHALL SUPPLY WATER TO FACILITATE ESTABLISHMENT OF CONTAINER PLANTS. WATER SOURCE AND METHOD OF APPLICATION TO BE DETERMINED

SEEDING SHALL OCCUR PRIOR TO RAINY SEASON, USING SEASONAL PRECIPITATION TO GERMINATE AND ESTABLISH PLANTS.

Erosion Control:

TO BE DETERMINED WHEN PRECISE PLANS ARE COMPLETED BY SAN LUIS OBISPO COUNTY.

PLANT LIST - Containers

ABBREV	SPACING	BOTANICAL NAME/COMMON NAME	QTY./SIZE	SOURCE
D **CHANNEL BANK EROSION CONTROL**				
SHRUBS				
AD	3'o.c.	Artemisia douglasiana/Mugwort	200 treebands	seed
CP	1'o.c.	Carex praegracilis/Field sedge	500 treebands	division
PF	3'o.c.	Prunus fasciculata/Sand almond	143 gallons	cutting
RC	6'o.c.	Rosa californica/California rose	143 treebands	cutting
RhC	6'o.c.	Rhamnus californica/Coffeeberry	250 treebands	seed

PLANT 60% OF SWALE (7,800 S.F.) WITH CONTAINER PLANTS. INSTALL 1,236 PLANTS IN SWALE AREA. LOCATE GROUPS OF 25 TO 40 PLANTS EVENLY THROUGHOUT THE LENGTH OF THE SWALE. EACH GROUP OF 25 TO 40 SHALL CONSIST OF A BLANCED MIX OF THE FIVE SPECIES.

DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

North

Scale: 1" = 50'-0"

0 25' 50' 100' 200' 300'

revision

Owner: County of San Luis Obispo
Department of General Services
1087 Santa Rosa Street
San Luis Obispo, California

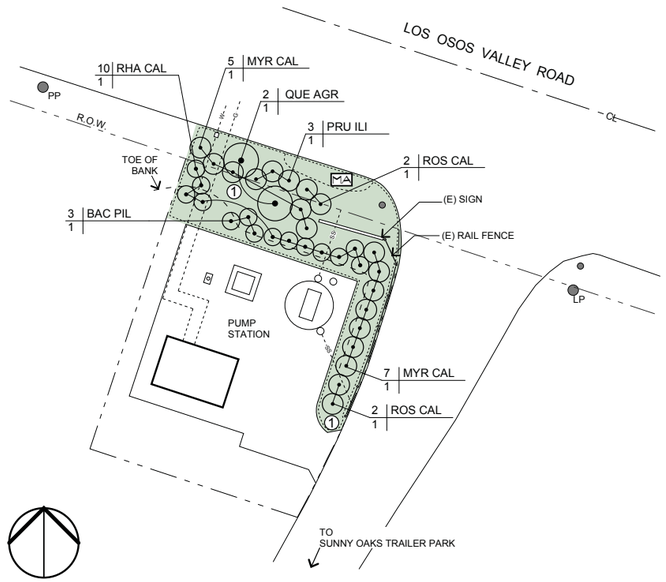
Project: Los Osos Wastewater Project
Habitat Management Plan

Sheet Title: Mid-Town Site
Planting Plan

firma
landscape architecture
planning
environmental studies
ecological restoration
Principal David W. Forte ASLA
Registration No. 2117
187 Tank Farm Road, Suite 230
San Luis Obispo, CA 93401
805. 781. 9903 fax 805. 781. 9902

job no. 21035
plan check issue date: 5/12/11
bid set issue date:

SHEET 3 OF SHEETS



North

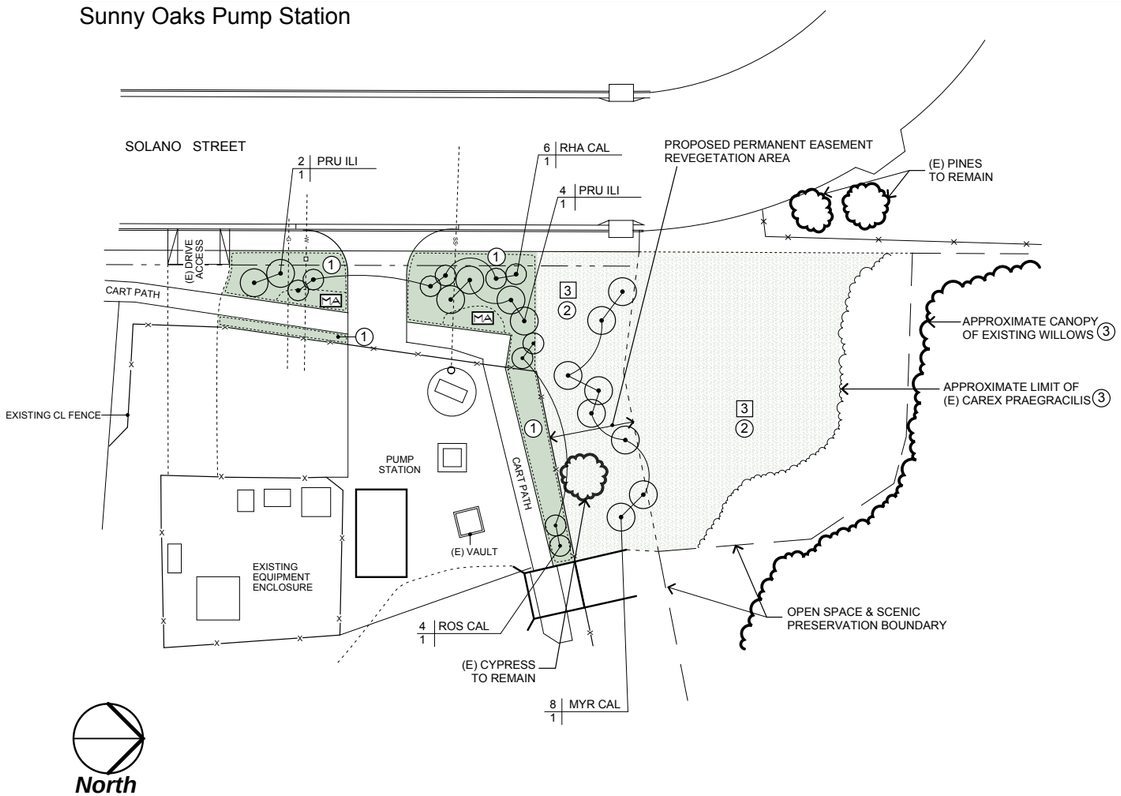
Sunny Oaks Pump Station

PLANT LIST - Containers

ABBREV	SPACING	SIZE	BOTANICAL NAME/COMMON NAME	SOURCE
TREES				
QUE AGR		T	Quercus agrifolia/California Live Oak	Acorns:collected
SHRUBS				
MA	3'o.c.	T/1G	Mimulus aurantiacus/Bush Monkey Flower	Seed/cutting:collected
BAC PIL	5'o.c.	T/1G	Baccharis pilularis/Coyote Brush	Seed/cutting:collected/vendor
MYR CAL	6'o.c.	T/1G	Myrica californica/Pacific Wax-leaf Myrtle	Cutting:collected
PRU ILI	6'o.c.	T/1G	Prunus ilicifolia/Hollyleaf Cherry	Seed/cutting:collected/vendor
RHA CAL	5'o.c.	T/1G	Rhamnus californica/Coffeeberry	Cutting:collected
ROS CAL	6'o.c.	T/1G	Rosa californica/California Rose	Cutting:collected

T = tree band
1G = one gallon

NOTES:
1. MULCH WITH 4" DEEP MATERIAL NOTED IN PLANTING SPECIFICATIONS



North

Solano Pump Station

PLANT LIST - Containers

ABBREV	SPACING	SIZE	BOTANICAL NAME/COMMON NAME	SOURCE
SHRUBS/PERENNIALS				
MA	3'o.c.	T/1G	Mimulus aurantiacus/Bush Monkey Flower	Seed/cutting:vendor/collected
MYR CAL	6'o.c.	T/1G	Myrica californica/Pacific Wax-leaf Myrtle	Cutting:collected
PRU ILI	6'o.c.	T/1G	Prunus ilicifolia/Hollyleaf Cherry	Cutting:collected
RHA CAL	5'o.c.	T/1G	Rhamnus californica/Coffeeberry	Cutting:collected
ROS CAL	6'o.c.	T/1G	Rosa californica/California Rose	Cutting:collected

T = tree band
1G = one gallon

PLANT LIST - Seed

BOTANICAL NAME / COMMON NAME	PLS LBS / ACRE
Seed Mix 3 - 0.15 AC	
Achillea millefolium/Yarrow	2.00
Artemisia californica/California Sage	0.50
Baccharis pilularis/Coyote Brush	0.05
Ericameria ericoides/Mock Heather	1.50
Eriogonum parvifolium/Sea-cliff Buckwheat	1.50
Eriophylum staechadifolium/Coastal Golden Yarrow	1.50
Helianthemum scoparium/Rushrose	0.50*
Isocoma menziesii/Coast Goldenbush	2.00
Lotus scoparius/Deerweed	3.00
Lupinus chamissonis/Dune Bush Lupine	2.50
Mimulus aurantiacus/Bush Monkey Flower	0.02*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

NOTES:
1. MULCH WITH 4" DEEP MATERIAL NOTED IN PLANTING SPECIFICATIONS
2. REMOVE ORNAMENTAL AND INVASIVE PLANTS, INCLUDING BUT NOT LIMITED TO ARUNDO DONAX, VELDT GRASS, RHAPHIOLEPIS.
3. EXISTING NATIVE PLANTS SHALL REMAIN IN PLACE AS PERMITTED BY CONSTRUCTION AND PLANT REMOVALS.

DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

Scale: 1" = 20'-0"

20' 10' 5' 0 20' 40' 60'

revision

Owner: County of San Luis Obispo
Department of General Services
1087 Santa Rosa Street
San Luis Obispo, California

Project: Los Osos Wastewater Project
Habitat Management Plan

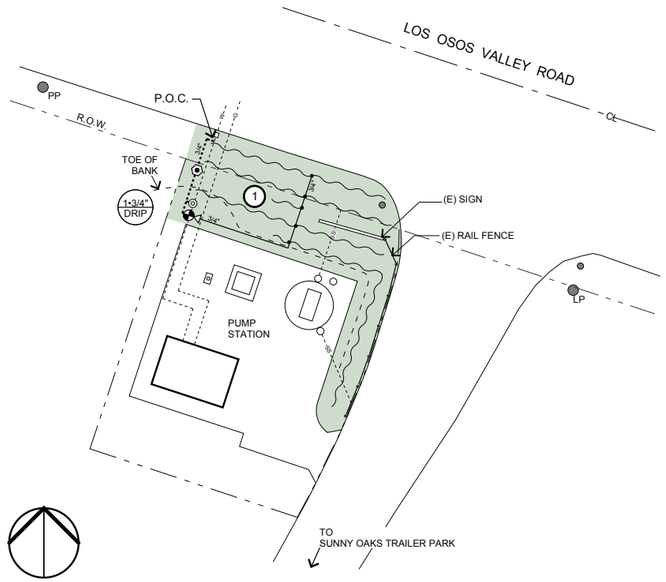
Sheet Title: Sunny Oaks & Solano Pump Stations
Planting Plan

firma
landscape architecture
planning
environmental studies
ecological restoration
Principal: David W. Foote, ASLA
Registration No. 2117
187 Tank Farm Road, Suite 230
San Luis Obispo, CA 93401
805. 781. 9300 fax 805. 781. 9303

job no. 21035
plan check issue date: 5/12/11
bid set issue date:

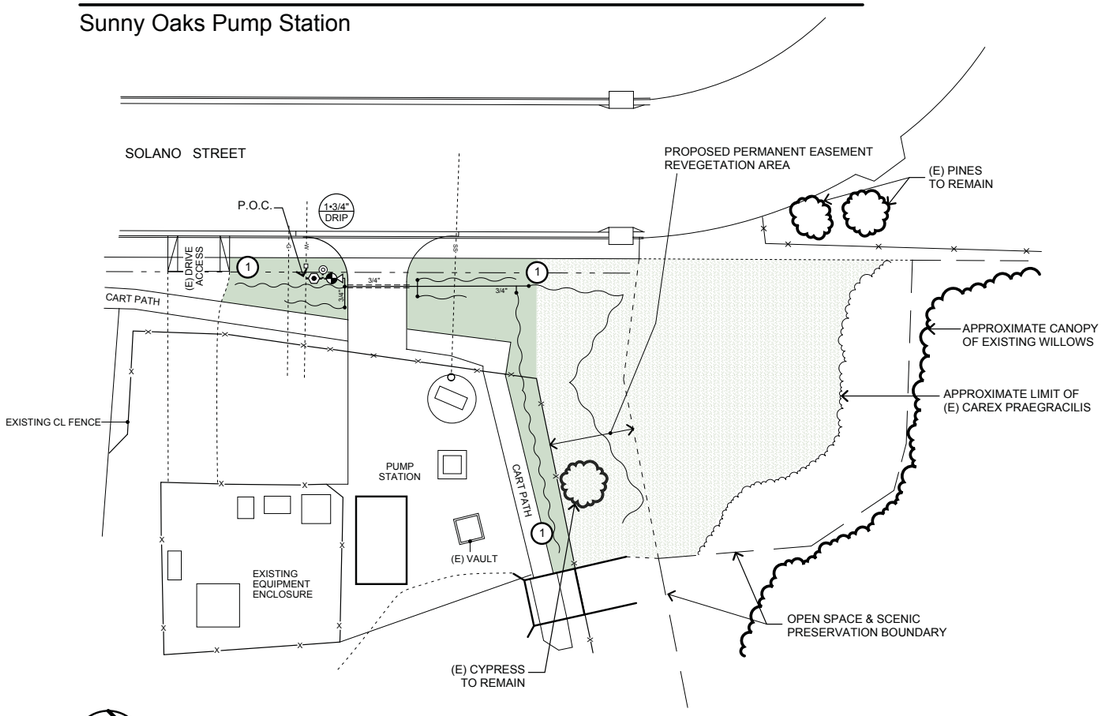
SHEET 4 OF SHEETS

File Name: !FirmaLos Osos Wastewater HMP (21035) Last Date Modified: 11/23/11



North

Sunny Oaks Pump Station



North

Solano Pump Station

Irrigation Schedule

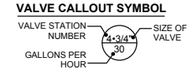
SYMBOL	DESCRIPTION	MODEL	NOTES
	EMITTER	TORO TURBO-SC PLUS DPJ-04-A (1 GPH) or TURBO-SC PLUS DPJ-08-A (2 GPH)	Dtl.30-33,L-8
C	CONTROLLER	IRRITROL IBOC 100 with BAT10 battery	Dtl. 10,L-8
	R.P. BACKFLOW	WILKINS 975XL - 3/4"	Dtl.11,L-8
	ELECTRIC CONTROL VALVE (DRIP)	IRRITROL 700 SERIES ULTRAFLOW, size per plan	Dtl. 10,L-8
	PRESSURE REGULATOR	WILKINS 500YSBR SERIES	Dtl. 20,L-8
	FILTER (DRIP)	AG PRODUCTS #4E, Size to match valve	Dtl. 20,L-8
	QUICK COUPLER VALVE	RAINBIRD 33DRC w/ 33K	Dtl. 22,L-8
	SHUTOFF VALVE	NIBCO T-560 BALL VALVE	Dtl. 23,L-8
	FLUSH VALVE	AG PRODUCTS 3/4-B BALL VALVE	Dtl. 21,L-8
	CHECK VALVE	KBI CV-SIZE PER PIPE, AS NEEDED (SEE NOTES)	
	PRESSURE LINE	SCHEDULE 40 PVC, 18" Deep	Dtl. 912,L-8
	DRIP PVC LATERAL	CLASS 200 PVC w/ DRIP TUBE ADAPTOR	Dtl. 30-33,L-8
1	DRIP ZONE	RAINBIRD XBS POLYETHYLENE HOSE .615" I.D.	Dtl. 30-33,L-8
	PVC SLEEVE	PVC SCH 40, 2x LINE SIZE	

EMITTER SCHEDULE

Plant Size	Emitter	Number Per Plant
1 G	1 GPH EMITTER	2
5 G	2 GPH EMITTER	2
15G	1 GPH EMITTER	4

- SLEEVE UNDER ALL PAVING PER SPECIFICATIONS.
- LATERAL & MAINLINE LOCATIONS ARE SCHEMATIC. LOCATE PIPING IN PLANTER ADJACENT TO PAVING EDGE.
- KING BROTHERS IN-LINE CHECK VALVE SHALL BE INSTALLED AT EVERY SEVEN FOOT CHANGE IN ELEVATION OF LATERAL LINES. VALVE SIZE TO MATCH PIPE SIZE.

VALVE CALLOUT SYMBOL



DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

Scale: 1" = 20'-0"

20' 10' 5' 0 20' 40' 60'

revision

Owner: County of San Luis Obispo Department of General Services 1087 Santa Rosa Street San Luis Obispo, California

Project: Los Osos Wastewater Project Habitat Management Plan

Sheet Title: Sunny Oaks & Solano Pump Stations Irrigation Plan

firma

landscape architecture planning environmental studies ecological restoration

Principal: David W. Foote ASLA Registration No. 2117 187 Tank Farm Road, Suite 230 San Luis Obispo, CA 93401 805. 781. 9300 fax 805. 781. 9303

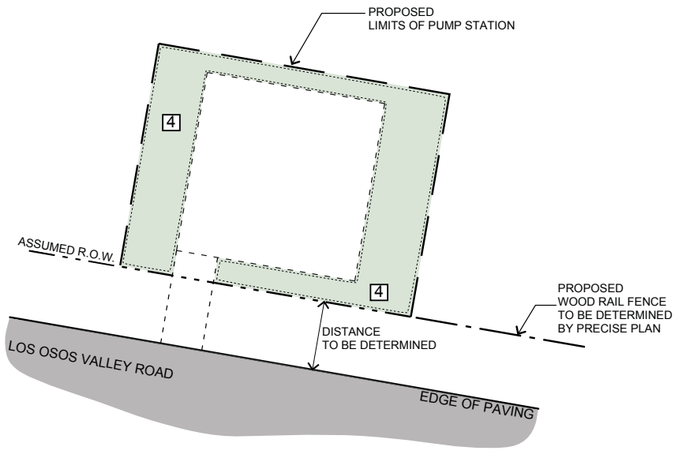
job no. 21035

plan check issue date: 5/12/11

bid set issue date:

SHEET 5 OF SHEETS

File Name: !FirmaLos Osos Wastewater HMP (21035) Last Date Modified: 11/23/11



PLANT LIST - Seed

BOTANICAL NAME / COMMON NAME	PLS LBS / ACRE
DISTURBED UPLAND AREA	
4 **Seed Mix 4 - Approx. 0.06 AC**	
Achillea millefolium/Yarrow	2.50
Artemisia californica/California Sage	2.75
Baccharis pilularis/Coyote Brush	0.75
Ericameria ericoides/Mock Heather	3.75
Eriogonum parvifolium/Sea-cliff Buckwheat	3.25
Eriophylum staechadifolium/Coastal Golden Yarrow	1.75
Lotus scoparius/Deerweed	7.50
Lupinus chamissonis/Dune Bush Lupine	3.50
Salvia mellifera/Black Sage	3.00

PLS LBS/ACRE = Pure live seed in pounds per acre

THIS PORTION OF THE LOS OSOS WASTEWATER PROJECT IS SCHEMATIC. DIMENSIONS OF FACILITY ARE NOT ESTABLISHED. THIS PLAN IS SUBJECT TO CHANGE. GOAL IS TO PROVIDE A PLANT PALLETTE MATCHING THE SURROUNDING AREA. THIS PLAN SHALL GUIDE AND DIRECT PRODUCTION OF A PRECISE PLAN BY SAN LUIS OBISPO COUNTY TO INSURE COMPLIANCE WITH THE COASTAL COMMISSION CONDITIONS OF APPROVAL.

North

Mid-Town Pump Station

PLANT LIST - Containers

ABBREV	SPACING	SIZE	BOTANICAL NAME/COMMON NAME	SOURCE
TREES				
QUE AGR		T	Quercus agrifolia/California Live Oak	Acorns:collected
SHRUBS				
MA	3'o.c.	T/1G	Mimulus aurantiacus/Bush Monkey Flower	Seed/cutting:collected
MYR CAL	6'o.c.	T/1G	Myrica californica/Pacific Wax-leaf Myrtle	Cutting:collected
PRU FAS	3'o.c.	T/1G	Prunus fasciculata punctata/Sand Almond	Seed/cutting:collected
PRU ILI	6'o.c.	T/1G	Prunus ilicifolia/Hollyleaf Cherry	Seed/cutting:collected
RHA CAL	5'o.c.	T/1G	Rhamnus californica/Coffeeberry	Cutting:collected
ROS CAL	6'o.c.	T/1G	Rosa californica/California Rose	Cutting:collected

T = tree band
1G = one gallon

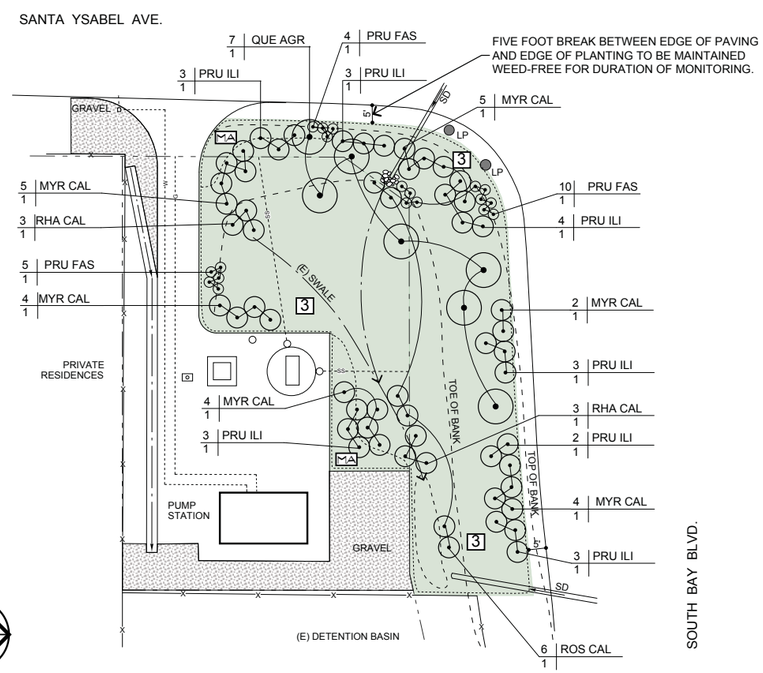
PLANT LIST - Seed

BOTANICAL NAME / COMMON NAME	PLS LBS / ACRE
3 **Seed Mix 3 - Approx. 0.2 AC**	
Achillea millefolium/Yarrow	2.00
Artemisia californica/California Sage	0.50
Baccharis pilularis/Coyote Brush	0.05
Ericameria ericoides/Mock Heather	1.50
Eriogonum parvifolium/Sea-cliff Buckwheat	1.50
Eriophylum staechadifolium/Coastal Golden Yarrow	1.50
Helianthemum scoparium/Rushrose	0.50*
Isocoma menziesii/Coast Goldenbush	2.00
Lotus scoparius/Deerweed	3.00
Lupinus chamissonis/Dune Bush Lupine	2.50
Mimulus aurantiacus/Bush Monkey Flower	0.02*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

PLS LBS/ACRE = Pure live seed in pounds per acre

NOTES:
1. PLACE JUTE MESH ON ENTIRE SLOPE FOLLOWING SEEDING AND PRIOR TO PLANTING, PER SPECIFICATIONS AND MANUFACTURER'S INSTRUCTIONS.



