Ventura County 2040 GENERAL PLAN

Chapter 11
Hazards and Safety

11 HAZARDS AND SAFETY

INTRODUCTION

This chapter summarizes the hazards and safety issues for the County of Ventura. It is organized into the following sections:

- Geologic and Seismic Hazards (Section 11.1)
- Flood Hazards (Section 11.2)
- Wildfire Hazards (Section 11.3)
- Aviation Hazards (Section 11.4)
- Hazardous Materials (Section 11.5)
- Noise and Vibration (Section 11.6)

SECTION 11.1 GEOLOGIC AND SEISMIC HAZARDS

Introduction

This section addresses the geology and soils conditions within Ventura County and the potential risk these conditions pose. Existing and potential problems related to geology and soils include seismic ground shaking, ground failure, and unsuitable soils. This chapter, which is consistent with the 2015 Ventura County Multi-Hazard Mitigation plan, summarizes the geologic and seismic conditions for the County of Ventura, which include the following areas of concern:

- Known Earthquake Faults
- Liquefaction
- Landslides
- Soil Erosion
- Unstable Geologic Units and Soil
- Expansive Soils

Major Findings

- There are several earthquake faults in the County of Ventura that have a status of "Active" or "Potentially Active," according to the California Geological Survey's Regional Geologic Hazards and Mapping Program. Fault designations within the County are subject to change as further evidence is received, providing either clearer proof of potential for activity or convincing geologic evidence of inactivity.
- The entire County of Ventura, including all cities, is susceptible to liquefaction, but the most vulnerable locations are along the Santa Clara River and in the Oxnard Plain.

Existing Conditions

Geologic Structures

Local physiography is dominated by the rugged slopes of the Transverse Ranges and reflects several water courses that run through the County. Three major riverine systems extend from the mountains to the ocean in the county: the Ventura River (watershed area is 227 square miles), the Santa Clara River, (watershed area is 1,634 square miles, approximately 60 percent of which is in Ventura County), and Calleguas Creek (watershed area is 343 square miles). Incised creeks, including Prince Barranca (from Hall Canyon) and Sanjon Barranca, dissect the hills to the north of the City of Ventura. Elevations range from sea level to 2,163 feet along the ridgeline of Red Mountain that lies between the Lake Casitas basin and the Pacific Ocean. The very large Ventura Oil Field runs along the axis of the Ventura Avenue Anticline. Residential and commercial development fills most of the coastal plain and the lowlands along the Ventura River.

Ventura County generally includes late Quaternary alluvial and fluvial sedimentary deposits, beach deposits, and artificial fill. These deposits are composed mainly of volcanic, marine and non-marine sedimentary rocks overlying a basement complex of granitic and metamorphic rock. The Oxnard Plain is immediately underlain by thick alluvial sediments, which overlie the older sedimentary and volcanic rocks. Young Quaternary deposits cover about 13 percent of the Ventura County Quadrangle. Most of the exposed valley alluvium is Holocene (<11,700 years old), with older Quaternary sediments locally exposed on the lower slopes of surrounding hills. Most Holocene sediments exposed along the Ventura River valley are wash (Qw), alluvial (Qya), and marine (Qym) deposits. Superficially, the alluvial fan units are composed of material ranging in size from boulders to clay, with silt and clay being the major components.

Expansive Soils

Soils within Ventura County vary, ranging from soils that are well-drained to excessively drained loamy sands to silty clay barns on alluvial fans and plains, and poorly drained loamy sands to silty clay barns in basins. The soils formed in alluvium derived predominantly from sedimentary rocks and to a lesser extent from basic igneous rocks. These generalized soil types have been derived from the more detailed soil survey of Ventura County and soils map. "Expansive soils" are soils that expand when wet and contract when dry. Historically, expansive soils have caused considerable damage in Ventura County. In the early 1960s, numerous homes were razed and many more were severely damaged in the Shadow Oaks Tract, adjacent to the City of Thousand Oaks. This area experienced soil expansion that cracked many two-inch-thick concrete slabs. As the damage started to appear in the new homes of this tract, many of them were vacated. Other houses were rented; a transient group of people occupied these and the neighborhood generally declined. In time, repairs saved some homes while others were replaced using sturdier construction techniques. The Shadow Oaks case was primarily responsible for the establishment of more stringent building code requirements. Since the initial damage in the 1960s, engineering studies have resulted in design techniques and procedures that provide for safe and economical construction on expansive soils. Local building ordinances have incorporated these techniques and procedures. This has allowed construction even in areas where the hazard is severe.

The resources most often affected by expansive soils are structures. Even though expansive soils are scattered throughout the County, their potential impact on structures is limited to just a few developed areas: portions of the Ojai Valley, the Camarillo Hills and areas around the community of Moorpark. The presence of expansive soils in these developed areas presents no threat, however, because soils tests and engineering solutions can overcome the dangers of expansive soils.

Mineral Resources

The hilly middle and southern onshore areas of the county are developed as oil fields (San Miguelito and Ventura Avenue Oil Fields). The large-scale structural feature responsible for petroleum accumulation is the Ventura Anticline, an east-west trending geologic structure 16 miles long, visible in the numerous rock outcrops in the rugged topography of the area. Within this feature, the primary petroleum-bearing unit is the Pico Formation, a sedimentary unit of turbidite sands of high porosity (16 to 20 percent). Oil was first discovered in the area in March 1919, reaching a depth of 3,498 feet. In 2009, an average of 11,600 barrels of oil per day was being drawn from the formation.

Earthquake Faults

The Transverse Range's geomorphic province is characterized by west-trending folds, thrust faults, and fault-bounded valleys. The structural framework of the region is generally considered the result of regional compression caused by right-lateral, strike-slip movement on the "Big Bend" segment of the San Andreas Fault. Major faults in the region are west-trending reverse faults. The significant faults summarized below are described in the 2015 Ventura County Multi-Hazard Mitigation Plan.

Malibu Coast Fault System

The Malibu Coast fault system includes the Malibu Coast, Santa Monica, and Hollywood faults. The system begins in the Hollywood area, extends along the southern base of the Santa Monica Mountains, and passes offshore a few miles west of Point Dume. The 1973 Point Mugu earthquake is believed to have originated on this fault system.

Oak Ridge Fault System

The Oak Ridge fault system is a steep (65 degrees) southerly dipping reverse fault that extends from the Santa Susana Mountains westward along the southerly side of the Santa Clara River Valley and into the Oxnard Plain. The system is more than 50 miles long on the mainland and may extend an equal or greater distance offshore. Several recorded earthquake epicenters on land and offshore may have been associated with the Oak Ridge fault system. Portions of the system are zoned by the state as active.

Pine Mountain Thrust Fault and Big Pine Fault

These two large faults occur in the mountainous portion of Ventura County, north of the Santa Ynez fault; the faults are located 9 and 16 miles north of the City of Ojai, respectively. The Pine Mountain thrust fault is reported to have ruptured the ground surface for a distance of 30 miles along its length during the northern Ventura County earthquakes of November 1852.

San Andreas Fault

San Andreas is the longest and most significant fault in California. While it does not run through Ventura County, it is located just north of the county boundary, in some cases less than a mile away. Because of clearly established historical earthquake activity, this fault has been designated as active by the State of California. The last major earthquake on the San Andreas Fault near Ventura County was the Fort Tejon earthquake of 1857, which was estimated at magnitude M 8.0 on the Mercalli Scale, causing the roof of Mission San Buenaventura to collapse and damaging its bell tower. It would have caused considerably

more damage if there had been structures in the county at the time. There is a 59 percent chance that a magnitude M 6.7 quake or larger will occur on this fault within the next 30 years.

San Cayetano–Red Mountain–Santa Susana Fault System

This fault system consists of a major series of north-dipping reverse faults that extend over 150 miles from Santa Barbara County into Los Angeles County. Within this system, the San Cayetano fault is the greatest hazard to Ventura County; it is a major, north-dipping reverse fault that extends for 25 miles along the northern portion of the Ventura Basin. The San Fernando earthquake of 1971 was caused by activity along this fault.

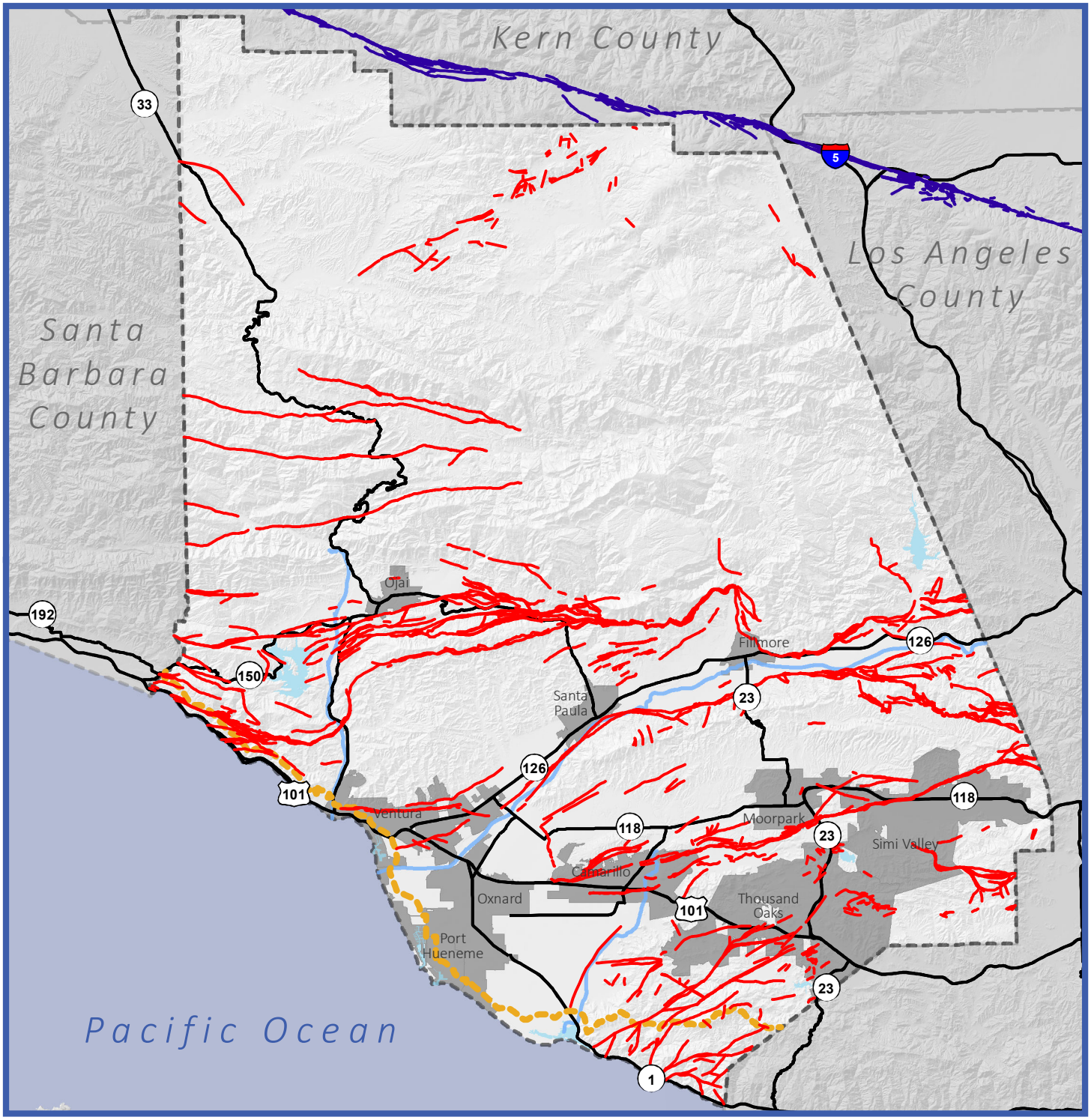
Simi–Santa Rosa Fault System

This fault system extends from the Santa Susana Mountains westward along the northern margin of the Simi and Tierra Rejada valleys and along the southern slope and crest of the Las Posas Hills to its westerly termination.

Ventura-Pitas Point Fault

The western half of this fault is known as the Pitas Point fault, and the eastern half is known as the Ventura fault. The Pitas Point fault extends offshore into the Pacific Ocean and is roughly 14 miles long. The Ventura fault extends into the communities of Ventura and Sea Cliff and runs roughly parallel to portions of U.S. 101 and State Route 126. The fault is roughly 12 miles long. The Ventura-Pitas Point fault is a left-reverse fault.

Figure 11-1 shows the general locations of faults in Ventura County.



Ventura County 2040 General Plan

Figure 11-1: Faults

Map Date: December 08, 2017

Source: Ventura County, 2016; California Department of Transportation, 2007; USGS, 2017.

0 7.5 15 Miles

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- Faults within Ventura County
- San Andreas Fault Zone
- Coastal Zone Boundary
- Major Roadways
- Major Waterways
- Water Bodies
- Cities

Ground Shaking

Seismically-induced ground shaking is a critical potential seismic hazard in Ventura County. The severity of ground shaking depends primarily upon the magnitude of the earthquake, the location of the fault with respect to the site, and the soil and/or rock conditions at the site. The two most common measures of earthquake intensity used in the United States are the Modified Mercalli Intensity Scale, which measures felt intensity, and peak ground acceleration (PGA), which measures instrumental intensity by quantifying how hard the earth shakes in a given location. Magnitude is measured by the amplitude of the earthquake waves recorded on a seismograph using a logarithmic scale. The following table, taken from the 2015 Ventura County Multi-Hazard Mitigation Plan, presents intensities that are typically observed at locations near the epicenter of earthquakes of different magnitudes, with interpretations of perceived shaking and potential damage to the built environment (Table 11-1).

TABLE 11-1
MAGNITUDE/INTENSITY/GROUND-SHAKING COMPARISONS

Magnitude	Instrumental Intensity	PGA (% g)	Perceived Shaking	Potential Damage
0 – 4.3	I	<0.17	Not Felt	None
	II – III	0.17 – 1.4	Weak	
4.3 – 4.8	IV	1.4 – 3.9	Light	
	V	3.9 – 9.2	Moderate	Very Light
4.8 – 6.2	VI	9.2 – 18	Strong	Light
	VII	18 – 34	Very Strong	Moderate
6.2 – 7.3	VIII	34 – 65	Violent	Moderate to Heavy
	IX	65 – 124	Very Violent	Heavy
7.3 – 8.9	X	124+	Extreme	Very Heavy
	XI			
	XII			

Source: United States Geological Survey, Earthquake Hazards Program: https://earthquake.usgs.gov/.

The effects of ground shaking in Ventura County depend on 1) conditions of the local geology influence events: solid bedrock is far less subject to intense shaking than loose sediment; 2) duration and intensity of the earthquake are subject generally to the size of the earthquake; and (3) distance (as the distance from the epicenter drops off so the intensity of the shaking decreases). The duration of strong ground motion is a function of magnitude, underlying geology, and distance from the fault. It is probably the single most important factor in producing excessive damage to structures. Long duration, reasonably high acceleration, and considerable amplitudes, such as would likely occur from a maximum seismic event on the Malibu Coast Fault system, are the combination that would cause the most damage to buildings in the County. A distant, maximum seismic event on the San Andreas Fault would produce less intensity of shaking; however, the duration of strong ground motion would be longer, resulting in a high potential for damage to high-rise flexible structures.

Distance is another important factor affecting the severity of ground shaking. Ground shaking from distant seismic events (greater than 40 miles) will be different than events within 10 miles of the County. For more distant, large events (greater than 7.5M), such as those that occur on the San Andreas Fault, the ground shaking will reflect a predominance of long period waves. This will have minimal effects upon structures less than three stories in height, but will affect flexible structures (typically high-rise buildings, and other

buildings taller than three stories), especially if the natural period of the building should coincide with that of the long period earthquake waves. The amplifications of such motions could result in serious damage to high-rise structures. Short period waves, however, are generally very destructive near the epicenter of moderate- and large-magnitude seismic events, causing severe damage predominately to low-rise rigid structures (less than three stories) not specifically designed to resist them.

The ground-shaking hazard exists throughout Ventura County, as it does throughout California. Certain areas may have increased ground shaking due to local geologic conditions, as well as, the location and orientation of the earthquake fault. The highest amplification of ground shaking occurs in areas with the greatest potential for long period wave shaking. Basically, this is the San Andreas Fault zone in the northern part of the county and the Oakridge Fault zone in the southern part of the county.

The areas with the greatest amplification of short period shaking are along the base of the hills, in minor river valleys and in the broken bedrock along fault lines such as the San Cayetano, Oak Ridge and Simi-Santa Rosa Faults. Slight to moderate amplification of short period oscillations may occur on terrace deposits or soft bedrock. However, certain locations may experience higher than normal ground shaking due to boundary effects or wave propagations. These materials are found in young hill areas such as South Mountain, Oak Ridge, Sulphur Mountain, the north coastal hill lands and the Piru area in the south half of the county. In the north half of the county, these are along the margins of the valley areas such as Hungry and Lockwood Valleys and north of Cuyama.

In addition to the forces causing horizontal movement, such as those that predominant along the San Andreas Fault, Ventura County and portions of adjacent areas are subject to compressional forces acting in north-south directions. These forces tend to compress or shorten the distance from the San Andreas Fault south to the coast. These compressional forces caused the San Fernando Earthquake of 1971, resulting in the thrusting of the southern margin of the San Gabriel Mountains several feet southward over the north margin of the San Fernando Valley. These forces also resulted in the 1994 Northridge Earthquake. Several faults in Ventura County have been formed by and are related to these same forces. These fault systems are described in the Surface Fault Rupture section below.

