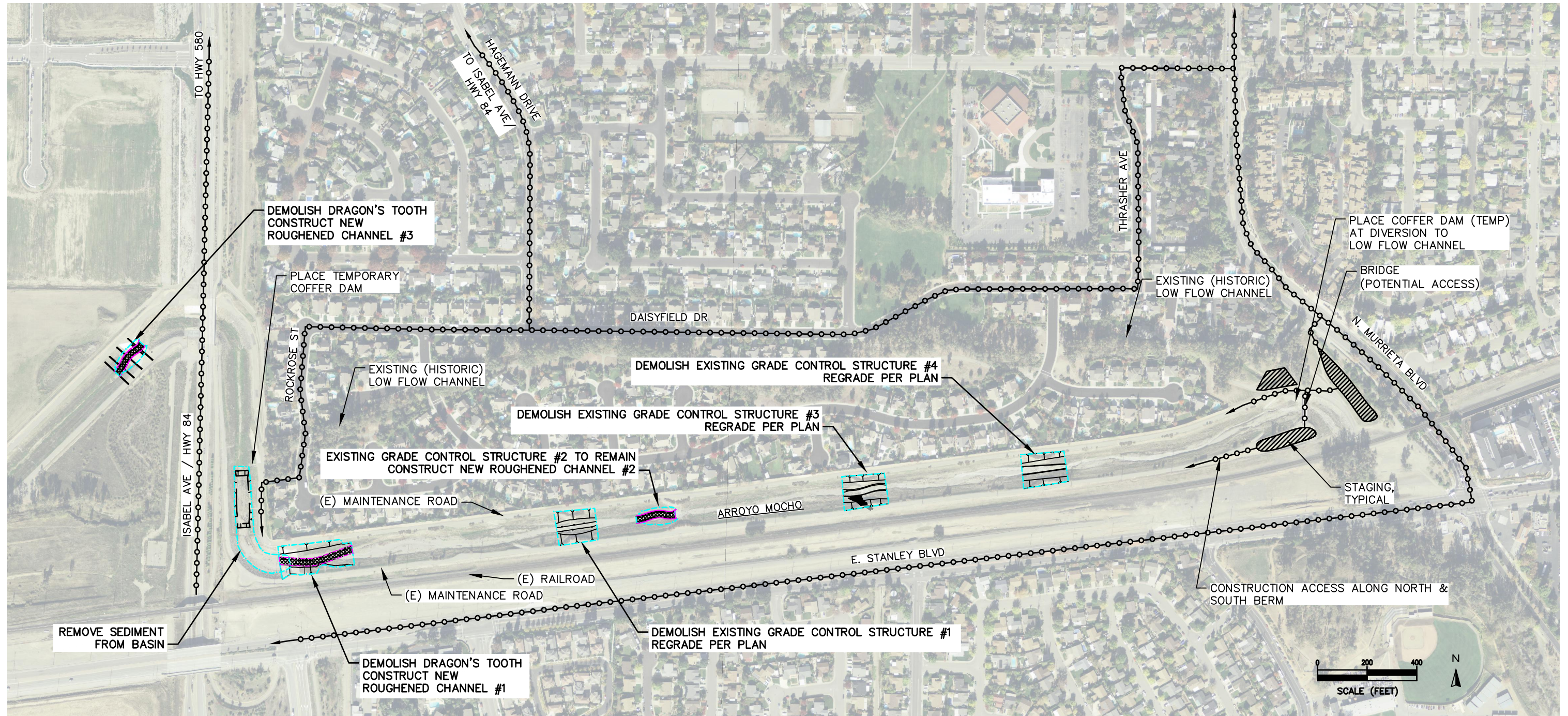




Appendix A

Arroyo Mochito Stanley Reach
Proposed Improvements





Stanley Reach Project Planting Plan

Developed for
Zone 7 Water Agency
By
Urban Creeks Council

Planting Design

The project was conceived as a field-test of the ability of a forested stream reach to reduce water temperatures over approximately 5,280 feet of channel. The planting plan is based on two primary objectives: to create a riparian canopy with the goals of augmenting native habitat and providing shade over the water of Arroyo Mocho, a 303(d) temperature-listed stream; and to maintain a roughness coefficient within the flood control channel that allows for flood protection to be maintained. Roughness coefficients will vary across the cross section, from moderate at the stream channel to low in the floodplain and upper banks.