North

Santa Ysabel Pump Station

DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

Scale: 1" = 20'-0"

20' 10' 5' 0 20' 40' 60'

REGISTERED LANDSCAPE ARCHITECT
DAVID W. FOOTE
NO. 2117
Signature
3-31-12
Expiration Date
Date
STATE OF CALIFORNIA

revision

Owner:
County of San Luis Obispo
Department of General Services
1087 Santa Rosa Street
San Luis Obispo, California

Project:
Los Osos Wastewater Project
Habitat Management Plan

Sheet Title:
Mid-Town & Santa Ysabel
Pump Stations
Planting Plan

firma
Principal: David W. Foote ASLA
Registration No. 2117
187 Tank Farm Road, Suite 230
San Luis Obispo, CA 93401
805. 781. 5900 fax 805. 781. 5905
landscape architecture
planning
environmental studies
ecological restoration

job no.	21035
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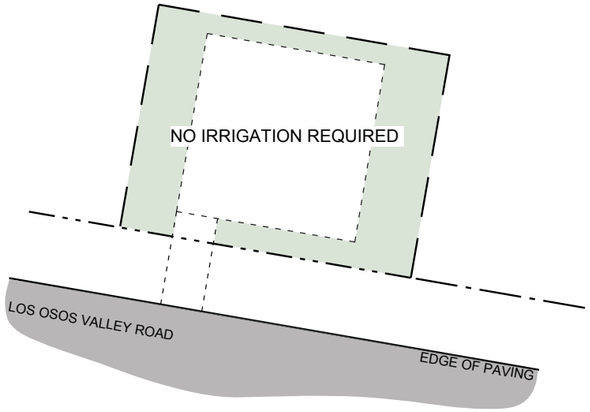
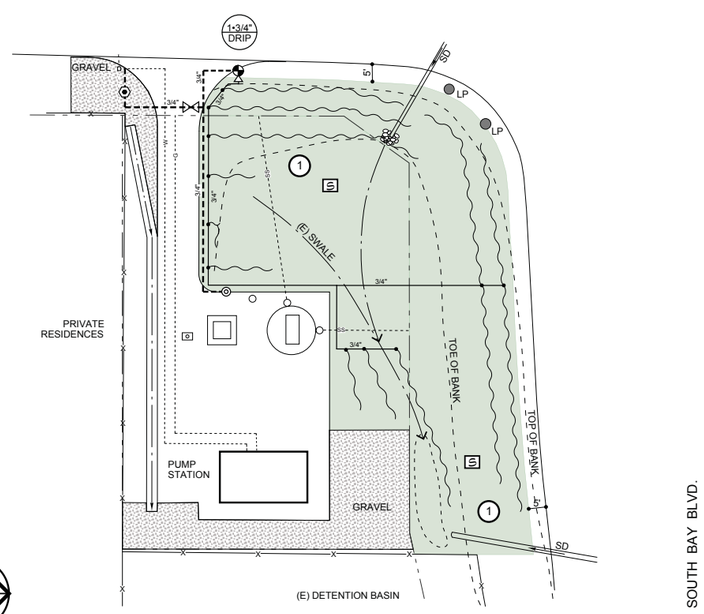
SHEET
6
OF SHEETS



North

Mid-Town Pump Station



North

Santa Ysabel Pump Station

Irrigation Schedule

SYMBOL	DESCRIPTION	MODEL	NOTES
	EMITTER	TORO TURBO-SC PLUS DPJ-04-A (1 GPH) or TURBO-SC PLUS DPJ-08-A (2 GPH)	Dtl.30-33,L-8
C	CONTROLLER	IRRITROL IBOC 100 with BAT10 battery	Dtl. 10,L-8
	R.P. BACKFLOW	WILKINS 975XL - 3/4"	Dtl.11,L-8
	ELECTRIC CONTROL VALVE (DRIP)	IRRITROL 700 SERIES ULTRAFLOW, size per plan	Dtl. 10,L-8
	PRESSURE REGULATOR	WILKINS 500YSBR SERIES	Dtl. 20,L-8
	FILTER (DRIP)	AG PRODUCTS #4E, Size to match valve	Dtl. 20,L-8
	QUICK COUPLER VALVE	RAINBIRD 33DRC w/ 33K	Dtl. 22,L-8
	SHUTOFF VALVE	NIBCO T-560 BALL VALVE	Dtl. 23,L-8
	FLUSH VALVE	AG PRODUCTS 3/4-B BALL VALVE	Dtl. 21,L-8
	CHECK VALVE	KBI CV-SIZE PER PIPE, AS NEEDED (SEE NOTES)	
	PRESSURE LINE	SCHEDULE 40 PVC, 18" Deep	Dtl. 912,L-8
	DRIP PVC LATERAL	CLASS 200 PVC w/ DRIP TUBE ADAPTOR	Dtl. 30-33,L-8
1	DRIP ZONE	RAINBIRD XBS POLYETHYLENE HOSE .615" I.D.	Dtl. 30-33,L-8
	PVC SLEEVE	PVC SCH 40, 2x LINE SIZE	

EMITTER SCHEDULE

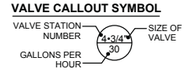
Plant Size	Emitter	Number Per Plant
1 G	1 GPH EMITTER	2
5 G	2 GPH EMITTER	2
15G	1 GPH EMITTER	4

- SLEEVE UNDER ALL PAVING PER SPECIFICATIONS.
- LATERAL & MAINLINE LOCATIONS ARE SCHEMATIC. LOCATE PIPING IN PLANTER ADJACENT TO PAVING EDGE.
- KING BROTHERS IN-LINE CHECK VALVE SHALL BE INSTALLED AT EVERY SEVEN FOOT CHANGE IN ELEVATION OF LATERAL LINES. VALVE SIZE TO MATCH PIPE SIZE.

NOTES:

S SEEDING SHALL OCCUR PRIOR TO RAINY SEASON, USING SEASONAL PRECIPITATION TO GERMINATE AND ESTABLISH PLANTS

VALVE CALLOUT SYMBOL



DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.

REGISTERED LANDSCAPE ARCHITECT
DAVID W. FOOTE
NO. 2117
Signature
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Scale: 1" = 20'-0"

20' 10' 5' 0 20' 40' 60'

revision

Owner: County of San Luis Obispo Department of General Services 1087 Santa Rosa Street San Luis Obispo, California

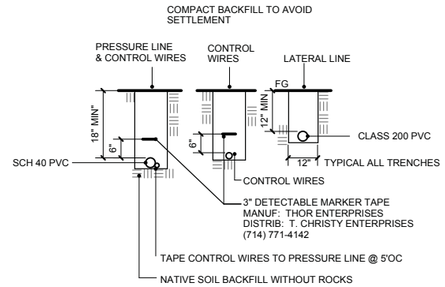
Project: Los Osos Wastewater Project Habitat Management Plan

Sheet Title: Mid-Town & Santa Ysabel Pump Stations Irrigation Plan

firma
Principal: David W. Foote ASLA Registration No. 2117
187 Tank Farm Road, Suite 230 San Luis Obispo, CA 93401
805. 781.1800 fax 805. 781.9853
landscape architecture
planning
environmental studies
ecological restoration

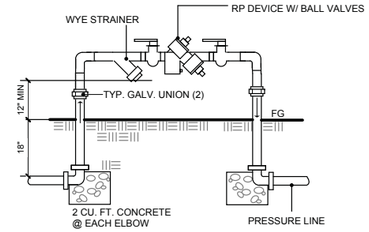
job no. 21035
plan check issue date: 5/12/11
bid set issue date:

SHEET 7 OF SHEETS



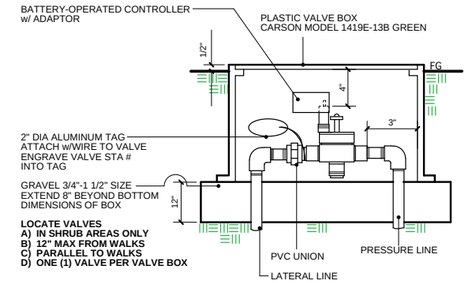
13

12 **TRENCHING**



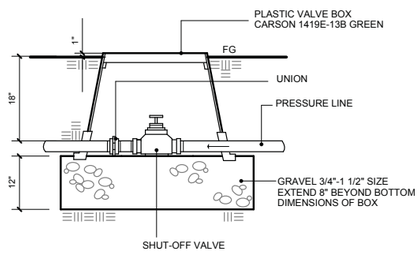
NOTES:
1. ALL PIPE FITTINGAS SHALL BE SCHEDULE 40, GALV. FLANGED STEEL UNLESS OTHERWISE SPECIFIED.
2. DISSIMILAR METALS SHALL BE SEPARATED BY AN APPROVED DIELECTRIC COUPLING.
3. THE BACKFLOW PREVENTER AND INSTALLATIONS SHALL BE APPROVED BY THE LOCAL DEPARTMENT OF HEALTH SERVICES AND WATER AGENCY.

11 **REDUCED PRESSURE BACKFLOW DEVICE**

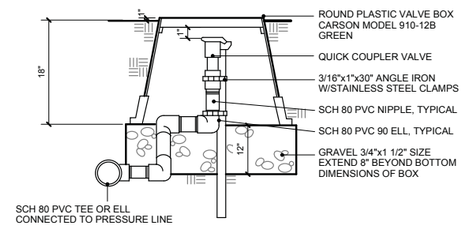


LOCATE VALVES
A) IN SHRUB AREAS ONLY
B) 12" MAX FROM WALKS
C) PARALLEL TO WALKS
D) ONE (1) VALVE PER VALVE BOX

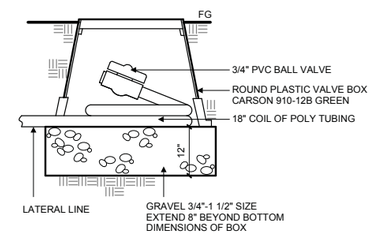
10 **ELECTRIC CONTROL VALVE with CONTROLLER**



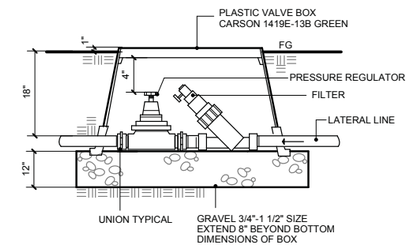
23 **SHUT-OFF VALVE**



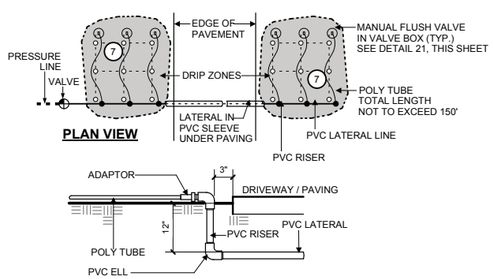
22 **QUICK COUPLER VALVE**



21 **FLUSH VALVE - DRIP**

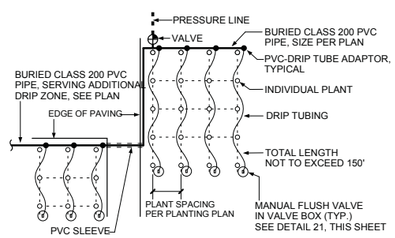


20 **FILTER AND PRESSURE REGULATOR - DRIP**



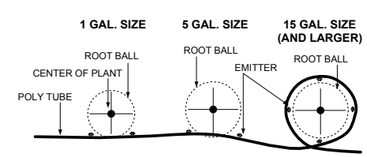
NOTE:
DO NOT RUN POLY TUBING UNDERGROUND.

