COUNTY CROSSINGS

INSECT AND INVERTEBRATES SITE ASSESSMENT

COUNTY CROSSINGS DEVELOPMENT

ANTIOCH, CONTRA COSTA COUNTY, CALIFORNIA

August 2005

Prepared for:

RCL ECOLOGY

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27 July 2005

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RE: Transcan Development, LLC - County Crossings Site in Antioch, CA
Habitat assessment for special-status insects and invertebrates

Dear Randy:

At your request, I conducted a habitat assessment for 23 special-status insects and invertebrates, which might potentially occur at the above-noted property, located east of Hillcrest Avenue and north of Highway 4 in Antioch, CA. This property is located about 0.75 miles southeast of the Antioch Dunes National Wildlife Refuge, which supports a number of special-status plants and animals, especially endemic and range-limited insects.

The insect and invertebrate taxa treated in this report were included because:
a) this property is located within or near the known geographic ranges of these species;
b) some species are associated with particular soil types, especially Delhi sands that have been identified from the property; and
c) plant communities that are known to support these species are known from nearby locations and might also occur at the property.

Most of these species are associated either with sand-based terrestrial and freshwater or brackish aquatic habitats in the San Joaquin Delta area.

On April 23rd, I met you at the site to tour it. We drove and hiked throughout the property to assess the suitability of habitat conditions there to support special-status insects and invertebrates treated herein. I revisited the site on June 15th.

BACKGROUND INFORMATION

Table 1 lists the special-status insect and invertebrate taxa treated in this report. Both the scientific and common names of all taxa are listed, along with their respective state and federal conservation status. Most of these taxa are recognized by the Natural Heritage Division of the California Department of Fish & Game or the U.S. Fish & Wildlife Service as special-status species.

My firm has developed and maintains a computerized database, which I refer to as the **"BUGGY Data Base"**, on the rare and special-status insects and invertebrates that occur in California. The contents of BUGGY are similar to the California Natural Diversity Database

Table 1. List of Special-Status Insects and Invertebrates for Transcan Development's County Crossings Site in Antioch, CA				
Common Name	Scientific Name	Order / Family	Conservation Status	
			Federal[1]	State[2]
Lange's Metalmark butterfly	*Apodemia mormo langei*	Lepidoptera: Lycaenidae	E	G5T1S1
Antioch Dunes Anthicid beetle	*Anthicus antiochensis*	Coleoptera: Anthicidae	SC	
Ciervo Aegialian Scarab beetle	*Aegialia concinna*	Coleoptera: Scarabaeidae	SC	G1S1
Curved-foot *Hygrotus* Diving beetle	*Hygrotus curvipes*	Coleoptera: Dytiscidae	SC	G1S1
Molestan Blister beetle	*Lytta molesta*	Coleoptera: Meloidae	SC	G2S2
Sacramento Anthicid beetle	*Anthicus sacramento*	Coleoptera: Anthicidae	SC	G1S1
San Joaquin Dune beetle	*Coelus gracilis*	Coleoptera: Tenebrionidae	SC	G1S1
Valley Elderberry Longhorn beetle	*Desmocerus californicus dimorphus*	Coleoptera: Cerambycidae	T	G3T2S2
Antioch Andrenid bee	*Perdita scitula antiochensis*	Hymenoptera: Andrenidae	SC	G1T1S1
Yellow-banded Andrenid bee	*Perditia hirticeps luteocincta*	Hymenoptera: Andrenidae	SC	
Antioch Mutillid wasp	*Myrmosula pacifica*	Hymenoptera: Mutillidae	SC	GHSH
Antioch Sphecid wasp	*Philanthus nasalis*	Hymenoptera: Sphecidae	SC	
Redheaded Sphecid wasp	*Eucerceris ruficeps*	Hymenoptera: Sphecidae		G1G3S1S3
Antioch Cophuran robberfly	*Cophura hurdi*	Diptera: Asilidae	SC	
Antioch Efferian robberfly	*Efferia antiochi*	Diptera: Asilidae	SC	G1G3S1S3
Hurd's Metapogon robberfly	*Metapogon hurdi*	Diptera: Asilidae	SC	G1G3S1S3
Middlekauff's Shieldback katydid	*Idiostatus middlekauffi*	Orthoptera: Tettigoniidae	SC	G1G2S1
Shieldback katydid	*Neduba extincta*	Orthoptera: Tettigoniidae	extinct	extinct
California Linderiella	*Linderiella occidentalis*	Anostraca: Linderiellidae	SC	G2G3S2S3
Longhorn Fairy shrimp	*Branchinecta longiantenna*	Anostraca: Branchinectidae	E	G1S1
Midvalley Fairy shrimp	*Branchinecta mesovallensis*	Anostraca: Branchinectidae	SC	G2S2
Vernal Pool Fairy shrimp	*Branchinecta lynchi*	Anostraca: Branchinectidae	T	G2G3S2S3
Vernal Pool Tadpole shrimp	*Lepidurus packardi*	Notostraca: Triopsidae	E	G2G3S2S3

