5 CONSERVATION

This chapter addresses the conservation of natural and cultural resources within Laguna Niguel. A city's natural resources form an important part of its unique character and quality of life.

This chapter is divided into the following sections:

5.1 BIOLOGICAL RESOURCES

This section describes biological resources in Laguna Niguel. There are several regulatory agencies whose responsibility includes the oversight of the natural resources of the State and nation including the California Department of Fish and Wildlife (CDFW), the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACE), and the National Marine Fisheries Service (NMFS). These agencies often respond to declines in the quantity of a particular habitat or plant or animal species by developing protective measures for those species or habitat type. The topic of biological resources is addressed in several City and County plans including the Open Space/Parks/Conservation chapter of the current General Plan, Laguna Niguel Hillside Protection Ordinance (subarticle 8 of the Zoning Code), County of Orange Resources Element, City of Laguna Niguel Local Coastal Program, South Laguna Specific Plan/Local Coastal Program, and Aliso Creek Corridor Specific Plan.

5.1.1 Environmental Setting

Bioregions

Laguna Niguel lies within the coastal hills of southern Orange County. Biologically, the coastal hills bioregion encompasses a range of Upper Sonoran terrestrial habitats from coastal sage scrub to riparian habitat. Gentle rolling hills covered with grasslands, coastal sage scrub and chaparral dominate this region. Riparian woodlands are supported by drainage courses that provide a conducive environment for natural wildlife. Large stands of coastal sage scrub exist in the coastal hills south of Aliso Canyon. Non-native annual herbs and grasses dominate lower slopes and areas where scrub vegetation was removed to provide grazing lands. The open space areas, which include approximately 2,250 acres within Laguna Niguel, contain a mix of native and introduced habitats, including coastal sage scrub, chaparral, and grassland. These remaining open space areas are important biologically because they support flora and fauna that now have limited distributions.

Wildlife Corridors

Wildlife corridors are the corridors of natural movement that species make within their lifetime. Wildlife corridors can range from the length of a river to the length of a continent. According to the current General Plan, urbanization within the City has eliminated most of the native coastal sage scrub and chaparral habitats that support wildlife corridors. Small, isolated pockets of chaparral and coastal sage scrub occur among residential and commercial developments. As a result, many of these islands of vegetation are not large enough to support the larger animals (deer, bobcat, and gray fox) that typically occupy these habitats. The lack of well-developed woodland habitat in the City further limits the use of this urban area by wildlife.

California Wildlife Habitat Relationship System

The California Wildlife Habitat Relationship (CWHR) habitat classification scheme has been developed to support the CWHR System, a wildlife information system and predictive model for California's regularly occurring birds, mammals, reptiles, and amphibians. At present, there are 59 wildlife habitats in the CWHR System, including: 27 tree, 12 shrub, 6 herbaceous, 4 aquatic, 8 agricultural, 1 developed, and 1 non-vegetated.

According to the CWHR System, there are eight cover types (wildlife habitat classification) in the City out of 59 found throughout the State. The vast majority of Laguna Niguel is designated as an Urban cover type. The second largest is Coastal Scrub, followed by Annual Grassland. The remainder of the City is made up of Mixed Chaparral, Eucalyptus, Lacustrine, Valley Foothill Riparian, and Barren.

Table 5-1 identifies the total area by acreage for each cover type (wildlife habitat classification) found in the City. Figure 5-1 illustrates the location of each cover type within Laguna Niguel. A brief description of the cover types found in the City and surrounding region is listed below.

Table 5-1: Cover Types – California Wildlife Habitat Relationship System

Name	Total Cover Type Acreage
Urban	7,203.02
Coastal Scrub	1,165.35
Annual Grassland	860.58
Mixed Chaparral	148.44
Eucalyptus	28.41
Lacustrine	25.80
Barren	19.17
Valley Foothill Riparian	13.01

SOURCE: CWHR, 2023.

Developed Habitats

Urban habitats are not limited to any particular physical setting. Three urban categories relevant to wildlife are distinguished: downtown, urban residential, and suburbia. The heavily developed downtown is usually at the center, followed by concentric zones of urban residential and suburbia. There is a progression outward of decreasing development and increasing vegetative cover. Species richness and diversity is extremely low in the inner cover. The structure of urban vegetation varies, with five types of vegetative structure defined: tree grove, street strip, shade tree/lawn, lawn, and shrub cover. A distinguishing feature of the urban wildlife habitat is the mixture of native and exotic species.

Herbaceous Dominated Habitats

Annual Grassland habitats are open grasslands composed primarily of annual plant species and occur mostly on flat plains to gently rolling foothills. Introduced annual grasses are the dominant plant species in this habitat. These include wild oats, soft chess, ripgut brome, red brome, wild barley, and foxtail fescue.

Shrub Dominated Habitats

Coastal Scrub habitats are typified by low to moderate-sized shrubs with mesophytic leaves, flexible branches, semi-woody stems growing from a woody base, and a shallow root system. Coastal Scrub seems to tolerate drier conditions than its associated habitats. It is typical of areas with steep, south-facing slopes; sandy, mudstone or shale soils; and average annual rainfall of less than 30 cm (12 in). However, it also regularly occurs on stabilized dunes, flat terraces, and moderate slopes of all aspects where average annual rainfall is up to 60 cm (24 in).

Mixed Chaparral is a structurally homogeneous brushland habitat dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. It is floristically rich and supports approximately 240 species of woody plant. Dominant species in cismontane Mixed Chaparral include scrub oak, chaparral oak, and several species of ceanothus and manzanita. Individual sites may support pure stands of these shrubs or diverse mixtures of several species. Commonly associated shrubs include chamise, birchleaf mountain mahogany, silk-tassel, toyon, yerba-santa, California buckeye, poison-oak, sumac, California buckthorn, hollyleaf cherry, Montana chaparral-pea, and California fremontia.

Tree Dominated Habitats

Eucalyptus habitats range from single-species thickets with little or no shrubby understory to scattered trees over a well-developed herbaceous and shrubby understory. In most cases, eucalyptus forms a dense stand with a closed canopy. Overstory composition is typically limited to one species of the genus, or mixed stands composed of other species of the same genus; few native overstory species are present within eucalyptus planted areas, except in small, cleared pockets. Where trees of this genus are established as small groves in native plant communities, understory species typically include coastal sage, chamise, manzanita, buckwheat, toyon, scrub oak, mountain mahogany, and assorted annuals. Eucalyptus is also known to become established along stream courses, encroaching upon existing riparian vegetation.

Valley Foothill Riparian Canopy height is approximately 30 m (98 ft) in a mature riparian forest, with a canopy cover of 20 to 80 percent. Most trees are winter deciduous. There is a subcanopy tree layer and an understory shrub layer. Herbaceous vegetation constitutes about one percent of the cover, except in openings where tall forbs and shade-tolerant grasses occur. Generally, the understory is impenetrable and includes fallen limbs and other debris. Dominant species in the canopy layer are cottonwood, California sycamore and valley oak. Subcanopy trees are white alder, boxelder, and Oregon ash. Typical understory shrub layer plants include wild grape, wild rose, California blackberry, blue elderberry, poison oak, buttonbrush, and willows. The herbaceous layer consists of sedges, rushes, grasses, miner's lettuce, Douglas sagewort, poison-hemlock, and hoary nettle.

Aquatic Habitats

Lacustrine habitats are inland depressions or dammed riverine channels containing standing water. They may vary from small ponds of less than one hectare to large areas covering several square kilometers. The plants and animals found in the littoral zone vary with water depth, and a distant zonation of life exists from deeper water to shore. A blanket of duckweed may cover the surface of shallow water. Desmids and diatoms, protozoans, and minute crustaceans, hyrdras and snails live on the under-surface of the blanket; mosquitoes and collembolans live on top. Submerged plants such as algae and pondweeds serve as support for smaller algae and as cover for swarms of minute aquatic animals. As sedimentation and accumulation of organic matter increases toward the shore, floating rooted aquatics such as water lilies and smartweeds often appear. Floating plants offer food and support for numerous herbiverous animals that feed both on phytoplankton and the floating plants.

Non-vegetated Habitats

Barren habitat is defined by the absence of vegetation. Any habitat with <2% total vegetation cover by herbaceous, desert, or non-wildland species and <10% cover by tree or shrub species is defined this way. Urban settings covered in pavement and buildings may be classified as barren as long as vegetation, including non-native landscaping, does not reach the percent cover thresholds for vegetated habitats.

5.1.2 Special Status Species

The following discussion is based on a search of special status species that are documented in the California Natural Diversity Database (CNDDB), the California Native Plant Survey (CNPS) Inventory of Rare and Endangered Plants, and the USFWS endangered and threatened species lists. The search was regional in scope and focused on the documented occurrences within the following U.S. Geological Survey quadrangles: Tustin, El Toro, Santiago Peak, Laguna Beach, San Juan Capistrano, Canada Gobernadora, Dana Point, and San Clemente (referred to herein as 9-quad search area), Laguna Niguel, and a 1-mile search area of the City.

Special Status Species Background

Special status species are those plants and animals that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized by federal, State, or other agencies. Some of these species receive specific protection that is defined by federal or State endangered species legislation. Others have been designated as "sensitive" on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. These species are referred to collectively as "special status species" in this report, following a convention that has developed in practice but has no official sanction. For the purposes of this assessment, the term "special status" includes those species that are:

- Federally listed or proposed for listing under the Federal Endangered Species Act (50 CFR 17.11-17.12);
- Candidates for listing under the Federal Endangered Species Act (61 FR 7596-7613);
- State listed or proposed for listing under the California Endangered Species Act (14 CCR 670.5);
- Species listed by the USFWS or the CDFW as a species of concern (USFWS), rare (CDFW), or of special concern (CDFW);
- Fully protected animals, as defined by the State of California (California Fish and Game Code Section 3511, 4700, and 5050);
- Species that meet the definition of threatened, endangered, or rare under CEQA (CEQA Guidelines Section 15380);
- Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.); and
- Plants listed by the CNPS as rare, threatened, or endangered (List 1A and List 2 status plants in Skinner and Pavlik, 1994).

Special Status Plants

The search revealed documented occurrences of over 400 special status plant species within the 9-quad search area. Of these special status plant species, 13 species are located within 1-mile of the City.

Table 5-2 provides a list of special status plant species that are documented within 1-mile of Laguna Niguel, and their current protective status. These special status plant species are illustrated on Figure 5-2. Figure 5-3 illustrates the special status plant species located within the 9-quad search area.

Table 5-2: Special Status Plants Present or Potentially Present (1-mile search area)

Scientific Name	Common Name	Federal Status	State Status	CNPS*
Atriplex coulteri	Coulter's Saltbush	None	None	1B.2
Brodiaea filifolia	Thread-Leaved Brodiaea	Threatened	Endangered	1B.1
Calochortus weedii var. intermedius	Intermediate Mariposa-Lily	None	None	1B.2
Chaenactis glabriuscula var. orcuttiana	Orcutt's Pincushion	None	None	1B.1
Comarostaphylis diversifolia ssp. diversifolia	Summer Holly	None	None	1B.2
Dudleya blochmaniae ssp. blochmaniae	Blochman's Dudleya	None	None	1B.1
Dudleya stolonifera	Laguna Beach Dudleya	Threatened	Threatened	1B.1
Euphorbia misera	Cliff Spurge	None	None	2B.2
Pentachaeta aurea ssp. allenii	Allen's Pentachaeta	None	None	1B.1
Pseudognaphalium leucocephalum	White Rabbit-Tobacco	None	None	2B.2
Quercus dumosa	Nuttall's Scrub Oak	None	None	1B.1
Quercus dumosa	Nuttall's Scrub Oak	None	None	1B.1
Verbesina dissita	Big-Leaved Crownbeard	Threatened	Threatened	1B.1

Source: CDFW CNDDB, 2023.

*Notes: *California Native Plant Society (CNPS) California Rare Plant Rank Key:*

1B.1: Plants rare, threatened, or endangered in California and elsewhere, Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)

1B.2: Plants rare, threatened, or endangered in California and elsewhere, Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)

2B.2: Plants rare, threatened, or endangered in California but more common elsewhere, Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat

Special Status Animals

The search revealed documented occurrences of 20 special status animal species within a 1-mile search radius of the City. This includes: 1 amphibian, 6 birds, 3 fish, 1 insect, 3 mammals, and 6 reptiles. Table 5-3 provides a list of the special status animal species that are documented within the 1-mile search area, and their current protective status. Locations of these special status animal species are illustrated on Figure 5-2. Figure 5-3 illustrates the special status species located within the 9-quad search area.

Table 5-3: Special Status Animals Present or Potentially Present (1-mile search area)

Taxonomy Group	Scientific Name	Common Name	Federal Status	State Status	CDFW Status*
Amphibians	Spea hammondii	Western Spadefoot	None	None	SSC
Birds	Vireo bellii pusillus	Least Bell's Vireo	Endangered	Endangered	
Birds	Polioptila californica californica	Coastal California Gnatcatcher	Threatened	None	SSC
Birds	Agelaius tricolor	Tricolored Blackbird	None	Threatened	SSC
Birds	Aimophila ruficeps canescens	Southern California Rufous-Crowned Sparrow	None	None	WL
Birds	Campylorhynchus brunneicapillus sandiegensis	Coastal Cactus Wren	None	None	SSC
Birds	Elanus leucurus	White-Tailed Kite	None	None	FP
Fish	Oncorhynchus mykiss irideus pop. 10	Steelhead - Southern California DPS	Endangered	Candidate Endangered	---
Fish	Eucyclogobius newberryi	Tidewater Goby	Endangered	None	---
Fish	Gila orcuttii	Arroyo Chub	None	None	SSC
Insects	Bombus crotchii	Crotch Bumble Bee	None	Candidate Endangered	---
Mammals	Myotis yumanensis	Yuma Myotis	None	None	---
Mammals	Eumops perotis californicus	Western Mastiff Bat	None	None	SSC
Mammals	Chaetodipus californicus femoralis	Dulzura Pocket Mouse	None	None	---
Reptiles	Arizona elegans occidentalis	California Glossy Snake	None	None	SSC
Reptiles	Phrynosoma blainvillii	Coast Horned Lizard	None	None	SSC
Reptiles	Anniella stebbinsi	Southern California Legless Lizard	None	None	SSC
Reptiles	Emys marmorata	Western Pond Turtle	None	None	SSC
Reptiles	Aspidoscelis tigris stejnegeri	Coastal Whiptail	None	None	SSC
Reptiles	Aspidoscelis hyperythra	Orange-Throated Whiptail	None	None	WL

Source: CDFW CNDDB, 2023.

*Notes: *CDFW Status Key:* ***FP*** *California Fully Protected* ***SSC*** *CDFW Species Of Special Concern* ***WL*** *CDFW Watch List*

5.1.3 Sensitive Natural Communities

The CDFW considers sensitive natural communities to have significant biotic value, with species of plants and animals unique to each community. The CNDDB search found no sensitive natural communities within the 9-quad search area.

Vernal Pools

Vernal pools are a temporary wetland that occur as a result of rainwater failing to drain into subsoils and provide habitat for several sensitive plant and animal species in the area. In California, vernal pools fill in the winter and spring, as water collects in depressions. The water eventually evaporates, leaving a dry depression in the summer and fall. Vernal pools support a range of unique plant and animal species. On some occasions, vernal pools can be connected by small drainages. These connected vernal pools are known as vernal complexes. According to the USGS National Wetlands Inventory (NWI) there are no vernal pools within Laguna Niguel.

Salt Creek Wetland Mitigation Project

The Salt Creek Wetland Mitigation Project is a restoration initiative which encompasses approximately 11.36 acres along the Salt Creek Trail near Chapparosa Park. The project focused on removing invasive plant species and replanting native vegetation, such as black willow and mulefat, to enhance habitat for threatened and endangered bird species and improve water quality by filtering urban runoff. Despite challenges like steep slopes, drought conditions, and the presence of sensitive bird species, the project was completed with minimal disturbance. Additionally, the City implemented a cost-saving measure by converting removed non-native plants into mulch and avoiding supplemental irrigation, aligning with broader environmental preservation goals.

5.1.4 References

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5.2 AIR QUALITY

This section discusses the regulatory setting, regional climate, topography, air pollution potential, and existing ambient air quality for criteria air pollutants, toxic air contaminants, odors, and dust. Information presented in this section is based in part on information gathered from the South Coast Air Quality Management District (SCAQMD) and the California Air Resources Board (CARB). The topic of air quality is addressed in several City, County, and regional plans, including the Circulation chapter of the current General Plan, the County of Orange Congestion Management Plan, and the South Coast Air Basin Air Quality Management Plan.

5.2.1 Environmental Setting

Regulatory Setting

Air quality with respect to criteria air pollutants and toxic air contaminants (TACs) within the South Coast Air Basin (SCAB) is regulated by the South Coast Air Quality Management District (SCAQMD), CARB, and the U.S. Environmental Protection Agency (EPA). Each of these agencies develops rules, regulations, policies, and/or goals to attain the goals or directives imposed through legislation. Although the EPA regulations may not be superseded, both State and local regulations may be more stringent.

In 1992 and 1993, the CARB requested delegation of authority for the implementation and enforcement of specified New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) to the following local agencies: Bay Area Air Quality Management District (BAAQMD) and South Coast Air Quality Management District (SCAQMD). EPA's review of the State of California's laws, rules, and regulations showed them to be adequate for the implementation and enforcement of these federal standards, and EPA granted the delegations as requested.

South Coast Air Basin

The City of Laguna Niguel is located within the SCAB, which is comprised of a single air district, the SCAQMD. Geographically, SCAB consists of parts of Los Angeles County, parts of Riverside County, parts of San Bernardino County, and all of Orange County. SCAB covers an area of 6,745 square miles with a population of 14.6 million. Air quality in this area is determined by such natural factors as topography, meteorology, and climate, in addition to the presence of existing air pollution sources and ambient conditions. These factors along with applicable regulations are discussed below.

Climate, Topography, and Air Pollution Potential

SCAB is considered a Mediterranean climate, typically consisting of moderate temperatures, low to moderate humidity, and low precipitation. The South Coast Air Basin is bounded by the Pacific Ocean to the west with the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. Though there is a slight variation in climate across the SCAB, the City of Laguna Niguel is within a portion of the air basin that has consistently moderate temperatures due to nearby oceanic influence.