33 **DRIP ZONE SCHEMATIC**



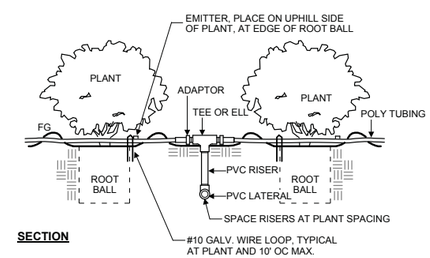
NOTE:
PLACE ENDS OF DRIP TUBE MAX. 3' FROM EDGE OF HARDSCAPE IN VALVE BOX WITH FLUSH VALVE AS SHOWN, TYPICAL.
SEE DETAILS 30 & 31 FOR PLACEMENT OF EMITTERS.

32 **DRIP TUBING LAYOUT SCHEMATIC**

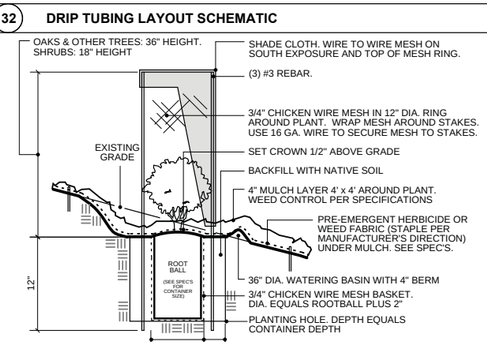


NOTE:
PLACE EMITTER AT EDGE OF ROOTBALL. **DO NOT** PLACE TUBE & EMITTER AGAINST STEM / TRUNK OF PLANT.

31 **DRIP EMITTER PLACEMENT**

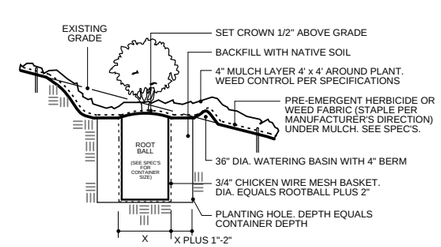


31 **DRIP RISER & TUBING SCHEMATIC**



NOTE:
WEED FABRIC SHALL BE USED ON ALL PLANTINGS WITHIN 50 FEET OF WETLANDS, E.G. POND, CREEK, MARSH ETC., OR OTHER AREAS WHERE THE PRE-EMERGENT HERBICIDE MANUFACTURER SPECIFIES RESTRICTIONS ON USE, UNLESS OTHERWISE SPECIFIED IN THIS DOCUMENT.
INSTALL AT BRODERSON AND GIACOMAZZI SITES

43 42 **TREE, & SHRUB PLANTING WITH EXCLOSURE**



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INSTALL AT MIDTOWN AND PUMP STATION SITES

41 **TREE & SHRUB PLANTING**

DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5,6 & 7 APPLY TO THESE DRAWINGS.

40

revision

Owner:
County of San Luis Obispo
Department of General Services
1087 Santa Rosa Street
San Luis Obispo, California

Project:
Los Osos Wastewater Project
Habitat Management Plan

Sheet Title:
Planting & Irrigation Details

firma
Principal: David W. Foote ASLA
Registration No. 2117
187 Tank Farm Road, Suite 230
San Luis Obispo, CA 93401
805. 781. 9900 fax 805. 781. 9905
landscape architecture
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job no.	21035
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SHEET
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OF SHEETS

Planting Specifications

1. Scope of work: All labor materials tools and the transportation and performance of all the work required as indicated on the drawings and specifications and reasonable incidental to:

   a. Furnish all contract grown plant material & seed.
   b. Eradication of exotic species
   c. Protection of existing vegetation to be undisturbed
   d. Planting trees and shrubs.
   e. Seeding via seed drilling or hydroseeding.
   f. Erosion control netting.
   g. Weed control.
   h. Mulch placement.
   i. Clean up
   j. Establishment period

2. Implementation: The project will be implemented by a qualified restoration contractor. Contractor shall work in coordination with a County-appointed qualified biologist or restoration specialist (Project Biologist) for entirety of project.

3. Verification of job conditions: Contractor shall verify actual job conditions and report any discrepancies between the plans and actual conditions immediately to the County (County of San Luis Obispo), refraining from doing any work in said areas until given approval to do so.

4. Acorn collection: Acorns will be collected in the fall from Coast Live Oak trees in the Los Osos region. Viability of acorns shall be determined per the Habitat Mangement Plan, and only viable acorns shall be planted. Acorns shall be planted in fall on site or in containers per plans, specifications and details.

5. Plant propagation: To the maximum extent feasible propagate all plant material from locally collected seed and vegetative propagules that are appropriate to the habitats and the Los Osos region. All container plants shall be well rooted #1 size containers or tree bands as noted on plant list.

6. Exotic Species Eradication: Prior to the start of construction, all invasive, non-native species shall be identified on each site by the Project Biologist. The most effective method of removal for each species shall be determined and an eradication plan provided by the contractor for the Project Biologist to review. Upon approval from the Project Biologist and the County the Contractor shall implement the eradication plan. Complete die-off is required prior to removal and disposal off site. Planting and seeding shall not occur until Project Biologist verifies complete removal of exotic plants. All herbicide application shall be done by a licensed pesticide operator. All necessary permits shall be the responsibility of the Contractor. All work shall be done in accordance with local and state laws regulating the use of herbicides.

7. Erosion Control Netting for graded areas identified on plan:
   a. RECP Netting (Jute Mesh) Type 'B' , weight shall be 20.6 ounces per square yard with open area of 50%. RECP Netting shall be composed completely of woven coir with tensile strength of 125 pounds per foot under ASTM D5035.
   b. Fasteners shall be 9 gauge 6" U-shaped staples with 6" legs and 1" crown.
   c. RECP Netting shall be rolled from top to bottom of slope secured by fasteners following manufacturer's directions. Netting shall have a minimum 3"overlap with adjacent lengths. Place on slopes of 3:1 or steeper.

8. Vegetation Protection: The Contractor shall preserve and protect all vegetation and trees not designated to be removed in areas where grading and construction are immediately adjacent. Vegetation shall be protected by a 48" orange plastic fencing staked every 10', placed at the dripline. Fencing locations shall be discussed with the Project Biologist prior to installation.

9. Planting procedures for container-grown plants: The Contractor shall excavate planting holes at least 24" diameter. Depth of hole shall be per planting detail. Use only native soil backfill. Do not fertilize. Crowns must be set slightly above the surrounding grade. Space plants as directed by the plans or by the Project Biologist. Completely fill the plant basin with water before mulching and allow to percolate. Fill again with water, percolate, apply weed barrier fabric or pre-emergent herbicide and mulch per note #11 below. Irrigate again in 2 weeks. Provide deep watering at wide intervals to encourage deep rooting, e.g. 30 to 60 days. Do not overwater.

10. Pre-emergent Herbicide: Apply an appropriate pre-emergent herbicide, according to manufacturer's directions, in mulched area around all container plants unless weed barrier is required, as shown on the planting details. Any plant materials showing loss of vigor or health due to improper application of herbicide shall be replaced by the Contractor.

11. Mulch with 4" layer of wood chip mulch extending beyond basin such that a 48" diameter area is mulched at each plant. Mulch should be shredded and composted bark and / or recycled wood product, consisting principally of wood chips and low in composted green waste fines, free from weeds and soil, plastic, metal, and paper debris, and certified free from levels of chlorine, salts or boron in levels that are harmful to plants, ***OR, chipped material stockpiled at Broderson site may be used at the direction of the Project Biologist***. Place mulch in 4 inch minimum layer in all container plant basins and where designated in planting areas. Mulch made from chemically-treated wood (including fertilizers) is not acceptable. Mulch containing walnut, hay, straw, almond hulls or seaweed is also not acceptable.

12. Inspection notice: The Contractor must give 48 hour prior notice to the County when materials or work are ready to be inspected.

13. Grade: Quality and size shall conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Contract grown stock only shall be used.

14. Inspection and substitutions: Plants shall be the species and sizes shown on the plan. No ornamental varieties or cultivars shall be used. No species substitutions will be used without the written approval of the Project Biologist. The Project Biologist shall inspect and approve or reject plant material prior to installation.

15. Shrub and tree planting: Per details on plans and Note #9 above. Notify the County if any obstructions, bedrock or hardpan conditions are encountered.

16. Grass plug planting: Native soil shall be smooth and loose prior to plugging. Make a single deep cut through surface roots on each side and bottom of plug. Drill 1" diameter holes 12" on center slightly less than the depth of plug. Step on planted plug insuring firm contact with soil, water immediately.

17. Hydroseeding: TheProject Biologist must be present to inspect the amounts of materials being mixed and applied and shall reject any materials or work not conforming to the specifications. Mixing time of materials shall not exceed 45 minutes from the time the seed contacts the water until the entire batch is discharged onto the earth.

    a) Repair slopes and Under Jute Mesh: Prepare Batch 1 of slurry using wood fiber mulch at 1000 pounds per acre with seed and water in proportions specified on the plans or herein. Apply this mix to areas designated on plans. Prepare Batch 2 of slurry using wood fiber mulch at 1000 pounds per acre and tackifier at 80 pounds per acre with no seed and water in proportions specified on the plans or herein. Apply this mix over Batch 1.
    b) All other areas identified on plans: Prepare slurry using wood fiber mulch at 2000 pounds per acre with seed and water in proportions specified on the plans or herein.

18. Drill Seeding:
    a) Equipment: Seeding equipment must be a rangeland drill seeder with a ring roller attached. The seeder must be equipped with a fluffy seed box with agitators to prevent bridging and clogging. The seed box must have metal row dividers and individual box adjustment to meter seed flow.
    b) Construction: Drill Seed must be applied as follows:
       1. Drill seed in rows at a maximum distance of 8 inches apart. Drill seed to a depth of 1 inch.
       2. A minimum of 3 passes in different directions with seeding equipment is required to distribute the seed and reduce uniform row appearance.

19. Commencement of establishment period: The establishment period shall begin after all work has been satisfactorily completed and granted final completion notice by the County. The establishment period shall be 12 months. See Performance and Establishment Specifications as well as Habitat Management Plan Report for tasks, and criteria for plant survival and plant health.

Irrigation Specifications

1. Scope of Work: All labor, materials, tools and the transportation and performance of all the work required as indicated on the drawings and specifications and reasonably incidental to:

   a. Connection to water supply.
   b. Backflow device and gate valves.
   c. Irrigation mains, laterals and couplings.
   d. Automatic controllers, electric control valves and wiring.
   e. Quick coupler valves.
   f. Drip irrigation.
   g. All related trenching and backfilling.

2. County of San Luis Obispo shall provide supply of water via a water truck or point of connection from wastewater facilities to establish all container plants.

3. Inspection: Contractor shall notify the Owner 48 hours in advance when each work phase is ready to be inspected.

4. Static Pressure: Contractor shall check static pressure at the irrigation point of connection to the water supply before beginning work and notify Owner in writing of the pressure available.

5. As Built: Contractor shall provide two copies of an "As-Built" plan of the irrigation system prior to final acceptance of work. Both copies shall be provided to the Owner.

6. Guarantee: All work under this section will be guaranteed for a period of one year from the final approval of work. Any damages caused by the irrigation system shall be the responsibility of the Contractor.

7. Piping under paving: All mains and laterals required under paving shall be in PVC sleeves, on a minimum of 6-inch deep sandy base under pipe, prior to paving. Pipe diameter to be two (2x) times pipe size, minimum.

8. Horizontal clearance: All irrigation lines shall have 12 inches of horizontal clearance from lines of other trades.

9. Trench depth: Pressure line minimum depth to be 18 inches. Under paving pressure line shall be 24-inch minimum depth. Lateral line minimum depth to be 12 inches. Under paving lateral line minimum depth shall be 24 inches.

10. Joints: Plastic to plastic joints shall be solvent-weld using solvent and procedures recommended by the pipe manufacturer.

11. Threaded fittings: Teflon tape or "Rector-Seal" soft set pipe dope shall be used on all threaded fittings.

12. Connection of valves: Connect control wires to valves using Rainbird Model ST-03 wire connectors and PT-S5 sealer or equals. Wire should be installed so that a loop encircles the valve. Provide slack so that it can be cut and reconnected if necessary.

