Russell City Energy Center: Nitrogen Deposition at East Bay Regional Parks

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DATE: February 24, 2009

The Environmental Protection Agency (EPA) has requested additional information from Calpine Corporation regarding the potential effects of nitrogen deposition from Calpine's Russell City Energy Center (RCEC) project on federally listed species or serpentine associated species that may be present in units of the East Bay Regional Park District (EBRPD) near the RCEC project site in Hayward, Alameda County, California. The EPA's inquiry is in connection with their approval of the RCEC's Prevention of Significant Deterioration (PSD) Permit.

Serpentine soil plant communities occur within the EBRPD and are known to be particularly sensitive to nitrogen deposition. Serpentine-derived soils in the San Francisco Bay Area support native grassland plant communities that provide habitat for rare and endemic species that are adapted to nutrient-poor soils. Increased nitrogen levels may encourage non-native annual grasses to out-compete native species (Weiss 1999, as cited in CEC 2007).

This summary considers areas of interest to the EPA within the Hayward Regional Shoreline, Garin/Dry Creek Pioneer Regional Park, Redwood Regional Park, and Lake Chabot Regional Park. The following listed or serpentine associated species are known to or could potentially occur in or near these parks: California clapper rail, salt marsh harvest mouse, western snowy plover, and California least tern at Hayward Regional Shoreline; and California red-legged frog, California tiger salamander, and serpentine associated plants, including Presidio clarkia and most beautiful jewel-flower at Garin/Dry Creek Pioneer, Redwood, and Lake Chabot Regional Parks.

1.0 Species and Habitat Distribution

Information on species occurrence and habitat distribution was derived from CDFG (2009).

Hayward Regional Shoreline

Hayward Regional Shoreline supports freshwater emergent and estuarine wetlands that provide habitat for the California clapper rail, salt marsh harvest mouse, western snowy plover, and California least tern. All of these species have been identified within or immediately adjacent to the regional shoreline (Figure 1; CDFG, 2009).

Garin/Dry Creek Pioneer Regional Park

Garin/Dry Creek Pioneer Regional Park supports annual grasslands, riparian vegetation, stream systems, and other freshwater habitats that potentially support California red-legged

frog and California tiger salamander. While tiger salamander has not been reported within the park, red-legged frogs have been observed along Dry Creek and its tributaries (Figure 2; Bobzien and DiDonato, 2007; CDFG, 2009). The U.S. Fish and Wildlife Service has proposed for designation this portion of the Dry Creek watershed as red-legged frog critical habitat (CFR 73:53492, 9/16/08).

Redwood Regional Park

Redwood Regional Park supports serpentine-derived soils that provide habitat for Presidio clarkia and potential habitat for most beautiful jewel-flower and other serpentine associates. Presidio clarkia has been documented within the park, and most beautiful jewel-flower has been recorded within less than half a mile of the park (Figure 3; CDFG, 2009).

Lake Chabot Regional Park

Lake Chabot Regional Park supports serpentine-derived soils that provide potential habitat for most beautiful jewel-flower and other serpentine associates. Most beautiful jewel-flower has been recorded within a mile of the park (Figure 4; CDFG, 2009).

2.0 Modeled Nitrogen Deposition

Wet and dry Nitrogen (N) species deposition rates were calculated for identified habitat areas using the EPA AERMET/AERMOD meteorological and air dispersion model. Atmospheric Dynamics performed the modeling analysis and has provided a technical disussion of the modeling methodologies and assumptions in a separate document (included as Attachment A to this document). To obtain the highest modeled N deposition rates in locations within the regional parks that may serve as habitat for the listed or serpentine associated species, the deposition map created by Atmospheric Dynamics from AERMOD modeling results was matched using a Geographical Information (GIS) mapping system with the park boundaries and California Natural Diversity Database GIS data showing the locations of known species occurrences. Annual N deposition rates, in kilograms per hectare per year (kg/ha/yr) were then interpolated from the map. The results are shown in Table 1.

