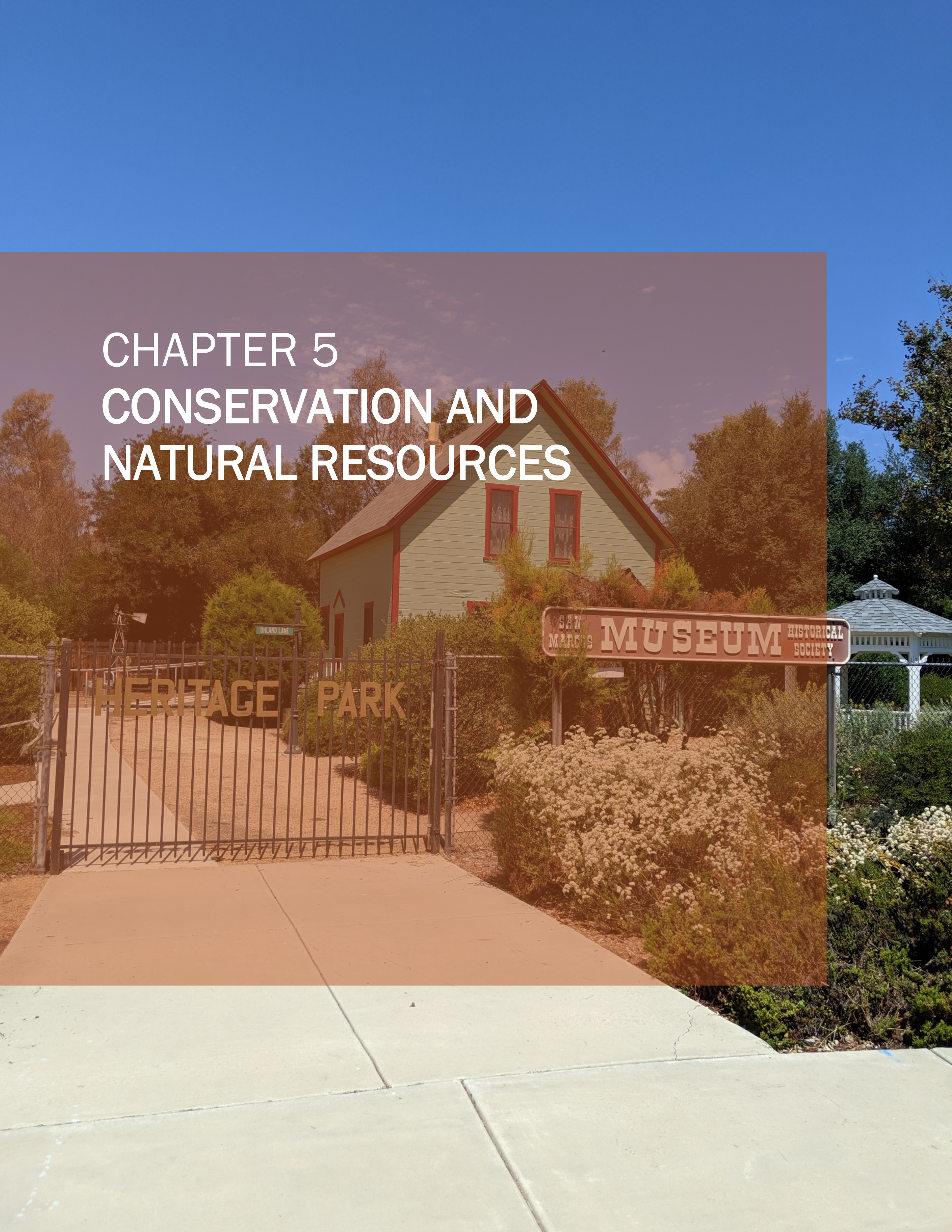
CHAPTER 5
CONSERVATION AND NATURAL RESOURCES



5 CONSERVATION AND NATURAL RESOURCES

The city's natural resources form an important part of its unique character and quality of life. In an effort to identify and understand the key natural resources of the city, this chapter is divided into the following sections **[CULTURAL AND HISTORIC RESOURCES TO BE PROVIDED UNDER SEPARATE COVER]**:

- 5.1 Biological Resources
- 5.2 Air Quality
- 5.3 Greenhouse Gases
- 5.4 Geology, Soils, and Seismicity
- 5.5 Mineral Resources
- 5.6 Hydrology and Water Quality
- 5.7 Visual Resources and Community Image

5.1 BIOLOGICAL RESOURCES

This section describes biological resources in the Planning Area. There are a number of 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 existing City of San Marcos General Plan identifies the following policies related to biological resources.

Element	Topic Area	Goal	Policy
Conservation and Open Space Element	Natural Resources	Goal COS-1: Identify, protect, and enhance significant ecological and biological resources within San Marcos and its adaptive Sphere of Influence.	Policy 1.1: Support the protection of biological resources through the establishment, restoration, and conservation of high-quality habitat areas. Policy 1.2: Ensure that new development, including Capital Improvement Projects, maintain the biotic habitat value of riparian areas, oak woodlands, habitat linkages, and other sensitive biological habitats. Policy 1.3: Continue to work with other federal, State,

		Goal COS-2: The City is committed to conserving, protecting, and maintaining open space, agricultural, and limited resources for future generations. By working with property owners, local organizations, and State and federal agencies, the City can limit the conversion of resource lands to urban uses.	regional, and local agencies. Policy 2.1: Provide and protect open space areas throughout the City for its recreational, agricultural, safety, and environmental value. Policy 2.2: Limit, to the extent feasible, the conversion of open space to urban uses and place a high priority on acquiring and preserving open space lands for recreation, habitat protection and enhancement, flood hazard management, water and agricultural resources protection, and overall community benefit. Policy 2.3: Protect existing agricultural areas, encourage farm to consumer, promote public health, and promote small-scale agriculture such as community gardens and the growing of organic produce. Policy 2.6: Preserve healthy mature trees where feasible; where removal is necessary, trees shall be replaced at a ratio of 1:1.

Source: City of San Marcos General Plan, 2012

5.1.1 Environmental Setting

The City of San Marcos is located in the northwestern portion of San Diego County. San Marcos is bordered by the City of Vista to the northwest, Escondido to the east, Carlsbad to the west, and Encinitas to the southwest. San Marcos is located approximately 40 miles north of downtown San Diego.

San Marcos is included in numerous regional efforts to protect local biological resources. These regional efforts include the San Diego Association of Government's (SANDAG) Multiple Habitat Conservation Program (MHCP), and County of San Diego's North County Multiple Species Conservation Program (MSCP).

Bioregions

San Marcos is located within the Southern California Coast bioregion. This bioregion is bounded on the north by the southern edge of the Los Padres National Forest and the northern base of the San Gabriel and San Bernardino Mountains. This bioregion is bounded on the east by the western edge of the Bureau of Land Management (BLM) California Desert Conservation Area, and is bordered on the south by the Mexican border. Landscapes in this bioregion range from flatlands to mountains, and ecosystems range from ocean to desert. The region also contains two of California's largest cities (Los Angeles and San Diego). More than any other bioregion in the State, urbanization has caused intense effects on natural resources. Urbanization in the Southern California Coast bioregion has resulted in the loss of habitat, spread of nonnative species, and the loss of native species.

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 existing General Plan, a majority of wildlife movement within San Marcos occurs within the northern and southern portions of the City. The central portion of the City is not as hospitable to wildlife movement given the urban environment. Of the limited wildlife movement that occurs within the urbanized portions of the City, a majority occurs along riparian creeks and drainage corridors, including San Marcos Creek, Las Posas Creek, Twin Oaks Valley Creek, Buena Creek, Agua Hedionda Creek, and some tributaries

SANDAG North County Multiple Habitat Conservation Program

The Multiple Habitat Conservation Program (MHCP) is a comprehensive conservation planning process that addresses the needs of multiple plant and animal species in North Western San Diego County (CDFW, 2021). The MHCP encompasses the cities of Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista. Its goal is to conserve approximately 19,000 acres of habitat, of which roughly 8,800 acres (46 percent) are already in public ownership and contribute toward the habitat preserve system for the protection of more than 80 rare, threatened, or endangered species.

Development of the MHCP subarea plan for San Marcos is ongoing. The MHCP Subregional Plan and Final Environmental Impact Statement / Environmental Impact Report (EIS/EIR) were adopted and certified by the SANDAG Board of Directors on March 28, 2003. Subarea plans for the cities of

Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, and Vista are being prepared and must be adopted by each City Council and implementing agreements with the CDFW and USFWS must be signed before incidental take permits can be issued. The City of Solana Beach does not need to prepare a subarea plan. To date, only one subarea plan has been completed in the City of Carlsbad (County of San Diego, 2019).

Coordinated through SANDAG, the MHCP is one of three subregional habitat conservation planning programs in the region that, together, will contribute to a coordinated preserve system for the San Diego region and Southern California. With the preserve area defined in advance of development, builders will know where new homes, employment, and commercial centers can be placed. When completed, the habitat preservation areas will serve as a key component of the region's smart growth efforts by preserving habitat and open space and by directing forecasted growth into appropriate areas.

County of San Diego North County Multiple Species Conservation Program

The County Multiple Species Conservation Program (MSCP) is a long-term, regional habitat conservation program focused on balancing protection of habitat with recreation, development and agricultural activities. The County's MSCP comprises of three separate planning areas covering the unincorporated regions of San Diego: the South County Plan, draft North County Plan, and draft East County MSCP. The North County Plan Area, which includes portions of the Planning Area, encompasses approximately 316,000 acres and includes over 120,000 acres of existing development with over 58,000 existing dwelling units. Preparation of the North County MSCP is ongoing, with the latest Preliminary Draft North County Plan revised in 2017 (County of San Diego, 2019).

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, one developed, and one non-vegetated.

According to the CWHR System, there are 16 cover types (wildlife habitat classifications) in the Planning Area out of 59 found in the State. These include: Annual Grassland, Barren, Chamise-Redshank Chaparral, Coastal Oak Woodland, Coastal Scrub, Deciduous Orchard, Eucalyptus, Evergreen Orchard, Fresh Emergent Wetland, Irrigated Row and Field Crops, Lacustrine, Mixed Chaparral, Pasture, Perennial Grassland, Urban, and Valley Foothill Riparian.

Table 5-1 identifies the total area by acreage for each cover type (wildlife habitat classification) found in San Marcos and the Sphere of Influence. Figure 5-1 illustrates the location of each cover type (wildlife habitat classification) within San Marcos. A brief description of each cover type is listed below.

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

Name	City Boundary (acres)	Sphere of Influence (acres)	Total Planning Area (acres)
Annual Grassland	966.03	247.61	1,213.64
Barren	179.53	15.40	194.94
Chamise-Redshank Chaparral	18.01	0.00	18.01
Coastal Oak Woodland	0.00	80.15	80.15
Coastal Scrub	2,469.63	573.59	3,043.22
Deciduous Orchard	52.47	792.26	844.73
Eucalyptus	19.35	34.91	54.26
Evergreen Orchard	0.00	57.65	57.65
Fresh Emergent Wetland	10.45	0.00	10.45
Irrigated Row and Field Crops	54.29	385.67	439.96
Lacustrine	13.34	65.16	78.50
Mixed Chaparral	2,356.26	1,369.38	3,725.64
Pasture	139.01	264.40	403.41
Perennial Grassland	3.11	0.00	3.11
Urban	9,229.18	1,530.13	10,759.31
Valley Foothill Riparian	209.53	28.89	238.42
Total	15,720.20	5,445.19	21,165.40

Source: CWHR, 2020.

Developed Cover Types

Deciduous Orchard is typically open single species tree dominated habitats. Depending on the tree type and pruning methods they are usually low, bushy trees with an open understory to facilitate harvest. Deciduous orchards include trees, such as, almonds, apples, apricots, cherries, figs, nectarines, peaches, pears, pecans, pistachios, plums, pomegranates, prunes and walnuts. Trees range in height at maturity for many species from 15 to 30 feet but may be 10 feet or less in pomegranates and some dwarf varieties, or 60 feet or more in pecans and walnuts (Sunset, 1972). Crowns usually touch and are in a linear pattern. Spacing between trees is uniform depending on desired spread of mature trees. The understory is typically composed of low-growing grasses, legumes, and other herbaceous plants, but may be managed to prevent understory growth totally or partially, such as along tree rows.

Evergreen Orchard is typically open single species tree dominated habitats. Depending on the tree type and pruning methods they are usually low, bushy trees with an open understory to facilitate harvest. Evergreen orchards include trees, such as, avocados, dates, grapefruit, lemons, limes, olives, oranges, tangerines, tangelos and tangors. Trees range in height at maturity for many species from 15 to 30 feet but may be 10 feet or less in some dwarf varieties, or 60 feet or more in date palms (Sunset, 1972). Crowns often do not touch and are usually in a linear pattern. Spacing between trees is uniform depending on desired spread of mature trees. The understory is typically composed of low-growing grasses, legumes, and other herbaceous plants, but may be managed to prevent understory growth totally or partially, such as along tree rows.

Irrigated Row and Field Crops occur in association with orchards, vineyards, pasture, urban, and other wildlife habitats such as riparian, chaparral, wetlands, desert, and herbaceous types. They are located on flat to gently rolling terrain. When flat terrain is put into crop production, it usually is leveled to facilitate irrigation. Rolling terrain is usually irrigated by sprinklers. Soils often dictate the crops grown.

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 suburbs. 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 Cover Types

Annual Grassland habitat occurs mostly on flat plains to gently rolling foothills. Climatic conditions are typically Mediterranean, with cool, wet winters and dry, hot summers. The length of the frost-free season averages 250 to 300 days.

Fresh Emergent Wetland habitat occurs on virtually all exposures and slopes, provided a basin or depression is saturated or at least periodically flooded. However, they are most common on level to gently rolling topography. They are found in various landscape depressions or at the edge of rivers or lakes. The length of the frost-free season averages 250 to 300 days. This habitat is characterized by erect, rooted, herbaceous hydrophytes. Dominant vegetation is generally perennial monocots to 6.6 feet tall. All emergent wetlands are flooded frequently, enough so that the roots of the vegetation prosper in an anaerobic environment.

Pasture vegetation is a mix of perennial grasses and legumes that normally provide 100 percent canopy closure. Heights of vegetation varies, according to season and livestock stocking levels, from a few inches to two or more feet on fertile soils before grazing.

Perennial Grassland habitats occur in two forms in California: coastal prairie, found in areas of northern California under maritime influence, and relics in habitats now dominated by annual grasses and forbs. Perennial Grassland habitat typically occurs on ridges and south-facing slopes, alternating with forest and scrub in the valleys and on north-facing slopes. Perennial Grassland habitats are most often found on Mollisols.

Hardwood Woodland Cover Types

Coastal Oak Woodland habitats occupy a variety of Mediterranean type climates that vary from north to south and west to east. Precipitation occurs in the milder winter months, almost entirely as rainfall, followed by warm to hot, dry summers. Near the coast, the summers are tempered by fogs and cool, humid sea breezes. Mean annual precipitation varies from about 40 inches in the north to about 15 inches in southern and interior regions. Mean minimum winter temperatures are 29 to 44 °F, and the mean maximum summer temperatures are 75 to 96 °F. The growing season ranges from six months (180 frost-free days) in the north to the entire year in mild coastal regions to the south. The soils and parent material on which coastal oak woodlands occur are extremely variable. Coastal oak woodlands generally occur on moderately to well-drained soils that are moderately deep and have low to medium fertility.

Valley Foothill Riparian habitats are found in valleys bordered by sloping alluvial fans, slightly dissected terraces, lower foothills, and coastal plains. They are generally associated with low velocity flows, flood plains, and gentle topography. Valleys provide deep alluvial soils and a high water table. The substrate is coarse, gravelly, or rocky soils more or less permanently moist, but probably well aerated. Frost and short periods of freezing occur in winter (200 to 350 frost-free days). This habitat is characterized by hot, dry summers and mild and wet winters. Temperatures range from 75 to 102 °F in the summer to 29 to 44 °F in the winter. Average precipitation ranges from 6 to 30 inches, with little or no snow. The growing season is seven to 11 months.

Tree-Dominated Cover Types

Eucalyptus habitat occurs from San Diego and Imperial counties in the south, usually at elevations below 1,500 feet, but it has been found up 2,100 feet; and to Shasta in the north. However, most eucalyptus is found around populated areas of southern and central California. 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.