Southern Ventura County

The south half of the county is considered that portion southerly of the east-west projection of Nordoff Ridge located immediately north of Ojai Valley. Even though the historic record indicates that no strong earthquakes or surface displacement have occurred along the faults within the south half, the likelihood of the occurrence of one or more of such events within the next 50 to 100 years is not remote. The San Fernando Earthquake of 1971 occurred along a fault having little historic record of activity. Several of the faults within the south half of the county, such as Santa Susana and San Cayetano, are subject to similar tectonic forces as those that caused the San Fernando Earthquake. Crustal deformation (shortening) resulting in earthquakes will continue into the indefinite future. It is probable that earthquakes of magnitude 6 or larger will occur in the south half of the county, in the nearby offshore areas, and along the San Andreas in the northern portion of the county.

According to the "Geology and Mineral Resources Study of Southern Ventura County" (CDMG 1972) prepared by the State Division of Mines and Geology in cooperation with the Ventura County Department of Public Works, the earthquake history of the south half of the county is dominated by small to moderate shocks. No earthquake greater than magnitude 4.7 has been recorded in Ventura County, or the immediate offshore area, since 1934, when adequate instrumental records became available. These relatively minor shocks have caused local damage but no recorded loss of life. A review of the earlier, less accurate record

from 1769 to 1934 suggests a similar history for the south half, although there were significant earthquakes in 1812, 1857, 1925, 1971, and 1994 that caused structural damage in specific areas of the south half of the county.

Northern Ventura County

The most important faults in the vicinity of the northern county area are the San Andreas, Big Pine, San Gabriel, and Frazier Mountain Thrust, all of which converge at the northeast corner of Ventura County. All of these faults, except perhaps the Frazier Mountain Thrust Fault, are considered to be active (i.e., are potential focal points for the occurrence of earthquakes and displacement of the ground surface). Other mapped and unknown faults within the north half may also prove to be active by future displacement or detailed investigations. The earthquakes of November 1852 were accompanied by about 30 miles of surface faulting in Lockwood Valley. The exact location of the surface breaks is unknown, but geologic evidence and reports indicate that it may have been along the Big Pine Fault, a major left-lateral fault with some oblique slip (subject to both horizontal and vertical displacement).

Several other faults found in the Lockwood Valley area have had recent movement identified by virtue of their cutting of terrace deposits and offset of other faults. These faults range from several hundred to a few thousand feet in length. Some of them indicate the region has recently undergone, and is probably still undergoing compression along north-south directions.

Geologic and survey evidence indicate that stress is building up along the San Andreas Fault to the north. It is just a question of time until the fault in this area again displaces; the resulting earthquake will probably be severe. Prediction of when displacement will occur is not possible at this time; however, it is likely that it will occur within 100 years and possibly much sooner.

Earthquakes and strong-to-severe ground shaking originating along faults within the north half is highly possible, but again, prediction of when this will happen is not possible. The historic record shows that the north half has experienced several severe shocks originating along faults both within and immediately outside of the county.

All of Ventura County is vulnerable to ground shaking from an earthquake and the entire county is in the severe, violent or extreme ground shaking potential categories. Table 11-2 provides information on the percentage of the county's population by jurisdiction that could be affected by severe, violent, or extreme ground shaking.

During severe, violent and extremely violent ground shaking events buildings can be damaged by the shaking itself or by the ground beneath them settling to a different level than it was before the earthquake (subsidence). Buildings can even sink into the ground if soil liquefaction occurs. Liquefaction is the mixing of sand or soil and groundwater (water underground) during the shaking of a moderate or strong earthquake. Buildings can also be damaged by strong surface waves making the ground heave and lurch. Any buildings in the path of these surface waves can lean or tip over from all the movement. The ground shaking may also cause landslides, mudslides, and avalanches on steeper hills or mountains, all of which can damage buildings and hurt people.

TABLE 11-2
PERCENT OF COUNTY POPULATION AFFECTED BY EARTHQUAKE RELATED GROUND SHAKING
(Ventura County, California)

Jurisdictional Area	Severe	Violent	Extreme
Camarillo	–	97.40	2.60
Moorpark	–	89.20	10.80
Ojai	–	100	–
Oxnard	–	20.40	79.6
Santa Paula	–	0.10	99.9
Simi Valley	0.02	49.60	50.3
Thousand Oaks	0.70	99.30	–
Ventura	–	25.30	74.4
Unincorporated	2.90	70.90	26.0
Fillmore	–	–	100
Port Hueneme	–	–	65.9

Source: Ventura County Multi-Hazard Mitigation Plan, September 2015.

Ground Failure

Seismically-induced ground failure includes liquefaction, differential compaction, ground lurching, ground cracking, and earthquake-induced slope failures.

Liquefaction

Liquefaction occurs when seismic waves pass through saturated granular soil, distorting its granular structure, and causing some of the empty spaces between granules to collapse. Poor water pressure may also increase sufficiently to cause the soil to behave like a fluid for a brief period and cause deformations. Liquefaction causes lateral spreads (horizontal movements of commonly 10 to 15 feet, but up to 100 feet), flow failures (massive flows of soil, typically hundreds of feet, but up to 12 miles), and loss of bearing strength (soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property. Figure 11-2 shows areas prone to liquefaction within the County.

The entire county, including all cities, is susceptible to liquefaction, but the most vulnerable locations are along the Santa Clara River and in the Oxnard Plain. The following percentages of the population live in liquefaction susceptible areas: Camarillo, 23.10 percent; Fillmore, 97.81 percent; Moorpark, 48.64 percent; Ojai, 11.48 percent; Oxnard, 99.99 percent; Port Hueneme, 100 percent; Santa Paula, 34.74 percent; Simi Valley, 42.10 percent; Thousand Oaks; 2.79 percent; Ventura, 40.26 percent; and Unincorporated Ventura County, 32.23 percent.

Liquefaction can result in settling of roadways, rupture of underground pipelines and cables, and shifting of building foundations. As foundations lose support, buildings and other objects on the ground surface can settle, tilt, and collapse. Lightweight buried structures can float to the surface. Four types of failure commonly result from liquefaction: lateral spreading, flow failure, ground oscillation and loss of bearing strength.

Low coastal terraces could be subject to liquefaction where groundwater is less than 15 feet from the surface. The coastal area of the Oxnard Plain may be particularly prone to liquefaction. A special study

completed after the February 21, 1973, Point Mugu earthquake indicates that the areas south of the Santa Clara River, generally between Gonzales Road and Oxnard Shores, have a moderate to low liquefaction potential, while the Preble and Olivas communities, and Channel Islands Harbor extending southward to Arnold Road, have a moderate to high liquefaction potential.

The Central Coast coastal zone is the most heavily populated area along the Ventura coastal zone. Several large industries and utilities are located there, including Southern California Edison Company's Mandalay and Ormond Beach power plants, Oxnard and Ventura wastewater treatment plants, and three harbors. Liquefaction from severe ground shaking could cause major damage and disruption of services.

Differential Compaction/Consolidation or Settlement

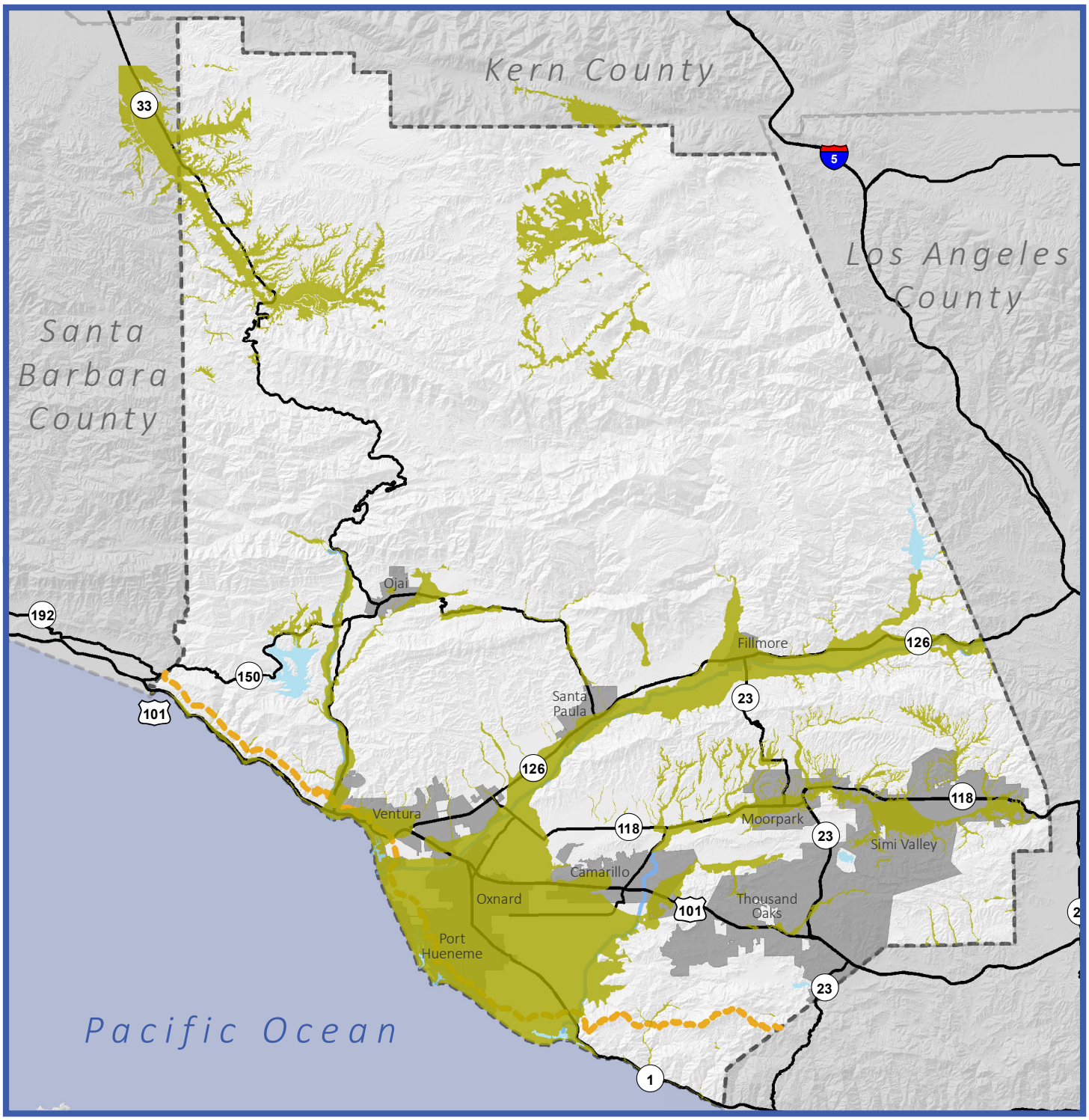
Collectively, differential compaction and differential consolidation are known as "differential settlement." Differential compaction is caused by differences in soil types and densities in adjacent materials, leading to varying degrees of settlement when subjected to loads (e.g., buildings or vehicles). Differential consolidation occurs in saturated or nearly saturated soils when excess water pressure in one area is forced to other areas with lower pressure.[1] Differential settlement is a potential hazard in parts of Ventura County. The significance of the hazard at any particular site can be determined only by a site-specific geotechnical investigation.

Ground Cracking, Ground Lurching and Lateral Spreading

Both ground lurching and cracking are secondary effects of strong-to-moderately strong ground shaking and also may be associated with liquefaction. Ground cracking usually occurs in near-surface materials, reflecting the differential compaction or liquefaction of underlying materials. The potential for ground cracking exists especially in areas of the county that have a moderate -to-high potential for liquefaction as well as in areas on known artificial fill. Ground lurching can result when soft, water-saturated surface soils are thrown into undulatory motion. Figure 11-2 shows areas prone to liquefaction within the county.

Lateral spreading is referred to as limited displacement ground failure, and is often associated with liquefaction. Compact surface materials may slide on a liquefied, or low shear strength, layer at shallow depth, moving laterally several feet down slopes of less than two degrees. Lack of adequate subsurface data prohibits delineating areas in Ventura County prone to lateral spreading. Such a hazard may be present where conditions conducive to shallow liquefaction exist or where soils exist along the bluffs adjacent to the Ventura River.

[1] Soil consolidation relates to forcing water out of soil pores, whereas soil compaction relates to forcing air out of soil pores. Consolidation is the process by which soil particles, under saturated or nearly saturated conditions, are packed more closely together under the application of static loading (e.g. buildings), resulting from gradual drainage of water from soil pores. Consolidation is a natural and gradual process that takes years, compared to soil liquefaction, which results from earthquakes/strong ground shaking.



Ventura County 2040 GENERAL PLAN

Figure 11-2
Liquefaction

Map Date: July 18, 2016

Source: Ventura County, 2016; California Department of Transportation, 2007; USGS, 2013.

0 7.5 15 Miles

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Liquefaction

Coastal Zone Boundary

Major Roadways

Major Waterways

Water Bodies

Cities

Surface Fault Rupture

Surface fault rupture is the differential movement of two sides of a fault at the earth's surface. Displacement along faults—both in terms of length and width—varies but can be significant (e.g., up to 20 feet), as can the length of the surface rupture (e.g., up to 200 miles). Surface fault rupture can cause severe damage to linear structures, including railways, highways, pipelines, tunnels, and dams. The likelihood of surface rupture on a given fault can be determined principally by studying the seismic history of the fault and reviewing geologic evidence, which suggests historic or prehistoric surface rupture. Many past studies have shown that future surface fault rupture is most likely to occur where the trace ruptured before, especially so if there is evidence of repeated and significant displacement on the trace. Faults affecting Ventura County are described under Earthquake Faults earlier in this section.

Seiche

A seiche can be considered very similar to a tsunami with the difference being that the water waves are generated in a closed or restricted body of water such as a lake or within a harbor. The most common seiche experienced by county residents in most swimming pools occurred during the 1994 Northridge earthquake. The shaking of an earthquake (or other vibration) can result in large and destructive oscillations that produce waves tens of feet above normal lake (water) level. In harbors (such as Ventura Harbor, Mandalay Bay and the Port of Hueneme) and closed or restricted bays, these waves can destroy harbor and shore facilities. Indirectly, tsunamis, can set up smaller internal oscillations in bays and harbors by causing a rapid change in sea level or more commonly by the wave itself. These seiches are very similar to tsunamis, but the waves are usually smaller and of lower energy. The trigger mechanism for seiche waves is similar to tsunamis wave generation.

The extent of most seiches is small, usually no more than ten to twenty feet above water level, and the duration is short, usually only a few minutes. However, a landslide can displace a wave that could travel hundreds of feet up the opposite shore of a body of water. Also, tsunami-caused seiches can last for many hours due to the possible rejuvenation of the seiche by each passing tsunami crest; however, each seiche would last only a few minutes and be of decreasing severity.

There is no way to alleviate the effects of possible seiches except by prohibiting construction within the hazard area. Typically, where practical, the structure is moved to a slightly higher elevation to reduce the damage potential and amount. Due to the indefinite nature of the triggering mechanisms, it seems doubtful that enough information will ever be known for general prediction of the hazard or predicting accurate seiche uprush limits for planning purposes.

There is no record of a seiche occurring in Ventura County. As such, the actual threat that is posed by seiches in Ventura County is small, in that it is probably the most remote of the hazards studied, although it may not be the least severe.

Erosion

Erosion is the removal of soil and rock from the landscape as a result of wind, water, ice. Erosion occurs as a result of three processes: detachment, entrainment, and transport. Detachment results in particles losing cohesion with surrounding material via a medium that moves the particles, most commonly wind, water, or ice. Entrainment is the lifting of particles, and transport is their movement. The process of erosion eventually ends in the deposition of the eroded particles by some factor that reduces their velocity until they settle.

Erosion can result in a variety of hazards and issues within the planning area. Wind-related erosion and wind-blown sand can cause visibility problems and damage architectural coatings and building material. Erosion due to rain or other fluvial events can deposit sediments in downstream water bodies, possibly changing drainage patterns and affecting biological regimes. Recently-graded soils are most susceptible to erosion. Unpaved roadways and other areas not stabilized by vegetation or otherwise capped can also be eroded. Erosion can also result in the loss or dispersion of nutrient rich topsoil.

Landslide

Landslide is a general term for the dislodging and fall of a mass of soil or rocks along a sloped surface, or for the dislodged mass itself. The term is used for varying phenomena, including mudflows, mudslides, debris flows, rock falls, rock slides, debris avalanches, debris slides, and slump-earth flows. Landslides may result from a wide range of combinations of natural rock, soil, or artificial fill. The susceptibility of hillside and mountainous areas to landslides depends on variations in geology, topography, vegetation, and weather. Landslides may also occur because of indiscriminate development of sloping ground or the creation of cut-and-fill slopes in areas of unstable or inadequately stable geologic conditions.

Additionally, landslides often occur together with other natural hazards, thereby exacerbating conditions, as described below:

- Shaking due to earthquakes can trigger events ranging from rock falls and topples to massive slides.
- Intense or prolonged precipitation that causes flooding can also saturate slopes and cause failures leading to landslides.
- Wildfires can remove vegetation from hillsides, significantly increasing runoff and landslide potential.
- Landslides into a reservoir can indirectly compromise dam safety; a landslide can even affect the dam itself.

