

**Purpose:** The study will use geographic information system (GIS) analysis to aid in resource protection and avoidance to ensure consistency with the Guiding Principles and Siting and Design Criteria. Resource avoidance mapping will focus on federally or state-listed endangered, threatened, or candidate species and/or narrow endemic species, wetlands, and cultural resources during the siting of preliminary trail alignments using the methodologies outlined below.

Guild	Resource Avoidance Mapping Methodology	Prioritization Rationale / Avoidance and Minimization Measures
<b>Group 1 – Additional Permits Required</b>		
Quino Checkerspot Butterfly	<ul style="list-style-type: none"> <li>• <u>Known Resource Area</u><sup>1</sup>: All known occurrences, plus a 261-foot buffer<sup>2</sup></li> <li>• <u>Potential Habitat</u>:               <ul style="list-style-type: none"> <li>○ Suitable vegetation communities (coastal sage scrub, chaparral, maritime succulent scrub, native and non-native grassland, disturbed habitat, and variants of these)<sup>3</sup></li> </ul> </li> <li>• Quino Checkerspot Butterfly Final Critical Habitat</li> <li>• U.S. Fish and Wildlife Service (USFWS) required survey area</li> </ul>	<p><u>Prioritization Rationale</u> Group 1 Resources meet the following criteria:</p> <ul style="list-style-type: none"> <li>• Lack coverage in a Multiple Species Conservation Program (MSCP) Subarea; and/or</li> <li>• Would require permits for impacts.</li> </ul>
Mexican Flannelbush	<ul style="list-style-type: none"> <li>• <u>Known Resource Area</u>: Species observations, plus a 50-foot buffer<sup>4</sup></li> <li>• <u>Potential Habitat</u>: Sites that meet all of the following criteria:               <ul style="list-style-type: none"> <li>○ Suitable vegetation communities (closed cone coniferous forest and southern mixed chaparral);</li> <li>○ Metavolcanic soil (San Miguel-Exchequer series); and</li> <li>○ Within known range of species (vicinity of Otay Mountain and Cedar Creek)<sup>5</sup></li> </ul> </li> <li>• Mexican Flannelbush Final Critical Habitat</li> <li>• Cedar Canyon Area of Critical Environmental Concern</li> </ul>	<p><u>Avoidance and Minimization Measures for Group 1 Species/Habitats</u></p> <ul style="list-style-type: none"> <li>• Avoid siting trails or staging areas within ‘Known Resource Area’.</li> <li>• Minimize trails and staging areas in ‘Potential Habitat’ and Designated Critical Habitat, unless within existing roads, trails, or disturbed areas.</li> <li>• Conduct focused surveys within Potential Habitat according to accepted protocols during environmental review process. Re-align trails where they intersect with Group 1 resources, or obtain necessary permits and mitigate for impacts.</li> </ul>
Wetlands	<ul style="list-style-type: none"> <li>• <u>Known Resource Area</u>:               <ul style="list-style-type: none"> <li>○ Suitable vegetation communities (freshwater marsh, riparian forest/woodland/scrub, open water, alkali seep, and variants of these)<sup>6</sup></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Incorporate measures that reduce edge effects where trails are known to occur in proximity to Group 1 resources such as fencing and signage.</li> </ul>
