Wildlife Corridor Study: Revised Final Report for the State Route 138 Northwest Corridor Improvement Project Interstate 5 to State Route 14 Los Angeles County, California

(Agreement No. 07A3144, Task Order No. 13, EA 265100)

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State Route 138 Northwest Corridor Improvement Project

Interstate 5 to State Route 14

Los Angeles County, California

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February 2016

STATE OF CALIFORNIA
Department of Transportation

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1.0 INTRODUCTION

The California Department of Transportation (Caltrans), in cooperation with the Los Angeles County Metropolitan Transportation Authority, propose to widen and improve approximately 36.8 miles of State Route (SR-) 138 between the Interstate (I-) 5 interchange and the SR-14 interchange.

The existing facility is a two-lane highway that contributes to the local circulation network and provides an alternate route for east-west traffic in northwest Los Angeles County. The Northwest SR-138 Corridor Improvement Project (Project) would widen SR-138 and provide operational and safety improvements. The project corridor spans east-west approximately 36.8 miles (Post Mile [PM] 0.0 to PM 36.8) in the portion of Los Angeles County, just south of the Kern County border (Figure 1).

1.1 Project Description

This section describes the proposed action and the project alternatives that were developed to achieve the identified purpose and need of the project, while avoiding or minimizing environmental impacts. The alternatives are the No Build Alternative, Alternative 1 (Freeway/Expressway) with or without a design option for a bypass around Antelope Acres, and Alternative 2 (Expressway/ Conventional Highway).

The proposed project is located in north Los Angeles County on SR-138 from I-5 on the west to SR-14 on the east and covers a distance of approximately 36.8 miles (PM 0.0 to PM 36.8). SR-138 is an undivided 2-lane highway that travels around the south side of Quail Lake and east to SR-14. SR-138 is not a controlled-access facility; access and egress points include at-grade intersections with paved and unpaved roads and driveways. The existing roadway consists of two 12-foot lanes with variable shoulders ranging from 2- to 4-foot paved to 8 foot unpaved non-standard shoulders.

The purpose of the project is to improve mobility and operations in northwest Los Angeles County, enhance safety within the SR-138 Corridor based on current and future projected traffic conditions, and accommodate foreseeable increases in travel and goods movement within northern Los Angeles County.

The need for the proposed project is derived from foreseeable increases in travel demand that would exceed the current capacity of SR-138 and higher than average state-wide fatal accident rates at several locations.

NO- BUILD ALTERNATIVE
Implementation of the No-Build Alternative would maintain the existing configuration of SR-138 and would not result in improvements to the route.

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Service Layer Credits: Sources: USGS, ESRI, TANA, AND

Figure 1. Project Vicinity

2014-039 SR-138

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The No-Build Alternative would not accommodate the projected population growth or expected substantial increase in goods movement truck traffic in Northern Los Angeles County and the existing corridor would not be improved. Under the No Build Alternative, SR-138 would operate at LOS E or worse conditions between Gorman Post Road and 300th Street during AM and PM peak hours. For all other study segment locations, SR-138 would operate at LOS D or better under the No Build Alternative. The No-Build Alternative could result in indirect impacts on air quality, mobility, safety, and the economy within Northern Los Angeles County. There would be increased maintenance costs to maintain the route without any other improvements.

Under NEPA, the No-Build Alternative provides a baseline for comparing the impacts associated with the Build Alternatives. (Under CEQA, existing conditions at the start of environmental studies provide a baseline for environmental impact analysis.)

BUILD ALTERNATIVE 1 | Freeway - Expressway

Alternative 1 (Freeway/Expressway) would include a 6-lane freeway from the I-5 interchange to 300th Street West , and a 4-lane expressway from 300th Street West to the SR-14 interchange generally following the existing alignment of SR-138. There would also be improvements to the I-5/SR-138 and SR-138/SR-14 freeway connectors and structure over the SR 14. Study limits on I-5 are from PM 79.5 to PM 83.1 and on SR -14 the limits are from PM 73.4 to PM 74.4.

BUILD ALTERNATIVE 1 WITH DESIGN OPTION l Antelope Acres Bypass

Antelope Acres Bypass. There is a design option with this alternative to include a bypass route around the Antelope Acres community. This option was developed for the existing residences of Antelope Acres due to the proposed four-lane expressway along the existing alignment of SR-138. The alignment would bypass the community to the north along West Avenue C and going from west to east, the alignment would begin to deviate from the existing SR-138 near 100th Street West and continue in a northeasterly direction towards West Avenue C. After paralleling West Avenue C for approximately one mile, the alignment would continue in a southeasterly direction back towards the existing SR-138, and eventually join the existing SR-138 near 70th Street West. The existing highway would be relinquished to the County as a local roadway between 100th Street West and 70th Street West to maintain access, with appropriate speed reduction measures proposed to reduce cut-through traffic.

BUILD ALTERNATIVE 2| Expressway – Conventional Highway

Alternative 2 (Expressway/Highway) would include a 6-lane freeway from the I-5 interchange connector ramps to Gorman Post Road, a 6-lane expressway from the Gorman Post Road interchange to 300th Street West, a 4-lane expressway from 300th Street West to 240th Street West, and a 4-lane limited access Conventional Highway from 240th Street West to the SR-14 interchange, generally following the existing alignment of SR-138. There would also be improvements to the I-5/SR-138 and SR-138/SR-14 freeway connections and the structure over the SR 14. The study limits on these connectors would be the same as Alternative 1; on I-5 from PM 79.5 to PM 83.1 and on SR -14 the limits are from PM 73.4 to PM 74.4.

1.2 Project Location

The Project corridor is located between PM 0.0 and 36.8 on SR-138 (Figures 1 and 2). The Project corridor extends from I-5, just south of Gorman Post Road, and continues east to SR-14 at West Avenue D, just north of the City of Lancaster (Figure 2). Elevations in the Project corridor range from approximately 3,590 feet (ft) (1,094 meters [m]) above mean sea level (msl) at the western extent of the Project corridor to approximately 2,320 ft (707 m) above msl at its eastern extent.

The Project corridor is depicted on the Black Mountain, Fairmont Butte, La Liebre Ranch, Lebec, Little Buttes, Neenach School, and Rosamond United States Geological Survey 7.5-minute topographical quadrangles. The townships, ranges, and sections within the Project corridor are detailed in Table 1.

Table 1. Townships, Ranges, and Sections within the Project Corridor

Township	Range	Sections
8N	12W	7 through 10, 15 through 22, 27 through 30
8N	13W	7 through 30
8N	14W	7 through 30
8N	15W	7 through 30
8N	16W	7 through 30
8N	17W	9-16, 19, 25, 28, 29, 30
8N	18W	1 through 5, 13 through 18, 20 through 29, 33 through 36

1.3 Purpose of Assessment

The Project corridor is located largely within an area of Antelope Valley that may provide important linkages for wildlife movement between the San Gabriel and Tehachapi Mountains, as well as for movement of individuals within populations that occur on the valley floor. The western portion of the Project corridor is located at the convergence of the San Gabriel and Tehachapi Mountains, which likely provides an important corridor for wildlife moving between these mountain ranges (South Coast Wildlands 2008; County of Los Angeles 2015). The purpose of this assessment, therefore, is to determine the potential for use of the Project corridor (or portions thereof) by terrestrial wildlife as they move along linkages through the vicinity and/or region, so that Project design or mitigation opportunities that maintain or enhance wildlife permeability and connectivity may be identified for the proposed Project. This analysis will allow for an identification of recommendations for Project design that would maintain or enhance opportunities for wildlife movement along linkages, while at the same time providing safe automobile travel on the proposed, improved road. The entire Project corridor was studied during this assessment (the study area is referred to as the Area of Potential Effects on subsequent report figures).

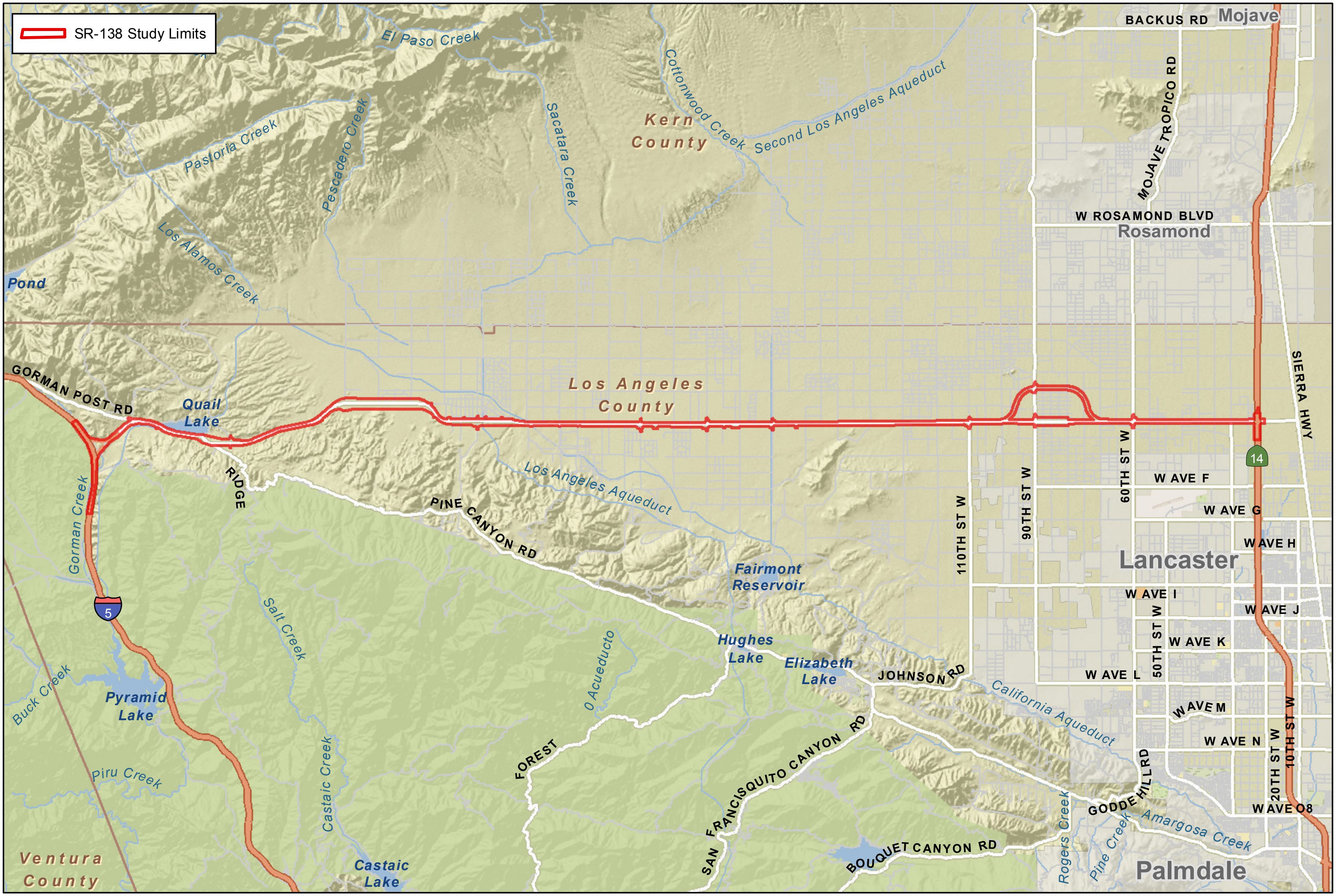

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Figure 2. Project Location

2014-039 SR-138

2.0 BACKGROUND INFORMATION

ECORP compiled available datasets to characterize the ecological conditions in the Project corridor vicinity and region in order to assess the potential for wildlife movement through linkages in the Project corridor and identify ecologically important areas within and adjacent to the Project corridor that may provide important areas for dispersing wildlife. A thorough discussion of the data compilation and review can be found in the Interim Wildlife Permeability Analysis Report (ECORP 2014). A summary of regional and local settings and factors that may drive wildlife movement with regard to the Project is included below.

2.1 Regional Setting

The Project corridor is situated on the north side of the San Gabriel Mountains, largely within the Antelope Valley that comprises the western Mojave Desert, and south of the Tehachapi Mountains. The majority of the eastern portion of the Project corridor is largely composed of vegetation communities characteristic of the Mojave Desert, whereas the western one-third of the Project corridor represents a transition zone between desert, foothill and montane environments. This portion of the Project corridor contains a high level of species diversity due to the convergence of these three geographic regions, described briefly below. Detailed descriptions of these geographic regions and their respective suitability for wildlife movement can be found in the Interim Wildlife Permeability Analysis Report (ECORP 2014).

The San Gabriel Mountains are located in the northern portion of Los Angeles County between the greater Los Angeles metropolitan area and the Mojave Desert. The San Andreas Fault creates the northern border of the San Gabriel Mountains, and the Angeles National Forest extends through much of the range. Like most montane environments, varying elevations and complex topography allow for many different vegetative communities.

The Tehachapi Mountains form a small transverse range that extends between the coast range and the southern extent of the Sierra Nevada Mountain Range. The Tehachapi Mountains are approximately 45 mile (mi, 72 km) in length and between 4,000 and 8,000 ft (1,219 and 2,438 m) in elevation. The range occurs primarily in Kern County, but the southern portion occurs in the northwestern part of Los Angeles County. The Tehachapi Mountains extend southwest to northeast and form a barrier between the San Joaquin Valley in the north and the Mojave Desert to the south, and connect the southern extent of the Sierra Nevada Mountains with the Coast Range and the San Gabriel Mountains.

The Mojave Desert is located between the southern, low elevation, hot Sonoran Desert and the northern, high elevation, relatively cool Great Basin. This approximately 25,000-square-mi (64,750 square-km) region occurs in southeastern California, and portions of Arizona, Nevada, and Utah. The western boundary of the Mojave Desert is formed by the convergence of the Tehachapi and San Gabriel Mountains, and it reaches its southern-most extent east of the San Bernardino Mountains near the Salton Sea, where it transitions into the Colorado Desert, a subset of the Sonoran Desert. Considered a high desert, the Mojave ranges in elevation from roughly 3,000 to 6,000 ft (914 to 1,829 m).

2.2 Land Use

The Project corridor is largely situated in undeveloped areas within the Antelope Valley. Anthropogenic land uses and features in the vicinity of the Project corridor include low- to medium-density residential developments, ranches, agricultural croplands, solar energy facilities, and water aqueducts and reservoirs. Much of the area in the Project vicinity primarily consists of farmlands and grazing lands. Residential development in the Project vicinity is mostly scattered and low-density, with medium density developments located in Neenach and the community of Del Sur in northwestern Lancaster. The West Branch California Aqueduct intersects the Project corridor near its western terminus at I-5, and includes Quail Lake reservoir, an artificial lake in which water is stored. The Antelope Valley Solar Ranch Project was recently constructed in the vicinity of the Project and is situated between 160th and 180th Streets East, east of Neenach, where it encompasses the Project corridor. There are also a number of open space areas in the vicinity of the Project corridor. These areas may be an attractant for wildlife species because of the relative lack or low occurrences of human and vehicular activity, as well as provide centers from which wildlife may disperse into the Project corridor.

2.2.1 Tejon Ranch

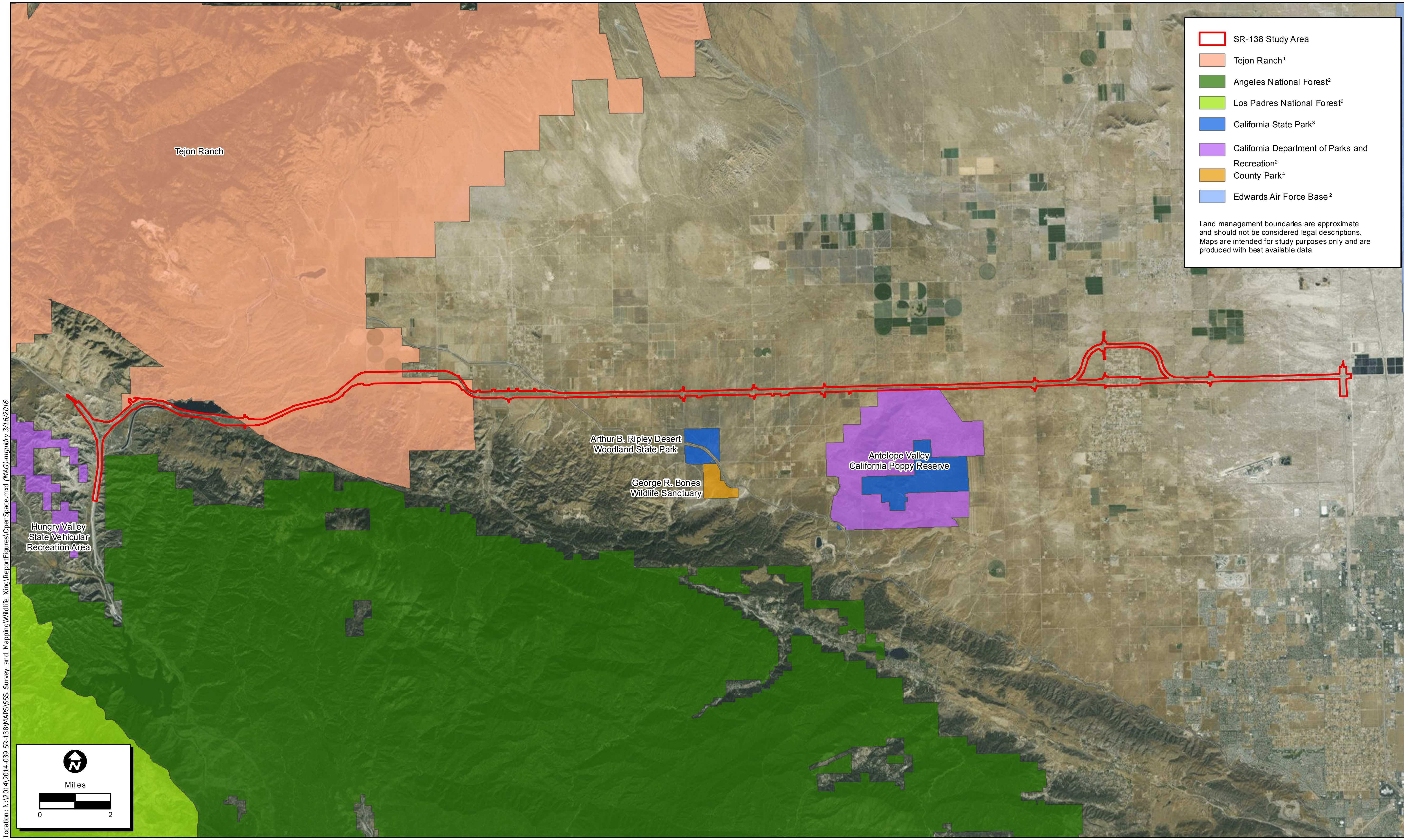
Tejon Ranch, the largest private land holding in California, is located north of the Project corridor (Figure 3) and supports a diverse array of wildlife species, including mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), pronghorn (*Antilocarpa americana)*, and American black bear (*Ursus americanus*). Much of the property is fenced by four- or five-strand barbed wire, but this fencing is not considered a barrier to wildlife movement, as wildlife can cross over, under, or through the fencing with little effort. Tejon Ranch is managed for several different land uses, including livestock grazing, farming, hunting, and outdoor recreation. Much of Tejon Ranch is undeveloped and up to 90 percent of the property is designated for permanent conservation.