SCAB is the nation's second largest urban area and California's largest metropolitan region. SCAB is home to over 40% of the total State population, or about 16 million people, and over 10 million vehicles. Fifty thousand heavy duty diesel trucks travel nearly 10 million miles through the region annually, and well over 50,000 diesel engines are used to move goods and power construction and mining equipment.

The topography and climate of Southern California combine to make the basin an area of high air pollution potential. SCAB experiences a persistent temperature inversion due to its climate. Temperature inversion limits the vertical dispersion of air contaminants, as it inhibits air that is close to the ground from intermixing with air at higher elevations, thereby trapping air pollutants at the ground level. Due to consistently abundant sunshine, warm temperatures, and poor vertical air mixing, smog is commonly formed in the basin. Light winds can further limit ventilation.

The City of Laguna Niguel is located in the southern portion of the Orange County Coastal Plain. A semi-permanent, subtropical high-pressure zone over the Pacific Ocean influences the standard climate patterns. As mentioned, the oceanic influence aids in the moderate temperature averages within the City. The City has a mild Mediterranean climate with hot dry summers and mild wet winters. Temperatures in the summer months can reach into the high 80s and low 90s during the day, but at night temperatures often drop down into the mid-50s and 60s. In winter months, temperatures usually stay in the mid-50s during the day and dip down into the 40s at night. The area receives an average of 14 inches of rain annually, with most of it falling between October and April.

5.2.2 Existing Ambient Air Quality: Criteria Air Pollutants

CARB and the U.S. EPA currently focus on the following air pollutants as indicators of ambient air quality: ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and lead (Pb). Because these are the most prevalent air pollutants known to be deleterious to human health, they are commonly referred to as "criteria air pollutants." Sources and health effects of the criteria air pollutants are summarized in Table 5-4.

Table 5-4: Common Sources and Health Effects of Criteria Air Pollutants

Pollutants	Sources	Effects on Health and Environment
Ozone (O_3)	Atmospheric reaction of organic gases with nitrogen oxides in sunlight	Health: Aggravation of respiratory and cardiovascular diseases; reduced lung function; increased cough and chest discomfort. Environment: Crop, forest, and ecosystem damage; damage to materials, including rubber, plastics, fabrics, paint, and metals.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Stationary combustion of solid fuels; construction activities; industrial processes; atmospheric chemical reactions	Health: Reduced lung function; aggravation of respiratory and cardiovascular diseases; increases in mortality rate; reduced lung function growth in children; premature death.
Nitrogen Dioxide (NO_2)	Motor vehicle exhaust; high temperature stationary combustion; atmospheric reactions	Health: Aggravation of respiratory illness (e.g., lung irritation; enhanced allergic responses).
Carbon Monoxide (CO)	Incomplete combustion of fuels and other carbon-containing substances, such as motor vehicle exhaust; natural events, such as decomposition of organic matter	Health: Aggravation of some heart diseases; reduced tolerance for exercise; impairment of mental function (e.g., light-headedness); headaches; birth defects; death at high levels of exposure.
Sulfur Dioxide (SO_2)	Combination of sulfur-containing fossil fuels; smelting of sulfur-bearing metal ore; industrial processes	Health: Aggravation of respiratory diseases (including asthma); reduced lung function.
Lead (Pb)	Contaminated soil	Health: Learning disabilities in children; nervous system impairment; impaired mental functioning; brain and kidney damage.

SOURCE: CALIFORNIA AIR RESOURCES BOARD, 2023.

Ozone (O3), or smog, is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between reactive organic gases (ROG) and nitrous oxide (NO_X) in the presence of sunlight. O_3 formation is greatest on warm, windless, sunny days. The main sources of NO_X and ROG, often referred to as O_3 precursors, are combustion processes (including motor vehicle engines), the evaporation of solvents, paints, and fuels, and biogenic sources. Automobiles are a primary source of O_3 precursors in the SCAB. Tailpipe emissions of ROG are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. They decline as speeds increase up to about 50 miles per hour (mph), then increase again at high speeds and high engine loads. ROG emissions associated with evaporation of unburned fuel depend on vehicle and ambient temperature cycles. Nitrogen oxide emissions exhibit a different curve; emissions decrease as the vehicle approaches 30 mph and then begin to increase with increasing speeds.

O_3 levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, it can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Chronic exposure to high O_3 levels can permanently damage lung tissue. O_3 can also damage plants and trees, and materials such as rubber and fabrics.

Particulate Matter (PM) refers to a wide range of solid or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. $PM_{2.5}$ includes a subgroup of finer particles that have an aerodynamic diameter of 2.5 micrometers or less. Some particulate matter, such as pollen, is naturally occurring. In the southern Orange County region, Particulate Matter is caused by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM_{10} is of concern because it bypasses the body's natural filtration system more easily than larger particles and can lodge deep in the lungs. The EPA and the State of California revised their PM standards several years ago to apply only to these fine particles. $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. Motor vehicles are currently responsible for a large portion of particulate matter in the SCAB. Wood burning in fireplaces and stoves is another large source of fine particulates.

Nitrogen Dioxide (NO2) is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to O_3 formation, nitrogen dioxide can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high O_3 levels.

Carbon Monoxide (CO) is an odorless, colorless gas. It is formed by the incomplete combustion of fuels. The single largest source of CO in the SCAB is motor vehicles. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds. New findings indicate that CO emissions per mile are lowest at about 45 mph for the average light-duty motor vehicle and begin to increase again at higher speeds. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

Sulfur Dioxide (SO^2) is a colorless acid gas with a pungent odor. It has potential to damage materials, and it can have health effects at high concentrations. It is produced by the combustion of sulfur-containing fuels, such as oil, coal, and diesel. SO_2 can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in the air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Sixty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, the EPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The EPA banned the use of leaded gasoline in highway vehicles in December 1995. As a result of the EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector and levels of lead in the air decreased dramatically.

Ambient Air Quality Standards and Designations

The current federal and State ambient air quality standards (AAQS) and attainment standards are presented in Table 5-5.

Table 5-5: Ambient Air Quality Standards and Designations

Pollutant	Averaging Time	State Standard	National Standard
Ozone (O_3)	1-hour	0.09 ppm (180 μg/m^3)	–
	8-hour	0.070 ppm (137 μg/m^3)	0.070 ppm (137 μg/m^3)
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)
	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 μg/m^3	–
	24-hour	50 μg/m^3	150 μg/m^3
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 μg/m^3	15 μg/m^3
	24-hour	–	35 μg/m^3
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	0.030 ppm (for certain areas)
	24-hour	0.04 ppm (105 μg/m^3)	0.14 ppm (for certain areas)
	3-hour	–	–
	1-hour	0.25 ppm (655 μg/m^3)	75 ppb (196 μg/m^3)
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)	0.053 ppm (100 μg/m^3)
	1-hour	0.18 ppm (339 μg/m^3)	100 ppb (188 μg/m^3)
Lead	30-day Average	1.5 μg/m^3	–
	Calendar Quarter	–	1.5 μg/m^3
	Rolling 3-Month Average	–	0.15 μg/m^3
Sulfates	24-hour	25 μg/m^3	–

SOURCES: CALIFORNIA AIR RESOURCES BOARD, 2023.

NOTES: PPM = PARTS PER MILLION, PPB = PARTS PER BILLION, UG/M^3 = MICROGRAMS PER CUBIC METER

The U.S. EPA established new national air quality standards for ground-level O_3 and for fine particulate matter in 1997. The 1-hour O_3 standard was phased out and replaced by an 8-hour standard of 0.075 parts per million (ppm). Implementation of the 8-hour standard was delayed by litigation but was determined to be valid and enforceable by the U.S. Supreme Court in a decision issued in February of 2001. In April 2005, CARB approved a new 8-hour standard of 0.070 ppm and retained the 1-hour O_3 standard of 0.09 after an extensive review of the scientific literature. The U.S. EPA signed a final rule for the federal O_3 8-hour standard of 0.070 ppm on October 1, 2015, and was effective as of December 28, 2015.

In 1997, new national standards for fine particulate matter diameter 2.5 microns or less ($PM_{2.5}$) were adopted for 24-hour and annual averaging periods. The current PM_{10} standards were to be retained, but the method and form for determining compliance with the standards were revised.

In addition to the criteria pollutants discussed above, TACs are another group of pollutants of concern. TACs are injurious in small quantities and are regulated despite the absence of criteria documents. The identification, regulation, and monitoring of TACs is relatively recent compared to that for criteria pollutants. Unlike criteria pollutants, TACs are regulated on the basis of risk rather than specification of safe levels of contamination.

Existing air quality concerns within Laguna Niguel are related to increases of regional criteria air pollutants (e.g., O3 and particulate matter), exposure to toxic air contaminants, odors, and increases in GHG emissions contributing to climate change. The primary source of O3 pollution is motor vehicles, which account for 70% of the O3 in the region. Particulate matter is caused by dust, primarily dust generated from construction and grading activities, and smoke which is emitted from fireplaces, wood-burning stoves, and agricultural burning.

Attainment Status

In accordance with the California Clean Air Act (CCAA), the CARB is required to designate areas of the State as attainment, nonattainment, or unclassified with respect to applicable standards. An "attainment" designation for an area signifies that pollutant concentrations did not violate the applicable standard in that area. A "nonattainment" designation indicates that a pollutant concentration violated the applicable standard at least once, excluding those occasions when a violation was caused by an exceptional event, as defined in the criteria.

Depending on the frequency and severity of pollutants exceeding applicable standards, the nonattainment designation can be further classified as serious nonattainment, severe nonattainment, or extreme nonattainment, with extreme nonattainment being the most severe of the classifications. An "unclassified" designation signifies that the data does not support either an attainment or nonattainment status. The CCAA divides districts into moderate, serious, and severe air pollution categories, with increasingly stringent control requirements mandated for each category.

The U.S. EPA designates areas for O_3, CO, and NO_2 as "does not meet the primary standards," "cannot be classified," or "better than national standards." For SO_2, areas are designated as "does not meet the primary standards," "does not meet the secondary standards," "cannot be classified," or "better than national standards." However, the CARB terminology of attainment, nonattainment, and unclassified is more frequently used.

SCAB is a nonattainment area for $PM_{2.5}$ under California and National AAQS and a nonattainment area for PM_{10} under the California AAQS. SCAB is designated extreme nonattainment for O_3 under the California AAQS (1-hour and 8-hour) and National AAQS (8-hour). Table 5-6 presents the State and national attainment statuses for SCAB.

Table 5-6: State and National Attainment Status

Pollutant	State Designation	National Designation
Fine Particulate Matter (PM2.5)	Nonattainment	Nonattainment
Respirable Particulate Matter (PM_{10})	Nonattainment	Attainment
Ozone (O_3)	Nonattainment (1-Hour and 8-Hour)	Nonattainment (8-Hour)
Carbon Monoxide (CO)	Attainment	Unclassified/Attainment
Nitrogen Dioxide (NO_2)	Attainment	Unclassified/Attainment
Sulfur Dioxide (SO_2)	Attainment	Unclassified/Attainment
Sulfates	Attainment	--
Lead (Pb)	Attainment	Nonattainment
Hydrogen Sulfide	Unclassified	--
Visibility Reducing Particles	Unclassified	--

SOURCES: CALIFORNIA AIR RESOURCES BOARD, 2023; U.S. ENVIRONMENTAL PROTECTION AGENCY.

Monitoring Data

SCAQMD maintains numerous air quality monitoring sites throughout the SCAB to measure O_3, $PM_{2.5}$, and PM_{10}. The closest active SCAQMD monitoring site to Laguna Niguel is Mission Viejo-26081 Via Pera. Table 5-7 shows State and federal ambient air quality monitoring data for this site (abbreviated MV site) and compares it to data for the entire SCAB for years 2019-2021. The federal 1-hour standard was revoked in 2005 and is no longer in effect, therefore, only the 8-hour standard is shown. O_3 concentrations have remained mostly constant for both the MV site and SCAB between 2019 and 2021 with some fluctuation in 2020. $PM_{2.5}$ concentrations generally increased in 2021 over 2019 levels for the MV site, while there was more fluctuation in $PM_{2.5}$ concentrations for SCAB. PM_{10} concentrations generally decreased in 2021 over 2019 levels both the MV site and SCAB.

Table 5-7: Ambient Air Quality Monitoring Data

Pollutant	Year	Days Exceeded State Standard (MV site)	Days Exceeded State Standard (SCAB)	Days Exceeded Federal Standard (MV site)	Days Exceeded Federal Standard (SCAB)	Highest State Average (MV site)	Highest State Average (SCAB)	Highest National Average (MV site)	Highest National Average (SCAB)
Ozone (O3) (8-hour)	2021	8	118	8	114	0.082	0.120	0.081	0.120
	2020	34	145	32	141	0.123	0.140	0.122	0.139
	2019	11	111	11	109	0.088	0.118	0.087	0.117
Fine Particulate Matter (PM2.5) (24-hour)	2021			0	14	32.6	105.8	32.6	102.1
	2020	No State Standard	No State Standard	6.9	19	47.6	175	46.6	175
	2019			0	10.1	20.8	120.9	20.8	81.3
Particulate Matter (PM10) (24-hour)	2021	0	90.9	0	2	34.6	138.5	35.2	233.3
	2020	*	35.6	*	2.1	55.1	185.2	56.2	324.7
	2019	0	116.4	0	2	44.2	182.4	45.1	283.5

Source: California Air Resources Board (Aerometric Data Analysis and Management System or iADAM) Air Pollution Summaries., https://www.arb.ca.gov/adam/select8/sc8display.php , accessed August 2023.

*Note: * = insufficient (or no) data available to determine the value.*

5.2.3 Odors

Typically, odors are regarded as a nuisance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

With respect to odors, the human nose is the sole sensing device. The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; in fact, an odor that is offensive to one person (e.g., from a fast-food restaurant) may be perfectly acceptable to another.

It is also important to note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word "strong" to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air.

When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Certain land uses are more likely to emit odors in higher concentrations that are detectable to humans. These land uses include industrial uses, agricultural uses, composting operations, refineries, wastewater treatment plants, landfills, etc. Within the City, there are some agricultural uses, industrial uses, and landfills present which may be potential sources of odor.

5.2.4 Sensitive Receptors

Sensitive receptors are areas where human populations, especially children, seniors, and sick persons, are present and where there is a reasonable expectation of continuous human exposure to pollutants. Examples of sensitive receptors include residences, hospitals, schools, daycare facilities, elderly housing, and convalescent facilities.

There are numerous sensitive receptors within the City. Such sensitive receptors include residential areas, schools, and medical facilities. These sensitive receptors are located across Laguna Niguel and may be impacted by odor-emitting sources in neighboring cities.

5.2.5 References

C Donald Ahrens, 2006. *Meteorology Today: An Introduction to Weather, Climate, & the Environment.*

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California Air Resources Board. *Maps of State and Federal Area Designations.* https://ww2.arb.ca.gov/resources/documents/maps-state-and-federal-area-designations, accessed August 2023.

California Air Resources Board, 2020. *Aerometric Data Analysis and Management System or iADAM Air Pollution Summaries.* https://www.arb.ca.gov/adam/select8/sc8start.php, accessed August 2023.

5.3 GREENHOUSE GASES (GHG)

This section discusses regulations related to greenhouse gases (GHG) and the linkage between GHG and climate change.

5.3.1 Regulatory Setting

Key GHG emissions reduction legislation has been passed since the City's last General Plan update. These include Assembly Bill (AB) 32, Senate Bill (SB) 32, and SB 375. AB 32 (the California Global Warming Solutions Act of 2006) required California to reduce its GHG emissions to 1990 levels by 2020. SB 32 (the California Global Warming Solutions Act of 2016) expanded on AB 32 and requires a reduction in GHG emissions to 40% below the 1990 levels by 2030. SB 375 (the Sustainable Communities and Climate Protection Act) was adopted in 2008 to connect the GHG emissions reductions targets for the transportation sector to local land use decisions that affect travel behavior. Its intent is to reduce GHG emissions from light-duty trucks and automobiles (excludes emissions associated with goods movement) by aligning regional long-range transportation plans, investments, and housing allocations to local land use planning to reduce vehicle miles traveled (VMT) and vehicle trips.

The City relies on the parameters specified in the CEQA Guidelines Appendix G Checklist for assessing impacts related to GHG emissions as well as the Southern California Association of Governments (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The RTP identifies transportation strategies to address mobility needs for the future. The SCS is a new element of the RTP that was put in place by the passage of SB 375 with the goal of ensuring that the SCAG region can meet its regional GHG reduction targets set by CARB.

5.3.2 Greenhouse Gases and Climate Change Linkages

Various gases in the Earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the Earth's surface temperature. Solar radiation enters Earth's atmosphere from space, and a portion of the radiation is absorbed by the Earth's surface. The Earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation.

Naturally occurring greenhouse gases include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also greenhouse gases, but they are, for the most part, solely a product of industrial activities. Although the direct greenhouse gases CO_2, CH_4, and N_2O occur naturally in the atmosphere, human activities have changed their atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2011, concentrations of these three greenhouse gases have increased globally by 40, 150, and 20%, respectively (IPCC, 2013).

Greenhouse gases, which are transparent to solar radiation, are effective in absorbing infrared radiation. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This phenomenon is known as the greenhouse effect. Among the prominent GHGs contributing to the greenhouse effect are CO_2, CH_4, O_3, water vapor, N_2O, and chlorofluorocarbons (CFCs).

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by the industrial sector (California Air Resources Board, 2017b).

As the name implies, global climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern, respectively. California produced approximately 440 million gross metric tons of carbon dioxide equivalents ($MMTCO_2e$) in 2015 (California Air Resources Board, 2017b). By 2020, California is projected to produce 509 $MMTCO_2e$ per year (California Air Resources Board, 2014).

Carbon dioxide equivalents are a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. Expressing GHG emissions in carbon dioxide equivalents takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted.

Consumption of fossil fuels in the transportation sector was the single largest source of California's GHG emissions in 2015, accounting for 39% of total GHG emissions in the State. This category was followed by the industrial sector (23%), the electricity generation sector (including both in-state and out of-state sources) (29%) and the agriculture sector (8%), the residential sector (6%), and the commercial sector (5%) (California Air Resources Board, 2020).