Another type of landslide occurs in areas cut by perennial streams. As floodwaters erode channel banks, rivers have undercut clay-rich sedimentary rocks along their south bank, thereby destabilizing the ground and causing the ground above it to slide.

Landslides have occurred in areas along the Rincon Fault, hillsides south of the Santa Clara River, and the east side of the Ventura River. In recent years, the most damaging landslides in Ventura County have occurred in the coastal community of La Conchita, just southeast of the Santa Barbara county line. La Conchita has been the site of multiple non-earthquake-induced landslides.

La Conchita was built on ground that had been graded by the Southern Pacific Railroad after a 1909 landslide slid into the railroad tracks. The land was intended to be a buffer zone between the retreating and eroding cliff and the Pacific Ocean. However, it was subdivided into smaller residential lots in 1924. Along the bluff face above La Conchita, the upper portion of the bluff is underlain by two rock formations separated by the Red Mountain fault.

The bluff above La Conchita has been associated with a variety of landslide activity, with historical accounts dating back to 1865. More recently, two small slides occurred in 1988 and 1991, followed by large movements of the same landslide mass in 1995 and 2005. The 1995 landslide, which occurred one

month after the heaviest rainfall of an extraordinarily wet year, was considered to be a deep, slow-moving landslide. This landslide destroyed nine houses. The January 2005 event was a shallow and highly fluid remobilization of the same material that carried a thick layer of dry, viscous material. This landslide, which occurred at the peak of an extremely wet 2-week period, killed 10 people and destroyed 13 homes. Approximately 400,000 tons of debris cascaded down the slope behind the La Conchita housing development.

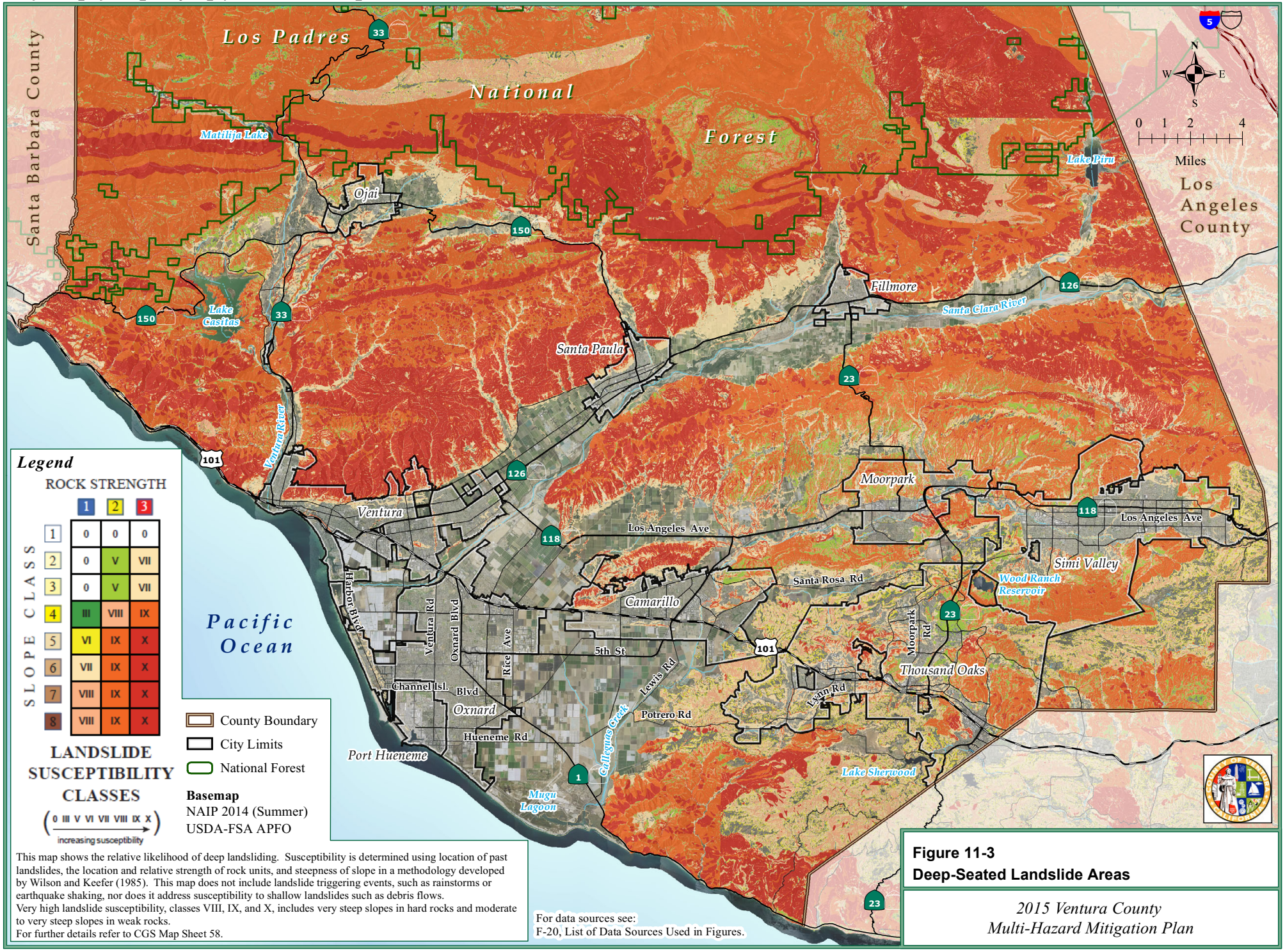
Slope failures are associated with landslides, and occurred along shattered ridge crests of the Santa Susana Mountains during the 1994 Northridge Earthquake.

In 2011, the California Geological Survey (CGS) created the "Susceptibility to Deep-Seated Landslides" grip map, covering the entire state of California. The map shows the relative likelihood of deep landsliding based on a methodology developed by Wilson and Keefer (1985), and uses the following information:

- Landslide inventory, including all previously mapped deep-seated landslides in California (approximately 57,000) that were assigned the lowest value of rock strength.
- Geology from a general geologic statewide map and a detailed geologic map over the most populated areas.
- Rock strength to measure the resistance to landsliding, developed from geologic and landslide inventory maps. Geologic units were classified into three rock strength units: (1) highest rock strength unit, which includes crystalline rocks and well-cemented sandstones; (2) intermediate rock strength unit, including weakly cemented sandstones; and (3) weakest rock strength unit, including shale, claystone, pre-existing landslides, and unconsolidated surficial units.
- Slope, including eight slope classes ranging from nearly flat (less than 3 degrees) to very steep (greater than 40 degrees).
- Average annual rainfall in inches.
- Earthquake shaking potential.

As shown on Figure 11-3, the factors listed above were combined to create classes of landslide susceptibility. These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks. Very high landslide susceptibility—classes VIII, IX, and X—includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks. In Ventura County, areas most susceptible to landslide are generally located on the edge of cities, outside of the cities, and in the northern portion of the county. Each city in the county, with the exception of Port Hueneme, has some land mass in the class VII, IX, and X landslide susceptibility zones. Approximately 1,110 square miles of Ventura County located in the Very High Landslide Susceptibility area, including 175 square miles in class VIII, 670 square miles in class IX, and 265 square miles in class X.

V:\Projects\GIS_Proj\VenCo_HMPUpdate_10yr\Deliverables\Geohazard_Landslide.mxd



SLOPE CLASS \ ROCK STRENGTH	1	2	3
1	0	0	0
2	0	V	VII
3	0	V	VII
4	III	VIII	IX
5	VI	IX	X
6	VII	IX	X
7	VIII	IX	X
8	VIII	IX	X

This map shows the relative likelihood of deep landsliding. Susceptibility is determined using location of past landslides, the location and relative strength of rock units, and steepness of slope in a methodology developed by Wilson and Keefer (1985). This map does not include landslide triggering events, such as rainstorms or earthquake shaking, nor does it address susceptibility to shallow landslides such as debris flows.
Very high landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks.
For further details refer to CGS Map Sheet 58.

For data sources see:
F-20, List of Data Sources Used in Figures.

Figure 11-3
Deep-Seated Landslide Areas

2015 Ventura County
Multi-Hazard Mitigation Plan

Subsidence

"Subsidence" is any settling or sinking of the ground surface over a regional area arising from surface or subsurface causes, such as earthquakes or groundwater, or oil and gas extraction. The damage caused by subsidence is generally not of an immediate or violent nature. Except when prompted by seismic shaking, the compaction of alluvium and settling of the land surface is a process that occurs over several tens to thousands of years and over a large area.

Subsidence that results from groundwater withdrawal can be responsible for numerous structural effects. Most seriously affected are long, linear surface infrastructure facilities that are sensitive to slight changes in gradient or slope. Drainage courses, roads, rail lines, wells, oil/gas pipelines, and utility (water, gas, power, and sewer) lines are potentially the most vulnerable to damage. Basically, the process by which this most important type of subsidence occurs involves the extraction of a large quantity of water from an unconsolidated aquifer. As water is removed from the aquifer, the total weight of the overburden that the water used to help to support is placed on the alluvial structure; the overburden can then become compressed. If fine-grained silts and clays make up portions of the aquifer, the additional load can squeeze the water out of these layers and into the coarser grained portions of the aquifer. All of this compaction produces a net loss in volume and hence a depression in the land surface.

Several areas within Ventura County are experiencing subsidence due to groundwater extraction including the Oxnard Plain, the Las Posas Valley, and the Santa Clara River Valley.

Regulatory Setting

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Special Studies Zones Act was signed into law in 1972 (renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994). The Act's primary purpose is to mitigate the fault rupture hazard on human life and property by limiting the potential for siting human occupancy structures across an active fault trace.

The Act requires the State Geologist (Chief of the California Geological Survey) to delineate Earthquake Fault Zones along faults that are "sufficiently active and well defined." These faults show evidence of Holocene surface displacement along one or more of their segments (sufficiently active) and are clearly detectable by a trained geologist as a physical feature at or just below the ground surface (well defined). The boundary of an Earthquake Fault Zone is generally about 500 feet from major active faults, and 200 to 300 feet from well-defined minor faults. The Act dictates that cities and counties withhold development permits for sites within an Earthquake Fault Zone until geologic investigations demonstrate that the sites are not threatened by surface displacements from future faulting.

Alquist-Priolo maps are distributed to all affected cities and counties for planning and controlling new or renewed construction. Local agencies must regulate most development projects within these zones, including all land divisions and most structures for human occupancy. State law exempts single-family wood-frame and steel-frame dwellings less than three stories that are not part of a development of four units or more. However, local agencies can be more restrictive.

Seismic Hazards Mapping Act

The Alquist-Priolo Earthquake Fault Zoning Act addresses the hazard of surface fault rupture but is not directed toward other earthquake hazards. Recognizing this, the State passed the Seismic Hazards Mapping Act (SHMA) in 1990, which addresses non-surface fault rupture earthquake hazards, including strong ground shaking, liquefaction and seismically induced landslides. The California Geological Survey (CGS) is the principal state agency charged with implementing the Act. Pursuant to the SHMA, the CGS is directed to provide local governments with seismic hazard zone maps that identify areas susceptible to liquefaction, earthquake-induced landslides and other ground failures. The goal is to minimize loss of life and property by identifying and mitigating seismic hazards. The seismic hazard zones delineated by the CGS are referred to as "zones of required investigation." Site-specific geological hazard investigations are required by the SHMA when construction projects fall within these areas.

Pursuant to the 1990 SHMA, the CGS has been releasing seismic hazards maps since 1997, with emphasis on the large metropolitan areas of Los Angeles, Orange, and Ventura counties. To date, the CGS has collected data for "zones of required investigation" for most of the county.

California Building Code

The California Building Standards law states that every local agency enforcing building regulations must adopt the provisions of the California Building Code (CBC) within 180 days of its publication; however, each jurisdiction can require more stringent regulations issued as amendments to the CBC. The publication date of the CBC is established by the California Building Standards Commission and the code is known as Title 24 of the California Code of Regulations. In the past, the CBC was modeled on the Uniform Building Code (UBC); however, beginning with the 2007 version, the CBC is now modeled after the International Building Code (IBC). Building codes provide minimum requirements to prevent major structural failure and loss of life related to floods, fires, and earthquakes.

The County of Ventura adopted the 2013 CBC through Ordinance 4456 on January 9, 2014. The 2013 CBC bases its seismic design criteria on maximum considered ground motion through maps prepared by the United States Geological Survey (USGS) for the National Seismic Hazard Mapping Program (see Section 1613). Chapter 18 (Soils and Foundations) and Appendix J (Grading) of the 2013 CBC have also been adopted by the County to establish grading and foundation standards. Standards include requirements for excavation, fill, footings, retaining walls, and pier and pile foundations. Pursuant to the CBC, soils reports are required to be submitted prior to issuance of grading or depending on the permit type, other permits that allow ground disturbance.

Real Estate Disclosure Act

Since June 1, 1998, the Natural Hazards Disclosure Act has required that sellers of real property and their agents provide prospective buyers with a *Natural Hazard Disclosure Statement* when the property being sold lies within one or more State-mapped hazard areas. If a property is located in a Seismic Hazard Zone as shown on a map issued by the State Geologist, the seller or the seller's agent must disclose this fact to potential buyers. The law specifies two ways that this disclosure can be made. One is to use the Natural Hazards Disclosure Statement as provided in Section 1102.6c of the California Civil Code. The other way is to use the Local Option Real Estate Disclosure Statement as provided in Section 1102.6a of the California Civil Code. The Local Option Real Estate Disclosure Statement can be substituted for the Natural Hazards Disclosure Statement only if the Local Option Statement contains substantially the same information and substantially the same warning as the Natural Hazards Disclosure Statement.

Unreinforced Masonry Laws

Enacted in 1986, the Unreinforced Masonry Law (Section 8875 et seq. of the California Government Code) required all cities and counties in Seismic Zone 4 (zones near historically active faults) to identify potentially hazardous unreinforced masonry (URM) buildings in their jurisdictions, establish a URM loss reduction program, and report their progress to the State by 1990. The owners of such buildings were to be notified of the potential earthquake hazard these buildings pose.

Local

2005 Ventura County General Plan

The General Plan covers geologic and seismic hazards in Chapter 2, Hazards. Sections 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, and 2.8 includes goals, policies, and programs related to geologic and seismic hazards. The following Area Plans also contain applicable goals and policies related to geologic and seismic hazards:

- Coastal Area Plan;
- Oak Park Area Plan;
- Ojai Valley Area Plan;
- Piru Area Plan; and
- Lake Sherwood/Hidden Valley Area Plan.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for geologic and seismic hazards. These can be found in the following sections: 10. Fault Rupture Hazard; 11. Ground Shaking Hazard; 12. Liquefaction Hazards; 13. Seiche and Tsunami Hazards; 14. Landslide/Mudflow Hazards; 15. Expansive Soil Hazards; and 16. Subsidence Hazard.

2016 Coastal Zoning Ordinance

The Coastal Zoning Ordinance regulates geologic and seismic hazards through Section 8178-4 Mitigation of Potential Hazards

Key Terms

Alluvium. Loose, unconsolidated soil or sediments, which has been eroded, reshaped by water in some form, and redeposited in a non-marine setting.

Anticline. Anticlines are folds in which each half of the fold dips away from the crest.

Fluvial. Refers to processes associated with rivers and streams and the deposits and landforms created by them.

Holocene. The geological epoch that began after the Pleistocene at approximately 9,700 BCE (before common era) and continues to the present time.

Liquefaction. The process by which water-saturated, unconsolidated sediments are transformed into a substance that acts like a liquid, often in an earthquake.

Pleistocene. The geological epoch that lasted from about 2,588,000 to 11,700 years ago, spanning the earth's recent period of recent glaciations.

Quaternary. The current and most recent of the three periods of the Cenozoic Era. It follows the Neogene Period and span from 2.588 (±0.005) million years ago to the present time. The Quaternary period is divided into two epochs: the Pleistocene and the Holocene.

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SECTION 11.2 FLOOD HAZARDS

Introduction

This section addresses the flood hazard conditions within Ventura County and the potential risk these conditions pose. Existing and potential problems related to flood hazards include annual flooding, dam failure, and seismic-induced flooding. This section summarizes the flood hazard conditions for the County of Ventura, which include the following areas of concern:

- General Flooding
- Dam Failure Inundation
- Levee Failure Inundation
- Post-Fire Debris Flow
- Tsunami

These summaries are derived from the County's 2015 Multi-Hazard Mitigation Plan (VCMHMP). Consistent with the VCMHMP, each section includes explanations of the nature, history, location, extent, and probability associated with each type of flood hazard.

Major Findings

- Three types of flood risk have been mapped in Ventura County: upland, broad floodplain, and coastal. The Ventura County Digital Flood Insurance Rate Map (DFIRM) identifies the following Special Flood Hazard Area (SFHAs): 7.8 square miles in the 100-year "coastal high hazard" flood zone; 78.4 square miles in the 100-year flood zone; and 51.7 square miles in the 500-year flood zone.
- According to the Federal Emergency Management Agency's (FEMA) definition, ten dams in Ventura County are considered high hazard (i.e., over 1,000 acre-feet of storage capacity). Eight of these are under State jurisdiction and are inspected annually to ensure that they are in good operating condition. There is no record of a failure of any dam located in Ventura County.
- The Ventura County Watershed Protection District (VCWPD) monitors nine provisionally accredited levees (PALs) in the Calleguas Creek, Santa Clara River, and Ventura River watersheds. Most of these levees, which protect a total 5.2 square miles of land in the county, require rehabilitation to be fully compliant with FEMA levee certification regulations.
- Because of its history of wildfires, Ventura County is susceptible to potentially hazardous debris flows. The susceptibility affects areas adjacent to and downslope of these burn areas, especially in locations that are in ravines and canyons, and at the mouths of canyons.
- Coastal areas in Ventura County are subject to inundation resulting from tsunamis, including areas within the cities of Oxnard, Port Hueneme, and Ventura and unincorporated areas south of Ormond Beach and around Mugu Lagoon.