Habitat types and planting methods

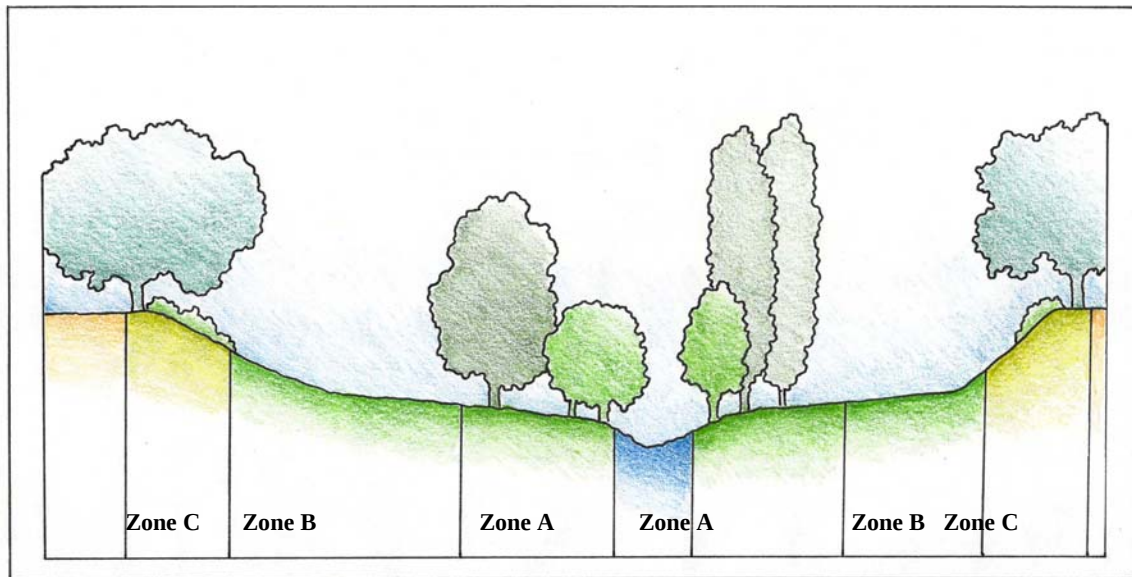
The planting plan for Stanley Reach includes three habitat types: valley oak woodland at the top of bank, native grassland on the bank slopes, and a riparian canopy forest along both sides of the active channel. Material will be sourced from appropriate sites within east Alameda County. To increase genetic diversity, material will be collected from multiple dense populations, at least 20 meters apart. Woody plants will be installed as seed, live stake or D40 container size. The advantage of this approach is primarily in the ability of young plants to adapt to ambient conditions (larger nursery stock is more expensive, requires irrigation, and is more vulnerable to transplant mortality). The project's size and location make irrigation unfeasible; planting small plants reduces the risk of transplant shock-related mortality, as younger plants have a high root-shoot ratio



and low transpiration rates. This method closely approximates the process by which plants naturally regenerate and grow in the field.

Structure

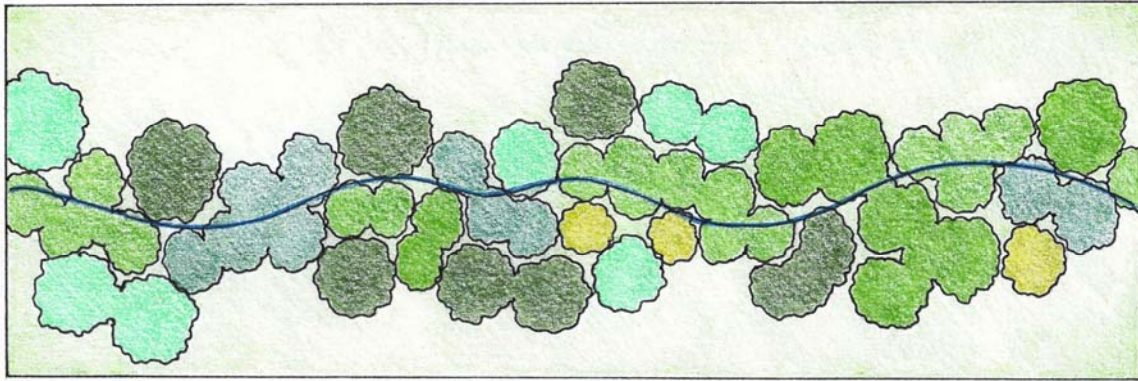
The following graphic shows a conceptual cross-section of the three zones of the Stanley Reach planting plan. The project consists of three zones: Zone A, within the wetted perimeter, the area of floodplain that is continuously moistened by flow from the active channel; Zone B, the area above the active floodplain; and Zone C, a 12 foot wide section at the top of both banks. Zone A is densely vegetated with riparian tree species, Zone B is seeded to native grassland as a low-roughness area of the channel, and Zone C is planted with native oak species, as frequently seen on abandoned floodplains and alluvial terraces similar to the upper banks on the project site. The timeline to canopy closure is approximately 10 years for riparian forest and 30 to 50 years for oak woodland.