Shrub-Dominated Cover Types

Chamise-Redshank Chaparral habitat structure is influenced by fire. Mature Chamise-Redshank Chaparral is single layered, generally lacking well-developed herbaceous ground cover and overstory trees. Shrub canopies frequently overlap, producing a nearly impenetrable canopy of interwoven branches. Chamise-dominated stands average 3.3 to 6.6 feet in height but can reach 9.8 feet. Total shrub cover frequently exceeds 80 percent but may be considerably lower on extremely xeric sites with poor soils. Redshank stands are slightly taller, averaging 6.6 to 13.1 feet but occasionally reach 19.7 feet. Mature redshank frequently is more open than chamise and can have sparse herbaceous cover between shrubs. Composition in southern California includes white sage, black sage, and California buckwheat, which are common at lower elevations and on recently disturbed sites.

Coastal Scrub habitat is 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 12 inches. However, coastal scrub habitat also regularly occurs on stabilized dunes, flat terraces, and moderate slopes of all aspects where average annual rainfall is up to 24 inches. Stand composition and structure differ markedly in response to these physiographic features.

Mixed Chaparral is a structurally homogeneous brushland type dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. Shrub height and crown cover vary considerably with age since last burn, precipitation regime, aspect, and soil type. At maturity, cismontane Mixed Chaparral typically is a dense, nearly impenetrable thicket with greater than 80 percent absolute shrub cover. Canopy height ranges from 3.3 to 13.1 feet., occasionally to 19.6 feet. Mixed Chaparral is a floristically rich type that supports approximately 240 species of woody plants. Composition changes between northern and southern California and with precipitation regime, aspect, and soil type. Dominant species in cismontane Mixed Chaparral include scrub oak, chaparral oak, and several species of ceanothus and manzanita.

Aquatic Cover Types

Lacustrine habitats are inland depressions or dammed riverine channels containing standing water. These habitats may occur in association with any terrestrial habitats, Riverine, or Fresh Emergent Wetlands. They may vary from small ponds less than one acre to large areas covering several square miles. Depth can vary from a few inches to hundreds of feet. Typical lacustrine habitats include permanently flooded lakes and reservoirs, and intermittent lakes and ponds (including vernal pools) so shallow that rooted plants can grow over the bottom. Most permanent lacustrine systems support fish life; intermittent types usually do not.

Non-Vegetated Habitats

Barren habitat is defined by the absence of vegetation, and habitat with less than 2% total vegetation cover by herbaceous, desert, or non-wildland species, and less than 10% cover by tree or shrub species. Structure and composition of the substrate is largely determined by the region of the State and surrounding environment. 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: Escondido, Valley Center, San Marcos, Rancho Santa Fe (referred to herein as four-quad search area), and a one-mile search area of the City SOI.

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 41 special status plant species within the four-quad search area. Of these 41 special status plant species, 23 species are located within one-mile of the SOI.

Table 5-2 provides a list of special status plant species that are documented within one-mile of the San Marcos Sphere of Influence, 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 four-quad search area.

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

Scientific Name	Common Name	Federal Status	State Status	CNPS*
Adolphia californica	California adolphia	None	None	2B.1
Isocoma menziesii var. decumbens	decumbent goldenbush	None	None	1B.2
Arctostaphylos glandulosa ssp. crassifolia	Del Mar manzanita	Endangered	None	1B.1
Corethrogyne filaginifolia var. linifolia	Del Mar Mesa sand aster	None	None	1B.1
Baccharis vanessae	Encinitas baccharis	Threatened	Endangered	1B.1
Monardella hypoleuca ssp. lanata	felt-leaved monardella	None	None	1B.2
Quercus dumosa	Nuttall's scrub oak	None	None	1B.1
Brodiaea orcuttii	Orcutt's brodiaea	None	None	1B.1
Harpagonella palmeri	Palmer's grapplinghook	None	None	4.2
Tetracoccus dioicus	Parry's tetracoccus	None	None	1B.2
Arctostaphylos rainbowensis	Rainbow manzanita	None	None	1B.1
Horkelia truncata	Ramona horkelia	None	None	1B.3
Eryngium aristulatum var. parishii	San Diego button-celery	Endangered	Endangered	1B.1
Bloomeria clevelandii	San Diego goldenstar	None	None	1B.1
Iva hayesiana	San Diego marsh-elder	None	None	2B.2
Acanthomintha ilicifolia	San Diego thorn-mint	Threatened	Endangered	1B.1
Leptosyne maritima	sea dahlia	None	None	2B.2
Centromadia parryi ssp. australis	southern tarplant	None	None	1B.1
Navarretia fossalis	spreading navarretia	Threatened	None	1B.1
Dudleya viscida	sticky dudleya	None	None	1B.2
Comarostaphylis diversifolia ssp. diversifolia	summer holly	None	None	1B.2
Brodiaea filifolia	thread-leaved brodiaea	Threatened	Endangered	1B.1
Ceanothus verrucosus	wart-stemmed ceanothus	None	None	2B.2
Adolphia californica	California adolphia	None	None	2B.1
Isocoma menziesii var. decumbens	decumbent goldenbush	None	None	1B.2
Arctostaphylos glandulosa ssp. crassifolia	Del Mar manzanita	Endangered	None	1B.1
Corethrogyne filaginifolia var. linifolia	Del Mar Mesa sand aster	None	None	1B.1
Baccharis vanessae	Encinitas baccharis	Threatened	Endangered	1B.1
Monardella hypoleuca ssp. lanata	felt-leaved monardella	None	None	1B.2
Quercus dumosa	Nuttall's scrub oak	None	None	1B.1
Brodiaea orcuttii	Orcutt's brodiaea	None	None	1B.1

Harpagonella palmeri	Palmer's grapplinghook	None	None	4.2
Tetracoccus dioicus	Parry's tetracoccus	None	None	1B.2
Arctostaphylos rainbowensis	Rainbow manzanita	None	None	1B.1
Horkelia truncata	Ramona horkelia	None	None	1B.3
Eryngium aristulatum var. parishii	San Diego button-celery	Endangered	Endangered	1B.1
Bloomeria clevelandii	San Diego goldenstar	None	None	1B.1
Iva hayesiana	San Diego marsh-elder	None	None	2B.2
Acanthomintha ilicifolia	San Diego thorn-mint	Threatened	Endangered	1B.1
Leptosyne maritima	sea dahlia	None	None	2B.2
Centromadia parryi ssp. australis	southern tarplant	None	None	1B.1
Navarretia fossalis	spreading navarretia	Threatened	None	1B.1
Dudleya viscida	sticky dudleya	None	None	1B.2
Comarostaphylis diversifolia ssp. diversifolia	summer holly	None	None	1B.2
Brodiaea filifolia	thread-leaved brodiaea	Threatened	Endangered	1B.1
Ceanothus verrucosus	wart-stemmed ceanothus	None	None	2B.2

Source: CDFW CNDDB, 2020.
Notes:
**California Native Plant Society (CNPS) Key*
1 CNPS - Rare, Threatened, or Endangered
2 CNPS - Rare, Threatened, or Endangered in California, But More Common Elsewhere
3 CNPS - Review list: plants which more information is needed
4 CNPS – Plants of limited distribution - a watch list

Special Status Animals

The search revealed documented occurrences of 19 special status animal species within a one-mile search radius of San Marcos. This includes: one amphibian, five birds, six mammals, one crustacean, and six reptiles. Table 5-3 provides a list of the special-status animal species that are documented within the one-mile search area, and their current protective status. These special status animal species are illustrated on Figure 5-2. Figure 5-3 illustrates the special status species located within the four-quad search area.

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

Scientific Name	Common Name	Federal Status	State Status	CDFW Status*
Taxidea taxus	American badger	None	None	SSC
Artemisiospiza belli belli	Bell's sage sparrow	None	None	WL
Phrynosoma blainvillii	coast horned lizard	None	None	SSC
Polioptila californica californica	coastal California gnatcatcher	Threatened	None	SSC
Aspidoscelis tigris stejnegeri	coastal whiptail	None	None	SSC
Plestiodon skiltonianus interparietalis	Coronado skink	None	None	WL
Lasiurus cinereus	hoary bat	None	None	
Vireo bellii pusillus	least Bell's vireo	Endangered	Endangered	
Chaetodipus fallax fallax	northwestern San Diego pocket mouse	None	None	SSC
Aspidoscelis hyperythra	orange-throated whiptail	None	None	WL
Lepus californicus bennettii	San Diego black-tailed jackrabbit	None	None	SSC
Neotoma lepida intermedia	San Diego desert woodrat	None	None	SSC
Branchinecta sandiegonensis	San Diego fairy shrimp	Endangered	None	
Anniella stebbinsi	southern California legless lizard	None	None	SSC
Aimophila ruficeps canescens	southern California rufous-crowned sparrow	None	None	WL
Corynorhinus townsendii	Townsend's big-eared bat	None	None	SSC
Agelaius tricolor	tricolored blackbird	None	Threatened	SSC
Thamnophis hammondii	two-striped gartersnake	None	None	SSC
Spea hammondii	Western spadefoot	None	None	SSC

Source: CDFW CNDDB 2020.
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 revealed 25 sensitive natural communities within the four-quad search area, and seven sensitive natural communities within one-mile of San Marcos. Sensitive natural communities within the one-mile search area include Southern Cottonwood Willow Riparian Forest, Southern Willow Scrub, Southern Riparian Forest, San Diego Mesa Claypan Vernal Pool, and Southern Riparian Scrub.

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. Within San Marcos, the remaining vernal pool complexes are concentrated in a highly urbanized area within 11 lots located in the Business/Industrial District. This area is defined by Pacific Street on the west, Mission Road on the north, San Marcos Boulevard on the south, and South Bent Avenue on the East (City of San Marcos General Plan EIR, 2012). The SANDAG Multiple Habitat Conservation Program for North County identifies the vernal pools within urbanized San Marcos as areas that support critical populations of several narrow endemic species.

Creeks and Water Bodies

There are a number of large water bodies and creeks in the Planning Area. Large water bodies in the Planning Area include Lake San Marcos, Discovery Lake, South Lake, and Jacks Pond. Creeks within the Planning Area include San Marcos Creek, Twin Oaks Valley Creek, and the unnamed San Marcos Creek tributary running through Twin Oaks Valley, and Agua Hedionda Creek.

These water bodies and creeks support the riparian and wetland habitats that are listed above within the CDFW identified sensitive natural communities and support a number of the special status species identified within this document.

5.1.4 References

Barbour and Major. 1988. Terrestrial vegetation of California.

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

California Dept. of Fish and Game. 2020. "Special Animals List." Natural Diversity Database.

California Dept. of Fish and Wildlife. 2021. NCCP Plan Summary – North County Multiple Species Conservation Program Plan (San Diego County). Accessed on September 30, 2021. Available at: https://wildlife.ca.gov/Conservation/Planning/NCCP/Plans/North-San-Diego-MSCP

California Dept. of Fish and Wildlife. 2020. "State and Federally Listed Endangered, Threatened, and Rare Plants of California."

California Dept. of Fish and Wildlife. 2020. "Special Vascular Plants, Bryophytes, and Lichens List." Natural Diversity Database.

California Dept. of Fish and Game. 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities.

California Dept. of Fish and Wildlife. 2020. "State and Federally Listed Endangered, Threatened, and Rare Animals of California"

California Dept. of Water Resources. 2010. Final 2010 Integrated Report (CWA Section 303(d) List / 305(b) Report).

CalWater, California Interagency Watershed Mapping Committee. 2008. California Watershed Boundary Dataset (WBD).

County of San Diego. 2019. Multiple Species Conservation Plan Status Review and Options Assessment.

Hickman, James C. 1993. Jepson Manual: Higher Plants of California.

Holland, R.F., 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, The Resources Agency, Nongame Heritage Program, Dept. Fish & Game, Sacramento, Calif. 156 pp.

San Diego Association of Governments (SANDAG). 2003. Final Multiple Habitat Conservation Plan.

Sawyer, John and Todd Keeler-Wolf. 1995. A Manual of California Vegetation.

Seaber, P.R., Kapinos, F.P., and Knapp, G.L., 1987, Hydrologic Unit Maps: U.S. Geological Survey Water-Supply Paper 2294, 63 p.

Skinner, Mark W. and Bruce M. Pavlik, Eds. 2001. California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California.

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 San Diego Air Pollution Control District (SDAPCD) and the California Air Resources Board (CARB). The existing City of San Marcos General Plan identifies the following policies related to Air Quality.

Element	Topic Area	Goal	Policy
Conservation and Open Space Element	Air Quality, Climate Change, and Energy	Goal COS-4: Improve regional air quality and reduce greenhouse gas emissions that contribute to climate change.	Policy 4.1: Continue to work with the U.S. Environmental Protection Agency (EPA), California Air Resources Board, SANDAG, and the San Diego Air Pollution Control District (SDAPCD) to meet state and federal ambient air quality standards. Policy 4.2: Require new sensitive-use development, such as schools, day care centers and hospitals, located near mobile and stationary toxic air contaminants be designed with consideration of site and building orientation, location of trees, and incorporation of appropriate technology (i.e., ventilation and filtration) for improved air quality to lessen any potential health risks. Policy 4.3: Participate in regional efforts to reduce greenhouse gas emissions. Policy 4.4: Quantify community-wide and municipal greenhouse gas (GHG) emissions, set a reduction goal, identify and implement measures to reduce greenhouse gas emissions as required by governing legislation. Policy 4.5: Encourage energy conservation and the use of alternative energy sources within the community. Policy 4.6: Promote efficient use of energy and conservation of available resources in the design, construction, maintenance and operation of public and private facilities, infrastructure and equipment. Policy 4.7: As City facilities and services are constructed or

			upgraded, incorporate energy and resource conservation standards and practices by: • Taking a leadership role in implementing programs for energy and water conservation, waste reduction, recycling and reuse and increased reliance on renewable energy. • Upgrading City buildings and infrastructure facilities to comply with State of California green building standards. • Implementing landscaping that reduces demands on potable water; this may include the use of drought tolerant landscaping and/ or use of well water for irrigation, favoring recycling and energy-efficient products and practices when issuing City purchase agreements. Policy 4.8: Encourage and support the generation, transmission and use of renewable energy. Policy 4.9: Encourage use and retrofitting of existing buildings under Title 24 of the California Building Energy Code.

Source: City of San Marcos General Plan, 2012

5.2.1 Environmental Setting

Regulatory Setting

Air quality with respect to criteria air pollutants and toxic air contaminants (TACs) within the San Diego Air Basin (SDAB) is regulated by the SDAPCD, CARB, and 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 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.

San Diego Air Basin

San Marcos is located within the SDAB, which is comprised of a single air district, the SDAPCD, and consists of all of San Diego County. 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

Highly varied terrain and weather patterns make the region vulnerable to emissions sourced from transport emissions that travel from northern polluting cities. The SDAB is classified as a transport recipient of emissions rather than an emissions contributor. The transport pollutants are ozone (O_3), nitrogen oxides (NOx) and volatile organic compounds (VOCs), that are transported from the South Coast Air Basin (SCAB), which includes Orange County, portions of Riverside County, portions of Los Angeles County, and portions of San Bernardino County.

The SDAB experiences frequent temperature inversions due to its climate. Temperature inversions inhibit air that is close to the ground from intermixing with air at higher elevations, thereby trapping air pollutants at the ground level. Additionally, a combination of abundant sunshine, warm temperatures, and poor vertical air mixing is conducive to the formation of ozone, commonly referred to as "smog". Daytime winds from the north aggravate smog conditions even further by pushing the air pollutants inland toward the warmer foothills.

The problem is further heightened by the extent of exposure to elevated pollution levels from the adjacent air basin. The SCAB is located immediately to the north of the SDAB. SCAB is the nation's second largest urban area and California's largest metropolitan region. The SCAB is home to over 40 percent 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. High air pollution levels often occur when polluted air from the SCAB travels southwest over the ocean at night and is brought on shore into San Diego by the sea breeze during the day (San Diego County Air Pollution Control District 2010a).

San Marcos has a Mediterranean climate with mild, dry summers. The climate is dominated by the Pacific High Pressure System that results in these mild, dry summers, and mild, wet winters. The Pacific High is a semi-permanent, subtropical area of high pressure in the North Pacific Ocean that drives the existing winds in the SDAB. During the summer months, there is typically an inversion layer created over the coastal areas in the SDAB. This inversion layer increases the O_3 levels in the air basin. During the winter months, a shallow inversion layer dominates the region, which results in an increased carbon monoxide and fine particulate matter ($PM_{2.5}$) concentration as a result of residential wood burning. The hot and dry Santa Ana winds that occur during the fall months, tend to push pollution from the SDAB toward the ocean. The County of San Diego experiences an average of 201 days above 70 degrees Fahrenheit and nine to 13 inches of rain per year.

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 of Health Effects for 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, 2017

Ozone (O_3), 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. Ozone formation is greatest on warm, windless, sunny days. The main sources of NO_X and ROG, often referred to as ozone precursors, are combustion processes (including motor vehicle engines), the evaporation of solvents, paints, and fuels, and biogenic sources. Automobiles are a primary source of ozone precursors in the SDAB. 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.