Annual N deposition rates modeled for areas potentially occupied by the selected species range from 0.02 to 0.37 kg/ha/yr. No records of the selected species were found within Lake Chabot Regional Park. The highest annual N deposition rate modeled for areas within this park is approximately 0.03 kg/ha/yr. Figure 4 shows the modeled values, with the park boundaries indicated.

TABLE 1
Modeled Nitrogen Deposition Within Potentially Occupied Habitat of Federally Listed or Serpentine Associated Species

Park	CNDDB Record (Occurrence No.)	Annaul N Deposition Rate (modeled, kg/ha/yr)
Hayward Regional Shoreline	California clapper rail (#107)	0.25
	salt marsh harvest mouse (#117)	0.25
	Western snowy plover (#89)	0.37
	California clapper rail (#77)	0.12
	Western snowy plover (#122)	0.12

TABLE 1
Modeled Nitrogen Deposition Within Potentially Occupied Habitat of Federally Listed or Serpentine Associated Species

Park	CNDDB Record (Occurrence No.)	Annaul N Deposition Rate (modeled, kg/ha/yr)
	California least tern (#82)	0.12
	salt marsh harvest mouse (#54)	0.12
	California clapper rail (#78)	0.12
Garin/Dry Creek Pioneer Regional Park	most beautiful jewel-flower (#67)	0.34
	California red-legged frog (#34)	0.2
Redwood Regional Park	Presidio clarkia (#4)	0.02

As described by the CEC (2007) in the staff report for the Eastshore Energy Center Application for Certification, a threshold at which harmful effects from nitrogen deposition on plant communities has not been firmly established. However, a value of 5 kg/ha/yr is often used as a screening value for comparing nitrogen deposition among plant communities. Research conducted in the South San Francisco Bay Area indicates that intensified annual grass invasions can occur in areas with nitrogen deposition levels of 11-20 kg/ha/yr, with limited invasions at levels of 4-5 kg/ha/yr (Weiss 2006a and Weiss 2007, as cited in CEC 2007).

The effects of ammonia and atmospheric nitrogen deposition on salt and freshwater marsh communities have not been assessed (Weiss 2006b, as cited in CEC 2007). The highest annual deposition rate modeled on potentially occupied habitats at any of these EBRPD parks, however, is 0.37 kg/ha/yr (Table 1), which is less than 10 times lower than levels where limited invasions of non-native species have been observed in grassland communities.

Similarly, the highest nitrogen deposition values modeled for areas within the upland regional parks (Garin/Dry Creek, Lake Chabot, Redwood) having serpentine-derived soils and serpentine endemic species as well as upland amphibians (red-legged frog and tiger salamander) is 0.34 kg/ha/yr. This is an order of magnitude below the screening level significance threshold of 5 kg/ha/yr. Modeled deposition levels in Redwood Regional Park (Presidio clarkia) are 0.02 kg/ha/yr, also significantly lower than the threshold.

Atmospheric Dynamics also conducted N deposition modeling using the CALPUFF air dispersion model. The results of the CALPUFF modeling showed significantly lower annual N deposition than the AERMOD results showed (an order of magnitude lower). Both modeling methodologies are conservative in their approach and in the modeling assumptions; therefore, the actual N deposition is likely to be lower than that modeled using either the AERMOD or CALPUFF methods.

Consequently, the deposition of nitrogen from the RCEC would not be likely to cause significant adverse effects to vegetation communities and sensitive species living in the East Bay Regional Parks.