5.3.3 Effects of Global Climate Change

The effects of increasing global temperature are far-reaching and extremely difficult to quantify. The scientific community continues to study the effects of global climate change. In general, increases in the ambient global temperature as a result of increased GHGs are anticipated to result in rising sea levels, which could threaten coastal areas through accelerated coastal erosion, threats to levees and inland water systems and disruption to coastal wetlands and habitat.

If the temperature of the ocean warms, it is anticipated that the winter snow season will be shortened. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of supply for the State. The snowpack portion of the supply could potentially decline by 70% to 90% by the end of the 21st century (Cal EPA, 2006). This phenomenon could lead to significant challenges securing an adequate water supply for a growing State population. Further, the increased ocean temperature could result in increased moisture flux into the State; however, since this would likely increasingly come in the form of rain rather than snow in the high elevations, increased precipitation could lead to increased potential and severity of flood events, placing more pressure on California's levee/flood control system.

Sea level has risen approximately seven inches during the last century, and it is predicted to rise an additional 22 to 35 inches by 2100, depending on the future GHG emissions levels (Cal EPA, 2006). If this occurs, resultant effects could include increased coastal flooding, saltwater intrusion, and disruption of wetlands (Cal EPA, 2006). As the existing climate throughout California changes over time, mass migration of species, or failure of species to migrate in time to adapt to the perturbations in climate, could also result. Under the emissions scenarios of the Climate Scenarios report (Cal EPA, 2006), the impacts of global warming in California are anticipated to include, but are not limited to, the following:

Public Health. Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, days with weather conducive to O_3 formation are projected to increase from 25 to 35% under the lower warming range, to 75 to 85% under the medium warming range. In addition, if global background O_3 levels increase as predicted in some scenarios, it may become impossible to meet local air quality standards. Air quality could be further compromised by increases in wildfires, which emit fine particulate matter that can travel long distances depending on wind conditions. The Climate Scenarios report indicates that large wildfires could become up to 55% more frequent if GHG emissions are not significantly reduced.

In addition, under the higher warming scenario, there could be up to 100 more days per year with temperatures above 90°F in Los Angeles and 95°F in Sacramento by 2100. This is a large increase over historical patterns and approximately twice the increase projected if temperatures remain within or below the lower warming range. Rising temperatures will increase the risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat.

Water Resources. A vast network of man-made reservoirs and aqueducts capture and transport water throughout the State from northern California rivers and the Colorado River. The current distribution system relies on the Sierra Nevada snowpack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snowpack, increasing the risk of summer water shortages.

The State's water supplies are also at risk from rising sea levels. An influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion caused by rising sea levels is a major threat to the quality and reliability of water within the southern edge of the Sacramento/San Joaquin River Delta, a major state fresh water supply. Global warming is also projected to seriously affect agricultural areas, with California farmers projected to lose as much as 25% of the water supply they need; decrease the potential for hydropower production within the State (although the effects on hydropower are uncertain); and seriously harm winter tourism. Under the lower warming range, the ski season at lower elevations could be reduced by as much as 1 month. If temperatures reach the higher warming range and precipitation declines, there might be many years with insufficient snow for skiing and snowboarding.

If GHG emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90%. Under the lower warming scenario, snowpack losses are expected to be only half as large as those expected if temperatures were to rise to the higher warming range. How much snowpack will be lost depends in part on future precipitation patterns, the projections for which remain uncertain. However, even under the wetter climate projections, the loss of snowpack would pose challenges to water managers, hamper hydropower generation, and nearly eliminate all skiing and other snow-related recreational activities.

Agriculture. Increased GHG emissions are expected to cause widespread changes to the agriculture industry, reducing the quantity and quality of agricultural products statewide. Although higher carbon dioxide levels can stimulate plant production and increase plant water-use efficiency, California's farmers will face greater water demand for crops and a less reliable water supply as temperatures rise. Crop growth and development will change, as will the intensity and frequency of pest and disease outbreaks. Rising temperatures will likely aggravate O_3 pollution, which makes plants more susceptible to disease and pests and interferes with plant growth.

Plant growth tends to be slow at low temperatures, increasing with rising temperatures up to a threshold. However, faster growth can result in less-than optimal development for many crops, so rising temperatures are likely to worsen the quantity and quality of yield for a number of California's agricultural products. Products likely to be most affected include wine grapes, fruits, nuts, and milk.

In addition, continued global warming will likely shift the ranges of existing invasive plants and weeds and alter competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Should range contractions occur, it is likely that new or different weed species will fill the emerging gaps. Continued global warming is also likely to alter the abundance and types of many pests, lengthen pests' breeding seasons, and increase pathogen growth rates.

Forests and Landscapes. Global warming is expected to intensify this threat by increasing the risk of wildfire and altering the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55%, which is almost twice the increase expected if temperatures stay in the lower warming range. However, since wildfire risk is determined by a combination of factors, including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform throughout the State. For example, if precipitation increases as temperatures rise, wildfires in southern California are expected to increase by approximately 30% toward the end of the century. In contrast, precipitation decreases could increase wildfires in northern California by up to 90%.

Moreover, continued global warming will alter natural ecosystems and biological diversity within the State. For example, alpine and sub-alpine ecosystems are expected to decline by as much as 60 to 80% by the end of the century as a result of increasing temperatures. The productivity of the State's forests is also expected to decrease as a result of global warming.

Rising Sea Levels. Rising sea levels, more intense coastal storms, and warmer water temperatures will increasingly threaten the State's coastal regions. Under the higher warming scenario, sea level is anticipated to rise 22 to 35 inches by 2100. Elevations of this magnitude would inundate coastal areas with saltwater, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.

5.3.4 References

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5.4 GEOLOGY, SOILS, AND SEISMICITY

This section addresses soil, seismic, and geologic hazards in Laguna Niguel. The federal government and State of California have established a variety of regulations and requirements related to seismic safety and structural integrity, including the California Building Standards Code, the Alquist-Priolo Earthquake Fault Zoning Act, and the Seismic Hazards Mapping Act. The topic of geologic hazards is addressed in the Seismic/Public Safety chapter of the current General Plan, and additional information is provided by the California Geological Survey.

5.4.1 Environmental Setting

Geomorphic Provinces

California's geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landform. Earth scientists recognize eleven provinces in California. Each region displays unique, defining features based on geology, faults, topographic relief, and climate. These geomorphic provinces are remarkably diverse. The City of Laguna Niguel is within the eastern portion of the San Joaquin Hills, a part of the Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges geomorphic province consists of a series of mountain ranges separated by long valleys, formed from faults branching from the San Andreas Fault. The topographic trend is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rocks intruding the older metamorphic rocks. The Los Angeles Basin and the Channel Islands of Santa Catalina, Santa Barbara, San Clemente, and San Nicolas are included in this province. Also included is the surrounding continental shelf (cut by deep submarine fault troughs).

Regional Geology

The geology of southern California formed as a result of complex plate tectonics and fault movement. The most notable fault in southern California, the San Andreas Fault, is a right lateral strike-slip (or transform) fault that marks the boundary between the Pacific tectonic plate and the North American tectonic plate (Wallace 1990). Both plates are moving northward, but the Pacific plate is moving at a faster rate than the North American plate and the relative difference in the two rates results in movement along the San Andreas Fault (Wallace 1990). Northwest of the Los Angeles basin, where the southern San Joaquin Valley meets the San Emigdio and Tehachapi Mountains, the orientation of the San Andreas Fault changes from generally northwest to west-northwest (Wallace 1990). This portion of the fault system is known as the "Big Bend" (Singer, 2005). Another large fault in southern California, the left-lateral Garlock Fault, intersects the San Andreas Fault system at this location. This bend in the San Andreas Fault system results in transpressional forces between the two tectonic plates, a geologic result of which was the uplift of the Transverse Ranges, including the San Gabriel Mountains (Wallace 1990).

Geologically the City is within the eastern portion of the San Joaquin Hills, a part of the Peninsular Ranges Geomorphic Province. These hills are the product of the environmental conditions that have shifted and shaped the terrain during geologic time. The tectonic forces acting on the Peninsular Ranges over the past 1–2 million years have broadly compressed and warped geologically young marine sediments from the sea to elevations over 1,000 feet in these hills. These bedrock sediments have been continuously worn by erosion into the subtle, rolling hillsides characteristic of southern Orange County.

From approximately 10,000 through 30,000 years ago, a distinctly wetter climate generated a dynamic erosional environment regionally and locally. This period coincides with an overall globally cooler climate and is responsible for most of the topography seen in the City of Laguna Niguel today. This environment resulted in flowing rivers and deeply cut canyons flanked by uplifted and saturated hillsides. Numerous landslides occurred throughout Laguna Niguel and surrounding areas during this time.

Seismic Hazards

Seismic Groundshaking

Seismic hazards include both rupture (surface and subsurface) along active faults and ground shaking, which can occur over wider areas. Ground shaking, produced by various tectonic phenomena, is the principal source of seismic hazards in areas devoid of active faults. All areas of the State are subject to some level of seismic ground shaking.

Several scales may be used to measure the strength or magnitude of an earthquake. Magnitude scales (ML) measure the energy released by earthquakes. The Richter scale, which represents magnitude at the earthquake epicenter, is an example of an ML. As the Richter scale is logarithmic, each whole number represents a 10-fold increase in magnitude over the preceding number. Table 5-8 represents effects that would be commonly associated with Richter Magnitudes:

Table 5-8: Richter Magnitudes and Effects

Magnitude	Effects
< 3.5	Typically, not felt
3.5 – 5.4	Often felt but damage is rare
5.5 – 6.0	Damage is slight for well-built buildings
6.1 – 6.9	Destructive potential over ±60 miles of occupied area
7.0 – 7.9	"Major Earthquake" with the ability to cause damage over larger areas
≥ 8	"Great Earthquake" can cause damage over several hundred miles

SOURCE: USGS, EARTHQUAKE PROGRAM.

Faults and Fault Zones

Faults are classified as Historic, Holocene, Late Quaternary, Quaternary, and Pre-Quaternary according to the age of most recent movement (California Geological Survey, 2002). These classifications are described as follows:

- **Historic:** faults on which surface displacement has occurred within the past 200 years;
- **Holocene:** shows evidence of fault displacement within the past 11,000 years, but without historic record;
- **Late Quaternary:** shows evidence of fault displacement within the past 700,000 years, but may be younger due to a lack of overlying deposits that enable more accurate age estimates;
- **Quaternary:** shows evidence of displacement sometime during the past 1.6 million years; and
- **Pre-Quaternary:** without recognized displacement during the past 1.6 million years.

Faults are further distinguished as active, potentially active, or inactive (California Geological Survey, 2002).

- **Active:** An active fault is a Historic or Holocene fault that has had surface displacement within the last 11,000 years;
- **Potentially Active:** A potentially active fault is a pre-Holocene Quaternary fault that has evidence of surface displacement between about 1.6 million and 11,000 years ago; and
- **Inactive:** An inactive fault is a pre-Quaternary fault that does not have evidence of surface displacement within the past 1.6 million years. The probability of fault rupture is considered low; however, this classification does not mean that inactive faults cannot, or will not, rupture.

An active earthquake fault, per California's Alquist-Priolo Act, is one that has ruptured within the Holocene Epoch (≈11,000 years). Based on this criterion, the California Geological Survey identifies Earthquake Fault Zones. These Earthquake Fault Zones are identified in Special Publication 42 (SP42), which is updated as new fault data become available. The SP42 lists all counties and cities within California that are affected by designated Earthquake Fault Zones. The Fault Zones are delineated on maps within SP42 (Earthquake Fault Zone Maps).

Southern California is a region of high seismic activity. Like most cities in the region, Laguna Niguel is subject to risks associated with potentially destructive earthquakes. The City is in the seismically active southern California region. While there are no known active or potentially active faults in the City, there are several active faults located within Orange County. The Newport-Inglewood Fault angles from offshore near Dana Point and passes through the northwestern portion of the County and is believed capable of producing a maximum credible earthquake of 7.5 magnitude. The Whittier Fault roughly parallels the Newport-Inglewood Fault across the northeasterly edge of the County and the maximum credible earthquake estimated is 7.0 magnitude. In addition, newly studied thrust faults such as the San Joaquin Hills Fault and the Puente Hills Fault could also have a significant impact on the County (County of Orange, 2021). Figure 5-4 illustrates the location of nearby fault zones surrounding the City.

Earthquakes on faults located outside Orange County can also cause damage within Laguna Niguel. Depending on their magnitude, earthquakes can cause minor to moderate damage to an area within a fifty-mile radius of their epicenter. Active faults that have the potential to impact the City include San Andreas; San Jacinto, Malibu-Coast, Palos Verdes, San Gabriel, and Sierra Madre–Santa Susana–Cucamonga faults.

The risk of damage due to ground rupture during an earthquake is minimal because of the absence of active faults in the City. However, the risk of structural damage (both above and underground), and loss of life as a result of groundshaking are considerable due to the combination of proximate active faults and the developed character of Laguna Niguel. It is recognized that low density residential development and low intensity land uses are less vulnerable to seismic hazards. The City is marked by relatively low intensity residential land use and is, therefore, at less risk than intensely developed 'urban' communities.

Liquefaction

Liquefaction, which is primarily associated with loose, saturated materials, is most common in areas of sand and silt or on reclaimed lands. Cohesion between the loose materials that comprise the soil may be jeopardized during seismic events and the ground will take on liquid properties. Thus, liquefaction requires specific soil characteristics and seismic shaking.

Liquefaction zones are areas where historical occurrence of liquefaction, or local geological, geotechnical, and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required. Liquefaction may induce lateral spreading. Lateral spread refers to landslides that are a result of lateral displacement of gently sloping ground. Areas identified to have high liquefaction susceptibility as well as sloping grounds are vulnerable to lateral spreading.

Figure 5-5 shows areas having the potential for liquefaction within the City. There are three areas within Laguna Niguel designated as having the potential for liquefaction: one in the northwestern portion near La Paz Road and Aliso Creek Road, a second in the northeastern position along Camino Capistrano, and a third in the southcentral position along Crown Valley Parkway.

Seismic Induced Landslides

Earthquake-Induced Landslide Zones Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required. The California Seismic Hazard Mapping Program (SHMP) delineates the approximate boundaries of areas susceptible to earthquake-induced landslides and other slope failures (e.g., rockfalls). Figure 5-5 shows there are numerous areas, primarily located in the hillsides, having the potential for seismic induced landslides within the City.

5.4.2 Other Geologic Hazards

Soils

According to the Natural Resource Conservation Service (2022), there are 21 different soil types located in Laguna Niguel. Table 5-9 and Figure 5-6 present the soil types and associated acreages located in the City.

Table 5-9: Laguna Niguel Soils

Soil Types	Total Acres
Alo series	4419.11
Alo clay, 15 to 30 percent slopes, dry	1141.02
Alo clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	3197.93
Alo clay, 9 to 15 percent slopes	80.16
Balcom series	144.13
Balcom clay loam, 15 to 30 percent slopes	8.61
Balcom clay loam, 30 to 50 percent slopes	26.65
Balcom-Rock outcrop complex, 15 to 50 percent slopes	108.87
Beaches	2.49
Beaches	2.49
Bolsa series	7.68
Bolsa silty clay loam, drained	7.68
Bosanko series	714.83
Bosanko clay, 15 to 30 percent slopes	411.54
Bosanko clay, 30 to 50 percent slopes	242.26
Bosanko clay, 9 to 15 percent slopes	61.03
Botella series	675.88
Botella clay loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	196.22
Botella clay loam, 9 to 15 percent slopes	442.32
Botella loam, 2 to 9 percent slopes, warm MAAT, lower MAP, MLRA 19	37.35
Calleguas series	740.70
Calleguas clay loam, 50 to 75 percent slopes, eroded	740.70
Capistrano series	14.21
Capistrano sandy loam, 2 to 9 percent slopes	14.21
Chesterton series	23.53
Chesterton loamy sand, 2 to 15 percent slopes	23.53
Chino series	0.03
Chino silty clay loam, drained	0.03
Cineba series	89.64
Cieneba-Rock outcrop complex, 30 to 75 percent slopes	82.53
Rock outcrop-Cieneba complex, 30 to 75 percent slopes	7.11
Corralitos series	94.63
Corralitos loamy sand, moderately fine substratum	94.63
Cropley series	114.92
Cropley clay, 2 to 9 percent slopes, warm MAAT, MLRA 19	114.92
Modjeska series	74.80
Modjeska gravelly loam, 15 to 30 percent slopes	69.51
Modjeska gravelly loam, 9 to 15 percent slopes	5.29

Soil Types	Total Acres
Myford series	49.55
Myford sandy loam, 2 to 9 percent slopes	8.71
Myford sandy loam, 9 to 15 percent slopes	30.43
Myford sandy loam, 9 to 30 percent slopes, eroded	3.07
Myford sandy loam, thick surface, 2 to 9 percent slopes	7.34
Riverwash	69.23
Riverwash	69.23
Soboba series	2.61
Soboba cobbly loamy sand, 0 to 15 percent slopes	2.61
Soper series	1114.68
Soper gravelly loam, 15 to 30 percent slopes, MLRA 20	176.00
Soper gravelly loam, 30 to 50 percent slopes, MLRA 20	871.95
Soper-Rock outcrop complex, 30 to 75 percent slopes	66.73
Sorrento series	565.94
Sorrento clay loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	22.02
Sorrento clay loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	46.36
Sorrento loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	8.11
Sorrento loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	489.45
Water	32.11
Water	32.11
Yorba series	513.05
Yorba cobbly sandy loam, 30 to 50 percent slopes	196.15
Yorba cobbly sandy loam, 9 to 30 percent slopes, eroded	135.31
Yorba gravelly sandy loam, 15 to 30 percent slopes	17.15
Yorba gravelly sandy loam, 9 to 15 percent slopes	164.43
Grand Total	9463.77

Source: Natural Resource Conservation Service, 2022.

Erosion

The U.S. Natural Resource Conservation Service (NRCS) delineates soil units and compiles soils data as part of the National Cooperative Soil Survey. The following description of erosion factors is provided by the NRCS Physical Properties Descriptions:

> *Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.*

Soil erosion data for the City of Laguna Niguel was obtained from the NRCS. As identified by the NRCS web soil survey, the erosion factor K within the City varies from 0.2 to 0.55, which is considered a medium to high potential for erosion. Generally, erosion potential within Laguna Niguel aligns with water features/drainages.