2.2.2 Angeles National Forest

The 668,000-acre Angeles National Forest is located in the San Gabriel Mountains south of the Project corridor (Figure 3). The Forest provides habitat for more than 350 species of wildlife and over 1,500 species of plants. The land within the Forest supports a diverse terrain, with elevations ranging from 1,200 to 10,064 ft (366 to 3,067 m) above msl.

2.2.3 Antelope Valley Poppy Reserve

The 1,745-acre Antelope Valley Poppy Reserve is located approximately 1.5 miles south of the Project corridor (Figure 3). This Reserve is known for being California's most consistent California poppy-bearing land; poppies are complemented by other annuals such as owl's clover (*Castilleja densiflora*), lupines (*Lupinus* spp.), goldfields (*Lasthenia* spp.), cream cups (*Platystemon californicus*), and coreopsis (*Coreopsis* spp.). This natural area provides an important open space habitat for numerous wildlife species. The Antelope Valley Poppy Reserve is bordered to the north, west, and south by lands owned by California Department of Parks and Recreation (Figure 3).



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Map Date: 3/16/2016
Imagery Source: Esri; [1]Tejon Ranch; [2]BLM Land Status database; [3]State of California; [4]Los Angeles County

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Figure 3. Locations of open space reserves in the vicinity of the SR-138 Project corridor

2014-039 SR-138 CalTrans

2.2.4 Arthur B. Ripley Desert Woodland State Park

The 640-acre Arthur B. Ripley Desert Woodland State Park is located 1.0 mile to the south of the Project corridor (Figure 3). The park preserves one of the few remaining relatively undisturbed stands of Joshua trees (*Yucca brevifolia*) and California junipers (*Juniperus californica*), which were once abundant throughout the western and southern Antelope Valley.

2.2.5 George R. Bones Wildlife Sanctuary (Desert Pines Sanctuary)

The 100-acre Desert Pines County Wildlife Sanctuary is located 1.5 mi south of the Project corridor and immediately south of the Arthur B. Ripley Desert Woodland State Park (Figure 3). The sanctuary is located on the alluvial fan at the base of the Liebre Mountains and contains a portion of the wash associated with the Kings Canyon drainage. This open space supports stands of foothill pines, Joshua trees, blue elderberry, and coffeeberry, along with over 160 other documented plant species.

2.2.6 Hungry Valley State Vehicular Recreation Area

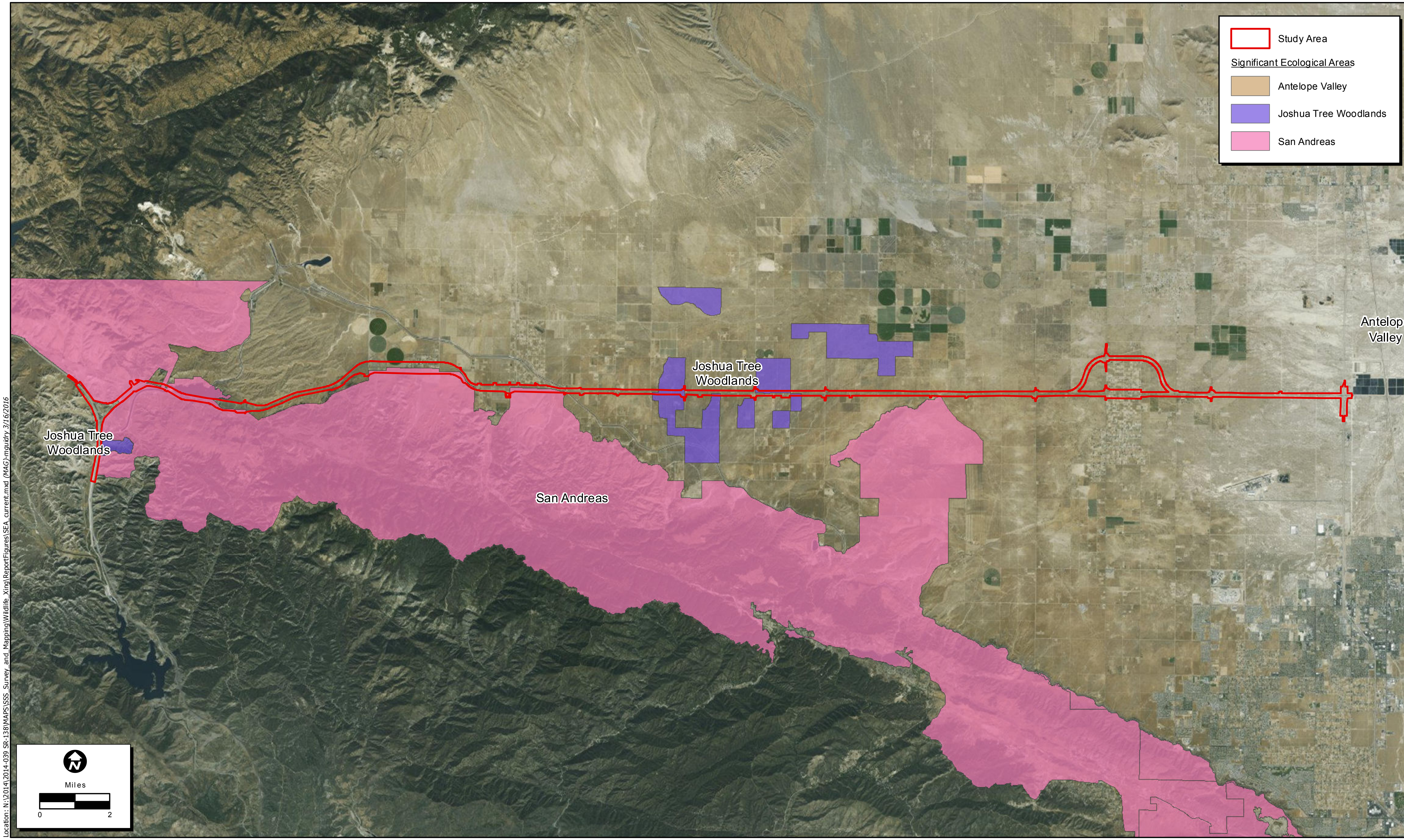
The Hungry Valley State Vehicular Recreation Area, located just west of I-5 at the western terminus of the Project corridor, contains more than 19,000 acres of open space that are managed for off-highway vehicle (OHV) use (Figure 3). Elevations within the recreation area range from approximately 3,000 to 6,000 ft (914 m to 1,829 m) above msl, and grassland, coastal sage scrub, and oak woodland communities characterize most of the vegetation communities there.

2.2.7 Edwards Air Force Base

Edwards AFB is located on approximately 301,000 acres in the Antelope Valley, located approximately one mile east of the eastern terminus of the Project corridor (Figure 3). The installation lies in the western Mojave Desert in portions of Kern, Los Angeles, and San Bernardino counties, and supports a diversity of natural desert vegetation communities, and wildlife habitats and populations.

2.2.8 County of Los Angeles General Plan Significant Ecological Areas

The County of Los Angeles General Plan 2035 (County of Los Angeles 2015) designated Significant Ecological Areas (SEAs) throughout the county in order to protect land that contains irreplaceable biological resources. SEAs have been designated by determining land that is generally undisturbed or mildly disturbed, supports habitat for threatened species, contains corridors to promote species movement, and is large enough to support populations of these species. The boundaries of these SEAs were revised in the final General Plan adoption in October 2015. The Project corridor crosses through two different SEAs, the San Andreas SEA and the Joshua Tree Woodlands SEA (Figure 4). These SEAs and their resources are discussed below.



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Map Date: 2/26/2016
Photo Source: Esri, LA County

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Figure 4. Locations of Los Angeles County Significant Ecological Areas (SEA) in the vicinity of the SR-138 Project corridor

2014-039 SR-138 CalTrans

Joshua Tree Woodlands SEA

The Joshua Tree Woodlands SEA is located in the western portion of the Antelope Valley, and northwest of the Antelope Valley California Poppy Reserve. This SEA consists of gradual slopes of high elevation desert areas ranging from 2,500 to 4,000 ft (762 m to 1,219 m) above msl, and supports numerous old-growth stands of Joshua Trees (PCR Services Corporation 2000b). The Project corridor crosses through or abuts Joshua Tree Woodlands SEA in four different areas (Figure 4). Joshua tree woodland habitat has become very fragmented in this area due to residential and agricultural development (County of Los Angeles 2015). The Joshua Tree Woodlands SEA provides habitat for migratory birds, reptiles, and small mammals.

San Andreas SEA

The San Andreas SEA is the second largest SEA and is located in the western Antelope Valley. Several diverse habitats occur in this SEA, including those found in the Antelope Valley, Tehachapi Mountains, California Coastal Mountains, California Central Valley, and San Gabriel Mountains. The convergence of these five substantial ecoregions is not only biologically important due to the diversity of habitats present, but also represents an important area in southern California for wildlife linkages throughout and between these various habitats. Specifically, this SEA includes linkages between the Coastal Ranges, the San Gabriel Mountains, and the Tehachapi Mountains, which provides movement corridors for large mammals as well as topographic reference points and high altitude foraging grounds for migratory birds (County of Los Angeles 2015). The Project corridor crosses through and abuts the San Andreas SEA in several places, mostly in the western portion of the Project area. A small portion of the SEA abuts the southern portion of the Project corridor in the central portion, just east of the Joshua Tree Woodlands SEA (Figure 4).

2.3 Known Linkages in the Project Vicinity

The landscape in the majority of the eastern portion of the Project corridor is generally flat and characterized by open habitats that would not constrict or limit wildlife movement. The diffuse permeability that characterizes this portion of the Project corridor largely precludes it from providing specific linkages. However, there are a few small drainages and patches of vegetation that provide cover that may provide important wildlife crossing areas. In locations where SR-138 crosses these drainages, culverts may provide important crossing areas for wildlife that move within or along these washes. Outside of these culverts, the majority of the eastern portion of the SR-138 Project corridor provides at-grade crossing opportunities for wildlife.

The western portion of the Project corridor is characterized by more diverse landscapes and habitats that may be used by a relatively greater variety of wildlife species, and the convergence of the San Gabriel and Tehachapi Mountains in the vicinity of I-5 is known to be an important corridor for terrestrial wildlife moving between these mountainous regions (South Coast Wildlands 2008; County of Los Angeles 2015). Many species likely access this corridor, and it no doubt provides a valuable link for gene flow between populations inhabiting the San Gabriel and Tehachapi Mountains. The Tehachapi Mountains provide additional linkages to the southern-most extent of the Sierra Nevada Mountains and the Coast Ranges, highlighting the importance of the linkage at the western extent of the Project corridor.

2.3.1 Impediments to Wildlife Movement

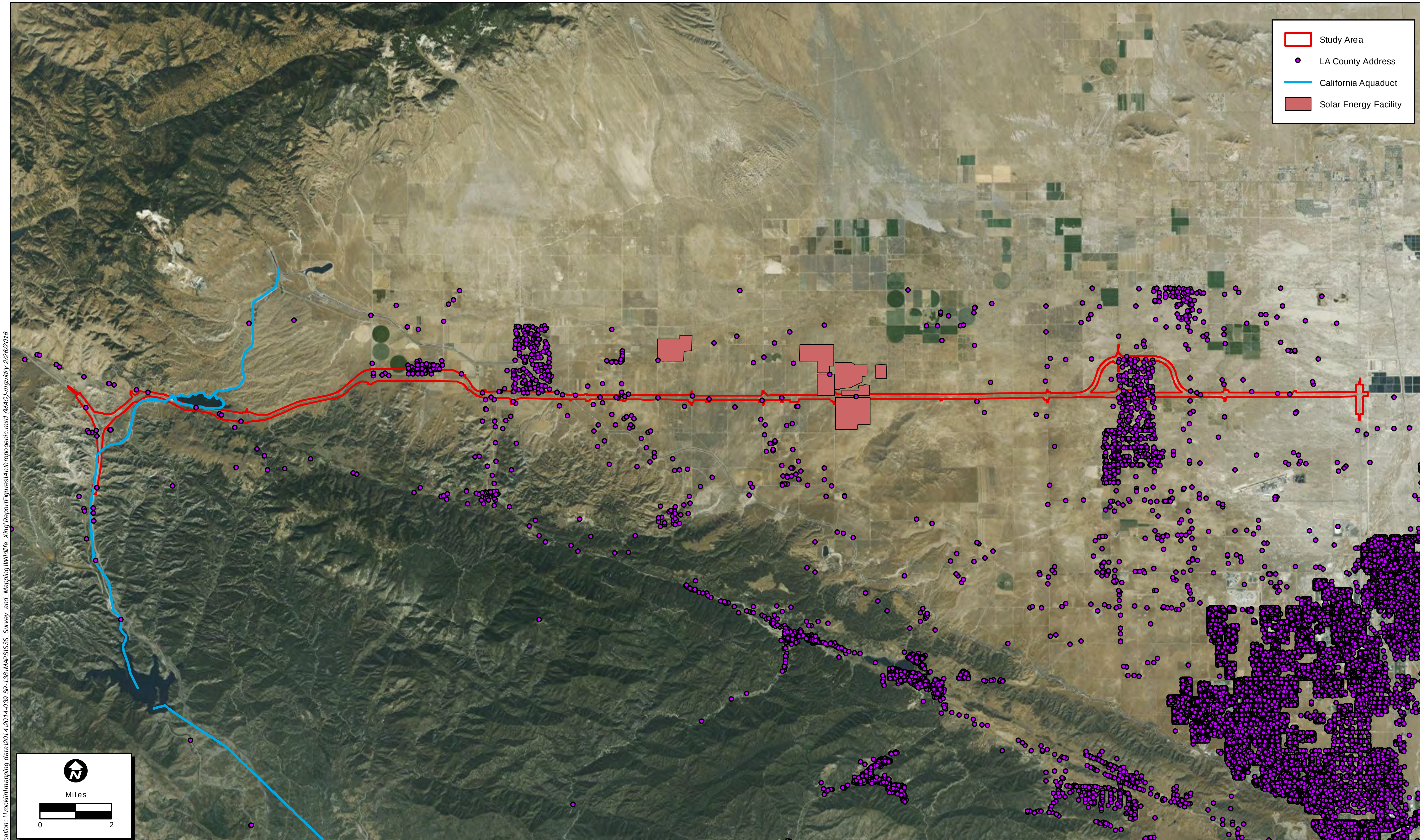
The relatively open and undeveloped nature of the Project corridor provides many opportunities for wildlife to move within and throughout the corridor. However, several anthropogenic features in the vicinity of the Project corridor impede wildlife movement across SR-138, including the West Branch California Aqueduct, medium density residential developments, and solar energy facilities, such as the Antelope Valley Solar Ranch 1 (Figure 5). While these features impede wildlife movement, they also direct wildlife toward areas that are more permeable to their movements. Some species, such as coyotes, may be attracted to these anthropogenic features because of the increased availability of food (in the form of trash or prey items) and water sources. More secretive species, such as bobcats, will likely avoid these features and cross the Project corridor in more remote, undeveloped areas.

2.3.2 SEA Connectivity and Constriction

The Los Angeles County Significant Ecological Areas Technical Advisory Committee (SEATAC) identified areas within and between existing and proposed SEAs that are conducive to or a hindrance to wildlife movement between the SEAs (County of Los Angeles 2015). Referred to as the Constriction and Connectivity Areas Map, this figure was created as a supplemental tool to further enhance the purpose of the SEAs as being conservation areas for wildlife habitats and serve as linkages and corridors for regional wildlife movement. Nine proposed Constriction and/or Connectivity Areas cross the Project corridor (Figure 6). Five of these are in the western portion of the Project corridor near Quail Lake and four are in the central portion of the Project corridor in the Joshua Tree SEA. Several more Constriction and/or Connectivity Areas are found in the vicinity of the Project.

Wildlife movement within the Joshua Tree Woodlands SEA is potentially limited to local movement; however, on a large scale the native desert habitat likely facilitates movement throughout the Antelope Valley. Due to the fragmented Joshua tree habitat within this SEA, wildlife movement is likely to converge in areas where movement can still occur resulting in "bottlenecked" movement (County of Los Angeles 2015). The San Andreas SEA is likely more conducive to wildlife movement due of the presence of large, undeveloped expanses of land that could provide limitless opportunities for movement. Also, the change in topography and vegetation communities within this SEA attracts a higher diversity of wildlife species to inhabit these areas.

The five Constriction and/or Connectivity Areas identified in the western portion of the Project corridor associated with the San Andreas SEA, near I-5 and Quail Lake, all appear to be located in areas that may constrict wildlife movement due to the presence of man-made disturbances such as the California Aqueduct, paved roads, or other areas exhibiting high levels of human activity (such as Quail Lake). The four remaining Constriction and/or Connectivity Areas are located within the central portion of the Project are associated with the proposed Joshua Tree Woodlands SEA. These areas may facilitate wildlife movement across the Project corridor due to the presence of open, relatively undisturbed, native desert scrub habitats.