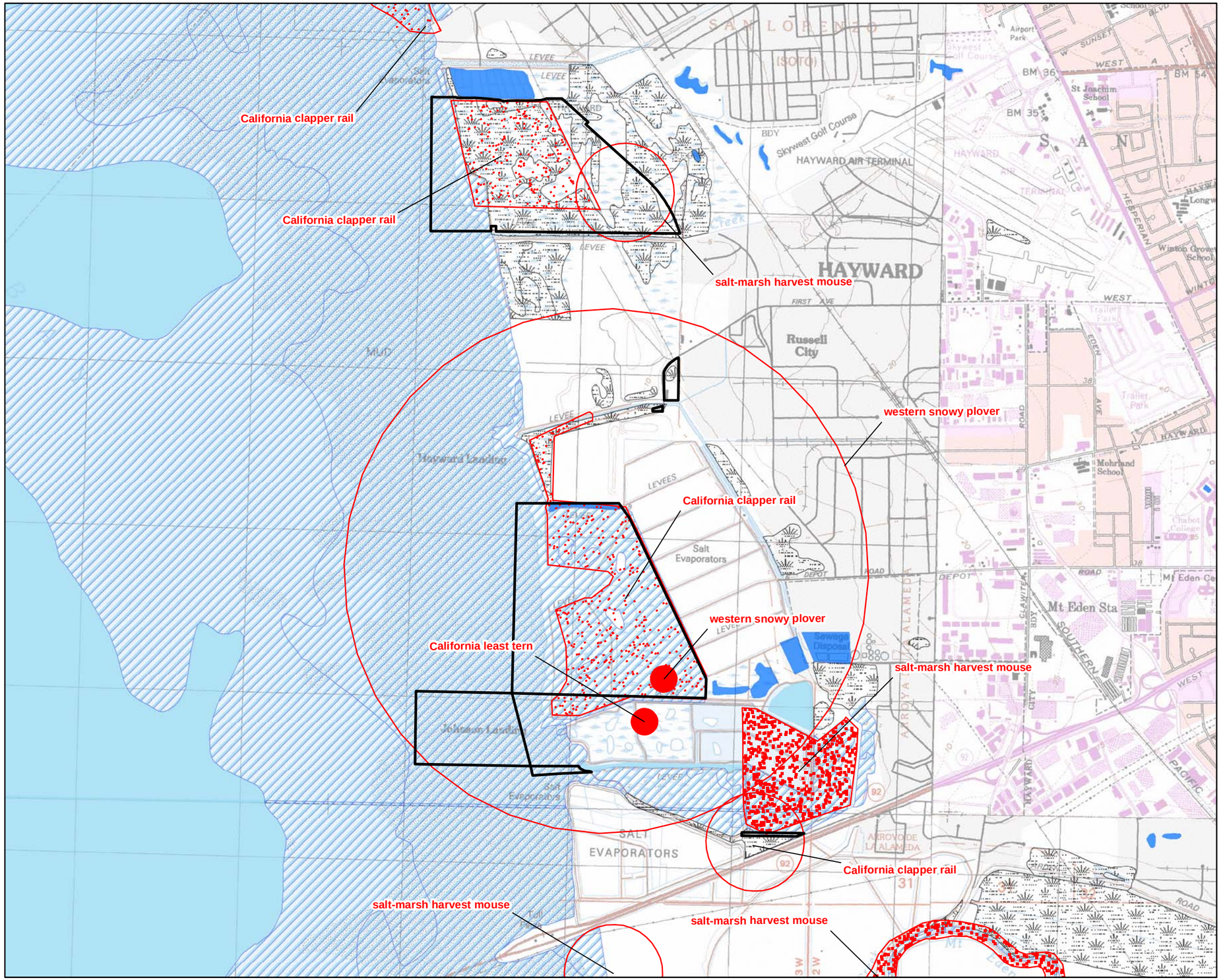
3.0 References

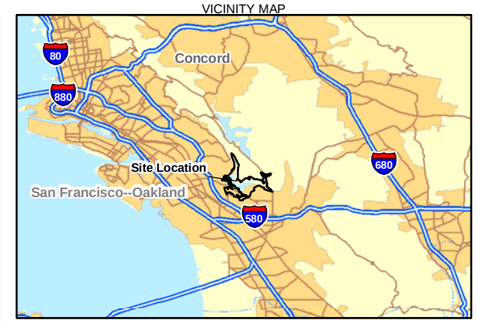
Bobzien, S. and J. E. DiDonato, 2007. The status of the California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), foothill yellow-legged frog (*Rana boylii*), and other aquatic herpetofauna in the East Bay Regional Park District, California. East Bay Regional Park District.