Ozone 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 ozone levels can permanently damage lung tissue. Ozone 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 San Diego region, much of the particulate matter is a result of transport emissions from northern cities. However, there is significant particulate matter sourced from the SDAB region as well. Particulate Matter in the region 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 SDAB. Wood burning in fireplaces and stoves is another large source of fine particulates.

Nitrogen Dioxide (NO_2) 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 ozone 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 ozone 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 SDAB 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 air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Twenty 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 and attainment standards are presented in Table 5-5.

Table 5-5: Ambient Air Quality Standards and Designations

Pollutant	Averaging Time	State Standard	Federal Primary Standards
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	–

Notes: ppm = parts per million, ppb = parts per billion, ug/m^3 = Micrograms per Cubic Meter
Sources: California Air Resources Board, 2017; SCAQMD, 2017.

The U.S. EPA established new national air quality standards for ground-level ozone and for fine particulate matter in 1997. The 1-hour ozone 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 eight-hour standard of 0.070 ppm and retained the one-hour ozone standard of 0.09 after an extensive review of the scientific literature. The U.S. EPA signed a final rule for the federal ozone eight-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 the Planning Area are related to increases of regional criteria air pollutants (e.g., ozone and particulate matter), exposure to toxic air contaminants, odors, and increases in greenhouse gas emissions contributing to climate change. The primary source of ozone (smog) pollution is motor vehicles which account for 70 percent of the ozone 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 ozone, 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.

San Diego County (encompassing the SDAB) has a state designation of nonattainment for ozone, PM_{10}, and $PM_{2.5}$ and is designated either unclassified or attainment for all other criteria pollutants. The County has a national designation of nonattainment for 8-Hour Ozone. The County is designated either attainment or unclassified/attainment for the remaining national standards. Table 5-6 presents the state and national attainment statuses for San Diego County.

Table 5-6: State and National Attainment Status

Pollutant	State Designation	National Designation
Ozone (O_3)	Nonattainment	Nonattainment (8 Hour Ozone)
Carbon Monoxide (CO)	Attainment	Unclassified/Attainment
Respirable Particulate Matter (PM_{10})	Nonattainment	Unclassified/Attainment
Fine Particulate Matter ($PM_{2.5}$)	Nonattainment	Unclassified/Attainment
Sulfur Dioxide (SO_2)	Attainment	Unclassified/Attainment
Nitrogen Dioxide (NO_2)	Attainment	Unclassified/Attainment
Lead	Attainment	Unclassified/Attainment
Hydrogen Sulfide	Unclassified	--
Sulfates	Attainment	--
Visibility Reducing Particles	Unclassified	--

Sources: California Air Resources Board, 2020

Monitoring Data

SDAPCD and CARB maintain numerous air quality monitoring sites throughout various cities in the Air Basin to measure O_3, $PM_{2.5}$, and PM_{10}. It is important to note that the Federal ozone 1-hour standard was revoked by the EPA and is no longer applicable for federal standards. The two closest monitoring sites for gaseous pollutants in the SDAPCD monitoring network are the Escondido and McClellan-Palomar Airport Stations. Both stations are approximately 7 miles from the City of San Marcos. However, the closest monitoring site within the network which measures data for Ozone, PM_{10}, and $PM_{2.5}$ is the Kearny Villa Road site, located 25 miles away. Data obtained from these monitoring stations is shown in Table 5-7.

Table 5-7: Ambient Air Quality Monitoring Data

Pollutant	State	Federal	Year	Max Concentration	Days Exceeded State/Federal Standard
	Primary Standard				
Ozone (O_3) (8-hour)	0.07 ppm for 8 hour	0.07 ppm for 8 hour	2018 2017 2016	0.082 0.095 0.091	23 54 13
Particulate Matter (PM_{10})	50 ug/m^3 for 24 hours	150 ug/m^3 for 24 hours	2018 2017 2016	53 66 79	0 0 0
Fine Particulate Matter ($PM_{2.5}$)*	No 24 hour State Standard	35 ug/m^3 for 24 hours	2018 2017 2016	41.9 42.7 34.4	ND 1 0

Source: California Air Resources Board (Aerometric Data Analysis and Management System or iADAM) Air Pollution Summaries. Note: ND = No data

As shown in the Table 5-7, San Diego has realized a significant decrease in Ozone (8-Hour) levels over the last three years. It should be noted that the data in the table reflects San Diego County averages. Similarly, County trends show that PM_{10} concentrations have decreased over the last three years. However, the Countywide data shows that $PM_{2.5}$ concentrations in the SDAB have not declined over the last three years, but have varied depending on the year.

At the nearest site to the City of San Marcos, the Kearny Villa Road Station, the maximum concentration for 8-Hr Ozone for the year 2018 was 0.077 ppm. At the same site, the maximum PM_{10} concentration for 24-hrs for the year 2018 was 38 μg/m^3. $PM_{2.5}$ was not measured at this location.

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 Planning Area, agricultural land uses along the perimeter and industrial uses zoned closer to the central core 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 Planning Area. Such sensitive receptors include residential areas, schools, mobile home parks, and hospital/medical facilities. A majority of the sensitive receptors within the Planning Area are located within or adjacent to the core of the City and are more likely to be impacted by odors from industrial uses rather than odors from agricultural uses, which are predominantly located along the perimeters of the Planning Area.

5.2.5 References

San Diego Air Pollution Control District. Annual Air Quality Monitoring and Network Plan 2018. Available at: https://www.sandiegocounty.gov/content/dam/sdc/apcd/monitoring/2018_Network_Plan.pdf

County of San Diego. August 2011. San Diego County General Plan. Air Quality Section.

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

California Air Resources Board. 2017. California Ambient Air Quality Standards (CAAQS). Page last updated August 10, 2017. Available at: www.arb.ca.gov/research/aaqs/caaqs/caaqs.htm

California Air Resources Board. 2018. Area Designations Map/State and National. Page last updated on October 18, 2017. Accessed on March 1, 2020. Available at: https://www.arb.ca.gov/desig/adm/adm.htm

California Air Resources Board. 2019. Aerometric Data Analysis and Management System or iADAM Air Pollution Summaries.

5.3 GREENHOUSE GASES

This section discusses the linkage between greenhouse gases and climate change, the effects of global climate change, and existing and projected greenhouse gas emissions in San Marcos. The existing City of San Marcos General Plan identifies the following policies related to Greenhouse Gas.

Element	Topic Area	Goal	Policy
Conservation and Open Space Element	Air Quality, Climate Change, and Energy	Goal COS-4: Improve regional air quality and reduce greenhouse gas emissions that contribute to climate change.	Policy 4.1: Continue to work with the U.S. Environmental Protection Agency (EPA), California Air Resources Board, SANDAG, and the San Diego air Pollution Control District (SDAPCD) to meet state and federal ambient air quality standards. Policy 4.3: Participate in regional efforts to reduce greenhouse gas emissions. Policy 4.4: Quantify community-wide and municipal greenhouse gas (GHG) emissions, set a reduction goal, identify and implement measures to reduce greenhouse gas emissions as required by governing legislation. Policy 4.5: Encourage energy conservation and the use of alternative energy sources within the community. Policy 4.6: Promote efficient use of energy and conservation of available resources in the design, construction, maintenance and operation of public and private facilities, infrastructure and equipment. Policy 4.7: As City facilities and services are constructed or upgraded, incorporate energy and resource conservation standards and practices by: • Taking a leadership role in implementing programs for energy and water

			conservation, waste reduction, recycling and reuse and increased reliance on renewable energy. • Upgrading City buildings and infrastructure facilities to comply with State of California green building standards. • Implementing landscaping that reduces demands on potable water; this may include the use of drought tolerant landscaping and/ or use of well water for irrigation, favoring recycling and energy-efficient products and practices when issuing City purchase agreements. Policy 4.8: Encourage and support the generation, transmission and use of renewable energy. Policy 4.9: Encourage use and retrofitting of existing buildings under Title 24 of the California Building Energy Code.

Source: City of San Marcos General Plan, 2012

5.3.1 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 percent, 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, accounting for almost 40 percent of statewide emissions in 2019, followed by the industrial sector (California Air Resources Board, 2021).

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 418.2 million metric tons of carbon dioxide equivalents ($MMTCO_2e$) in 2019, 7.2 $MMTCO_2e$ lower than 2018 levels and almost 13 $MMTCO_2e$ below the 2020 GHG Limit of 431 $MMTCO_2e$ (California Air Resources Board, 2021).

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 2019, accounting for 39.7 percent of total GHG emissions in the State. This category was followed by the industrial sector (21.1 percent), the electricity generation sector (including both in-state and out-of-state sources) (14.1 percent), the residential and commercial sector (10.5 percent), and the agricultural sector (7.6 percent), with High Global Warming Potential

Gases and recycling and waste making up the remaining 7 percent (California Air Resources Board, 2021).

5.3.2 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 would 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 ozone formation are projected to increase from 25 to 35 percent under the lower warming range, to 75 to 85 percent under the medium warming range. In addition, if global background ozone 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 percent 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^{o}F in Los Angeles and 95^{o}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 Sierra Nevada snow pack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snow pack, 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 percent 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 snow pack by as much as 70 to 90 percent. Under the lower warming scenario, snow pack losses are expected to be only half as large as those expected if temperatures were to rise to the higher warming range. How much snow pack 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 snow pack 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 ozone 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 percent, 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 percent toward the end of the century. In contrast, precipitation decreases could increase wildfires in northern California by up to 90 percent.

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 percent 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.

5.3.3 Local Greenhouse Gas Emissions

The City of San Marcos developed a Climate Action Plan (CAP) as part of its General Plan update process in 2013. The City initiated an update to its CAP in 2017 in order to comply with the State's SB 32 requirements to reduce GHG emissions to 40 percent below the 1990 levels by 2030. The City adopted the updated CAP (2020 CAP) in December 2020. The CAP identifies GHG baselines, projections, and reduction targets, strategies, and measures, including monitoring the progress by participating in SANDAG's biennial update of its local GHG inventory.

Emissions Inventory

The 2020 CAP assessed GHG emission within the City's jurisdictional boundaries based on a baseline year of 2012. The completed San Marcos Emissions Inventory estimates the total GHG emissions from San Marcos in 2012 were 599,000 metric tons CO_2e ($MTCO_2e$). The highest emitters by category included on-road transportation (54 percent), electricity (27 percent), and natural gas (12 percent), followed by solid waste (three percent), off-road transportation (two percent), water (one percent) and wastewater (less than one percent).

Projected GHG Emissions in San Marcos (2020, 2030, 2035)

Table 5-8 compares the 2012 baseline to the projected GHG emissions in San Marcos for the years 2020 and 2030. The emission projections are distinguished by emissions category, as well as by two projection scenarios, referred to as the "business-as-usual" (BAU) and Legislatively-Adjusted BAU scenarios. The BAU projection assumes no additional efforts (including the 2020 CAP), beyond what have already been adopted, will be made to reduce GHG emissions in the future. Legislatively-Adjusted BAU projections provide a reduction from the BAU projection accounting for federal and

State actions that are planned to take place in the future. Both projections assume that population, employment, and transportation activity will grow over time, consistent with SANDAG projections.

Table 5-8: San Marcos Projected GHG Emissions (MTCo2e)

Emissions Category	2012 (Baseline)	2020		2030	
		BAU	Legislatively-Adjusted BAU	BAU	Legislatively-Adjusted BAU
On-road Transportation	322,000	307,000	296,000	317,000	252,000
Electricity	162,000	121,000	110,000	136,000	49,000
Natural Gas	75,000	79,000	77,000	88,000	79,000
Off-Road Transportation	14,000	14,000	14,000	18,000	18,000
Solid Waste	15,000	15,000	15,000	17,000	17,000
Water	9,000	10,000	10,000	11,000	11,000
Wastewater	3,000	3,000	3,000	3,000	3,000
Total	**599,000**	**549,000**	**526,000**	**591,000**	**429,000**
Percent Change from 2012	-	*-8%*	*-12%*	*-1%*	*-28%*

Note: BAU = business as usual; GHG = greenhouse gas emissions; MTCO2 e = metric tons of carbon dioxide equivalent
Sources: City of San Marcos Final Climate Action Plan, 2020.

As shown in Table 5-8, although the City would experience an overall reduction in annual GHG emissions in 2020 under the BAU Conditions, the City's GHG emissions would begin to slowly increase under BAU conditions until 2030, as a result of growth in population and employment. The Legislatively-Adjusted BAU accounts for a variety of approved legislative actions that will further reduce BAU emissions from the City. While these projections include federal and State actions, they do not include local government actions such as the implementation of GHG emissions reduction measures identified in the 2020 CAP. Under the Legislative-Adjusted BAU scenario, GHG emissions were estimated to be 526,000 MTCO_2e in 2020 or 12 percent lower than 2012 emissions and 429,000 MTCO_2e in 2030 or 28% lower than 2012 emissions. While existing activities would be adequate to meet the City's 2020 target, these activities, along with federal and State legislative actions, would not be adequate to achieve the City's 2030 GHG reduction target of 42 percent below 2012 levels; therefore, the CAP focuses on reducing emissions in 2030 through local actions.

The City estimates that under the local reduction strategies and measures proposed in the 2020 CAP, the City would reduce total emissions by 82,000 MTCO_2e by 2030, which would close the gap and help the City meet its 2030 target, consistent with SB 32 requirements. The CAP proposes eight strategies and 22 GHG reduction measures organized under five GHG emissions categories to achieve this goal. Strategies include:

- Strategy 1: Increase Use of Zero-Emission or Alternative Fuel Vehicles;Strategy 2: Reduce Fossil Fuel Use;
- Strategy 3: Reduce Vehicle Miles Traveled;
- Strategy 4: Increase Building Energy Efficiency;
- Strategy 5: Increase Renewable and Zero-Carbon Energy;
- Strategy 6: Reduce Water Use;

- Strategy 7: Reduce and Recycle Solid Waste; and
- Strategy 8: Increase Urban Tree Cover.

5.3.4 References

City of San Marcos. 2020. Final Climate Action Plan.

California Air Resources Board. 2021. California Greenhouse Gas Emissions for 2000 to 2019: Trends of Emissions and Other Indicators. Available at: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2019/ghg_inventory_trends_00-19.pdfCalifornia Energy Commission. 2012. Energy Almanac. Retrieved August 2012. Available at: http://energyalmanac.ca.gov/overview/index.html

California Energy Commission. 2018. California Greenhouse Gas Emission Inventory – 2018 Edition. July 11, 2018. Available at: https://www.arb.ca.gov/cc/inventory/data/data.htm

California Environmental Protection Agency. 2010. Climate Action Team Report to Governor Schwarzenegger and the Legislature. December 2010. Available at: http://www.climatechange.ca.gov/climate_action_team/reports/

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

Intergovernmental Panel on Climate Change. 2013. "Climate Change 2013: The Physical Science Basis, Summary for Policymakers." Available at: http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf

International Energy Agency. 2018. FAQs: Oil. Available at: https://www.iea.org/about/faqs/oil/

National Resources Defense Council. 2014. NRDC Fact Sheet: California Snowpack and the Drought. April 2014. Available at: https://www.nrdc.org/sites/default/files/ca-snowpack-and-drought-FS.pdf

United States Energy Information Administration (U.S. EIA). 2018a. California State Energy Profile. Last updated November 15, 2018. Available at: https://www.eia.gov/state/print.php?sid=CA

United States Energy Information Administration (U.S. EIA). 2018b. Total System Electric Generation. Data as of June 21, 2018. Available at: http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html

5.4 GEOLOGY, SOILS, AND SEISMICITY

This section addresses soil, seismic, and geologic hazards in the Planning Area. 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 existing City of San Marcos General Plan Public identifies the following goals and policies related to geologic hazards.

Element	Topic Area	Goal	Policy
Safety Element	Natural Geologic Hazards	Goal S-1: Reduce risks to the community from earthquakes by regulating new development and redevelopment to prevent the creation of new geologic and seismic hazards.	Policy 1.1: Reduce the risk of impacts from geologic and seismic hazards by applying current and proper land use planning, development engineering, building construction, and retrofitting requirements. Policy 1.2: Investigate specific groundwater levels and geologic conditions underlying all new development or redevelopment proposals in areas where potential fault rupture, liquefaction, or other geologic hazards are suspected.

Source: City of San Marcos General Plan, 2012

5.4.1 Environmental Setting

The City of San Marcos and Planning Area are located within the Peninsular Range Geomorphic Province which extends from Mount San Jacinto in the north to Baja, California in the south and includes the Inland Empire, Los Angeles, Orange County, and San Diego, California. The Peninsular Ranges Geomorphic Province is located in the southwestern corner of California and is bounded by the Transverse Ranges Geomorphic Province to the north and the Colorado Desert Geomorphic Province to the east. This geomorphic province is characterized by elongated northwest-trending mountain ridges separated by sediment-floored valleys. Many faults to the west of the Salton Trough section of the San Andreas Fault Zone, parallel this northwest-south east trending fault zone and have taken up some of the strain of the San Andreas.