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Map Date: 2/23/2016
Source: Esri, LA County

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Figure 5. Anthropogenic Features in the Vicinity of the SR-138 Project Corridor that Impede Wildlife Movement

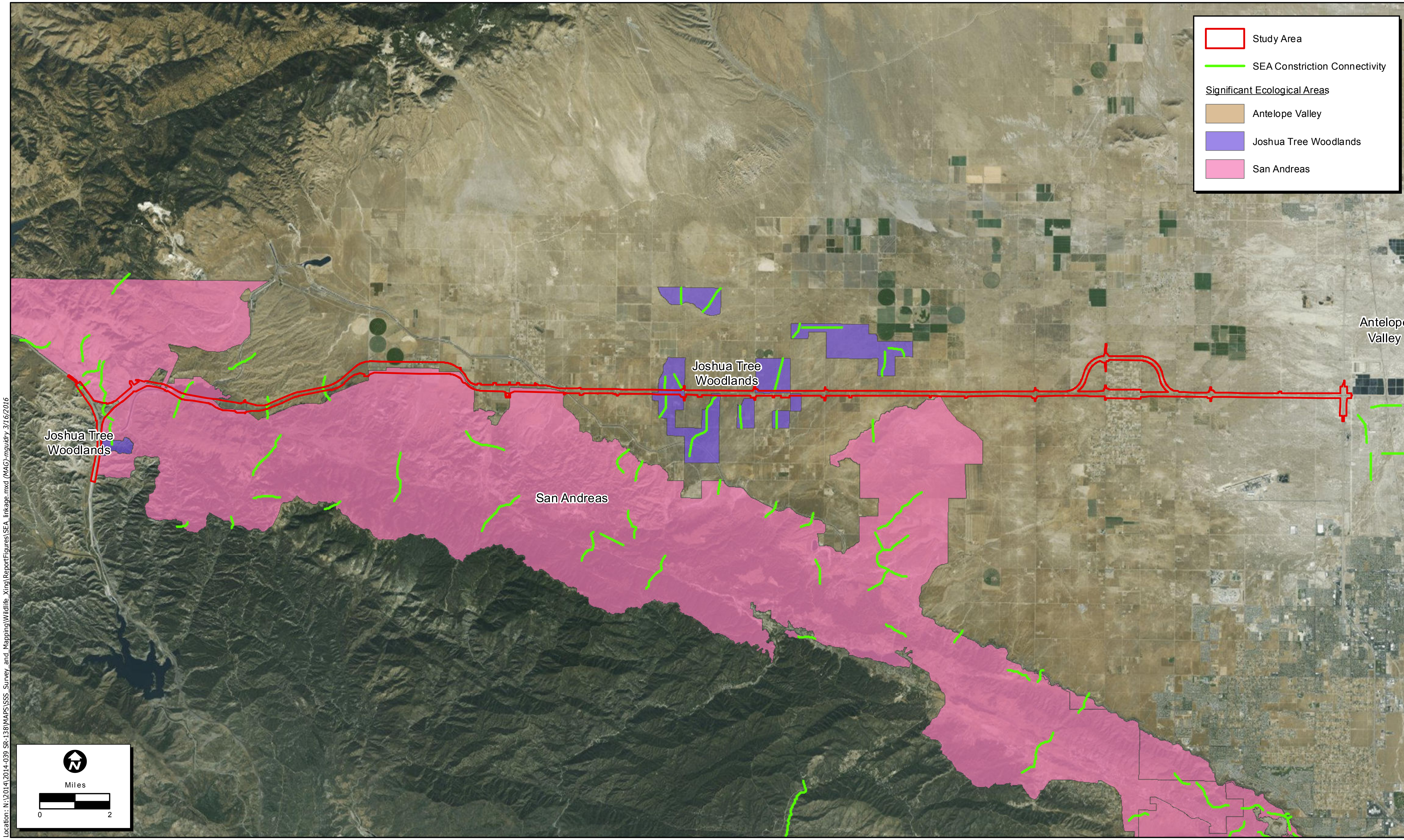

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Photo Source: Esri, LA County

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Figure 6. Connectivity linkages within Significant Ecological Areas in the vicinity of the SR-138 Project corridor

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2.3.3 South Coast Missing Linkages

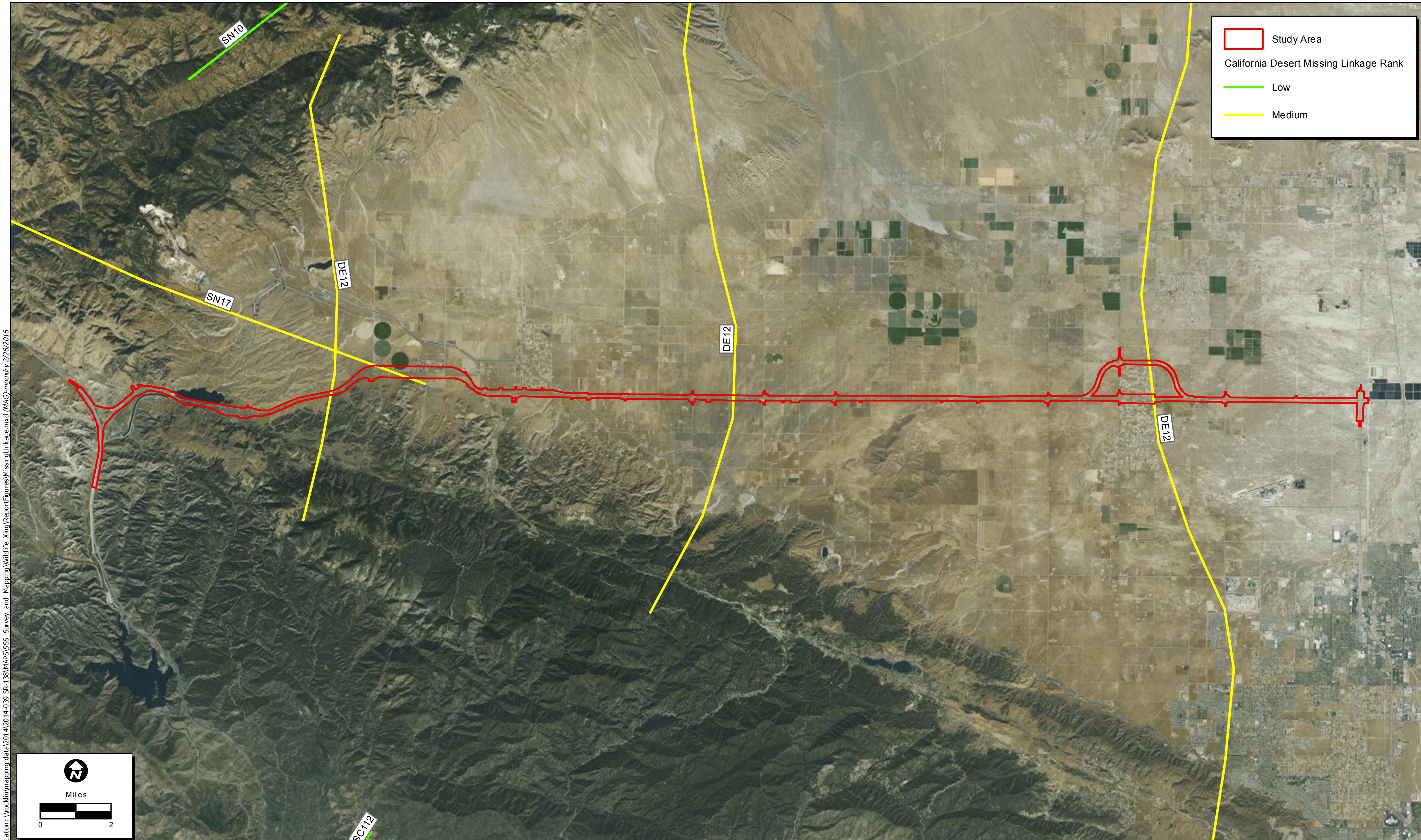
An interagency report produced by South Coast Wildlands (2008) identified a network of high-priority, not yet established landscape linkages within the South Coast Ecoregion, an area that extends along the coastal zone from southern Kern and Ventura Counties down into Baja California, for their potential to preserve the region's biodiversity and mitigate the effects of habitat loss and fragmentation. The linkages were identified based on their potential to connect large tracts of relatively intact wild areas and allow natural movement of wildlife throughout the region.

Four of the proposed linkages identified in the report cross the Project corridor: DE12 (three linkages in this category) and SN17 (Figure 7; Penrod et al. 2000). The linkages in DE12 are listed as medium priority with the potential to provide movement of general wildlife. The SN17 linkage that crosses the Project corridor in the western portion is also listed as medium priority and potentially represents a choke-point for movement for mule deer (*Odocoileus hemionus*), American black bear, and mountain lion. A fifth proposed linkage is located north of the Project corridor, SN10, and potentially provides a landscape linkage for mule deer, American black bear, mountain lion, and bobcat.

2.3.4 California Essential Habitat Connectivity

The California Essential Habitat Connectivity Project (CEHC) was a collaboration between Caltrans and the California Department of Fish and Wildlife (CDFW) to identify the important wildlands that should be conserved for the purpose of habitat connectivity and wildlife movement state-wide (Spencer et al. 2010). The CWHC addresses these areas on a coarse scale and was intended to be used as a supplemental document paired with more refined regional and local habitat connectivity plans to create a complete picture of undeveloped lands that are important for movement activities, gene flow, and other resources necessary for supporting wildlife populations. It is important to note that the CEHC does not address the individual needs or occurrences of localized wildlife movement. Rather, it identifies lands that are most likely important to wildlife movement within the state.

The CEHC has identified the mountainous areas to the northwest, west, and southwest of the Project as being conducive to wildlife movement (i.e., there is less risk of mortality or energy expenditure for an animal to move through that area). There are identified landscape blocks that abut the western 1/3 of the Project corridor, but no connectivity corridors that intersect it (Figure 8).



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Map Date: 2/26/2016
Photo Source: Esri, LA County

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Figure 7. California Desert Linkage Network, Missing Linkages

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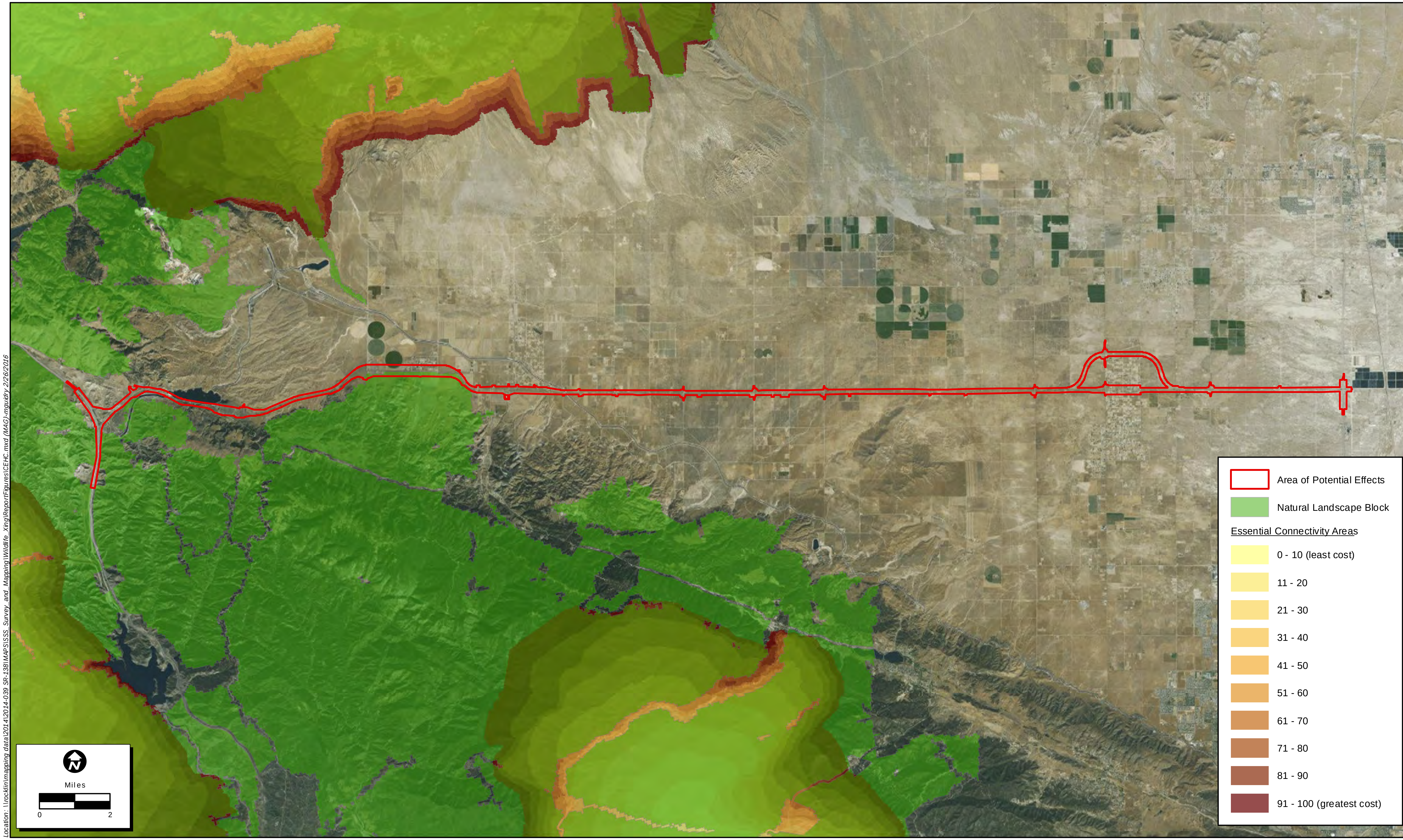

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Map Date: 2/23/2016

Source: Esri, CDFW

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Figure 8. California Essential Habitat Connectivity

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2.4 Traffic Accident Surveillance and Analysis System (TASAS) Data

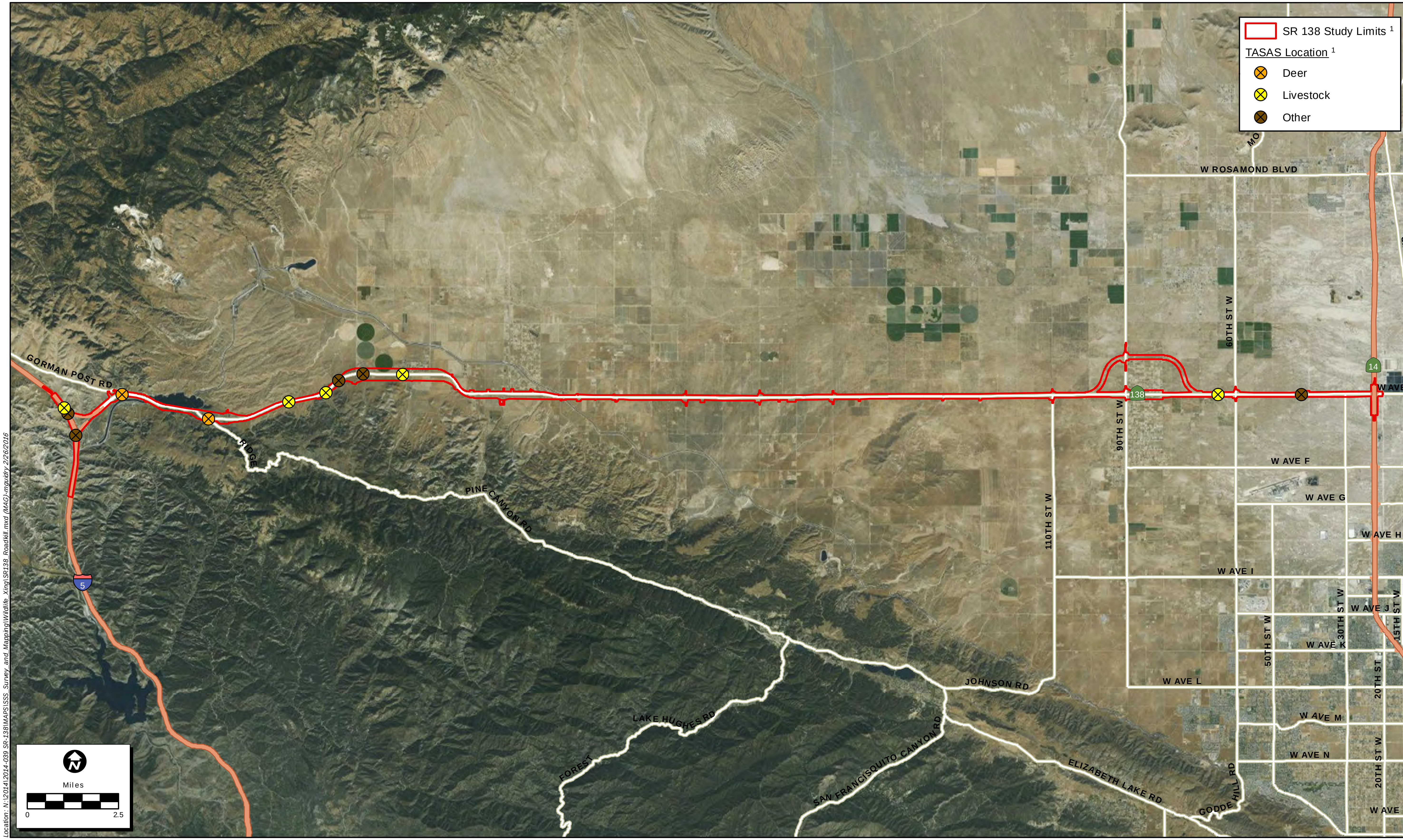
A review of the Traffic Accident Surveillance and Analysis System (TASAS) data was performed to determine the locations of wildlife-vehicle collisions recorded on SR-138, SR-14, and I-5 between January 1, 2003 and December 31, 2013. It is important to note that specific species involved in wildlife-related crashes during this reporting period were not recorded. All wildlife-related crashes were categorized into three classifications: deer, non-deer, and livestock.

Analysis of these data found that nine wildlife-related crashes occurred at various locations on SR-138, of which two were deer, three were non-deer, and four were livestock (Figure 9). Three wildlife-related crashes were documented on I-5 between PM 81 and 82: one livestock and two non-deer. There were no wildlife-related crashes documented on SR-14 during this reporting period.

Caltrans District 7 does not input wildlife data into the Integrated Maintenance Management System (personal communication, Hugo Guzman, District 7 Maintenance Engineering); therefore, a review of this database was not performed.

2.5 Vegetation Communities

During a prior survey conducted within the Project corridor, ECORP characterized the vegetation communities in the immediate vicinity of the Project corridor in order to assess how wildlife may occur and move through the vicinity. Vegetation community type descriptions followed the designations in Sawyer et al. (2009) and Holland (1986). The dominant vegetation communities within the Project corridor include allscale (*Atriplex polycarpa*) scrub and rubber rabbitbrush (*Ericameria nauseousa*) scrub. These communities intergrade frequently with several other vegetation communities, including Joshua tree woodlands, California juniper woodland, big sagebrush (*Artemisia tridentata*), and cheat grass (*Bromus tectorum*) grassland. Riparian habitats, such as Fremont cottonwood (*Populus fremontii*) forest, black willow (*Salix gooddingii*) thickets, and sandbar willow (*Salix exigua*) thickets, are present in the western portion of the Project corridor. In addition, locations throughout the Project corridor have been disturbed by previous land uses these areas are generally dominated by non-native plant species, such as cheat grass, redstem stork's bill (*Erodium cicutarium*), and Russian thistle (*Salsola tragus*). Descriptions of the vegetation communities can be found in the Interim Wildlife Permeability Analysis Report (ECORP 2014).



Location: N:\2014\2014-039 SR-138\MAPS\SSS_Survey_and_Mapping\Wildlife_Xing\SR138_RoadKill.mxd (MAG)-mguidry 2/26/2016

Map Date: 2/26/2016
Photo Source: Esri
[1] Caltrans

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Figure 9. TASAS Locations (1/1/2003 through 12/31/2013)

2014-039 SR-138

3.0 METHODS

3.1 Target Terrestrial Wildlife Species

Numerous terrestrial wildlife species inhabit portions of the Project corridor and vicinity and likely cross SR-138 to access habitat on either side of the road. For the purposes of this assessment, the wildlife species that were targeted during the survey were limited to native mammal species that were greater than 5 pounds (2.3 kilograms) and are likely to occur within the Project vicinity. Accordingly, the following species were targeted during the study: pronghorn, coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), bobcat, striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), mountain lion, mule deer, spotted skunk (*Spilogale gracilis*), American badger (*Taxidea taxus*), gray fox (*Urocyon cinereoargenteus*), American black bear, and desert kit fox (*Vulpes macrotis arsipus*). Descriptions of each of these species, including their dispersal and movement patterns, habitat preferences, and areas of potential use within the Project corridor, are provided in the Interim Wildlife Permeability Analysis Report (ECORP 2014).

3.2 Seasonal Wildlife Movement Surveys

ECORP used four distinct sampling surveys conducted seasonally over a single year. The Summer, Fall, Winter, and Spring surveys were conducted in September 2014, November 2014, January 2015, and March 2015, respectively. Study design followed the recommendations in the Wildlife Crossings Guidance Manual (Caltrans 2009).

An initial field assessment was conducted at the start of the study to determine the appropriate sampling methods and locations in the Project corridor. After performing the initial field assessment, ECORP employed three sampling techniques to capture data on wildlife movement for the study: temporary tracking stations, remote camera stations, and pronghorn visual sampling stations. ECORP biologists also documented incidental observations of wildlife moving throughout the Project corridor (in the form of live observations, tracks, scat, and roadkill carcasses) during the survey to augment data collected at the tracking and remote camera stations. The methods for these sampling techniques are described below.