California Department of Fish and Game (CDFG). 2009. California Natural Diversity Data Base. Biogeographic Data Branch. (Database updated February 3).

California Energy Commission (CEC). 2007. Final Staff Assessment, City of Hayward Eastshore Energy Center Application for Certification (06-AFC-6). November.

Figures





LEGEND

Hayward Regional Shoreline

CNDDB Data February 2009

- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)

Wetland Type

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Pond

Notes:

1. Source: The California Natural Diversity Database (CNDDB), February 3, 2009.
2. U.S. Fish and Wildlife Service National Wetlands Inventory, January, 2009.
3. East Bay Regional Park District, 2009.

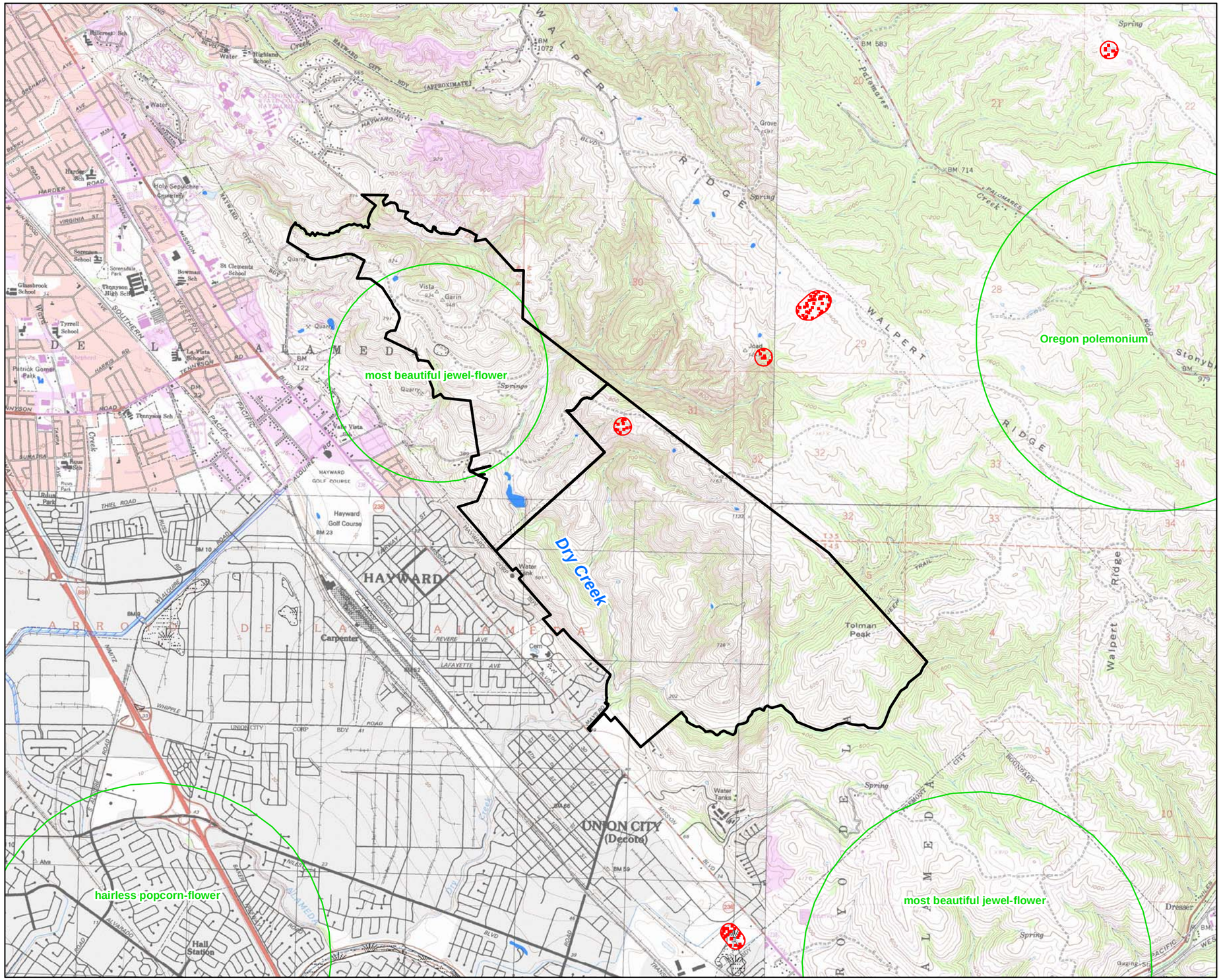
This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

