CALIFORNIA RIGHTS-OF-WAY

This scenario is intended to represent rights-of-way areas including roads, power lines, and railroads in Central/Coastal California. Unlike most of EFED existing scenarios, the scenario is conceptually different in that it represents a linear surface that drains into an adjacent water body (drainage ditch). However, for this exercise, EFED assumes that while conceptually different, the scenario is for practicality purposes developed in a similar manner as a standard scenario that assumes a 172 hectare field draining into a 1 hectare static pond.

Crop cover parameters for this scenario were based on typical plants found adjacent to state maintained highway right-of ways. In most cases rights-of-way areas are generally bare ground kept clear of vegetation (Darren Haver of UC Cooperative Extension & Frank Spurlock of CADPR, personal communication). Pesticides are usually applied in rights-of-way areas to control European weeds, mustard, and thistles. Most weeds are eradicated when they are only a few inches tall.

Rights-of-way occur throughout the state. Soils were selected with the intent of yielding "high-end" runoff for right of way areas. The area of interest (AOI) was refined to include areas where the greatest amount of pesticides are used on rights-of ways. Based on 2005 California Pesticide Use reporting data (CalPIP, 2006) approximately 45% of all pesticides applied to rights-of-ways are applied to Los Angeles, Kern, Ventura, Fresno, Kings, Monterey, San Luis Obispo, Santa Barbara, Tulare, and Kings Counties. In comparison, counties in the San Francisco bay area (San Francisco, Contra Costa, Alameda, Santa Clara, and Sacramento) comprise approximately 13% of the total pesticide usage (CalPIP, 2006) likely due to aggressive pesticide stewardship programs (D. Haver, personal communication). Table 5 presents a summary of the most common soils in the AOI, including physical soil properties obtained from USDA (2006a). Gaviota soils were initially selected because they are in hydrologic group D, are among the highest for erodibility, and are among the steepest sloped soils which include the maximum slope on which rights-of-ways are located (D. Haver, personal communication). To verify that these soils are located in rights-of-ways, the spatial location of soils data were cross-checked with available rights-of-ways layers, including major roads and railways (locations of power lines were unavailable). Figure 1 shows the location of Gaviota soils in the AOI and the overlap with major roads and railways.

The Gaviota series was selected for this scenario because it is located in rights-of-way areas based on preliminary analysis, and because it is among the most vulnerable soils in drainage, erodibility, and slope. Gaviota is a Hydrologic Group D soil with a USLE K factor of 0.24-0.55 which includes the 90th percentile of these soils in erodibility (Table 5). The relatively low organic matter content is also expected to result in lower microbial activity and thus reduced potential for pesticide degradation. Gaviota soils are extensive, found mostly in the California Coast Ranges (MLRA 15, 20) (USDA, 2006b). They are located on hills and mountains and have slopes of 2 to 100 percent (USDA, 2006b); however slopes in the AOI range from 5 to 75% (Table 5). Gaviota soils have an A horizon from 0 to 10 inches (0 to 25 cm) deep. Depth to a lithic contact of hard rock is 6 to 20 inches (USDA, 2006b). Scenario parameters were taken from Gaviota sandy loam, 5 to 15 percent slopes, located in northern Santa Barbara County (USDA, 2006a).

Metfile W23234 (Santa Maria) is the meteorological data set used to represent rights-of-ways. The station is located along the coast in Santa Barbara County within MLRA 15, in the same county as the field used to represent rights-of-ways. The Fresno station is also in the AOI, however the Santa Maria station was deemed more representative for several reasons. First, this scenario is generally a coastal scenario. Fresno is an inland station whereas the coastal Santa Maria station is more representative of the Coastal Climate of this scenario. In addition, the Santa Maria station receives approximately three inches more annual rainfall than the Fresno station, increasing the conservative nature of the scenario (NOAA, 2006).