Existing Conditions

General Flooding

Nature

A flood occurs when the existing channel of a stream, river, canyon, or other watercourse cannot contain excess runoff from rainfall or snowmelt, resulting in overflow onto adjacent lands. Flooding can also occur in areas in low lying areas that have no outlet. In coastal areas, flooding may occur when high winds or tides result in a surge of seawater into areas that are above the normal high tide line.

A floodplain is the area adjacent to a watercourse or other body of water that is subject to recurring floods. Floodplains may change over time as a result of natural processes, changes in the characteristics of a watershed, or human activity such as construction of bridges or channels. In areas where flow contains a high sediment load, such as along the Santa Clara River in Ventura County, the course of a river or stream may shift dramatically during a single flood event. Coastal floodplains may also change over time as waves and currents alter the coastline. Secondary hazards from floods can include the following:

- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features.
- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects.
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands.
- Release of sewage and hazardous or toxic materials when wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

In areas such as Ventura County that do not have extended periods of below-freezing temperatures or significant snowfall, floods usually occur during the season of highest precipitation or during heavy rainfalls after prolonged dry periods. Ventura County is dry during the late spring, summer, and early fall and receives most of its rain during the winter months. The rainfall season extends from October 1st through April 15th, with approximately 95 percent of the annual rainfall occurring during this period. The average annual rainfall in Ventura County ranges from less than 8 inches in the Cuyama Valley in northwestern Ventura County to 38 inches in the Ventura River watershed west of Ojai (as measured in the general area of Matilija Dam). Along the coast near Oxnard, Ventura, Simi Valley, and Thousand Oaks, the average rainfall is approximately 14 inches.

The prevailing weather patterns during the winter and the orientation of the mountain ranges in the northern half of the county combine to produce extremely high-intensity rainfall. The peak historic rainfall intensity recorded by a Ventura County rain gage occurred on February 12, 1992. A rainfall intensity of approximately 4 inches per hour was measured during a 15-minute period at the Wheeler Gorge gage, approximately 3 miles northeast of Matilija Dam. Such intensities can produce severe flooding conditions, particularly in small watersheds where flash floods are likely.

Flash floods are particularly dangerous. The National Weather Service (NWS) defines a flash flood as one in which the peak flow travels the length of a watershed within a 6-hour period. These floods arise when

storms produce a high volume of rainfall in a short period over a watershed where runoff collects quickly. They are likely to occur in areas with steep slopes and sparse vegetation. They often strike with little warning and are accompanied by high-velocity flow.

History

Damaging floods in Ventura County were reported as early as 1862. A 1945 report by the Ventura County Flood Control District reported that floods of sufficient magnitude to cause extensive damage occurred in 1862, 1867, 1884, 1911, 1914, 1938, 1941, 1943, and 1944.

The largest and most damaging natural floods recorded in the Santa Clara and Ventura watersheds occurred in January and February of 1969. The January flood was a result of the highest monthly precipitation total ever recorded in Ventura County at that time. The February flood was a result of intense rainfall similar in magnitude to the rainfall that caused the record-breaking flood in January. The combined effects of the 1969 floods were disastrous: 13 people lost their lives, and property damage was estimated at $60 million (1969 dollars). Homes in Casitas Springs, Live Oak Acres, and Fillmore were flooded, and 3,000 residents in Santa Paula and several families in Fillmore were evacuated twice. A break in the Santa Clara River levee threatened the City of Oxnard. Agricultural land, primarily citrus groves, was seriously damaged or destroyed. All over the county, transportation facilities, including roads, bridges, and railroad tracks, were damaged. The Fillmore, Oak View, and Ventura sewage treatment plants were severely damaged and dumped raw sewage into the Santa Clara and Ventura rivers. The untreated sewage polluted the rivers and the beaches at their outlets into the ocean. In addition, sewer trunk lines were broken along the Ventura River and its tributary, San Antonio Creek. Suspended sediment concentrations and discharge in many streams greatly exceeded any previously measured levels in the flood-affected areas. Suspended sediment concentrations reached a maximum of about 160,000 milligrams per liter in the Santa Clara River at Saticoy, and the maximum daily sediment discharge was 20 million tons during the storm peak.

In 1980, Calleguas Creek breached its levee in the Oxnard Plain and caused approximately $9 million (in 1980 dollars) in damage to the Point Mugu Naval Base from flooding and sediment deposition. In addition, approximately 1,500 acres of farmland were covered by floodwaters. The peak discharge was 9,310 cubic feet per second at the Madera Road Bridge in Simi Valley.

In 1983, a federal disaster was declared because of storm damage. Repairs to flood-control facilities have been estimated to cost $15 million (in 1983 dollars). Improved channels in Moorpark and Simi Valley suffered severe damage from erosion during this event, and Calleguas Creek experienced record flooding. Damage to other public and private facilities has been estimated at approximately $39 million, with little more than half of that total due to damage to agricultural lands.

Table 11-1 details the major flood events to affect Ventura County over the past 20 years.

TABLE 11-1 MAJOR DISASTER DECLARATIONS FOR FLOODS, 1995-2015	
Date	**Description**
January 1995	On January 9 and 10, the region was subjected to an intense winter storm that produced more than 6 inches of rain in some areas. A major Disaster Declaration was declared for all but one county throughout California on January 10, 1995.
January through March 1995	A second powerful winter storm brought heavy rain, heavy snow, and strong winds throughout much of California from mid-January to mid-March. On January 13, a Major Disaster Declaration was declared for nearly half the counties in California.
December 1996 through January 1997	A series of subtropical storms hit California from late December through early January, resulting in one of the wettest Decembers on record. On January 4, 1997, a Major Disaster Declaration was declared for half of the counties in California, including Ventura County.
February 1998	El Niño conditions led to extensive flooding throughout California. A Major Disaster Declaration was declared for more than 30 counties, including Ventura County. Countywide damages exceeded $50 million.
December 2004 through January 2005	A powerful Pacific storm brought heavy rain, snow, flash flooding, high winds, and landslides to Central and Southern California. During the multi-day event, rainfall totals ranged from 3 to 10 inches over coastal areas, with up to 32 inches in the mountains. A Major Disaster Declaration was declared on February 4, 2005, for multiple counties, including Ventura County.

Location

Figure 11-4 shows the special flood hazard areas (SFHAs) in Ventura County, including 100- and 500-year flood zones according to the 2015 FEMA Digital Flood Insurance Rate Maps (DFIRMs). The areas of the county that are susceptible to flooding can be categorized into three types: upland, broad floodplains, and coastal, as described below.

Upland Flooding

The mountainous terrain of northern Ventura County and the hills in the central and eastern parts of the county give rise to numerous annual streams, many draining into steep canyons. These streams are subject to floods of relatively short duration, often following high-intensity rainfall. Such floods may occur with little warning and carry large quantities of sediment and debris. Communities adjacent to the upland areas, such as Fillmore, Ojai, Piru, and Santa Paula, are subject to this hazard. Many of the watersheds in question contain dams or basins designed to attenuate flow and trap debris, reducing the effects on downstream communities.

Broad Floodplains

The watersheds of the Santa Clara River (watershed area of 1,650 square miles), Ventura River (watershed area of 226 square miles), and Calleguas Creek (watershed area of 325 square miles) drain to the broad coastal plain in the southern part of Ventura County. This plain is subject to inundation during longer intervals of rain, typically as the result of a series of winter storms. These floods typically have longer duration and may be forecast with more warning time. The Santa Clara River Valley, which crosses central Ventura County, is also subject to flooding. Numerous levees have been built to protect the agricultural lands along the river; because of its sediment load, the river has historically migrated across the valley floor during flooding intervals. The levees are typically not sufficient to withstand severe flood events.

Coastal Flooding

The county's 43-mile coastline is subject to tidal flooding, storm surge, and wave action, all of which usually occur during winter storms. Areas that are susceptible to severe wave action are generally confined to a narrow area immediately adjacent to the tidal zone, including Sea Cliff Colony, Oxnard Shores, Silver Strand Beach, and several sections of U.S. 101 from Rincon Point to Emma Wood State Beach. However, the effects of coastal flooding can be severe—in addition to wave action, beach and bluff erosion can cause significant damage to coast-side homes and infrastructure. Coastal flooding may also occur as the result of tsunamis, which are waves, or series of waves, generated by an earthquake, landslide, volcanic eruption, or even large meteor hitting the ocean. In addition to flooding, winter coastal storms can cause coastal erosion along the shores of Ventura County. Coastal erosion is a natural process that occurs particularly in the winter, when coastal storms wear away land by wave action, tidal currents, or wave currents. Material deposited on beaches during the mild summer and fall months gets redistributed by the waves. According to City of Ventura engineers, the majority of the sand is pulled just off coast and then comes back to shore over time. Although most receding sand stays fairly close to shore, some sand is driven south by currents until it reaches Hueneme Canyon, a large deep-water depression near the Port of Hueneme.

The anticipated rise in sea levels will also impact coastal flooding. As discussed in Chapter 12 (Climate Change), the California Energy Commission has calculated sea-level estimates due to the impacts of climate change. Ventura County could experience coastal erosion of up to 1.4 meters per year (approximately 4.6 feet), by 2100 as a result of sea-level rise and related coastal flooding.

Potential climate impacts due to sea-level rise and storm events in Ventura County include:

- more frequent flooding events due to rising sea levels;
- more extensive and longer duration of flooding;
- permanent inundation in coastal areas due to higher ocean levels and shifts in the tidal range;
- increased shoreline erosion; and
- elevated groundwater levels and salinity intrusion.

Critical infrastructure within the county, including 170 miles of roads and railways, hospitals, schools, emergency facilities, wastewater treatment plants, three power plants, and facilities and structures at Naval Base Ventura County, will be at increased risk of inundation, as will wetland areas and other natural ecosystems. In addition, the cost of replacing property at risk of coastal flooding with a 1.4-meter rise in sea levels is projected at $2.2 billion (in year 2000 dollars) (CEC 2009).

Notably, FEMA released preliminary flood maps for coastal areas of Ventura County in April 2017 and initiated a 90-day Appeal Period, which started in June 2017 and ended in September 2017. FEMA is tentatively anticipating making map changes effective in July 2018. FEMA initiated the California Coastal Analysis and Mapping Project (CCAMP) in December 2011 to restudy coastal flooding risks in all 15 California open Pacific coastal counties. Results from the study are used to remap the coastal flood risk and wave hazards for the entire California coastline. In Ventura County, new flood hazard zones, floodplain boundaries, and coastal base flood elevations for the cities of Ventura, Oxnard, and Port Hueneme, Point Mugu Naval Base, and county unincorporated areas are presented in the revised Flood Insurance Study Report and on the preliminary flood maps. (More information about the updated FEMA maps is available at **www.r9map.org**.)

Unmapped Flood Hazards

Unmapped flood hazard areas include numerous small channels. Agricultural drainage ditches and urban drains cover much of the flatter parts and urban areas of Ventura County. Flooding in these areas is due to high-intensity rainfall occurring over a very short period. The flooding is usually shallow and mainly affects roadways and other low-lying areas. In particular, the Hollywood Beach and Silver Strand residential coastal communities have historically experienced localized flooding conditions primarily due to inadequate storm drainage infrastructure and topography (hence, the "Zone B"/"Zone X-Shaded" FEMA designations on the Flood Insurance Rate Maps [FIRMs] / Digital Flood Insurance Rate Map [DFIRMs]). These residential coastal communities, (which are largely built out) are not currently mapped by FEMA in the "Zone VE" coastal high hazard Special Flood Hazard Area (SFHA). These communities have historically been mapped by FEMA as a Zone B and most recently under the DFIRMs as a Zone X-Shaded (500-year floodplain). Other unmapped hazards include debris flows in the Coastal Mountain areas that can occur after saturation of the surface and intense rainfall storms that deliver 2-inch per hour intensities. Examples are in the Casitas Springs area and the La Conchita Community.

Extent

The magnitude of flooding that is used as the standard for floodplain management in the United States is a flood with a probability of occurrence of one percent in any given year. This flood is also known as the 100-year flood or the base flood. The most readily available source of information regarding the 100-year flood, as well as the 500-year flood, is on the FIRMs prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP) described in more detail in the Regulatory Setting section below.

FEMA has recently prepared and updated countywide DFIRM and a Flood Insurance Study (FIS) for the unincorporated areas of Ventura County and for each incorporated city in the county. Figure 11-4 shows the SFHAs identified in the Ventura County DFIRM. The Ventura County DFIRM identifies the following SFHAs: 7.8 miles in the 100-year "coastal high hazard" flood zone; 78.4 square miles in the 100-year flood zone; and 51.7 square miles in the 500-year flood zone.

Probability of Future Events

On average, floods causing major damage within Ventura County occur every 5 years.

Figure 11-4
Special Flood Hazard Areas

Dam Failure Inundation

Nature

Dam failure involves unintended releases or surges of impounded water, resulting in downstream flooding. The high-velocity, debris-laden wall of water released from dam failure results in the potential for human casualties, economic loss, disruption of lifelines (e.g., electric, water, transportation, and emergency service systems), and environmental damage. Although dam failure may involve the total collapse of a dam, this is not always the case, because damaged spillways, overtopping from prolonged rainfall, or other problems—including the unintended consequences from normal operations—can result in the creation of a hazardous situation. Because they occur without advance warning, failures from natural events such as earthquakes or landslides may be particularly severe. Dam failure may be caused by a variety of natural events, human-caused events, or a combination thereof. Dam failure usually occurs when the spillway capacity is inadequate and water overtops the dam, or when internal erosion through the dam foundation occurs (also known as piping). Factors contributing to dam failure events may include structural deficiencies from poor initial design or construction, lack of maintenance or repair, and the gradual weakening of the dam through the normal aging process.

History

There is no record of a failure of any dam located in Ventura County. The 1928 failure of the St. Francis Dam in Los Angeles County, however, had catastrophic effects in Ventura County. The dam, located in the San Francisquitos Canyon in the Santa Clara River watershed, was constructed to provide 38,000 acre-feet of storage for water from the Los Angeles–Owens River Aqueduct. The collapse of the dam occurred after the newly constructed concrete-arch dam was completely filled for the first time. The resulting flood swept through the Santa Clara Valley in Ventura County toward the Pacific Ocean, about 54 miles away. At its peak, the wall of water was reported to be 78 feet high; by the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed, including structures, railways, bridges, livestock, and orchards. By the time the flood subsided, parts of Ventura County lay under 70 feet of mud and debris. Nearly 500 people were killed, and damage estimates exceeded $20 million. The communities of Piru, Fillmore, Santa Paula, Bardsdale, Saticoy, Montalvo, and El Rio sustained extensive life and property loss from the flood.

Location

Table 11-2 shows the name, year built, capacity, type, and inundation area for the dams that constitute failure hazards for Ventura County. Figure 11-5 shows the name, location, and extent of the dam failure inundation areas for every dam failure that would affect Ventura County. Clearly, it is not anticipated that every dam would fail at the same time. Rather, this map is intended to provide an approximate assessment of total risk for the county. Figure 11-6 illustrates dam failure inundation areas for particular dams. In some instances, if one dam fails there is potential that another dam downstream will also fail. For instance, according to the 2015 Ventura County Multi-Hazard Mitigation Plan, if the Pyramid Dam fails, the Santa Felicia Dam will likely fail too. Figure 11-6 does not illustrate cumulative effects. Additional information on specific dam inundation areas may be obtained from the agency that owns the dam. The map shows that dam failures may occur outside Ventura County but still pose a threat of inundation within the county. In particular, if dams in the Santa Clara River watershed in Los Angeles County fail, the resulting flood would affect the Santa Clara River corridor, which includes the cities of Santa Paula and Oxnard, as demonstrated by the 1928 St. Francis dam failure described above.