3.2.1 Initial Field Assessment

ECORP biologists performed an initial field assessment to identify potential sampling locations and determine the most appropriate sampling methods for capturing data. The biologists identified, mapped, and described potential wildlife crossing locales not identified during the desktop analysis (ECORP 2014), including bridges and culverts, fill slopes, at-grade crossings, and barriers (such as shoulder barriers, median barriers, soundwalls, fences, guardrails, presence of domestic animals, etc.). The biologists also recorded incidental sign of wildlife species activity, including tracks, scat, game trails, roadkill, and visual sightings. All data were recorded using a handheld global positioning system (GPS) unit in North American Datum 1983, Universal Transverse Mercator coordinates, Zone 11 S.

3.2.2 Tracking Stations Sampling

Tracking stations were placed in various locations throughout the Project corridor to document wildlife species use and movement frequency throughout the Project corridor. A total of 72 proposed tracking station locations were identified during the desktop analysis and initial field reconnaissance and given numerical station names beginning with "T-" to identify the location as a tracking station. Tracking station locations were then modified in the field during the surveys based on site conditions and level of human activity at each of the proposed sites. Tracking station placement was limited to areas not heavily traveled by humans or vehicles (to prevent compromised stations due to vehicle tracks) and properties that had the appropriate rights of entry permissions for the Project.

Topographic or anthropogenic features and changes in terrain, topography, and habitat types (i.e., vegetation communities) were a focus during tracking station placement as these features may attract wildlife and/or funnel movement in the area. Each station consisted of a cleared area located adjacent to a feature within the Project corridor that was likely to influence travel patterns of local wildlife. All stations were approximately the same size, ranging from approximately 5 to 10 ft (1.5 to 3 m) in width by approximately 20 to 30 ft (6 to 9 m) in length. Biologists took photographs of each station and recorded the exact location of each station using a GPS unit. Moon phase was also noted on data sheets during tracking station setup, as moon phases have been known to affect nocturnal wildlife movement and activity.

Tracking stations were sampled for five consecutive days during each seasonal survey, and every station was visited twice daily (morning and evening). In the evenings, approximately three to four hours prior to sunset, the native soils at each station were cleared using a large broom to smooth out the soils to create a 'blank' station. If soils at a tracking station location were not suitable for track register (if station soils were rocky or hard), then softer, finer soils were moved from a nearby portion of the Project corridor and placed over the soils at the station location. "Transplanted" soil was not removed from, nor was placed in, any drainages, washes, or other water features. Flour, decomposed granite, track plates, or other "artificial" substrates were not used to aid in track registry. Non-native vegetation was also removed in the immediate vicinity of some tracking stations to increase surface area of the station. The stations were subsequently checked early the following morning for tracks, scat, or additional sign of wildlife activity. Biologists identified all track sets present at each station and recorded the species, track location (using a GPS unit), direction of travel, and any other pertinent notes for all target species detected. Tracks were identified using file guides, specifically *The Tracker's Field Guide: A Comprehensive Manual for Animal Tracking* (Lowery 2013) and *Mammal Tracks and Sign: A Guide to North American Species* (Elbroch 2003). Data were recorded on data sheets and in an electronic database on the GPS unit. Track and stride measurements were recorded for a few track sets to aid in identification of the species that created the tracks. In cases where two track sets belonging to same species registered on a station during a morning check, biologists documented each track set as a single crossing event because of the difficulty in ascertaining whether the animals traveled together or at two different points throughout the night. Photographs of tracks were taken when conditions were suitable (e.g., tracks clearly registered in soil, shadows were conducive to reading tracks, etc.). Data were also recorded for non-target species that were detected; however, detailed location information and direction of travel were not documented for non-target species.

If biologists found a well-registered track in suitable soils during morning station checks, then a plaster cast of the track was made. The cast was made using plaster of Paris mixed with water and poured into a circular form made from cardstock and paperclips. The cast was left in place to dry for at least 24 hours before being picked up by biologists.

3.2.3 Remote Camera Station Sampling

In order to augment the wildlife movement data collected at the tracking stations, remote camera stations were established at various locations throughout the Project corridor. The remote camera sampling effort was conducted concurrently with the tracking stations sampling. Particular emphasis was placed on establishing stations at culverts, drainages, and undercrossing structures to document wildlife use of these features to move throughout the Project area. A total of 40 proposed camera station locations were identified during the desktop analysis and initial field reconnaissance and given numerical station names beginning with "C-" to identify the location as a camera station. During camera set up in the field, camera stations were modified based on site conditions and level of human activity at each of the proposed sites. Cameras were placed in or near a variety of vegetation communities, and topographic features. Where possible, two cameras were placed at culvert undercrossings, one at each end, to document successful wildlife crossing events through the culverts. Camera station placement was limited to areas not heavily used by humans and properties that had the appropriate rights of entry permissions. Biologists took photographs, documented the habitat types and topography surrounding the station, and recorded the exact location of each of the remote camera stations using a GPS unit. Data were recorded on data sheets and in an electronic database on the GPS unit.

Each camera station consisted of a single, individually labeled movement-detection camera (Browning® Dark Ops, Model BTC-6) mounted on a plywood base or strapped to a structure (i.e., tree trunk, fence post, or wooden power pole). Individually labeled data cards were inserted into each camera and the identification numbers of both the camera and data card were recorded onto data sheets at the time of camera set up to link the photograph data to the camera station name. Camera stations were not baited with food or scent to lure wildlife in and, aside from trimming small amounts of vegetation to prevent false triggers, no other modifications to the area surrounding the camera stations were made. Each camera was programmed to take four photos each time the sensor was triggered. During the Summer survey the cameras were programmed with a pause interval of 30 seconds before the camera could be triggered again; in subsequent surveys the pause interval was changed to 10 seconds. Photo resolution was set to ten megapixels for all four surveys.

If a camera was being falsely triggered too often (usually due to unavoidable vegetation moving in the wind, vehicles driving on SR-138, or heavy shadows), the camera's programming was changed to conserve battery and data card space. These changes may have included reducing the photo resolution, reducing the number of photos taken for every camera trigger, or both.

Burlap (jute netting) was wrapped around most cameras and the associated plywood bases to further camouflage the remote camera setup. The burlap was taped down to the front of the camera and weighted on the base prevent interference with the camera trigger or lens. Figure 10 provides an example of burlap wrapped around the camera and wooden base to camouflage a camera station. If the camera station was already well camouflaged or if the station was well away from human use then the camera was strapped to an existing structure (Figure 11).

Figure 10. Camera wrapped in burlap to camouflage its presence at a camera station.

Figure 11. Remote camera strapped to fence post (no burlap covering).

During the surveys, camera stations were set up within one to two days following the tracking station setup day and allowed to run through the last day of the survey. Biologists checked on every camera at least every other day during the survey to monitor battery usage, data card space, and to ensure the camera was functioning properly. When necessary, batteries and data cards were replaced and adjustments were made to the camera view to better capture the surrounding areas. Data for camera checks were recorded on data sheets.

At the end of the survey biologists removed the cameras from each station and processed the photographs on the data cards. All photographs of wildlife (target and non-target species) and one photograph of the general camera view for each sampling day per camera station were saved to a photograph database. Each photograph was individually labeled with the date, a four-letter species code, camera station, and direction of travel. Data on camera location, camera function, sampling dates, number of photographs taken, and number of operational days for each camera during the survey were documented in a camera data spreadsheet. Operational days were determined based on notes taken in the field on camera operation and the date stamps on each photograph during the analysis after the field survey was completed. A camera was considered operational for a full day every 24 hours beginning at 0000 (midnight). Any portion of a day that the camera was non-operational was considered a fraction of one day in quarterly increments, rounded up or down as appropriate. For example, if a camera was operational from midnight until 0700, the operational time would be considered one-fourth of a day. Data taken from the photographs (wildlife species, time and date of observations, direction of travel, and other pertinent data) were entered into a separate remote camera photograph data spreadsheet.

3.2.4 Pronghorn Visual Sampling Stations

Due to the presence of pronghorns in the vicinity of or potentially crossing the Project corridor, CDFW requested that there be a specific sampling method conducted during the wildlife corridor study that addresses pronghorn use of the Project corridor. Several small groups of pronghorn are known to use different areas within Tejon Ranch; however, the three most pertinent groups to the study occur in the Mojave Desert region of Tejon Ranch: north of SR-138 (bordered by the California Aqueduct to the west and north and 300th Street West on the east; an area known as Coe Field), west of the National Cement Plant (bordered by Bitterwater to the east; an area known as the Berrendas), and north of Quail Lake (bordered by Oso Canyon to the north and the California Aqueduct to the east) (Kunkel 2013). The pronghorn that occur within the Coe Field boundaries are often observed traveling individually in the field just north of SR-138. (Note that the term "group" is used in reference to the specific populations of pronghorn on Tejon Ranch lands because the individuals in some of the groups do not travel together as a herd.)

Pronghorn visual sampling stations were placed at locations throughout the western section of the Project corridor to document pronghorn use and movement throughout the Project corridor. This sampling technique was employed during the Winter and Spring surveys at the request of CDFW. A total of six proposed pronghorn station locations were identified prior to the Winter survey within the western-most 7 mi (11 km) of the Project corridor. Pronghorn stations were given numerical station names beginning with "P-" to identify the location as a pronghorn station. Proposed pronghorn stations were spaced approximately one mi (1.6 km) apart throughout the western section of the Project corridor. Pronghorn station locations were then modified in the field during the Winter survey based on the best available view of the areas adjacent to each of the proposed sites. Biologists took photographs of each station and recorded the exact location of each of the stations using a GPS unit.

Pronghorn stations were sampled for three consecutive days and every station was visited twice daily (morning and evening) at the same time that the track stations were being checked or reset. At each station two biologists, one with a spotting scope and the other with binoculars, observed the area to the north or south of the station for 15 minutes each. The biologists would observe the station with the same piece of equipment looking the same direction for both sessions one day and then switch directions the next day (e.g., the biologist with the spotting scope would observe the area north of the pronghorn station for the morning and evening sessions one day while the biologist with the binoculars observed south of the pronghorn station; the next day the biologists would switch and the spotting scope would be facing south while the binoculars faced north). If a pronghorn was observed the location of the observation was recorded using a GPS unit and data on the animal's behavior, direction of travel, and surrounding habitat were recorded on data sheets.

3.2.5 Incidental Observations

Incidental observations of target large mammal species moving throughout the Project corridor (not associated with the tracking, remote camera stations, or pronghorn stations) were also documented during the survey. Incidental observations included tracks, scat, live animals crossing the Project corridor, or carcasses (roadkill). Incidental observations were made during tracking or camera station setup (e.g., tracks that were registered in the soil before the station was set up for each survey), pronghorn visual surveys, and other studies conducted within the Project corridor.

For each incidental observation, biologists recorded the species, direction of travel (if possible), date, time of day the observation was made, as well as any other details that would be pertinent to the overall study (e.g., whether the animal was using an existing linear feature such as a wash or a road or if it was traveling across open land). Data were recorded on data sheets and locations were documented using a GPS unit. Following field data collection, all incidental observations were labeled "I-" followed by a two-digit number to distinguish these observations from the data recorded at tracking or camera stations during analysis.

Biologists recorded all special-status species observed throughout the course of the study using a GPS unit. The observations notes on behavior were also recorded on data sheets.

3.3 Data Analysis

Following each field survey effort, all data were reviewed for errors and consistency prior to being entered into the respective data spreadsheets. Data were then analyzed in two ways: the data were "corrected" using a simple mathematical equation in order to compare all data evenly, regardless of collection method (tracking or remote camera stations); and the raw data (i.e., non-corrected data) were incorporated into a map with graduated arrows placed on station locations in each direction of movement that was recorded at the station. The methods for both analyses are described below.

During the data collection process, some data were recorded as "unidentified" at tracking and camera stations because there was a lack of clear evidence to make a species determination based due to weather (high wind events or firm soils after precipitation), track imprints being compromised by vehicular or human activity, or because a clear image was not recorded on the remote camera. "Unidentified" data were eliminated to maintain consistency during the data analysis.

Data "Correction"

Data "correction" was performed to analyze data objectively, despite any disparity in the number of days each station location was surveyed throughout the study. Once data were entered for the four surveys, the number of movement occurrences was determined for each station. One occurrence was considered one track set recorded at a tracking station or one animal captured on photograph(s) at a remote camera station. The number of survey days was then calculated for each station; one survey day for a tracking station was one evening followed by a morning check of the station and one survey day for a camera station was one 24-hour period of operation. The number of occurrences was then divided by the number of survey days to determine how many occurrences were documented per day at each station.

In cases where multiple remote cameras and/or track stations were combined with one another in a single location to document successful wildlife crossings through culverts (as described in Section 3.2.3), then the combined stations were treated as one collective location and data correction methods changed slightly. First, the data from the combined stations were reviewed to determine which data points were duplicated. Duplicate points were set aside from the data set to prevent one animal occurrence from appearing as multiple occurrences in the data set (it is important to note that the duplicate data were not permanently removed from the data set in the same way "unidentified" data were removed). For example, if a bobcat was observed on two cameras and bobcat tracks were found in one tracking station between the two cameras, resulting in three total data points, then two of the data points were set aside so the occurrence was only represented by one data point. The number of individual occurrences from each data collection method (tracking and remote camera stations) were then added together. After the total number of individual occurrences the location as a whole was determined, then the total number of survey days for each data collection method were added together. The occurrences were then divided by the total number of survey days to determine the number of occurrences that were documented per day at that location. In the example above, the tracking station would have 20 survey days and each camera, for the purposes of explanation, had 6.5 survey days each. If the bobcat was the only occurrence that the three stations recorded during the study, then the one occurrence was divided by 33 total survey days (20+6.5+6.5) to obtain a number of occurrences per day per location. In this example, the number of occurrences per day per location would be 0.03.

A table showing the number of occurrences, number of survey days, and number of occurrences per day was created, with the stations/locations with the highest occurrences per day listed at the top. All stations exhibiting an occurrence per day number of 0.30 or higher were generally determined to be "high use" areas within the Project corridor. This would be the equivalent of a target mammal traveling through an area approximately once every three days or roughly twice a week.

Results Map

In order to provide a visual representation of the raw data collected during the study, a map of all sampling stations was created and graduated arrows were placed on the station location in each direction of movement that was recorded at the station. Data collected for each target species was combined based on direction of travel. Larger arrows in a single direction signified more data recorded for movement in that particular direction. For example, if four coyotes, one bobcat, and one raccoon were all documented traveling north at a single station, the size of the arrow on the map would indicate six data points were documented moving in that direction.

The locations and direction of travel of incidentally observed target species were also assessed to determine if there were additional areas within the Project corridor that were not studied that could possibly be considered high use areas.

4.0 RESULTS

The results of the four seasonal surveys and subsequent data analysis are discussed below.

4.1 Seasonal Wildlife Movement Surveys

4.1.1 Initial Field Assessment

The initial field assessment was conducted on September 2, 2014, by biologists Michael Tuma and Kristen (Mobraaten) Wasz. The biologists identified potential tracking and camera station locations during this effort.

4.1.2 Tracking Stations

Tracking station sampling efforts were conducted by three teams of two biologists each. Table 2 shows the survey details for each seasonal survey effort.

Table 2. Survey Dates and Personnel

Season	Date	Survey Leads*	Assistants	General Weather	Moon Phase	Number of Stations Sampled
Summer	9/7/14 - 9/12/14	Brad Haley, Shannan Shaffer, Kristen Wasz, Phillip Wasz,	Kevin Cornell, Lily Sam, Amy Trost	60-90 °F, 0-20 mph wind, clear to cloudy skies, rain event 9/8/14	Full	54
Fall	11/16/14 - 11/20/14	Brad Haley, Amy Trost, Michael Tuma, Kristen Wasz, Phillip Wasz	Kevin Cornell, Carley Lancaster, Rebecca Valdez	31-66 °F, 0-25 mph wind, clear to overcast skies	Last Quarter	58
Winter	1/19/15 - 1/24/15	Brad Haley, Amy Trost, Kristen Wasz	Kevin Cornell, Carley Lancaster, Rebecca Valdez	28-72 °F, 0-10 mph wind, clear to overcast skies	New	59
Spring	3/22/15 - 3/27/15	Brad Haley, Ben Smith, Kristen Wasz, Phillip Wasz	Rebecca Valdez, Amy Trost, Kevin Cornell	41-86 °F, 0-30 mph wind, clear to overcast skies, very high winds 3/22-3/24	New	58

*Survey leads were switched in and out of the study based on schedule and availability.

Stations were placed as close to locations identified in the initial field assessment as possible; however, minor changes were made to station placement and locations throughout the year-long study to accommodate for changes in Project alignment design, soil, vegetation growth, and roadside maintenance activities. Several stations were added during the Fall and Winter surveys (four stations and three stations, respectively) to accommodate for alignment changes and to ensure the entire Project corridor was sampled thoroughly. A few stations were removed from the study in the Winter and Spring surveys (two stations and one station, respectively) due to soil compaction and vegetation growth due to recent rain events. In addition, station sizes were drastically reduced in some cases during the Winter and Spring surveys due to the large amounts of annual vegetation growth. Station names were not in chronological order for this reason. The locations of all tracking stations are shown on Figure 12 and details on tracking station locations with representative photographs are included as Appendix A.

Forty-one stations detected coyote, 11 detected black-tailed jackrabbit, nine detected bobcat, five detected desert kit fox, four detected mule deer, four detected raccoon, and two detected mountain lion. A detailed analysis of the tracking station results can be found in Section 4.2.

4.1.3 Remote Camera Observations

Remote camera stations were placed as close to the locations selected during the initial field effort as possible to maintain a consistent naming schema; however, the station names were not assigned in numerical order. Several of the proposed stations were located in areas with access issues (private property owners, permissions had not been granted etc.). As access issues were resolved, or permissions granted, additional stations were added in the subsequent survey. Out of the 40 proposed camera stations, 31 stations were established throughout the Project corridor during the Summer survey, 34 stations during the Fall survey, 37 stations during the Winter survey, and 36 stations during the Spring survey. Figure 12 shows the locations of all camera stations sampled throughout the study.