Expansive Soils

The NRCS delineates soil units and compiles soils data as part of the National Cooperative Soil Survey. The following description of linear extensibility (also known as shrink-swell potential or expansive potential) is provided by the NRCS Physical Properties Descriptions:

> *"Linear extensibility" refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.*
>
> *The shrink-swell potential is low if the soil has a linear extensibility of less than 3%; moderate if 3 to 6%; high if 6 to 9%; and very high if more than 9%. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.*

Figure 5-7 illustrates the shrink-swell potential of soils in the City. The linear extensibility of the soils within the City of Laguna Niguel ranges from "Low" to "Very High."

Landslide

The California Geological Survey classifies landslides with a two-part designation based on Varnes (1978) and Cruden and Varnes (1996). The designation captures both the type of material that failed and the type of movement that the failed material exhibited. Material types are broadly categorized as either rock or soil, or a combination of the two for complex movements. Landslide movements are categorized as falls, topples, spreads, slides, or flows. Landslide potential is influenced by physical factors, such as slope, soil, vegetation, and precipitation. Landslides require a slope, and can occur naturally from seismic activity, excessive saturation, and wildfires, or from human-made conditions such as construction disturbance, vegetation removal, wildfires, etc.

Figure 5-8 illustrates the landslide potential (for non-seismically included potential) within the City, which ranges from 0 (low susceptibility) to 10 (high susceptibility). Much of the City, mostly along hillsides, is within the 7 to 10 range. Areas underlain by shale and siltstone are more prone to landslide when compared to other bedrock geology, and the Capistrano, Monterey, and Topanga Formations, prevalent through hillside areas in the City, are most prone to slow-developing, slump-type failure. Slope stability hazards in the City relate to undeveloped hillside areas, as grading activities and soil remediation techniques required by the City's Grading and Excavation Code are used to mitigate these hazards prior to development.

Subsidence

Subsidence is the settlement of soils of very low density generally from either oxidation of organic material, or desiccation and shrinkage, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. In California, large areas of land subsidence were first documented by USGS scientists in the first half of the 20th century. Most of this subsidence was a result of excessive groundwater pumping. Completion of California's State and federal water projects that bring water from California's wet north to its dry south allowed some groundwater aquifers to recover, and subsidence decreased in these areas. Laguna Niguel does not have any historic or current USGS-recorded subsidence.

Collapsible Soils

Hydroconsolidation occurs when soil layers collapse, or settle, as water is added under loads. Natural deposits susceptible to hydroconsolidation are typically aeolian, alluvial, or colluvial materials that have a high apparent strength when dry. The dry strength of the materials may be attributed to the clay and silt constituents in the soil and the presence of cementing agents (i.e., salts). Capillary tension may tend to act to bond soil grains. Once these soils are subjected to excessive moisture and foundation loads, the constituency including soluble salts or bonding agents is weakened or dissolved, capillary tensions are reduced, and collapse occurs resulting in settlement. Existing alluvium within the City may be susceptible to collapse and excessive settlements, which could create the risk of hydroconsolidation if these soils were exposed to excessive moisture.

Naturally Occurring Asbestos

The term "asbestos" is used to describe a variety of fibrous minerals that, when airborne, can result in serious human health effects. Naturally occurring asbestos (NOA) is commonly associated with ultramafic rocks and serpentinite. Ultramafic rocks, such as dunite, peridotite, and pyroxenite are igneous rocks comprised largely of iron-magnesium minerals. As they are intrusive in nature, these rocks often undergo metamorphosis, prior to their being exposed on the Earth's surface. The metamorphic rock serpentinite is a common product of the alteration process. While NOA is present all over the State of California — in 42 of 58 counties — it can be found most abundantly in and around Humboldt County, in areas of San Benito and Monterey counties, and in western El Dorado county. According to the California Geological Survey, there is no naturally occurring asbestos mapped within the City.

Tsunami/Seiches

Tsunamis and seiches are standing waves that occur in the ocean or relatively large, enclosed bodies of water that can follow seismic, landslide, and other events from local sources (California, Oregon, Washington coast) or distant sources (Pacific Rim, South American Coast, Alaska/Canadian coast). The City is not within a tsunami or seiche hazard area.

5.4.3 References

California Department of Conservation, 2002. *California Geological Survey, Note 36.*

California Division of Mines and Geology, 1997. *Guidelines for Evaluating Seismic Hazards in California. CDMG Special Publication 117.*

California Geological Survey (CGS), 2002. *California Geomorphic Provinces. California Geological Survey Note 36. Sacramento, CA. California Department of Conservation.*

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California Geological Survey, 2013. *Seismic Shaking Hazards in California Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model.* http://www.conservation.ca.gov/cgs/rghm/psha

California Geological Survey, 2015. *Geological Gems of California State Parks Peninsular Ranges Geomorphic Province. GeoGem Note 46.* https://www.parks.ca.gov/pages/734/files/CGS_SR230_GeoGems.pdf, accessed July 24, 2023.

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U.S. Department of Agriculture and Natural Resources Conservation Service, 2023. *Web Soil Survey*. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx, accessed July 23, 2023.

U.S. Department of Agriculture and Natural Resources Conservation Service. 2017. *Web Site for Official Soil Series Descriptions and Series Classification, Official Soil Series Descriptions (OSD).* https://soilseries.sc.egov.usda.gov/

U.S. Department of the Interior. *What is the probability that an earthquake will occur in the Los Angeles Area? In the San Francisco Bay area?* https://www.usgs.gov/faqs/what-probability-earthquake-will-occur-los-angeles-area-san-francisco-bay-area

U.S. Department of the Interior. *U.S. Geological Survey ISSN 2327-6916 (print) ISSN 2327-6932 (online) Fact Sheet 2015–3009 March 2015.USGS UCERF3*: *A New Earthquake Forecast for California's Comple Fault System.* https://pubs.usgs.gov/fs/2015/3009/pdf/fs2015-3009.pdf

Wallace, Robert E. (ed.), 1990. *The San Andreas Fault System, California. U.S. Geological Survey Professional Paper 1515. Washington, DC*: *U.S. Department of the Interior.*

Yerkes, R.F. et al., 1965. *Geology of the Los Angeles Basin California – an Introduction.*

5.5 MINERAL RESOURCES

This section describes the mineral resource classification system and the mineral resources that occur within Laguna Niguel. Chapter 3 of the current General Plan states that no mineral resources have been identified within Laguna Niguel. The City of San Juan Capistrano, located immediately south and east of Laguna Niguel, does contain some sand and gravel operations along Trabuco Creek.

5.5.1 Environmental Setting

Mineral Resource Classification

Pursuant to the Surface Mining and Reclamation Act of 1975 (SMARA), the California State Mining and Geology Board oversees the Mineral Resource Zone (MRZ) classification system. The MRZ system characterizes both the location and known/presumed economic value of underlying mineral resources. The mineral resource classification system uses four main MRZs based on the degree of available geologic information, the likelihood of significant mineral resource occurrence, and the known or inferred quantity of significant mineral resources. The four classifications are described in Table 5-10.

Table 5-10: Mineral Resources Classification System

Classification	Descriptions
MRZ-1	Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
MRZ-2	Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.
MRZ-3	Areas containing mineral deposits, the significance of which cannot be evaluated.
MRZ-4	Areas where available information is inadequate for assignment to any other MRZ classification.

Source: California Department of Conservation Division of Mines and Geology, 2000.

Mineral Resources

Mineral resources include commercially viable oil and gas deposits, and nonfuel mineral resources deposits. Nonfuel mineral resources include metals such as gold, silver, iron, and copper; industrial metals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, including sand, gravel, and crushed stone. California is the largest producer of sand and gravel in the nation. Figure 5-9 shows resources by classification within the City. Two mineral resource zones (MRZ-1 and MRZ-3) are present in Laguna Niguel. These mineral resource zones are described in the table above. MRZ-1 dominates the City, while a small portion of the City is classified as MRZ-3.

Location of Permitted Aggregate Mines

The California Office of Mine Reclamation periodically publishes a list of qualified permitted aggregate mines regulated under SMARA that is generally referred to as the AB 3098 List. The Public Contract Code precludes mining operations that are not on the AB 3098 List from selling sand, gravel, aggregates, or other mined materials to State or local agencies. As of October 10, 2023, there are no mines listed within the City.

5.5.2 References

California Department of Conservation. 2002. *California Geological Survey, Note 36.*

California Department of Conservation. 2023. *AB 3098 List – Current Listing July 11, 2023.* https://filerequest.conservation.ca.gov/RequestFile/79092, accessed July 27, 2023.

5.6 HYDROLOGY AND WATER QUALITY

This section describes the groundwater management, watershed setting, and surface water quality for Laguna Niguel. The information included here is summarized from an infrastructure report prepared by Fuscoe Engineering in April 2024, located in Appendix A: Infrastructure Analysis.

5.6.1 Sustainable Groundwater Management

The Sustainable Groundwater Management Act (SGMA) addresses the sustainable management of groundwater in California. This legislation results from water shortages in California, long-term issues with land subsidence, and over drafting of groundwater aquifers. The Department of Water Resources identified the status of water basins by overdraft and priority levels (e.g., very low, low, medium, or high). The consistency requirement between Moulton Niguel Water District's (MNWD) Urban Water Management Plan (UWMP) and SGMA is not applicable because MNWD does not use groundwater as a supply. Although MNWD does not use groundwater as a supply MNWD is investigating the potential for the Orange County Groundwater Basin as a resource for additional storage during emergencies or potential drought periods (Fuscoe, 2024). See Figure 5-10 for the hydrologic basins in the City.

Orange County Groundwater Basin

The Orange County Groundwater Basin is managed by the Orange County Water District (OCWD) and although the basin is not overdrafted, OCWD prepared a groundwater management plan[1] to expand long-term groundwater sustainability. The Plan describes basin hydrogeology, water supply monitoring, management and operation of recharge facilities, groundwater replenishment system, seawater intrusion and barrier management, and water quality protection.

[1] Orange County Water District, 2015. *Groundwater Management Plan*. Found here: https://www.ocwd.com/wp-content/uploads/groundwatermanagementplan2015update_20150624.pdf

San Juan Groundwater Basin

The San Juan Groundwater Basin or Basin is situated in South Orange County within the San Juan Creek Watershed, spans 26 square miles and is bounded by the Pacific Ocean to the west and semi-permeable marine deposits. The Basin is considered a very low priority basin, which underlies portions of the City of Laguna Niguel, Mission Viejo, San Juan Capistrano, Dana Point, and unincorporated areas of South Orange County. It has four sub-basins: Upper San Juan, Middle San Juan, Lower San Juan, and Lower Trabuco. The Basin is recharged through various sources including San Juan Creek, Oso Creek, Arroyo Trabuco Creek Channel, precipitation, and Hot Spring Canyon flows.

Although MNWD does not currently utilize groundwater as a resource, MNWD is a member San Juan Basin Authority (SJBA). SJBA was established in 1971 as a joint authority that oversees water resources development and water quality in the San Juan Basin. Its members include Santa Margarita Water District (SMWD), MNWD, South Coast Water District (SCWD), and the City of San Juan Capistrano. As the basin is classified as a subterranean flowing stream, the SWRCB issues water rights permits for extraction and diversion.

5.6.2 Watershed Setting

Laguna Niguel resides within several watersheds including the Aliso Creek Watershed, the Dana Point Coastal Streams Watershed, and the San Juan Creek Watershed. These watersheds fall within the South Orange County Watershed Management Area (SOCWMA) and the Integrated Regional Water Management (IRWM) Group. The majority of the City is encompassed into the Aliso Creek Watershed to the north, the Dana Point Coastal Watershed to the south, with smaller portions of the City's eastern boundary falling into the San Juan Creek Watershed (Fuscoe, 2024). Laguna Niguel drains to the following OCFCD facilities and receiving water bodies.

Table 5-11: Laguna Niguel Watersheds

Aliso Creek Watershed	Dana Point Coastal Streams Watershed	San Juan Creek Watershed
• Aliso Creek Channel • Narco Channel • Sulphur Creek Channel • Laguna Niguel Park Lake (Sulphur Creek Reservoir) • Niguel Storm Drain	• Salt Creek Channel	• Oso Creek Channel • Arroyo Trabuco Creek Channel, Lower

Fuscoe Engineering, Inc. 2024. City of Laguna Niguel General Plan Update, Existing Conditions Infrastructure Report for Water, Sewer, Storm Drainage, and Water Quality. Appendix A

The water bodies listed above all drain to other storm drainage facilities that ultimately drain to the Pacific Ocean. See Figure 5-11 for a depiction of the regional watersheds surrounding the City. See Figure 5-12 for the water features and surface water in Laguna Niguel.

5.6.3 Surface Water Quality

In general, potential hazards to surface water quality include the following nonpoint pollution problems: high turbidity from sediment resulting from erosion of improperly graded construction projects, concentration of nitrates and dissolved solids from agriculture or surfacing septic tank failures, contaminated street and lawn run-off from urban areas, and warm water drainage discharges into cold water streams.

The most critical period for surface water quality is following a rainstorm which produces significant amounts of drainage runoff into streams at low flow, resulting in poor dilution of contaminates in the low flowing stream. Such conditions are most frequent during the fall at the beginning of the rainy season when stream flows are near their lowest annual levels. Besides the greases, oils, pesticides, litter, and organic matter associated with such runoff, heavy metals such as copper, zinc, and cadmium can cause considerable harm to aquatic organisms when introduced to streams in low flow conditions.

Surface water pollution is also caused by erosion. Excessive and improperly managed grading, vegetation removal, quarrying, logging, and agricultural practices all lead to increased erosion of exposed earth and sedimentation of watercourses during rainy periods. In slower moving water bodies these same factors often cause siltation, which ultimately reduces the capacity of the water system to percolate and recharge groundwater basins, as well as adversely affecting both aquatic resources and flood control efforts.

303(d) Impaired Water Bodies: Section 303(d) of the Federal Clean Water Act requires states to identify waters that do not meet water quality standards or objectives and, thus, are considered "impaired." Once listed, Section 303(d) mandates prioritization and development of a Total Maximum Daily Load (TMDL). The TMDL is a tool that establishes the allowable loadings or other quantifiable parameters for a waterbody and thereby the basis for the states to establish water quality-based controls. The purpose of TMDLs is to ensure that beneficial uses are restored and that water quality objectives are achieved.

Table 5-12 shows the 303(d) list and TMDLs for the applicable regional channels and water bodies that receive flows from the City (Fuscoe, 2024).

Table 5-12: List of 303(d) Impairments and TMDLs

Water Body / Channel	List of 303(d) Impairments	TMDL
Aliso Creek Watershed		
Aliso Creek Channel	Benthic Community Effects, Indicator Bacteria, Malathion Nitrogen, Phosphorus, Selenium, Toxicity	Indicator Bacteria
Dana Point Coastal Streams Watershed		

Salt Creek Channel	Benthic Community Effects, Imidacloprid, Malathion, Toxicity	N/A
San Juan Creek Watershed		
Oso Creek Channel	Nitrogen, Phosphorus, Selenium, Toxicity	N/A
Arroyo Trabuco Creek Channel, Lower	Benthic Community Effects, Indicator Bacteria, Nitrogen, Phosphorus, Toxicity	N/A

Source: San Diego Regional Water Quality Control Board, Adopted TMDLs. Available at: https://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/tmdladopted.html

5.6.4 References

Fuscoe Engineering, Inc. 2024. *City of Laguna Niguel General Plan Update, Existing Conditions Infrastructure Report for Water, Sewer, Storm Drainage, and Water Quality*. Appendix A: Infrastructure Analysis. Prepared April 1, 2024.

Orange County Water District, 2015. *Groundwater Management Plan*. Found here: https://www.ocwd.com/wp-content/uploads/groundwatermanagementplan2015update_20150624.pdf

San Diego Regional Water Quality Control Board, Adopted TMDLs. Available at: https://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/tmdladopted.html

5.7 CULTURAL RESOURCES

This section describes the historic and cultural resources within Laguna Niguel, including buildings, sites, structures, or objects that may have historical, architectural, archaeological, cultural, or scientific importance. This section is based on and summarizes the *Cultural and Paleontological Resources Assessment for the Laguna Niguel General Plan Update* Project, prepared by Cogstone Resources Management, located in Appendix B: Cultural and Paleontological Resources Study. The topics of archaeological, cultural, and paleontological resources are addressed in the Open Space/Parks/Conservation chapter of the current General Plan.

5.7.1 Prehistoric Context

Approaches to prehistoric frameworks have changed over the years from being based on material attributes to radiocarbon chronologies to association with cultural traditions. Archaeologists defined a material complex consisting of an abundance of milling stones (for grinding food items) with few projectile points or vertebrate faunal remains dating from about 7,000 to 3,000 years before the present as the "Millingstone Horizon." Later, the "Millingstone Horizon" was redefined as a cultural tradition named the Encinitas Tradition with various regional expressions including Topanga and La Jolla. Use by archaeologists varied as some adopted a generalized Encinitas Tradition without regional variations, some continued to use "Millingstone Horizon" and some used Middle Holocene (the time period) to indicate this observed pattern.

Recently, the fact that generalized terminology is suppressing the identification of cultural, spatial, and temporal variation and the movement of peoples throughout space and time was noted. These factors are critical to understanding adaptation and change.

The latest cultural revisions for the City define traits for time phases of the Greven Knoll pattern of the Encinitas Tradition applicable to the Pasadena area. This pattern is replaced in the Project Area by the Angeles pattern of the Del Rey Tradition later in time. Each pattern has subdivisions as identified by specific changes in cultural assemblages through time. Phases are identified by their archaeological signatures in components within sites.

Greven Knoll sites tend to be in valleys similar to areas like Laguna Niguel. These inland peoples did not switch from manos/metates to pestles/mortars like coastal peoples (c. 5,000 years before present); this may reflect their closer relationship with desert groups who did not exploit acorns. The Greven Knoll toolkit is dominated by manos and metates throughout its extent. In Phase I, other typical characteristics were pinto dart points for atlatls or spears, charmstones, cogged stones, absence of shell artifacts and flexed position burials. In Phase II, Elko dart points for atlatls or spears and core tools are observed along with increased indications of gathering. In addition, the Greven Knoll populations are biologically Yuman (based on skeletal remains) while the later Angeles populations are biologically Shoshonean.