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 **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). At the northern end of the province, Mount San Jacinto forms the dramatic backdrop to the Coachella Valley more than 10,000 feet below. The Peninsular Ranges extend south across the international border into Baja California, forming the spine of Baja California.

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).

The City of San Marcos and Planning Area lies within the western foothills of the Peninsular Ranges. The topography of San Marcos varies, including hillsides, creek areas and lakes. Elevations range from approximately 590 feet above sea level to approximately 1,200 to 1,600 feet above sea level. The topography of the area is a result of regional landforms, fault movements, climate, and erosion. The higher elevation areas within San Marcos are a result of the range of hills and hillsides surrounding the City. The City is located in the northwestern portion of San Diego County. San Diego county is a coastal plain with connecting broad valleys and low hills, bounded by the Pacific Ocean to the west and high mountain ranges to the east. The topography in the County varies significantly, from beaches on the west, to mountains and then desert to the east. Much of the topography in between consists of mesas intersected by canyons.

Faults

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.

There are no known fault zones located within the City or City's Sphere of Influence. The nearest fault zones include: the Newport-Inglewood-Rose Canyon Fault Zone and the Elsinore Fault Zone. Figure 5-4 illustrates the location of nearby fault zones surrounding the Planning Area.

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. The following table represents effects that would be commonly associated with Richter Magnitudes:

Table 5-9 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

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. Similar to most cities in the region, San Marcos is subject to risks associated with potentially destructive earthquakes. The Planning Area is located in the seismically active southern California region; however, there are no designated Alquist-Priolo fault zones within the Planning Area.

Historically active regional faults and their associated size and frequency are shown in Table 5-10.

Table 5-10 Principal Historically Active and Active Faults in the Region

Fault	Maximum Moment Magnitude	Historical Seismicity (Last 150 Years)	Slip Rate (mm/year)
San Andreas (Mojave section)	7.4	M 7.0 (1899)	30.0
Newport-Inglewood	7.1	M 6.4 (1933)	1.0
Sierra Madre (San Fernando section)	6.7	M 6.4 (1971)	2.0
Whittier-Elsinore	6.8	M 5.9 (1987)	2.5
Palos Verdes	7.3	--	3.0
San Gabriel	7.2	--	1.0
Verdugo	6.9	--	0.5
Santa Monica	6.6	--	1.0

Source: California Geological Survey, 2003, 2010

Although there are no fault zones within the Planning Area, regional fault zones may have an impact on the City if the rupture is of a significant magnitude. No instrumentally recorded earthquake of greater than magnitude (M) 6.0 has occurred within 50 miles of the Planning Area.

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. Figure 5-5 shows areas having the potential for liquefaction within the Planning Area. There are three areas designated as having the potential for liquefaction. Two of these areas are located in the central portion of the City, while the third area is located in the northern portion and continues outside of the City's boundaries.

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). SHMP mapping has not been completed for all areas of the State, and no maps have been prepared for north San Diego County or the Planning Area. However, areas with known landslides and bedrock formations more susceptible to landslides and surficial (soil-slip) failures are the most susceptible to earthquake-induced landslides. Within the Planning Area, an extremely limited area registers as having a "moderate" soil slip susceptibility.

5.4.2 Other Geologic Hazards

Soils

According to the Natural Resource Conservation Service (2020), there are 37 different soil series located in the Planning Area. Table 5-11 and Figure 5-6 presents the soil types and associated acreages located in the Planning Area. Although there are 351 soil types, some of the types fall within the same soil series.

Table 5-11 Planning Area Soils

Soil Types	Total Acres
Acid igneous rock land	293.32
Altamont (15 to 30 percent, 5 to 9 percent, and 9 to 15 percent)	271.13
Auld Aw	271.13
Auld Ay	41.47
Bonsali	15.97
Bosanko	12.90
Cieneba coarse sandy loam (15-30 and 5-15 percent slopes) eroded	191.20
Cieneba rock coarse sandy loam, 9 – 30 percent slopes, eroded	722.38
Cieneba- Fallbrook rocky sandy loams, 30 to 65 percent, eroded	98.44
Cieneba- Fallbrook rocky sandy loams, 9 to 30 percent slopes, eroded	163.72
Diablo Clay, 15 to 30 percent slopes	48.68
Diablo Clay, 2 to 9 percent slopes	245.99
Diablo Clay, 9 to 15 percent slopes, warm MAAT, MLRA 20	77.34
Escondido very fine sandy loam, 15 to 30 percent slopes, eroded	706.30
Escondido very fine sandy loam, 5 to 9 percent slopes	878.91
Escondido very fine sandy loam, 9 to 15 percent slopes, eroded	1,055.71
Escondido very fine sandy loam, deep, 5 to 9 percent slopes	21.10
Exchequer rocky silt loam, 30 to 70 percent slopes	1,997.87
Exchequer rocky silt loam, 9 to 30 percent slopes	1,165.81
Fallbrook sandy loam, 15 to 30 percent slopes, eroded	1.57
Fallbrook sandy loam, 2 to 5 percent slopes	18.60
Fallbrook sandy loam, 5 to 9 percent slopes	149.30
Fallbrook sandy loam, 9 to 15 percent slopes, eroded	12.49
Fallbrook rocky sandy loam, 5 to 9 percent slopes	3.33

Fallbrook-Vista sandy loams, 15 to 30 percent slopes	0.77
Fallbrook-Vista sandy loams, 9 to 15 percent slopes	50.86
Friant fine sandy loam, 30 to 50 percent slopes	225.65
Friant rocky fine sandy loam, 30 to 70 percent slopes	581.15
Friant rocky fine sandy loam, 9 to 30 percent slopes	756.21
Gaviota fine sandy loam, 9 to 30 percent slopes	242.80
Grangeville fine sandy loam, 0 to 2 percent slopes	251.46
Gravel pits	33.18
Greenfield sandy loam, 2 to 5 percent slopes	10.95
Huerhuero loam, 2 to 9 percent slopes	1,540.86
Huerhuero loam, 5 to 9 percent slopes, eroded	305.32
Huerhuero loam, 9 to 15 percent slopes	25.99
Huerhuero loam, 9 to 15 percent slopes, eroded	36.87
La Posta loamy coarse sand, 5 to 30 percent slopes, eroded	22.74
Las Flores loamy fine sand, 15 to 30 percent slopes	18.52
Las Flores loamy fine sand, 2 to 9 percent slopes	793.87
Las Flores loamy fine sand, 5 to 9 percent slopes, eroded	20.57
Las Flores loamy fine sand, 9 to 15 percent slopes	76.00
Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	113.62
Las Flores-Urban land complex, 2 to 9 percent slopes	180.50
Las Posas fine sandy loam, 15 to 30 percent slopes, eroded	115.09
Las Posas fine sandy loam, 5 to 9 percent slopes	11.65
Las Posas fine sandy loam, 5 to 9 percent slopes, eroded	68.96
Las Posas fine sandy loam, 9 to 15 percent slopes, eroded	223.66
Las Posas stony fine sandy loam, 30 to 65 percent slopes	410.72
Las Posas stony fine sandy loam, 9 to 30 percent slopes	118.87
Las Posas stony fine sandy loam, 9 to 30 percent slopes, eroded	15.71
Linne clay loam, 9 to 30 percent slopes	21.32
Olivenhain cobbly loam, 2 to 9 percent slopes	12.27
Olivenhain cobbly loam, 9 to 30 percent slopes	10.68
Placentia sandy loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	109.39
Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	1,055.84

Placentia sandy loam, 5 to 9 percent slopes, eroded	5.47
Placentia sandy loam, 9 to 15 percent slopes, eroded	10.06
Placentia sandy loam, thick surface, 0 to 2 percent slo pes	169.56
Placentia sandy loam, thick surface, 2 to 9 percent slo pes	19.02
Ramona sandy loam, 2 to 5 percent slopes	98.45
Ramona sandy loam, 5 to 9 percent slopes	87.11
Ramona sandy loam, 5 to 9 percent slopes, eroded	63.42
Ramona sandy loam, 9 to 15 percent slopes, eroded	52.72
Reiff fine sandy loam, 2 to 5 percent slopes	9.03
Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes	1,678.30
San Miguel rocky silt loam, 9 to 30 percent slopes	296.94
San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes	768.71
Steep gullied land	29.80
Visalia sandy loam, 0 to 2 percent slopes	47.24
Visalia sandy loam, 2 to 5 percent slopes	815.18
Visalia sandy loam, 5 to 9 percent slopes	26.80
Vista coarse sandy loam, 15 to 30 percent slopes, eroded	19.40
Vista coarse sandy loam, 15 to 30 percent slopes, MLRA 20	32.99
Vista coarse sandy loam, 5 to 9 percent slopes	293.52
Vista coarse sandy loam, 9 to 15 percent slopes, eroded	85.94
Vista coarse sandy loam, 9 to 15 percent slopes, MLRA 20	252.34
Vista rocky coarse sandy loam, 5 to 15 percent slopes	49.99
cordiWater	72.08
Wyman loam, 2 to 5 percent slopes	140.22
Wyman loam, 5 to 9 percent slopes	173.64
Wyman loam, 9 to 15 percent slopes	10.47
Grand Total	21,165.39

Source: Natural Resource Conservation Service, 2020.
Note: The total acres listed is slightly larger than the planning area acreage listed as this figure includes right-of-way and other land use features that do not warrant land use designations.

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. 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. Erosion factor Kw indicates the erodibility of the whole soil, whereas Kf indicates the erodibility of the fine soils. The estimates are modified by the presence of rock fragments. Soil erosion data for the City of San Marcos were obtained from the NRCS. As identified by the NRCS web soil survey, the erosion factor K within the Planning Area varies from 0.02 to 0.55, which is considered a low to high potential for erosion. Generally, erosion potential within the Planning Area increases to the south.*

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 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. 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.

The linear extensibility of the soils within San Marcos ranges from Low to High. Figure 5-7 illustrates the shrink-swell potential of soils in the Planning Area. The majority of the Planning Area has low expansive soils. The areas with high expansive soils represent only a small portion of the Planning Area and would require special design considerations due to shrink-swell potentials.

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) in the vicinity of the Planning Area.

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. The City of San Marcos 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 Planning Area may be susceptible to collapse and excessive settlements, which could create the risk of hydroconsolidation if these soils were exposed to excessive moisture.

According to the geotechnical background report prepared by Wilson Geosciences, Inc. (2009) for the 2012 San Marcos General Plan and EIR, within the Planning Area there are both; younger alluvial deposits in San Marcos Creek and old sedimentary, metasedimentary, and crystalline basement rocks in the surrounding hills. Underlying formations of natural deposits are alluvium (both young and old) in the lowest areas, sedimentary and crystalline rocks in the intermediate elevation hills, and metavolcanic/crystalline rocks in the higher hills and mountains.

The alluvial surface in the central section of the Planning Area is underlain young alluvium over crystalline tonalite “hard” bedrock. Older alluvium occupies limited valley bottoms in the eastern position of the City. A relatively “soft” bedrock formation underlies the westernmost portions of the City and consists of poorly bedded sandstone, siltstone and claystone with conglomerate. The Cerro de las Posas Mountains (with Mount Whitney, Double Peak, and Frank’s Peak), as well as the surrounding higher hills around Twin Oaks Valley, are underlain by “hard” metavolcanic rocks with some plutonic crystalline rocks. These units are cut by San Marcos Creek and numerous unnamed secondary drainages filled with younger alluvium consisting of slightly consolidated silt, sand, and gravel.

As previously mentioned, existing alluvium within the Planning Area may be susceptible to collapse and excessive settlements, which could create the risk of hydroconsolidation if these soils were exposed to excessive moisture.

Liquefaction Induced Lateral Spreading

Liquefaction, which is primarily associated with loose, saturated materials, is most common in areas of sand and silt or on reclaimed lands. When liquefaction occurs, soils suddenly lose strength due to groundwater permeating the soil due to groundshaking. Thus, liquefaction requires specific soil characteristics and seismic shaking.

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.

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 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. According to the California Geological Survey, there is no naturally occurring asbestos mapped within the Planning Area.

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 Planning Area 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.

California Geological Survey. 1999, Revised 2002. Simplified Fault Activity Map of California. Compiled by Charles W. Jennings and George J. Saucedo.

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

California Geological Survey. Geological Gems of California State Parks Peninsular Ranges Geomorphic Province. GeoGem Note 46. ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sr/SR_230/Notes_LR/CGS_SR230_PeninsularRanges_GeomorphProvince_lr.pdf

San Marcos, City of. City of San Marcos General Plan. San Marcos, CA. 2012.

U.S. Department of Agriculture and Natural Resources Conservation Service. 2010. Soil Survey Geographic (SSURGO) Database San Marcos, California.

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). Available at: <https://soilseries.sc.egov.usda.gov/>.

U.S. Department of the Interior 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 Complex 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 the Planning Area. The existing City of San Marcos General Plan Public identifies the following goals and policies related to mineral resources.

Element	Topic Area	Goal	Policy
Conservation and Open Space Element	Open Space and Limited Resources	Goal Cos-2: The City is committed to conserving, protecting, and maintaining open space, agricultural, and limited resources for future generations. By working with property owners, local organizations, and state and federal agencies, the City can limit the conversion of resource lands in urban uses.	Policy 2.4: Ensure compliance with State of California requirements for mineral resources contained in the State Surface Mining and Reclamation Act.

Source: City of San Marcos General Plan, 2012

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 5-12.

Table 5-12: 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 Planning Area. All four mineral resource zones (MRZ-1, MRZ-2, MRZ-3, MRZ-4) are present in the City of San Marcos. These mineral resource zones are described in the table above.

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 March 10, 2020, there are no mines listed within the Planning Area. Two historic mining/quarry locations exist within the corporate City limits; Meadowlark Ranch Quarry located in the southwest portion of the City and the former mine near Village Drive at Twin Oaks Valley Road. In the Sphere of Influence, there is one historic mine, known as the Galbrath Quarry. The Galbrath Quarry is located east of the City of Vista (City of San Marcos General Plan, 2012).

5.5.2 References

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

California Department of Conservation. March, 2020. AB 3098 List – Current Listing 2018. Available at: http://www.conservation.ca.gov/omr/SMARA%20Mines/ab_3098_list.

City of San Marcos. General Plan. 2012.

5.6 HYDROLOGY AND WATER QUALITY

This section describes the regulatory setting, regional hydrology and water quality, and local hydrology and water quality for the Planning Area. The existing City of San Marcos General Plan Public identifies the following goals and policies related to Hydrology and Water Quality.

Element	Topic Area	Goal	Policy
Conservation and Open Space Element	Watershed and Water Quality Protection	Coal COS-6: Protect and restore appropriate surface water and groundwater beneicial uses through prioritizing the improvement of locally impaired water bodies within the City of San Marcos subwater sheds.	Policy 6.1: Establish sources, constituents, and water body priorities based on surface water quality and groundwater quality for each watershed within the City of San Marcos. For each subwatershed promote beneficial use designations and water quality objectives that are scientifically valid for each subwatershed. Reduce pollutant loads and flows that adversely impact ground water and surface water integrity in each subwatershed. For each subwatershed, support the identification and development of sustainable projects that provide diverse habitats and water quality benefits. For each subwatershed, cordinate development with existing watershed management plan Policy 6.2: Promote watershed stewardship as the community norm. Policy 6.3: Develop partnerships with other agencies to prioritize and implement watershed protection plans. Policy 7.1: Promote public policies that support watershed protection for

		Goal COS-7: Achieve sustainable watershed protection or surface and ground water quality that balances social, economical, and environmental needs.	surface water, ground water quality, and attainable beneficial uses. Policy 7.2: Obtain public support for long term sustainable funding for stormwater management, surface water quality, hydromodification, and groundwater quality initiatives.
		Goal COS-8: Focus watershed protection, surface and groundwater quality management on sources and practices that the City has the ability to affect.	Policy 8.1: Identify pollutants of concern in each subwatershed for groundwater and surface water. Policy 8.2: Work with regulatory agencies and other parties to ensure that pollutant sources in subwatersheds to surface water and groundwater are re-assigned to the appropriate regulatory process (air, waste, water). Policy 8.3: Promote public policy that reduces pollutants of concern in subwatersheds, surface water and groundwater through source pollutant replacement, substitution, or application. Policy 8.4: Require new development and redevelopment to protect the quality of water bodies and natural drainage systems through site design, source controls, storm water treatment, runoff reduction measures, Best Management

			Practices (BMPs), low impact development (LID), hydromodification strategies consistent with the Current San Diego Regional Water Quality Control Board Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) Permit, and all future municipal stormwater permits.
		Goal COS-9: Support the development of a regulatory framework and organizational structure that facilitates the implementation of the most effective and efficient watershed protection programs for surface water and groundwater quality and beneficial use programs	Policy 9.1: Focus each watershed assessment on information needed to implement the most effective control strategies and adaptive management. Policy 9.2: Focus surface water, hydromodification, and groundwater quality monitoring programs, BMPs, and management programs at a subwatershed scale within each service neighborhood. Policy 9.3: Establish watershed-based educational programs for residents and business owners to reduce and prevent pollutants from entering the surface water and groundwater through the watershed and City's storm drain system.