Table 1. PRZM 3.12 Climate and Time Parameters for Cental/Coastal, CA.		
Parameter	**Value**	**Source/Comments**
Starting Date	Jan. 1, 1961	Meteorological File from Santa Maria, CA (W 23273).
Ending Date	Dec. 31, 1990	Meteorological File from Santa Maria, CA (W 23273).
Pan Evaporation Factor (PFAC)	0.77	PRZM Manual Figure 5.1 (EPA 1998). Value represents much of CA coastline.
Snowmelt Factor (SFAC)	0	Snow is not expected to occur in Central/Coastal California.
Minimum Depth of Evaporation (ANETD)	17.5	Mid point of range (15-20), PRZM Manual, Figure 5.2 (EPA 1998).

Table 2. PRZM 3.12 Erosion and Landscape Parameters for San Francisco – rights-of-way.		
Parameter	**Value**	**Source/Comments**
Method to Calculate Erosion (ERFLAG)	4 (MUSS)	Default value.
USLE K Factor (USLEK)	0.28 tons EI^{-1}*	Gaviota sandy loam, 5 to 15 percent slopes, N. Santa Barbara County, CA. NRCS Soil Data Mart Database (http://soildatamart.nrcs.usda.gov/).
USLE LS Factor (USLELS)	1.1	Calculated according to Haan and Barfield (1978) equation: $LS = ((\lambda/72.6)^m)((430x^2 + 30x + 0.43)/6.613)$, where λ = slope length, x = SLP/100 and m = constant. In this case, λ = 400 m (default value) and m = 0.5 (EPA 2004).
USLE P Factor (USLEP)	1	No contour plowing is expected (EPA 2004).
Field Area (AFIELD)	172 ha	Default drainage area for index reservoir (EPA, 2004)
NRCS Hyetograph (IREG)	2	PRZM Manual, Figure 5.12 (EPA, 1998).
Slope (SLP)	5 %	Slopes in right of way areas are < 5%. In rare cases they exceed 5%. D. Haver, Watershed Management Advisor, UCCE. (EPA 2004).
Hydraulic Length (HL)	600 m	Shipman Reservoir (EPA, 1999b)
Irrigation Flag (IRFLAG)	0	Typically no irrigation in rights-of-way areas. (Darren Haver of UC Cooperative Extension & Frank Spurlock of CADPR)
* EI = 100 ft-tons * in/ acre*hr		

Table 3. PRZM 3.12 Crop Parameters for CA – rights-of-way.		
Parameter	**Value**	**Source/Comments**
Initial Crop (INICRP)	1	Default value
Initial Surface Condition (ISCOND)	1	1= Fallow. Rights-of-way areas are usually bare ground and are kept clear of vegetation. (F. Spurlock, CADPR).
Number of Different Crops (NDC)	1	Set to number of crops in simulation. Default value.
Number of Cropping Periods (NCPDS)	30	Set to weather data in meteorological file: Santa Maria, CA (W 23273).
Maximum rainfall interception storage of crop (CINTCP)	0.1	Value is representative of light density crops (EPA, 1998). Little interception is expected because R.O.W areas are kept clear of vegetation. (Darren Haver of UC Cooperative Extension & Frank Spurlock of CADPR, personal communication).
Maximum Active Root Depth (AMXDR)	15 cm	Vegetation includes European weeds, mustard, thistles, etc with root depths <6 inches. However, weeds are eradicated at an early stage and interaction with the root zone is minimal. (Darren Haver of UC Cooperative Extension & Frank Spurlock of CADPR, personal communication).
Maximum Canopy Coverage (COVMAX)	10%	Vegetation in rights-of-way areas is eradicated at an early stage. Canopy cover is at most 10%. (Darren Haver of UC Cooperative Extension)
Soil Surface Condition After Harvest (ICNAH)	3	1= Fallow. Rights-of-way areas are usually bare ground and are kept clear of vegetation. (F. Spurlock, CADPR).
Date of Crop Emergence (EMD, EMM, IYREM)	01/09/61	Vegetation emerges in late fall, beginning in September. Weeds are eradicated within a few months post-emergence. Any weeds that are not eradicated through management die-off in mid-summer (June/July). (Darren Haver of UC Cooperative Extension).
Date of Crop Maturity (MAD, MAM, IYRMAT)	01/11/61	
Date of Crop Harvest (HAD, HAM, IYRHAR)	02/11/61	
Maximum Dry Weight (WFMAX)	0.0	Not used in scenario.
Maximum Canopy Height (HTMAX)	15 cm	Vegetation includes European weeds, mustard, thistles, etc with but is generally eradicated before plants reach 6 inches in height. (Darren Haver of UC Cooperative Extension & Frank Spurlock of CADPR, personal communication).
SCS Curve Number (CN)	92, 92, 92	TR-55 (Table 2-2a). CN for paved; open ditches (including rights-of-way).
Manning's N Value (MNGN)	0.110	Fresno Pasture, warm season (C23PWPWN). Rights-of-way were not simulated in the RUSLE EPA Pesticide Project (USDA, 2000). This file incorporates no tillage and has a cover code representing first year grass, pasture or hay crops (2). Similar to TR-55 (Table 3-3) for short grass surface condition.