The Angeles pattern generally is restricted to the mainland and appears to have been less technologically conservative and more ecologically diverse, with a largely terrestrial focus and greater emphases on hunting and nearshore fishing. In Angeles Phase I, Elko points for atlatls or darts appear, small steatite objects such as pipes and effigies from Catalina are found, shell beads and ornaments increase, fishing technologies increase including bone harpoons/fishhooks and shell fishhooks, donut stones appear, and hafted micro blades for cutting/graving wood or stone appear. In addition, several Encinitas (Topanga) traits, such as discoidals, cogged stones, plummet-like charm stones and cairn burials virtually disappear from the record. Mortuary practices changed to consist of primarily flexed primary inhumations, with extended inhumations becoming less common. Settlement patterns made a shift from general use sites being common to habitation areas separate from functional work areas. Subsistence shifted from mostly collecting to increased hunting and fishing.

The Angeles Phase II is identified primarily by the appearance of a new funerary complex, with other characteristics similar to Angeles I. The complex features killed (broken) artifacts including manos, metates, bowls, mortars, pestles, points, and others plus highly fragmented cremated human bones and a variety of faunal remains. In addition to the cremains, the other material also often burned. None of the burning was performed in the burial feature.

The Angeles III Phase is the beginning of what has been known as the Late Period and is marked by several changes from Angeles I and II. These include the appearance of small projectile points, steatite shaft straighteners and increased use of asphaltum all reflecting adoption of bow and arrow technology, obsidian sources changed from mostly Coso to Obsidian Butte and shell beads from Gulf of California species began to appear. Subsistence practices continued as before, and the geographic extent of the Angeles Pattern increased.

Angeles Phase IV is marked by new material items including Cottonwood points for arrows, Olivella cupped beads and Mytilus shell disks, birdstones (zoomorphic effigies with magicoreligious properties) and trade items from the Southwest including pottery. It appears that populations increased and that there was a change in the settlement pattern to fewer but larger permanent villages. The presence and utility of steatite vessels may have impeded the diffusion of pottery into the Los Angeles Basin. The settlement pattern altered to one of fewer and larger permanent villages. Smaller special-purpose sites continued to be used.

Angeles V components contain more and larger steatite artifacts, including larger vessels, more elaborate effigies and comals. Settlement locations shifted from woodland to open grasslands. The exploitation of marine resources seems to have declined, and use of small seeds increased. Many Gabrielino inhumations contained grave goods while cremations did not.

The Angeles VI phase reflects the ethnographic mainland Gabrielino of the post-contact (i.e., post-A.D. 1542) period. One of the first changes in Gabrielino culture after contact was undoubtedly population loss due to disease, coupled with resulting social and political disruption. Angeles VI material culture is essentially Angeles V augmented by a number of Euroamerican tools and materials, including glass beads and metal tools such as knives and needles (used in bead manufacture). The frequency of Euroamerican material culture increased through time until it constituted the vast majority of materials used. Locally produced brownware pottery appears along with metal needle-drilled Olivella disk beads.

The ethnographic mainland Gabrielino subsistence system was based primarily on terrestrial hunting and gathering, although nearshore fish and shellfish played important roles. Sea mammals, especially whales (likely from beached carcasses), were prized. In addition, a number of European plant and animal domesticates were obtained and exploited. Ethnographically, the mainland Gabrielino practiced interment and some cremation.

5.7.2 Ethnographic Overview

Juaneño Acjachemen

About 1,300 years ago the Acjachemen (Juaneño), who were hunters and gatherers of the San Luis Rey Cultural Pattern, moved into southern Orange County. The Acjachemen speak a language that is part of the Takic language family. Their traditional tribal territory was situated partly in northern San Diego County and partly in southern Orange County. The boundaries were Las Pulgas Creek (south), Aliso Creek (north), the Pacific Ocean (west) and the Santa Ana Mountains (east). Villages were mostly along San Juan Creek, Trabuco Creek, and San Mateo Creek.

In prehistory, the Acjachemen had a patrilineal society and lived in groups with other relatives. These groups had established claims to places including the sites of their villages and resource areas. Marriages were usually arranged from outside villages establishing a social network of related peoples in the region. There was a well-developed political system including a hereditary chief. Religion was an important aspect of their society. Religious ceremonies included rites of passage at puberty and mourning rituals.

Houses were typically conical in shape and thatched with locally available plant materials. Work areas were often shaded by rectangular brush-covered roofs (ramada). Each village had a ceremonial structure in the center enclosed by a circular fence where all religious activities were performed.

Women are known to have been the primary gatherers of plant foods, but also gathered shellfish and trapped small game animals. Men hunted large game, most small game, fished, and assisted with plant food gathering, especially of acorns. Adults were actively involved in making tools including nets, arrows, bows, traps, food preparation items, pottery, and ornaments. Tribal elders had important political and religious responsibilities and were involved in the education of younger members.

5.7.3 Historical Setting

Spanish Period (1769-1820)

The earliest exploration of Orange County by Europeans was the land expedition of Gaspar de Portola. He set out from Mission San Diego to find a land route to the Bay of Monterey. His expedition passed through Orange County in northward (1769) and southward (1770) bound directions. He named Trabuco Creek, Santiago Creek, and other geographic features he encountered.

Mexican Period (1821-1847)

Mexico gained independence from Spain in 1821, and the new liberal politics of the Mexican Constitution of 1824 were embraced by the emerging generation of Californios and Californias (persons of Mexican heritage born in California). Most of these young peoples' parents were soldiers from Sonora and Sinaloa who had risen to positions of authority within the military. The opportunities for upward mobility for themselves and their families were significant.

In 1846, the Mexican-American war erupted following the Bear Flag Revolt in California. Both the 1848 Treaty of Guadalupe Hidalgo in which Mexico ceded California to the United States and the unprecedented events of the Gold Rush that same year destabilized California, producing rapid, dramatic change.

American Period (1848-Present)

The Mexican-American war followed on the heels of the Bear Flag Revolt of June 1846. General Andrés Pico and John C. Frémont signed the Articles of Capitulation in December 1847, and with the signing of the Treaty of Guadalupe Hidalgo in February 1848, hostilities ended and Mexico relinquished California to the United States. Under the treaty, Mexico ceded the lands of present-day California, New Mexico, and Texas to the U.S. for $15 million. Within two years following the treaty, California applied for admission as a state.

Laguna Niguel History

Juan Avila received the 13,316-acre Laguna Niguel land grant in 1842 and re-established the title in 1848 after California become part of the United States. He remained owner of Rancho Niguel until 1865. By 1884, Chicago born Lewis Moulton rented Rancho Niguel from then owner Cyrus B. Rawson to rear sheep and cattle. In 1895, Moulton and his business partner, French Basque born Jean Pierre Daguerre, purchased the rancho and established the Moulton-Daguerre Ranch. Following the death of Daguerre in 1911 and Moulton in 1938, the surviving Moulton family maintained the ranch until 1950. The land was then divided amongst the Moulton and Daguerre families.

In 1954, the Daguerre daughters sold their massive 7,000+ acre parcel to Eugene Shumaker. Four years later, in 1958, Schumaker sold the land to the development company Cabot, Cabot, and Forbes. The company immediately formed the Laguna Niguel Corporation in 1959 with the intent of using the land to create a master planned community. A large team of architects, engineers, artists, and landscapers were assembled to undertake the monumental planning task. Essential utility development began in 1959 with continuous community expansion up through the 1980s.

In 1962, the Laguna Niguel Corporation officially opened the residential communities of Monarch Bay and Niguel Terrace which comprised of a total of 565 homes. Two years later, the residential population had grown to 1,000 and by 1966 the Laguna Niguel Homeowner's Association was formed. In 1986, a community services district was formed following a residential vote. In November of 1988, voters overwhelmingly supported incorporation which became official on December 1, 1989, making Laguna Niguel the 29th city in Orange County.

By 1990, the local population had grown to 45,000 which spurred future development of neighborhood parks and additional public facilities. In 2011, a new City Hall was opened.

5.7.4 Cultural Resources

A search of the California Historic Resources Inventory System (CHRIS) at the South Central Coastal Information Center (SSCIC) located at California State University, Fullerton on August 14, 2023. The records search covered the entire City. Thirty-six (36) cultural resources have been recorded within Laguna Niguel. Of these, 27 are prehistoric archaeological sites, four are prehistoric archaeology isolates, and five are historic-aged built environment resources. The prehistoric archaeology resources range from habitation sites, lithic scatters, middens, and bedrock milling sites. All archaeology sites are unevaluated for NRHP/CRHR listing. Of the five historic-aged built environment resources previously recorded within the City, four of the resources have been evaluated for NRHP eligibility. The four historic-aged built environment resources are described below.

P-30-176950 was originally recorded in 2009 by Roderic McClean as a historic cylindrical steel water storage tank known as Pacific Island Reservoir No. 2. The tank was built in 1963 with a capacity of one million gallons which services the City of Laguna Niguel. The tank was recommended ineligible for listing on the National Register of Historic Places (NRHP). In 2014, the tank was revisited by K. A. Crawford and the associated water system was recorded as part of the site. The concrete foundation, steel exterior, metal ladders, piping system and ancillary equipment building were all added to the site record. The tank was again recommended to be ineligible for listing on the NRHP.

P-30-177041 was recorded in 2010 by K. A. Crawford as a historic cylindrical steel water storage tank reservoir of recycled water. The water tank is in a complex of 3 total water storage tanks with associated equipment buildings. The tank was recommended to be ineligible for listing on the NRHP.

P-30-177064 was recorded in 2011 by Roderic McClean as a historic cylindrical steel water storage tank reservoir of potable water. The tank was built in 1964 and services the City of Laguna Niguel. The tank was recommended to be ineligible for listing on the NRHP.

P-30-177527 was recorded in 2014 by K. A. Crawford as a historic cylindrical steel water storage tank reservoir. The tank has associated equipment storage areas and perimeter fence. The tank was recommended to be ineligible for listing on the NRHP.

In addition, a variety of other sources were consulted, including the California State Historic Property Data File (which includes the National Register of Historic Places, California Register of Historical Resources, California Historical Landmarks, and California Points of Historical Interest), the Built Environment Resource Directory (BERD), California Office of Historic Preservation's Historic Resources Inventory (HRI) directory, as well as a review of known cultural resource surveys, excavation reports, and historic aerial photos and maps. No resources were identified in the City in the NRHP, CRHR, CHL, or Caltrans Historic Bridge Inventory.

Built Environment Resource Directory (BERD)

Below are descriptions of the results found in the BERD record search:

Chet Holifield Federal Building (OTIS ID: 665856)

The most current version of the Built Environment Resource Directory (BERD) assigns the Chet Holifield Federal Building (CHFB) (OTIS ID: 665856) the California Historical Resource Status Code: 2S2 (Individual property determined eligible for National Register by a consensus through Section 106 process. Listed in the California Register).

Built between 1968 and 1971, the Chet Holifield Federal Building was designed to resemble a ziggurat by William L. Pereira & Associates. The architectural design of this building is rare in the United States with key features including seven-stepped tiers, precast concrete panels, textured finish, and incorporates some elements of Brutalism style (exposed concrete surfaces, massive forms, and recessed windows) (GSA 2023). The building was originally constructed for North American Aviation and Rockwell International, however, ownership changed to the General Services Administration in 1974. Primary tenants today include various federal agencies.

Rancho Niguel Water Tank Clearwire (CA-ORC5083A; OTIS ID 517624)

No additional information could be located regarding the history of this resource. This resource is assigned the California Historical Resource Status Code: 2S (Individual property determined eligible for National Register by the Keeper. Listed in the California Register).

Pacific Island Reservoir No.2 (OTIS ID 5714593)

No additional information could be provided regarding the history of this resource. This resource is assigned the California Historical Resource Status Code: 6Y (Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.)

Niguel Water Tank No. 2 (OTIS ID 517625)

No additional information could be provided regarding the history of this resource. This resource is assigned the California Historical Resource Status Code: 6Y (Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.)

Niguel Water Tank No. 3 (OTIS ID 517625)

No additional information could be provided regarding the history of this resource. This resource is assigned the California Historical Resource Status Code: 6Y (Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.)

5.7.5 Paleontological Resources

A search for paleontological records was completed by the Natural History Museum of Los Angeles County. Published literature, unpublished paleontological reports, and online databases were also searched for fossil records. Unpublished reports included an earlier literature review from the near vicinity of the City. Databases included the Natural History Museum of Los Angeles County Invertebrate Paleontology, the Paleobiology Database, and the University of California Museum of Paleontology. Summaries of the paleontological resources within and near Laguna Niguel are provided below.

Late Eocene to Latest Early Miocene: Sespe Formation

At least 25 fossils of terrestrial animals have been recovered from 17 localities in the Sespe Formation in Orange County. Two localities were recovered from the Lower Bowerman Landfill, nine localities were recovered from the Upper Bowerman Landfill, four localities were recovered from the Foothill Transportation Corridor-Oso segment, and a locality was recovered from the San Joaquin Hills. The OCPC listed one locality from the El Toro 7.5' USGS topographic quadrangle. These localities have produced fossils of canine, weasel, peccary, oreodont, camel, musk deer, opossum, shrew, pika, squirrel, rodent, and iguana

Early Miocene: Vaqueros-Sespe Formation

At least 2400 fossils of terrestrial animals and plants have been recovered from 122 localities in the Vaqueros-Sespe Formation in Orange County. These localities have produced fossils of canine, bear, weasel, rhinoceros, horse, peccary, pig-like artiodactyl, oreodont, camel, deer-like artiodactyl, musk deer, hedgehog, shrew, pika, rabbit, squirrel, rodent, opossum, and reptile.

Middle Miocene: Topanga Group

At least 375 fossils of marine and terrestrial animals have been recovered from 37 localities in the Topanga Group in Orange County. These localities have produced fossils of pinnipeds, baleen and toothed whales, dugongs, sea cows, desmostylians, proboscideans, rodents, birds, sea turtles, bony fish, sharks, rays, and invertebrates.

Late Miocene: Monterey Formation

At least 150 fossils of marine animals have been recovered from 31 localities within and near to the City. These localities have produced fossils of pinnipeds, baleen and toothed whales, dugongs, desmostylians, birds, crocodiles, sea turtles, bony fish, sharks and rays, and invertebrates. Numerous species of land plants and algae have also been recovered from these localities.

Late Miocene to Early Pliocene: Capistrano Formation

At least 375 fossils of marine and terrestrial animals have been recovered from 33 localities from the Oso Sand of the Capistrano Formation. These localities have produced fossils of pinnipeds, rodents, camels, baleen and toothed whales, horses, rhinoceros, mastodon, dugong, sea cows, desmostylians, birds, sea turtles, tortoise, bony fish, sharks and rays, and invertebrates. Numerous species of land plants and algae have also been recovered from these localities.

At least 100 fossils of marine and terrestrial animals have been recovered from 30 localities from undifferentiated deposits of Capistrano Formation. These localities have produced fossils of pinnipeds, camels, baleen and toothed whales, horses, birds, sea turtles, tortoise, crocodile, bony fish, sharks and rays, and invertebrates.

Pliocene To Pleistocene: Niguel Formation- Quaternary Terrace

A fossil of a sea lion and a camel have been recovered from two localities in Niguel Formation – Quaternary terrace deposits.

Pleistocene Deposits

At least 225 fossils of terrestrial animals have been recovered from 29 localities from Pleistocene deposits outside of Laguna Niguel. These localities have produced fossils of ground sloth, short faced bear, American lion, mammoth, mastodon, horses, ancient bison, shrews, reptiles, and amphibians. The most significant of these localities is Costeau Pit, located nearby Laguna Niguel in the City of Laguna Hills, which has additionally produced coyote, dire wolf, saber-toothed cat, camel, llama, diminutive pronghorn, long-horned bison, rabbits, rodents, and birds.

The following units include Pleistocene sediments:

- Quaternary very old axial channel deposits (Qvoa, Qvoa2, Qvoa3); early to middle Pleistocene
- Quaternary very old alluvial fan deposit (Qvof); early to middle Pleistocene
- Quaternary young axial channel deposit (Qya); late Pleistocene to Holocene
- Quaternary young alluvial fan deposit (Qyf); late Pleistocene to Holocene
- Quaternary young landslide deposit (Qyls); late Pleistocene to Holocene

Holocene Deposits

No fossils are known from any of the Holocene deposits as they are all too young to contain fossils. The following units are Holocene in age:

- Very young colluvial deposits (Qc); late Holocene
- Very young slope wash deposits (Qsw); late Holocene
- Very young landslide deposits (Qls); late Holocene
- Artificial fill; modern

5.7.6 References

Cogstone Resource Management, October 2024. *Cultural and Paleontological Resources Assessment for the Laguna Niguel General Plan Update Project, City of Laguna Niguel, Orange County, California*. Appendix B: Cultural and Paleontological Resources Study.

5.8 VISUAL RESOURCES

Laguna Niguel occupies a hilly basin near the southern end of the San Joaquin Hills, a small coastal mountain range in southern Orange County. Elevations in Laguna Niguel range from near sea level to 936 feet at the summit of Niguel Hill, in the southwest corner of the City. Low mountain ridges, some of which attain heights of one- to two-hundred feet, trend northeast to southwest and dissect much of the Laguna Niguel area.

The City's visual character is defined by an abundance of open space and development consisting predominantly of detached single-family residential communities. There are nearly 200 distinct neighborhoods or subdivisions, with most of the detached single-family communities within a homeowners association (HOA). These residential uses are connected by landscaped corridors and surrounded by extensive open space and recreational uses. The natural setting of Laguna Niguel is characterized by low lying hills and steeper escarpments that create several prominent landforms. Most of the natural landscape of Laguna Niguel has been altered by previous grading activities; however, there are still several prominent ridgelines in the City. One of the more important ridge areas is in the southwestern portion of the City, in the Aliso Canyon area. This area is characterized by predominantly steep slopes with elevations ranging from 818 to 220 feet and provides distant views of the ocean. Other ridges are in the Salt Creek and Colinas Bluff areas. Many of these ridge areas have slopes that are more than 30 percent.

Retail, office, industrial, and public/institutional land uses make up a small proportion of the City's total land area and are primarily located along major corridors, such as Crown Valley Parkway, Alicia Parkway, La Paz Road, and Golden Lantern. Most retail land uses are concentrated within neighborhood and community shopping centers such as Town Center, the Marketplace at Laguna Niguel, Plaza de la Paz, Ocean Ranch Village, Laguna Niguel Promenade, Crown Valley Mall, Laguna Niguel Plaza, Laguna Heights and the Center at Rancho Niguel.