Land Use and Community Design	Growth Management and Adequate Provision of Services	Goal LU-15: Flood Control and Storm Water Drainage Facilities: Ensure adequate flood control and storm water drainage is provided (to) the community.	Policy 15.1: Implement activities, practices, procedures, or facilities that avoid, prevent, or reduce pollution of the San Marcos Storm Water Conveyance System and Receiving Waters. Policy 15.2: Improve inadequate or undersized drainage/ flood control facilities to solve both small neighborhood and large regional drainage and flood control problems.

Source: City of San Marcos General Plan, 2012

5.6.1 Environmental Setting

The State of California uses a hierarchical naming and numbering convention to define watershed areas for management purposes. Boundaries are defined according to size and topography, with multiple sub-watersheds within larger watersheds. Table 5-13 shows the primary watershed classification levels used by the State of California. The second column indicates the approximate size that a watershed area may be within a particular classification level, although variation in size is common.

Table 5-13: State of California Watershed Hierarchy Naming Convention

Watershed Level	Approximate Square Miles (Acres)	Description
Hydrologic Region (HR)	12,735 (8,150,000)	Defined by large-scale topographic and geologic considerations. The State of California is divided into ten HRs.
Hydrologic Unit (HU)	672 (430,000)	Defined by surface drainage; may include a major river watershed, groundwater basin, or closed drainage, among others.
Hydrologic Area (HA)	244 (156,000)	Major subdivisions of hydrologic units, such as by major tributaries, groundwater attributes, or stream components.
Hydrologic Sub-Area (HSA)	195 (125,000)	A major segment of an HA with significant geographical characteristics or hydrological homogeneity.

Source: Calwater, California Interagency Watershed Mapping Committee, 2008.

Hydrologic Region

The Planning Area is located within the South Coast HR, a large coastal watershed in southern California (DWR 2003: 148). The South Coast HR spans approximately 6.78 million acres and is bounded on the west by the Pacific Ocean, on the north by the Transverse Ranges, on the east by the Colorado River HR, and on the south by the international boundary with Mexico.

Hydrologic Unit

Within the South Coast HR, the Planning Area located within the Carlsbad HU. The San Diego Regional Water Quality Control Board (RWQCB) governs basin planning and water quality within the Carlsbad HU. Figure 5-10 shows Hydrologic Units within and surrounding the city.

Hydrologic Area

For purposes of planning on a citywide basis, hydrologic areas are generally considered to be the appropriate watershed planning level. As a planning area becomes smaller the hydrologic area level may be too large in terms of scale, and a hydrologic subarea may be considered more appropriate. Within the Carlsbad HU, the City is located within three HAs: Agua Hedionda HA in the northwestern portion of the city, Escondido Creek HA in the southern portion of the city, and San Marcos HA in the majority of the City. There is an additional HA within the northern portion of the San Marcos Planning Area but outside of the City boundaries, called the Lower San Luis. Figure 5-11 shows Hydrologic Areas within and surrounding the city.

Hydrologic Sub-Area

There are several hydrologic sub-areas within and throughout Planning Area. Analysis of hydrologic sub-areas is appropriate for the review of individual projects, but it is not appropriate for the watershed analysis of the City's General Plan.

Creeks and Waterways

The Planning Area is contained within the Carlsbad Hydrologic Unit, a watershed covering approximately 210 square miles and containing six hydrologic areas: San Marcos, Agua Hedionda, Loma Alta, Encinas, Buena Vista Creek, and Escondido Creek. The Carlsbad Hydrologic Unit contains several smaller tributaries and bodies of water, including Loma Alta Creek, Buena Vista Creek, Buena Vista Lagoon, San Marcos Creek, Batiquitos Lagoon, Escondido Creek, San Elijo Lagoon, and Lake Wohlford. The Carlsbad Hydrologic Unit ultimately drains to the Pacific Ocean. A small portion of the Planning Area, located outside of the City limit in the northeast, is located within the San Luis Rey Hydrologic Unit. Figure 5-11 (Hydrologic Areas) shows local waterways in relation to the city.

The Planning Area is located within the Carlsbad HA and is separated into four primary sub watersheds based on topographical drainage areas to creek systems:

- San Luis Rey River (Moosa Creek);
- Agua Hedionda Creek;
- San Marcos Creek; and
- Escondido Creek.

Groundwater

The City of San Marcos is underlain by a small groundwater basin, identified by the California Department of Water Resources (CDWR) as Basin 9-32 or San Marcos Groundwater Basin. The Planning Area also includes additional groundwater basins and wells, but Basin 9-32 is the only groundwater basin formally designated in the Planning Area. Groundwater in San Marcos is not considered to be a major water source. The San Marcos Groundwater Basin covers a surface area of 2,130 acres within the City and is located entirely within San Marcos Creek HAS 904.52, which is designated as impaired.

Water Quality

Surface water quality is affected by point source and non-point source pollutants. Point source pollutants are those emitted at a specific point, such as a pipe, while non-point source pollutants are typically generated by surface runoff from diffuse sources, such as streets, paved areas, and landscaped areas. Point source pollutants are controlled with pollutant discharge regulations or waste discharge requirements (WDRs). Non-point source pollutants are more difficult to monitor and control although they are important contributors to surface water quality in urban areas.

Stormwater runoff pollutants vary based on land use, topography, the amount of impervious surface, and the amount and frequency of rainfall and irrigation practices. Runoff in developed areas typically contains oil, grease, and metals accumulated in streets, driveways, parking lots, and rooftops, as well as pesticides, herbicides, particulate matter, nutrients, animal waste, and other oxygen-demanding substances from landscaped areas. The highest pollutant concentrations usually occur at the beginning of the wet season during the "first flush."

Water quality in the city is governed by the San Diego RWQCB, which sets water quality standards in the Water Quality Control Plan for the Santa Diego Region. The Basin Plan identifies beneficial uses for surface water and groundwater and establishes water quality objectives to attain those beneficial uses.

The Clean Water Act (CWA) 303(d) list is a register of impaired and threatened waters which the CWA requires all states to submit for Environmental Protection Agency approval. The list identifies all waters where the required pollution control measures have so far been unsuccessful in reaching or maintaining the required water quality standards. Waters that are listed are known as "impaired." In San Marcos, five water bodies are known to be adversely affected by pollutants generated by activities associated with each land use type in each watershed and as a result are listed on the State Water Resources Control Board's (SWRCB) 303(d) impaired waters list. The five listed water bodies are:

- Agua Hedionda Creek,
- Buena Creek,
- Escondido Creek,
- San Marcos Creek,
- Lake San Marcos.

According to the 303(d) list, pollutants in Agua Hedionda Creek include: enterococcus, fecal coliform, manganese, phosphorus, selenium, TDS, nitrogen, and toxicity. Buena Creek contains dichlorodiphenyltrichloroethane (DDT) and nitrate.

Storm Drain System

There are five major drainage basins within the Planning Area. These major drainage basins include: San Marcos Creek-North Basin, San Marcos Creek-East Basin, San Marcos Creek-Main Basin, Las Posas Basin, North Outlying Basin, and South Outlying Basin. San Marcos Creek-North

Basin, San Marcos Creek-East Basin and Las Posas Basin are all tributary to the San Marcos Creek-Main Basin.

- The San Marcos Creek-North Basin: Approximately 7,000 acres consisting of San Diego County to the north and the City of San Marcos to the south.
- The San Marcos Creek- East Basin: Approximately 4,500 acres consisting of portions of San Diego county, City of Escondido, and City of San Marcos.
- The Las Posas Basin: Approximately 2,100 acres entirely within the City of San Marcos.
- The San Marcos Creek-Main Basin: Approximately 6,200 acres consisting of San Diego County, City of San Marcos, and ta small portion of the City of Carlsbad.
- The North Outlying Basin: Approximately 2,500 acres consisting primarily of the City of San Marcos with small portions of the City of Vista and San Diego County.
- The South Outlying Basin: Approximately 2,100 acres consisting primarily of the City of San Marcos with small portions of San Diego County.

These major drainage basins are further divided into sub-basins, each of which has a maximum area of approximately 20 acres.

There are 619,271 linear feet (LF) of existing pipes that transport stormwater within the City. According to the Drainage Master Plan for San Marcos, there are 188,185 LF of hydraulically deficient pipes in San Marcos. This deficiency was measured using a 2-year, 10-year, 50- year, and 100-year storm events. For a 100-year 24-hour storm event, 22,220 LF of a total 188,185 LF of deficient pipe has only upstream surcharging; 50,683 LF of a total 188,185 LF of deficient pipe has only downstream surcharging; 93,232 Lf of a total 188,185 LF of deficient pipe has both upstream and downstream surcharging.

As part of the recent Drainage Master Plan, the City of San Marcos developed a Capital Improvement Program (CIP), to produce order of magnitude probable construction costs drainage improvement projects throughout the City. The CIP supports a citywide initiative to develop new infrastructure and replace existing infrastructure to address deficiencies in the system. Ultimately, it is recommended the City ensure all drainage infrastructure can accommodate a 100-year storm event.

5.6.2 References

California Department of Water Resources. 2006. California's Groundwater Bulletin 118 – San Marcos Groundwater Basin.

California Department of Water Resources. 2012. Final 2012 Integrated Report (CWA Section 303(d) List / 305(b) Report).

State Water Resources Control Board (SWRCB). 2010 Integrated Report, Clean Water Act Section 303(d) List / 305(b) Report. Sacramento, CA. November 12, 2010. http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

U.S. Geological Survey. "National Hydrography Dataset." U.S. Department of the Interior. http://nhd.usgs.gov/. (Accessed December 2017).

San Marcos 2012 General Plan Environmental Impact Report. City of San Marcos.

5.7 VISUAL RESOURCES AND COMMUNITY IMAGE

The City of San Marcos and the surrounding areas possess numerous visual resources that contribute to San Marcos' community image. Many scenic resources are found in the natural areas surrounding the city, while within San Marcos visual resources include hillsides, creek areas, lakes, and trails, as well as defining visual elements including trees, landscaping, and structures. These resources enhance the quality of life for San Marcos residents, and provide for outdoor recreational opportunities. This section reviews and summarizes San Marcos' key visual resources. The City's existing General Plan contains the following goals and policies related to visual resources and community image.

Element	Topic Area	Goal	Policy
Conservation and Open Space	Open Spaces and Limited Resources	Goal COS-3 Protect natural topography to preserve and enhance the natural beauty of San Marcos	Policy 3.1: Preserve scenic resources, including prominent landforms such as Double Peak, Owens Peak, San Marcos Mountains, Merriam Mountains, Cerro de Las Posas, Franks Peak, and canyon areas through conservation and management policies. Policy 3.2: Encourage and maintain high-quality architectural and landscaping designs that enhance or complement the hillsides, ridgelines, canyons, and view corridors that comprise the visual character in San Marcos. Policy 3.3: Continue to work with new development and redevelopment project applicants in designing land use plans that respect the topography, landforms, view corridors, wildlife corridors, and open space that exists. Policy 3.4: Evaluate potential impacts to visual and aesthetic resources, including the potential to create new light sources, while still maintaining and being sensitive to rural lighting standards.
		Goal COS-2: The City is committed to conserving, protecting, and maintaining open space, agricultural, and limited resources for future generations. By working with property	Policy 2.1: Provide and protect open space areas throughout the City for its recreational,

		owners, local organizations, and state and federal agencies, the City can limit the conversion of resource lands to urban uses.	agricultural, safety, and environmental value. Policy 2.2: Limit, to the extent feasible, the conversion of open space to urban uses and place a high priority on acquiring and preserving open space lands for recreation, habitat protection and enhancement, flood hazard management, water and agricultural resources protection, and overall community benefit. Policy 2.3: Protect existing agricultural areas, encourage farm to consumer, promote public health, and promote small-scale agriculture such as community gardens and the growing of organic produce. Policy 2.4: Ensure compliance with State of California requirements for mineral resources contained in the State Surface Mining and Reclamation Act. Policy COS-2.5: Continue to review future development proposals to ensure that cultural resources (including prehistoric, historic, paleontological, and Senate Bill 18 Tribal resources) are analyzed and conserved in compliance with CEQA requirements. Policy 2.6: Preserve healthy mature trees where feasible; where removal is necessary, trees shall be replaced at a ratio of 1:1.

Source: City of San Marcos General Plan, 2012

5.7.1 Environmental Setting

San Marcos has a varied topography defined by hillsides, creeks, and canyons that provide a variety of scenic views. The elevations in the City range from approximately 590 feet above sea level at the central SR-78/West San Marcos Boulevard area of the City to prominent ridgelines of approximately 1,200 to 1,600 feet above sea level west of North Twin Oaks Valley Road and at Double Peak in the Questhaven/La Costa Meadows Neighborhoods, respectively. The broad range of elevations allows for plentiful scenic vistas within the City.

Prominent natural landforms within the City or visible from the City of San Marcos include; Mount Whitney, Double Peak, Owens Peak, San Marcos Mountains, Merriam Mountains, Cerro de Las Posas, Frank's Peak, and canyon areas that enhance the visual and scenic aesthetics of the City. Viewsheds of these peaks are visible from overlook points, trails, and roads.

Open space areas and preserves within San Marcos protect the area's natural beauty and contribute to a regional system of hiking, biking, and equestrian trails. In addition, the open space areas within the community preserve habitat for a variety of plants and animals. The City contains 2,499 acres of dedicated open space, which is approximately 12 percent of the City's acreage. A majority of the area designated as open space is located in the southern portion of the Planning Area. There are a number of areas north of SR-78 that are also designated as open space. These undeveloped open space areas in the north and south contribute to the aesthetic character of the Planning Area and provide opportunities for residents to experience natural open space areas within an urbanized environment.

In addition to open space, there are numerous agricultural lands within the Planning Area that contribute to its aesthetic character. Agricultural lands are designated in the northern portion of the Planning Area, as well as a small area designated in the southeast portion of the Planning Area. The Planning Area contains approximately 166 acres identified as Prime Farmland, 145 acres of Farmland of Statewide Importance, and 1,407 acres of Unique Farmlands. The Planning Area also contains approximately 807 acres of farmland classified by the County of San Diego as Farmland of Local Importance. In addition, approximately 11 acres of Williamson Act contract lands are located in the Twin Oaks Valley Neighborhood within the Sphere of Influence.

Because San Marcos has unique access to various mountains and hillsides, the City has a Ridgeline Protection and Management Overlay Zone to protect natural viewsheds and natural resources, minimize physical impacts to ridgelines, and establish innovative sensitive architectural standards. There are three main sections of the Ridgeline Protection and Management Overlay Zone. One section is located toward the west, on the northern border of the City. The other two sections are located in the southern portion of the City. This overlay zone protects the aesthetic quality of the Planning Area and allows for preserved visual character within the community.

Other natural landmarks and scenic resources contribute to the City's aesthetic quality including, but not limited to, creek corridors, eucalyptus stands, rock outcroppings, landmark or historic buildings, and ocean views. Urban and suburban features also contribute to the aesthetic quality of the community, such as the City's parks, landmarks, historic buildings, and public facilities. These resources are a focal point for community involvement and are well-known landmarks that provide a sense of community identity and pride. A list of City parks and community facilities can be found in Chapter 3.0 Utilities and Community Services.