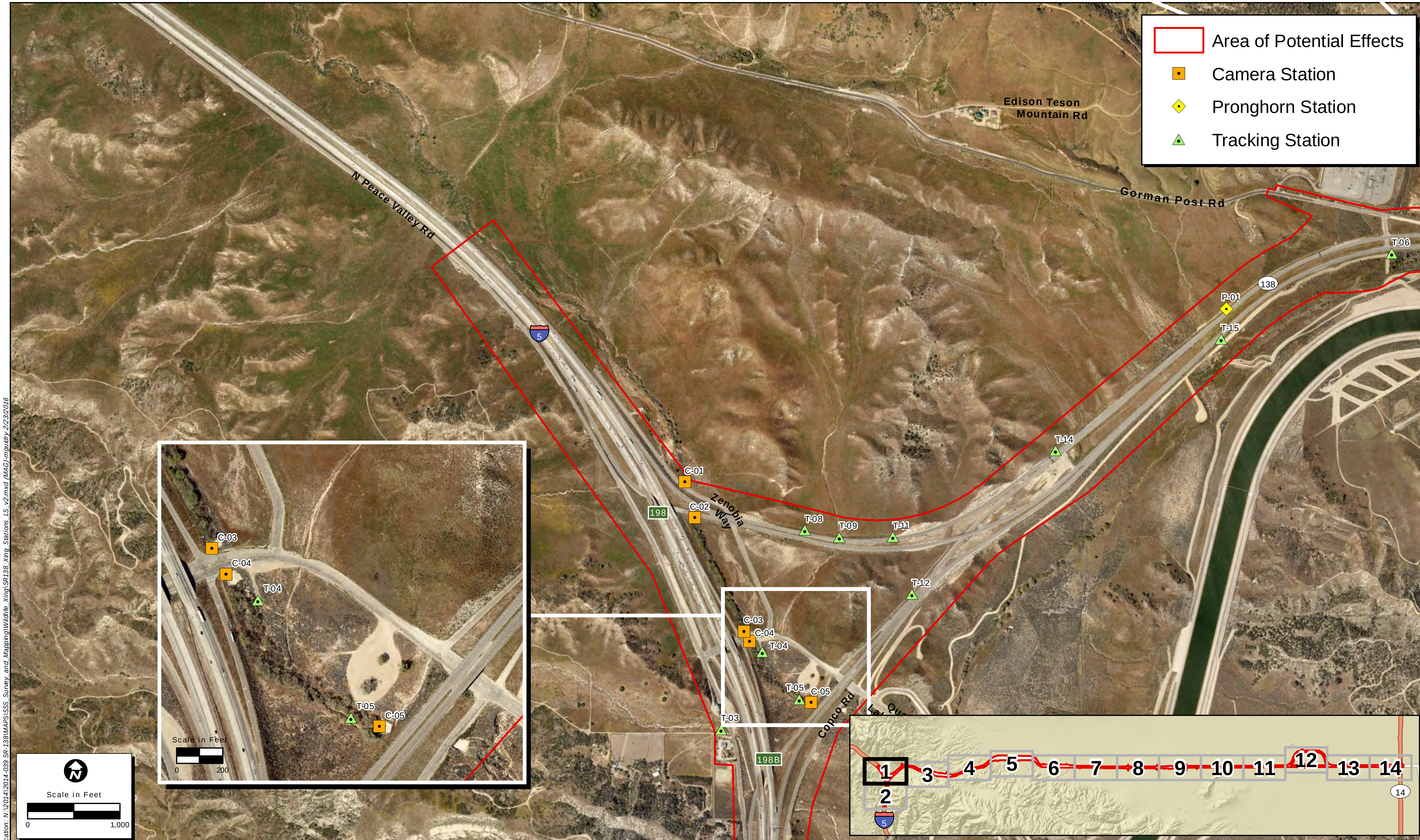
Three camera stations were removed from the survey. One camera station, C-15, was placed at a permanent pool of water just south of Quail Lake during the Summer survey but was removed from subsequent surveys because the vegetation surrounding the water feature was so abundant that, even with modified camera programming, the data card would fill up with "blank" images before the camera could be checked the next day. There was no alternate location to move this station, so it was removed from the study. One camera was stolen from the western end of the corridor during the Winter survey, around the intersection of Quail Lake Road and I-5 (C-05), thus resulting in lost data. Lastly, the bolt located on the bottom of the camera at station C-35 broke mid-way through the Spring station, so the station was removed from the study.

The camera stations sampled a total of 487.25 trap-days (the total number of cameras multiplied by the number of operational days) throughout the four surveys. A total of 18.75 trap-days were lost due to camera malfunction or error, or because of external circumstances, such as high winds. Table 3 shows the breakdown of operational trap-days per survey. Appendix B contains a list of all the camera stations, representative photographs of the stations, habitat and topography associated with them, and details on maintenance conducted during the sampling effort.

Table 3. Camera Station Survey Data

Season	Number of Cameras	Number Operational Trap-days
Summer	31	86.25
Fall	34	125
Winter	37	126
Spring	36	150

Figure 12. Sampling Station Locations



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Map Date: 5/7/2015
Photo Source: USGS, Esri

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Figure 12-1. Sampling Station Locations

2014-039 SR 138 Cal Trans

Location: N:\2014\2014-039 SR-138\MAPS\SSS_Survey and Mapping\Wildlife_Xing\SR138_Xing_Stations_LS_v2.mxd (MAG)-mguidry 2/23/2016

Map Date: 5/7/2015
Photo Source: USGS, Esri

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Figure 12-2. Sampling Station Locations

2014-039 SR 138 Cal Trans

Map Date: 5/7/2015
Photo Source: USGS, Esri

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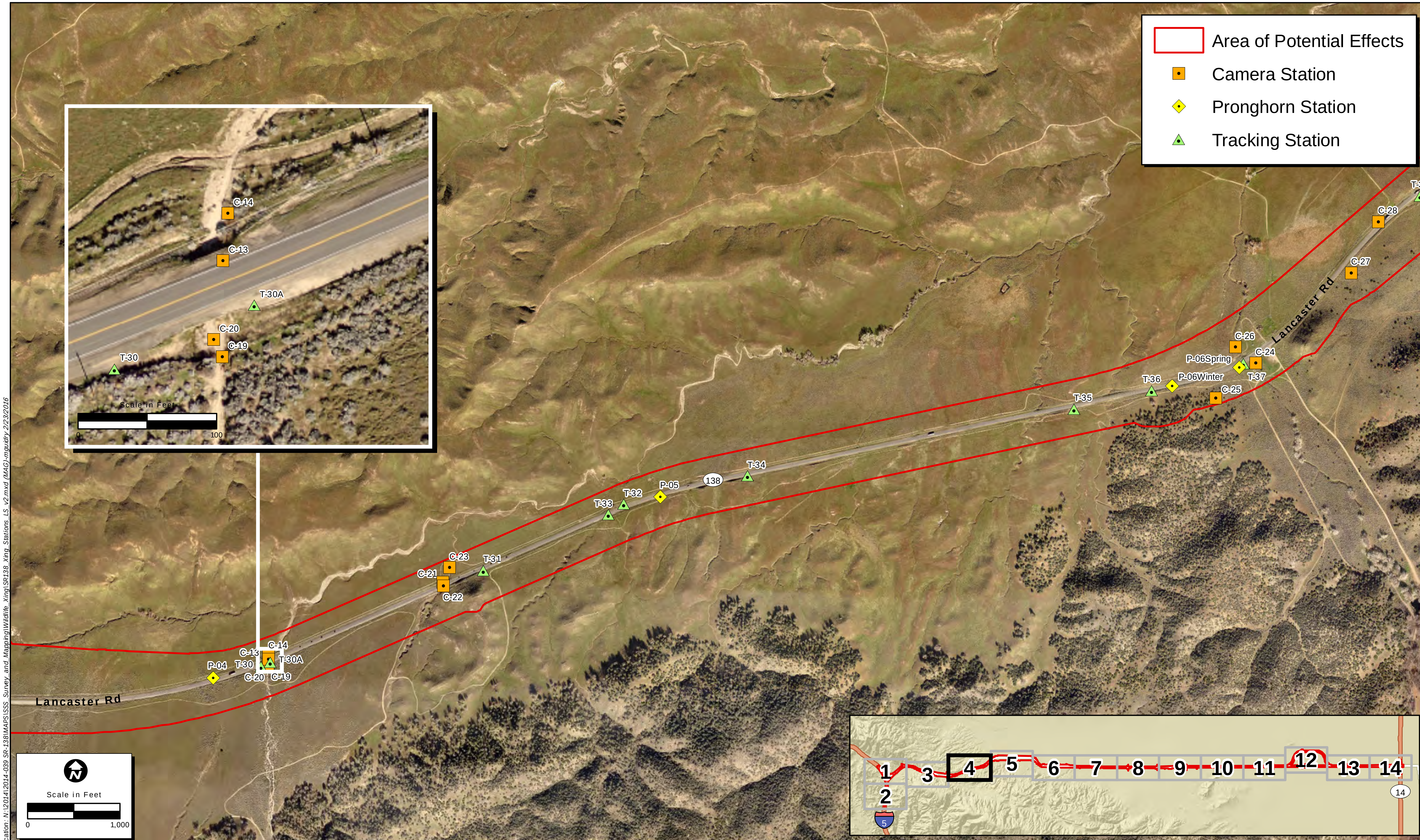
Figure 12-3. Sampling Station Locations

2014-039 SR 138 Cal Trans



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Map Date: 5/7/2015
Photo Source: USGS, Esri

Figure 12-4. Sampling Station Locations

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Map Date: 5/7/2015
Photo Source: USGS, Esri

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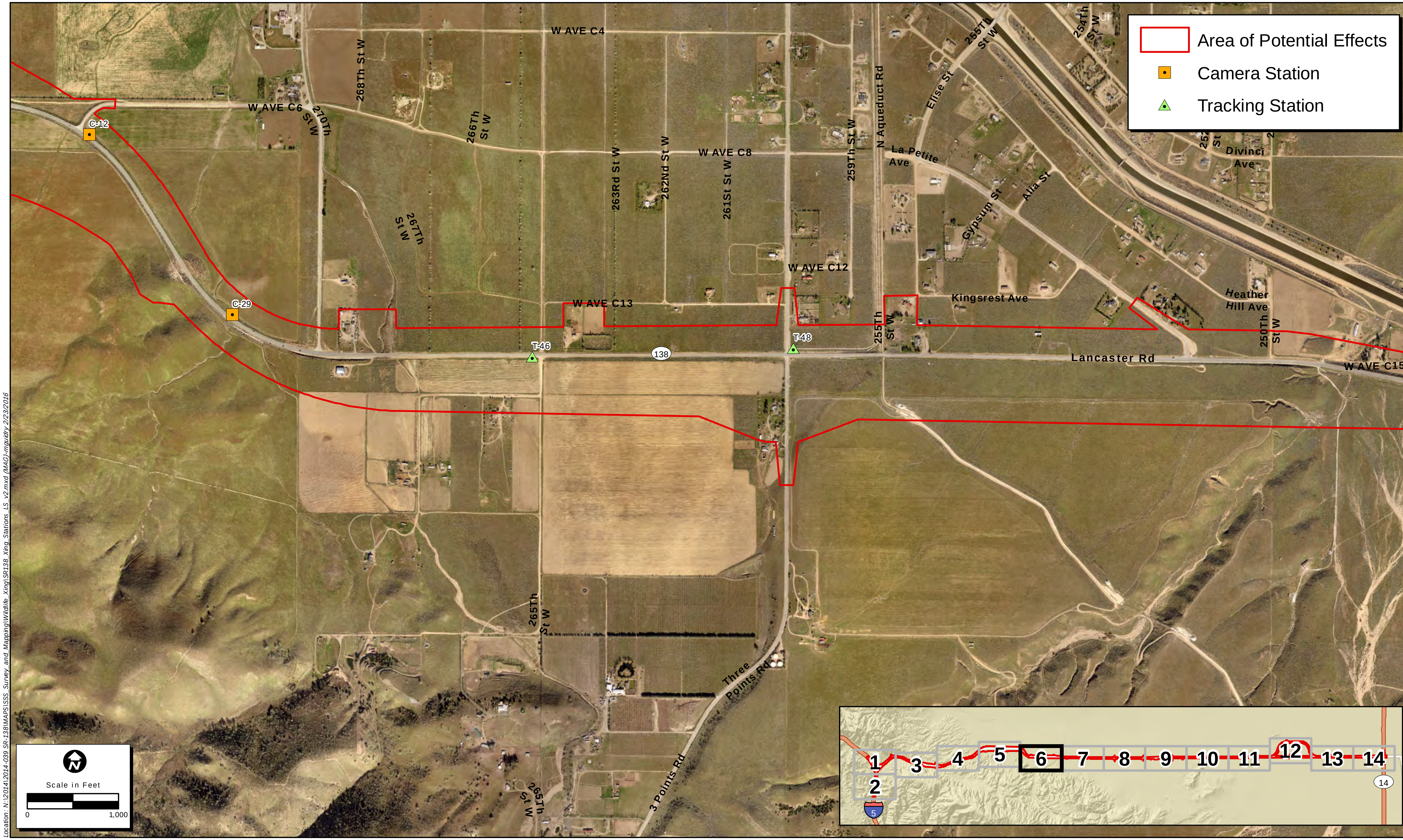
Figure 12-5. Sampling Station Locations

2014-039 SR 138 Cal Trans



Map Date: 5/7/2015
Photo Source: USGS, Esri

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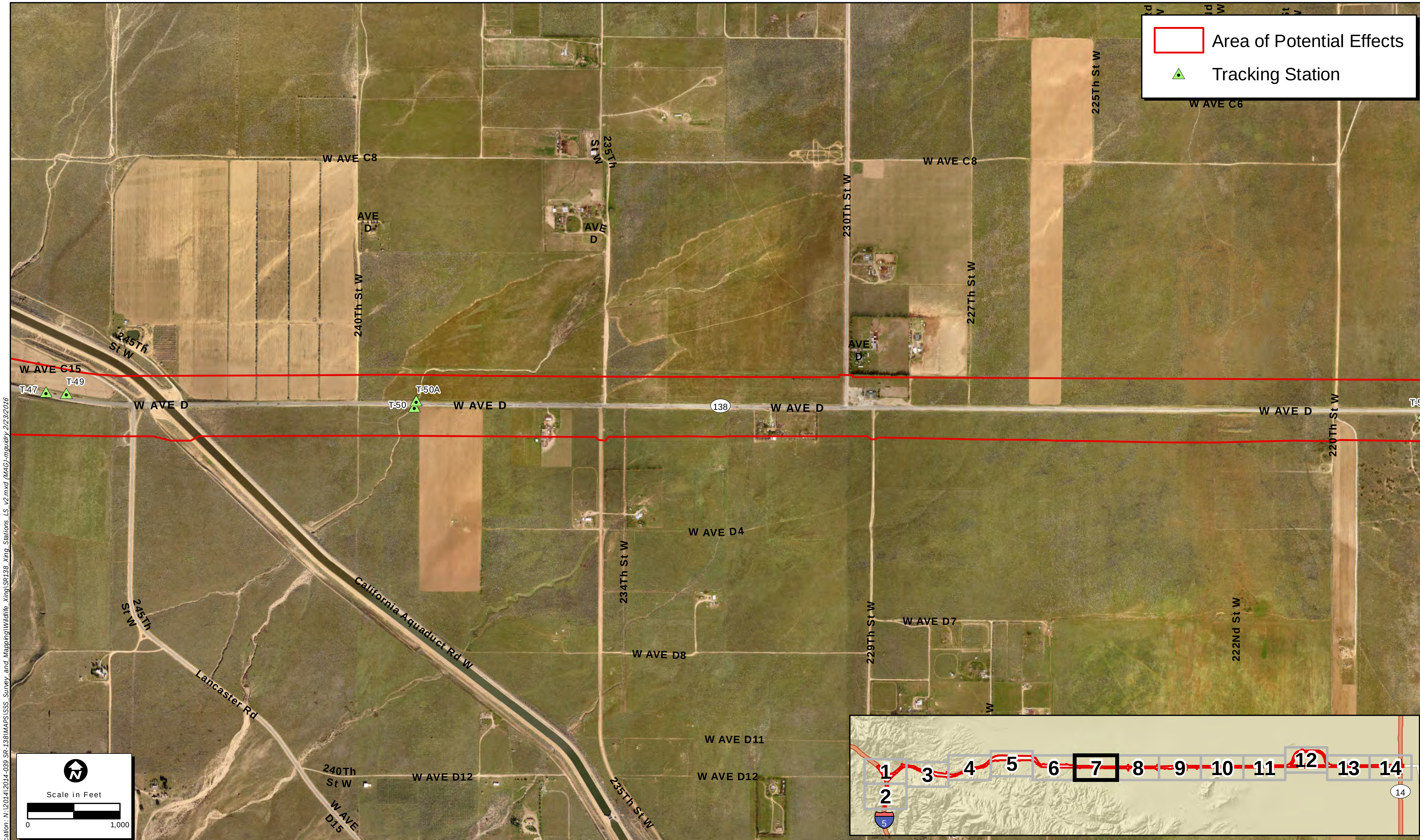
Figure 12-6. Sampling Station Locations

2014-039 SR 138 Cal Trans

Location: N:\2014\2014-039 SR-138\MAPS\SSS_Survey_and_Mapping\Wildlife_Xing\SR138_Xing_Stations_LS_v2.mxd (MAG)-mguidry 2/23/2016



Map Date: 5/7/2015
Photo Source: USGS, Esri

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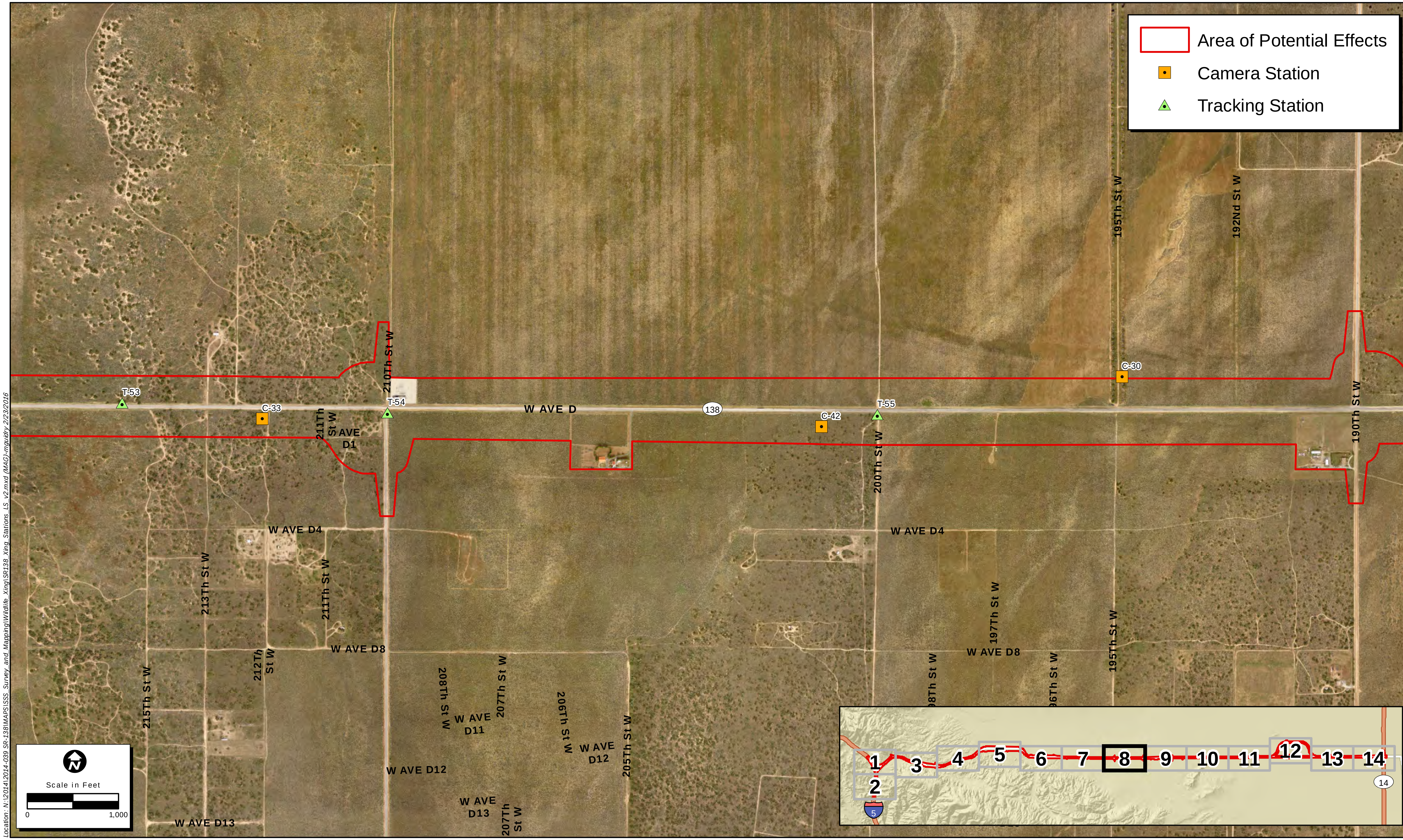
Figure 12-7. Sampling Station Locations