5.8.1 Scenic Vistas

While the City's existing General Plan does not designate scenic vistas (publicly accessible viewsheds that include scenic resources), views of scenic resources are available from numerous public vantage points within the Planning Area, including public trails, parks and open space areas, and streets. Mid-to-long range views of the San Joaquin Hills and long-range views of the Santa Ana Mountains are generally available throughout much of the Planning Area. Long-range views of the Pacific Ocean are also afforded from public trails, parks, and streets within the southern portion of the Planning Area, such as Aliso Summit Trail, Laguna Ridge Trail, Colinas Bluff Trail, and Long View Trail. Views of these scenic resources are highly dependent on topographic features of the area and atmospheric conditions. Publicly accessible long-range views are primarily provided from elevated locations at public trails, parks, and streets within the Planning Area. Other features that contribute to the visual character within the Planning Area include open space areas, trees and landscaping, the density and distribution of existing development, and the architecture of the built environment.

5.8.2 Scenic Highways

No eligible or designated State Scenic Highways exist within the Planning Area.[2] The nearest officially designated State Scenic Highway is a portion of State Route 91 (SR-91) in the City of Anaheim, beginning at the intersection of SR-91 and SR-55. The portion of SR-91 that is officially designated as a State Scenic Highway is located approximately 20 miles north of the Planning Area; the Planning Area is not within the viewshed of this State Scenic Highway. The nearest eligible State Scenic Highways include a portion of SR-1 from the City of Long Beach to the intersection of Interstate 5 (I-5) in Dana Point, approximately 0.25-miles west of the City at its closest point; a portion of I-5 from San Diego to the intersection of SR-74 near San Juan Capistrano, approximately one mile southeast of the City at its closest point; and a

[2] California Department of Transportation, *California State Scenic Highway System Map*, https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa, accessed March 18, 2025.

portion of SR-74 from its intersection with I-5 to Idyllwild, approximately 1.2 miles east of the City at its closest point.

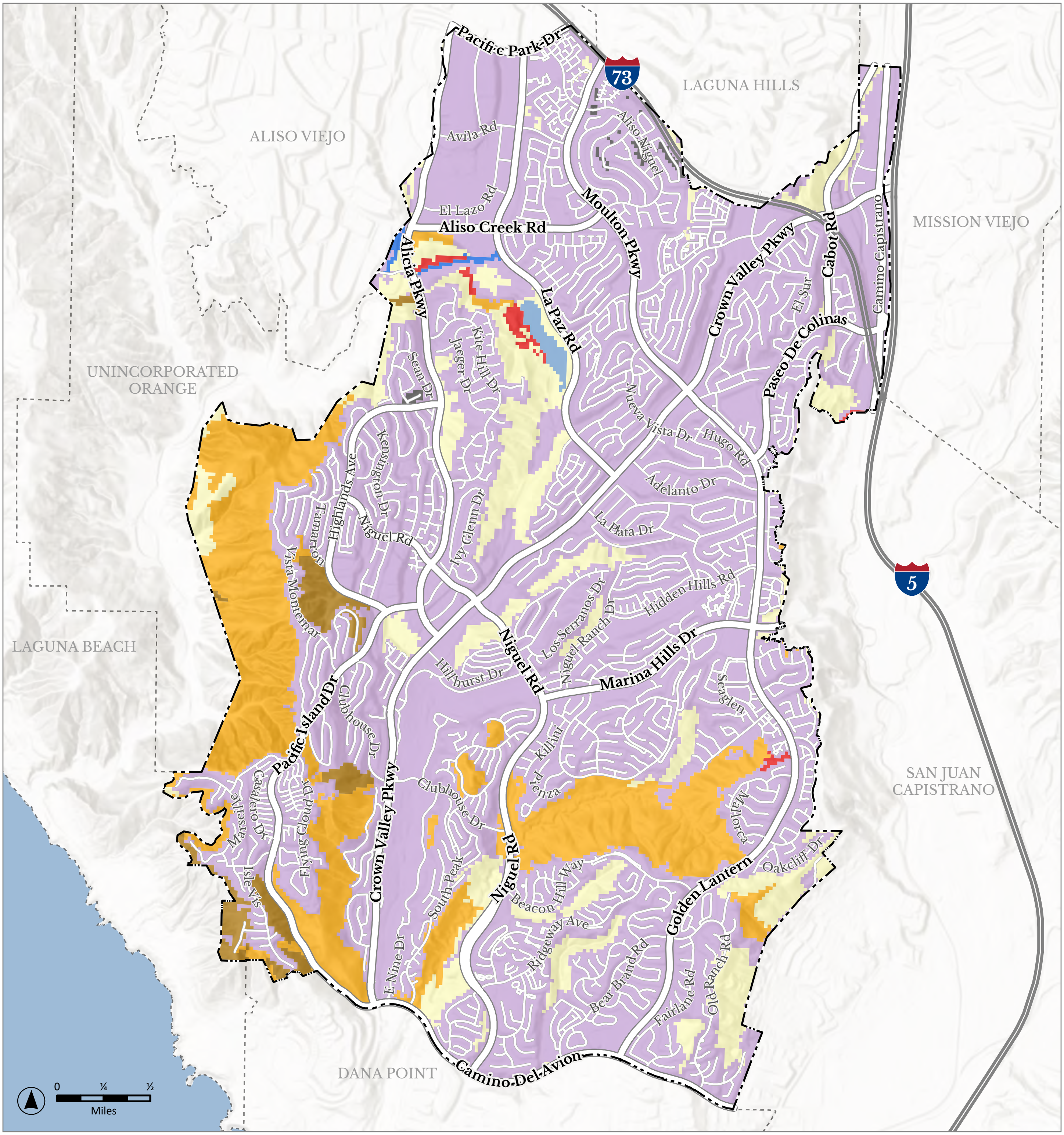
While there are no designated State Scenic Highways, Laguna Niguel has identified multiple thoroughfares that are designated as Landscape Corridors, which are valued for their scenic character and intended to enhance the driving experience and overall visual quality of the community.[3] These routes are consistent with the County of Orange Master Plan of Scenic Highways, apart from the addition of the portion of Alicia Parkway between Aliso Creek Road and Crown Valley Parkways and Pacific Island Drive. Adjacent landscaping and public and private properties contribute to the visual appeal of Landscape Corridors and help soften the transition to surrounding developed areas. See Figure 5-13, for a map of designated Landscape Corridors within Laguna Niguel.

5.8.3 References

California Department of Transportation, 2023. *California State Scenic Highways.* https://dot.ca.gov/programs/design/lap-landscape-architecture-and-community-livability/lap-liv-i-scenic-highways, accessed August 17, 2023.

City of Laguna Niguel, 1992. *City of Laguna Niguel General Plan.*

[3] City of Laguna Niguel, 1992. *City of Laguna Niguel General Plan.*



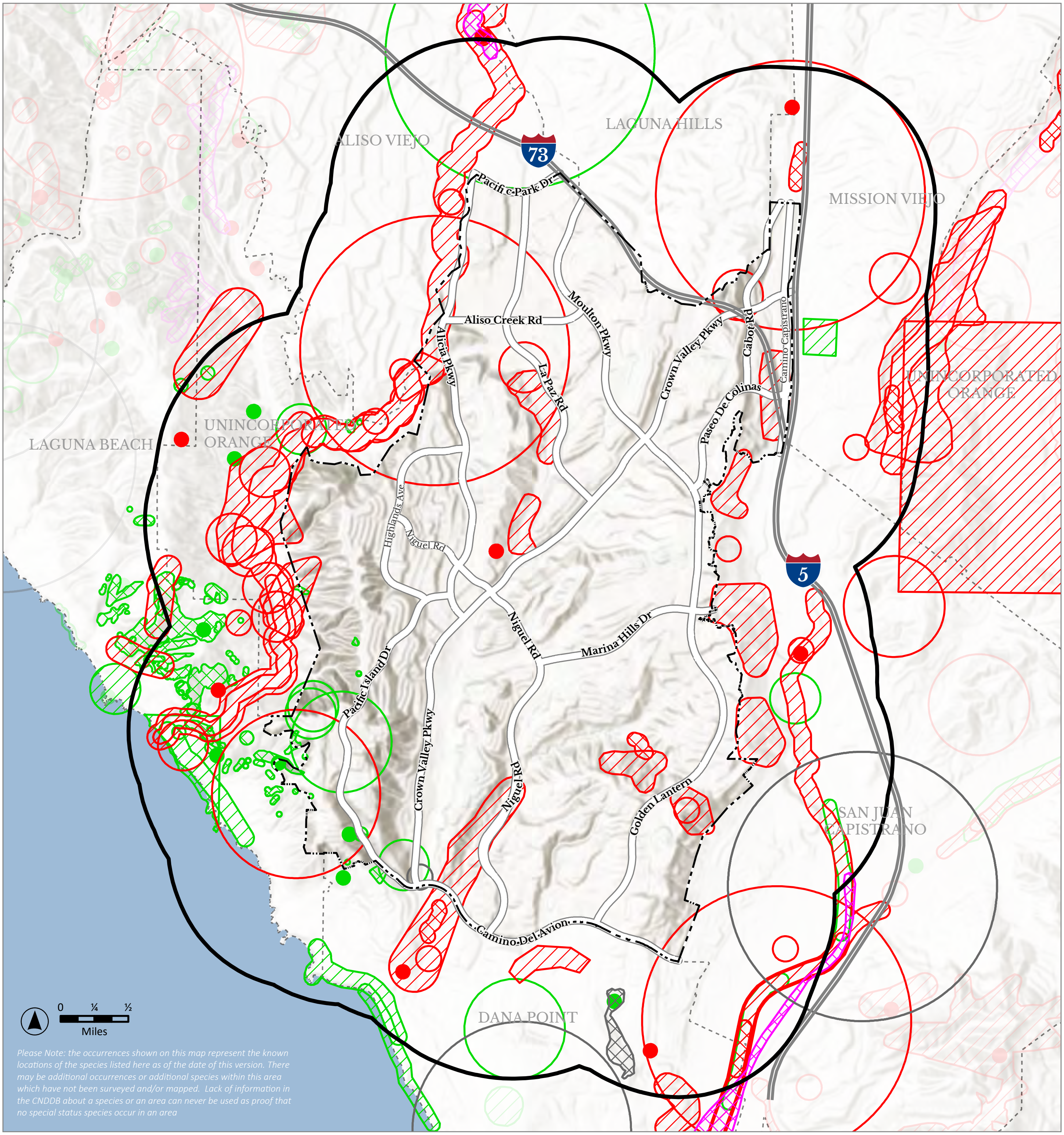
Data sources: CALFIRE/FRAP 2015; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 2, 2023

LEGEND

- Laguna Niguel City Boundary
- Other Jurisdictions
- Annual Grassland
- Coastal Scrub
- Mixed Chaparral
- Eucalyptus
- Lacustrine
- Valley Foothill Riparian
- Urban
- Barren

Figure 5-1.
Land Cover Types



Data sources: CNDDB 10/3/2023; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 23, 2023

LEGEND

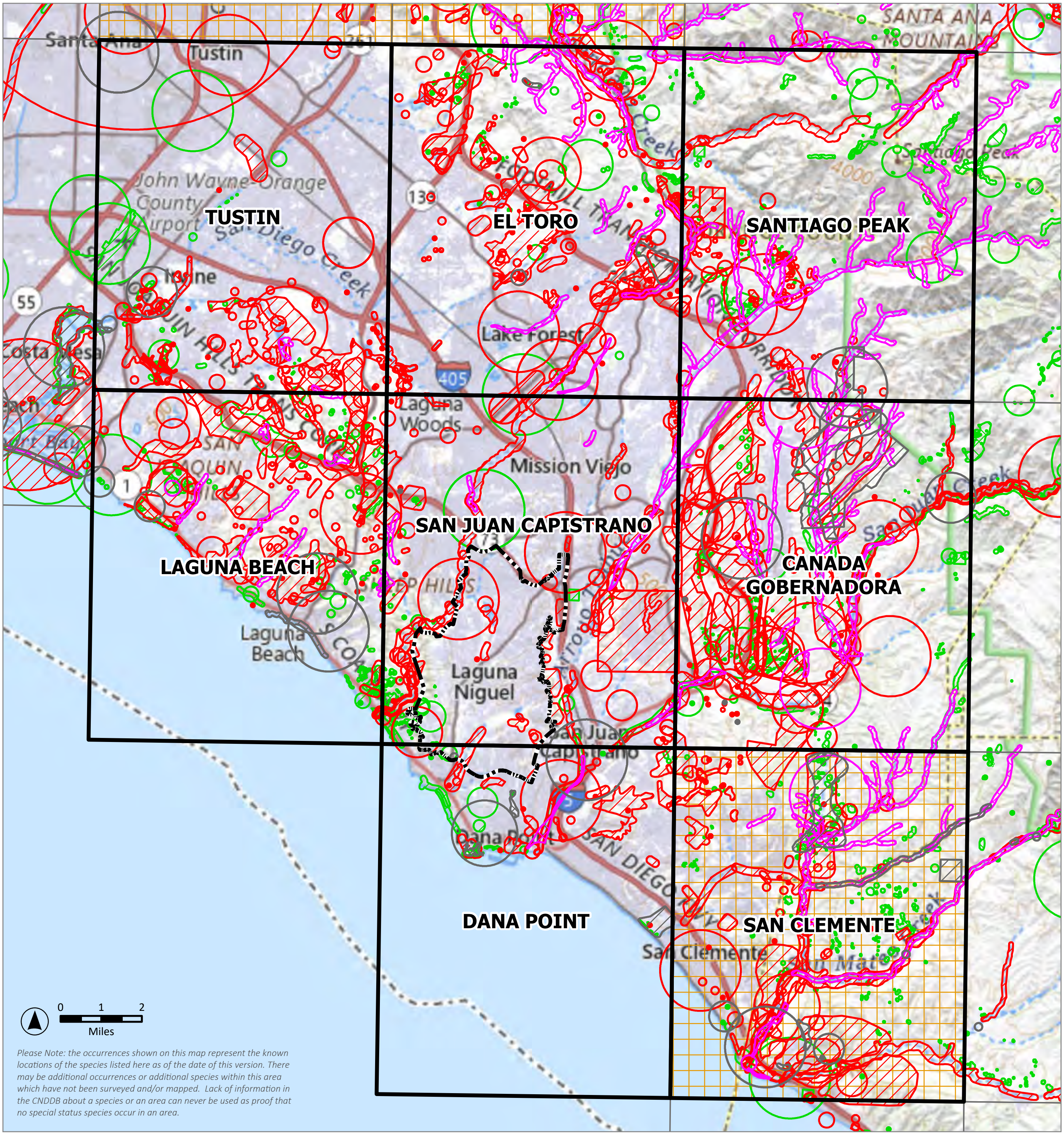
- Laguna Niguel City Boundary
- Other Jurisdictions

Special Status Species Occurrence

- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (specific)
- Multiple (specific)
- Multiple (circular)

Figure 5-2.

California Natural Diversity Database 1-mile Search



Data sources: CNDDB 10/3/2023; City of Laguna Niguel; Orange County GIS; USGS Topographic Map Service.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 23, 2023

LEGEND

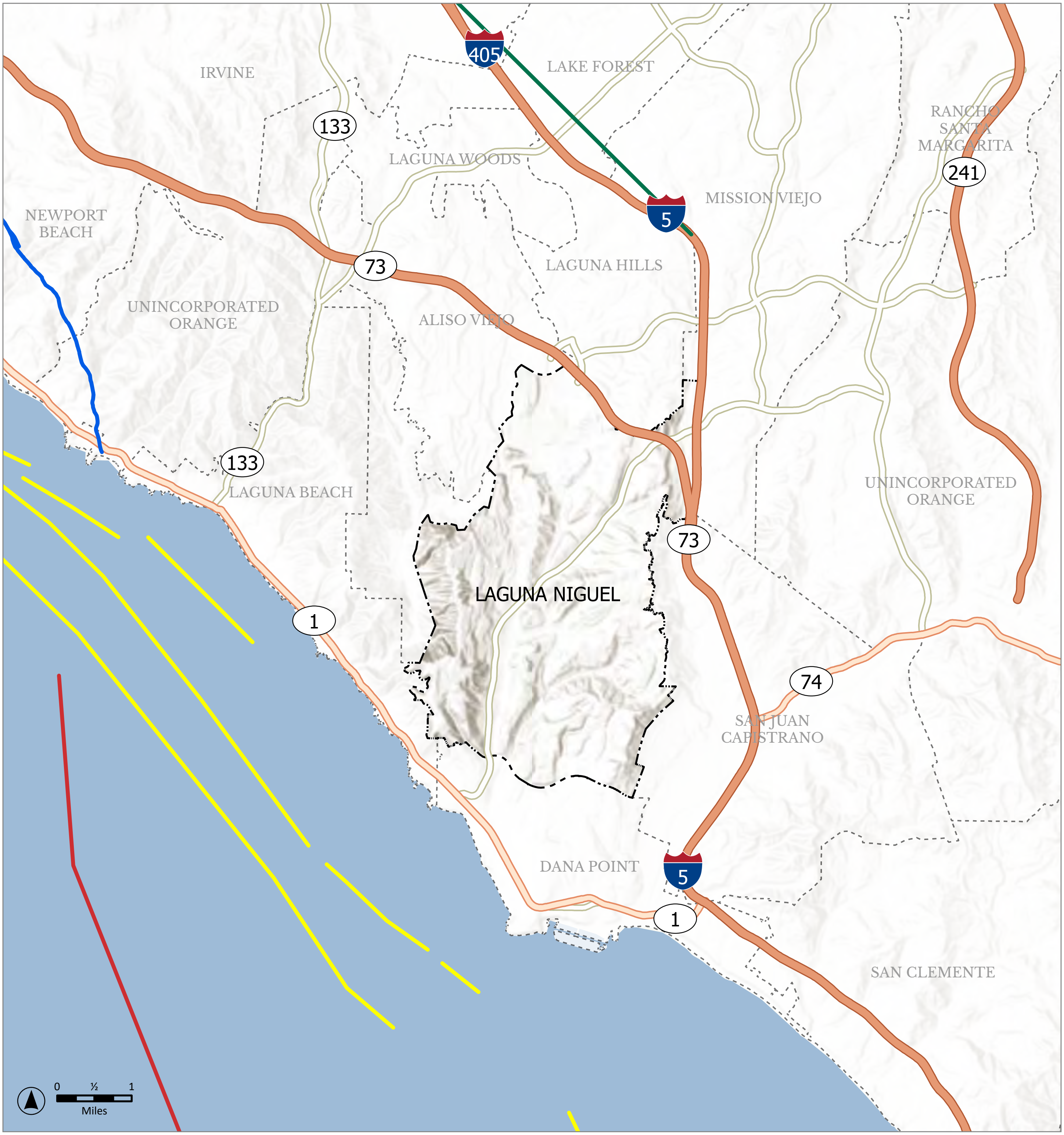
- Laguna Niguel City Boundary

Special Status Species Occurrence

- Sensitive Environmental Occurrence
- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (specific)
- Terrestrial Comm. (circular)
- Multiple (80m)
- Multiple (specific)
- Multiple (non-specific)
- Multiple (circular)

Figure 5-3.