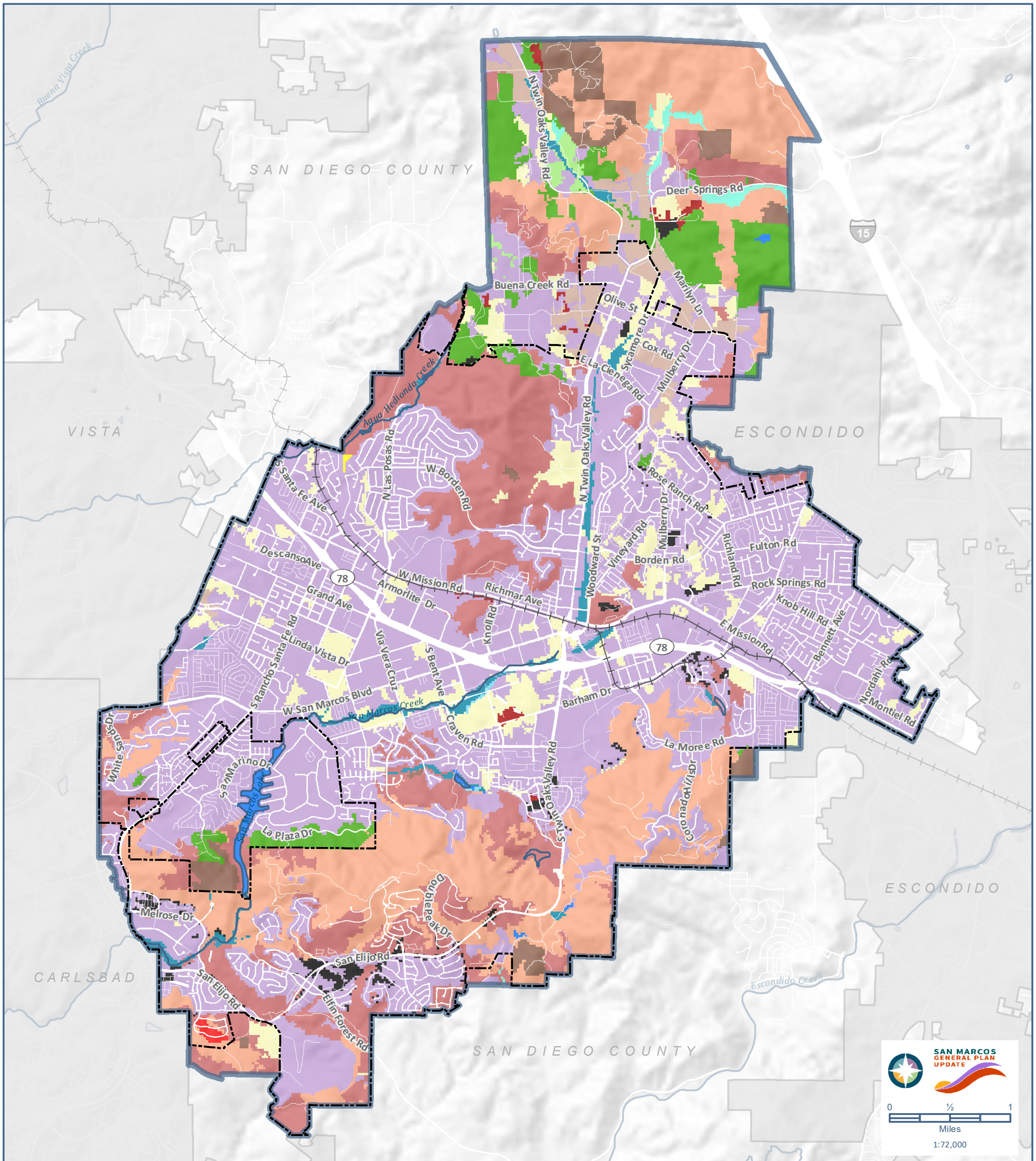
Scenic Highways and Corridors

According to the California Scenic Highway Mapping System, administered by Caltrans, there are no officially designated State Scenic Highways in the Planning Area. State Route 78, is designated by the City of San Marcos as a view corridor and is eligible as a State Scenic Highway. This highway corridor provides views of the Merriam Mountains, Mount Whitney, Double Peak, CSUSM, and Palomar Community College. Pacific Ocean views are visible from Double Peak Park and from roads and pathways within San Elijo Hills.

5.7.2 References

California Department of Transportation, California Scenic Highway Program

City of San Marcos. City of San Marcos General Plan. Adopted 2012.



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Unincorporated San Diego County
- Lake or Pond
- Creek
- Railroad
- Annual Grassland
- Barren
- Chamise-Redshank Chaparral
- Coastal Oak Woodland
- Coastal Scrub
- Deciduous Orchard
- Eucalyptus
- Evergreen Orchard
- Fresh Emergent Wetland
- Irrigated Row and Field Crops
- Lacustrine
- Mixed Chaparral
- Pasture
- Perennial Grassland
- Urban
- Valley Foothill Riparian

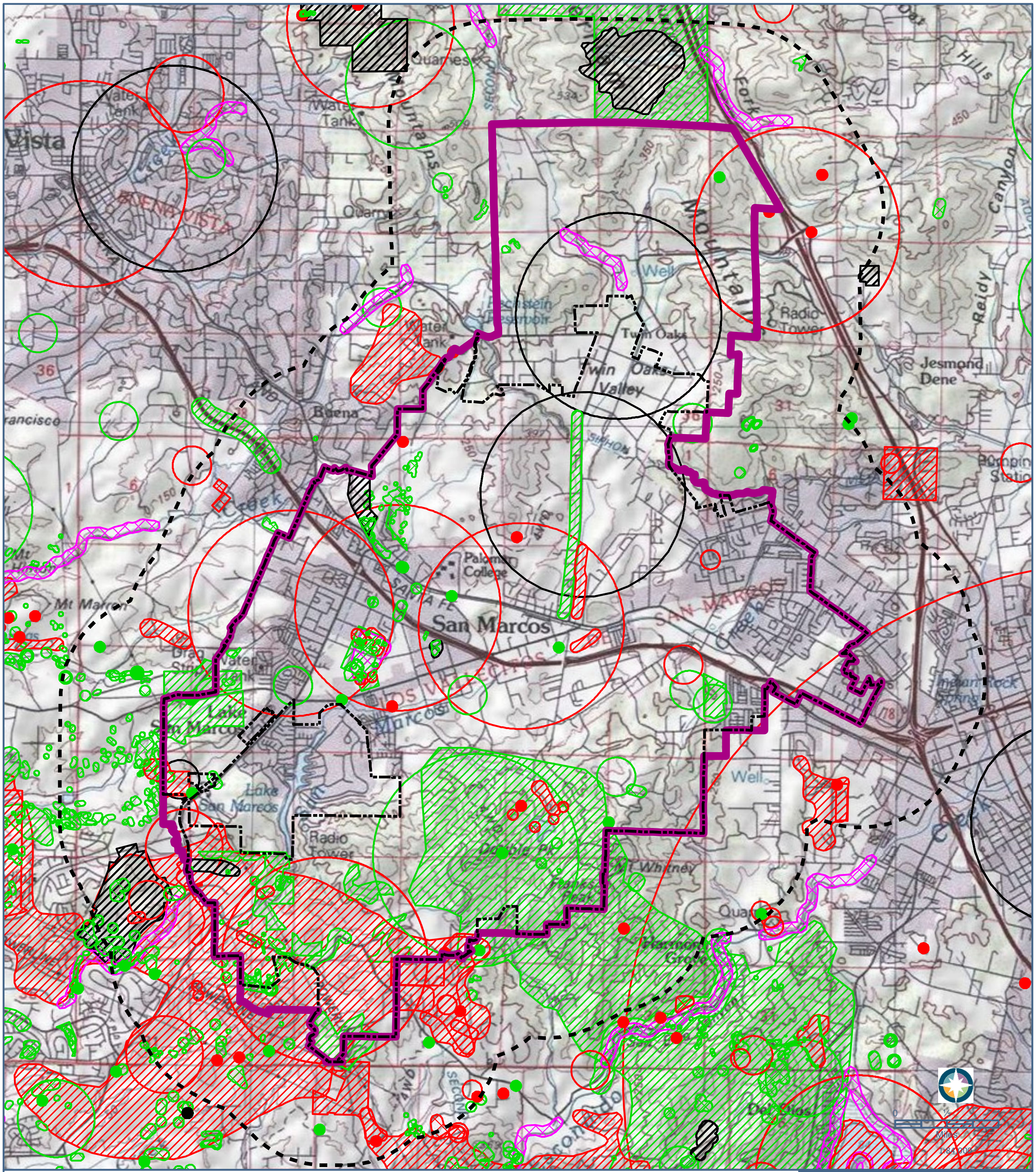
FIGURE 5.1.

LAND COVER TYPES

Data sources: California Department of Forestry and Fire Protection, Vegetation (fveg_15), 2015; SandGIS/SANDAG; CalAtlas. Map date: April 17, 2020.

De Novo Planning Group

This page left intentionally blank



LEGEND

Plant (80m)	Animal (specific)	Multiple (specific)	City of San Marcos
Plant (specific)	Animal (non-specific)	Multiple (non-specific)	Sphere of Influence
Plant (non-specific)	Animal (circular)	Multiple (circular)	1-mile Radius of SOI
Plant (circular)	Terrestrial Comm. (specific)		
Animal (80m)	Multiple (80m)		

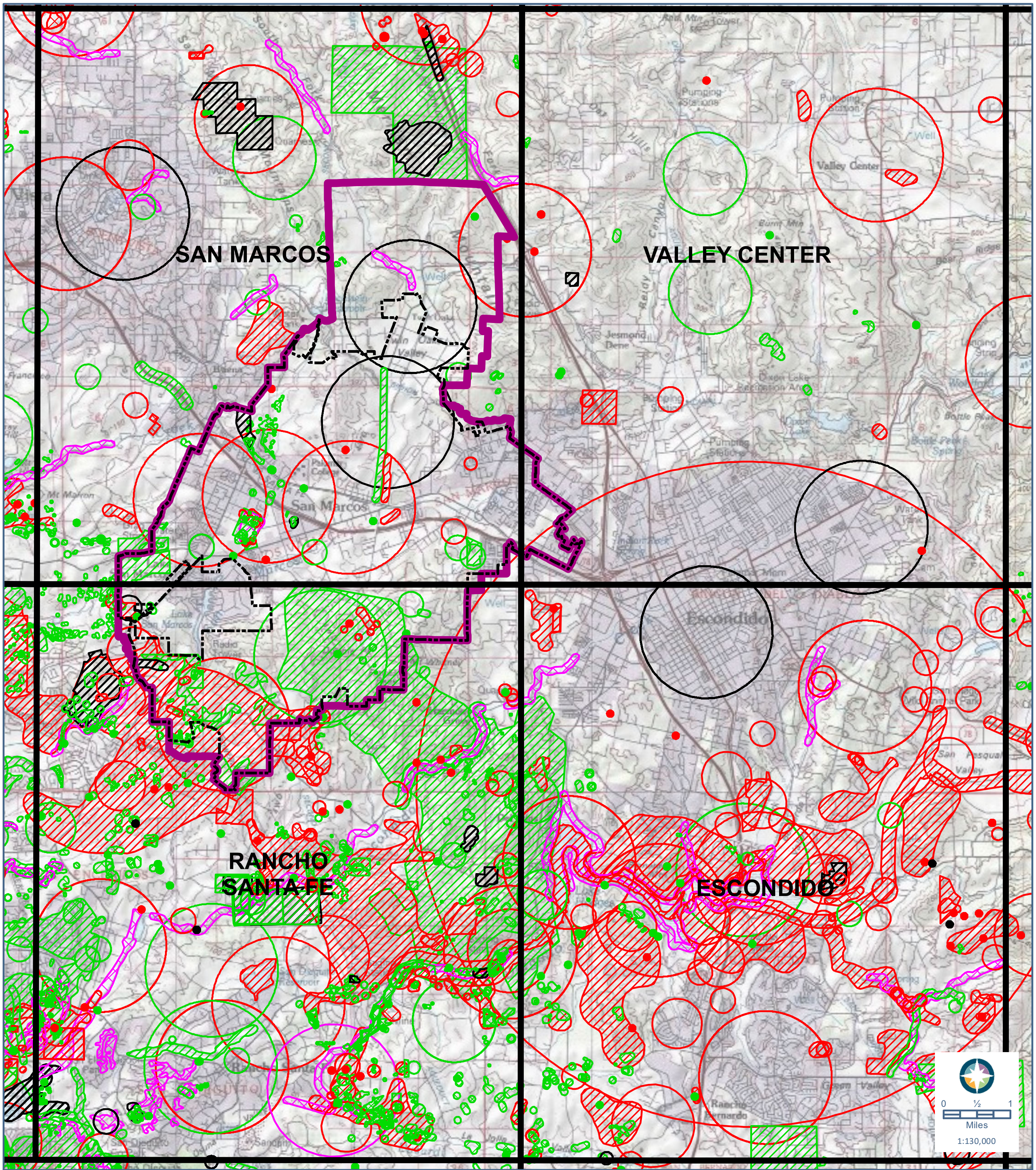
Sources: SanGIS; ArcGIS Online USGS Topographic Map Service; CNDDB version 03/01/2020. Please Note: the occurrences shown on this map represent the known locations of the species listed here as of the date of this version. There may be additional occurrences or additional species within this area which have not been surveyed and/or mapped. Lack of information in the CNDDB about a species or an area can never be used as proof that no special status species occur in an area. Map date: March 12, 2020.

FIGURE 5.2

CALIFORNIA NATURAL DIVERSITY DATABASE

1-MILE RADIUS

This page left intentionally blank



LEGEND

- 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)
- City of San Marcos
- Sphere of Influence
- USGS 7.5' Quadrangle Boundary

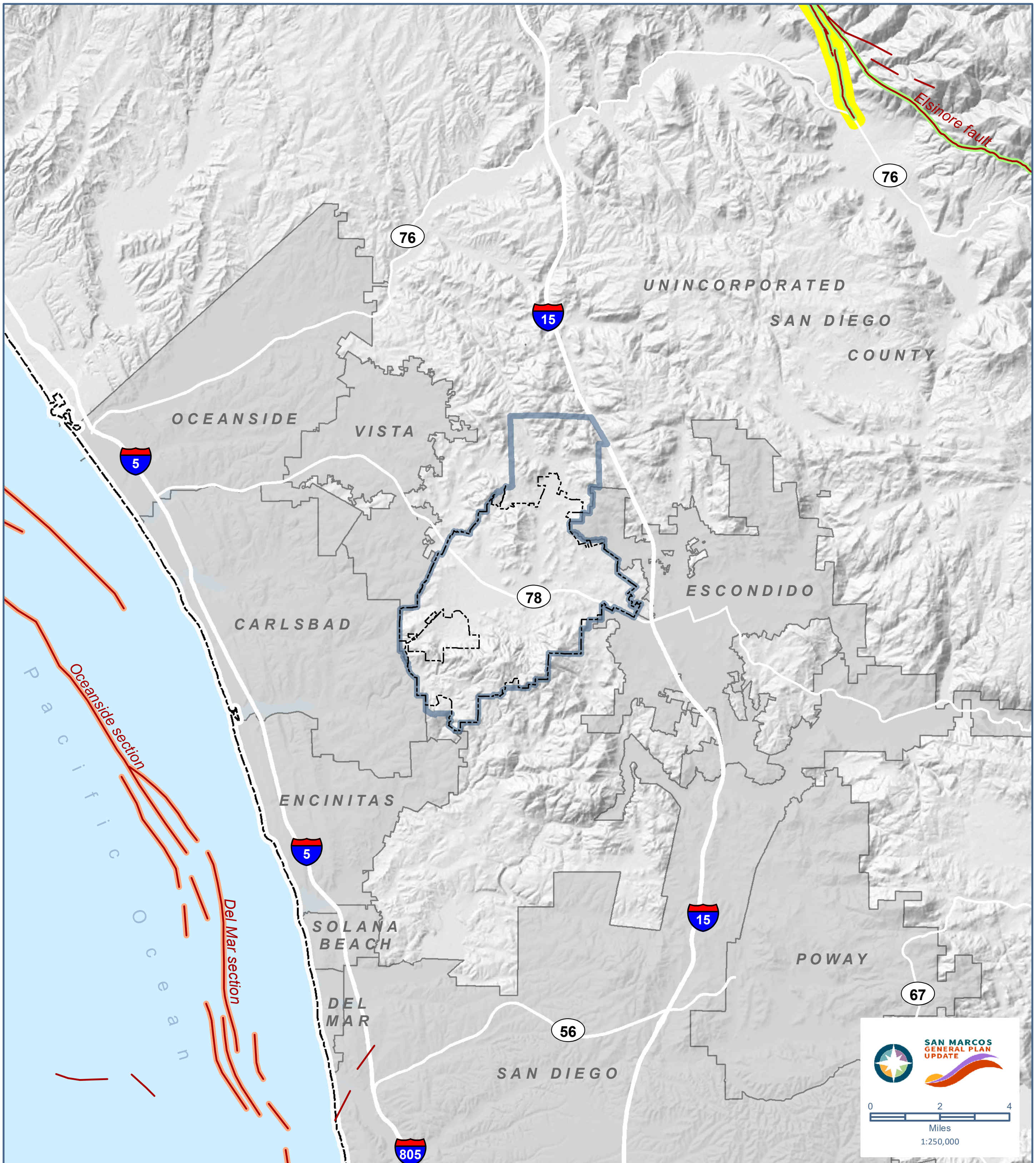
FIGURE 5.3

CALIFORNIA NATURAL DIVERSITY DATABASE

QUADRANGLE SEARCH

Sources: SanGIS; ArcGIS Online USGS Topographic Map Service; CNDDB version 03/01/2020. Please Note: the occurrences shown on this map represent the known locations of the species listed here as of the date of this version. There may be additional occurrences or additional species within this area which have not been surveyed and/or mapped. Lack of information in the CNDDB about a species or an area can never be used as proof that no special status species occur in an area. Map date: March 13, 2020.