[1] – E = endangered, T = threatened, SC = special concern

[2] – see www.dfg.ca.gov/whdab/html/cnddb/html for an explanation of these conservation status codes

(CNDDB), which is maintained by the California Department of Fish & Game. However, BUGGY contains records for California's special-status insects and invertebrates from approximately 100,000 specimens that are housed in various North American institutional and private collections, literature citations, and other pertinent information about the distribution, life history, status, and taxonomic specialists for each taxon. Background information for the species discussed in this report was taken from the BUGGY database (Entomological Consulting Services, Ltd. 2005), the CNDDB (2005), pertinent entomological literature, and my prior experience with these taxa.

The remainder of this section briefly summarizes available information about the distribution, natural history, and known habitat requirements about each of the insect and invertebrate species. For some species, such information is quite limited, hence my discussion about such species is somewhat abbreviated compared to other taxa.

Lange's Metalmark Butterfly.

The Lange's Metalmark butterfly is one of the first insects from California to be recognized at the federal level as an endangered species under the Endangered Species Act of 1973. Today, this butterfly is known from only the Antioch Dunes in Contra Costa County. Historically, it may have been found at other sandy deposits, especially Delhi sands, in eastern Contra Costa County, wherever its food plant, *Eriogonum nudum* ssp. *auriculatum* (Polygonaceae) grew. One adult metalmark was collected near Brannan Island in the 1960's.

Both adults and larvae of this endangered butterfly feed on this single food plant, which is commonly referred to as Naked Buckwheat. Larvae feed on the leaves, flowers, and stems, while adults drink the nectar. Adults will occasionally visit other dune endemic plants, especially late summer-flowering composites for nectar (Arnold 1983).

The metalmark has a single generation per year. Adults are active in August and September. Eggs hatch after the onset of winter rains, and the larvae have a protracted developmental period that is about nine months in duration. Population numbers of the metalmark declined to dangerously low levels in the late 1970's and early 1980's (Arnold 1983). However, habitat management has substantially increased numbers of the metalmark's food plant at the dunes, and the butterfly population has rebounded dramatically.

Valley Elderberry Longhorn Beetle.

In 1980, the USFWS recognized the Valley Elderberry Longhorn Beetle (VELB) as a threatened species and proposed portions of Putah Creek in Yolo and Solano counties and the American River in Sacramento County as critical habitat (USFWS 1980). The VELB was recognized as a threatened species because of loss and alteration of its riparian habitat and because it naturally occurs at low population densities. Subsequent surveys have demonstrated that the VELB is more widespread. At this time, the VELB is known from widely scattered localities in the Central Valley. Adult specimens have been collected in locations ranging from the Kaweah River in Tulare County by Jeff Halstead (Barr 1991) to Red Bluff in Tehama County by Jones & Stokes Associates, Inc. (Barr 1991). Exit holes of this wood-boring beetle have been observed in elderberries growing as far north as the Shasta/Tehama county line (Barr 1991) and as far south as Caliente Creek in Kern County (Shields 1990a and 1990b).