California Natural Diversity Database 9-quad Search



Data sources: USGS; City of Laguna Niguel; Orange County GIS.

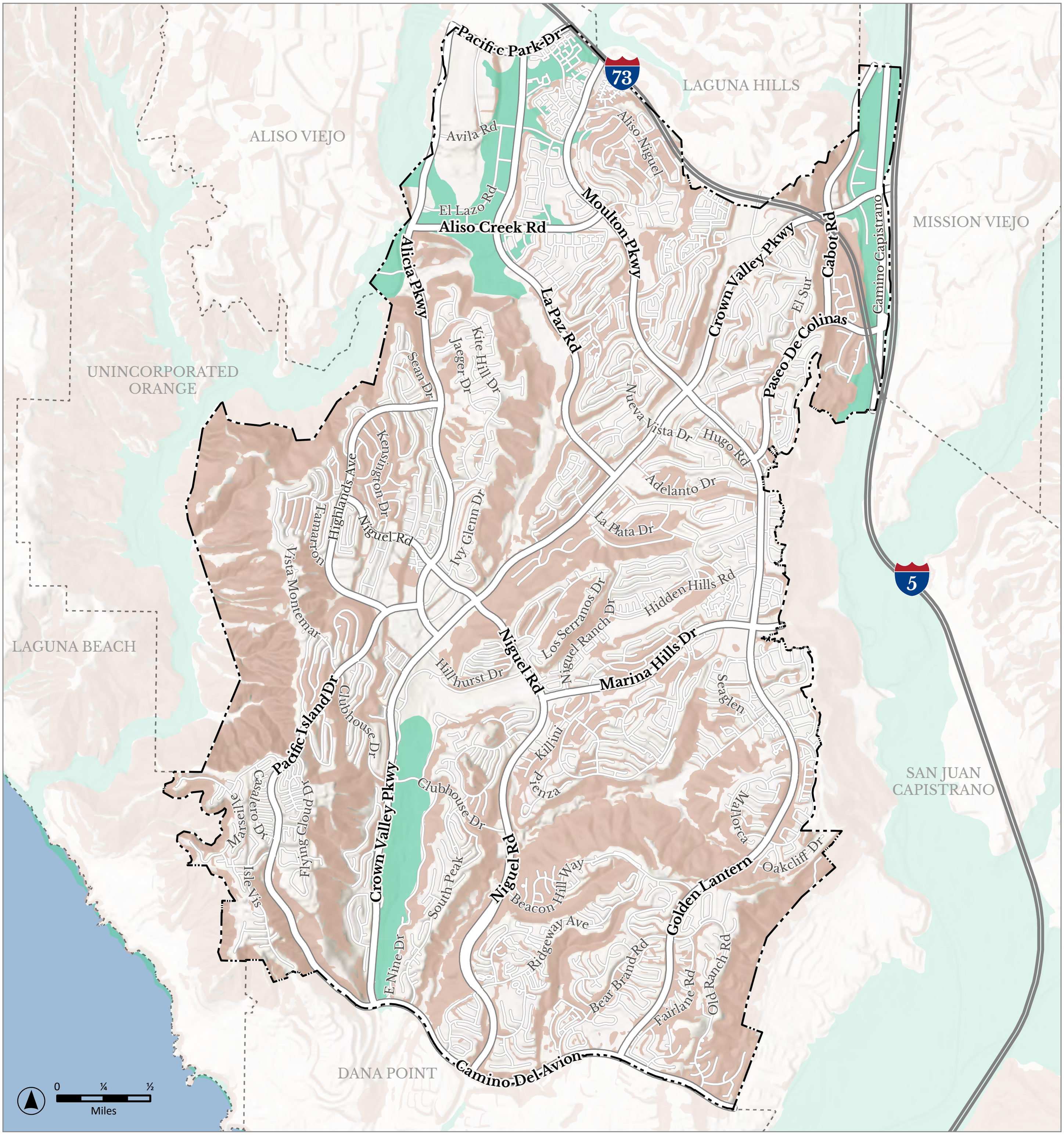
Prepared for the City of Laguna Niguel by De Novo Planning Group
October 26, 2023

LEGEND

- Laguna Niguel City Boundary
- Other Jurisdictions
- Newport-Inglewood-Rose Canyon fault zone
- Oceanside fault
- Pelican Hill fault
- San Joaquin Hills thrust

Figure 5-4.

Geologic Faults



Data sources: CGS Information Warehouse, Seismic Hazards Zonation Program (Dana Point/San Juan Capistrano/Laguna Beach quads); City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 2, 2023

LEGEND

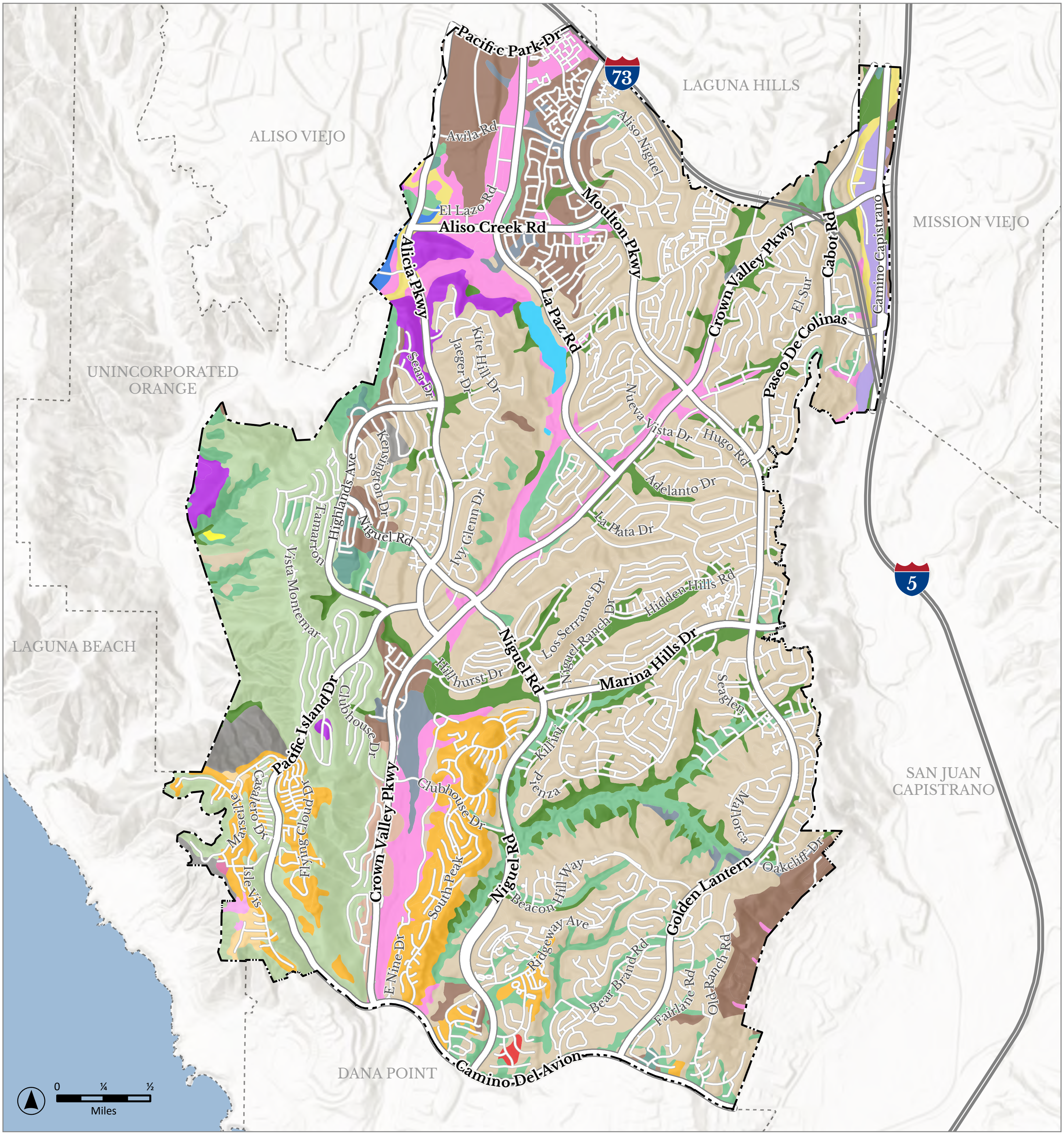
- Laguna Niguel City Boundary
- Other Jurisdictions

Seismic Hazard Zones

- Liquefaction Zone
- Landslide Zone

Figure 5-5.

Seismic Hazard Zones



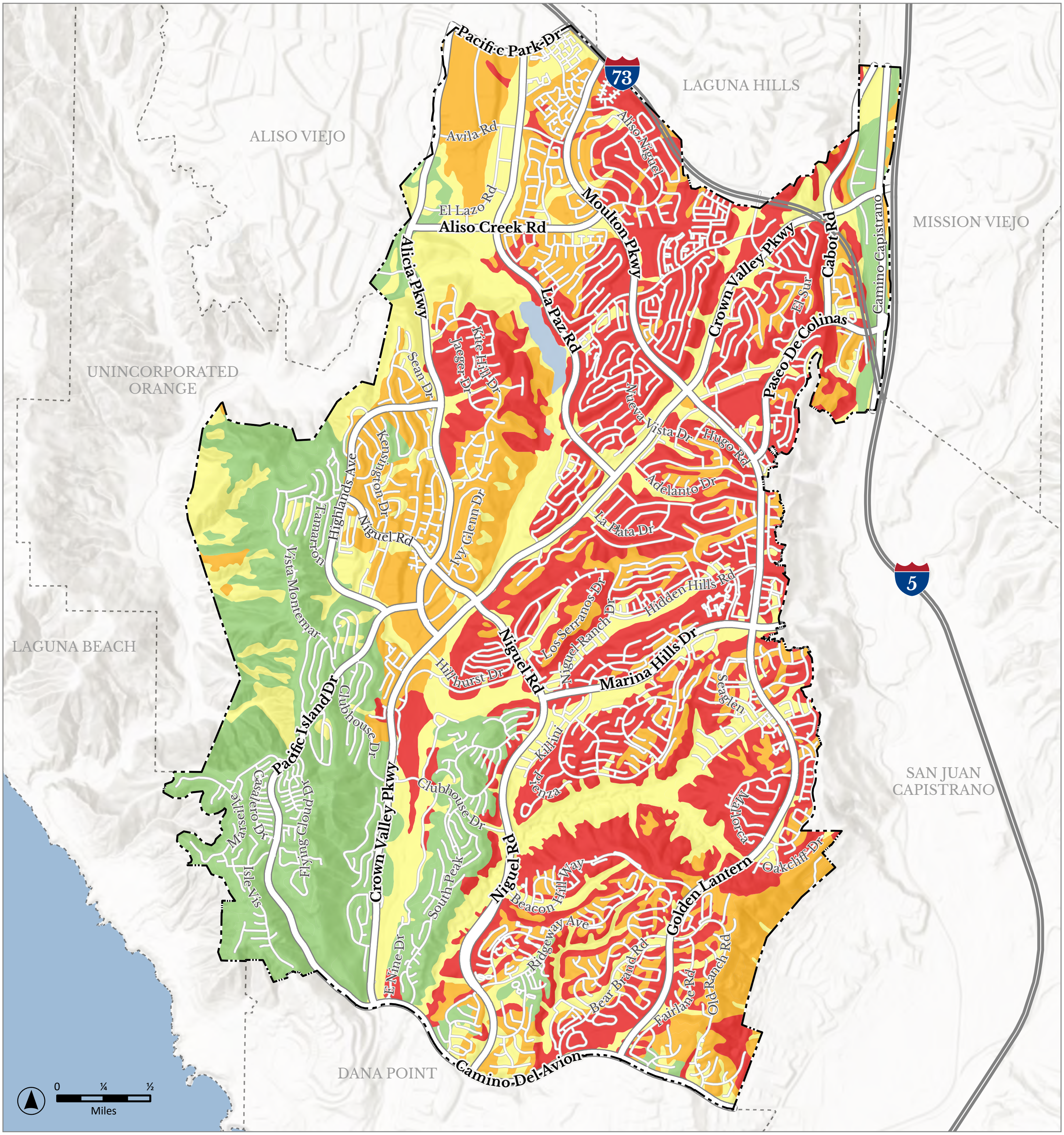
Data sources: NRCS Web Soil Survey, CA678 v16, 9/6/2022; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
September 21, 2023

LEGEND

- Laguna Niguel City Boundary
- Other Jurisdictions
- Alo clay
- Balcom clay loam
- Beaches
- Bolsa silty clay loam
- Bosanko clay
- Botella loam/clay loam
- Calleguas clay loam
- Capistrano sandy loam
- Chesterton loamy sand
- Chino silty clay loam
- Cieneba-Rock outcrop complex
- Corralitos loamy sand
- Cropley clay
- Modjeska gravelly loam
- Myford sandy loam
- Riverwash
- Rock outcrop-Cieneba complex
- Soboba cobbly loamy sand
- Soper gravelly loam/ rock outcrop complex
- Sorrento loam
- Yorba gravelly sand
- Water

Figure 5-6.
Soils Map



Data sources: NRCS Web Soil Survey, CA678 v16, 9/6/2022; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
September 21, 2023

LEGEND

Laguna Niguel City Boundary

Other Jurisdictions

Shrink-Swell Potential of Soil*

- Low
- Moderate
- High
- Very High

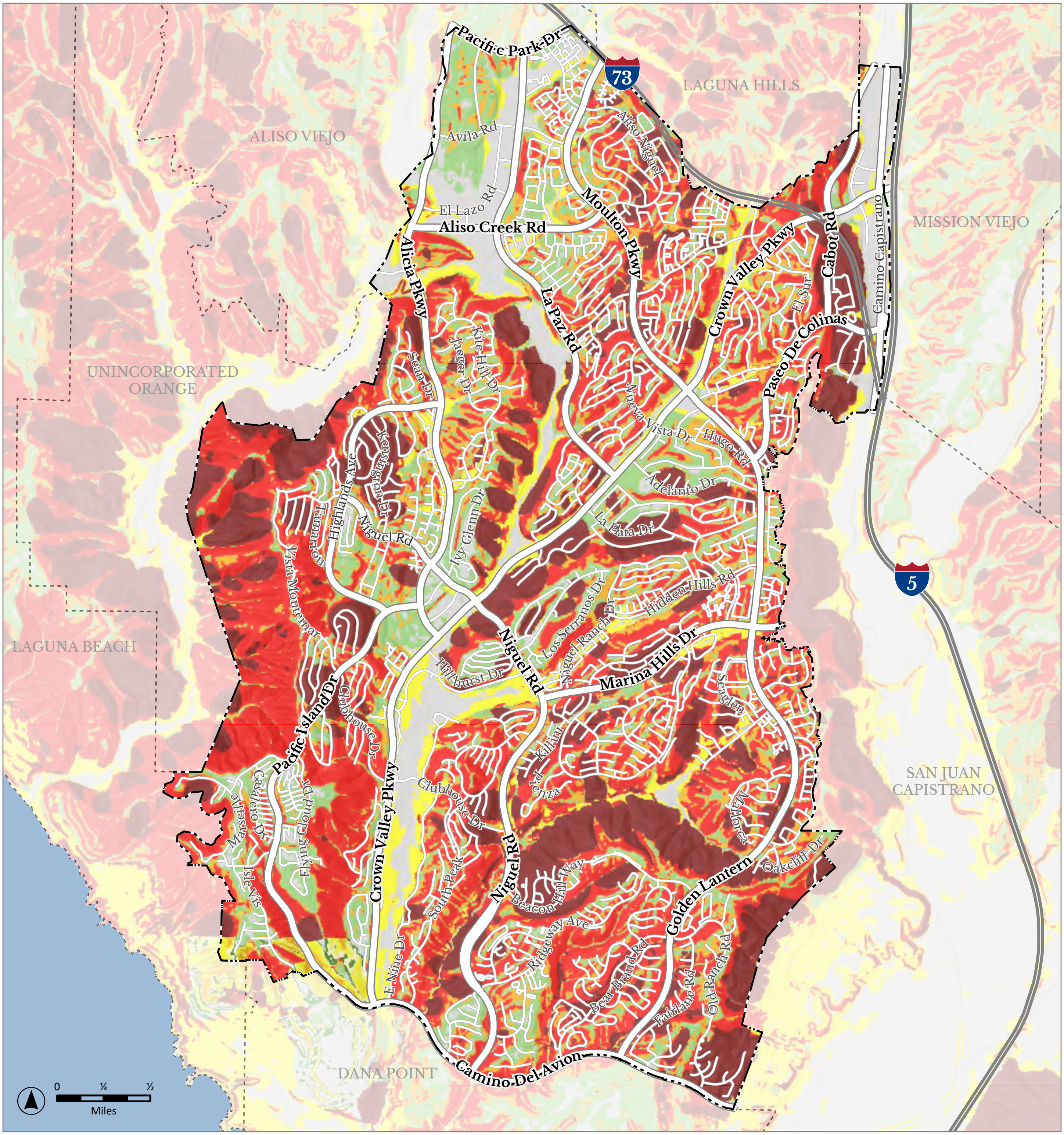
** Shrink-Swell Potential is based on a linear extensibility rating. Linear extensibility refers to the change in volume of an unconfined clod of soil as moisture content is decreased from a moist to a dry state. The volume change is reported as percent change for the whole soil.*

A map unit is typically composed of one or more soil/rock components. Each of these components may have its own linear extensibility rating. For mapping purposes, these individual ratings are aggregated into a single value that represents the map unit as a whole. For each map unit, linear extensibility is actually recorded as three separate values: a low value, a high value, and a "representative" value. The "representative" value indicates the expected value for the soil component. This map is based on the "representative" value of each aggregated map unit, using the Weighted Average Aggregation method where percent composition is the weighting factor.