This page left intentionally blank



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Unincorporated San Diego County
- Quaternary fault
- Elsinore fault zone
- Newport-Inglewood-Rose Canyon fault zone
- Alquist-Priolo Zone

FIGURE 5.4.

GEOLOGIC FAULTS

Data sources: United States Geological Survey; SANGIS; CalAtlas. Map date: April 15, 2020.

De Novo Planning Group

This page left intentionally blank

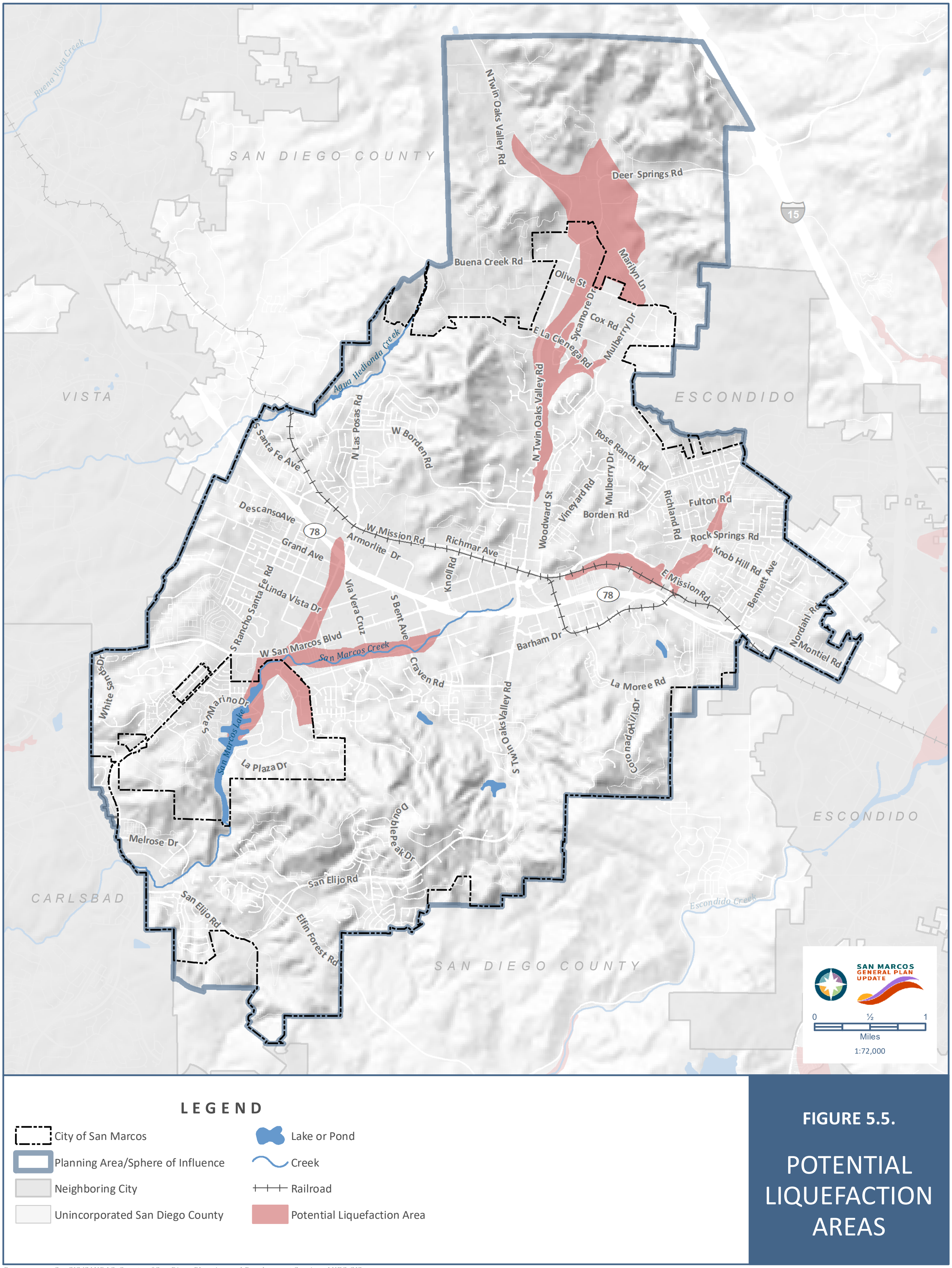


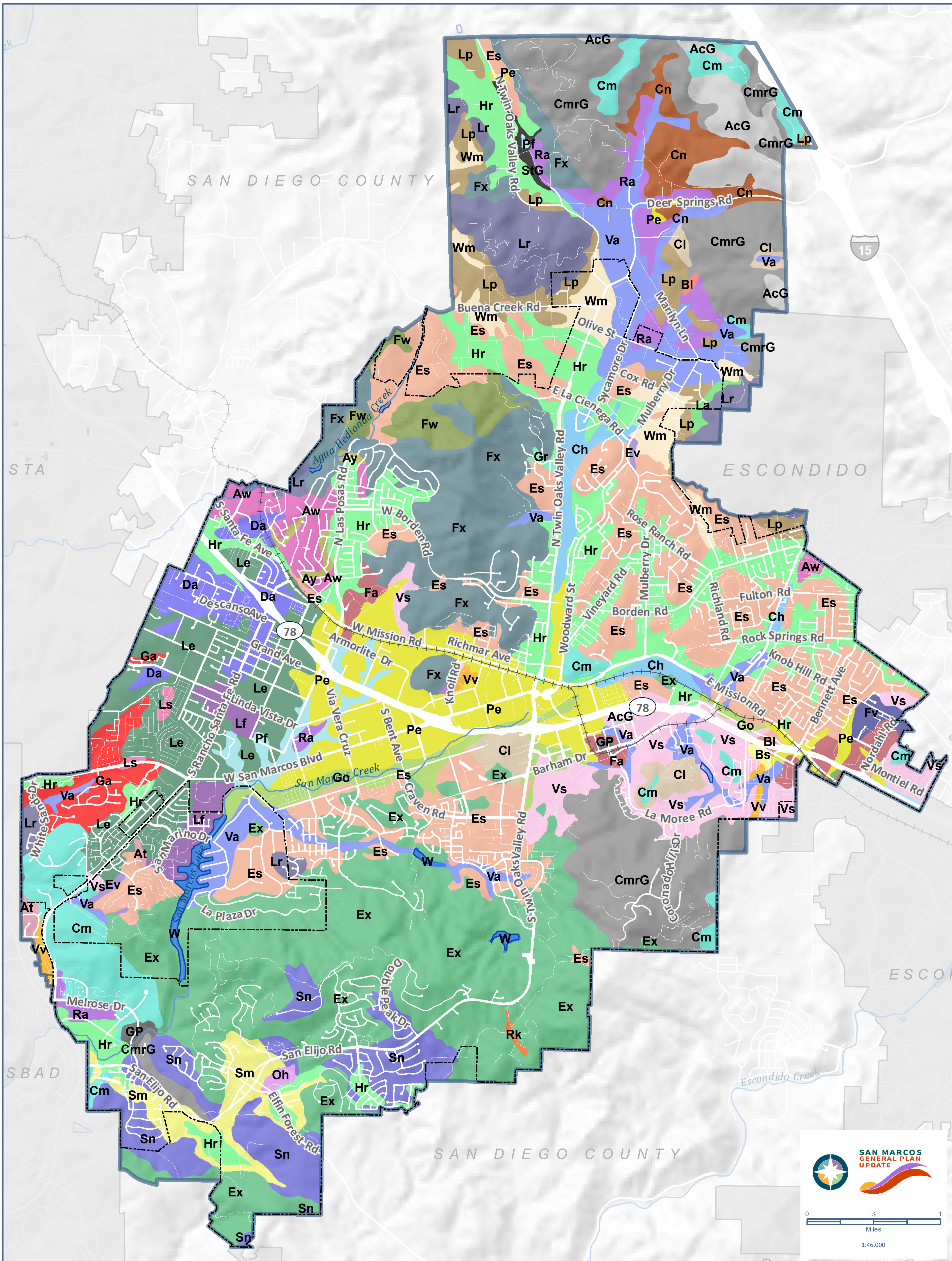
FIGURE 5.5.

POTENTIAL LIQUEFACTION AREAS

Data sources: SanGIS/SANDAG, County of San Diego Planning and Development Services, LUEG-GIS Services, National Earthquake Hazards Reduction Program; CalAtlas. Map date: April 17, 2020.

De Novo Planning Group

This page left intentionally blank



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Unincorporated San Diego County
- Lake or Pond
- Creek
- Railroad

Miscellaneous Areas

- AcG- Acid igneous rock land
- CmrG- Rock outcrop
- GP- Gravel pits
- StG- Steep gullied land
- W- Water

Soil Series

- At- Altamont clay
- Aw- Auld clay
- Ay- Auld stony clay
- Bl- Bonsall sandy loam
- Bs- Bosanko clay
- Ch- Chino fine sandy loam
- Cl- Cieneba coarse sandy loam
- Cm- Cieneba rocky coarse sandy loam
- Cn- Cieneba-Fallbrook rocky sandy loam
- Da- Diablo clay
- Es- Escondido very fine sandy loam
- Ev- Escondido very fine sandy loam, deep
- Ex- Exchequer rocky silt loam
- Fa- Fallbrook sandy loam
- Fe- Fallbrook rocky sandy loam
- Fv- Fallbrook-Vista sandy loam
- Fw- Friant fine sandy loams
- Fx- Friant rocky fine sandy loams
- Ga- Gaviota fine sandy loam
- Go- Grangeville fine sandy loam
- Gr- Greenfield sandy loam
- Hr- Huerhuero loam
- La- La Posta loamy coarse sand
- Le- Las Flores loamy fine sand
- Lf- Las Flores-Urban land complex
- Lp- Las Posas fine sandy loam
- Lr- Las Posas stony fine sandy loam
- Ls- Linne clay loam
- Oh- Olivenhain cobbly loam
- Pe- Placentia sandy loam
- Pf- Placentia sandy loam, thick surface
- Ra- Ramona sandy loam
- Rk- Reiff fine sandy loam
- Sm- San Miguel rocky silt loam
- Sn- San Miguel-Exchequer rocky silt loam
- Va- Visalia sandy loam
- Vs- Vista coarse sandy loam
- Vv- Vista raocky coarse sandy loam
- Wm- Wyman loam

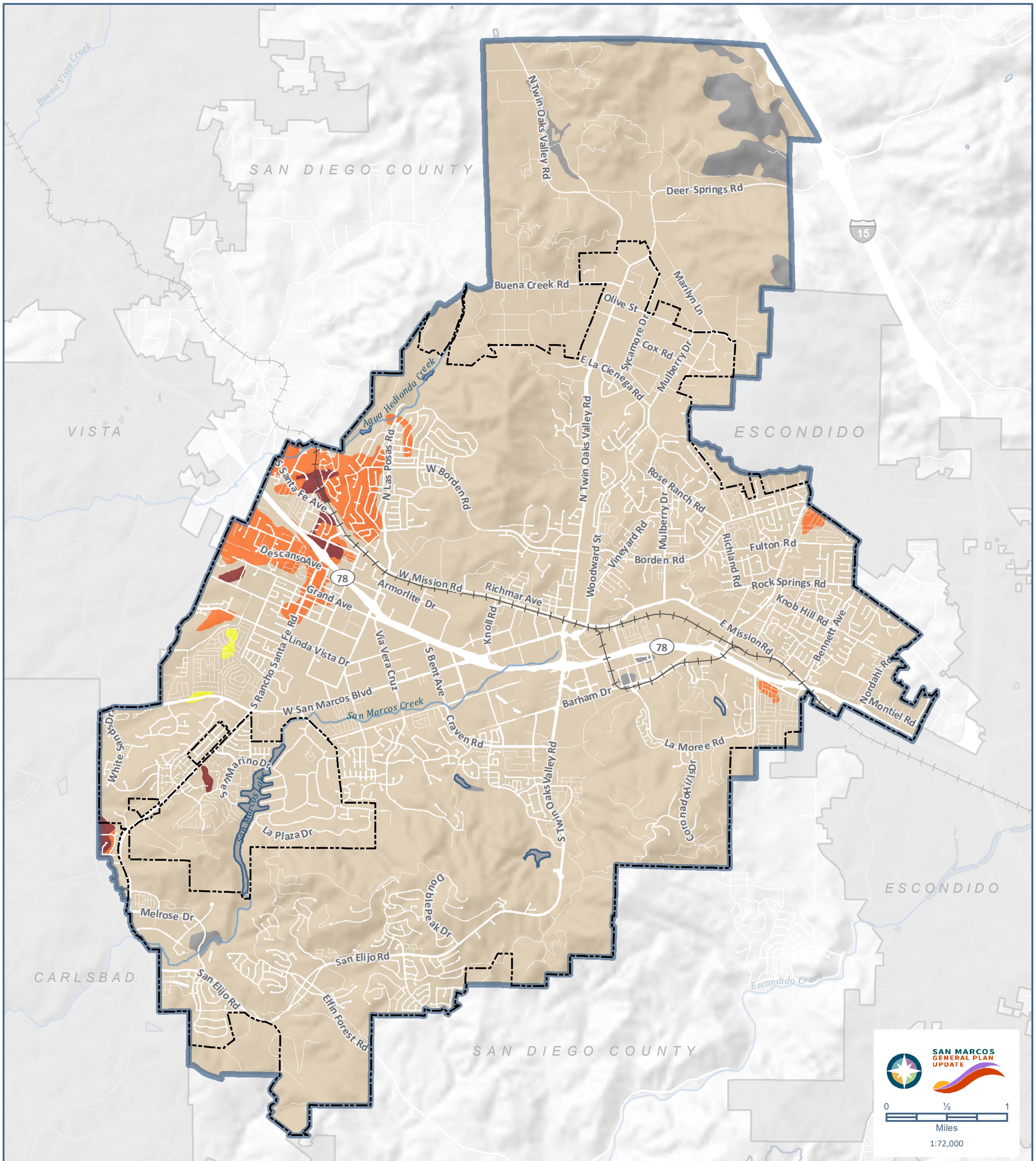
FIGURE 5.6

NRCS SOILS

Data sources: NRCS soil database server accessed via ArcGIS Online, 3/18/2020; SANGIS; CalAtlas. Map date: March 18, 2020.