Vernal Pools and Associated Species <ul style="list-style-type: none"> <li>• Riverside fairy shrimp</li> <li>• San Diego fairy shrimp</li> <li>• Spreading navarretia</li> <li>• Orcutt’s brodiaea</li> <li>• California Orcutt grass</li> <li>• San Diego button celery</li> <li>• Orcutt’s bird’s beak</li> <li>• Otay mesa mint</li> </ul>	<ul style="list-style-type: none"> <li>• <u>Known Resource Area</u>:               <ul style="list-style-type: none"> <li>○ Vernal pools, plus a 100-foot buffer<sup>4</sup></li> <li>○ Species observations, plus a 100-foot buffer<sup>4</sup></li> </ul> </li> <li>• <u>Potential Habitat</u>: Sites that meet all of the following criteria:               <ul style="list-style-type: none"> <li>○ Vernal pool soils – Auld, Diablo, Huerhuero, Las Posas, Linne, Olivenhain, Placentia, Ramona, Redding, Salinas, and Stockpen series<sup>7</sup>;</li> <li>○ Suitable vegetation communities (coastal sage scrub, maritime succulent scrub, native and non-native grasslands, agricultural areas, and disturbed areas); and</li> <li>○ Slopes of less than 10 percent<sup>7</sup></li> </ul> </li> <li>• Final Critical Habitats for Riverside fairy shrimp, San Diego fairy shrimp, and spreading navarretia</li> </ul>	
Cultural Resources	<p><u>Cultural Resource Sensitivity Areas</u></p> <ul style="list-style-type: none"> <li>○ Kuchamaa Area of Critical Environmental Concern</li> <li>○ Archaeological and historic sites, with buffer</li> <li>○ Tribal cultural resource sites, as provided during informal tribal consultation (NOTE: data pending)</li> </ul>	

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<b>Group 2 – Narrow Endemic Plants</b>		
Clay Endemics <ul style="list-style-type: none"> <li>Otay tarplant</li> <li>San Diego thornmint</li> <li>Variiegated dudleya</li> </ul>	<ul style="list-style-type: none"> <li><u>Known Resource Area:</u> All known occurrences, plus a 50-foot buffer<sup>4</sup></li> <li><u>Potential Habitat:</u> Sites that meet all of the following criteria:               <ul style="list-style-type: none"> <li>Suitable vegetation communities (native and non-native grassland, wildflower field, Diegan coastal sage scrub, maritime succulent scrub, chaparral, and variants of these); and</li> <li>Clay soils (Auld, Bosanko, Diablo, Diablo-Olivenhain, Linne, Salinas, and Stockpen), as well as Las Posas series which is known to contain clay lens inclusions<sup>5</sup></li> </ul> </li> <li>Otay Tarplant Final Critical Habitat</li> </ul>	<p><u>Prioritization Rationale</u> Group 2 Resources meet the following criteria:</p> <ul style="list-style-type: none"> <li>Are subject to the narrow endemic plant protections in each jurisdiction’s MSCP Subarea Plan.</li> </ul> <p><u>Avoidance and Minimization Measures for Group 2 Species</u></p> <ul style="list-style-type: none"> <li>Avoid siting trails within ‘Known Resource Area’, unless within existing roads, trails, or disturbed areas.</li> <li>Conduct focused surveys according to accepted protocols within Potential Habitat during environmental review process.</li> <li>Where trails intersect narrow endemic plant populations inside MSCP Preserve areas, re-route trails to completely avoid plant populations. Where re-routing trails is not feasible due to other environmental constraints, comply with the narrow endemic plant protections in the applicable MSCP Subarea Plan. Within the County’s Subarea, impacts would need to be less than 20 percent of the plant population on-site and comply with the provisions of the Biological Mitigation Ordinance. Within the City of Chula Vista’s Subarea, impacts would be limited to 5 percent within 100 percent Conservation Areas, and would need to comply with the provisions of the Habitat Loss and Incidental Take Ordinance. Within the City of San Diego’s Subarea, impacts would need to comply with the provisions of the Biology Guidelines.</li> <li>Where trails are located within close proximity to narrow endemic plants, incorporate measures that reduce edge effects such as fencing.</li> </ul>