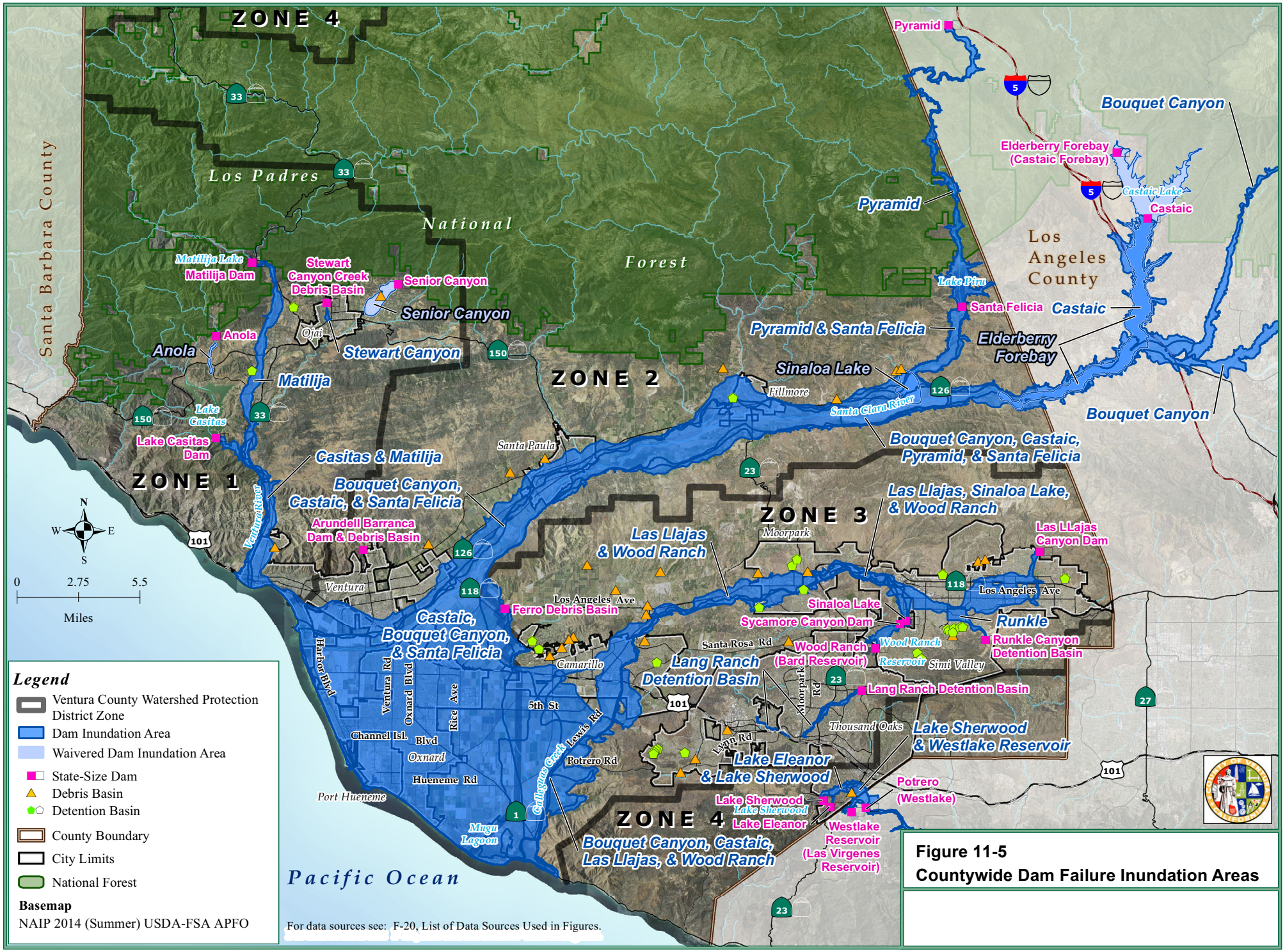
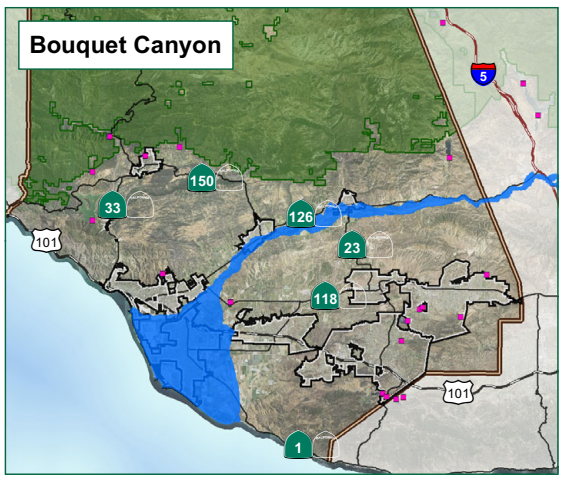
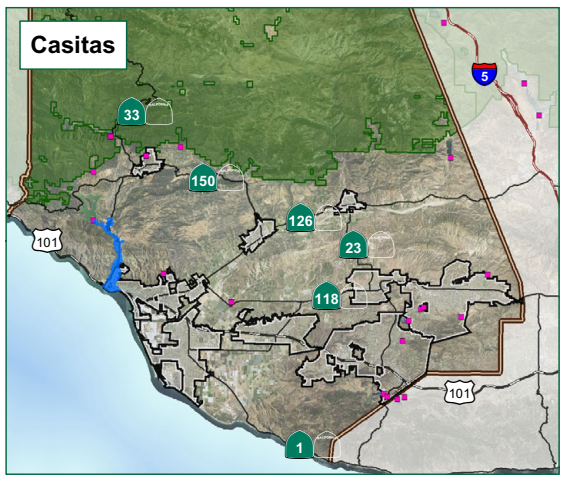
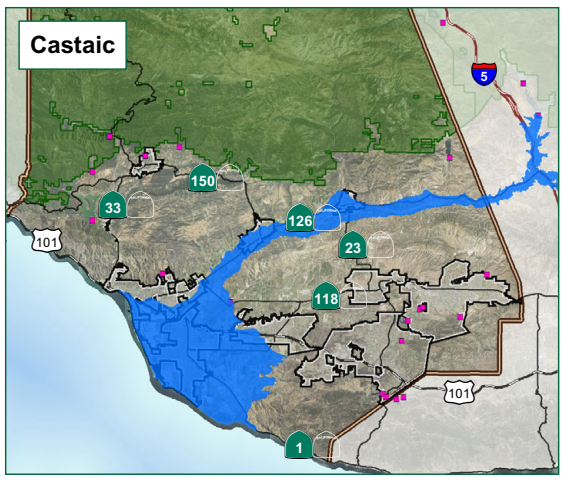
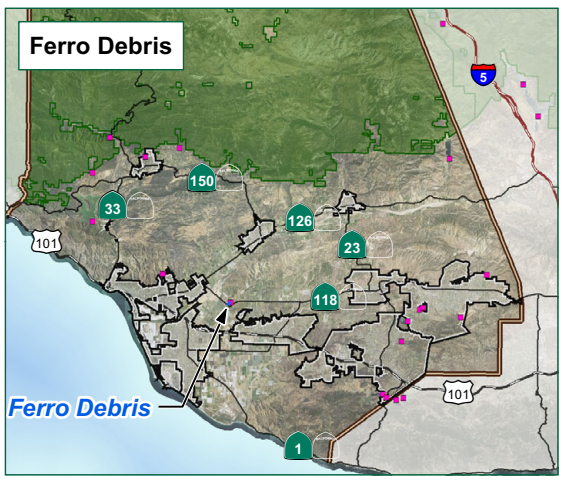


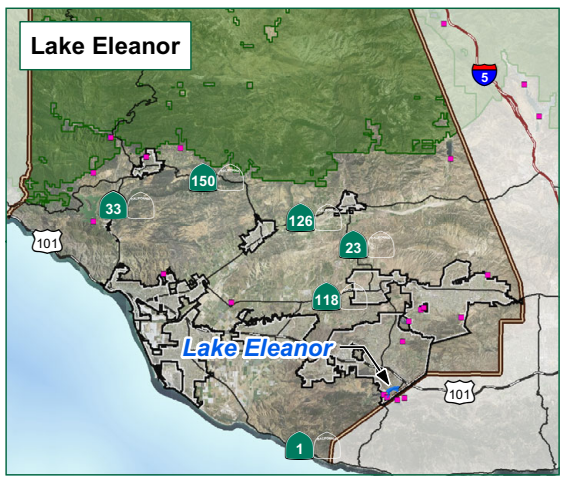
Figure 11-5
Countywide Dam Failure Inundation Areas

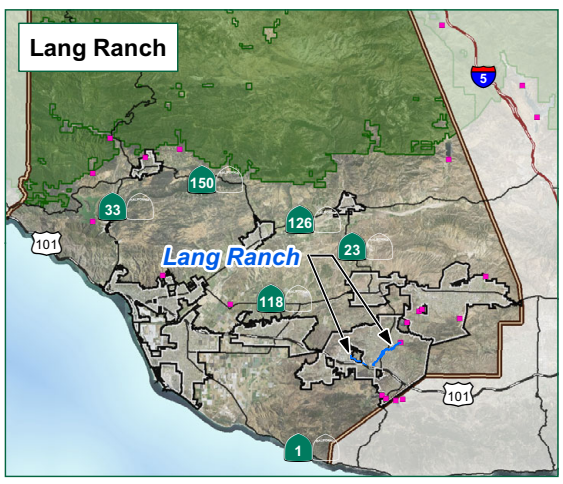


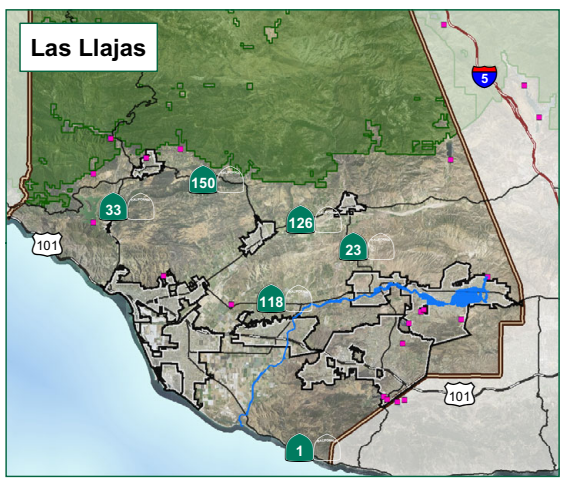


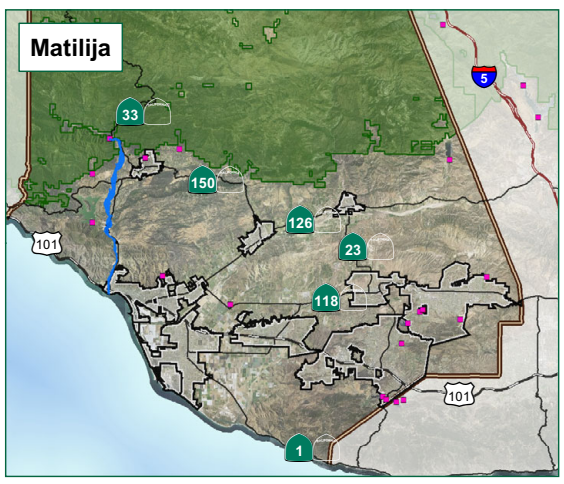


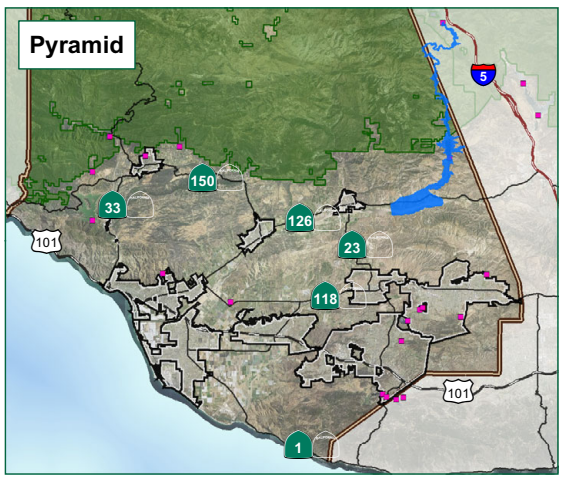


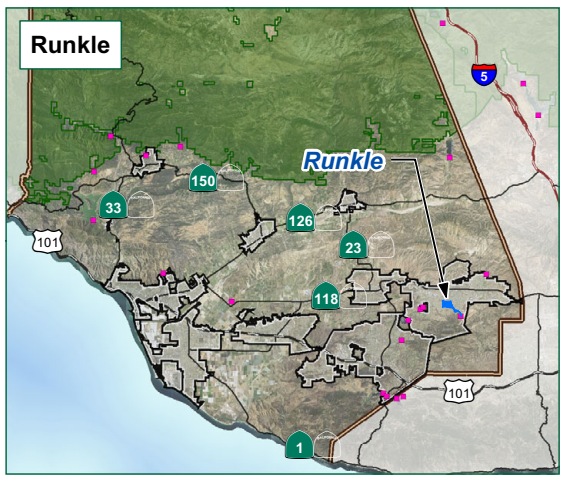


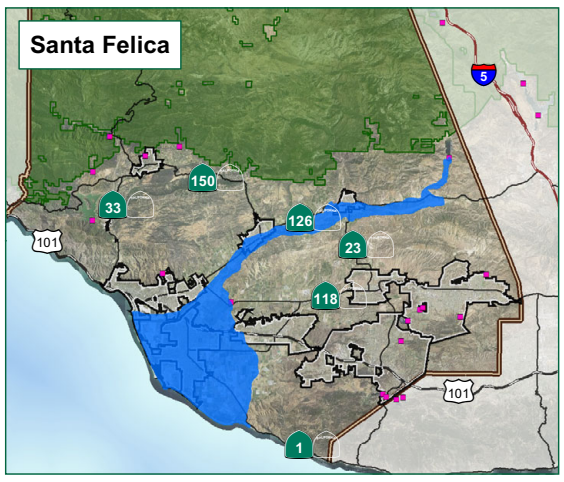


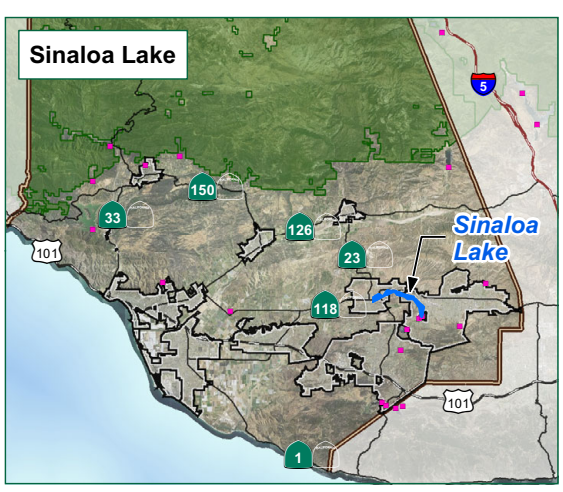


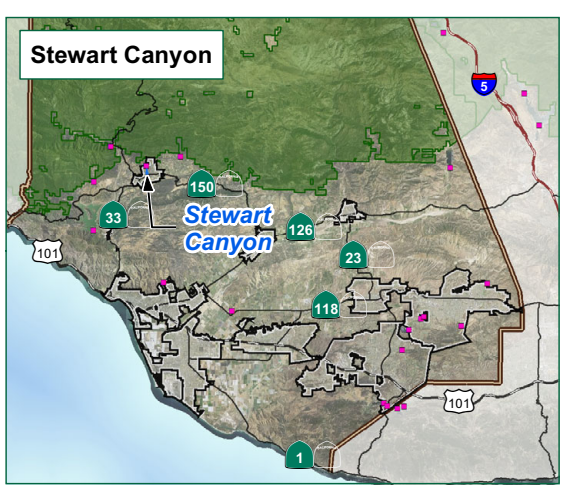


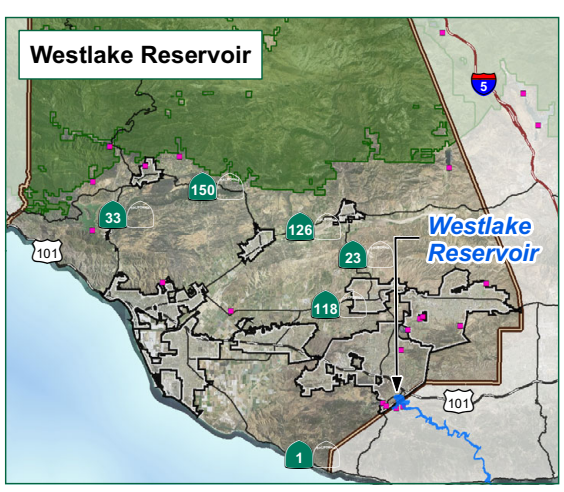


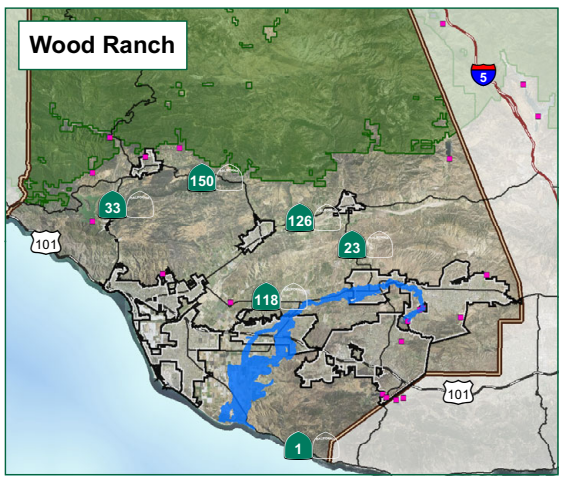


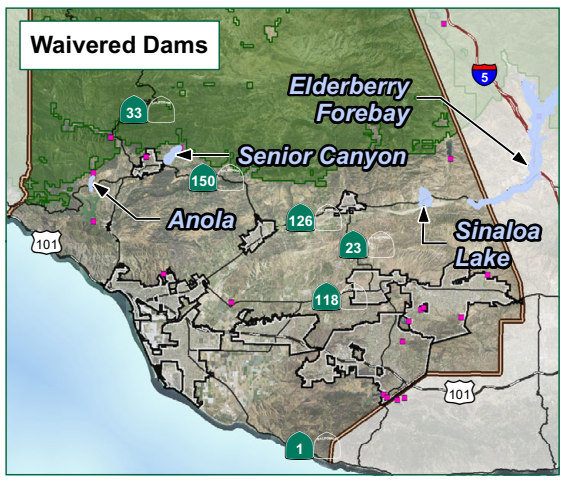












Legend

- Dam Inundation Area
- Waivered Dam Inundation Area
- State-Size Dam
- County Boundary
- City Limits
- National Forest

Basemap

NAIP 2014 (Summer) USDA-FSA APFO

0 4 8 16

Miles

N W E S

For data sources see: F-20, List of Data Sources Used in Figures.