2014-039 SR 138 Cal Trans

Location: N:\2014\2014-039 SR-138\MAPS\SSS_Survey_and_Mapping\Wildlife_Xing\SR138_Xing_Stations_LS_v2.mxd (MAG)-mguidry 2/23/2016



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Map Date: 5/7/2015
Photo Source: USGS, Esri

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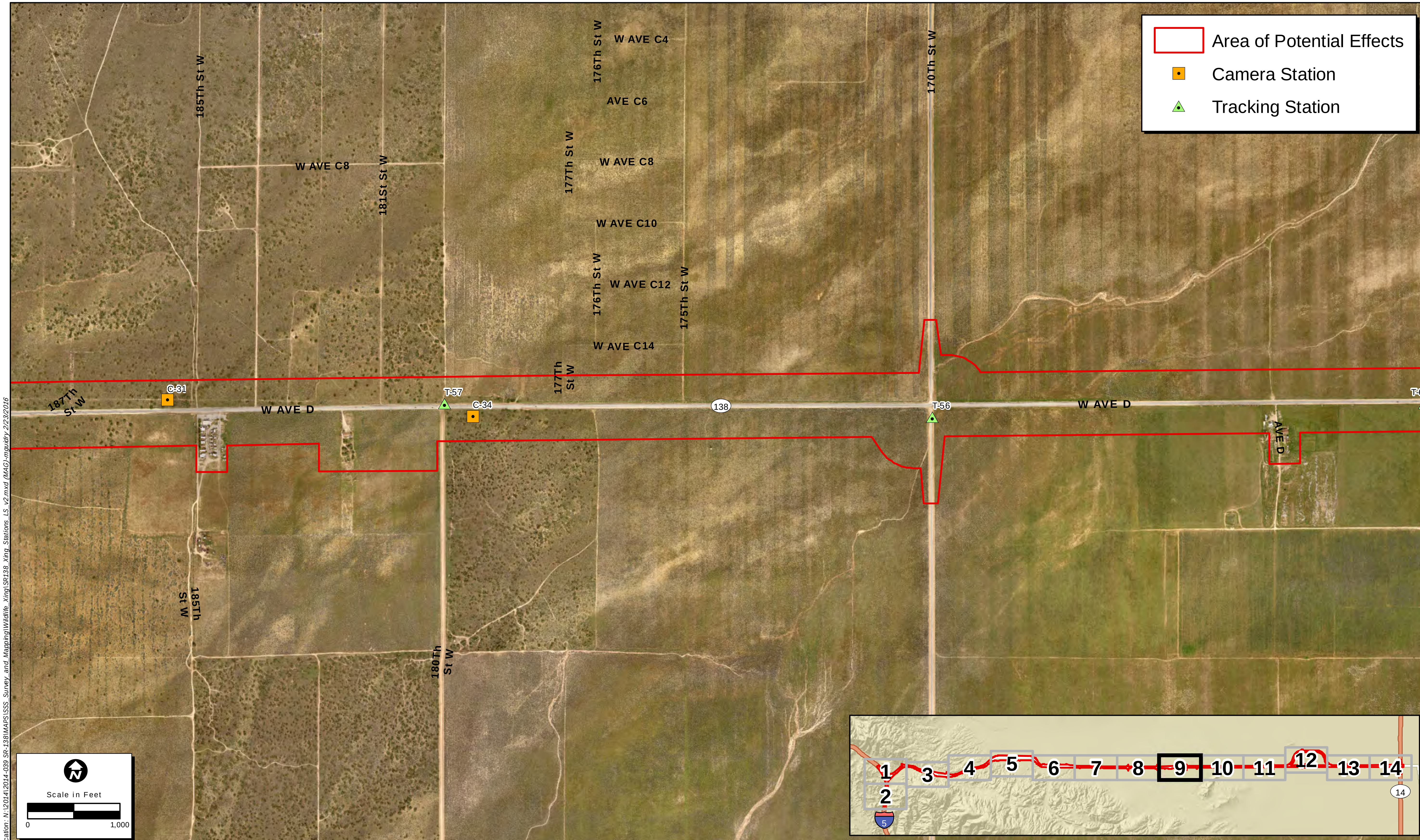
Figure 12-8. Sampling Station Locations

2014-039 SR 138 Cal Trans



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Map Date: 5/7/2015
Photo Source: USGS, Esri

Figure 12-9. Sampling Station Locations

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Location: N:\2014\2014-039 SR-138\MAPS\SSS Survey and Mapping\Wildlife Xing\SR138 Xing Stations LS v2.mxd (MAG)-mguidry 2/23/2016

Map Date: 5/7/2015
Photo Source: USGS, Esri

Figure 12-10. Sampling Station Locations

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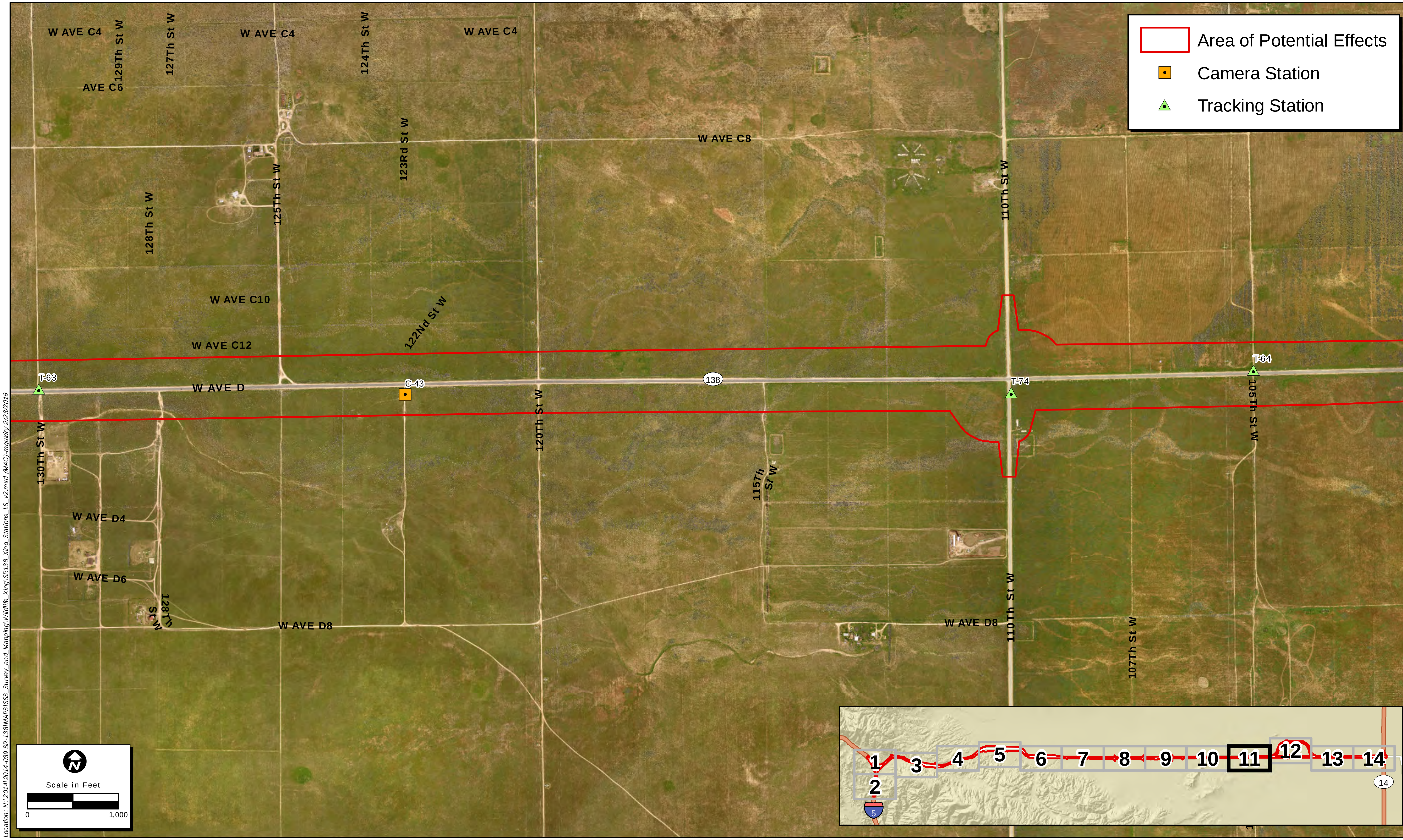

Map Date: 5/7/2015
Photo Source: USGS, Esri

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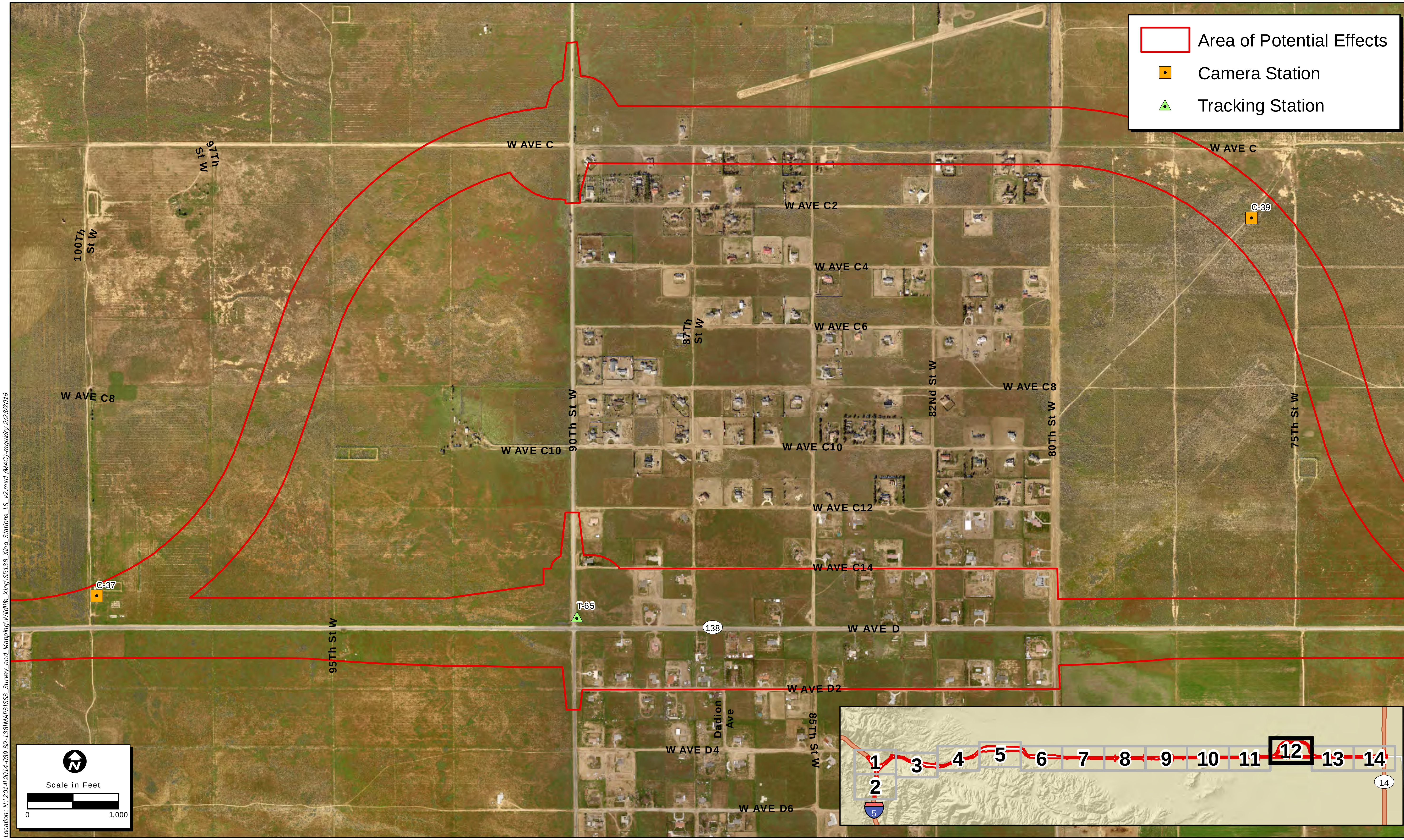
Figure 12-11. Sampling Station Locations



Map Date: 5/7/2015
Photo Source: USGS, Esri

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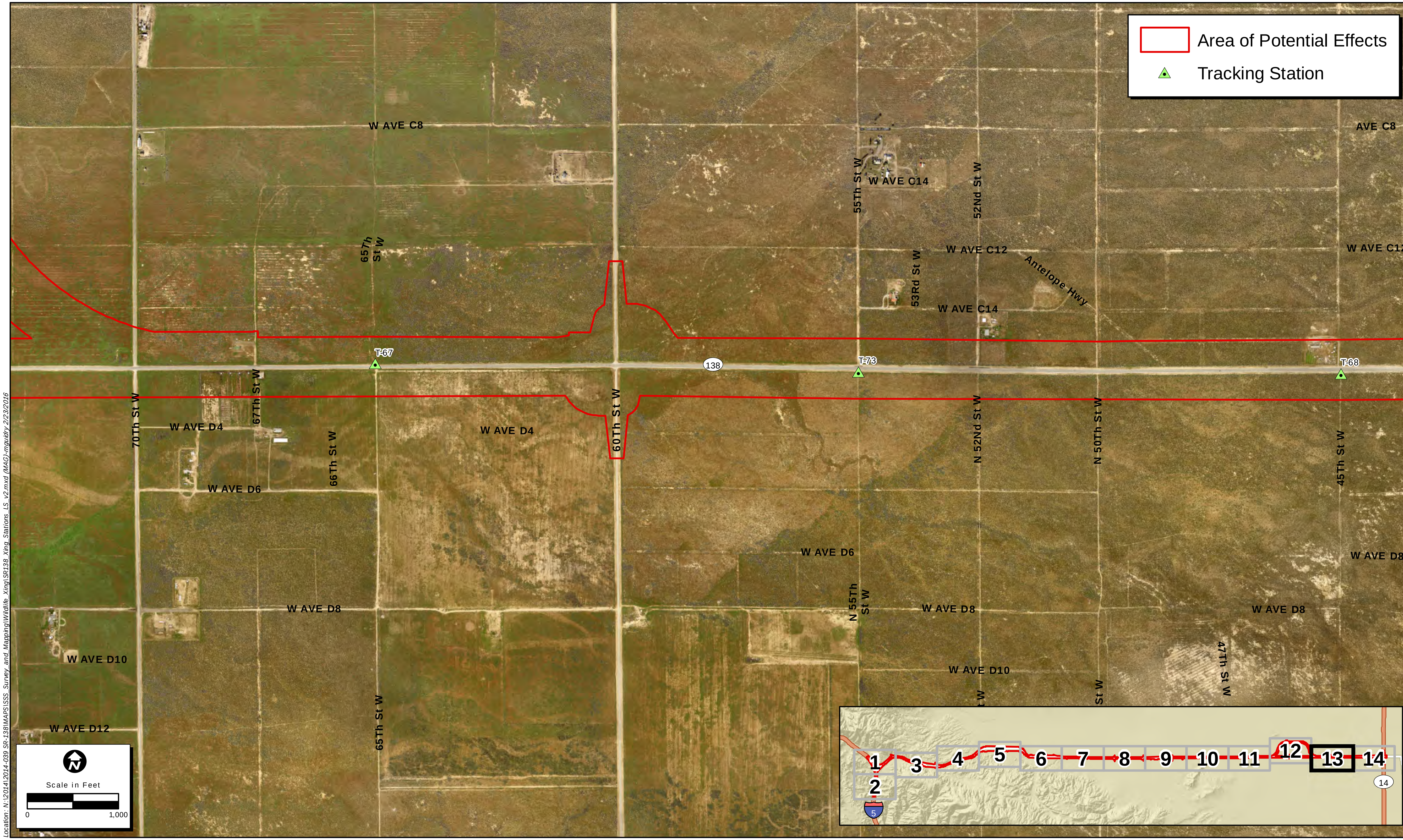
Figure 12-12. Sampling Station Locations

2014-039 SR 138 Cal Trans



Location: N:\2014\2014-039 SR-138\MAPS\SSS_Survey_and_Mapping\Wildlife_Xing\SR138_Xing_Stations_LS_v2.mxd (MAG)-mguidry 2/23/2016

Map Date: 5/7/2015
Photo Source: USGS, Esri

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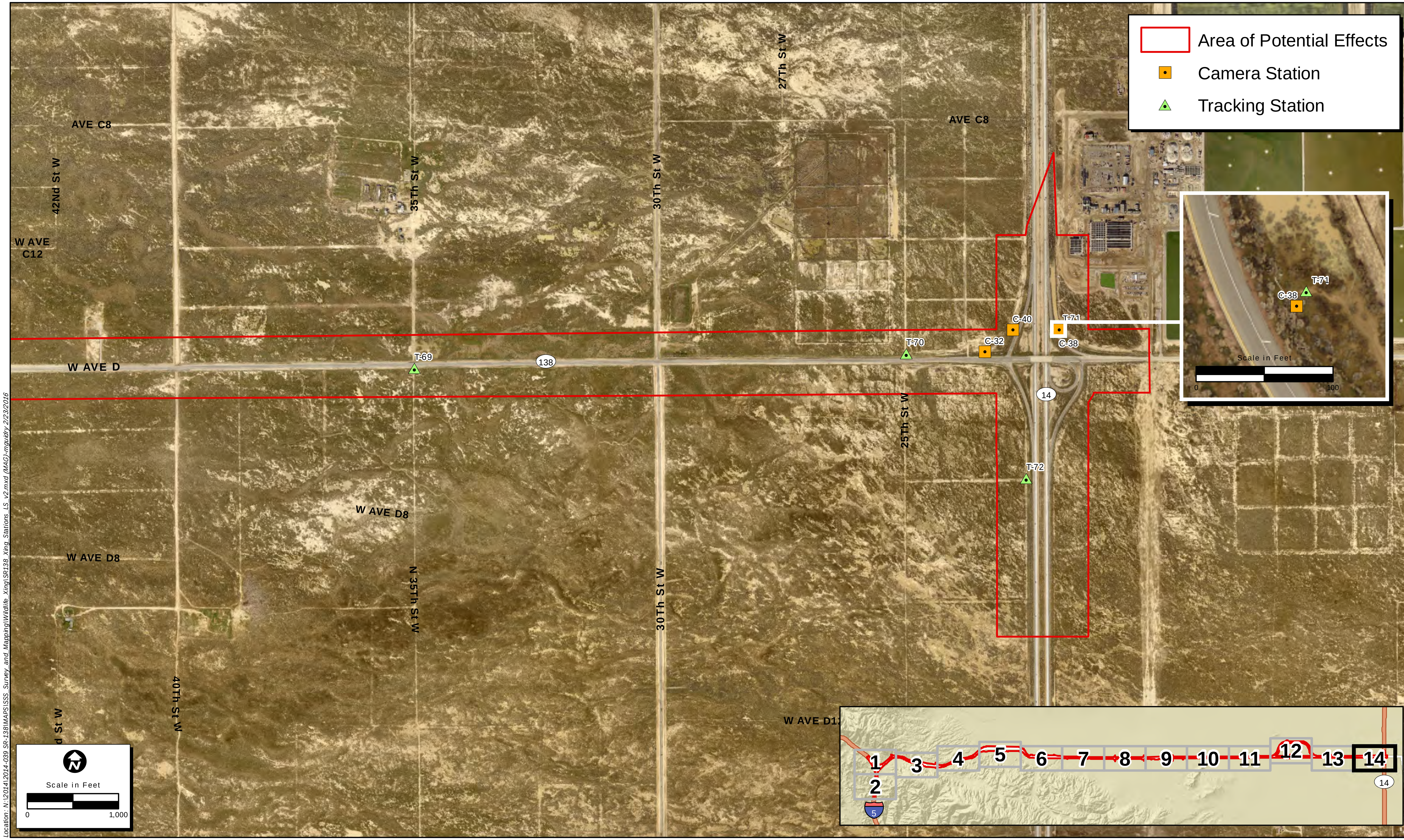
Figure 12-13. Sampling Station Locations



Map Date: 5/7/2015
Photo Source: USGS, Esri

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Figure 12-14. Sampling Station Locations

2014-039 SR 138 Cal Trans

Sixteen camera stations contained photos of coyotes, 10 stations had bobcat, eight stations had black-tailed jackrabbit, three stations had mountain lion, two stations had desert kit fox, and two stations had raccoon. A detailed analysis of the tracking station results can be found in Section 4.2. Appendix C contains a sampling of photographs captured at select remote camera stations.