Metavolcanic and Gabbro Endemics <ul style="list-style-type: none"> <li>Gander’s pitcher sage</li> <li>Felt-leaved monardella</li> <li>Dunn’s mariposa lily</li> </ul>	<ul style="list-style-type: none"> <li><u>Known Resource Area:</u> Species observations, plus a 50-foot buffer<sup>4</sup></li> <li><u>Potential Habitat:</u> Sites that meet all of the following criteria:               <ul style="list-style-type: none"> <li>For Gander’s pitcher sage and felt-leaved monardella: Chaparral on gabbro soils (San Miguel-Exchequer series); or</li> <li>For Dunn’s mariposa lily: Chaparral, grassland, and coniferous forest on gabbro and metavolcanic soils (San Miguel-Exchequer and Las Posas series)<sup>5</sup></li> </ul> </li> </ul>	
Other Narrow Endemics <ul style="list-style-type: none"> <li>Palmer’s goldenbush</li> <li>San Diego ambrosia</li> <li>Willowy monardella</li> <li>Encinitas baccharis</li> <li>Snake cholla</li> </ul>	<ul style="list-style-type: none"> <li><u>Known Resource Area:</u> Species observations, plus a 50-foot buffer<sup>4</sup></li> </ul>	
<b>Group 3 – Wildlife</b>		
Raptors <ul style="list-style-type: none"> <li>Golden eagle</li> <li>Burrowing owl</li> <li>Northern harrier</li> </ul>	<ul style="list-style-type: none"> <li><u>Known Resource Area:</u> <ul style="list-style-type: none"> <li>All known burrowing owl observations, plus a 300-foot buffer<sup>8,9</sup>;</li> <li>All known northern harrier nesting sites, plus a 900-foot buffer<sup>8</sup>; and</li> <li>All active golden eagle nests (CDFW 2017a), plus a 4,000-foot buffer<sup>8</sup></li> </ul> </li> <li><u>Historic Resource Area:</u> <ul style="list-style-type: none"> <li>All historic golden eagle nests, territories, and observations (CDFW 2017a and 2017b; County of San Diego 1996 and 2017<sup>[JG1]</sup>; RECON Environmental [RECON] 2017; U.S. Department of the Interior 2013; Wildlife Research Institute 2010)</li> </ul> </li> </ul>	<p><u>Prioritization Rationale</u> Group 3 Resources meet the following criteria:</p> <ul style="list-style-type: none"> <li>Are subject to specific avoidance areas per the MSCP?</li> </ul> <p><u>Avoidance and Minimization Measures for Group 3 Species</u></p> <ul style="list-style-type: none"> <li>Avoid siting trails or staging areas within ‘Known Resource Area’ to ensure compliance with required MSCP avoidance areas.</li> <li>Minimize trails and staging areas in ‘Potential Habitat’ and Designated Critical Habitat.</li> <li>Conduct focused surveys according to accepted protocols within Potential Habitat during environmental review process, and re-align trails where they intersect with resources or incorporate measures that reduce edge effects.</li> </ul>
Southwestern Pond Turtle	<ul style="list-style-type: none"> <li><u>Known Resource Area:</u> All known occurrences, plus a 1,500-foot buffer<sup>8</sup></li> <li><u>Potential Habitat:</u> <ul style="list-style-type: none"> <li>Locations mapped as ‘Potentially Suitable’ by U.S. Geological Survey (USGS; 2003)</li> </ul> </li> </ul>	
Arroyo Toad	<ul style="list-style-type: none"> <li><u>Known Resource Area:</u> All known occurrences, plus a 3,281-foot (1-kilometer) buffer<sup>8</sup></li> <li><u>Potential Habitat:</u> <ul style="list-style-type: none"> <li>All areas within 3,281 feet (1-kilometer) of Cottonwood Creek</li> </ul> </li> </ul>	

Guild	Resource Avoidance Mapping Methodology	Prioritization Rationale / Avoidance and Minimization Measures
<b>Group 4 – Wildlife</b>		
Coastal California Gnatcatcher	<ul style="list-style-type: none"> <li>• <u>Known Resource Area:</u> All known occurrences, plus a 50-foot buffer<sup>10</sup></li> <li>• <u>Potential Habitat:</u> <ul style="list-style-type: none"> <li>○ All habitats with a value of 0.5 or greater using the <i>Coastal California Gnatcatcher Proposed Regional Monitoring Sampling Design</i> (USGS 2015)</li> </ul> </li> <li>• Coastal California Gnatcatcher Final Critical Habitat</li> </ul>	<p><u>Prioritization Rationale</u> Group 4 Resources meet the following criteria:</p> <ul style="list-style-type: none"> <li>• Remaining federally-listed, state-listed and/or narrow endemic animals.</li> </ul>