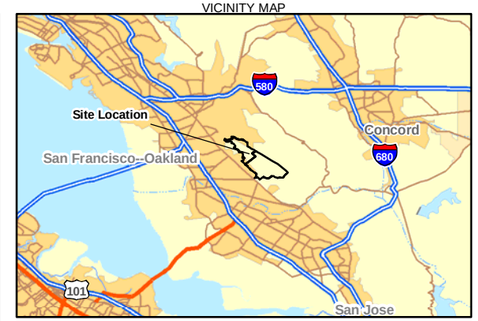
0 1,000 2,000

Feet

FIGURE 1
HAYWARD REGIONAL SHORELINE RESOURCES
HAYWARD, CALIFORINA



VICINITY MAP



LEGEND

Garin / Dry Creek Pioneer Regional Park

CNDDB Data February 2009

- California red-legged frog
- Plant (80m)
- Plant (specific)
- Plant (non-specifc)
- Plant (circular)

Wetland Type

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Pond

Notes:

1. Source: The California Natural Diversity Database (CNDDB), February 3, 2009.
2. U.S. Fish and Wildlife Service National Wetlands Inventory, January, 2009.
3. East Bay Regional Park District, 2009.

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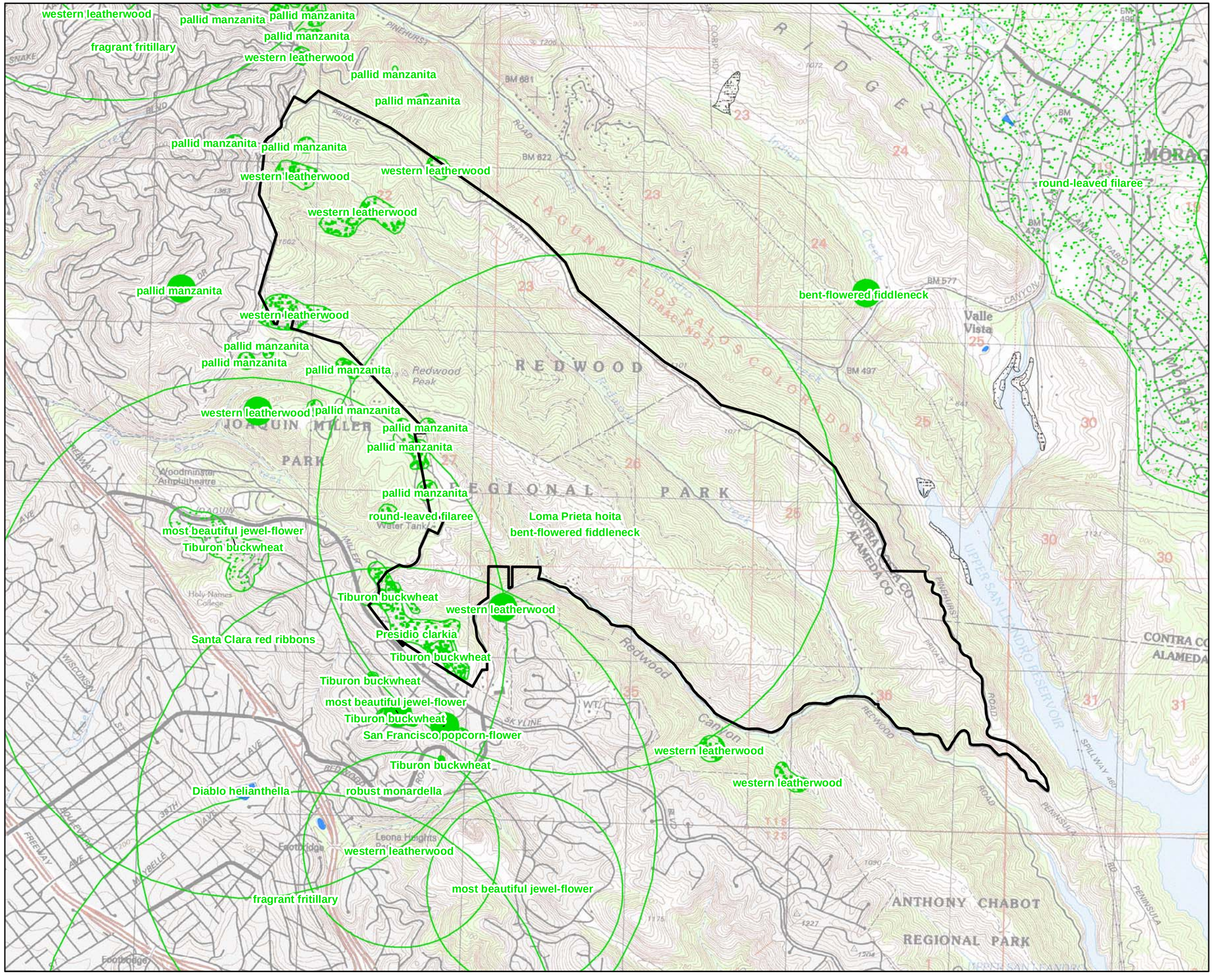
N