Map units with a representative values of 0-3% linear extensibility are considered Low for shrink-swell potential. Ratings of 3-6% are considered moderate. Ratings of 6-9% are considered high, and ratings above 9% are very high. Some map units are not rated.

Figure 5-7.

Shrink-Swell Potential of Soils



Data sources: California Geological Survey Map Sheet 58, Susceptibility to Deep-Seated Landslides in California, 2011; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 2, 2023

LEGEND

Laguna Niguel City Boundary

Other Jurisdictions

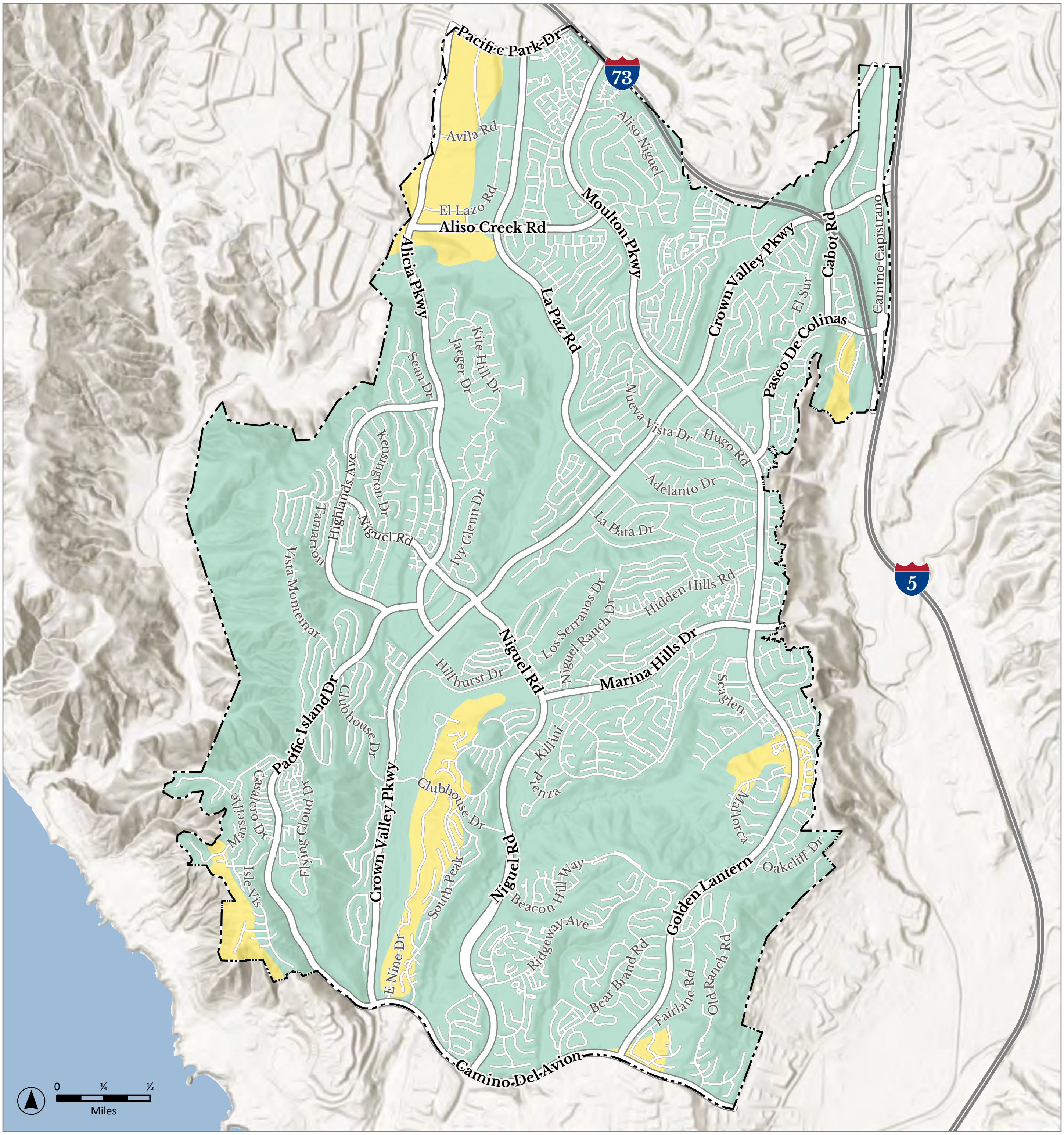
Landslide Susceptibility Class

increasing susceptibility

0 3 5 6 7 8 9 10

Figure 5-8.

Landslide Susceptibility



Data sources: California Department of Conservation Division of Mines and Geology, Open-File Report 94-15, Update of Mineral Land Classificatoin of the Portland Cement Concrete Aggregate in Ventura, Los Angeles, and Orange Counties, California, Part III - Orange County, 1994; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 26, 2023

LEGEND

- Laguna Niguel City Boundary
- Other Jurisdictions
- MRZ-1: Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ-3: Areas containing mineral deposits the significance of which cannot be evaluated from available data.

Figure 5-9.

Mineral Resource Zones

Data sources: USGS Watershed Boundary Dataset; California State Geoportal; City of Laguna Niguel; Orange County GIS.

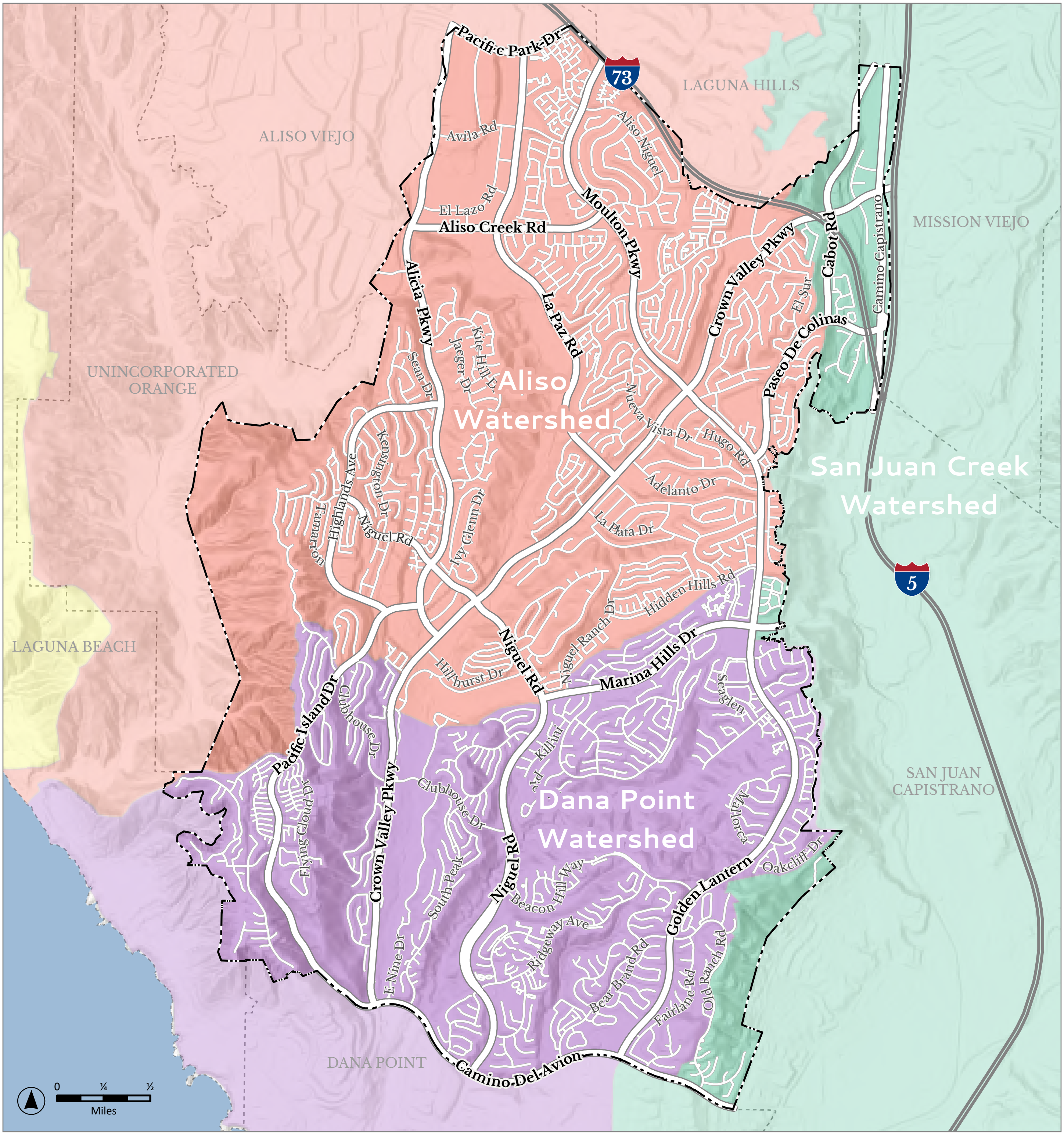
Prepared for the City of Laguna Niguel by De Novo Planning Group
October 26, 2023

LEGEND

Laguna Niguel City Boundary
California State Boundary
Hydrologic Basins (HU-6)
Laguna-San Diego Coastal
Salton Sea
Santa Ana
Hydrologic Subbasins (HU-8)

Figure 5-10.

Hydrologic Basins



Data sources: Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
February 9, 2024.

LEGEND

Laguna Niguel City Boundary

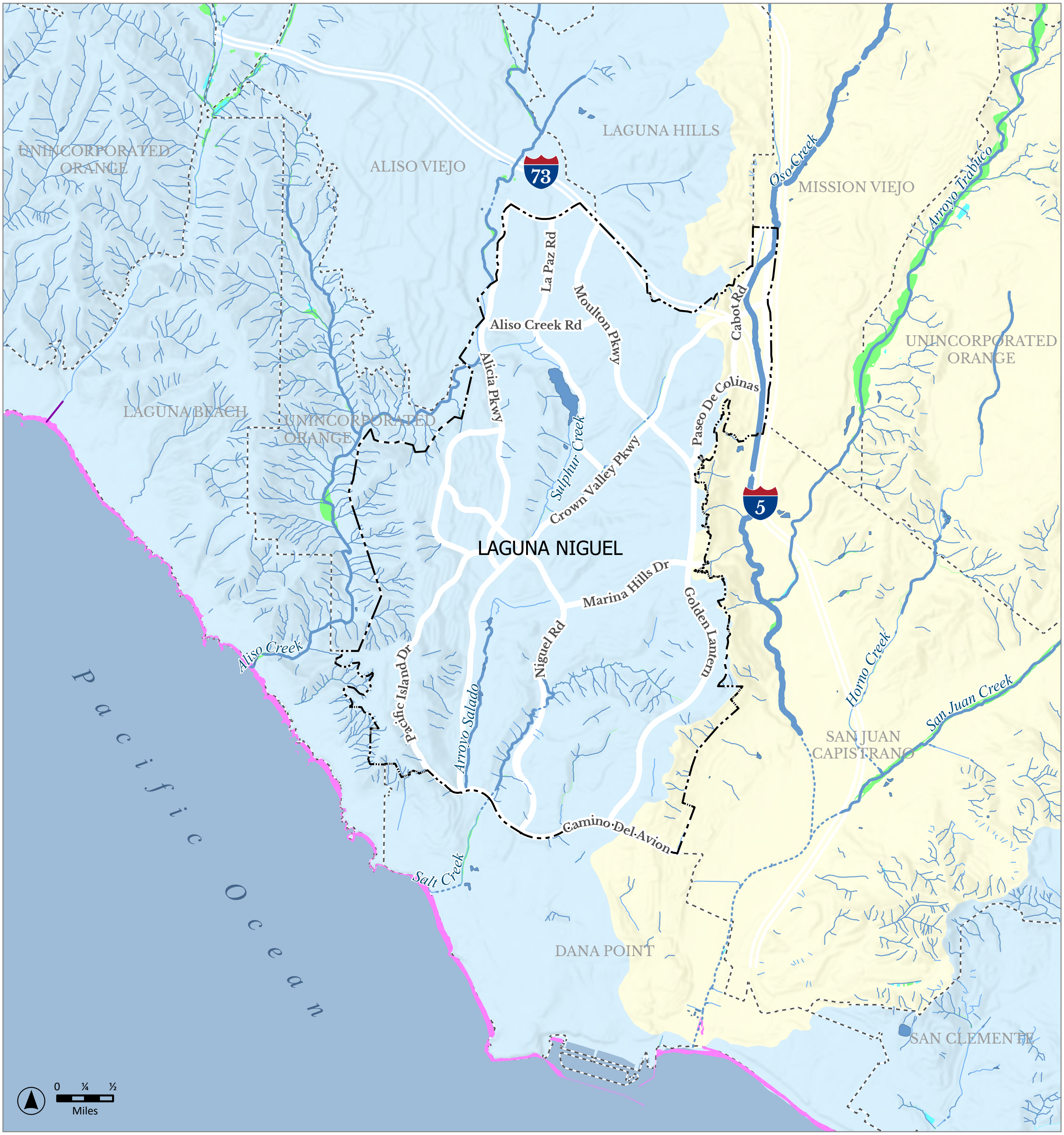
Other Jurisdictions

Regional Watersheds

- Aliso
- Dana Point
- Laguna Coast
- San Juan Creek

Figure 5-11.

Regional Watersheds



Data sources: USGS Watershed Boundary Dataset and National Wetlands Inventory; City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
October 26, 2023

LEGEND

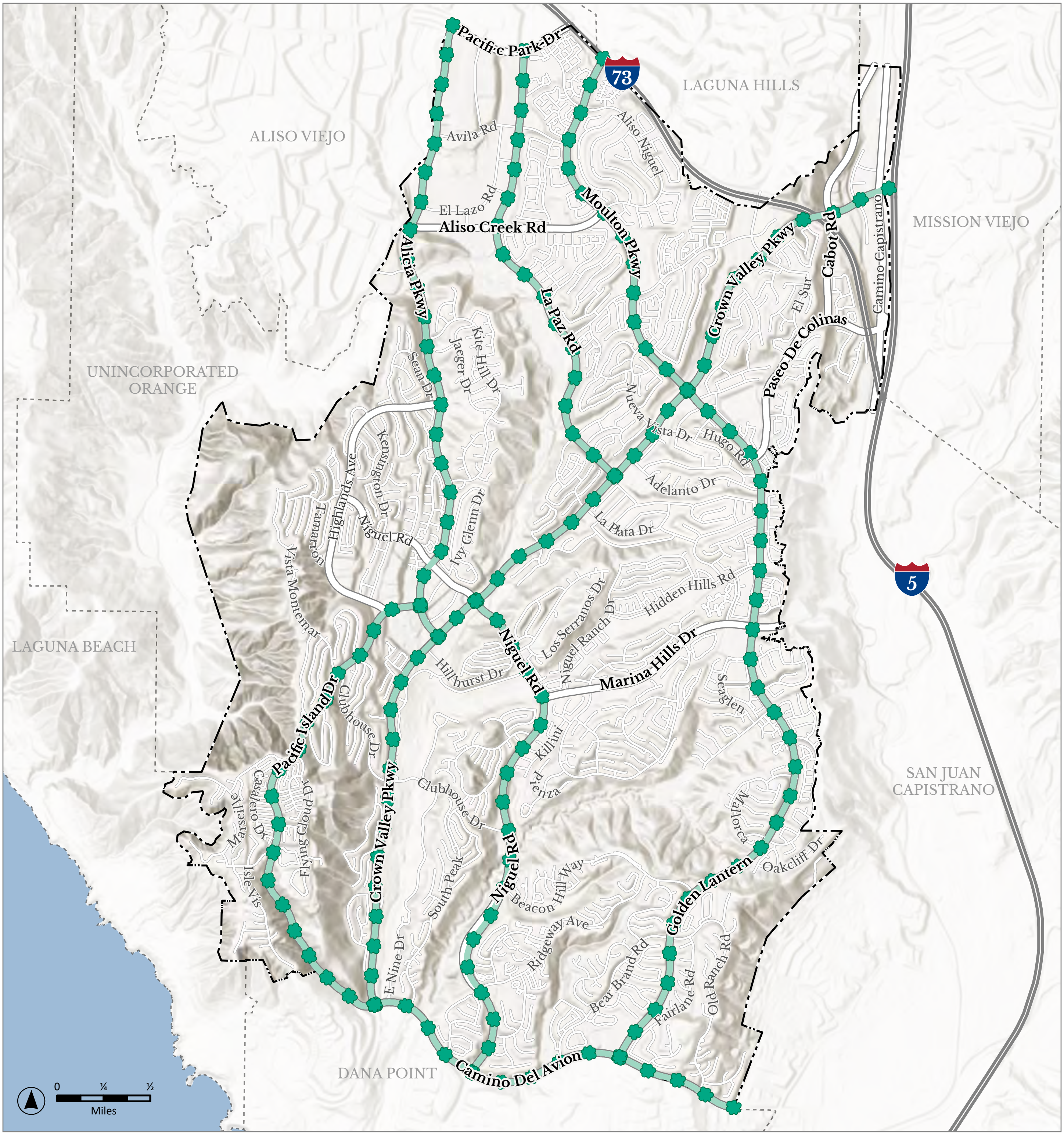
Laguna Niguel City Boundary

Watersheds (HU-10)
- Aliso Creek-Frontal Gulf of Santa Catalina
- San Juan Creek

Water Features
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Connector/Artificial Path
- Canal/Ditch
- Underground Pipeline
- Lake/Pond/Reservoir

Wetlands
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

Figure 5-12.
Watersheds and Surface Water



Data sources: City of Laguna Niguel; Orange County GIS.

Prepared for the City of Laguna Niguel by De Novo Planning Group
September 12, 2023

LEGEND

Laguna Niguel City Boundary

Other Jurisdictions

Landscape Corridors

Figure 5-13.

Landscape Corridors