

# Planting plan for the wetland restoration at the Surfer Lot and Rodeo Beach wetland



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For:

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### *Project Overview*

Following earthwork and placement of erosion protection onto bare dirt surfaces, the disturbed, restored, and rewetted areas of the Surfer Lot wetland restoration will be planted with appropriate species to establish a functional and self-sustaining plant community. Most of the ground surface that will be disturbed during the excavation and placement of fill will be subject to a wetland hydrologic regime following restoration. These areas will be planted with native wetland plants whose primary purpose will be to provide critical structure for the newly restored site and to quickly reestablish a soil-stabilizing plant community.

Water flow will occur across the main restored surface, and the planted species will grow to provide above ground roughness (stems and leaves) that will slow water flow, reducing erosive potential. The plants will also grow a dense, intertwined below-ground network of roots and rhizomes that will bind the soil in place and resist erosive flows. Because gullying and erosion have been among the primary impacts to the site, it is critical to establish plants that will provide self-sustaining erosion protection. Engineered erosion protection in the form of erosion blanket, coir wattles, and mulch will be required initially to suppress invasive species and to prevent soil erosion while the native plants become established and grow sufficiently large and dense to protect the site themselves.

Successful transplanting and rapid growth of the dominant species, *Scirpus microcarpus* is needed for long-term, self-sustaining soil stabilization within the actively flowing and perennially saturated wetland area (Zone 1, and all or part of Zone 2, see Figure 1). Additional species add benefit by adding diversity that may aid in rapidly occupying ecological niches that may otherwise become dominated by invasive species. However even with a diverse planting plan, it is likely that some active management and treatment of invasive species will be required on site in the first few years as native plants become established. It is critical to ensure that invasive species do not prevent the establishment of a self-sustaining native wetland plant community. Failure to establish *Scirpus microcarpus* in the main wetland area would leave the site vulnerable to erosion and gully reformation.

Three planting zones have been identified in the restoration area (Figure 1). Wetland zone 1 is the site of the cut and fill grading and following earthwork will be bare dirt covered with erosion blanket, experiencing sheetflow hydrology. Wetland zone 2 is outside of the direct earthwork area, so the existing soil and plants will not be disturbed. However, as a result of the regrading within zone 1, zone 2 will receive perennial surface runoff and will support wetland vegetation where it does not already. Thirdly, a bare-soil upland hillslope zone will be created by earthwork in the restoration process. This

zone will be out of the flow path of valley-bottom sheetflow water and well above saturated soil conditions.

#### *Plant Palettes and Planting Methods*

Wetland zone 1 will be planted with nursery-grown transplants, primarily *Scirpus microcarpus* (65%) and *Juncus lescurii* (15%). *Carex obnupta*, *Oenanthe sarmentosa*, *Schoenoplectus pungens* var. *longispicatus*, and *Stachys chamissonis* will each represent 5% of the planting mix. In addition, *Eleocharis macrostachys*, *Juncus bufonius*, *Oenanthe sarmentosa*, *Scirpus microcarpus* and *Persicaria punctata* will be direct seeded onto the site (Table 2). The seedlings will be planted in offset rows oriented perpendicular to water flow, 18 inches apart, with plants within a row also spaced 18 inches apart. Individual plants of each species should be regularly spaced, not spatially clustered, throughout the planting zone according to their planting ratio. Since planting will occur along rows, this spacing will be most efficiently achieved by planting in minimum representative units (MRU). An MRU is the smallest number of plants that contains the desired planting ratio. For zone 1, the MRU is 20 plants, consisting of 13 *Scirpus microcarpus*, 3 *Juncus lescurii*, and 1 each of *Carex obnupta*, *Oenanthe sarmentosa*, *Schoenoplectus pungens* var. *longispicatus*, and *Stachys chamissonis*. As planters proceed along rows they should plant in MRUs, haphazardly arranging species planting order within each MRU to obtain an even species distribution across the zone.

The total area of wetland zone 1 is 2.140 acres (93,213 square feet), with each plant allotted 2.25 square feet. This amounts to 41,428 plants required to plant this area. See Table 1 for a full accounting of plant requirements by species and planting zone, and Table 2 for an accounting of directly-seeded species.