Figure 11-6
Individual Dam Failure Inundation Areas

a

BACK OF FIGURE 11-6
DAM FAILURE INUNDATION: INDIVIDUAL DAMS

TABLE 11-2
DAMS UNDER STATE OR FEDERAL JURISDICTION WITH INUNDATION AREAS
Ventura County

Dam	Year Built	Capacity (Acre Feet)	Height (Feet)	Type	Inundation Area (Sq. Mi.)
Bouquet Canyon	1934	36,505	190	earth	109.67
Casitas	1958	254,000	279	earth	5.09
Castaic	1973	323,700	340	earth	163.41
Ferro Debris	1986	24	45	earth	0.06
Lake Eleanor 1763	N/A	128	37	earth	0.32
Lake Sherwood	1904	2,694	45	constant radius arch	2.01
Lang Creek Detention Basin	2004	263	67	earth	0.48
Las Llajas	1981	1,250	96	earth	8.13
Matilija	1949	1,800	163	variable radius arch	3.85
Pyramid	1973	178,700	386	earth and rock	13.94
Runkle	1949	100	41	earth	0.65
Santa Felicia Dam	1955	100,000	213	earth	121.19
Sinaloa Lake	1925	205	30	earth	2.32
Stewart Canyon Debris Basin	1963	67	34	earth	0.06
Westlake Reservoir	1972	9,200	158	earth	2.65
Wood Ranch	1965	11,000	146	earth	33.61

Source: DSOD 2015.

Extent

FEMA characterizes a dam as a high hazard if it stores more than 1,000 acre-feet of water, is taller than 150 feet, and has the potential to cause downstream property damage. The hazard ratings for dams are set by FEMA and confirmed with site visits by engineers. Most dams in the county are characterized by increased hazard potential because of downstream development and increased risk as a result of structural deterioration or inadequate spillway capacity.

The Division of Safety of Dams (DSOD) regulates state-size dams and inspects them annually to ensure that they are in good operating condition. Also, as required by DSOD regulations, the flood inundation limits resulting from a dam breach during the design storm (probable maximum precipitation) are established for each state-size dam. The resultant maps contain flood-wave arrival time estimates and flood inundation areas. These maps are developed by Cal Office of Emergency Services (OES) and provided to DSOD and local communities. Inundation areas are shown in Table 11-2.

Probability of Future Events

The probability of dam failure inundation is unknown, but such an event would likely be the result of an extreme storm.

Levee Failure Inundation

Nature

Levees are typically earthen embankments designed to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems are built for agricultural purposes and provide flood protection and flood loss reduction for farm fields and other land used for agricultural purposes. Urban levee systems are built to provide flood protection and flood loss reduction for population centers and the industrial, commercial, and residential facilities within them.

Levees are designed to provide a specific level of flood protection. Agricultural levee systems provide a level of protection that is appropriate based on the value of the assets being protected. Because urban levee systems are designated to protect urban areas, they are generally built to higher standards. Urban levee systems that are shown to provide protection from a one percent annual chance flood occurrence event on a FEMA FIRM must document ongoing compliance with the FEMA Levee Certification requirements found in Section 65.10 of the NFIP regulations (i.e., 44 CFR 65.10). No levee system provides full protection from all flooding events to the people and structures located behind it. Some level of flood risk exists in the levee-affected areas.

Levee failure is the overtopping, breach, or collapse of a levee wall. Levees can fail because of an earthquake, internal erosion, seepage, poor engineering/construction or maintenance, or landslides, but levees most commonly fail as a result of significant flows. During heavy precipitation periods or sudden melting of accumulated snow, excessively large flows may overtop levee sections and cause failure. The overflow of water washes away the top portion of the levee, creating deep grooves. Eventually, the levee weakens, resulting in a breach or collapse of the levee wall and the release of uncontrollable amounts of water.

History

The floods of January and February 1969 were the most damaging floods along the Santa Clara River in Ventura County. The estimated peak discharge of the 1969 flood was 165,000 cubic feet per second (cfs), before the gage data adjustment referenced in the Ventura County hydrology report titled *Santa Clara River 2006 Hydrology Update: Phase I, From Ocean to County Line* (VCWPD 2006) was performed.

The following excerpts taken from the United States Army Corps of Engineers (USACE) report entitled *Floods in Southern California during January and February 1969* (USACE 1969) document the significant damage that occurred to the SCR-1 Levee protecting Oxnard, specifically within the reach from Highway 118 to Highway 101.

> *"The only significant damage that occurred during this reach during the January (1969) flood was damage to the revetment of an existing levee constructed by the Corps of Engineers. February flood flows washed out about 500 feet of State Route 118 Bridge, damaged agricultural properties constructed by the Corps of Engineers. ... The flood eroded the south bank (of the Santa Clara River) near the existing Corps levee, damaging some groins; then deflected, ricocheted from the State Route 118 bridge, and returned to the south bank – where the flood flows cut in close to the Corps levee, bounced off the north bank, and carved a long arch. The flood flows then deflected to south bank where they undercut the toe protection on the Corps levee, causing the failure of about 2,000 feet of levee and eroding the ground behind the levee for a distance of about 100 feet."*

After the 1969 flood, USACE repaired the resulting damage (completed in 1971). In December 1985, the VCWPD completed additional repairs in the vicinity of the 1969 levee failure location. The damage repaired in 1985 may have been due to the 1983 flood, which had a peak discharge of 100,000 cfs. The damage was likely due to the low-flow channel encroaching and washing out parts of the levee. The repair included removal of approximately two feet of existing rock and placement of two tons of rock riprap back to the original design dimensions and backfilling the uncompacted fill. This is the only known non-Corps stone that has been added to the SCR-1 Levee.

Location

In November 2009, the VCWPD completed federally-mandated engineering evaluations of nine provisionally accredited levees (PALs) within the Calleguas Creek, Santa Clara River, and Ventura River watersheds. At that time, VCWPD submitted Levee Certification Report (LCR) compliance documentation packages to FEMA for three of the nine PAL-designated levees. As shown on Figure 11-7, these levees include the ASR-2 Levee Floodwall along Arroyo Santa Rosa in the unincorporated community of Santa Rosa Valley, the AS-6 Levee along Arroyo Simi in Simi Valley, and the SC-1 Levee along Sespe Creek in Fillmore.

At that same time, PAL-Response Reports (PRRs) were also submitted to FEMA for the remaining six PAL-designated levees also shown on Figure 11-7. These are AS-7 along Arroyo Simi in Simi Valley, CC-2 and CC-3 along Calleguas Creek in Camarillo, SCR-1 along the Santa Clara River in Oxnard, VR-1 along the Ventura River in Ventura, and VR-3 in the unincorporated areas of the Ventura River Valley. The PRRs indicated that in their current condition, those six levees could not be certified by the VCWPD before FEMA's November 30, 2009, compliance submittal deadline date.

Subsequently, two additional levee systems, SC-2 (the south half of the Sespe Creek levee in Fillmore) and SCR-3 (along the Santa Clara River in Oxnard) were added to the above list of six VCWPD levees requiring rehabilitation work to be fully compliant with federal levee certification regulations (i.e., 44 CFR 65.10). Also, the VR-2 levee system, along the west bank of the Ventura River, which was originally constructed by the Natural Resources Conservation Service (NRCS) in 1979 to provide flood protection for the unincorporated community of Casitas Springs, was added to the list of VCWPD levees requiring rehabilitation and/or improvement work.

Extent

There are 5.17 square miles in Ventura County protected by VCWPD PALs from the 100-year flood.

Probability of Future Events

The probability of future levee failures in Ventura County is unknown, but may result from a large winter storm or seismic event.

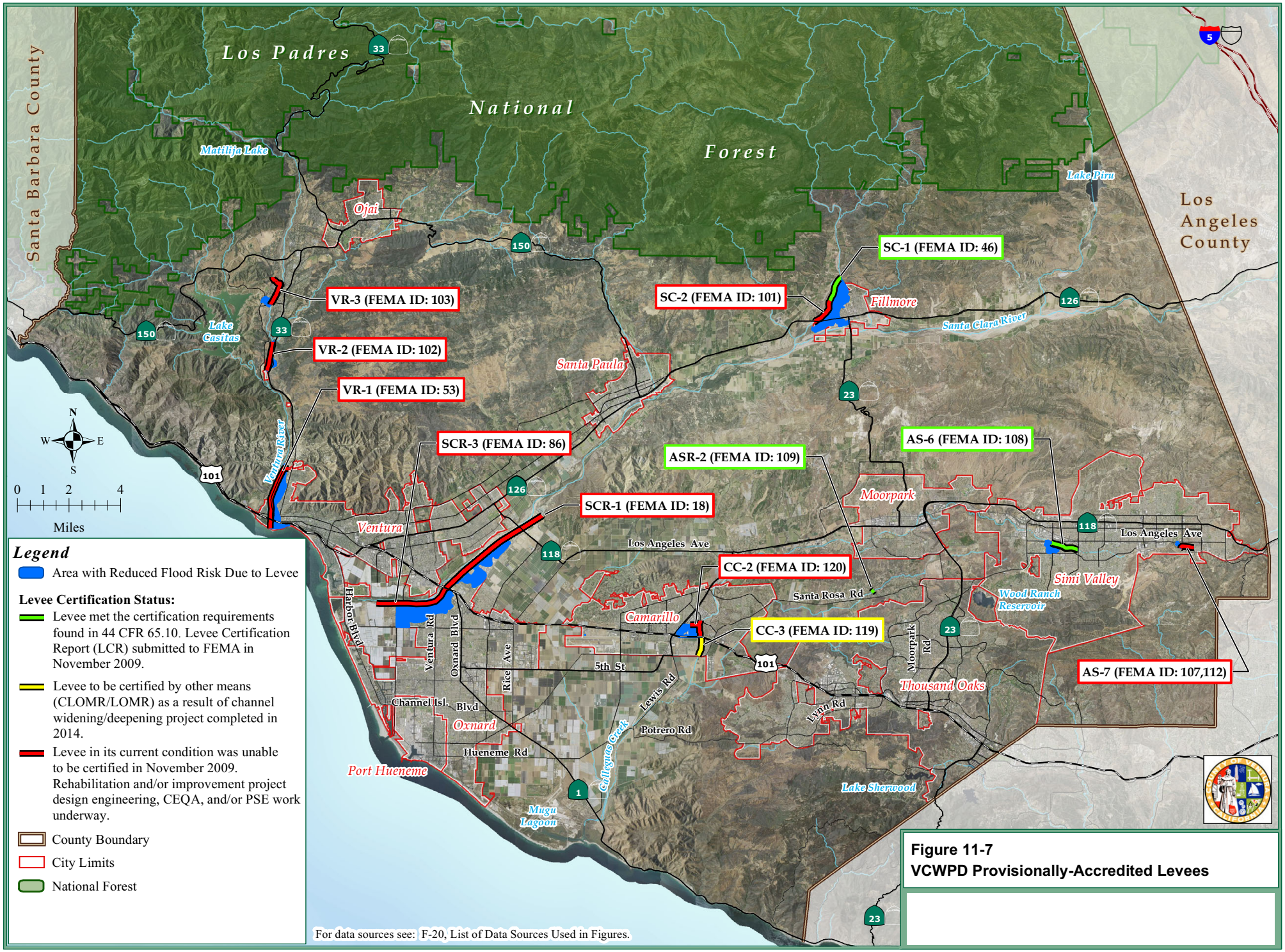


Figure 11-7
VCWPD Provisionally-Accredited Levees

Post-Fire Debris Flow

Nature

Wildfires are a common occurrence in the hills and mountainous regions of Ventura County. By reducing or destroying vegetative cover and altering soil characteristics, fires often result in conditions that can significantly increase runoff and erosion when winter rains begin to fall. These conditions may result in a debris flow (also referred to as mud flow), which is a slurry of water, sediment, and rock that converges in a stream channel.

The threats of erosion, flooding, and debris flows are significantly increased by the following processes:

- **Reduced infiltration and increased runoff:** A fire's consumption of vegetative cover increases exposure of the soil surface to raindrop impact. Soil heating destroys organic matter that binds the soil together. Extreme heating may also cause the development of water-repellant, or "hydrophobic," soil conditions that further reduce infiltration.
- **Changes in hill slope conditions:** Fires remove obstructions to overland flow, such as trees, downed timber, and plants, increasing flow velocity and therefore erosive power. Increased sediment movement also fills depressions, reducing storage capacity and further contributing to increased velocity and volume of flow. These factors combine to allow more of the watershed to contribute flow to the flood at the same time, increasing the volume of the flood.
- **Changes in channel conditions:** Increased overland flow and sediment transport result in increased velocity and volume of flow in defined channels. Channel erosion increases, as do peak discharges.

The occurrence of erosion, floods, and debris flows in burned areas is also dependent on precipitation intensity—storms with high intensity are more likely to initiate the processes described above and result in flood events. Additionally, easily eroded soils facilitate changes in hill slope conditions and increase the volume of runoff. Both of these conditions are likely to occur in Ventura County.

In extreme situations, the conditions described above combine to form a debris flow. These flows are often the most destructive events resulting from heavy rainfall in fire-affected areas. They occur with little warning, carry vast quantities of rock and other material, and strike objects with extreme force. Because of their viscosity and density, debris flows can move or carry away objects as large as vehicles and bridges, and they may travel great distances down canyons and stream valleys. Debris flow fronts may also travel at high speeds, exceeding 50 miles per hour.

History

Evidence of debris-flow movement was widespread following the 1969 storms throughout the mountain ranges in Ventura County. Debris flows occurred in numerous watersheds, including Cozy Dell Canyon, Stewart Canyon, Senior Canyon, Orcutt Canyon, Jepson Wash, and others. Mudflows also occurred in 1969 and 1971 in watersheds that were underlain by fine-grained sedimentary rocks and had been more recently burned by wildfires near Ojai. Witnesses to the mudflows described surges of what appeared to be mud covered with water behind a moving boulder.

In 2014, two post-fire debris flows occurred in the Camarillo Springs area. Around midnight on November 1, 2014, a heavy rain—the first in Ventura County in many months—dislodged debris and

created thick mud from the hills recently burned by the Springs Fire in May 2013. Twenty homes were evacuated, including two homes that were severely damaged. According to the Ventura County Fire Department, a storm drain system that should have prevented the mud and debris from flooding the area apparently filled to capacity, in part because of additional amounts of debris left on the hillside due to Springs Fire.

On December 12, 2014, a second debris flow affected Camarillo Springs when a storm dumped 1.8 inches of rainfall over the region. According to the Ventura County Fire Department, 16 homes were damaged, including 10 homes that were red-tagged. Hours before the storm was expected, mandatory evacuations were ordered for 124 homes. Contractors hired by the City of Camarillo worked to clear drainage areas before the storm hit and had put up K-rails to direct water and mud away from homes in the projected debris flow area. The City of Camarillo has installed steel mesh nets in hillside areas that successfully contain alluvial fan flows and will prevent further damage to private property.

Location

Areas of Ventura County that have been subject to recent wildfires are susceptible to potentially hazardous debris flows. Areas susceptible to debris flow include localities that are adjacent to and downslope of these burn areas, especially in locations that are in ravines and canyons, and at the mouths of canyons. Figure 11-8 shows wildfire perimeters of concern; this includes wildfires since 2012 (Grand and Springs fires) and burned areas that are recovering slowly (Day fire).

Extent and Probability of Future Events

Ventura County has a long history of flooding and wildfires, which are two major factors in the occurrence of post-fire debris flow. However, because a number of complex factors lead to debris flow (basin morphometry, burn severity, soil properties, and rainfall characteristics), the probability and estimate of the volume of post-fire debris flow in Ventura County is unknown. The USGS has developed model predictions that can be calculated at specific basin outlets, and along the draining network within and immediately downstream of a burn area. These models can be applied post- fires to predict the probabilities of debris flows and estimate debris-flow volumes throughout a burn area in response to a specific rainstorm event.

V:\Projects\GIS_Proj\VenCo_HMPUpdate_10yr\Deliverables\Wildfire_RecentOfConcern.mxd

Figure 11-8
Wildfire Perimeters of Concern

Tsunami

Nature

A tsunami is a series of traveling ocean waves of extremely long length, generated by disturbances associated primarily with earthquakes occurring below or near the ocean floor. Subduction zone earthquakes at plate boundaries often cause tsunamis. However, tsunamis can also be generated by submarine landslides, submarine volcanic eruptions, the collapse of volcanic edifices, and—in very rare instances—large meteorite impacts in the ocean.

In the deep ocean, a tsunami may have a length from wave crest to wave crest of 100 miles or more but a wave height of only a few feet or less. Thus, the wave period can be up to several hours, and wavelengths can exceed several hundred miles. Therefore, tsunamis are unlike typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of up to 300 feet. Tsunamis cannot be felt aboard ships and they cannot be seen from the air in the open ocean. In deep water, the waves may reach speeds exceeding 700 miles per hour.