13. General: The Contractor shall not allow nor cause any of his work to be covered or enclosed until it has been inspected and approved by the Owner. Should any of his work be enclosed or covered before such inspection or test, he shall uncover the work at his own expense, and after it has been inspected, tested and approved, shall make all repairs with like materials necessary to restore all his work and that of the other contractors to its original condition.

14. Pressure test: After completion of the piping system and prior to backfilling, the entire system shall be thoroughly flushed under pressure to remove dirt, scale or other material from the lines. The pressure lines shall then be tested at full pressure for 2 hours with couplings exposed and pipe sections center loaded. Provisions shall be made to bleed the lines of air. Should any leaks develop, the system shall be retested following repair. The pressure test must be made in the presence of the Owner.

15. Compaction: After the work has been inspected and approved, backfill all trenches with fine earth materials and tamp to 90 per cent compaction. All trenches shall be left flush with adjoining grade in a firm unyielding condition. Flooding of trenches shall not be permitted

16. Drip system: Pressure setting (outflow): Delivery pressure at the pressure reducing device shall be 30 psi, or to allow normal operation of each emitter on the circuit, per manufacturer's specifications.

16. Drip tubing: Maximum drip tubing lateral lengths may not exceed 300 feet from valve. Do not run continuous, winding tube laterals. Lay tubing in parallel lines approximately 5 feet apart, depending on plant spacing, and meander among plants.

17. Remove all excess materials and other debris from the site. Sweep all paved areas of soil, leaves and other material. Rake clean all landscaped areas.

Performance and Establishment Specifications

1. Coastal Development Permit Conditions of Approval: Contractors shall comply with plans, details and specifications to meet requirements of C.O.A. #3 'Habitat Management Plan'(HMP), (c) 'Planting and Invasive /Non-Native Plant Provisions: Except that the mature eucalyptus trees, and the mature cypress trees on the Broderson site shall remain and be managed as part of the HMP, all invasive and/or non-native plant species shall be removed from all restoration and enhancement areas, and native species of local stock appropriate to the habitats and the Los Osos area shall be planted. Seed and/or vegetative propagules shall be obtained from local natural habitats so as to protect the genetic makeup of natural populations.

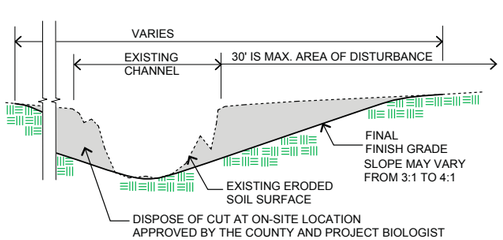
2. Performance Standards
   The restored area will be maintained and managed to meet the following criteria (minimum performance standards):
   + For set out plants, 75% survival at the end of three years, 100% mortality of up to three species within the parameter of 75% survival of total plants is acceptable.
   + For seeded area, minimum 40% cover composition of native grasses and herbaceous plants at the end of three years.
   + Health and vigor: Adequate
   + Exotic species: No more than 5% cover
   + Erosion: Not apparent or minimal

   If an area fails to meet the above stated revegetation standards, corrective actions will be identified in the annual report and enacted by the County prior to the start of field surveys for the next annual report. The determination of the success of the restoration objectives shall be made by the consulting restoration specialist in consultation with the Coastal Commission.

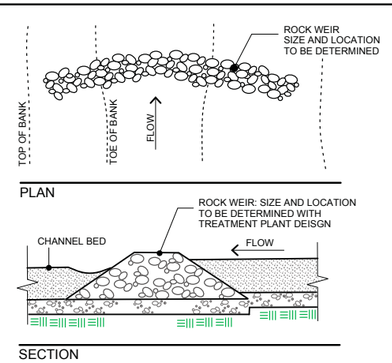
3. Maintenance: Maintenance refers to those activities necessary to ensure that the project objectives are achieved, including: 1) regular removal of invasive, exotic plants before seed is set; 2) revegetation of areas where damage has occurred or plant cover deficiencies are identified, and; 3) prevention of damage to plants from herbivores and human activities.

   During the 12 month establishment/maintenance period the contractor shall 1) apply irrigation as appropriate for prevailing weather conditions and maintain the irrigation system in good repair; 2) perform weed control to guarantee less than 10% non-indigenous plant species; 3) provide re-seeding and/or containers plants installed in a timely manner at the optimal season to guarantee a minimum of 40% of perennial native species in good health and vigor.

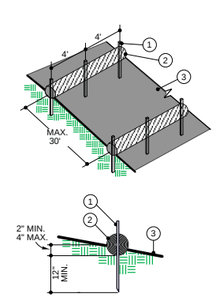
DIRECTIVES AND STANDARDS FROM THE HABITAT MANAGEMENT PLAN REPORT, SECTIONS 4, 5, 6 & 7 APPLY TO THESE DRAWINGS.



43 SCHEMATIC REPAIR OF CHANNEL - GIACOMAZZI AREA 2



42 GRADE CONTROL FOR DRAINAGE CHANNEL - GIACOMAZZI AREA 2



FIBER ROLL NOTES

1. 3/4"x3/4"x24" WOOD STAKE AT 4' ON CENTER
2. PREFABRICATED ROLLS OF BIODEGRADABLE MATERIAL
3. SLOPE VARIES

4. LOCATE ROLLS ON LEVEL CONTOURS.

5. TURN ENDS OF FIBER ROLLS UP SLOPE MIN. OF 2'.

6. ADJACENT ROLLS ON SAME CONTOUR SHALL BE OVERLAPPED A MINIMUM OF 2'.

41 FIBER ROLLS - SKETCH

40

REGISTERED LANDSCAPE ARCHITECT DAVID W. ROOSE NO. 2117 Signature 3-31-12 Expiration Date Date STATE OF CALIFORNIA

revision

Owner: County of San Luis Obispo Department of General Services 1087 Santa Rosa Street San Luis Obispo, California

Project: Los Osos Wastewater Project Habitat Management Plan

Sheet Title: Technical Specilications Erosion Control Details

firma

Principal: David W. Roose ASLA Registration No. 2117 187 Tank Farm Road, Suite 230 San Luis Obispo, CA 93401 805. 781. 5910 fax 805. 781. 5903

landscape architecture planning environmental studies ecological restoration

job no. 21035
plan check issue date: 5/12/11
bid set issue date:

SHEET 9 OF SHEETS

File Name: 1FirmaLos Osos Wastewater HMP (21035) Last Date Modified: 5/12/11

APPENDIX B:
Container Plant and Seed Lists

GIACOMAZZI TREATMENT PLANT SITE
Channel Bank Erosion Repair Areas Total Plants: 870

Container Plant List
Artemisia californica/California Sage
Artemisia douglasiana/Mugwort
Baccharis pilularis/Coyote Brush
Rubus ursinus/California Blackberry
Salvia mellifera/Black Sage

SUNNY OAKS
Facility Screening Total Plants: 48

Container Plant List
Baccharis pilularis/Coyote Brush
Mimulus aurantiacus/Bush Monkey Flower
Myrica californica/Pacific Wax-leaf Myrtle
Prunus ilicifolia/Hollyleaf Cherry
Rhamnus californica/Coffeeberry
Rosa californica/California Rose

MID-TOWN SITE
Percolation Basin and Swale Total Plants: 1,236

Container Plants
Artemisia douglasiana/Mugwort
Carex praegracilis/Field Sedge
Prunus fasciculata punctata/Sand Almond
Rosa californica/California Rose
Rhamnus californica/Coffeeberry

BRODERSON
Leach Field Total Plants: 1,500

Container Plants
Artemisia californica/California Sage
Baccharis pilularis/Coyote Brush
Ceanothus cuneatus var. cuneatus/Buckbrush
Lupinus chamissonis/Dune Bush Lupine
Salvia mellifera/Black Sage

SOLANO
Pump Station Total Plants:38

Container Plant List
Mimulus aurantiacus/Bush Monkey Flower
Myrica californica/Pacific Wax-leaf Myrtle
Prunus ilicifolia/Hollyleaf Cherry
Rhamnus californica/Coffeeberry
Rosa californica/California Rose

EAST YSABEL
Pump Station Total Plants:111

Container Plant List
Mimulus aurantiacus/Bush Monkey Flower
Myrica californica/Pacific Wax-leaf Myrtle
Prunus ilicifolia/Hollyleaf Cherry
Quercus agrifolia/Coast Live Oak
Rhamnus californica/Coffeeberry
Rosa californica/California Rose

TOTAL CONTAINER PLANTS SPECIFIED 3,803

GIACOMAZZI SITE

Seed Mix 1 (Coastal Scrub/Grasses, 6 acres)	PLS Lbs/Acre
Artemisia californica/California Sage	2.00
Baccharis pilularis/Coyote Brush	1.00
Bromus carinatus/California Brome	1.00*
Leymus condensatus/Giant Rye	1.00*
Lotus scoparius/Deerweed	3.00
Mimulus aurantiacus/Bush Monkey Flower	0.01*
Nassella pulchra/Purple Needlegrass	1.00*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

Seed Mix 2 (Coastal Scrub/Riparian repair areas, 2.5 acres)	PLS Lbs/Acre
Artemisia californica/California Sage	2.00
Artemisia douglasiana/Mugwort	2.50
Baccharis pilularis/Coyote Brush	0.50
Distichlis spicata/Saltgrass	0.25*
Leymus condensatus/Giant Rye	1.00*
Leymus triticoides/Beardless Wildrye	1.00*
Lotus scoparius/Deerweed	3.00
Mimulus aurantiacus/Bush Monkey Flower	0.02*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

BRODERSON/SOLANO/EAST YSABEL SITES

Seed Mix 3 (Coastal Dune Scrub/Maritime Chaparral, 10.5 acres)	PLS Lbs/Acre
Achillea millefolium/Yarrow	2.00
Artemisia californica/California Sage	0.50
Baccharis pilularis/Coyote Brush	0.05
Ericameria ericoides/Mock Heather	1.50
Eriogonum parvifolium/Sea-cliff Buckwheat	1.50
Eriophylum staechadifolium/Coastal Golden Yarrow	1.50
Helianthemum scoparium/Rushrose	0.50*
Isocoma menziesii/Coast Goldenbush	2.00
Lotus scoparius/Deerweed	3.00
Lupinus chamissonis/Dune Bush Lupine	2.50
Mimulus aurantiacus/Bush Monkey Flower	0.02*
Salvia mellifera/Black Sage	2.00

*or as much as can be feasibly obtained within the approved collection area

MID-TOWN SITE

Seed Mix 4 (Coastal Dune Scrub Upland Areas, 4.8 acres)	PLS Lbs/Acre
Achillea millefolium/Yarrow	2.50
Artemisia californica/California Sage	2.75
Baccharis pilularis/Coyote Brush	0.75
Ericameria ericoides/Mock Heather	3.75
Eriogonum parvifolium/Sea-cliff Buckwheat	3.25
Eriophylum staechadifolium/Coastal Golden Yarrow	1.75
Lotus scoparius/Deerweed	7.50
Lupinus chamissonis/Dune Bush Lupine	3.50
Salvia mellifera/Black Sage	3.00

Seed Mix 5 (Coastal Dune Scrub Percolation Basin & Swale, 3.1 acres)	PLS Lbs/Acre
Artemisia douglasiana/Mugwort	3.50
Baccharis pilularis/Coyote Brush	0.75
Eriophylum staechadifolium/Coastal Golden Yarrow	1.75
Isocoma menziesii/Coast Goldenbush	4.25
Lotus scoparius/Deerweed	7.50

TOTAL NATIVE SEED REQUIREMENT (approx) 471 lbs

APPENDIX C:
Monitoring Methods and Forms

D. Daubenmire Method

1. *General Description* The Daubenmire method consists of systematically placing a 20- x 50-cm quadrat frame along a tape on permanently located transects (see Figure 4 on page 13). The following vegetation attributes are monitored using the Daubenmire method:

   - Canopy cover
   - Frequency
   - Composition by canopy cover

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is applicable to a wide, variety of vegetation types as long as the plants do not exceed waist height.