Direct seeding of *Eleocharis macrostachys*, *Juncus bufonius*, *Oenanthe sarmentosa*, *Scirpus microcarpus* and *Polygonum punctata* will be conducted in June 2014 when grading is completed and before erosion control measures are installed. Following grading, the soil will be scarified via hand raking prior to seeding. Seeds will be mixed with dirt and then evenly distributed throughout zone 1 using a hand spreader. Rice straw will be spread over seed to a thickness not greater than ½” and erosion controls will be installed over straw. Planting will be conducted in the late fall of 2014. Plants will be installed through erosion control material, with care taken to maintain the structural integrity of erosion control materials. Both seeding and planting will be conducted by restoration contractors. Table 3 lists the available seed.

Wetland zone 2 is outside of the direct earthwork area, so the existing soil and plants will not be disturbed. However, as a result of the regrading within zone 1, zone 2 will receive perennial surface runoff and will support wetland vegetation where it does not already. Because some areas of zone 2 currently support mostly upland vegetation and the exact extent of perennial flooding in this zone will not be known because this area is not being graded, we recommend conducting a test plot of plantings before treating all of zone 2. The existing, undisturbed vegetation in zone 2 will provide erosion protection so the planting density here can be much lower. For the zone 2 test plot 100 seedlings of *Scirpus microcarpus* will be planted in 10 rows perpendicular to flow, 36" apart, and the 10 plants within a row will also be separated by 36". The addition of these 100 plants brings the zone 1 plus zone 2 plant total to 41,528 (Table 1). The total area of wetland zone 2 is 0.274 acres (11,936 square feet). If post-restoration monitoring of the first-year test plot indicates that the entire area of zone 2 should be planted, a total of 1326 plants will be required (1226 added to the 100 already planted in the test plot), with each plant allotted 9 square feet.

Thirdly, a bare-soil upland hillslope zone will be created by earthwork in the restoration process. This zone will be out of the flow path of valley-bottom sheetflow water and well above saturated soil conditions. The most appropriate vegetation for this site will be upland plants. We recommend planting a diverse coastal scrub community, co-dominated by *Artemisia californica*, the upright form of *Baccharis pilularis*, *Rubus ursinus*, and *Juncus patens*, and 23 other species. The seedlings have various plant-spacing recommendations, based on species. The total ground surface area of the upland hillslope zone is 0.897 acres (37,345 square feet), adjusted from a map area of 36,778 sq. ft. to compensate for the steep (10 degree) slope which causes a ~1.5% increase in ground surface area compared with map area.

The FHWA contractor will be required to use Type 3.B. rolled erosion control fabric after construction and prior to planting. Planting contractors will need to anticipate planting into erosion control fabric in a fashion that will not compromise the integrity and purpose of the fabric.

All species names used here conform to the nomenclature in the Second Edition of the Jepson Manual of Vascular Plants of California. The selection of species to be planted in the 3 zones has been expanded to increase diversity, especially in the upland zone, by request and consultation with Sue Fritzke, Chris Friedel, and Darren Fong of the National Park Service.