Tsunamis can originate hundreds or even thousands of miles away from coastal areas. Local geography may intensify the effect of a tsunami. Areas at greatest risk are less than 50 feet above sea level and within one mile of the shoreline. Tsunamis arrive as a series of successive crests (high water levels) and troughs (low water levels). These successive crests and troughs can occur anywhere from five to 90 minutes apart. They usually occur 10 to 45 minutes apart.

Tsunamis not only affect beaches that are open to the ocean, but also bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves can also diffract around land masses. Because tsunamis are not symmetrical, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography. However, tsunamis do propagate outward from their source, so coasts in the shadow of affected land masses are usually fairly safe.

History

According to the California Tsunami Evacuation Playbook, City of Ventura – Ventura County (No. 2014-Vent-01), and as shown in Table 11-3, there have been eight notable tsunami events run-ups recorded in Ventura County.

Location

Figure 11-9 shows tsunami evacuation areas based on two scenarios—Phase 3 and Maximum Phase—as described in the California Tsunami Evacuation Playbook, City of Ventura – Ventura County. This map illustrates coastal land areas, including areas in the cities of Oxnard, Port Hueneme, and Ventura, that can become submerged due to tsunami run-up. The area of land subject to inundation is a factor of the following factors:

- Distance of shoreline from the tsunami-generating event
- Magnitude of the earthquake causing the event; duration and period of waves
- Run-up elevations
- Tidal level at time of occurrence
- Location along shore and direction of shore in respect to propagated waves
- Topography of the seabed

TABLE 11-3 TSUNAMI EVENTS Ventura County			
Year	**Source/Source Location**	**Tsunami Location**	**Remarks**
12/21/1812	Earthquake and Landslide	City of Ventura	6.5-foot run-up
4/01/1946	Earthquake – Aleutian Islands, Alaska	Port Hueneme	3-foot run-up
		Ormond Beach	5-foot run-up
11/4/1952	Earthquake – Kamchatka Peninsula	Port Hueneme	2-foot run-up
3/09/1957	Earthquake – Aleutian Islands, Alaska	Port Hueneme	2-foot run-up
3/28/1964	Earthquake and Landslide – Alaska	City of Ventura	Tide dropped 8.0 feet
		Oxnard	Large swells
9/29/2009	Earthquake – Samoa	Ventura	Buoys moved near mouth of harbor
2/27/2010	Earthquake – Chile	Ventura, Oxnard, Port Hueneme	3-foot run-up
3/11/2011	Earthquake – Japan	Ventura, Oxnard	4-foot run-up
		Port Hueneme	5-foot run-up

Source: CGS 2014.

Run-up = the large amount of water that a tsunami pushes onto the shore above the regular sea level, that is the maximum vertical height onshore above sea level reached by a tsunami

Extent

Figure 11-9 shows the Phase 3 Evacuation and Maximum Evacuation Phase, based on models of maximum local and distance tsunamis and for tsunamis coming from the Cascadia Subduction Zone. The Phase 3 Evacuation estimates a tsunami flood level of 1.7 to 5.0 feet above the high tide line, and a tsunami flood level of 7.7 to 11.0 feet above low tide conditions. The Maximum Evacuation Phase estimates a tsunami flood level of more than 5.0 feet above the high tide line, and a tsunami flood level of more than 11.0 feet above low tide conditions.

Probability of Future Events

Based on the history of tsunami run-ups in the region and the history of earthquakes in the Pacific Rim, another tsunami event is likely to occur, although the extent and probability is unknown.

Figure 11-9 Tsunami Evacuation Areas

For data sources see: F-20, List of Data Sources Used in Figures.

Regulatory Setting

The most effective means of preventing flood damage appears to be floodplain management (i.e., the regulation of the types of activities permitted in flood hazard areas). Floodplain management addresses the problems encountered in the utilization of floodplains and considers the total spectrum of possible solutions to problems involving possible future land uses. Floodplain management cannot, however, protect all existing development. Therefore, to provide for the maximum alleviation of flood hazards, a combination of federal, state, and local corrective and preventive measures is necessary. These measures are discussed in detail below.

Federal

Federal Emergency Management Act (FEMA).

FEMA is the Federal agency that oversees floodplains and manages the National Flood Insurance Program (NFIP), as adopted under the National Flood Insurance Act of 1968. FEMA's regulations govern the delineation of floodplains and establish requirements for floodplain management. FEMA prepares Digital Flood Insurance Rate Maps (DFIRMs) that indicate the regulatory floodplain to assist communities such as Ventura County with land use and floodplain management decisions to meet the requirements of the National Flood Insurance Program. FEMA has prepared a DFIRM for all of Ventura County, effective January 20, 2010.

National Flood Insurance Program (NFIP)

The regulations of the National Flood Insurance Program, which is administered by FEMA, require that communities adopt land use restrictions for the 100-year floodplain to qualify for federally subsidized insurance. The NFIP was enabled by the National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973. The type of restrictions communities must adopt are listed in some detail in Title 44 Code of Federal Regulations, Sections 59 through 70. Additionally, the Ventura County Floodplain Management Ordinance 4465, includes a requirement that habitable structures be elevated a minimum of one foot of freeboard above the base flood elevation of the one percent annual chance flood and be flood-proofed. Participation in the National Flood Insurance Program is virtually mandatory, since flood insurance (within identified "special flood hazard" areas) is a prerequisite for receiving mortgages or construction loans from federally regulated lending institutions. Disaster assistance is not available to public agencies in hazard areas if they do not participate and remain compliant in the Program. Thus, the County must be, and is a participating community in the National Flood Insurance Program and thus qualifies for disaster assistance in the event of a declared natural disaster. Outside these limits, the prime responsibility for regulating activities in flood hazard areas lies with state and local government.

Community Rating System for Flood Control

The Community Rating System (CRS) is a program administered by FEMA. The program offers financial incentives to cities and counties that voluntarily exceed the minimum requirements of the National Flood Insurance Program. The three goals of the CRS are to: (1) reduce and avoid flood damage to insurable property; (2) strengthen and support the insurance aspects of the NFIP; and (3) foster comprehensive flood plan management. The CRS includes multiple programs or "activities" in which communities can participate to earn CRS points. These include public outreach and education on flood prevention measures, preserving open space, maintaining special certifications for staff members as Certified Floodplain

Managers, removing debris and sediment from flood control channels, and adoption of an All-Hazards Mitigation Plan. Each community receives a Class Rating based on the number of points earned. The number of points a community has earned determines if a discount is available to property owners on their flood insurance policies. As of 2016, five percent of all NFIP member communities participate in the CRS program, and fifteen percent of all NFIP California communities participate in the program.

CRS Classes are rated from 1 to 9, with Class 1 representing the highest (best) class. On May 1, 2016, Ventura County received a Class 6 rating, and consequently, properties within a floodplain in the unincorporated areas of Ventura County are eligible for a 20 percent premium discount on flood insurance.

Disaster Mitigation Act of 2000 (DMA 2000)

On October 30, 2000, Congress passed DMA 2000 (Public Law 106-390), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act) (Title 42 of the United States Code Section 5121 et seq.) by repealing the Act's previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. This new section also provided the legal basis for the FEMA's mitigation plan requirements for mitigation grant assistance. Under DMA 2000, local governments throughout the United States must adopt and maintain mitigation plans in order to be eligible for specific types of grant assistance. DMA 2000 is administered by FEMA (in California, Region IX) in collaboration with State Hazard Mitigation Officers (in California, the State Office of Emergency Services).

State

California Dam Safety Act

The California Dam Safety Act (Section 8589.5 California Emergency Services Act) requires the preparation of dam inundation maps showing areas of potential flooding in the event of sudden or total dam failure as well as emergency procedures for notification and evacuation of nearby residents.

Local

2005 Ventura County General Plan

The General Plan covers flood hazards in Chapter 2, Hazards. Section 2.10 includes goals, policies, and programs related to flood hazards. The following Area Plans also contain applicable goals and policies related to flood hazards:

- Coastal Area Plan;
- El Rio/Del Norte Area Plan;
- North Ventura Avenue Area Plan;
- Oak Park Area Plan;
- Ojai Valley Area Plan;
- Piru Area Plan;
- Saticoy Area Plan;
- Thousand Oaks Area Plan; and
- Lake Sherwood/Hidden Valley Area Plan.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for flood hazards. These can be found in Sections 17a. Hydraulic Hazards-Non-FEMA and 17b. Hydraulic Hazards-FEMA.

2016 Coastal Zoning Ordinance

The Coastal Zoning Ordinance regulates flood hazards through Section 8178-4 Mitigation of Potential Hazards

Ventura County Emergency Operations Plan (2012)

The Ventura County Emergency Operations Plan (EOP) describes what the County's general actions will be during a response to an emergency. The EOP also includes appendices that describe in more detail the actions required of each local jurisdiction's departments/agencies. Further, EOP describes the role of the Emergency Operation Center (EOC) and the coordination that occurs between the EOC and each local jurisdiction's departments and other response agencies. Finally, the EOP describes how the EOC serves as the focal point among local, state, and federal governments in times of disaster.

Ventura County Floodplain Management Ordinance

Ventura County's Flood Plain Management Ordinance (Ordinance No. 4465) ensures compliance with the National Flood Insurance Program. This includes permit review for structures built in the floodplain and evaluation of site plans for developments that include identified floodplains. Residential development is not allowed in the FEMA designated floodway.

Office of Emergency Services (OES)

In Ventura County, disaster coordination and planning is the responsibility of the Sheriff's Department through its Office of Emergency Services (OES). The OES serves as the depository for the County's Dam Inundation maps and is charged with ongoing maintenance of the County's Dam Failure Response Plan, which was adopted by the Board of Supervisors on September 13, 1983.

Key Terms

Alluvial Fan. An alluvial fan is a triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt (i.e., alluvium). Alluvial fans are usually created as flowing water interacts with mountains, hills, or the steep walls of canyons. Streams carrying alluvium can be trickles of rainwater, a fast-moving creek, a powerful river, or even runoff from agriculture or industry. As a stream flows down a hill, it picks up sand and other particles (alluvium).

Anticlinal. In structural geology, an anticline is a type of fold that is an arch-like shape and has its oldest beds at its core.

Erodibility. An indicator of a soil's susceptibility to rain, runoff, and other erosive processes.

Inundation. To cover with water, especially flood waters. To overwhelm as if with a flood.

Levee. Levees are typically earthen embankments designed to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems are built for agricultural purposes and provide flood protection and flood loss reduction for farm fields and other land used for agricultural purposes. Urban levee systems are built to provide flood protection and flood loss reduction for population centers and the industrial, commercial, and residential facilities within them. Agricultural levee systems provide a level of protection that is appropriate based on the value of the assets being protected.

National Flood Insurance Program (NFIP). The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically.

Slurry. A semi-liquid mixture, typically of fine particles of manure, cement, or coal suspended in water.

Special Flood Hazard Area (SFHA): The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V.

References

Reports/Publications

Ventura, County of. Ventura County Hazard Mitigation Plan. Adopted by the Ventura County Board of Supervisors September 2015.

Websites

www.flood.org

www.vcfloodinfo.com

www.floodsmart.gov

www.FEMA.gov

SECTION 11.3 WILDFIRE HAZARDS

Introduction

This section addresses the wildfire hazard (also referred to as fire hazard) conditions within Ventura County and the potential risk these conditions pose. Issues related to fire hazards include fire hazard management, emergency response, and high fire hazard areas. This section summarizes the fire hazard conditions in Ventura County based on information from the 2015 Ventura County Multi-Hazard Mitigation Plan (VCMHMP). Consistent with the VCMHMP, each section includes explanations of the nature, history, location, extent, and probability associated with fire hazards. A discussion of fire protection services is included in Section 7.6 of Chapter 9 of this Background Report.

Major Findings

- Within Ventura County, very high fire hazard severity zones (FHSZs) are located in mountainous or hillside areas (west of Lake Casitas, northeast of Ojai, north of Fillmore, and surrounding Thousand Oaks and Simi Valley), where the greatest fuel density exists; very high FHSZs are also located throughout much of the county's large agricultural and cattle-grazing areas. 81.9 square miles are in the high FHSZ and 504.4 square miles are in the very high FHSZ. The populations that live in the very high FHSZ are mainly located in the cities of Moorpark (44.0 percent), Simi Valley (27.7 percent), Thousand Oaks (43.1 percent), as well as the unincorporated area (37.1 percent).
- Vegetation that has dried during long, hot summers provides a living fuel for wildfires and the Santa Ana winds combine to contribute to the high incidence of wildfires in Ventura County. In the past, fires burning more than 1,000 acres have occurred about every one to three years.

Existing Conditions

A wildfire is an uncontrolled fire that spreads through vegetative fuels, exploding and possibly consuming structures. Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may be visible from miles around. Wildfires can be human-caused (e.g., by arson or campfires), or can be caused by natural events such as lightning. Wildfires can be categorized into four types:

- **Wildland fires** occur mainly in areas under federal control, such as national forests and parks, and are fueled primarily by natural vegetation.
- **Interface or intermix fires** occur in areas where both vegetation and structures provide fuel. These are also referred to as urban-wildland interface fires.
- **Firestorms** occur during extreme weather (typically high temperatures, low humidity, and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted.
- **Prescribed fires and prescribed natural fires** are intentionally set or natural fires that are allowed to burn for beneficial purposes.

The following three factors contribute significantly to wildfire behavior; as described more fully below, these factors can be used to identify wildfire hazard areas:

- **Topography:** As slope increases, the rate of wildfire spread increases. South-facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops may mark the end of wildfire spread because fire spreads more slowly or may even be unable to spread downhill.
- **Fuel:** The type and condition of vegetation play a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the "fuel load"); the ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel's continuity is also an important factor, both horizontally and vertically.
- **Weather:** The most variable factor affecting wildfire behavior is weather. Variables such as temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signals reduced wildfire occurrence and easier containment. Years of precipitation followed by warmer years tend to encourage more widespread fires and longer burn periods. Also, since the mid-1980s, earlier snowmelt and associated warming due to global climate change has been associated with longer and more severe wildfire seasons in the western United States.

If not promptly controlled, wildfire may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. It is also important to note that in addition to affecting people, wildfire may severely affect livestock and pets. Such events may require the emergency watering/feeding, shelter, evacuation, and even burying of animals.

Wildfires can have serious effects on the local environment. In addition to stripping the land of vegetation and destroying forest resources, including the wildlife that lives in these areas, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capacity to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as described above. Wildfires can also greatly affect the air quality of the surrounding area.

History

Wildfires are a common occurrence in Ventura County. In the last 50 years (1965 through 2015), 23 wildfires, with an extent greater than 10,000 acres, have occurred. Table 11-4 illustrates the 10 largest fires over the last 50 years and Figure 11-10 shows the location of these and other fires between 1965 and 2015. In May 2013, the Springs fire burned 24,251 acres; 10 structures were destroyed and 12 were damaged, and 10 injuries were recorded.

TABLE 11-4 TEN LARGEST VENTURA COUNTY FIRES, 1965 THROUGH 2015		
Name	**Date**	**Acres Affected***
Day	September 2006	162,702
Simi Valley	October 2003	108,204
Piru	October 2003	63,991
Ranch**	October 2007	58,401
Ferndale	October 1985	47,064
Green Meadow	October 1993	38,477
Creek Road	September 1979	32,000
Steckel	October 1993	27,088
Parker Ranch	October 1967	25,000
Hopper	August 1997	24,793

Source: Cal FIRE 2015

*Acres affected = total acreage.