3. *Advantages and Limitations* This method is relatively simple and rapid to use. A limitation is that there can be large changes in canopy cover of herbaceous species between years because of climatic conditions, with no relationship to the effects of management. In general, quadrats are not recommended for estimating cover (Floyd and Anderson 1987; Kennedy and Addision 1987). This method cannot be used to calculate rooted frequency.

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form Appendix A)
   - Daubenmire forms (see Illustration 9 and 10)
   - Hammer
   - Permanent yellow or orange spray paint
   - Two stakes: 3/4 - or 1-inch angle iron not less than 16 inches long
   - Tape: 100- or 200-foot, delineated in tenths and hundreds, or a metric tape of the desired length.
   - Steel pins (reinforcement bar) for marking zero, mid, and end points of the transect
   - Frame to delineate the 20- x 50-cm quadrats (see Illustration 11)
   - Compass
   - Steel post and driver

5. *Training* The accuracy of data depends on the training and ability of the examiners. Examiners must be able to identify the plant species. They must receive adequate and consistent training in laying out transects and making canopy coverage estimates using the frame.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data (see Section III).

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a

single ecological site. Transects and sampling points need to be randomly located within the critical or key areas (see Section III).

b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

c **Number of Studies** Establish a minimum of one study on each study site; establish more if needed (see Section II.D and III.B).

d **Study Layout** Data can be collected using the baseline, macroplot, or linear study designs described in Section III.A.2 beginning on page 8. The linear technique is the one most often used.

(1) Align a tape (100-, or 200-foot, or metric equivalent) in a straight line by stretching it between the transect location and the transect bearing stakes. Do not allow vegetation to deflect the alignment of the tape. A spring and pulley may be useful to maintain a straight line. The tape should be aligned as close to the ground as possible.

(2) Drive steel pins almost to the ground surface at the zero point on the tape and at the end of the transect. A pin may also be driven into the ground at the midpoint of the transect. (see Figure 4 on page 13)

e **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

f **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (See Appendix B).

g **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

a **Cover Classes** This method uses six separate cover classes (Daubenmire 1959). The cover classes are:

Cover Class	Range of Coverage	Midpoint of Range
1	0 - 5%	2.5%
2	5 - 25%	15.0%
3	25 - 50%	37.5%
4	50 - 75%	62.5%
5	75 - 95%	85.0%
6	95 - 100%	97.5%

b **Ten Cover Classes** Where narrower and more numerous classes are preferred, a ten-cover class system can be used.

c **Collecting Cover Data** As the quadrat frame is placed along the tape at the specified intervals, estimate the canopy coverage of each plant species. Record the data by quadrat, by species, and by cover class on the Daubenmire form (see Illustration 9). Canopy coverage estimates can be made for both perennial and annual plant species.

(1) Observe the quadrat frame from directly above and estimate the cover class for all individuals of a plant species in the quadrat as a unit. All other kinds of plants are ignored as each plant species is considered separately.

(2) Imagine a line drawn about the leaf tips of the undisturbed canopies (ignoring inflorescence) and project these polygonal images onto the ground. This projection is considered "canopy coverage." Decide which of the classes the canopy coverage of the species falls into and record on the form.

(3) Canopies extending over the quadrat are estimated even if the plants are not rooted in the quadrat.

(4) Collect the data at a time of maximum growth of the key species.

(5) For tiny annuals, it is helpful to estimate the number of individuals that would be required to fill 5% of the frame (the 71- x 71-mm area). A quick estimate of the numbers of individuals in each frame will then provide an estimate as to whether the aggregate coverage falls in Class 1 or 2, etc.

(6) Overlapping canopy cover is included in the cover estimates by species; therefore, total cover may exceed 100 percent. Total cover may not reflect actual ground cover.

9. *Calculations* Make the calculations and record the results in the appropriate columns on the Daubenmire form (see Illustrations 9 and 10).

a **Canopy Cover** Calculate the percent canopy cover by species as follows:

(1) On the Daubenmire form (Illustration 9) count the number of quadrats in each of the six cover class (by species) and record in the Number column on the Daubenmire Summary form (Illustration 10).

(2) Multiply this value times the midpoint of the appropriate cover class (Illustration 10).

(3) Total the products for all cover classes by species.

(4) Divide the sum by the total number of quadrats sampled on the transect.

(5) Record the percent cover by species on the form.

b Frequency Calculate the percent frequency for each plant species by dividing the number of occurrences of a plant species (the number of quadrats in which a plant species was observed) by the total number of quadrats sampled along the transect. Multiply the resulting value by 100. Record the percent frequency on the form (Illustration 10).

c Species Composition With this method, species composition is based on canopy cover of the various species. It is determined by dividing the percent canopy cover of each plant species by the total canopy cover of all plant species. Record the percent composition on the form (Illustration 10).

10. *Data Analysis*

Tests should be directed at detecting changes in cover of the species and/or in major ground cover classes. Tests for changes in minor species will have low power to detect change. If quadrats are spaced far enough apart on each transect so as to be considered independent, the quadrat can be analyzed as the sampling unit. Otherwise, the transects should be considered the sampling units. If the transects are treated as the sampling unit, and given that the transects are permanent, either the paired t-test or the nonparametric Wilcoxon signed rank test should be used to test for change between two years. Repeated measures ANOVA can be used to test for differences between 3 or more years. If the quadrats are treated as the sampling units, care must be taken to ensure they are positioned the same along each transect in each year of measurement. A paired t-test, Wilcoxon signed rank test, or ANOVA is then used as described above for transects.

11. *References*

Daubenmire, Rexford. 1959. A Canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.

——— 1968. Plant communities: a textbook of plant synecology. Harper and Row, New York. 300 p.

USDI, Bureau of Land Management. 1985. Rangeland monitoring - Trend Studies TR4400-4.

Daubenmire

Page ____ of _____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Transect Number and Location	Number of Quadrats

Plant Species	Quadrat																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Plant Species	Quadrat																								
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

Illustration 9

Daubenmire

Page 1 of 1

Study Number 035-27W-08-02 | Date 7/24/95 | Examiner Chuck Wagon | Allotment Name & Number Quaking Aspen - 10373 | Pasture Sheep Creek

Transect Number and Location 3 miles north of Eagle Creek on the west side of the road | Number of Quadrats 50

Plant Species	Quadrat 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
AGSP	2		1		2				1				2			3		4					3	1	
PONE	1					2	3												4		1			2	
ORHY		3																							
STTH2				1	1					3													1		
SIHY								1																	
BRTE										1		1								1				1	
PHHO														2								1	2		
CRAC 2												1									1	1			
ASTER												2													
ARTR 2														3	3			4				4			
CHVI 8													4											3	

Plant Species	Quadrat 26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
AGSP			1							1	2				1			2	1		1	1	1		
PONE								2			1			1	3					1					
ORHY						1																		1	
STTH2					3																2				
SIHY					1																				
BRTE												1	2										1		
PHHO							1									1							1		
ASTER							1	1			2									1					
ARTR 2		4							4		4	4			1				2			2			
CHVI 8				3	3			5						2		2			4						

Illustration 9

Daubenmire Summary

Page ____ of _____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Study Location	Number of Quadrats

Cover Class	Mid-Point	Species		Species		Species		Species		Species		Species		Species		Species		Species		Species		Species	
		Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product
1 1-5%	2.5																						
2 5-25%	15																						
3 26-50%	37.5																						
4 51-75%	62.5																						
5 76-95%	85																						
6 96-100%	97.5																						
Total canopy																							
Number of Samples																							
% canopy cover																							
Species composition																							
Frequency																							

Illustration 10

Daubenmire Summary

Page 1 of 1

Study Number	Date	Examiner	Allotment Name & Number	Pasture
035-27W-08-02	7/24/95	Chuck Wagon	Quaking Aspen 11037	Sheep Creek

Study Location: Three miles north of Eagle Tank on the west side of road.

Number of Quadrats: 50

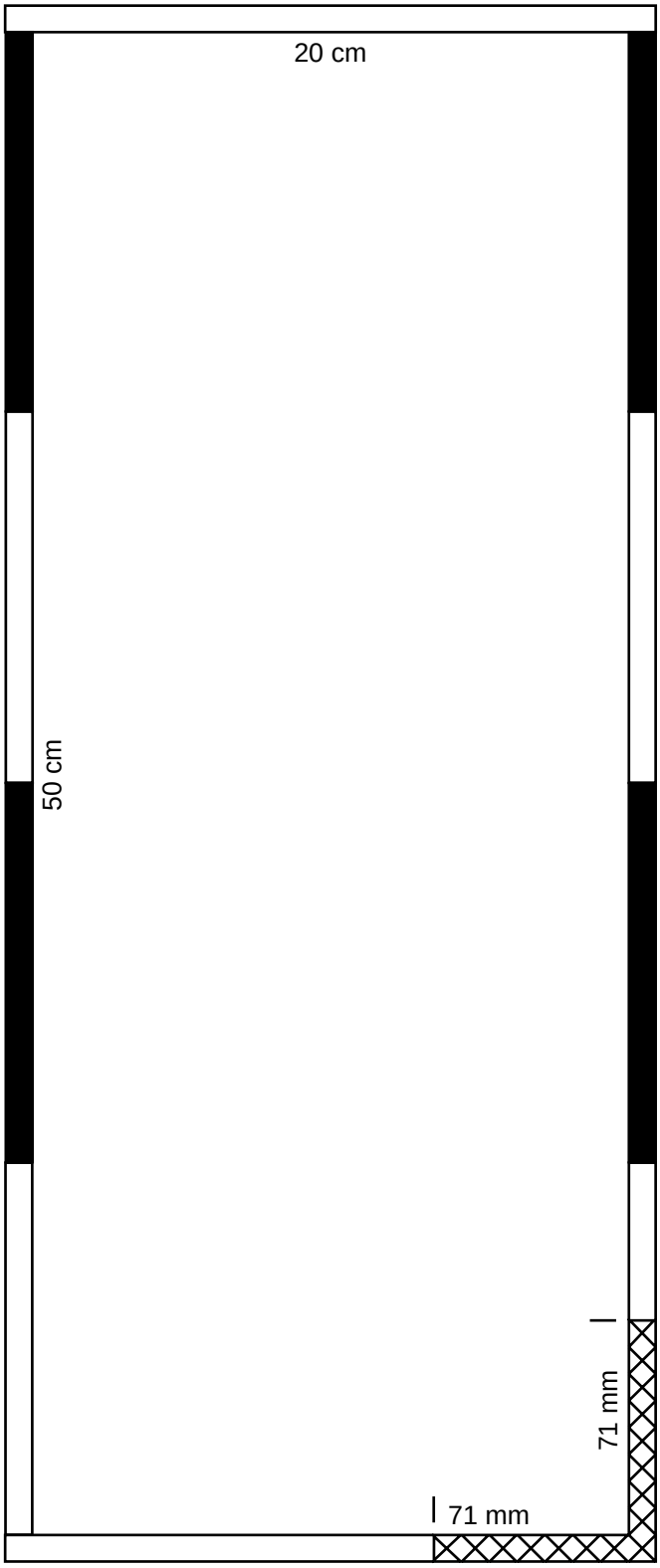
Cover Class	Mid-Point	Species AGSP		Species PONE		Species ORHY		Species STTH2		Species SIHY		Species BRTE		Species PHHO		Species CRAC2		Species Aster		Species ARTR2		Species CHIV8	
		Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product
1 1-5%	2.5	10	25	5	12.5	2	5	3	7.5	2	5	6	15	4	10	3	7.5	3	7.5	1	2.5		
2 5-25%	15	5	75	3	45			1	15			1	15	2	30			2	30	2	30	2	30
3 26-50%	37.5	2	75	2	75	1	37.5	2	75											2	75	3	112.5
4 51-75%	62.5	1	62.5	1	62.5															6	375	2	125
5 76-95%	85																					1	85
6 96-100%	97.5																						
Total canopy			237.5		195		42.5		97.5		5		30		40		7.5		37.5		482.5		352.5
Number of Samples			50		50		50		50		50		50		50		50		50		50		50
% canopy cover			5		4		1		2		—		1		1		—		1		10		7
Species composition			16		13		3		6		—		3		3		—		3		31		22
Frequency			36		22		6		12		4		14		12		6		10		22		16

Illustration 10

Rangeland Monitoring

Daubenmire Frame

Six Cover Class Frame



The frame is made of 3/8-inch iron rod. The inside dimensions of the frame are 20 x 50 centimeters. The frame should have sharpened legs 3 centimenters long welded to each corner to help hold the frame in place.