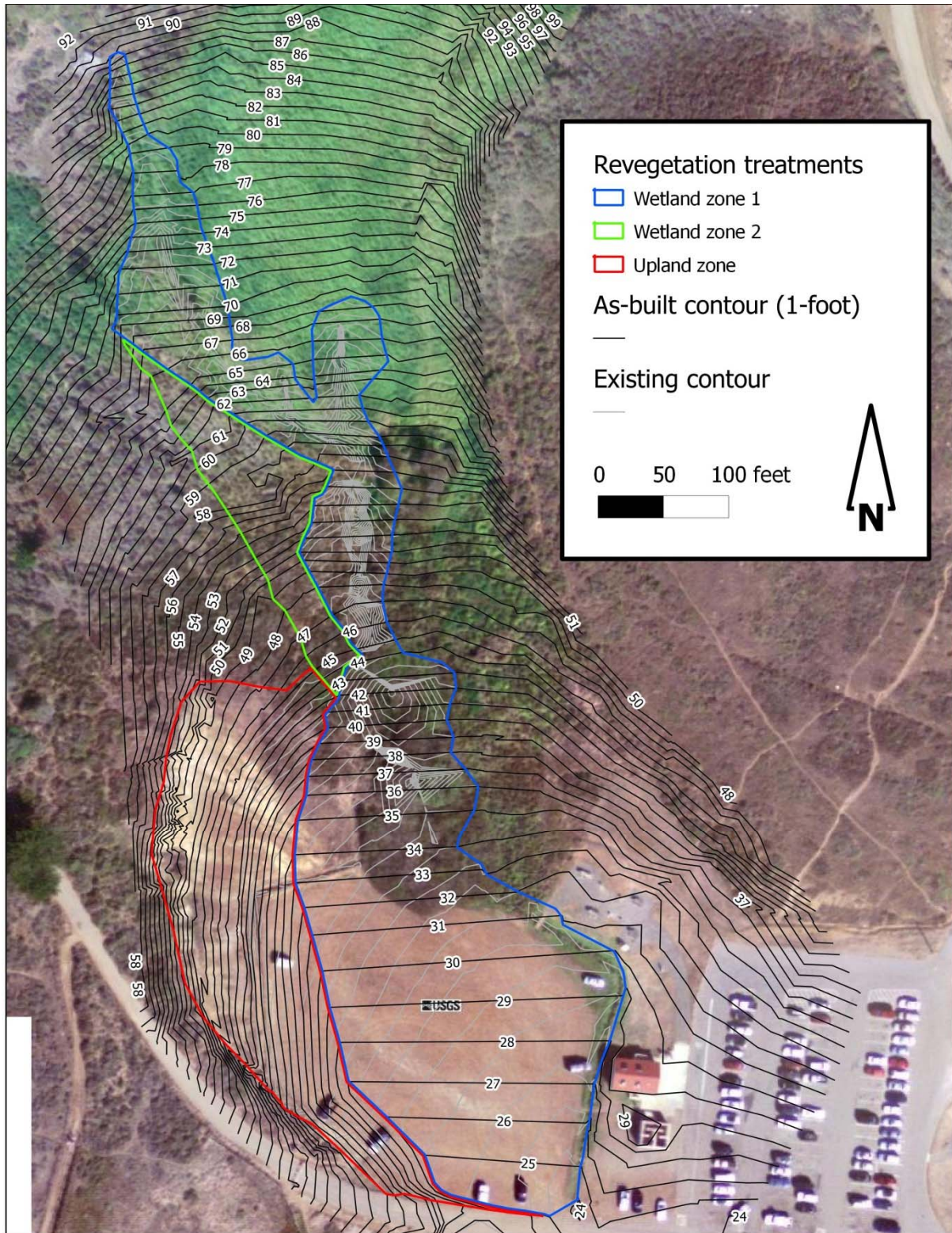
#### *Plant salvage*

The current FHWA contract calls for the salvage of large clumps of native vegetation flagged by NPS (generally *Juncus* spp.) using heavy equipment under the direction of the contracting officer. These salvaged clumps would be kept moist and shaded until time for replanting at the direction of the contracting officer.

#### Schedule

- June 2014
  - Grading completed
  - Soil scarification and direct seeding
  - Erosion control measures installed
- November/December 2014
  - Contractors will install plants in all three planting zones.

Figure 1. Aerial photograph of the wetland restoration area with existing and as-built topography and planting zones shown.



**WETLAND PLANTING ZONES**

93213 Zone 1 sq ft (full palate, full density)

11936 Zone 2 sq ft (only 100 SCMI in test plot)

Species	Percent Cover	Sq Ft/ Plant	Spacing-feet o.c.	TOTAL # Plants	TOTAL PLUS 10%	NOTES
<i>Carex obnupta</i>	5%	2.25	1.50	2071	2279	
<i>Juncus lescurii</i>	15%	2.25	1.50	6214	6836	
<i>Oenanthe sarmentosa</i>	5%	2.25	1.50	2071	2279	
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	5%	2.25	1.50	2071	2379	
<i>Scirpus microcarpus</i>	65%	2.25	1.50	27028	29731	Includes 100 plants for Zone 2 test
<i>Stachys chamissonis</i>	5%	2.25	1.50	2071	2279	
<b>Wetland SUBTOTAL</b>	<b>100%</b>			<b>41,528</b>	<b>45,781</b>	