The VELB generally occurs along waterways and in floodplains that support remnant stands of riparian vegetation. In particular, elderberry (*Sambucus* sp.: Caprifoliaceae) must be present, as both larvae and adults feed on this shrub or small tree. The VELB has also been observed in the Sierran foothills, particularly in Fresno, Madera, and Placer counties. At these foothill locations, the VELB is not restricted to riparian habitats. To the best of my knowledge, the nearest known records of the VELB to the proposed project site are from several localities, west and southwest of Stockton along the Middle and San Joaquin Rivers (BUGGY Data Base 2005).

San Joaquin Dune Beetle.

Coelus gracilis Blaisdell, 1939, is a flightless beetle that is found burrowing in sand dunes. Historically, it was collected at the Antioch Dunes prior to World War II, but has not been seen there since the early 1950's. This beetle is also known from a limited number of sandy localities in Fresno and Kings County (Doyen 1976).

Peak activity of the beetle is unclear because in drier climates dune beetles are only active during the winter, while coastal populations are only active during the summer. This beetle is a nocturnal detritivore, which feeds on decaying vegetation. Adults can be observed on the sand surface on cool, damp nights. Adults and larvae can also be found buried in the sand at depths of one to 12 inches.

Ciervo Aegialian Scarab Beetle.

Since its original description in 1977 (Gordon and Cartwright 1977), the beetle has been found at only three general locations: a) the Ciervo Hills-Monocline Ridge area of Fresno County; b) the Panoche Road area of San Benito County; and c) the Antioch Dunes of Contra Costa County (Gordon and Cartwright 1988).

Members of the genus *Aegialia* burrow in sand deposits, such as coastal or inland dunes, and presumably feed on detritus. They are most frequently found in association with the roots of native shrubs and grasses.

Curved-Foot *Hygrotus* Diving Beetle.

Hygrotus curvipes (Leach), 1936, is an aquatic beetle that was described from a series of specimens collected at a single pond in Oakley (Contra Costa County) in 1936. A second series was collected at the same pond in 1938 (Leach 1938). Today, all known occurrences of the Curved-foot *Hygrotus* Diving beetle (CFHDB), are from eastern Contra Costa and Alameda counties, in an area bounded by the Outer Coast Range and the San Joaquin Delta. The CFHDB was originally described as a new species in the genus *Coelambus* by Leach (1938). However, after further taxonomic study of this and related genera of dytiscid beetles, Leach (1966) subsequently placed this species in the genus *Hygrotus*.

For nearly half a century after its description as a new species in 1938, the CFHDB was known from only a single pond in the town of Oakley. More recent surveys have found this beetle at several sites within the Kellogg Creek watershed and at additional sites near the watershed (Jones & Stokes Associates, Inc. 1990). In 1990 and 1991, I found the CFHDB at the

Byron Airport and along Brushy Creek in southeastern Contra Costa County and at several sites between the airport and Mountain House, in northeastern Alameda County (Entomological Consulting Services, Ltd. 1990a and 1990b).

The preferred habitat of the aquatic-dwelling CFHDB is small, drying, mineralized pools formed by winter rains, plus small ponds, or pools in intermittent streams. Most of the sites are fringed by salt and salt-tolerant vegetation, for example salt grass, *Distichlis spicata* (Gramineae). The beetle has also occasionally been found in stock ponds that are near mineralized pools or intermittent streams.

Due to their size and similar appearance, species of *Hygrotus* beetles can often be difficult to distinguish from one another. In eastern Contra Costa County, at least one and often two other species of *Hygrotus* can be found in the same bodies of water as the CFHDB. Unlike the CFHDB, these other, sympatric species of *Hygrotus* are more widespread and typically occur in greater numbers than the CFHDB.

Molestan Blister Beetle.