Coastal Cactus Wren	<ul style="list-style-type: none"> <li>• <u>Known Resource Area:</u> All known occurrences, plus a 300-foot buffer<sup>11</sup></li> <li>• <u>Potential Habitat:</u> <ul style="list-style-type: none"> <li>○ Priority Restoration Areas (The Nature Conservancy 2015)</li> </ul> </li> </ul>	<p><u>Avoidance and Minimization Measures for Group 4 Species</u></p> <ul style="list-style-type: none"> <li>• Avoid siting trails within ‘Known Resource Area’, unless within existing roads, trails, or disturbed areas. Avoid siting staging areas within all mapped ‘Known Resource Area’ areas.</li> </ul>
Riparian Birds <ul style="list-style-type: none"> <li>• Least Bell’s vireo</li> <li>• Yellow-billed cuckoo</li> <li>• Southwestern willow flycatcher</li> </ul>	<ul style="list-style-type: none"> <li>• <u>Known Resource Area:</u> <ul style="list-style-type: none"> <li>○ Least Bell’s vireo: All known occurrences, plus a 50-foot buffer<sup>10</sup></li> <li>○ Yellow-billed cuckoo and southwestern willow flycatcher: All known occurrences, plus a 300-foot buffer<sup>11</sup></li> </ul> </li> <li>• <u>Potential Habitat:</u> <ul style="list-style-type: none"> <li>○ Major streams (0.5 cubic feet per second or greater) and mapped riparian forest, woodland, or scrub adjacent (within 100 feet)<sup>12</sup></li> </ul> </li> <li>• Least Bell’s Vireo Final Critical Habitats</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct focused surveys according to accepted protocols within Potential Habitat during environmental review process.</li> <li>• Incorporate measures that reduce edge effects where trails are known to occur in proximity to resources such as fencing and signage.</li> <li>• Comply with applicable seasonal requirements for grading and/or clearing in ‘Known Resource Area’, per the MSCP.</li> </ul>
Harbison’s Dun Skipper	<ul style="list-style-type: none"> <li>• <u>Known Resource Area:</u> All known occurrences, plus a 230-foot (70-meter) buffer<sup>13</sup></li> <li>• <u>Potential Habitat:</u> <ul style="list-style-type: none"> <li>○ Mapped San Diego sedge (<i>Carex spissa</i>) locations (RECON 2017; Marschalek and Deutschman 2015; San Diego Natural History Museum 2012); or</li> <li>○ Oak woodlands<sup>13</sup></li> </ul> </li> </ul>	
Thorne’s Hairstreak	<ul style="list-style-type: none"> <li>• <u>Known Resource Area:</u> All known occurrences, plus an 276-foot (84-meter) buffer<sup>14</sup></li> <li>• <u>Potential Habitat:</u> Sites that meet all of the following criteria:           <ul style="list-style-type: none"> <li>○ Suitable vegetation communities (Tecate cypress forest); and</li> <li>○ Within known range of species (Otay Mountain and Otay River near Alta Road)<sup>14</sup></li> </ul> </li> </ul>	
Hermes Copper	<ul style="list-style-type: none"> <li>• <u>Known Resource Area:</u> All known extant occurrences, plus a 164-foot (50-meter) buffer<sup>15</sup></li> <li>• <u>Potential Habitat (Historical Occurrences):</u> All mapped historical occurrences, plus a 164-foot (50-meter) buffer<sup>15</sup></li> </ul>	
<p>The following federally or state-listed plants/animals or narrow endemics are not included in the analysis due to the following rationale:</p> <ul style="list-style-type: none"> <li>• Small-leaved rose – only known extant population is located at Cal Terraces, outside of the study area.</li> <li>• American peregrine falcon – rare winter migrant; not known to breed in the study area.</li> <li>• Del Mar manzanita, Nevin’s barberry, thread-leaved brodiaea, Lakeside ceanothus, short-leaved dudleya, and Dehesa bear-grass – study area is located outside of the known range of these species.