Cross Section Planting Concept for Stanley Reach. Zone A, on either side of active channel, is densely vegetated with riparian tree species and subsequently pruned for flood control. Zone B is seeded with native grass species. Zone C, at top of bank, is planted with oak acorns. Not to scale.



Zone A: Riparian Canopy Forest



Description

Zone A consists of the area defined as wetland according to the delineation performed by ESA Associates in January 2013. The plan view above represents approximately 300 feet of streamlength with the mature canopy closed over the stream channel. The vegetated area will follow the meander being established by the stream, from the bankfull line to the edge of the wetland area. Zone A will be planted in the fall immediately following construction of the in-channel features.

LEGEND	
	<i>Acer negundo</i>
	<i>Alnus rhombifolia</i>
	<i>Fraxinus latifolia</i>
	<i>Juglans hindsii</i>
	<i>Populus fremontii</i>
	<i>Salix species</i>

Composition

The planting plan consists of a randomly generated sequence of the six species, which will be installed in a grid pattern with a planting site every 6 feet on center. The percent occurrence of the six species is as follows: willow species, 34%; white alder, 16%; box elder, 16%; cottonwood, 14%; Hinds walnut, 13%; and Oregon ash, 5%. This frequency is represented in the above planting plan, generated from the randomized list. The randomized planting sequence can be found as Appendix A. The frequency of each species is derived from field observations of relative species dominance.

Selection and Provenance

Salix species will be selected for harvest in the field based on abundance at collection sites, but species exhibiting a tree form, rather than shrub form, will be preferentially harvested for cuttings (listed below). Pruning *Salix* to a single-stemmed form will allow the roughness coefficient of the channel to remain within acceptable limits. *Salix* will be installed as live stakes, no smaller than 1" in diameter and no shorter than 4' in length. *Acer negundo*, *Alnus rhombifolia*, *Populus*, and *Fraxinus* will be grown from native material collected within the watershed and will be planted as D40 size container stock. *Juglans* seed will be collected from field sites (only where abundant to prevent depletion of food stocks), cold-stratified in the nursery to increase germination potential, and planted *in situ* in the field.



Maintenance and Goals

This zone will be thinned according to a randomly generated sequence. Closely spaced planting followed by selective thinning will ensure that enough trees survive to create a closed canopy while decreasing competition among individuals, resulting in better-formed, healthier trees. The ten-year target spacing for this zone is 18 feet on center. At ten years, native riparian forbs will be seeded under the canopy to increase ground cover and native habitat.

SPECIES:

Acer negundo, Box elder

Alnus rhombifolia, White alder

Fraxinus latifolia, Oregon ash

Juglans hindsii, Hinds Walnut

Populus fremontii, Fremont cottonwood

Salix ssp., tree form, e.g. *lasianдра*, *laevigata*, *gooddingii*

Zone B: Native Grassland

Description

Zone B is a variable-width section of the planting plan that will be wider or narrower at any given cross section depending on the meander pattern. This zone will be seeded with locally collected native grass seed in fall of 2013.

Composition and Provenance

Species composition will largely depend on availability at the time of collection, but species have been identified based on current availability from the local seed supplier. A minimum of four grass species and four forb species will be included, depending on availability. Mowing will be conducted twice per year for four years to give native species an advantage over invasives.

GRASS SPECIES:

Bromus carinatus, California brome

Elymus glaucus, Blue wildrye

Hordeum brachyantherum, Meadow barley

Leymus triticoides, Creeping wild rye

Nassella lepida, Foothill needlegrass

Nassella pulchra, Purple needlegrass

Pleuropogon californicus, Annual semaphoregrass

FORB SPECIES:

Achillea millefolium, Yarrow

Achyrrachaena mollis, Blow wifes

Castilleja exerta, Pink owl's clover

Downingia pulchella, Calicoflower

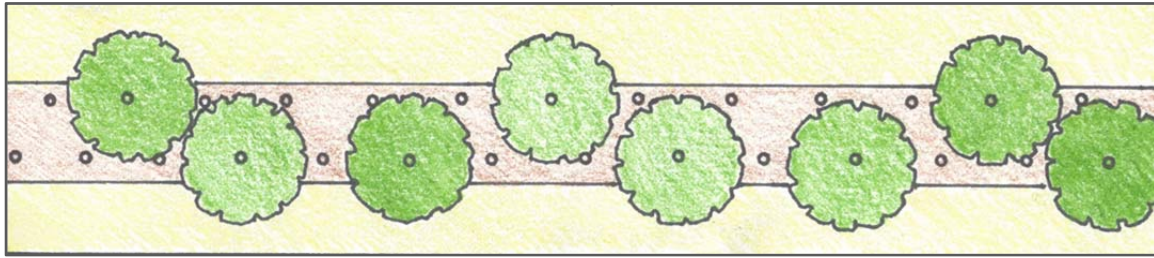
Epilobium ciliatum, Fringed willowherb

Lasthenia glabrata, Goldfields

Lupinus microcarpus, Chick lupine



Zone C: Oak Woodland



LEGEND

Zone C Species

■ *Quercus agrifolia* ■ *Quercus lobata*

Small circle = Planting site

Large circle = Established trees, 10 years

Structure

Zone C consists of two lines of oak species planted from acorns, in a 12-foot wide section at the top of both banks. This zone will be planted out via a volunteer planting program in fall of 2013. The spacing of planting sites and development of this zone are shown in the graphic above. Zone C will be planted on 10 foot centers along the length of the project reach. Three acorns will be planted per planting site, which will be protected with wire cages and weed suppression fabric. A combination of the expected 30-40% survival rate of the acorns and randomized thinning of individual trees will result in a final spacing of 30-50 feet. As with the plants in Zone A, a randomly generated formula will determine the sequence of species and thinning pattern. This can be found in Appendix B. The ten-year target spacing for this zone (shown) is 30 feet on center. As with Zone A, the ground layer will be seeded in year 10, in this case with a mix of native grasses, forbs, and shrubs.

Composition and Provenance

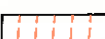
The two oak species were selected based on relative abundance in the area, suitability to the project site, and documented success when planted from acorns. Acorns will be collected from several populations within the watershed.