The six cover class frame is divided into fourths by painting alternate sections of the frame different colors as illustrated. Use orange and white or red and white paint.

In one corner of the frame, delineate two sides of an area 71 millimeters square as illustrated. This area represents 5% of the quadrat area.

The painted design provides visual reference areas equal to 5, 25, 50, 75, 95, and 100% of the plot area.

Illustration 11

E. Line Intercept Method

1. *General Description* The Line Intercept method consists of horizontal, linear measurements of plant intercepts along the course of a line (tape). It is designed for measuring grass or grass-like plants, forbs, shrubs, and trees. The following vegetation attributes are monitored with this method:

   - Foliar and basal cover
   - Composition (by cover)

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is ideally suited for semiarid bunchgrass-shrub vegetation types.

3. *Advantages and Limitations* The Line Intercept method is best suited where the boundaries of plant growth are relatively easy to determine. It can be adapted to sampling varying densities and types of vegetation. It is not well adapted, however, for estimating cover on single-stemmed species, dense grassland situations, litter, or gravel less than 1/2 inch in diameter. It is best suited to estimating cover on shrubs.

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form (see Appendix A)
   - Line Intercept form (see Illustration 12)
   - Hammer
   - Permanent yellow or orange spray paint
   - Two stakes: 3/4 - or 1-inch angle iron not less than 16 inches long.
   - Two tapes: 100- or 200-foot, delineated in tenths and hundredths, or a metric tape of the desired length
   - Compass
   - Steel post and driver

5. *Training* A minimum of training is needed to make sure the examiners understand how to lay out baselines and transects and how to make the measurements. The examiner must also be able to identify the plant species.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data (see Section III).

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas (see Section III).

b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

c **Number of Transects** Establish the minimum number of transects to achieve the desired level of precision for the key species in each study site (see Section III.B).

d **Length of Transect** The length of a transect is based on the density and homogeneity of the vegetation. If the vegetation is sparse, a longer transect is needed. Transects may be any length (eg. 100 feet, 200 feet, or even longer).

e **Study Layout** Line Intercept data can be collected using either the baseline or linear study design described in Section III.A.2 beginning on page 8. The baseline technique is the recommended study design.

(1) The study location stake is placed at the beginning of the baseline. After determining the bearing of the study, a stake is placed at the end of the baseline. Transects are run perpendicular to and at random distances along the baseline. Transect location stakes are placed at the beginning and end of each transect. The distance between the stakes dependents on the length of the transect. The height of the stakes depends on the height of the vegetation. (Directions for randomly selecting the location of transects to be run off of a baseline using random number tables are given in Appendix D).

Transect location stakes may be left in place as permanent markers or removed at the conclusion of the study. Permanently marking transects will result in greater power to detect change.

(2) Stretch the transect tapes between stakes as close to the ground as possible, with the zero point of the tape aligned on the baseline (the beginning point of the transect). Do not allow vegetation to deflect the alignment of the tape.

f **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

g **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground. (see Appendix B).

h **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

Proceed down the tape stretched along the transect line and measure the horizontal linear length of each plant that intercepts the line. Measure grasses and grass-like

plants, along with rosette-forming plants, at ground level. For forbs, shrubs, and trees, measure the vertical projection of the foliar cover intercepting one side of the tape. Be sure not to inadvertently move the tape to include or exclude certain plants. If the measurements are made in 10ths and 100ths of feet, the totals are easily converted to percentages. The measurements are recorded by species on the Line Intercept form (Illustration 12).

9. *Calculations* Make the calculations and record the results on the Line Intercept form (see Illustration 12).

a Cover

(1) Calculate the percent cover of each plant species by totaling the intercept measurements for all individuals of that species along the transect line and convert this total to a percent.

(2) Where the measurements are made in 10ths and 100ths of feet along a 100-foot transect, the totals for each species are the cover percentages.

(3) Calculate the total cover measured on the transect by adding the cover percentages for all the species. This total could exceed 100% if the intercepts of overlapping canopies are recorded.

b Composition With this method, species composition is based on the percent cover of each species. Calculate percent composition by dividing the percent cover for each plant species by the total cover for all plant species.

10. *Data Analysis* It is important to realize that each transect is a single sampling unit. For trend analysis permanent sampling units are suggested. If permanent transects are monitored, use the appropriate paired analysis technique. Use either a paired t-test or the nonparametric Wilcoxon signed rank test when testing for change between years. When comparing more than two sampling periods, use repeated measures ANOVA. If the transects are not permanently marked, use the appropriate nonpaired test.

11. *References*

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Line Intercept

Page ____ of _____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Line Length	Transect Location

NOTES (Use other side or another page, if necessary)	Grass Species							Forb Species						Shrub Species					NOTES
																			Totals
Totals																			
% Cover																			
% Comp																			100%

Illustration 12

Line Intercept

Page 1 of 1

Study Number 12N-37W-19-03	Date 10/3/95	Examiner Jack Straw	Allotment Name & Number Cow Gulch 20111	Pasture

Line Length 100 feet

Transect Location 3 miles east of Potter's Corral on north side of road.

NOTES (Use other side or another page, if necessary)	Grass Species							Forb Species						Shrub Species					NOTES
	BOCU	BOGR2	BOHI2	KOCR	SIHY			HYRI	PSORA	COWR2				CEGR	JUNIP				
100 ft. tape	.42	.10	.32	.11	.06			.52	2.04	.55				3.40	.06				
	.20	.02	.25	.02	.02			.46	1.32	.22				.13	2.13				
	.26	.03	.05	.12	.02			1.47	.59					4.90	.07				
	.03	.01		.08	.04			.28	3.30					.72	.02				
	.17	.10			.05			.80	.07					.14					
	.26	.29			.26			.05						1.02					
	.22	.24			.04														
	.22	.14			.03														
	.34	.10			.01														
	.32	.17			.19														
	.02	.12			.02														
	.02	.18			.35														
	.10	.13																	
	.02	.14																	
	.16	.04																	
	.18	.16																	
	.10	.05																	
	.14	.27																	
	.06	.03																	
	.03	.46																	
	.04	.07																	
	.10	.38																	
	.02	.12																	
	.03	.10																	
	.02	.11																	
	.16	.03																	
		.36																	
		.68																	
																			Totals
Totals	3.64	4.63	.62	.33	1.09			3.58	7.32	.77				10.31	2.28				
% Cover	4	5	1	0	1			4	7	1				10	2				
% Comp	11	14	3	—	3			11	20	3				29	6				100%

Illustration 12

F. Step-Point Method

1. *General Description* The Step-Point Method involves making observations along a transect at specified intervals, using a pin to record cover "hits." It measures cover for individual species, total cover, and species composition by cover.

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is best suited for use with grasses and forbs, as well as low shrubs. The greater the structure to the community, the more difficult it becomes to determine "hits" due to parallax, observer bias, wind, etc. This method is good for an initial overview of an area not yet subjected to intensive monitoring.

3. *Advantages and Limitations* This method is relatively simple and easy to use as long as careful consideration is given to the vegetation type to which it is applied. It is suitable for measuring major characteristics of the ground and vegetation cover of an area. Large areas can easily be sampled, particularly if the cover is reasonably uniform. It is possible to collect a fairly large number of samples within a relatively short time.

   A limitation of this method is that there can be extreme variation in the data collected among examiners when sample sizes are small. Tall or armored vegetation reduces the ability to pace in a straight line, and the offset for obstructions described in the procedures adds bias to the data collection by avoiding certain components of the community. Another limitation is that less predominant plant species may not be hit on the transects and therefore do not show up in the study records. The literature contains numerous studies utilizing point intercept procedures that required point densities ranging from 300 to 39,000 in order to adequately sample for minor species. One major consideration in the use of this method is to assure that a sharpened pin is used and that only the point is used to record "hits." Pins have finite diameters and therefore overestimate cover (Goodall 1952). Another limitation of this method is that statistical analysis of the data is suspect unless two and preferably more transects are run per site (see Section III - Study Design and Analysis).

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form (see Appendix A)
   - Cover Data form (see Illustration 13)
   - Permanent yellow or orange spray paint
   - Tally counter (optional)
   - One stake: 3/4- or 1-inch angle iron not less than 16 inches long
   - 3-foot long, 3/16th-inch diameter sharpened pin
   - Compass
   - Steel post and driver

5. *Training* A minimum amount of training is needed for this method. Examiners must be able to identify the plant species, be familiar with the ground-level cover

categories, know how to collect canopy or foliar cover data, and know how to collect cover data using a pin and notch in the boot.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data.

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas. (see Section III).

   b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

   c **Number of Transects** Establish the minimum number of transects to achieve the desired level of precision (see Section III.B).

   d **Study Layout** Data can be collected using either the baseline or linear study designs described in Section III.A.2 beginning on page 8. The linear technique is the one most often used.

   e **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

   f **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (see Appendix B).

   g **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

   a **Running a Transect** Determine the transect bearing and select a prominent distant landmark such as a peak, rocky point, etc., that can be used as the transect bearing point.

      (1) Start a transect by randomly selecting a point along the transect bearing and reading the first hit (observation point).

      (2) Read hits at specified intervals by placing the heel of the boot on the ground with the sole of the boot at a 30-degree angle to the ground. Place the pin into the 3/16th inch wide by 1/8th inch deep notch in the toe of

the boot and vertically lower the pin until it either intersects an herbaceous plant or the ground for the specified number of hits. It is recommended that the interval be a minimum of 5 paces. To lengthen the transect, increase the distance between hits (10 paces, 20 paces, etc.).

(3) When obstructions such as juniper trees, cholla cactus, or ledge rock, etc., are encountered, sidestep at 90° from the transect line and continue pacing parallel to the transect to avoid the obstructions. Return to the original transect line as soon as possible by sidestepping at 90° in the opposite direction. Continue pacing along the transect bearing. If the obstruction (juniper tree, cholla cactus, or ledge rock) is determined to be a highly important component of the community, this information can be recorded qualitatively on the back of the form.

(4) In most cases, do not count hits along portions of a transect that have been unnaturally disturbed, such as roads or trails. When such areas are encountered, proceed three paces past the disturbance before resuming the reading of hits along the transect line.

b Collecting Cover Data At each observation point, identify the ground level or basal hit with the point of the pin and record the data by dot count tally by category and/or plant species code in the appropriate section of the Cover Data form (see Illustrations 13 and 14). If there is a vegetation canopy layer, lower the pin through the vegetation until a basal or ground level hit is determined. Record the basal or ground level hit and any subsequent vegetation layers that intersect the pin. For vegetation structure above 3-feet (length of pin), a visual observation of plant intercepts above the notch in the boot can be made and recorded as additional canopy or foliar level hits on the data form.

(1) ***Ground-level or basal hits***

(a) Ground-level hits (excluding basal vegetation hits) will fall into four cover categories. They can be redefined and/or additional categories added, depending on the data needed. The four categories are:

L - Litter

B - Bare ground

G - Gravel (particle sizes between 1/12 inch and 10 inches)

S - Stone (greater than 10 inches)

(b) Record the ground-level hits by dot count tally by ground-level cover category in the Ground-Level Cover section of the form, except where there are ground-level and, basal or canopy cover hit combinations. In this situation, use the Basal and Canopy/Foliar Cover section of the form.