The Molestan Blister beetle was described in the late 1800's. It is among 15 species in the genus *Lytta* that occur in the Central Valley of California (Selander 1960). Collection records (BUGGY 2005; CNDDB 2005; Selander 1960; and Halstead and Haines 1992) indicate that approximately 250 specimens of *L. molesta* have been collected at about 30 locations, primarily in the San Joaquin Valley. The nearest records for this species to the project site are from Brentwood and the hills, three miles southwest of Brentwood (CNDDB report 2005; Selander 1960).

Specific biological information about *L. molesta* is unknown; however, several related species of *Lytta* are believed to be parasitic on wild, ground-nesting bees. Recorded hosts include Anthophorid bees of the genera *Anthophora*, *Diadasia*, *Emphoropsis*, and *Ptilothrix*, Andrenid bees in the genus *Andrena* (Andrenidae) and Colletid bees in the genus *Colletes* (Hurd 1979; Selander 1960). These bees often make their nests in sandy or hardpan type soils. Adult beetles congregate on various foodplants that typically grow in valley grassland and vernal pool habitats. Specific bee hosts for *L. molesta* are not known, but would likely include members of the aforementioned bee genera.

Known foodplants for species of *Lytta* include native species of Leguminosae, Convolvulaceae, Compositae, Papaveraceae, and Rosaceae plus the introduced filaree, *Erodium cicutarium* (Geraneaceae) (Selander 1960; MacSwain 1956; BUGGY specimen label data). The adult beetle feeds on both the petals and pollen. These same plants are also visited by the above-mentioned bees, which serve as hosts for developing larvae of *Lytta*. Specimen label data (Selander 1960; MacSwain 1956; BUGGY) indicates the use of *Lupinus* and *Erodium cicutarium* flowers by *Lytta molesta*. Also, the triungulin larval stage of *L. molesta* have been found on *Lupinus* flowers (MacSwain 1956).

Adult *Lytta* beetles are most frequently observed in March and April, but there are also a few collection dates during May, June, and July. Nearly all collection records from the floor of the Central Valley are prior to 1952, with most from the 1920's and 1930's. *L. molesta* was last

collected on the valley floor in 1952 at Wasco in Kern County. More recent collections occurred in 1980 and 1991 (BUGGY 2005) at Big Table Mountain, in Madera County.

Antioch Dunes and Sacramento Anthicid Beetles.

Anthicus antiochensis was described by Werner (1975) in 1975 from specimens collected in 1953 at the Antioch Dunes, and until recently, it was known only from the Antioch Dunes. However, recent surveys by Ken Hagen (1986) and Matthew Davis (1991) have discovered new populations of this beetle at four locations along the Sacramento River and near the town of Nicolaus on the Feather River.

Anthicus sacramento Chandler, 1978 was described from specimens collected at several localities in the San Joaquin-Sacramento Delta region. The latter species was formerly found along Putah Creek in Solano County and the Sacramento River in Butte County (Hagen 1986). More recently, Davis (1991) found this species at six locations along the Sacramento River in Solano, Butte, Glenn, Tehama, and Shasta counties; along the Feather River in Sutter County; and at four localities along the San Joaquin River in San Joaquin County.

Based on biological information of related taxa, these beetles are probably scavengers or detritus feeders that live in loose, fine-grained sand that is sparsely vegetated. Both beetles have been collected in natural sand deposits, such as sand dunes, sand bars, or riverine alluvial fans, and man-made deposits, such as dredge spoils.

Adults are active at night, foraging on the surface of the sand, and burrow in the sand during daytime. Adults have been collected throughout the year, but appear to be most common in June and July. Larvae have been observed in April and May. Despite the lengthy period of activity, each species appears to have only one generation per year.

Yellow-banded and Antioch Andrenid Bees.

Both *Perdita hirticeps luteocincta* Timberlake, 1960, and *P. scitula antiochensis* Timberlake, 1960, were described from the Antioch sand dunes (Timberlake 1960). The former taxon is known only from the type series collected in 1936, while the latter has been collected more recently at Antioch and nearby Oakley. Both bees are active in the late summer and early fall moths. They are active pollinators of *Gutierrezia californica*, *Eriogonum nudum*, and probably late-summer flowering composites.

Redheaded Sphecid Wasp.