De Novo Planning Group

This page left intentionally blank



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Unincorporated San Diego County
- Lake or Pond
- Creek
- Railroad

Shrink Swell Potential* (Linear Extensibility)

- Low Potential (0 - 3%)
- Moderate Potential (3 - 6%)
- High Potential (6 - 9%)
- Very High Potential (9 - 30%)
- Not rated or not available

**Shrink-Swell Potential is determined by linear extensibility. Linear extensibility refers to the change in length of an unconfined clod of soil as moisture content is decreased from a moist to a dry state. Soils are considered to have low potential when the linear extensibility is less than 3%, moderate if 3-6%, high if 6-9%, and very high if greater than 9%.*

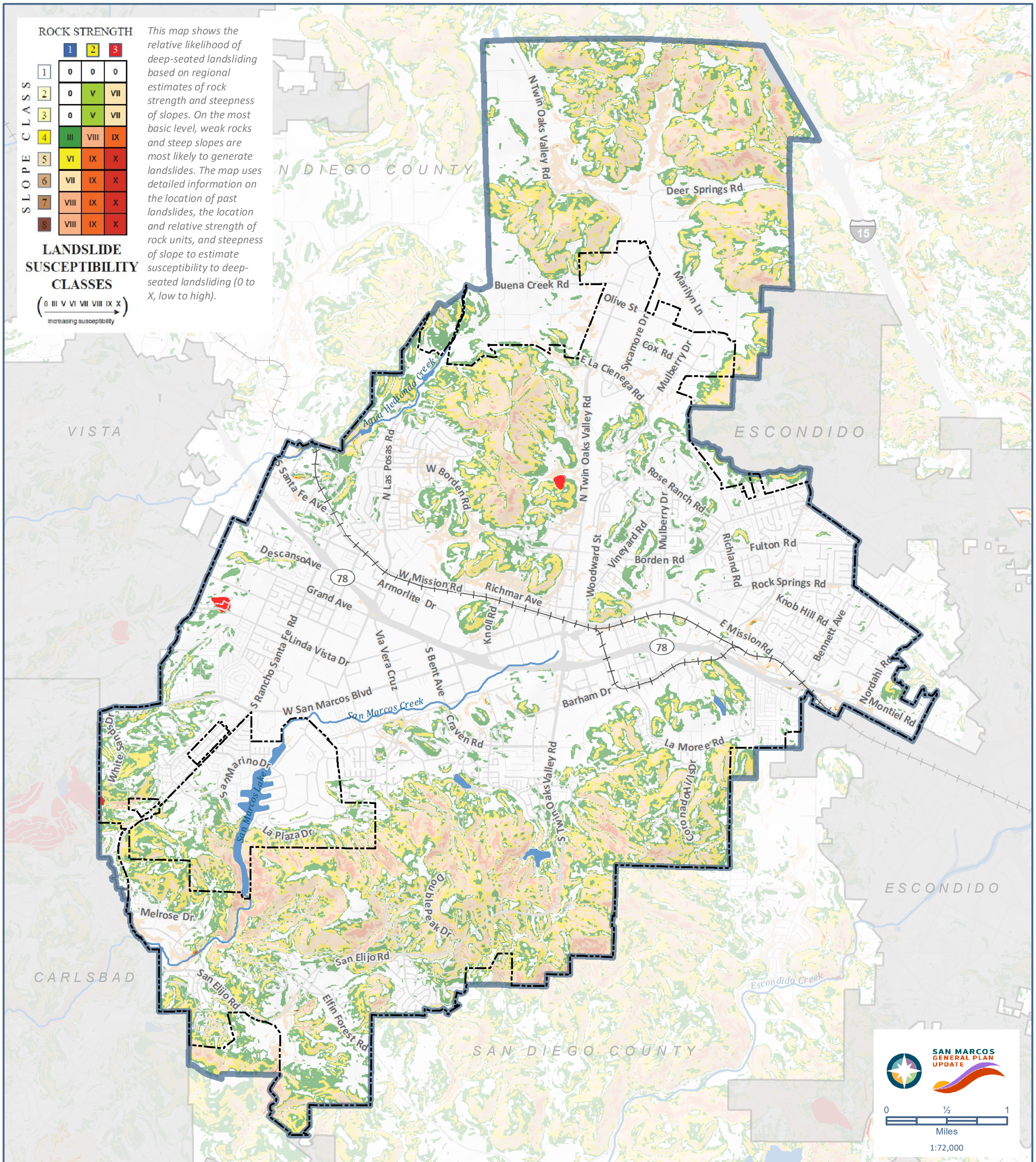
FIGURE 5.7.

SHRINK-SWELL POTENTIAL OF SOILS

Data sources: NRCS Web Soil Survey, SSA San Diego County Area, California, 9/6/2019; SANGIS; CalAtlas. Map date: April 17, 2020.

De Novo Planning Group
A Land Use Planning, Design, and Environmental Firm

This page left intentionally blank



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Unincorporated San Diego County
- Lake or Pond
- Creek
- Railroad

Landslide Susceptibility Classes

- Class 0 (least susceptible)
- Class III
- Class V
- Class VI
- Class VII
- Class VIII
- Class IX
- Class X (most susceptible)

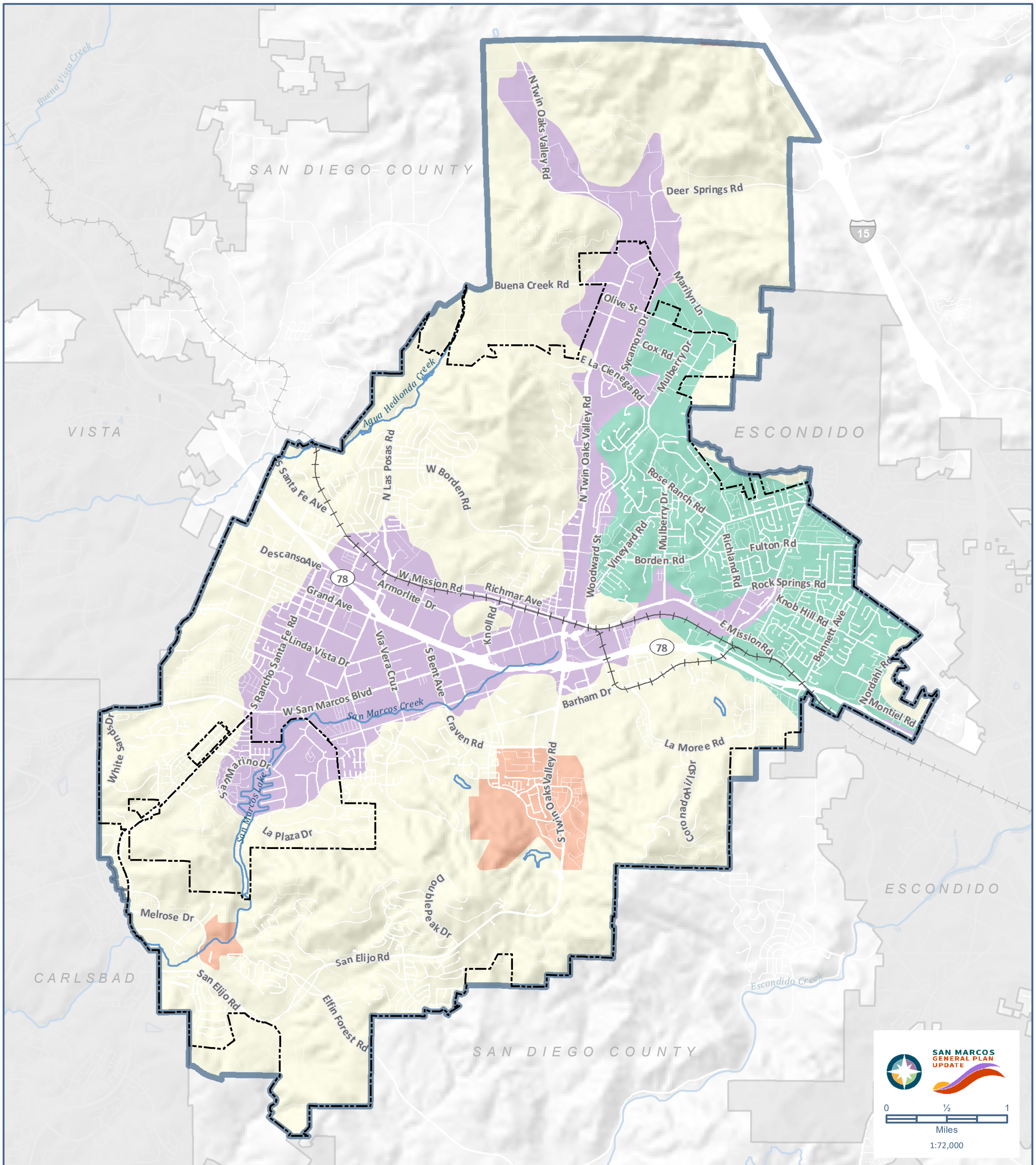
increasing susceptibility

FIGURE 5.8.

SUSCEPTIBILITY TO DEEP-SEATED LANDLSIDES

Data sources: Wills C.J., Perez, F., Gutierrez, C., 2011, Susceptibility to deep-seated landslides in California: California Geological Survey, Map Sheet 58, http://www.conservation.ca.gov/cgs/Documents/library-publications/MS58.pdf; SanGIS/SANDAG; CalAtlas. Map date: April 17, 2020.

This page left intentionally blank



LEGEND

- City of San Marcos
- Sphere of Influence
- Neighboring City
- Unincorporated San Diego County
- Lake or Pond
- Creek
- Railroad

Mineral Resource Zones*

- MRZ-1
- MRZ-2
- MRZ-3
- MRZ-4

**Mineral Resource Zone Descriptions*

MRZ-1: Areas where available geologic information indicates that little likelihood exists for the presence of significant mineral resources

MRZ-2: Areas where geologic information indicates that significant measured or indicated Portland Cement Concrete-grade aggregate resources are present

MRZ-3: Areas containing known or inferred mineral occurrences of undetermined mineral resource significance

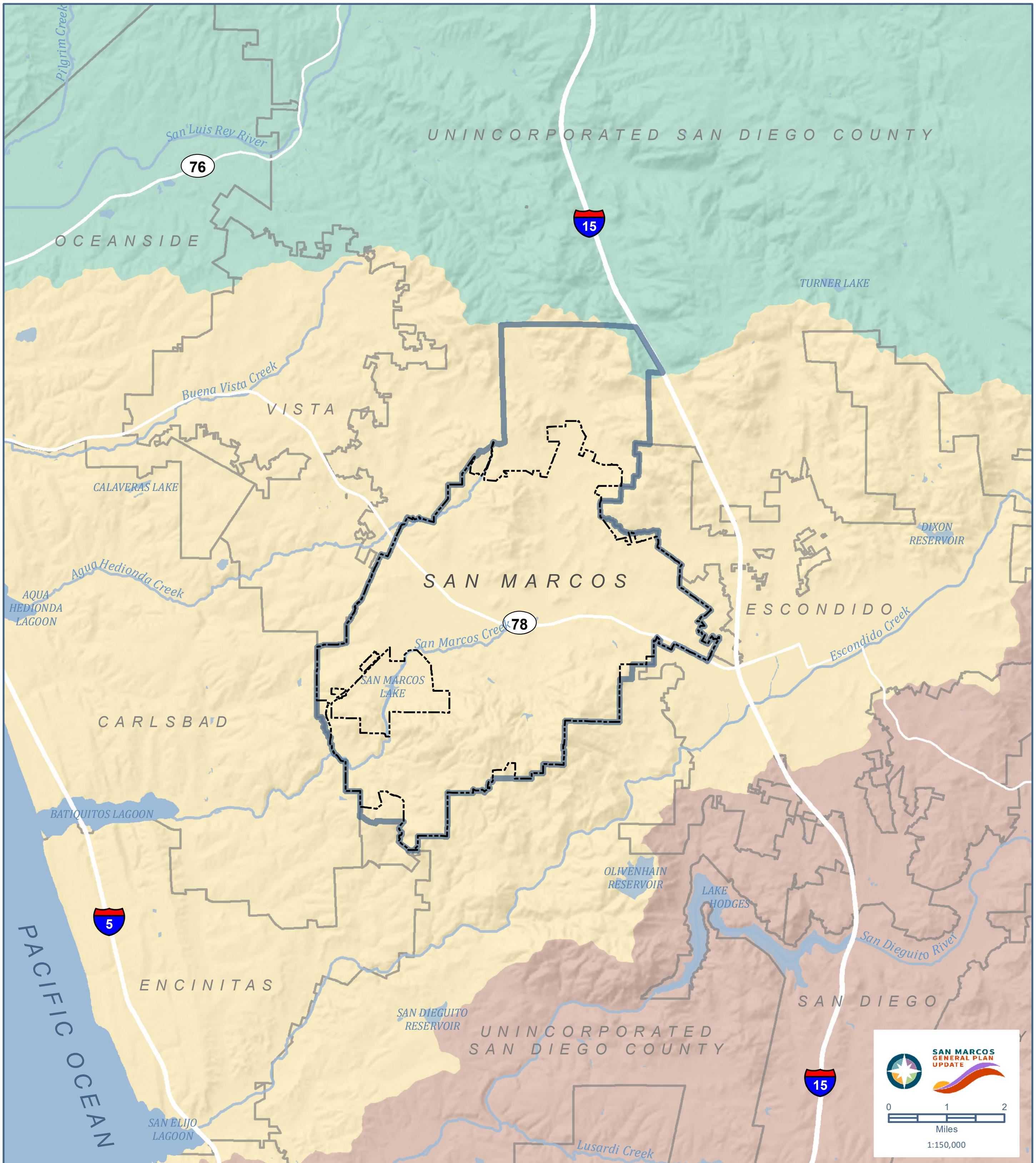
MRZ-4: Areas where available information is inadequate to assign to any other MRZ category

FIGURE 5.9.

MINERAL RESOURCE ZONES

Data sources: California Department of Conservation/California Geological Survey, 2017, "Special Report 240 - Update of Mineral Land Classification: Portland Cement Concrete-Grade Aggregate in the Western San Diego County Production-Consumption Region, California," SANGIS; CalAtlas. Map date: April 17, 2020.

This page left intentionally blank



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Water Body
- Creek or River

Hydrologic Unit

- Carlsbad
- San Dieguito
- San Luis Rey

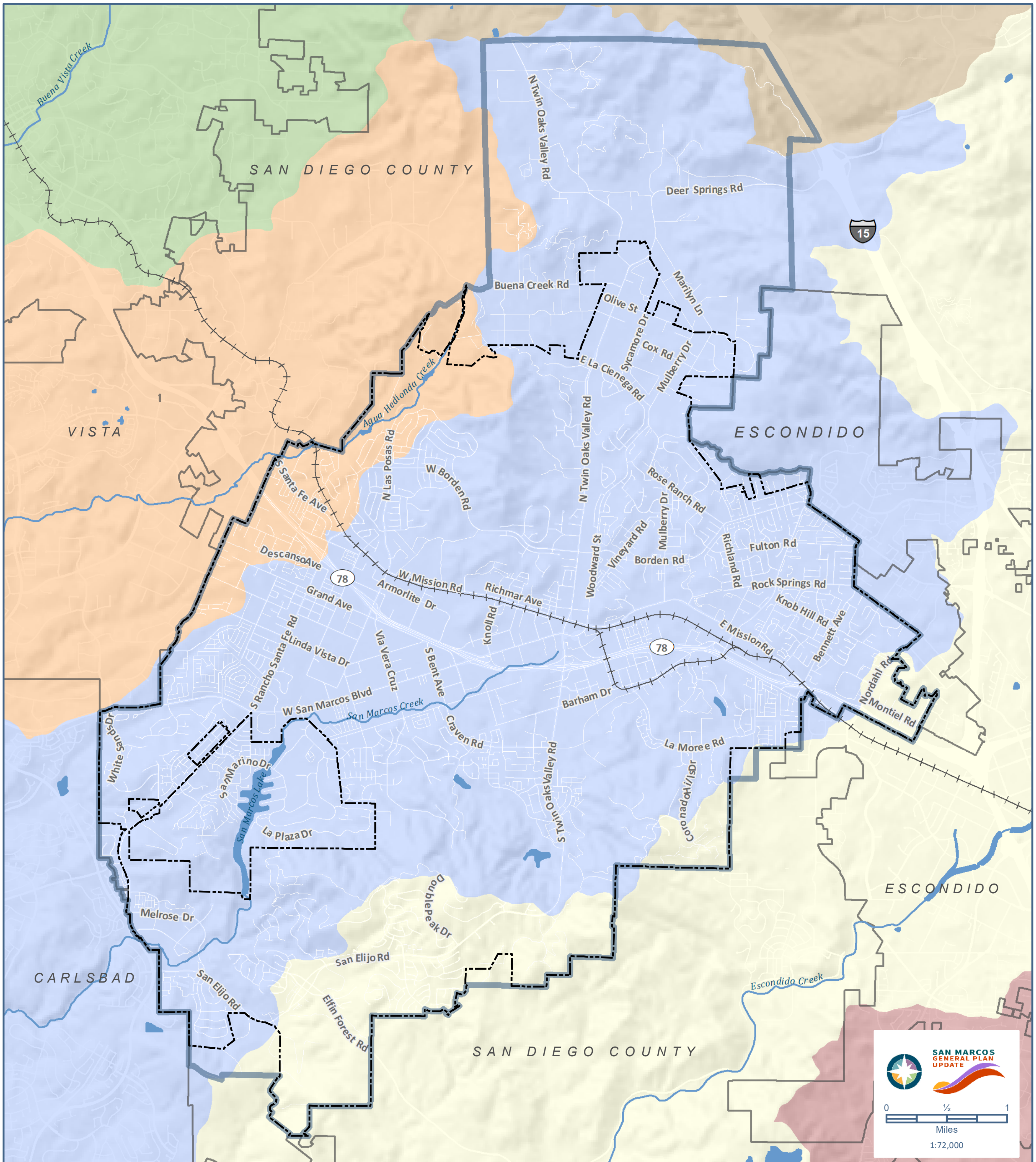
FIGURE 5.10.

HYDROLOGIC UNITS

Data sources: CalWater 2.2.1; SANGIS; CalAtlas. Map date: April 17, 2020.

De Novo Planning Group
A Land Use Planning, Design, and Environmental Firm

This page left intentionally blank



LEGEND

- City of San Marcos
- Planning Area/Sphere of Influence
- Neighboring City
- Lake or Pond
- Creek
- Railroad

Hydrologic Areas

- Agua Hedionda
- Buena Vista Creek
- Escondido Creek
- Hodges
- Lower San Luis
- San Marcos

FIGURE 5.11.

HYDROLOGIC AREAS

Data sources: CalWater 2.2.1; SANGIS; CalAtlas. Map date: April 17, 2020.

This page left intentionally blank