USLE C Factor (USLEC)	0.004	Fresno Pasture, warm season (C23PWPWN). Rights-of-way were not simulated in the RUSLE EPA Pesticide Project (USDA, 2000). This file incorporates no tillage and has a cover code representing first year grass, pasture or hay crops (2). Similar to TR-55 (Table 3-3) for short grass surface condition.

Table 4. PRZM 3.12 "Gaviota sandy loam, 5 to 15 percent slopes" Soil Parameters, N. Santa Barbara County, CA– rights-of-way.

Parameter	Value	Source/Comments
Total Soil Depth (CORED)	51 cm	Gaviota sandy loam, 5 to 15 percent slopes, N. Santa Barbara County. NRCS Soil Data Mart Database (http://soildatamart.nrcs.usda.gov/).
Number of Horizons (NHORIZ)	3	Additional data were listed for a 4th HORIZN. However, these were not included in this soil profile since the lower HORIZN is composed of sandstone (USDA, 2006b).
Horizon Thickness (THKNS)	10 cm (HORIZN =1) 23 cm (HORIZN =2) 18 cm (HORIZN =3)	
Bulk Density (BD)	1.55 g/cm3 (HORIZN =1) 1.55 g/cm3 (HORIZN =2) 1.55 g/cm3 (HORIZN =3)	
Initial Water Content (THETO)	0.173 cm3/cm3 (HORIZN =1) 0.173 cm3/cm3 (HORIZN =2) 0.136 cm3/cm3 (HORIZN =3)	PRZM Scenario Guidance (2004).
Compartment Thickness (DPN)	0.1 cm (HORIZN = 1) 1 cm (HORIZN = 2) 3 cm (HORIZN = 3)	
Field Capacity (THEFC)	0.173 cm3/cm3 (HORIZN =1) 0.173 cm3/cm3 (HORIZN =2) 0.136 cm3/cm3 (HORIZN =3)	
Wilting Point (THEWP)	0.087 cm3/cm3 (HORIZN =1) 0.087 cm3/cm3 (HORIZN =2) 0.066 cm3/cm3 (HORIZN =3)	
Organic Carbon Content (OC)	0.44 % (HORIZN =1) 0.44 % (HORIZN =2) 0.15 % (HORIZN =3)	Adjusted using the relationship % OC = % Organic Matter/1.724 (Doucette 2000).