0 1,500 3,000

Feet

FIGURE 2
GARIN / DRY CREEK PIONEER REGIONAL PARK RESOURCES
HAYWARD, CALIFORINA



VICINITY MAP

LEGEND

Redwood Regional Park

CNDDB Data February 2009

- Plant (80m)
- Plant (specific)
- Plant (non-specifc)
- Plant (circular)

Wetland Type

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Pond

Notes:

1. Source: The California Natural Diversity Database (CNDDB), February 3, 2009.
2. U.S. Fish and Wildlife Service National Wetlands Inventory, January, 2009.
3. East Bay Regional Park District, 2009.

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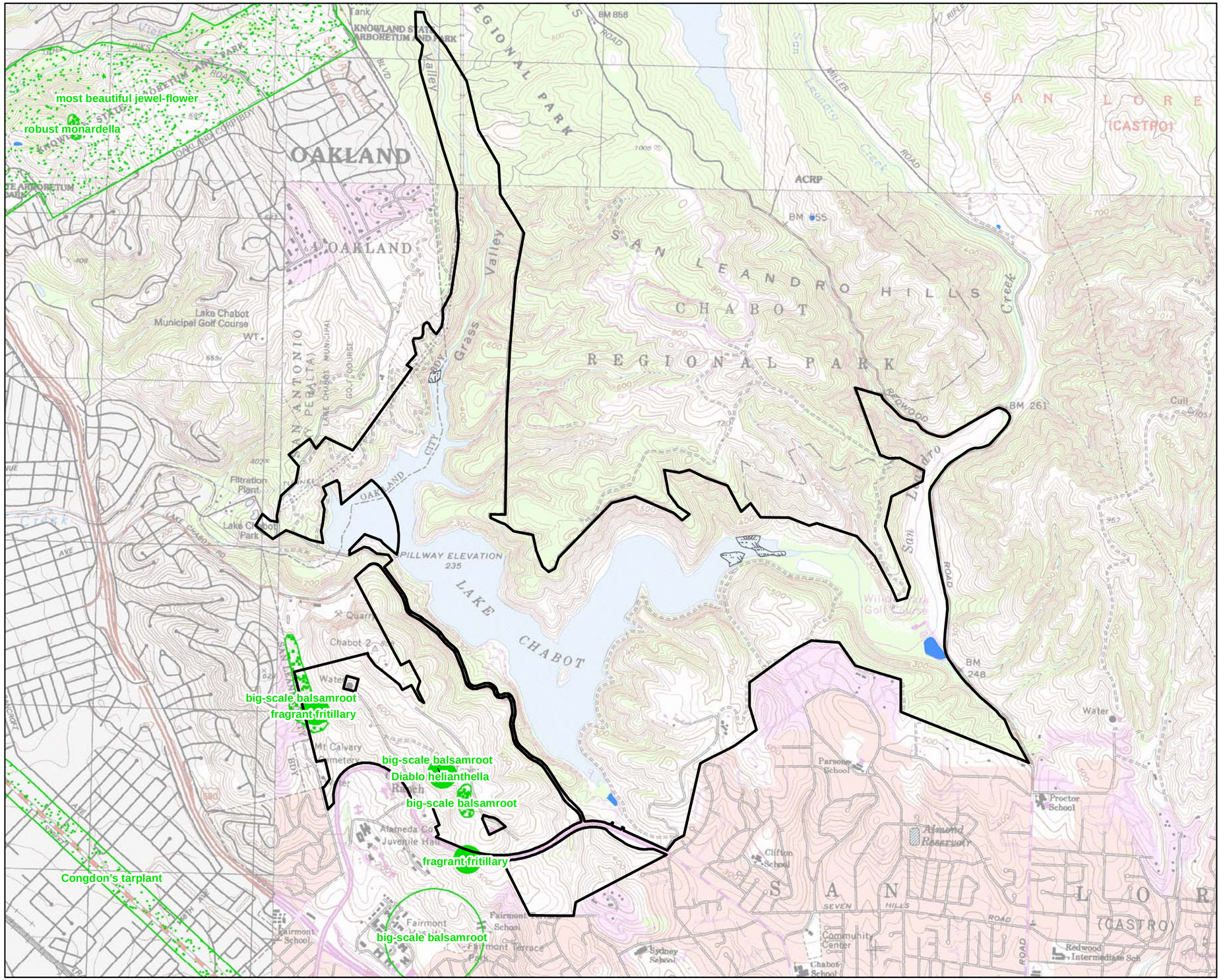
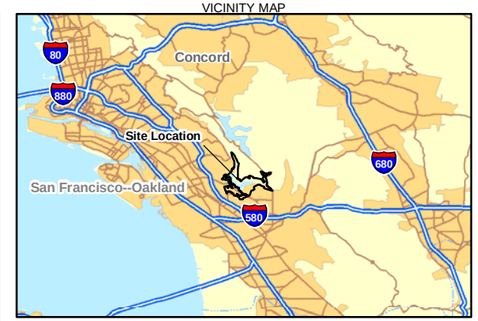
FIGURE 3
REDWOOD REGIONAL PARK RESOURCES
OAKLAND, CALIFORINA

CH2MHILL



VICINITY MAP



LEGEND

Lake Chabot Regional Park

CNDDB Data February 2009

- Plant (80m)
- Plant (specific)
- Plant (non-specifc)
- Plant (circular)

Wetland Type

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Pond

Notes:

1. Source: The California Natural Diversity Database (CNDDB), February 3, 2009.
2. U.S. Fish and Wildlife Service National Wetlands Inventory, January, 2009.
3. East Bay Regional Park District, 2009.