Although *Eucerceris ruficeps* Scullen, 1948 is known from a few sites in the Delta and foothills of the Central Valley, most specimens have been collected at the Antioch Dunes, its type locality. This wasp nests in the sand. At the Antioch Dunes, Linsley and MacSwain (1954) found it nesting in hard-packed sand, where the wasp was using abandoned burrows of halictine bees. Weevils (Coleoptera: Curculionidae) of the genera *Sitona* and *Dysticheus*, were found as prey items in the nests.

Antioch Dunes Sphecid.

Philanthus nasalis Bohart, 1972 is known only from the type series, collected in 1948 and

1959 at Antioch. At this time it is feared to be extinct at the dunes.

Antioch Mutillid Wasp.

Myrmosula pacifica (Mickel), 1940, is known from only one specimen collected at Antioch in 1938. Wasbauer (1974) considered it likely to be a synonym of *M. exaggerata* (Krombein), which is a widespread species. Mutillids are ant-like wasps that nest in the ground, usually in sandy soils.

Three Robberflies.

Cophura hurdi Hull, 1960, *Efferia antiochi* Wilcox, 1966, and *Metapogon hurdi* Wilcox, 1964 are robberflies that are associated with the Antioch Dunes. *Cophura hurdi* was described from a single specimen collected at Antioch in 1939, but unfortunately the type specimen was lost and the taxonomic status of this robberfly is uncertain due to possible confusion with another species. *Efferia antiochi* was named for its type locality, but this robberfly is also known from other localities in the Central Valley south to Fresno County. *Metapogon hurdi* was described from the Antioch Dunes, but is also known from Fresno County. All three robberflies are predaceous on other insects, probably taxa that are associated with sand dunes or loose sandy deposits.

Two Katydids.

Idiostatus middlekauffi is known only from the Antioch Dunes (Rentz 1973), where it was collected between 1937 and 1965, but has not been seen since despite intensive searches. This species lived on various shrubs indigenous to the dunes. It was active between April and August.

Neduba extincta is known only from a single specimen, collected at the Antioch Dunes in 1937. It is feared to be extinct. Unfortunately, nothing is known about its natural history.

Fairy and Tadpole Shrimps.

The Vernal Pool fairy shrimp, *Branchinecta lynchi* was described as a new species in 1990 by Eng, Belk, and Eriksen (1990). The Vernal Pool fairy shrimp is known from a number of locations throughout the Central Valley and as far south as Riverside County, and from a few locations in the Coast Range as far south as Santa Barbara County. It has also been found in Oregon (Eriksen and Belk 1999). This fairy shrimp is associated with vernal pools and grassy swales that are usually characterized by clear to tea-colored water. Collection records range from December through May, but probably vary considerably from year-to-year and in different localities depending upon the timing of winter rains.

A common cohabitant in these types of vernal pools is the California Linderiella, *Linderiella occidentalis*, whose distribution includes several locations in the Central Valley and Coast Range mountains, between Tehama and Riverside counties. Collection records range from October through May, but the actual annual activity period at a particular location will vary depending upon winter precipitation levels and the timing of winter rains. The Mid-Valley Fairy shrimp is another co-habitant of grassy swales and vernal pools. It is generally known from vernal pool complexes situated in the lower Sacramento Valley and upper San Joaquin Valley. All three

of these fairy shrimp taxa are known from localities in eastern Contra Costa County.

The Longhorn Fairy shrimp (*Branchinecta longiantenna*) is known from rock pools and vernal pools. It has a disjunct distribution, with populations known from the Altamont and Brushy Peak areas of Alameda-Contra Costa County, from the Carizo Plain area of eastern San Luis Obispo County, and from Merced County. The Vernal Pool Tadpole shrimp is known from the Central Valley and a single vernal pool complex in Fremont (Alameda County). Because its development after egg hatch takes longer than most fairy shrimp taxa, it is generally associated with playa pools or deep vernal pools that remain ponded longer than the usual, more shallow vernal pools.