**UPLAND PLANTING ZONE**

36778 horiz. sq ft

37345 Total slope sq. ft. (adjusted for a 10 deg slope)

Species	Percent Cover	Sq Ft/ Plant	Spacing-feet o.c.	TOTAL # Plants	TOTAL PLUS 10%	NOTES
<i>Artemisia californica</i>	15%	6.25	2.50	896	986	
<i>Artemisia douglasiana</i>	2%	4.00	2.00	187	205	
<i>Baccharis pilularis-prostrate</i>	5%	6.25	2.50	299	329	
<i>Baccharis pilularis-upright</i>	15%	6.25	2.50	896	986	
<i>Clinopodium douglasii</i>	1%	4.00	2.00	93	103	
<i>Elymus glaucus</i>	1%	1.00	1.00	280	308	formula is 0.75%
<i>Erigeron glaucus</i>	1%	2.25	1.50	166	183	
<i>Eriogonum latifolium</i>	1%	2.25	1.50	166	183	
<i>Eriophyllum staechadifolium</i>	4%	6.25	2.50	239	263	
<i>Festuca rubra/idahoensis</i>	1%	1.00	1.00	280	308	formula is 0.75%
<i>Fragaria vesca</i>	1%	4.00	2.00	93	103	
<i>Frangula californica</i>	5%	16.00	4.00	117	128	
<i>Heracleum maximum</i>	5%	6.25	2.50	299	329	
<i>Hordeum brachyantherum</i>	1%	1.00	1.00	280	308	formula is 0.75%
<i>Juncus effusus</i>	1%	4.00	2.00	93	103	wetter areas
<i>Juncus patens</i>	10%	4.00	2.00	934	1027	
<i>Lonicera hispidula</i>	1%	4.00	2.00	70	77	formula is 0.75%
<i>Lupinus arboreus</i>	5%	6.25	2.50	299	329	
<i>Marah fabacea</i>	1%	9.00	3.00	41	46	
<i>Mimulus aurantiacus</i>	3%	6.25	2.50	179	197	
<i>Morella californica</i>	1%	36.00	6.00	10	11	
<i>Polystichum munitum</i>	1%	6.25	2.50	60	66	will sub if not available at nursery
<i>Rubus ursinus</i>	15%	6.25	2.50	896	986	
<i>Scrophularia californica</i>	1%	4.00	2.00	93	103	
<i>Stachys ajugoides</i>	1%	6.25	2.50	60	66	wetter areas
<i>Symphotrichum chilensis</i>	2%	4.00	2.00	187	205	
<i>Vicia gigantea</i>	1%	6.25	2.50	60	66	wetter areas
<b>Upland SUBTOTAL</b>	<b>100%</b>			<b>7,274</b>	<b>8,001</b>	

**GRAND TOTAL****48,802****53,782**

Table 1. Accounting of number of plantings per species for the two wetland zones and the upland zone.

Table 2. Accounting of plant species to be direct seeded onto wetland zone 1.

**WETLAND PLANTING ZONES**

93213 Zone 1 sq ft (full palate, full density)

11936 Zone 2 sq ft (only 100 SCMI plugs in test plot)

Species	seed available (g)	seeds/g	seeds/sq. ft. (zone 1)	germination rate	germinants per sq. ft.
<i>Eleocharis macrostachya</i>	?	1111	?	?	?
<i>Juncus bufonius</i>	?	100000	?	?	?
<i>Oenanthe sarmentosa</i>	260.0	1495	4.2	?	?
<i>Pericaria punctata</i>	110.6	275	0.3	?	?
<i>Scirpus microcarpus</i>	1840.0	18078	356.9	?	?
<b>TOTAL</b>	<b>2210.6</b>		<b>361.4</b>		<b>?</b>

Table 3. Available seed for wetland zone:

Wetland seeding	Grams	Lbs	%
Carex obnupta	41.61	0.091542	1%
Juncus species	1018.63	2.240986	29%
Leymus triticoides	43	0.0946	1%
Oenanthe sarmentosa	260	0.572	7%
Polygonum punctatum--BULK	110.64	0.243408	3%
Scirpus microcarpus	1840	4.048	53%
Scirpus pungens	185.72	0.408584	5%
<b>TOTAL</b>		<b>7.69912</b>	