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N

0 1,000 2,000

Feet

FIGURE 4
LAKE CHABOT REGIONAL PARK RESOURCES
CASTRO VALLEY, CALIFORINA

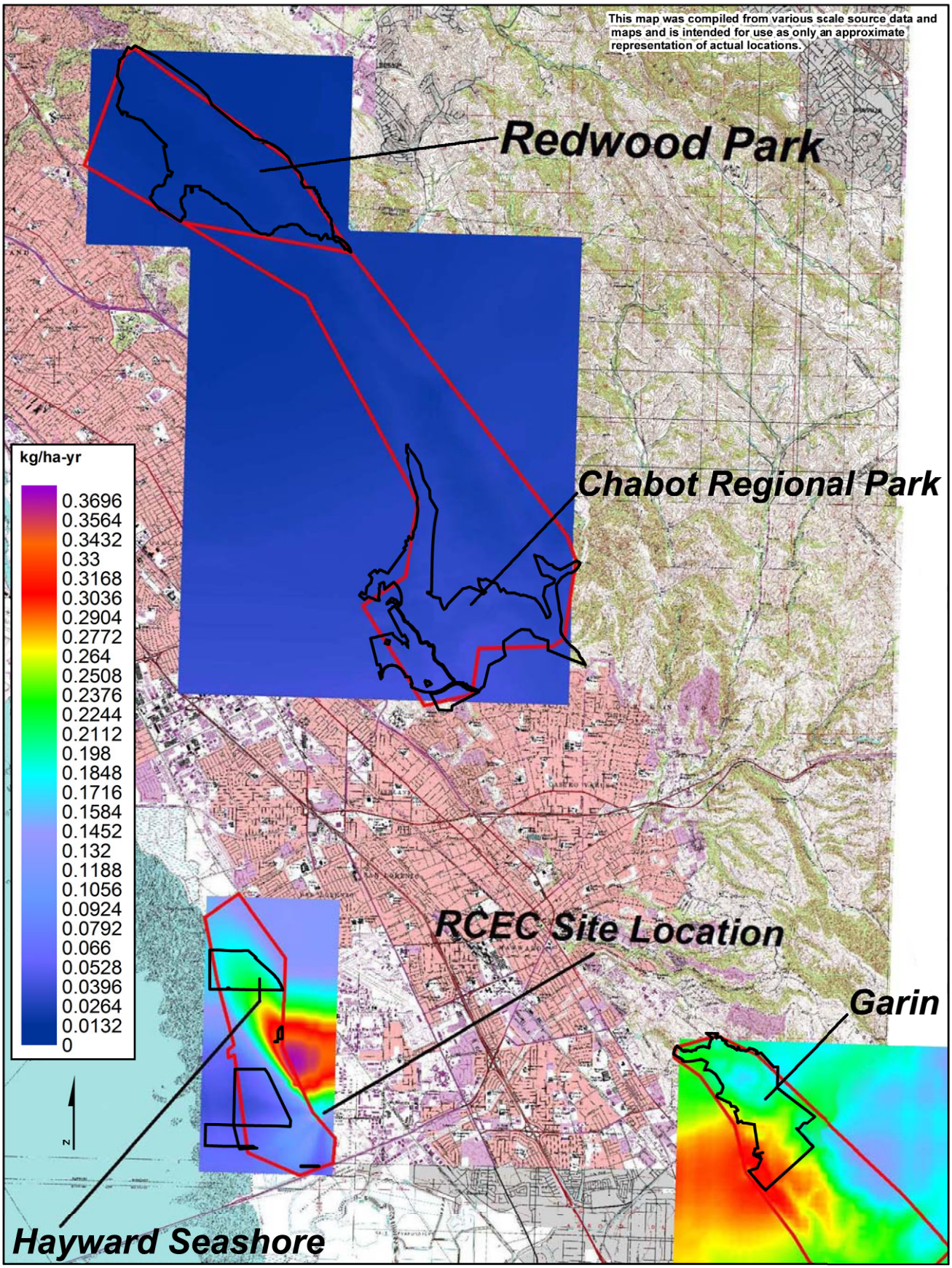

FIGURE 5
Annual Nitrogen Deposition Modeling Results Using AERMOD
Russell City Energy Center
Hayward, California

Attachment A

Air Dispersion Modeling Technical Report