Because they live in non-permanent bodies of water, all species of fairy and tadpole shrimps have life cycles specialized for living in temporary habitats. Females carry either sexual or parthenogenetic (asexual) eggs, externally in an egg or brood sac for a few days, and drop them in the mud. In some species and individuals, the egg sac remains attached until the female dies and sinks to the bottom of the pool. Thin-walled "summer" eggs hatch almost immediately, but thick-shelled "winter" eggs can withstand heat, cold, and long periods of desiccation. Viable eggs have been kept in dried pond mud on laboratory shelves for decades.

Eggs hatch within a few days after the pools are reflooded with water. The immatures, known as nauplii, molt about 12 to 20 times, growing until they attain sexual maturity. With each successive molt, they grow in size, add more segments and appendages, and the appendages become more well-developed. The number of instars (i.e., period between molts) varies with species, water temperature, and food supply. Under optimal conditions, some fairy shrimp taxa have been known to complete their entire life cycle in as few as 16 days. Their quick life cycle enables them to reproduce in temporary bodies of water, and in longer-lasting water habitats, to reproduce before predators, such as tadpoles of amphibians and aquatic insects, colonize the habitat or reach sufficient size to decimate the shrimp population.

Fairy shrimp swim on their backs by beating their legs in a wave-like, anterior to posterior direction. This behavior not only propels them through the water in a graceful gliding manner, but also serves as a mechanism for obtaining food. Most species feed on algae, phytoplankton, bacteria, protozoans, rotifers, and other detritus that is suspended in the water; hence, they are referred to as suspension feeders. Tadpole shrimp crawl around on the bottom of a pool and also swim.

HABITAT ASSESSMENT EVALUATION

Survey Methods.

A habitat assessment evaluation was conducted for each of the 23 special-status insect and invertebrate taxa considered in this report during my site visits. I drove and hiked throughout portions of the property that supported a mixture of native and non-native vegetation. to identify the habitats present and to evaluate the suitability of existing habitat conditions to support each of the special-status insect and invertebrate species, based on their respective habitat requirements and available information about their natural histories.

The timing of my visits did not coincide with the activity periods for most of the special-status species. Although I briefly searched for a couple of species that were active at the time of my visits, thorough status surveys were not conducted for any of the species treated in this report.

Habitats.

Natural habitats at the property have been largely converted to industrial and residential uses. In addition, much of the remaining undeveloped area has been disked for fire control, and suffered from the effects of off-road vehicle use, grazing, dryland farming, almond orchards, and dumping, which collectively have further degraded the remaining habitats and encouraged the growth of non-natives plants. The northeastern portion of the site appears to have been mined at some prior time.

Observed plant communities at the site included non-native annual grassland, coastal freshwater marsh/willow scrub (along East Antioch Creek which flows through the site), and seasonal wetlands. Each of these plant communities is characterized by a mixture of native and non-native plant taxa. In most portions of the site, non-native plants have largely displaced the native flora.

In the non-native annual grassland community dominant grasses and forbs include wild oats (*Avena fatua*), Italian ryegrass (*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), common vetch (*Vicia sativa*), rose clover (*Trifolium hirtum*) soft chess (*Bromus hordeaceus*), hoary mustard (*Hirschfeldia incana*), chicory (*Cichorium intybus*) yellow star thistle (*Centaurea solstitialis*), California poppy (*Eschscholzia californica* var. *californica*), and fiddleneck (*Amsinckia menziesii* var. *intermedia*). Tree cover is sporadic with the dominant species consisting of the invasive tree of heaven (*Ailanthus altissima*). Orchard remnants consist of almond (*Prunus dulcis*) and Northern California black walnut (*Juglans californica var. hindsii*). Others, such as iron bark eucalyptus (*Eucalyptus sideroxylon*), and Russian olive (*Elaeagnus angustifolius*), have been planted as windbreaks and landscape features near residential and commercial properties. A smaller subset of this community exists along the sandy slope on the south side of Oakley Road, where other species such as buckwheat (*Eriogonum* sp.), deer weed (*Lotus scoparius*), and valley gumplant (*Grindelia camporum*) are predominant.