4.1.4 Pronghorn Stations

All of the six proposed pronghorn station locations were established throughout the western portion of the Project corridor (Figure 12). Stations were placed as close to locations identified in the initial field assessment as possible to maintain a consistent distance between stations; however, stations were modified in the field to ensure a clear view of all habitat surrounding the stations. Pronghorns were neither observed nor detected during the visual observation periods conducted during the Winter and Spring surveys. Appendix D contains a list of all the pronghorn stations, descriptions of their locations, and photographs of the surrounding habitats surveyed.

4.1.5 Incidental Observations

Incidental observations of target large mammal species for the study and special-status species are discussed separately below. A complete list and corresponding map of all incidental observations is found in Appendix E.

Target Wildlife Species

Nine large mammal species were detected incidentally during sampling efforts, including black-tailed jackrabbit, bobcat, coyote, desert kit fox, gray fox, mountain lion, mule deer, pronghorn, and raccoon. These data are considered incidental because they were documented outside of the established tracking and remote camera station locations, and/or were incidentally observed outside of the sampling period. Coyote tracks were incidentally observed throughout the entire Project corridor, while the bobcat, gray fox, mountain lion, and pronghorn sightings were only located in the western portion (I-5 to 300th Street West). Mule deer and raccoon sightings were located in the western and central portions of the Project corridor (I-5 to 190th Street West). Black-tailed jackrabbit and desert kit fox observations were limited to the eastern portion of the Project corridor (110th Street West to SR-14).

Although not within the Project corridor, biologists observed a road-kill bobcat on the west shoulder of the northbound I-5 lanes approximately five miles north of the western portion of the Project corridor. The bobcat was observed on September 7, 2014.

Special-status Species

Five special-status wildlife species were incidentally observed during the four seasonal surveys: bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), loggerhead shrike (*Lanius ludovicianus*), northern harrier (*Circus cyaneus*), and Swainson's hawk (*Buteo swainsoni*). Each species is briefly discussed individually below.

Bald eagle
The bald eagle is protected federally by the Bald and Golden Eagle Protection Act (16 United States Code [U.S.C.] 668-668c) and is designated by the state as a fully-protected species (CDFW 2016). This species is typically found near lakes, reservoirs, rivers, marshes, and coastal areas, where it primarily feeds on fish. Bald eagles will occasionally prey upon mammals, birds, reptiles, and carrion. Bald eagles build large stick nests most commonly found in large, old growth trees near a permanent source of water. One bald eagle was observed being chased by common ravens on March 25, 2015 near SR 138 and 290th St. W.

Golden Eagle
The golden eagle is protected federally by the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) and is designated by the state as a fully-protected species (CDFW 2016). This species is typically found in open and semi-open areas, such as prairie, tundra, sparse woodlands, and sagebrush habitats, where it feeds primarily on small mammals. Golden eagles will also occasionally prey upon larger mammals, birds, and snakes and they are known to feed on carrion. This species builds very large (10-ft- [3-m-] wide) stick nests on cliffs of all heights or in sturdy trees that are in rugged, open habitat with canyons and escarpments nearby. One juvenile golden eagle was observed being harassed by common ravens on March 23, 2015 near the roadside near SR 138 and Tentrock Canyon.

Loggerhead shrike
The loggerhead shrike is a CDFW Species of Special Concern (SSC) (CDFW 2016). It prefers open areas with scattered trees and shrubs including savanna, desert scrub, and open woodland habitats. Its diet includes large insects and other invertebrates, but will also prey upon small mammals, lizards, and snakes. Five loggerhead shrike observations made along SR-138 between Quail Lake and 55th Street West were made on January 20, 21, 22, and March 27, 2015.

Northern harrier
The northern harrier is a CDFW SSC (CDFW 2016). This species breeds and forages in open areas typically dominated by low-growing vegetation with available perches such as fence posts or sturdy shrubs nearby. Northern harriers are found in a range of habitats including deserts, coastal sand dunes, pasturelands, croplands, dry plains, grasslands, old agricultural fields, estuaries, open floodplains, and marshes. Its diet consists of small to medium-sized vertebrates such as songbirds and rodents. Two northern harriers were observed flying over a field or being harassed by common ravens on November 17 and 19, 2014 near SR 138 between 240th St. W and 235th St. W.

Swainson's hawk
The Swainson's hawk is a state-listed threatened species (CDFW 2016). It prefers savanna, open woodlands, and cultivated lands. Its diet consists mainly of mammals and other vertebrates, but it will also eat various insects during the non-breeding season. It prefers to nest in open, riparian habitat with scattered trees or small groves in sparsely vegetated flatlands. Three Swainson's hawks were observed along SR 138 on March 22, 2015 near Tentrock Canyon.

4.2 Data Analysis

Twenty stations/locations were determined to be high use areas within the Project corridor (Table 4). The western and eastern portions of the Project corridor exhibited the most high use areas. Generally speaking, there were fewer occurrences recorded at the stations between the entrance of the High Desert Hunt Club on Tejon Ranch and 160th Street West.

One station, T-03, did not fall in the category of a high use area but was included in the table below because a mountain lion was documented traveling through the drainage during the Winter survey. Due to the large amount of open space required for mountain lion survival (mating, foraging, and cover), this location may be an important area for mountain lion travel within the Project corridor and was, therefore, included as a high use area. The complete results table for the occurrence data for all tracking and remote camera stations is found in Appendix F.

Table 4. High Use Areas within the Project Corridor

Station Number	Number Occurrences	Number Survey Days	Number Occurrences per Survey Day	Species	Habitat/ Topography	Area within Project Corridor
T-60	21	20	1.05	Coyote	Cheatgrass grassland/ dirt road (160th Street W).	East
T-18	18	20	0.90	Coyote, Raccoon	Rabbitbrush scrub/ road shoulder west of California Aqueduct and Quail Lake.	West
T-06	8	10	0.80	Coyote, Bobcat	Rabbitbrush scrub/ box culvert and associated drainage.	West
C-38	12	17.75	0.68	Coyote, Black-tailed Jackrabbit	Allscale scrub/ box culvert and associated drainage running east-west under SR-14.	East
C-37	10	15	0.67	Coyote, Desert Kit Fox, Black-tailed Jackrabbit	Allscale scrub/ drainage channel running north-south.	East
T-09	13	20	0.65	Coyote, Black-tailed Jackrabbit	Mojave mixed woody scrub/ adjacent to fenced drainage blocked with vegetation. Hole in chain-link fence provides north-south crossing opportunity in this area.	West
T-61	12	20	0.60	Coyote	Rabbitbrush scrub/ dirt road (165th St W).	East

Station Number	Number Occurrences	Number Survey Days	Number Occurrences per Survey Day	Species	Habitat/ Topography	Area within Project Corridor
T-21	8	20	0.40	Coyote	Rabbitbrush scrub/ road shoulder south of entrance to Quail Lake.	West
T-54	8	20	0.40	Coyote, Mule Deer, Black-tailed Jackrabbit	Rabbitbrush scrub/ dirt road southeast of the intersection between 210th Street W and SR-138.	East
T-71	8	20	0.40	Coyote, Bobcat, Black-tailed Jackrabbit	Allscale scrub/ box culvert and associated drainage running east-west under SR-14.	East
C-35	5	12.5	0.40	Coyote, Black-tailed Jackrabbit	Rabbitbrush scrub/ dirt road (165th St W).	East
C-32	6	15.5	0.39	Coyote, Desert Kit Fox, Black-tailed Jackrabbit	Allscale scrub/ large concrete pipe and associated drainage west of SR-14.	East
C-41	3	8.25	0.36	Coyote	Rabbitbrush scrub/ no linear features; open habitat.	East
T-11	7	20	0.35	Coyote	Mojave mixed woody scrub/ at the base of a hillside in the shoulder of SR-138.	West
T-63	7	20	0.35	Coyote	Rabbitbrush scrub/ dirt road (130th Street W).	East
C-02	5	16.25	0.31	Coyote, Bobcat	Sandbar willow thickets, large culvert and associated drainage running north-south.	West
C-13 / C-14 / C-19 / C-20 / T-30A	20	65.75	0.30	Coyote, Mountain Lion, Bobcat	Rabbitbrush scrub/ box culvert and associated drainage running north-south.	West
T-27	6	20	0.30	Coyote, Mule Deer	Rabbitbrush scrub/ dirt road south of residences at southeastern side of Quail Lake.	West
T-64	6	20	0.30	Coyote, Bobcat, Desert Kit Fox	Fallow agriculture and rabbitbrush scrub/ dirt road (105th Street W).	East

Station Number	Number Occurrences	Number Survey Days	Number Occurrences per Survey Day	Species	Habitat/ Topography	Area within Project Corridor
T-68	6	20	0.30	Coyote, Desert Kit Fox, Black-tailed Jackrabbit	Allscale scrub/ dirt road (35th Street W).	East
T-03*	3	20	0.15	Coyote, bobcat, mountain lion	Rabbitbrush scrub/ drainage channel west of I-5. *Although not classified as a high use area through data analysis, this channel was used by mountain lion for travel during Winter survey, which could make this location important for mountain lion travel in the area.	West

Two stations that were determined to be high use areas, C-39 and C-40, were eliminated from the occurrence table above because these stations only documented black-tailed jackrabbit activity. Much of the data collected at these stations were black-tailed jackrabbits foraging or temporarily traveling through the area in front of the cameras. Furthermore, this species is not known to migrate over long distances or require large expanses of land to survive, as many other target species documented during this study. Therefore, these stations were eliminated from consideration as high use areas.

The results map with graduated arrows showing the direction of wildlife travel documented at the tracking and remote camera stations based on raw data collection is also found in Appendix F.

Results of the incidentally observed target wildlife species generally mirrored the results of the tracking and remote camera station data analysis. There appeared to be two additional areas within the Project corridor that may be considered high use areas. The first was at 290th Street West, where several incidental coyote crossings were documented throughout the course of the study (around T-40). The second area was located near the entrance to the High Desert Hunt Club (near C-24 and T-37) where mountain lion tracks were incidentally observed traveling north through a drainage culvert.

5.0 DISCUSSION

5.1 Wildlife Linkages

Several known and potential locations for wildlife movement linkages were identified in the GIS analysis. These included patterns in the regional vegetation, connectivity zones identified within SEAs, and linkages identified in the California Desert Linkage Network and CEHC analyses. The GIS analysis also identified several important anthropogenic impediments to movement that likely redirect wildlife movements through portions of the Project corridor. The regional vegetation mapping analyses both indicated that vegetation types in the western portion of the Project corridor are more diverse and generally provide more cover; therefore, wildlife movements are expected to be more common across SR-138 and in the vicinity of I-5 due to these conditions. The diversity of vegetation communities in this area is a consequence of the diverse topography produced by the convergence of the San Andreas and Garlock Faults, and the San Gabriel and Tehachapi Mountains. The vegetation communities in this area provide cover for wildlife species that prefer moving in areas of greater cover. Additionally, the convergence of montane habitats in this portion of the Project corridor increases the likelihood of movement occurrences by wildlife species that inhabit the San Gabriel and Tehachapi Mountains, such as mule deer, mountain lion, and American black bear. Vegetation types in the eastern ¾ of the Project corridor are generally more open and much less diverse. Movements by wildlife in this portion of the Project corridor are likely more diffuse, and the wildlife that move through this area, such as black-tailed jackrabbit, bobcat, and American badger, tolerate or prefer the relatively open habitats there.

Several important anthropogenic features were identified within the Project corridor that impede and/or direct wildlife movement through it. In addition to SR-138, these features include the California Aqueduct and Quail Lake in the western portion of the Project corridor, the community of Neenach in the west-central portion of the Project corridor, the solar energy developments in the central portion of the Project corridor, and the community of Del Sur in the eastern portion of the Project corridor. These features limit the dispersal of most terrestrial wildlife species across the Project corridor where they abut SR-138. However, some species, particularly coyote, may be attracted to these features and travel along them before being directed across SR-138. The final Project design should consider these anthropogenic features and their effects on influencing wildlife movement in the design of any features that facilitate movement through the Project corridor.

Several potential movement Constriction and/or Connectivity Areas were identified in SEA maps produced by the County of Los Angeles SEATAC. These areas were generally located where anthropogenic features may prevent, impede, or slow wildlife movement within or outside of the SEAs. Five cross the western portion of the Project corridor in the vicinity of Quail Lake and I-5, and four abut SR-138 in the central portion of the Project corridor within the Joshua Tree Woodlands SEA. These areas may provide opportunities for design of the Project to facilitate wildlife movements where they may currently be impeded.

The South Coast Missing Linkages analysis identified four missing linkages that cross the SR-138, including two in the west, one in the central portion of the Project corridor, and another in the east (South Coast Wildlands 2008; Penrod et al. 2000). These missing linkages do not provide specific locations for wildlife movement, but rather provide a large-scale analysis of connections between large, open space areas and mountainous regions. This analysis is not likely to provide specific information pertaining to the development of Project features that would facilitate wildlife movement, but points out that SR-138 in its current configuration may represent an impediment to wildlife movements and/or gene flow in the region. The South Coast Wildlands (2008) identified one opportunity for improving wildlife movements in the Project corridor that included the portion of I-5 north of the interchange with SR-138. Here the only structures that would allow movement of wildlife across I-5 are four culvert box structures that measure approximately 5 by 5 ft (1.5 by 1.5 m). They recommend that a larger, more porous structure, such as a bridge undercrossing or a vegetated overcrossing, be constructed here to allow for the passage of wildlife in this vicinity.

The CEHC model identified areas of probability for wildlife movements that fell largely outside of the Project corridor within the mountainous areas to the north, south, and west. While this model provides little information about wildlife movements within the Project corridor, it underscores the importance of connections between the San Gabriel and Tehachapi Mountains and the need to maintain those connections, particularly within the western portion of the Project corridor.

Analysis of the TASAS data revealed that, of the 12 documented accidents involving wildlife (deer, non-deer, and livestock species) between 2003 and 2013, the majority (10) occurred within the western portion of the Project corridor, between I-5 and the community of Neenach. This indicates that adequate crossing structures in the western portion of the Project corridor are necessary not only for wildlife movement but also for motorist safety.

5.2 Results of the Study

The tracking stations placed throughout the Project corridor documented the movements of seven target mammal species: coyote, black-tailed jackrabbit, bobcat, desert kit fox, mule deer, raccoon, and mountain lion throughout the study. To avoid data collection bias by larger-sized tracking stations, all stations that were established for the study were roughly equivalent in size, approximately 5 to 10 ft (1.5 to 3 m) wide by 10 to 20 ft (3 to 6 m) long. This allowed for more consistent data collection throughout the Project corridor.

A total of 54 stations were sampled during the Summer survey, 58 during the Fall survey, 59 during the Winter survey, and 58 during the Spring survey. Although biologists tried to avoid it by proper station placement, there were several instances where stations were compromised due to vehicle tracks or road maintenance activities. Several stations registered vehicle tracks by the time the biologists conducted the morning check, which potentially resulted in a loss of data.

5.2.1 Tracking Stations

Three tracking stations were removed during the Winter and/or Spring surveys due to poor soils, heavy vegetation growth, or a combination of the two. Seven tracking stations were added to the study during the Fall and Winter surveys due to changes in property access and/or changes in Project alignments. Removing and adding tracking stations did not affect the overall data results analysis, as wildlife travel throughout the Project corridor was assessed as a whole, not necessarily in specific and discrete locations.

5.2.2 Remote Camera Stations

Six large mammal species were recorded on the remote camera stations established throughout the Project corridor, including coyote, bobcat, black-tailed jackrabbit, mountain lion, desert kit fox, and raccoon. A total of 31 camera stations were sampled during the Summer survey, 34 stations during the Fall survey, 37 stations during the Winter survey, and 36 station during the Spring survey. The camera stations sampled a total of 487.25 trap-days (number of operational days multiplied by the number of camera stations in operation). A total of 18.75 trap-days were lost (approximately 4 percent of the total sampling period) due to camera malfunction or errors, or because of external circumstances, such as high winds. Three camera stations were removed from the survey: C-15 because of the large amount of vegetation present and no alternative location, C-05 was stolen, and C-35 had a hardware malfunction.

Camera station placement was limited to areas not heavily used by humans and properties that had the appropriate rights of entry permissions. There were some areas throughout the Project corridor that would have been appropriate locations for a camera station due to topography and habitat; however, due to the higher levels of human activity and the associated threat of camera theft or vandalism, those locations were eliminated from consideration

The programmed settings for the remote cameras were sufficient to collect wildlife movement data during the study. Programmed settings were modified throughout the study on an as-needed basis to continuously improve the data collection capabilities of the camera. It was determined that the best settings for the study was a four-photograph, rapid-fire burst when the camera was triggered with a resting period of ten seconds between trigger events. Modifications to the programmed settings were rare events and did not affect the data collected during the survey. This was only conducted for a few of the cameras throughout the entire study, typically after substantial vegetation growth between surveys and was unavoidable (e.g., a large amount of vegetation would need to be removed).

Surveying an area using remote camera stations is a superior method for detecting wildlife travel compared to the tracking stations in areas containing rocky, coarse soils, or along paved roads, where track registry and identification would be difficult to impossible. However, the data collection capabilities of this method were limited to wildlife crossing in the view of the remote camera lens. The combination of data collection via remote camera and tracking stations maximized the data collected during the study.

5.2.3 Pronghorn Visual Surveys

Pronghorn visual surveys were conducted during the Winter and Spring surveys in response to a request made by CDFW to conduct surveys in association with the wildlife corridor study specifically targeted at pronghorn detection. Six visual observation stations were established in the western 7 mi (11 km) of the Project corridor. Pronghorns were neither observed nor detected during the visual surveys. Although the visual surveys were conducted twice daily for three consecutive days during the Winter and Spring surveys, it is possible that the timing of the surveys was not conducive to high activity periods for this species; pronghorns activity periods are generally from late summer through fall, when they breed, and the spring to early summer timeframe, when young are born and males are defending females within their territories. Pronghorns migrate during the late fall to early spring timeframe; however, it is unlikely that the populations on Tejon Ranch migrate over long distances off the ranch property due to the year-round availability of food. Furthermore, conversations with staff at the nearby Tejon Ranch have revealed that two of the three Mojave Desert pronghorn groups (the Berrrendas group and the group occupying the area between Oso Canyon and Quail Lake) on their property generally inhabit the interior ranch lands, fairly far north of the Project corridor. The group inhabiting Coe Field, estimated to be approximately 4 individuals in 2013 (Kunkel 2013), frequently travel individually on the north side of SR-138 on Tejon Ranch property. Sightings of an individual male pronghorn traveling in this area were incidentally documented by biologists during Project corridor studies, but there were no observations made during the visual observation periods. The animals in the Oso Canyon/Quail Lake and/or the Berrendas groups are occasionally seen by Department of Water Resources (DWR) employees working on or adjacent to the California Aqueduct (personal communication, 2015).