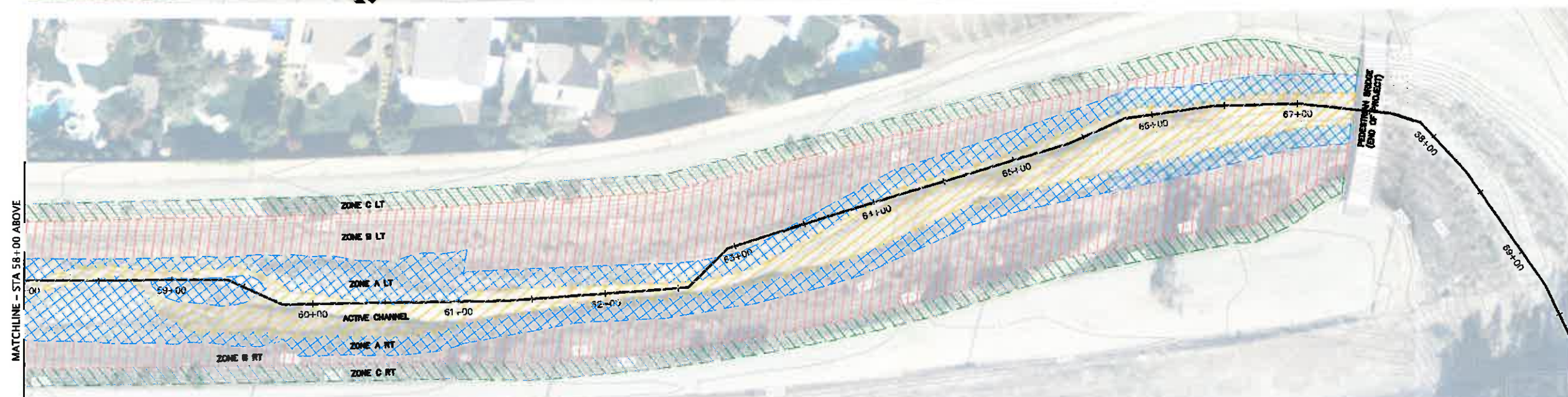
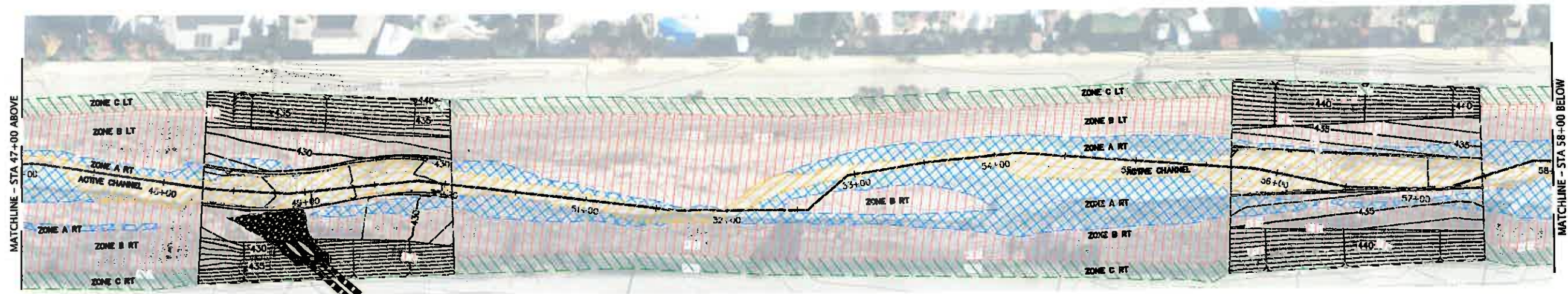
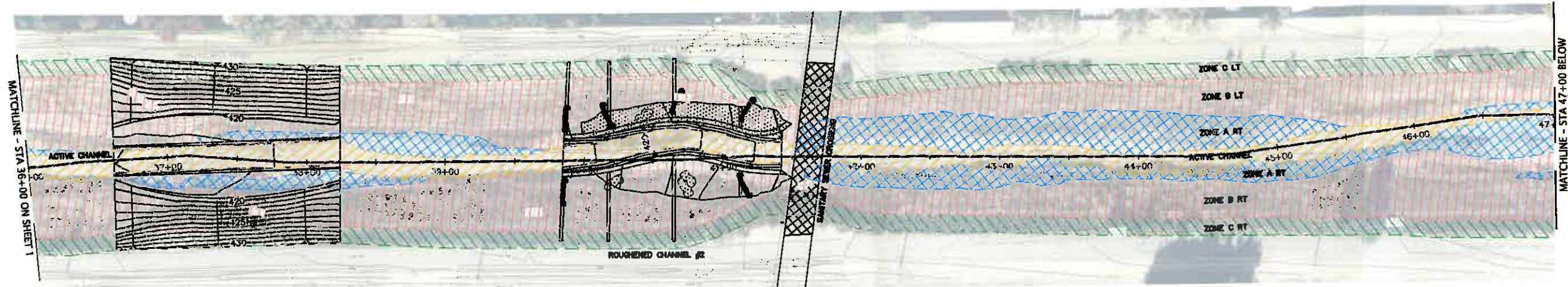
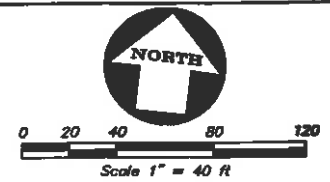
OAK SPECIES:

Quercus agrifolia, Coast live oak

Quercus lobata, Valley oak



	ACTIVE STREAM	2.256 AC	98,259 SF
	ZONE A LT	1.251 AC	54,556 SF
	ZONE A RT	1.502 AC	65,452 SF
	TOTAL	2.653 AC	120,008 SF
	ZONE B LT	3.851 AC	167,707 SF
	ZONE B RT	3.574 AC	155,708 SF
	TOTAL	7.425 AC	323,415 SF
	ZONE C LT	1.240 AC	54,028 SF
	ZONE C RT	1.268 AC	55,259 SF
	TOTAL	2.508 AC	109,287 SF



100% DRAFT
FOR CONSTRUCTION

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CIVIL ENGINEERS & SURVEYORS, INC.
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Livermore, California 94551
Phone (925) 245-8788
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SHEET TITLE
PLAN
PROJECT
**ARROYO MOCHO - STANLEY REACH
FISH PASSAGE IMPROVEMENTS**

PREPARED FOR:
**ALAMEDA COUNTY
FLOOD CONTROL - ZONE 7**



APPROVED
DESIGNED S. IRISH
DRAWN R. GIVDEN
INCHARGE S. IRISH
SCALE 1"=40'
DATE DEC., 2012
SHEET