(c) Basal hits on live vegetation are identified by species (includes mosses and lichens more than 1/16 inch thick). To count as a basal hit on live vegetation, the plant crown at or below a l-inch height above the ground MUST be intercepted by the pin.

(d) Enter the appropriate plant species code in the Basal or Ground-Level Column in the Basal and Canopy/Foliar Cover section of the form.

(e) Enter a dot count tally for each basal hit on a species in the Dot Count Column in the Basal and Canopy/Foliar Cover section of the form when the plant species code is first entered on the form. Enter an additional dot count tally each time there is a basal hit on that species on the transect, except where there are basal and canopy/foliar cover hit combinations.

(2) ***Ground-level or basal and canopy/foliar cover hit combinations***

(a) Identify the ground-level or basal hit, as well as any canopy cover hit(s) below 3 feet in height, intercepted at each point by the pin. For canopy cover above 3 feet, use line-of-sight observations directly perpendicular to the notch in the boot.

(b) Enter the appropriate ground-level cover category code and/or plant species code for each level of hit (up to four levels) in the appropriate columns in the Basal and Canopy/Foliar Cover section of the form (see Illustration 13).

(c) Enter a dot count tally for each ground-level or basal and canopy/foliar cover hit combination when it is first entered on the form and each time this same combination is encountered on the transect.

(d) Enclose plant species codes for vegetation cover hits more than 20 feet above ground level in brackets [ ].

9. *Calculations* Calculate the percent cover for each cover category by dividing the number of hits for each category by the total number of hits for all categories, including hits on vegetation.

a Ground Cover Ground cover is determined by dividing the total number of hits for all categories except bare ground by the total number of hits (including bare ground).

b Canopy/Foliar Cover Canopy/Foliar cover is determined by dividing the total number of hits on vegetation (includes all basal and canopy/foliar hits) by the total number of hits.

c Basal Cover Basal cover is determined by dividing the number of basal hits by the total number of hits.

10. *Data Analysis*

a When transects are the sampling units: For trend analysis, permanent sampling units are suggested. If permanent transects are monitored, use the appropriate paired analysis technique to compare change in average cover by species and cover class. When comparing more than two sampling periods, use repeated

measures ANOVA. If the transects are not permanently marked, use the appropriate nonpaired test.

b When points are the sampling units: To determine if the change between sampling periods is significant, use Chi Square analysis of variance for cover data.

11. References

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Cover Data

Study Number	Date	Examiner	Pasture

Allotment Name & Number	Study Location	Number of Points

Ground-Level Cover

Category	**B** Bare Ground	**L** Litter	**G** Gravel (2mm-10")	**S** Stone (>10")	Vegetation	Total
Dot Count						
Total Hits						
% Cover						

Basal and Canopy/Foliar Cover

Bsl or Grnd-Lev	Level 1	Level 2	Level 3	Dot Count	Total Hits
				Total	

Notes (use other side or another page)

Cover Data

Study Number	Date	Examiner	Pasture
Red Feather #2	9/28/95	Josh Gibson	1

Allotment Name & Number	Study Location	Number of Points
Red Feather 11473	Two miles south of Headquarters Well on west side of road.	100

Ground-Level Cover

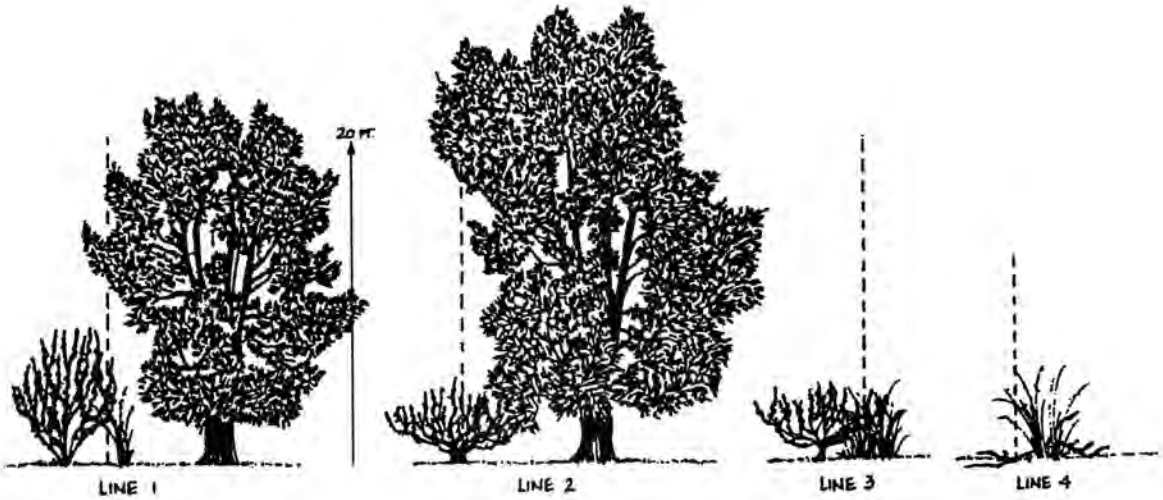
Category	B Bare Ground	L Litter	G Gravel (2mm-10")	S Stone (>10")	Vegetation	Total
Dot Count	⊠	⊠ :	⊠ ⊢ :	:		39
Total Hits	9	12	16	2	61	100
% Cover	9	12	16	2	61	100

Basal and Canopy/Foliar Cover

Bsl or Grnd-Lev	Level 1	Level 2	Level 3	Dot Count	Total Hits
L	BOCU			⊠ :	12
G	BOGR 2	D	[JUNIP]	•	1
BOGR 2	Junip			⊠ ⊠	20
G	BOCU			: :	4
SIHY				:	2
L	ERIOG			:	2
G	SIHY	RHTR		:	2
B	VIGUI			:	2
G	L	VIGUI		: :	4
B	BOCU			:	2
B	BOHI 2			: •	3
L	BOGR 2	BOCU		:	2
BOCU	L			:	2
OPUNT				•	1
BOGR 2	BOCU			:	2
				Total	61

Notes (use other side or another page)

Diagrammatic Sketches of Sample Units (Hits) and Recording Procedures



The data from the above illustrated sample units (hits) are recorded on the Cover Data Form as follows:

	BASAL and FOLIAR			
	BSL or grnd-lev	Foliar-level 1	Foliar-level 2	Foliar-level 3
Line 1 —	B	AGSP	PUTR 2	PIED
Line 2 —	ARTR 2	[PIED]		
Line 3 —	AGSP	CHNA 2		
Line 4 —	L	AGSP		

Note — To count as a basal hit on live vegetation, the plant crown at or below a 1-inch height above the ground must be intercepted by the pin.

— Dead vegetation in the canopy is counted as litter.

— Enclose plant species codes for vegetation cover hits more than 20 feet above ground level in brackets [ ].

Illustration 14

APPENDIX D:
Weed Species Removal and Management Methods

Bermuda buttercup (*Oxalis pes-caprae*)

Perennial
Reproduce via bulblets and stem runners
Control: Combination of physical removal and herbicide (Glyphosate with surfactant) application before flowering (later winter). First remove top growth and bulblets by sifting soil. Then spray emerging plants with herbicide monthly during growing season (after fall rains through late spring). Monitor site monthly November through May for three years, spraying newly emerging plants.

Bermuda grass (*Cynodon dactylon*)

Perennial grass, warm-season
Reproduce via seed and rhizomes
Control: Herbicide (2% solution of Glyphosate) application in Spring and Fall (when plants in full bloom) using a hand sprayer. Monitor site monthly during warm season for one to five years, spot spray and mulch.

Bristly ox-tongue (*Picris echioides*)

Annual (winter or summer), at times biennial or perennial
Reproduce via seed
Control: Physical removal including 2" of tap root before flowering in April. Monitor area March through June for 5 years, pulling seedlings.

Giant reed (*Arundo donax*)

Perennial grass
Reproduce via rhizomes and plant fragments
Control: <u>Option 1:</u> Herbicide (50 to 75% 'Rodeo') application on cut culms within 5 minutes of cutting in the Fall. Monitor site monthly during growing season for one year, spot spray all new growth. Burn all debris.
<u>Option 2:</u> Remove all surface vegetation and roots physically. Monitor site monthly during growing season for one year, spot spray new growth with herbicide (1.5% Glyphosate + 0.5% non-ionic surfactant). Burn all debris.

Poison hemlock (*Conium maculatum*)

Biennial, perennial at times
Reproduce via seed
Control: <u>Option 1:</u> Physically remove rosettes and mature plants In April or May, before setting seed. Monitor site for three years in late Spring, pulling seedlings.
<u>Option 2:</u> Herbicide (2,4 D ester, 2,4 D amine, or glyphosate plus surfactant) application in late Spring. Monitor site for three years in late Spring spraying or pulling seedlings.

Ice plant (*Carpobrotus* sp.)

Succulent Perennial
Reproduce via seed and vegetatively, rooting at any node contacting soil
Control: Option 1: Physically remove all live shoot segments. Monitor site monthly for one year, pulling all resprouts.
Option2: Herbicide (2% glyphosate with 1% surfactant) application any time of the year. Monitor site monthly for one year, spraying resprouts.

Italian thistle (*Carduus pycnocephalus*)

Annual
Reproduce via seed
Control: Option 1: Physical removal of plant and root 4" deep, in mid Spring before seeds set. Monitor every 6 months for up to 10 years, pull seedlings.
Option 2: Herbicide application in mid Spring before seeds set. A variety of herbicides are effective. Monitor every 6 months for up to 10 years, spraying or pulling seedlings.

Mustard (*Hirschfeldia, Brassica*)

Biennial, perennial at times
Reproduce via seed
Control: Physically remove plants below root crown in mid Spring. Monitor site every 6 months for up to 5 years, pulling seedlings.

Sweet fennel (*Foeniculum vulgare*)

Perennial herb
Reproduce via seed and root crown
Control: Prior to removal cut and bag flower heads to remove seeds from site.
Option 1: Herbicide application in early spring with growth of flowering stems. Use of triclopyr at 6 lbs/100 gallons of water (1 lb. of active ingredient per acre is most effective). Monitor site every 6 months for up to 5 years, spraying or pulling seedlings.
Option 2: Physical removal of plants, including 6" below base of root crown. Removal just prior to seed set, mid Spring is most effective. Monitor site every 6 months for up to 5 years, spray or pull seedlings. Combining options 1 & 2 is most effective for large stands.

Veldt grass (*Ehrharta calycina*)

Perennial Grass
Reproduce via seed and occasionally from rhizomes
Control: Application of grass-specific herbicide (Arrow 2EC is recommended, Fusilade is also effective), with surfactant, when grass is actively growing, after fall rains through May, or to new clump growth following mechanical treatment to reduce dead material (weedwhacker). Follow up applications over several years will be necessary to remove resprouts and seedlings.

Wild radish (*Raphanus sativus*)

Annual, perennial at times
Reproduce via seed
Control: Physically remove plants below root crown in mid Spring.
Monitor site every 6 months for up to 5 years, pulling seedlings.

SPECIES	MONITOR TIME	MOST EFFECTIVE SEASON OF REMOVAL	REMOVAL METHOD
Bermuda Buttercup	3 years Nov-May monthly	Late winter	Physical & herbicide
Bermuda Grass	1-5 years May-Sept monthly	Spring or Fall	Herbicide
Bristly Ox-tongue	5 years Mar –June monthly	April	Physical or herbicide
Giant Reed	1 year monthly	Fall	Physical & herbicide
Poison Hemlock	3 years Mar-June monthly	April or May	Physical or herbicide
Ice Plant	1 year monthly	Any time	Physical & herbicide
Italian Thistle	Up to 10 years 6 month intervals	April	Physical or herbicide
Mustard	Up to 5 years 6 month intervals	April	Physical or herbicide
Sweet Fennel	Up to 5 years 6 month intervals	March	Physical & herbicide
Veldt Grass	2 years 5 month intervals	January	Physical & herbicide
Wild Radish	Up to 5 years 6 month intervals	April	Physical & herbicide