East Antioch Creek flows through the project site and is characterized by coastal freshwater marsh/willow scrub vegetation. Narrow-leaved cattail (*Typha angustifolia*) is the most abundant species, followed by peppergrass (*Lepidium latifolium*), Italian thistle (*Cynara cardunculus*), and water parsley (*Oenanthe sarmentosa*). Where ponds occur within the marsh, willows such as yellow willow (*Salix lasiandra*) and arroyo willow (*Salix lasiolepis*) and Fremont cottonwood (*Populus fremontii*) are found along the banks.

Two types of seasonal wetlands occur at the project site. The first of these is found within the flood zone that borders the marsh. This type is dominated by creeping wildrye (*Leymus triticoides*). Associated species include Italian ryegrass, Mediterranean barley (*Hordeum marinum var. gussoneanum*), willow herb (*Epilobium brachycarpum*) and curley dock (*Rumex crispus*).

The other seasonal wetland type occurs on the disturbed soils within the old sand pit in the northeastern corner of the project area that captures runoff from Oakley road and adjacent residences, as well as road drainage from Highway 160. Species occurring in this type include spiny cocklebur (*Xanthium spinosum*), foxtail (*Alopecurus aequalis*), curly dock, rabbit foot grass (*Polypogon monspeliensis*), narrow-leaf milkweed (*Asclepias fascicularis*), pappose tarweed (*Centromadia parryi var parrryi*), Fremont cottonwood. and morning glory (*Onethera* sp.).

The remainder of this section discusses my habitat evaluation for each of the special-status species considered herein. For most of the taxa treated in this report, the conversion of the former native plant communities to other land uses has rendered most of the site unsuitable for habitation by several of the special-status insects and other invertebrates, and greatly reduced the likelihood of habitation by the remaining taxa. The remainder of this section discusses each of the species individually.

Lange's Metalmark Butterfly.

Due to the absence of the butterfly's sole larval food plant and primary adult nectar plant, *Eriogonum nudum* ssp. *Auriculatum* at the property, breeding habitat for this butterfly does not occur there. Other nectar plants, such as the native shrubs *Senecio* and *Guterriezia* are also absent, so adults would also not find any foraging habitat at the project site. For these reasons, the metalmark would not be expected to occur at the project site and the project will not adversely impact the butterfly or its habitat.

Valley Elderberry Longhorn Beetle.

This beetle is usually found in or near riparian areas where its elderberry food plant grows. Since no elderberries were observed, I would not expect the VELB to use this site. No impacts to this beetle or its habitat should occur as a result of the project.

San Joaquin Dune Beetle and Ciervo Aegialian Scarab Beetle.

These species normally burrow in the sand of well-developed sand dunes. Given the degraded condition of the undeveloped sandy areas at the site, these beetles are unlikely to still occur there. Even though they are detritivores, at other locations I have found them burrowing in sand dunes beneath indigenous plants, which are largely absent or occur in limited numbers at the County Crossings property. I sifted sand in a few portions of the site in an attempt to find these beetles, but did not. Based on the degraded habitat conditions at the site and the results of my limited survey efforts, I believe it is unlikely that they occur there.

Curved-foot *Hygrotus* Diving Beetle.

Even though it very poor quality habitat, East Antioch Creek was sampled to search for this beetle. No life stages of the beetle were observed. Due to the sandy soils beneath the seasonal wetlands, their hydroperiods may be too brief to allow the beetle to complete its life cycle. For these reasons, I doubt that this beetle occurs at the site.

Molestan Blister Beetle.

This species is associated with grassland habitats and adults are primarily found on various

native wild flowers or flowers of native shrubs. Since the native vegetation at the site has been converted to industrial, agricultural, and residential uses and is dominated by introduced species, these conditions reduce the likelihood that this beetle would be found there. Furthermore, the regular and extensive disking of the site greatly reduces the likelihood that ground nesting bees, the presumed host of the parasitic larval stage of this beetle, would occur at the site, as nests would be destroyed before a generation could complete its life cycle. The bees known to be parasitized are pollinators of plants indigenous to vernal pools, a habitat that does not occur at the site. During my field surveys I did not find any burrows of ground-nesting bees at the property. For all of these reasons, I conclude that the occurrence of this beetle at the County Crossings site is unlikely.