Table 5. Most common soils located in the AOI based on USDA 2006 soils data. Includes soils greater than 0.5% of the total soil area in the AOI.										
Soil	Total Acreage	% Area	Drainage	Erodibility	Slopes (%)	pH	OM (%)	% Sand	% Silt	% Clay
CAJON	320,500	2.71%	A	0.15-0.28	0-15	7.9-8.2	0-0.75	67.4-96	1.5-19.6	2.5-13
SANTA LUCIA	317,848	2.69%	C	0.1-0.49	2-75	5.8-6.1	1.5-10	17.4-35.4	33.6-52.6	30-31
NACIMIENTO	290,396	2.46%	C	0.24-0.43	9-75	8.2	2-3.5	18.1-39.2	33.6-50.9	23.5-31
KIMBERLINA	282,393	2.39%	C/B	0.24-0.43	0-9	7.5-8.2	0.4-0.75	68.3-71.3	16.7-19.7	12
CIENEBA	281,315	2.38%	C	0.24-0.37	15-85	6.1-6.7	0.5-0.75	45.7-68.3	19.2-41.8	8-12.5
ROCK OUTCROP	237,955	2.01%	D/	-	15-100	-	-	-	-	-
PANOCHE	224,969	1.90%	B	0.28-0.43	0-9	7.9-8.5	0.25-0.75	35.4-66	15-37.7	19-31
HANFORD	180,590	1.53%	B	0.2-0.37	0-9	6.3-7	0.75-1.5	45.7-71	16.5-41.8	12.5
LOS OSOS	172,555	1.46%	C	0.17-0.32	5-75	6.1-6.7	2.5-3	35.4-39.2	33.6-37.3	23.5-31
VISTA	161,940	1.37%	C	0.28-0.37	3-75	6.5-6.7	0.75	65.4-67	22-23.6	11
NORD	151,063	1.28%	B	0.28-0.37	0-2	7.5-8.8	1.5-2.5	45-70	16-41	14
AUBERRY	149,370	1.26%	B	0.28	3-70	5.8-6.1	2	65.7-67	21.5-22.8	11.5
SHEDD	149,334	1.26%	C	0.2-0.43	9-75	8.2	2.5-3	6.7-9.1	62.1-64.9	26-31
BLASINGAME	147,130	1.24%	C	0.24-0.37	3-70	6.7	1.25-1.5	34-65.1	18.9-38.5	16-28.5
LINNE	144,639	1.22%	C	0.2-0.32	5-75	8.2	2.5-3.5	18.1-35.4	33.6-50.9	31
HESPERIA	142,962	1.21%	B	0.2-0.32	0-9	7-8.5	0.25-0.75	67.4-68	19.5-19.6	12.5-13
WASCO	139,578	1.18%	A/B	0.24-0.37	0-5	7-7.2	0.25-0.8	60-70.5	16.5-28	12-13
GAVIOTA	137,277	1.16%	D	0.24-0.55	5-75	6.3-7.3	0.5-1.5	44.8-70	16.4-41.2	11-14
SAN JOAQUIN	130,299	1.10%	D	0.32-0.37	0-9	6.1-7.2	0.75-1.5	42-66	19-38	15-20
WALONG	130,158	1.10%	B	0.2-0.24	15-75	7.2	1.5	67.9-68	19.5-19.6	12.5
EXETER	128,019	1.08%	C	0.24-0.37	0-9	6.7-7.3	0.5-1.5	44-66	19-41	15
BALCOM	124,600	1.05%	B	0.32	9-75	8.2	0.75	39.8	37.7	22.5
TULARE	118,377	1.00%	D	0.28	0-1	8.2	2.5	22.1	27.9	50
MILHAM	117,470	0.99%	D/B	0.32	0-9	7.4-7.9	0.5-0.75	59-67.9	19.1-22	12.5-19
GARCES	108,362	0.92%	D	0.49	0-2	7.8-8.5	0.25-0.75	30.4-44.8	41.2-55.6	14
ARBUCKLE	101,800	0.86%	B	0.37	0-75	6.5-7	0.75	43-68.8	16.2-38.5	13-18.5
ARNOLD	100,455	0.85%	B/A	0.15-0.28	5-75	5.6-6.7	0.75	78.5-96	1.5-16.5	2.5-5