</li> </ul> <p><sup>1</sup>Known resource areas will be based off of the following sources: California Natural Diversity Database, San Diego Biological Information and Observation System, USFWS Observation Database, Master Occurrence Matrix Database, Otay Ranch Preserve monitoring data conducted by RECON (2011–2017), and data provided by the Steering Committee.</p> <p><sup>2</sup> Based on the maximum home range estimate of 2 hectares in a study on Bay checkerspot conducted by Brussard et al. (1979).</p> <p><sup>3</sup> Suitable habitat is based on the Quino Checkerspot Butterfly Survey Guidelines (USFWS 2014).</p> <p><sup>4</sup>Based on avoidance buffers for development contained in the Otay Ranch Final CEQA Findings of Fact (Otay Ranch Joint Planning Group 1993).</p> <p><sup>5</sup>Habitat requirements are based on Rare Plants of San Diego County (Reiser 2001). Suitable soils within the study area are based on the Soil Survey, San Diego Area, California (USDA 1973).</p> <p><sup>6</sup>Mapping will include all wetland vegetation communities that may be potentially jurisdictional by U.S. Army Corps of Engineers, California Department of Fish and Wildlife, the Regional Water Quality Control Board, and the applicable jurisdiction (e.g. County of San Diego, City of Chula Vista, City of San Diego).</p> <p><sup>7</sup>Habitat requirements are based on Bauder and McMillan (1998).</p> <p><sup>8</sup>Based on the required avoidance buffers for active nests contained in Table 3-5 of the MSCP Plan (County of San Diego 1998)</p> <p><sup>9</sup>Analysis assumes occupied burrows are in the vicinity of all observations due to high site affinity as described in the Staff Report on Burrowing Owl Mitigation (CDFW 2012)</p> <p><sup>10</sup>Buffer based on USFWS comment letter (2017) and evidence in existing literature that these species are tolerant of trails. Coastal California gnatcatcher appears tolerant of high levels of noise (e.g. from construction, highways, and military aircraft), and have successfully nested near roads and trails (Atwood and Bontrager 2001; Unitt 2004). Additionally, least Bell’s vireo appears to be tolerant of trails and is known to nest in close proximity to trails (USFWS 2017; California Partners in Flight 1999). Trails may be allowed on a case-by-case basis on existing roads/trails within the buffer zone, as determined by the Steering Committee.</p>		

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<sup>11</sup>	Buffer based on the standard construction avoidance buffer for nesting southwestern willow flycatcher and other sensitive birds utilized by the County of San Diego and City of San Diego. Trails may be allowed on a case-by-case basis on existing roads/trails within the buffer zone, as determined by the Steering Committee.	
<sup>12</sup>	Impacts to least Bell's vireo habitat within potential jurisdictional wetlands would be avoided through the Avoidance and Minimization Measures for Group 1 Species/Habitats, and ensure compliance with the County of San Diego's MSCP Subarea Plan which does not provide incidental take coverage for least Bell's vireo in jurisdictional wetlands.	
<sup>13</sup>	Per Marschalek and Deutschman (2015), flight patterns and lengths of Harbison's dun skipper are unknown. Though they state that this species remains close to its larval host plant, San Diego sedge, they report one nectaring Harbison's dun skipper approximately 70 meters from the larval host plant. Habitat requirements are also based on Marschalek and Deutschman (2015).	
<sup>14</sup>	Buffer based on maximum movement recorded (USFWS 2006).	
<sup>15</sup>	Buffer based Marschalek and Deutschman (2017), which states a majority of Hermes copper movements are well under 50 meters.	

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