It is unknown whether pronghorn cross SR-138 to access lands south of the Project corridor; Tejon Ranch does not maintain wildlife crossing records for their known pronghorn groups. Discussions with Tony Mattias (Tejon Ranch Wildlife Supervisor, personal communication, 2015) revealed that there have been two pronghorn that have succumbed to roadkill on SR-138 since 1998; however, he suspects these road-killed animals were likely a result of the pronghorn being chased by feral dogs or another type of predator into oncoming traffic. There are no known pronghorn occurrences located south of SR-138.

5.2.4 Incidental Observations

Biologists detected nine target mammal species through incidental observations during the summer survey, including black-tailed jackrabbit, bobcat, coyote, desert kit fox, gray fox, mountain lion, mule deer, pronghorn, and raccoon. These species were either observed or detected (via tracks or scat) traveling throughout the Project corridor. Coyote was the most abundant incidentally documented species and was observed throughout the entire Project corridor. The western portion of the Project corridor contained bobcat, gray fox, mountain lion, and pronghorn observations (I-5 to 300th Street West) while the central and western portions contained mule deer and raccoon observations (I-5 to 190th Street West). Black-tailed jackrabbit and desert kit fox observations were restricted to the eastern portion of the Project corridor (110th Street West to SR-14). The locations of the incidental observations within the Project corridor correlate to the general habitat preferences of the species observed. The majority of the incidentally-observed target species were documented traveling across SR-138, roughly in a north or south direction.

Five special-status avian species were incidentally observed during the four seasonal surveys: bald eagle, golden eagle, loggerhead shrike, northern harrier, and Swainson's hawk. Various state and federal regulations are applicable to the protection of these species and should be taken into consideration during project design and construction.

Although located outside of the Project corridor, biologists also observed a road-kill bobcat on the western shoulder of the northbound I-5 lanes on September 7, 2014, approximately 5 mi (8 km) north of the Project.

5.3 Wildlife Movement Analysis

Data analysis revealed that 20 stations/locations within the Project corridor were determined to be high use areas. These high use areas were more densely clustered in the western and eastern portions of the Project corridor, with not as much wildlife movement activity documented in the central portion (roughly between the entrance to the High Desert Hunt Club and 160th Street West).

Two stations that, based on data analysis, could be classified as high use areas were eliminated from consideration as such. Stations C-39 and C-40 only documented black-tailed jackrabbit activity. Although a target species of the study, black-tailed jackrabbits do not require large areas of open land for travel and survival in the same ways that many other target species do (such as mountain lion); therefore, these two stations were not considered high use areas.

One station, T-03, did not fall in the category of a high use area but was considered as such because a mountain lion was documented traveling through the drainage during the Winter survey. Due to the large amount of open space required for mountain lion survival (mating, foraging, and cover), this location may be an important area for mountain lion travel within the Project corridor. Along the same lines, one set of mountain lion tracks traveling north were incidentally observed near the entrance to the High Desert Hunt Club (near stations C-24 and T-37). This area should also be considered a high use area for the same reasons that T-03 is considered a high use area.

Results of the incidentally observed target wildlife species generally mirrored the results of the tracking and remote camera station data analysis. One additional area where a large number of coyotes were incidentally observed was around 290th Street West (near T-40). This area may be an important area for coyotes to travel through because of the open nature of the surrounding habitat.

In general, there are specific factors that drive wildlife movement in any given area: topography, human activity, presence of domestic wildlife, vegetation/habitat changes, and presence of water features (drainages, permanent water sources, dry washes, etc.). The topography of the Project corridor in the western portion contains elevation changes, drainages and permanent bodies of water (Quail Lake, California Aqueduct, and a small pond south of Quail Lake), and varying habitats (vegetation communities) that may influence movement of wildlife in the region. Additionally, the convergence of montane habitats in this portion of the Project corridor likely increases the species diversity and frequency of wildlife moving throughout the area. Flat topography, monotypic vegetation, and anthropogenic disturbances largely comprise the eastern portion of the Project corridor. Based on these differences, it would be expected that the majority of wildlife movement would be documented in the western portion of the Project corridor; however, there were several areas in the eastern portion of the Project corridor that were considered high use areas for wildlife movement. It is likely that the increased density of residential and solar facilities, and subsequent increase of human and domestic animal activity, towards the eastern portion of the Project corridor may direct wildlife travel to or from certain areas. This could create something similar to a funnel effect one might see typically associated with varied terrain or drastic changes in habitat. With more urban development planned for the areas surrounding the eastern portion of the Project corridor, wildlife specific crossing structures may be very important for travel, gene dispersal, and overall survival of the large mammal species that inhabit the area.

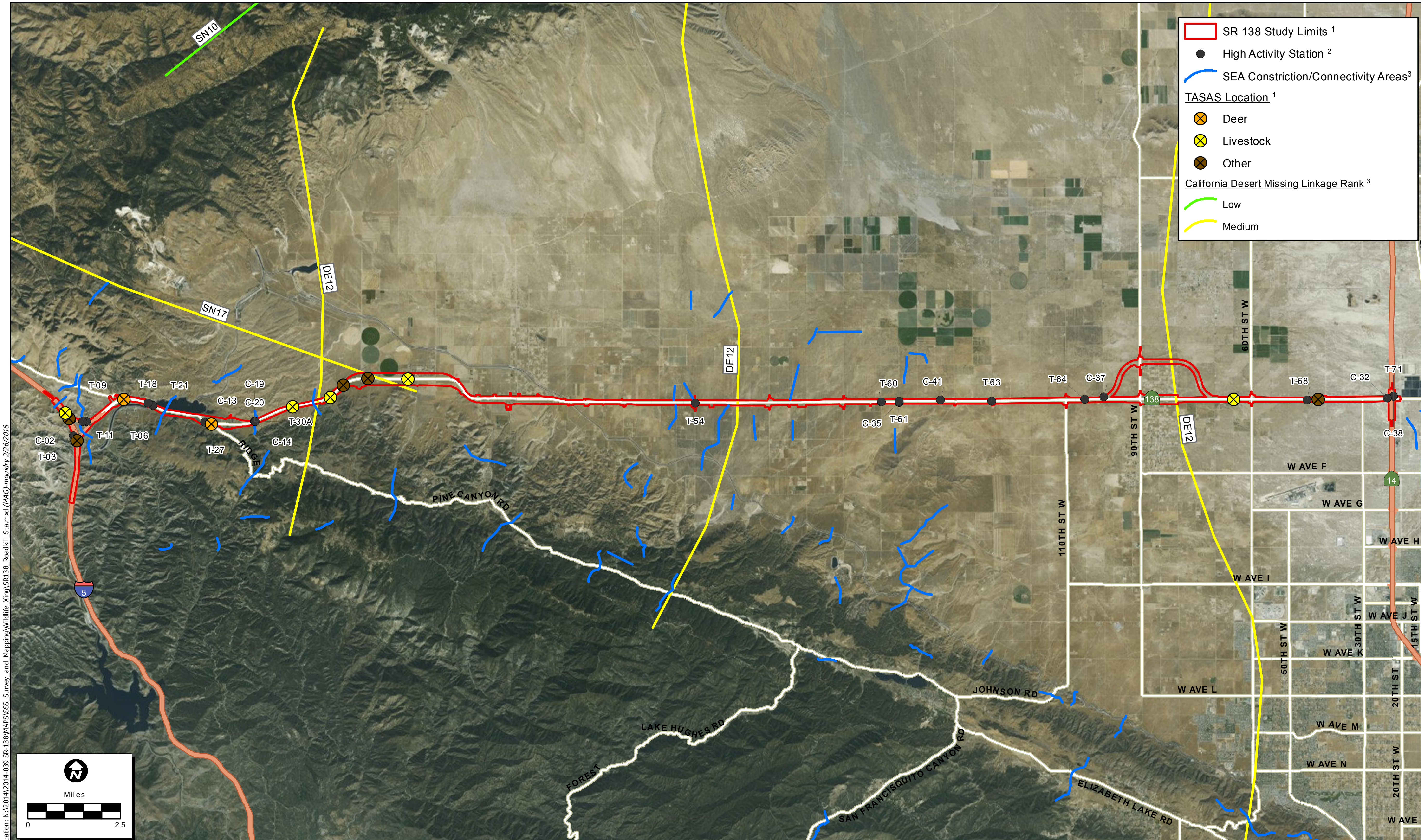
The central portion of the Project corridor exhibited the least amount of wildlife movement throughout the study. A lack of wildlife movement detected during the study does not preclude this area from being important for wildlife travel; rather, it may mean that movement activities are not restricted to particular areas based on urban development, topography, or changes in habitat. The open and undeveloped nature of the central portion of the Project area provide limitless opportunities for wildlife travel and the stations sampled during the study may not have been abundant enough to detect this more diffuse type of travel. Furthermore, intermittent livestock grazing on Tejon Ranch in this area may also influence wildlife travel, either attracting potential predators (such as mountain lion) to the area or discouraging shy species (such as bobcat) from the area.

The results of the 2014-2015 study were compared to the results of the research on wildlife linkages in the region in order to determine the highest priority areas within the Project corridor for wildlife movement. Figure 13 shows the proposed linkages from the California Desert Linkage Network, SEA constriction/connectivity areas, TASAS wildlife-vehicle crash data, and locations of the stations exhibiting the highest amounts of wildlife activity during the 2014-2015 study. Data from the CEHC were not included in this figure because there were no identified or proposed essential connectivity areas crossing the Project corridor. This visual representation of the combined studies reiterates the importance of the western portion of the Project corridor for wildlife movement. However, the central and eastern portions of the corridor cannot be ignored, as there were several areas in these portions of the Project that have also been identified as important for wildlife movement.

5.4 Study Limitations and Assumptions

As with any scientific study, there were assumptions made during the study design and limitations to the sampling methods that may have influenced data collection.

One external factor of the sampling effort that proved difficult to maintain consistency between all stations was the variation in native soils throughout the Project corridor. Soils at all tracking stations were different; some had finer soils (consisting of high clay content), which were more conducive to reading tracks than the coarser or more firmly packed soils (such as sandy or rocky areas). Stations with finer soils may have provided greater wildlife detection simply because the characteristic features in the registered tracks were more easily identified than in the rockier or sandier stations. Furthermore, soil composition changed with the amount of precipitation received by the area; soils in the Winter and Spring surveys were firmer because of recent rains than they were during the Summer and Fall surveys, when the weather was drier. Biologists attempted to level this survey bias by augmenting gravelly, firm, or coarse soils with softer, finer soils found nearby at certain stations; however, the issue of reading tracks in difficult substrates is still considered a limitation to the study.



Location: N:\2014\2014-039 SR-138\MAPS\SSS_Survey_and_Mapping\Wildlife_Xing\SR138_Roadkill_Sta.mxd (MAG)-mquidry 2/26/2016

Map Date: 2/25/2016
Photo Source: Esri
[1] Caltrans; [2] Ecorp; [3] CDFW

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Figure 13. Highest Priority Areas within the Project Corridor for Wildlife Movement

2014-039 SR-138

Along with precipitation events, high wind events experienced during the Spring survey compromised data collection at the tracking stations. In some instances, the tracks at the stations would be so distorted from high winds and dirt blowing over the surface of the station that the tracks were unidentifiable. Although the high winds were worst during the Spring survey, wind was an issue for reading tracks throughout all four surveys and may have resulted in the loss of data.

Although the study comprised surveys conducted during each of the four seasons, none of the surveys were conducted during the height of spring or summer. The Spring survey was conducted during the first full week of the spring season and the Summer survey was conducted approximately 1.5 weeks prior to the end of the summer season. Generally speaking, mating, young-rearing, and/or dispersal activities are common during the mid-spring to mid-summer timeframe for the study's target mammals and the study was not able to capture this activity period. The timing of the surveys was driven by contract limitations and could not be changed; however, moving the timing of the Spring and/or Summer surveys may have resulted in an increase in the amount of data collected.

The crepuscular and nocturnal movement patterns of the target mammal species were a focus in this study design, as most of the target species are active during dawn, dusk, and nighttime. Moon phases varied throughout the study; full during the Summer survey, last quarter during the Fall survey, and new during both the Winter and Spring surveys. Moon phase has been known to influence nocturnal movement patterns of mammal species, so this may have affected the data collected during the study. Scheduling the surveys during consistent moon phases would remove this variable from the study.

Several other factors affected data collected at tracking stations, such as changes in alignment design and private property rights of entries, highway shoulder maintenance activities, vegetation growth, and human and/or vehicle tracks found in the stations before the morning check was conducted. Some of these issues were so severe that it was necessary to eliminate some stations from the study, while others were simply moved to nearby areas that received less disturbance. Of all the stations that were sampled throughout the study, only a small percentage were actually eliminated; moving stations to a nearby location was the preferable alternative when disturbances were present. Eliminating and moving station locations were considered limitations to the study and likely limited the amount and consistency of data collected at these stations.

One assumption that was made for the study was that every track identified at a tracking station represented an individual animal. It may be likely that stations with numerous tracks or daily recordings represent the same animal traveling an area on a daily or semi-weekly basis, or even crossing multiple tracking stations during a single travel event. While it would be nearly impossible to document this possibility based solely on track identification at the stations, it is a possibility due to the highly mobile nature of the mammal species detected during the survey. However, this does not affect the data collected or the outcome of the data analysis for the study. Regardless of whether the track sets were made by one animal traveling through the station multiple times a week or multiple animals traveling through the station once each, the data still show that the location should be considered a high use area because multiple tracks were recorded at that station.

These discussion points and data analyses only represent a sample of wildlife movement activities in the Project corridor and are not representative of long distance movement corridors, nor are they representative of population sizes or population densities of the target mammal species. This wildlife corridor study was designed to capture data on local movement patterns and activities of the target species, not to capture distance measurements of wildlife travel or to identify individual animals crossing through an area.

5.5 Impact Minimization Recommendations

Project impacts to wildlife travel routes should be minimized by freeway design. The design of a new freeway should include wildlife crossing structures that are as natural and easy for wildlife to cross as possible to promote use by local wildlife. The following measures are recommended in the new freeway design (specific designs should be prepared in consultation with the regulatory agencies):

- When possible, use large, at-grade culverts under the new freeway where drainages bisect the Project corridor. Wildlife species are more likely to utilize at-grade culverts during travel when they can see across to the other side. In addition, where the road may include medians requiring long culverts, the culverts should be daylighted in the median to encourage wildlife travel and to allow vegetation to grow underneath the crossing (Penrod et al. 2012). Where feasible, suitable habitat for local wildlife should be preserved and/or constructed within and on either side of the crossing structure to promote wildlife use (Penrod et al. 2012). Examples of this include natural substrates, native vegetation, rocks, and other features similar to the surrounding areas.

- In the western portion of the Project corridor, use of the existing culverts for wildlife travel has been well documented. It is recommended that these culvert locations be preserved and, if possible, expanded in width so that they encourage and are more accommodating for wildlife travel. Culverts are not as abundant in the eastern portion of the Project corridor; therefore, it is more crucial to design and construct crossing structures in some of the high use areas in this area to prevent or substantially reduce collisions between vehicles and wildlife traveling across the freeway.

- When taking the data collected from this study into freeway design consideration, it may not be necessary to preserve all high use areas found within the Project corridor. However, some of these high use areas should be considered for construction of new wildlife crossing structures or preservation/enhancement of existing crossing structures (such as large pipes and culverts).

- When designing wildlife-specific crossing structures in the eastern portion of the Project corridor, research on the future plans for regional development north and south of SR-138 should be conducted to ensure that the open areas on either side of the road connected by the crossing structure would not be developed in the near future. A crossing structure would be rendered relatively useless for large wildlife if the structure did not connect two areas of open land and native habitat on either side. Ideally, a crossing should connect two land areas that are permanently conserved or at least have plans in place for long-term conservation.

- When determining location of wildlife-specific crossing structures, the existing and project land uses, projected development, and conservation status of areas immediately surrounding the Project corridor should be analyzed in conjunction with locations of high animal-vehicle mortality areas and habitat modeling data in order to determine the most appropriate locations for crossing structures. Figure 13 (referenced in Section 5.3) can also be used as a tool to help determine locations of wildlife-specific crossing structures for the Project corridor.

- Bridges and culverts constructed to cross drainage features should be constructed high enough and wide enough to allow large wildlife to travel underneath (Bank et al. 2002). The freeway design should also include culverts as crossing structures that are specifically designed for wildlife travel (Penrod et al. 2012).

- Focus wildlife crossing structures on drainages, washes, and established dirt roads that cross the new freeway. It also may be more cost-effective for the Project and valuable to wildlife to focus the placement of wildlife crossings on or around the existing features utilized as travel routes (washes, drainages, and roads).

- Except in areas where wildlife crossings are to be installed, maintain vegetation clearing adjacent to the freeway so it does not attract additional wildlife to roadways or road shoulders (Bank et al. 2002). Large trees and shrubs should not be included in revegetation plans immediately adjacent to the roadway. Additionally, artificial depressions that collect water should not be created or constructed adjacent to roadways. These measures will help reduce road-kill incidents on the new freeway by not attracting wildlife to the road shoulders.

- Vegetation in the immediate vicinity of wildlife crossing structures should be maintained in a way that helps funnel wildlife through crossing structures (Clevenger and Huijser 2011; Bank et al. 2002) and improves sight distance and visibility for wildlife. An example of this would be maintaining denser vegetation near the crossing structure that guides wildlife away from traveling on or near roadways and into the crossing structure instead (Ascensao and Mira 2007).

- Human activity should be restricted in the vicinity of each crossing structure, especially at night, to further promote use of the crossing structure by wildlife (Clevenger and Huijser 2011).

- One-way gates and ramps that provide escape routes for wildlife trapped on the freeway should be included in the freeway design to further reduce wildlife-motorist collisions (Clevenger and Huijser 2011; Banff National Park of Canada 2002).

- Install wildlife drift fencing along busy roadways with natural under- or over-crossings for wildlife. Fences should be constructed at an appropriate height with wings leading into each culvert or crossing to channel wildlife safely through the designated crossing areas (Penrod et al. 2012; Yanes et al. 1994). A portion of the fence should also be buried underground to prevent wildlife from digging underneath the fence (Clevenger and Huijser 2011). Additionally, fences should never be constructed in areas where they would block crossing features (Penrod et al. 2012; Yanes et al. 1994). Fencing should also be constructed in such a way that it helps funnel wildlife through crossing structures.

- In areas where wildlife drift fencing terminates, care should be taken to design the fence termination at a wildlife crossing structure (Clevenger and Huijser 2011). If this is not feasible, fence terminations should be in areas where animals are not likely to travel across roadways, such as areas containing rugged terrain or high levels of human activity.

- Placement and design of wildlife crossing structures should follow recommendations in Caltrans' Wildlife Crossings Guidance Manual (2009). In particular, it is recommended that placing crossing structures in locations with the greatest likelihood of wildlife-vehicle collisions to ensure motorist safety shall be given highest priority.

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