Table 5. Most common soils located in the AOI based on USDA 2006 soils data. Includes soils greater than 0.5% of the total soil area in the AOI.										
Soil	Total Acreage	% Area	Drainage	Erodibility	Slopes (%)	pH	OM (%)	% Sand	% Silt	% Clay
SUR	97,675	0.83%	B	0.32	50-85	6.5	1.5	65.9	19.1	15
LOPEZ	94,331	0.80%	D	0.15-0.37	9-99	5.6-6.5	1.5-6	34.7-39.2	33.5-37.8	23.5-31
SHERIDAN	92,620	0.78%	B	0.37	5-75	6.5	3	68.1	18.9	13
KETTLEMAN	91,206	0.77%	B	0.32-0.37	5-75	7.5-8.2	0.25-0.75	39.8-68.8	16.2-37.7	15-22.5
GRANGEVILLE	88,358	0.75%	A/B	0.32-0.37	0-2	7.2-9.8	1.5-3.5	30.4-70.5	16.5-55.6	13-14
COLPIEN	87,886	0.74%	B	0.37	0-2	7.5	2	39.8-39.8	37.7	22.5
DIABLO	86,192	0.73%	D	0.15-0.28	2-60	7.3-7.6	1.5-2.5	5.3-23.3	27.9-44.7	47.5-50
CHAMISE	83,162	0.70%	B/D	0.15-0.37	2-75	5.8-6.2	3.5-4.5	35.4-67.2	15.3-37.7	15-31
NAHRUB	79,920	0.68%	D	0.37-0.43	0-2	8.7-9.5	0.5-0.75	21.7-26.1	28.9-54.8	23.5-45
MOCHO	79,711	0.67%	B	0.17-0.49	0-9	7.9-8.2	3	18.1-68.8	16.2-53.5	15-31
LETHENT	74,555	0.63%	D	0.37-0.43	0-2	8-9.5	0.25-2	21.7-69.6	16.4-54.8	14-31
GAZOS	71,093	0.60%	C	0.17-0.49	9-75	6.1-6.7	2-3	18.1-42.4	37.3-57.6	19.5-31
CENTERVILLE	66,825	0.57%	D	0.2-0.24	0-30	7.3-7.5	1.5	22-22.1	27.9-28	50
METZ	65,770	0.56%	A/B	0.15-0.32	0-9	7.2-8.2	0.75	63.5-79.2	15.8-26.5	5-10
CIBO	65,114	0.55%	D	0.2-0.37	2-75	6.7-7.5	1.5	26-28.1	28.9-29.4	42.5-45
GEPFORD	64,074	0.54%	D	0.28	0-1	7.9-8.2	1.5	3-17.1	27.9-42	55
LOCKWOOD	61,210	0.52%	B	0.28-0.49	0-15	6.5-6.7	3.5	39.8-39.8	37.7	22.5
MILLSHOLM	60,849	0.51%	D	0.24-0.49	15-75	6.1-6.7	0.75-2	34.2-39.2	37.3-37.3	23.5-28.5
LODO	60,696	0.51%	D	0.17-0.24	5-75	6.5-7.6	2.5-3.5	35.2-39.8	33.6-38.3	22.5-31