Antioch Dunes and Sacramento Anthicid Beetles.

Both of these beetles are detritivores that live in loose sand. Although there is plenty of loose sand at the site, it is regularly disturbed by disking and off-road vehicles, activities that are not compatible with maintaining populations of these beetles. I sifted sand in selected portions of the property to search for these beetles but did not find them. For these reasons I do not expect either of these species to occur at the site.

Yellow-banded and Antioch Andrenid Bees.

The undeveloped sandy areas represent potential habitat for the Andrenid bees. However, these species are known to visit the flowers of various native shrubs that bloom in the late summer, especially *Eriogonum* and *Gutierrezia*, which do not grow at the property. Given the overall degraded conditions of the undeveloped sandy areas, plus the disking and other activities that would destroy their nests in the sand, plus the absence of preferred adult food plants, I do not expect these bees to occur there.

Antioch Dunes and Redheaded Sphecid Wasps.

Both of these species are associated with sand dunes, thus the undeveloped sandy areas represent potential habitat. Since these species nest in the ground, the extensive ground disturbance that has occurred with past development, sand mining, agricultural activities, and disking of undeveloped sandy areas, prevent theses wasps from using these habitats. For these reasons, I do not expect either of these wasps to occur at the property.

Antioch Mutillid Ant.

As discussed in the background information, this species is probably a synonym of a more widespread mutillid. Thus, this species is probably not as unique as was originally believed. The areas of undeveloped sandy soils represent potential habitat. Since this species nests in the ground, the extensive ground disturbance that has occurred with prior development, sand mining, agricultural activities, and disking, should prevent this wasp from using these habitats. For these reasons, I do not expect this wasp to occur at this property.

Three Robberflies.

All three of these species are associated with sand dunes, thus the undeveloped sandy areas represent potential habitat. As discussed in the background information, *Cophura hurdi* is known from only a single specimen and there is uncertainty about the taxonomic status of this

species. Prey items for all three robberfly taxa probably include other insects indigenous to sand dunes habitats. Past and current land uses at the site have substantially degraded these remnant sand-based habitats and displaced much of the native sand dune flora to such a degree that specific prey species may no longer inhabit the site. Persistence of these robberflies at the property is unlikely for these reasons.

Two Katydids.

Neither species of katydid is likely to occur at the property. Both species were formerly found at the Antioch Dunes, but neither has been seen for several decades. *Neduba extincta* is known from only a single specimen. *Idiostatus middlekauffi* was associated with various dune indigenous shrubs, which are absent from or quite limited in their occurrence at the County Crossings site. Thus, I do not expect either katydid to occur there.

Fairy and Tadpole Shrimps.

No true vernal pools, vernal playa pools, or rock pools were observed at the site. Seasonal wetlands were observed in the floodplain of the creek and marsh habitat, plus in the old sand pit. None of the listed fairy shrimp known from Contra Costa County and immediately surrounding areas are known to occur in seasonal wetlands on sandy soils; instead they occur in claypan vernal pools. Given the difference in substrate, I would not expect any of the listed shrimp taxa treated in this report to occur at the project site.

CONCLUSIONS

As was previously mentioned, past and current land uses at the County Crossings site have largely converted native plant communities to unuseable lands or substantially degraded their habitat values for most of the special-status insects and invertebrates that might have formerly occurred at this property. I conclude that none of the 23 treated invertebrate species are likely to occur at the property due to the absence of their requisite habitat features. Of particular note, no suitable breeding habitats for any of the federally-listed insects or shrimp were observed at the property, so no permits for endangered or threatened invertebrates should be required for this project.

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If you have any questions about my report, just contact me.

Sincerely,

Richard A. Arnold, Ph.D.
President

Attachment: Tables 1