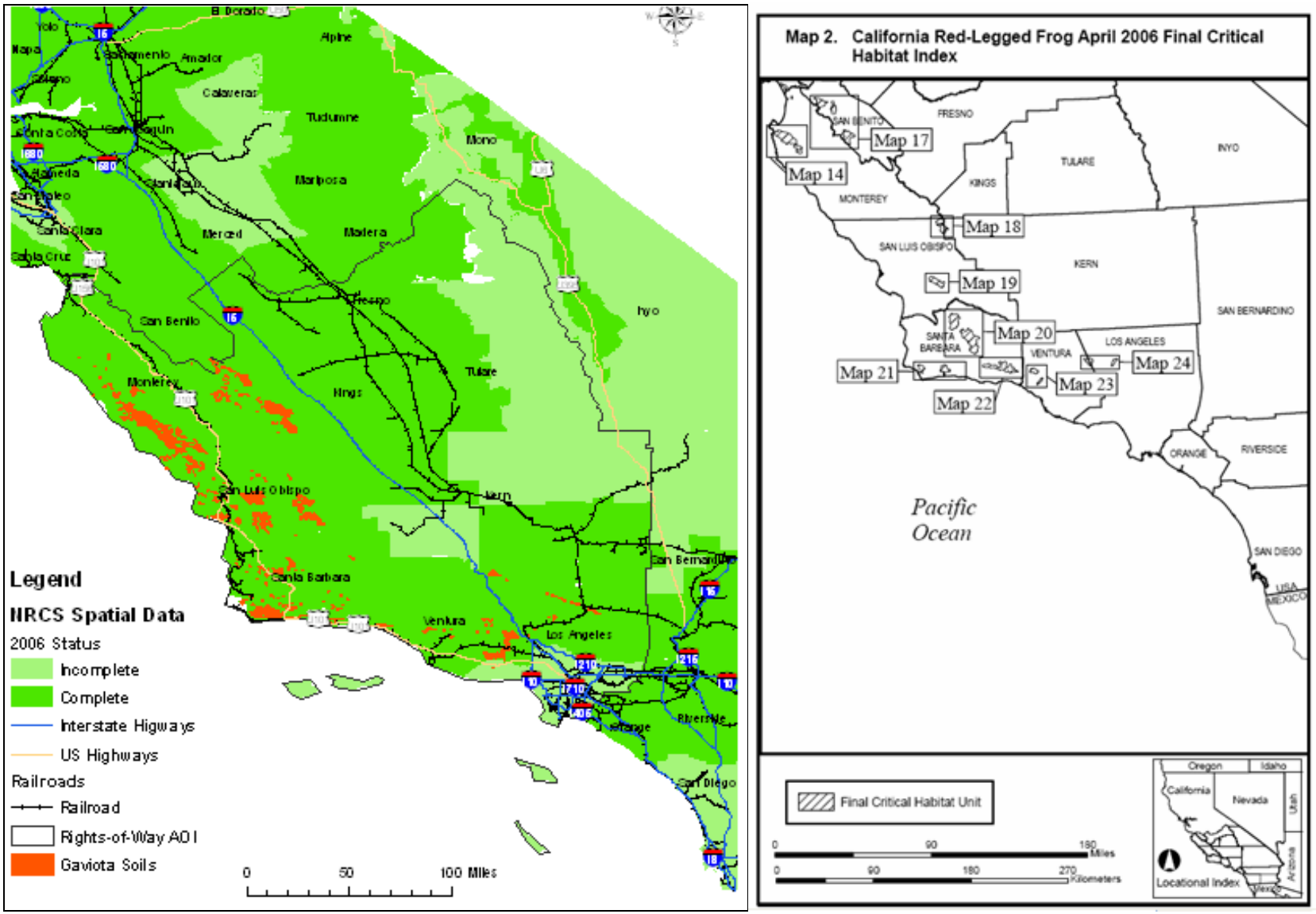

Figure 1. Locations of Rights-of-way used for scenario development including NRCS spatial soils data availability (left) and Red-legged frog critical habitat designations (right) from the USFWS.

Contacts

Frank Spurlock, Ph.D.
Frank Spurlock, Ph.D.
Research Scientist III
Environmental Monitoring
CA Department of Pesticide Regulation
1001 I Street, P.O. Box 4015
Sacramento CA 95812-4015
Phone (916) 324-4124

Darren L. Haver, Ph.D.
Watershed Management Advisor
Orange County
1045 Arlington Drive, Gate 4
Costa Mesa, CA 92626
Phone: (714) 708-1613
Fax: (714) 708-2754
http://ceorange.ucdavis.edu
Email: dlhaver@ucdavis.edu

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