** Fire occurred in both Ventura and Los Angeles counties.

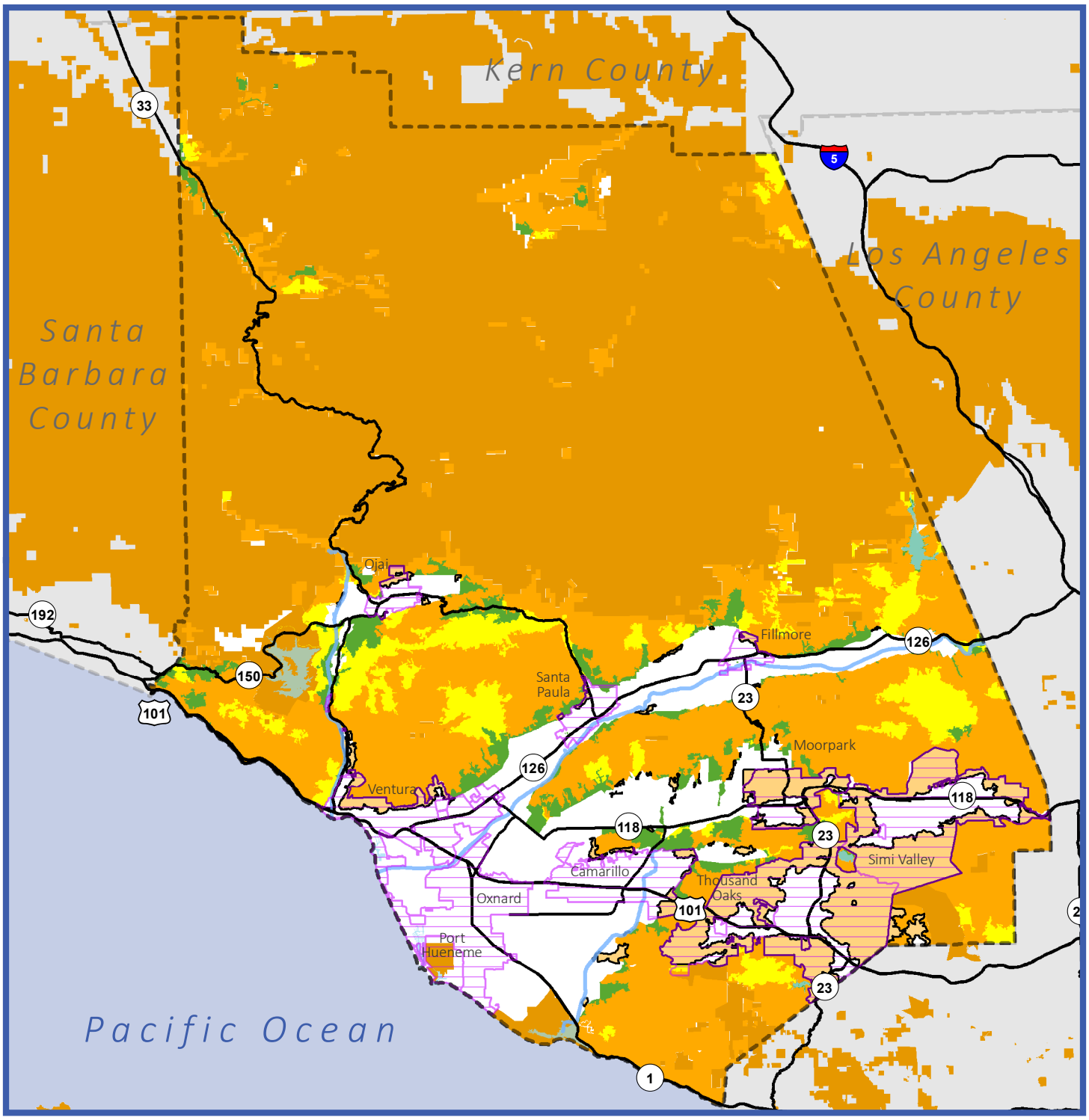
Location and Extent of Fire Hazard Severity Zones

Public Resources Code 4201-4204 and Government Code 51175-89 directed the California Department of Forestry and Fire Protection (Cal FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZs), are represented as very high, high, or moderate. Specifically, the maps were created using data and models describing development patterns, potential fuels over a 30- to 50-year time horizon, expected fire behavior, and expected burn probabilities. The maps are divided into local responsibility areas and state responsibility areas. Local responsibility areas generally include cities, cultivated agriculture lands, and portions of the desert. Local responsibility area fire protection is typically provided by city fire departments, fire protection districts, counties, and by Cal FIRE under contract to the local government. State responsibility area is a legal term defining the area where the state has financial responsibility for wildfire protection. Incorporated cities and federal ownership are not included. The prevention and suppression of fires in all areas that are not state responsibility areas are primarily the responsibility of federal or local agencies.

Figure 11-11 displays the areas of Ventura County most susceptible to wildfires. Within the unincorporated county, very high FHSZs are located in mountainous or hillside areas (west of Lake Casitas, northeast of Ojai, north of Fillmore, and surrounding Thousand Oaks and Simi Valley), where the greatest fuel density exists; as well as throughout much of the county's large agricultural and cattle-grazing areas. Although these areas are not heavily populated, they are near populated communities. Approximately 37.1 percent of the unincorporated area population is exposed to very high FHSZs. Population exposure in cities is highest in Moorpark (44.0 percent), Simi Valley (27.7 percent), and Thousand Oaks (43.1 percent)

As shown on Figure 11-11, in Ventura County there are 81.9 square miles in the high FHSZ and 504.4 square miles in the very high FHSZ.

Figure 11-10
Historical Wildfires, 1965 - 2015



Ventura County 2040 General Plan

Figure 11-11:
Fire Hazard Areas by Responsibility Area Federal, State, and Local

Map Date: January 09, 2017

Source: Ventura County, 2016; CAL FIRE 2007 (State), 2008 (Local), and 2016 (Federal); USGS, 2013.

0 7.5 15 Miles

N

- Ventura County Boundary
- Cities
- Major Roadways
- Major Waterways
- Water Bodies

Responsibility Areas:

- LRA - Very High
- SRA - High
- SRA - Moderate
- SRA - Very High
- FRA

Probability of Future Events

The climate in Ventura County is characterized as Mediterranean dry-summer featuring cool, wet winters and warm, dry summers. High moisture levels during the winter rainy season significantly increase the growth of plants. However, the vegetation is dried during the long, hot summers, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. As a result, fire susceptibility increases dramatically, particularly in late summer and early autumn. In addition, the presence of chaparral, a drought-resistant variety of vegetation that is dependent on occasional wildfires, is expected in Mediterranean dry-summer climates. Also, the history of plant succession in Ventura County is important in predicting fire susceptibility. For several years after a fire has occurred, easily flammable herbaceous species predominate and increase the likelihood of new fires. When woody species become reestablished, they contribute to a lower overall level of fire susceptibility for approximately 10 years. However, after this period, the slow aging plant community becomes ever more likely to burn because of increased levels of dead plant material and lowered plant moisture levels (Ventura County Multi-Hazard Mitigation Plan, September 2015).

In addition, the local meteorological phenomenon known as the Santa Ana winds contributes to the high incidence of wildfires in Ventura County. These winds originate during the autumn months in the hot, dry interior deserts to the north and east of Ventura County. They often sweep west into the county, bringing extremely dry air and high wind speeds that further desiccate plant communities during the period of the year when the constituent species have very low moisture content. The effect of these winds on existing fires is particularly dangerous, as the winds can greatly increase the rate at which fires spread.

Based on the conditions described above and the history of occurrence in the past, future events are very likely to occur. In the past, fires burning more than 1,000 acres have occurred about every one to three years. The extent of future events will depend on specific conditions at the time of the fire.

Regulatory Setting

Federal

Federal Land Assistance, Management, and Enhancement (FLAME) Act

In 2009, Congress passed the Federal Land Assistance, Management, and Enhancement (FLAME) Act (FLAME) as the basis for the U.S. Department of Agriculture (USDA) and the Department of the Interior (DOI) to develop a national cohesive wildland fire management strategy. In response to the FLAME Act, USDA and DOI published the National Cohesive Wildland Fire Management Strategy, which includes the National Strategy and the National Action Plan, both completed in April 2014. Together, these documents address elements requested by Congress after the passage of the FLAME Act and represent an approach wildland fire management based on the goal of achieving safer, more efficient, cost-effective public, and resource protection goals and more resilient landscapes.

Healthy Forest Restoration Act (HFRA)

The Healthy Forest Restoration Act (HFRA), enacted by the U.S. Congress on January 7, 2003, established a protocol for the creation of a type of document that articulated a wildfire safety plan for communities at risk from wildland fires- a Community Wildfire Protection Plan (CWPP). The Ventura County Fire Department has prepared a CWPP for all of Ventura County. As specified by the HFRA, the

Ventura County CWPP was developed in collaboration with local, county, state, and federal agencies as well as various community organizations within the County. The CWPP identifies wildfire risks and clarifies priorities for funding and programs to reduce impacts of wildfire on the communities at risk within Ventura County.

State

Strategic Fire Plan for California

Public Resources Code §4114 and §4130 authorize the State Board of Forestry and Fire Protection (Board) to establish a fire plan which, among other things, establishes the levels of statewide fire protection services for State Responsibility Area (SRA) lands. These levels of service recognize other fire protection resources at the federal and local level that collectively provide a regional and statewide emergency response capability. In addition, California's integrated mutual aid fire protection system provides fire protection services through automatic and mutual aid agreements for fire incidents across all ownerships. In 2010 the Board of Forestry and Fire Protection adopted the Strategic Fire Plan for California. This statewide fire plan was developed in concert between the State Board of Forestry and Fire Protection of and the California Department of Forestry and Fire Protection (CAL FIRE), in consultation with a group of outside experts to complete a needs assessment and to form the Fire Plan Steering Committee. This Committee worked for over a year preparing the 2010 Strategic Fire Plan. The Strategic Fire Plan seeks to protect lives, residential property, and natural resources. It is the basis for assessing California's complex and dynamic natural and man-made environment, and identifying a variety of actions to minimize the negative effects of wildland fire. Implementation of the 2010 Strategic Fire Plan for California is intended to occur at all levels of CAL FIRE, as well as through partnerships with local, state and federal agencies, private organizations (Fire Safe Councils, homeowners associations, industry, etc.) and citizens.

Senate Bill 1704 (Vegetation Management Program)

Senate Bill 1704 established the basic processes and procedures needed to manage chaparral-covered and associated lands within California. The Vegetation Management Program allows private landowners to enter into a contract with the California Department of Forestry and Fire Protection to use prescribed fire to accomplish a combination of fire protection and resource management goals. The main goals of the program are the reduction of conflagration fires, the optimization of soil and water productivity, and the protection and improvement of intrinsic floral and faunal values.

Public Resources Code Section 4291/Government Code Section 51182

Public Resources Code Section 4291 and Government Code Section 51182 require property owners in mountainous areas, forest-covered, lands, or any land that is covered with flammable material to create, at minimum, a 100-foot defensible space (or to the property line) around their homes and other structures. Under the law, property owners or those who control property must establish a 30-foot clean zone and a 70-foot reduced fuel zone.

Local

2005 Ventura County General Plan

The General Plan covers wildfire hazards in Chapter 1, Resources. Section 2.13 includes goals, policies, and programs related to wildfire hazards. The following Area Plans also contain applicable goals and policies related to wildfire hazards:

- Coastal Area Plan;
- Oak Park Area Plan;
- Ojai Valley Area Plan;
- Piru Area Plan;
- Saticoy Area Plan;
- Thousand Oaks Area Plan; and
- Lake Sherwood/Hidden Valley Area Plan.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for rural and wildland areas of the County. These can be found in Section 18. Fire Hazards,

2016 Coastal Zoning Ordinance

The Coastal Zoning Ordinance regulates wildfire hazards through Section 8178-4 Mitigation of Potential Hazards

Unit Strategic Fire Plan, Ventura County Fire Protection District

Ventura County maintains a contractual relationship with Cal Fire. A Unit Plan that is part of the California Strategic Fire Plan is used within the Ventura County Unit. The Unit Fire Plan also serves as the Community Wildfire Protection Plan (CWPP) for the County. The CWPP identifies wildfire risks and clarifies priorities for funding and programs to reduce impacts of wildfire on the communities at risk within Ventura County. Building on the proven and highly effective Weed Abatement Program implemented by Ventura County Fire Department under the authority of the Healthy Forests Restoration Act (HFRA), the County's CWPP documents and prioritizes the projects that stakeholders within communities at risk have identified.

Ventura County Fire Protection District Fire Hazard Reduction Program

The Ventura County Fire Protection District adopted a local ordinance that, among other things, requires mandatory 100-feet of brush clearance around structures located in or adjacent to Hazardous Fire Areas. The Fire Hazard Reduction unit manages this requirement throughout the VCFPD jurisdiction. Failure to comply with the program by the annual June 1st deadline can result in the Fire District completing the work and assessing a fee to the homeowner through a tax lien on their property. The role of individual property owners in responding to fire hazards is probably the most critical. Because of the large size of

the county and the preference of many homeowners to build within or adjacent to Hazardous Fire Areas, these individuals must assume responsibility for the prevention of conditions, that may result in property damage during the fire season. Measures that may be taken by property owners, include the planting of fire-resistant landscaping, landscape maintenance, mandatory clearance of brush around structures, and site design.

Key Terms

Conflagration. An extensive fire that destroys a great deal of land or property.

Herbaceous. Of, denoting, or relating to herbs (in the botanical sense).

Prescribed Fire. The knowledgeable and controlled application of fire to a specific land area to accomplish planned resource management objectives and weather conditions.

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Websites

N/A

Persons Consulted

N/A

SECTION 11.4 AVIATION HAZARDS

Introduction

This section summarizes the aviation issues for the County of Ventura. This chapter discusses the following issues pertaining to aviation:

- Airport Setting
- Airport Facilities
- Aircraft Incidents

Major Findings

- Airspace within the county can be heavily congested. Oxnard and Camarillo airports had a combined total of over 220,000 flights in 2015. Naval Base Ventura County Point Mugu averaged 29,493 annual flight operations between 2009-2013, and an estimated 70,000 flights occur at the Santa Paula Airport.
- Since 2010, there have been a total of 23 reported aviation incidents at Camarillo, Oxnard, Point Mugu, and Santa Paula, of which eight resulted in fatalities. During this same period, there have been a total of 33 reported incidents (five of which resulted in substantial damage to aircraft), and eight near mid-air collisions (all of them at Camarillo).

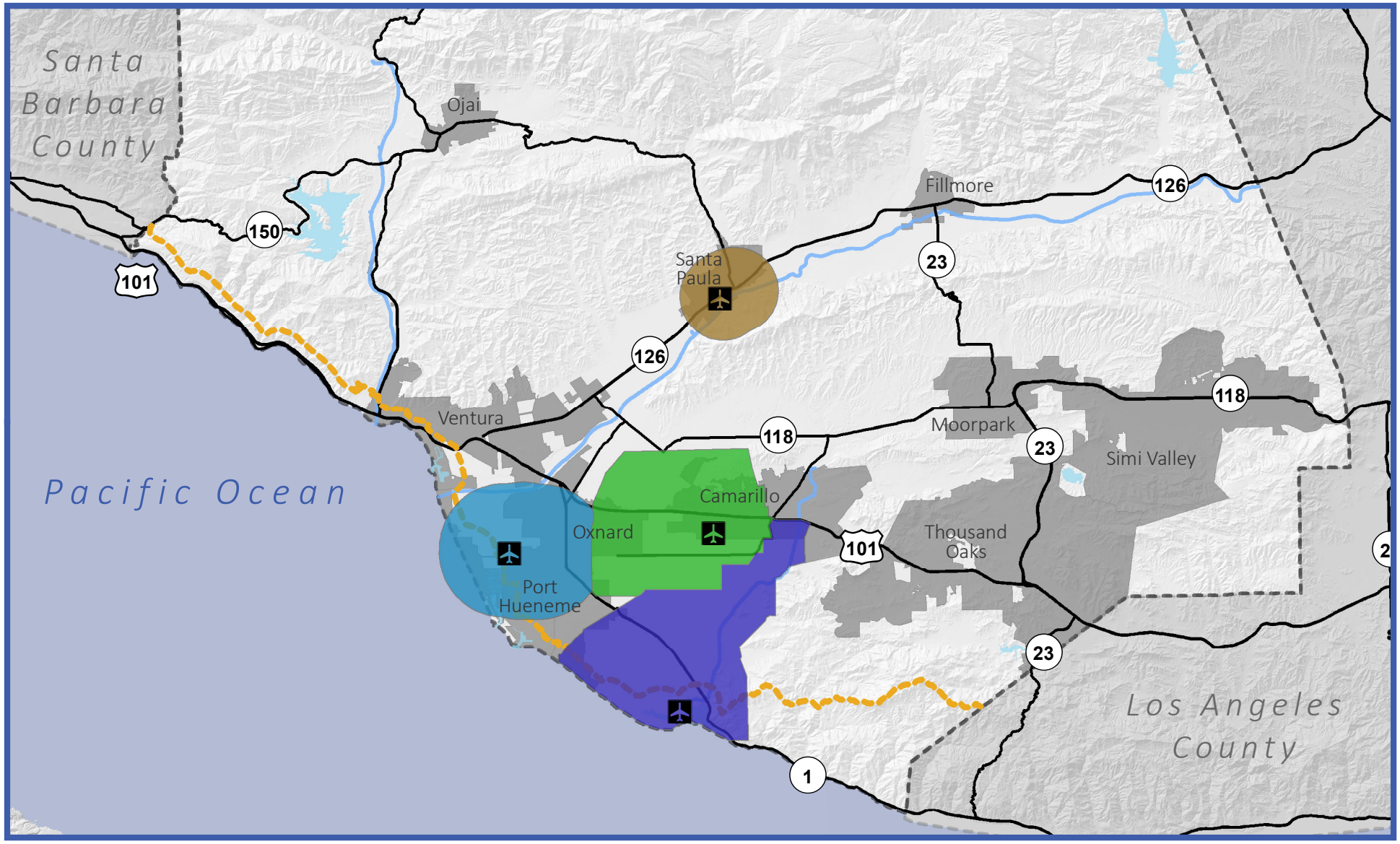
Existing Conditions

Airport Setting

There are four airports in Ventura County: the County-owned and operated airports at Camarillo and Oxnard, a private airstrip at Santa Paula that is open to the public, and the federally-operated Navy Base Ventura County Point Mugu Site, formerly the Point Mugu Naval Air Weapons Station. Figure 11-12 shows airport spheres of influence in the County. The California Air National Guard has an operation on a 204-acre site adjacent to, and utilizes the runways at, the Point Mugu Site. In addition, there are approximately 13 heliports (five associated with hospitals/medical centers), and a few privately-owned landing strips located in various parts of the county.

Airport Environs Land Use Plans

The *Airport Comprehensive Land Use Plan for Ventura County* is intended to protect and promote the safety and welfare of residents near the military and public use airports in the County, as well as airport users, while promoting the continued operation of those airports. Specifically, the plan seeks to protect the public from the adverse effects of aircraft noise, to ensure that people and facilities are not concentrated in areas susceptible to aircraft accidents, and to ensure that no structures or activities encroach upon or adversely affect the use of navigable airspace.



Ventura County 2040 GENERAL PLAN

Figure 11-12
Airport Spheres of Influence

Map Date: July 18, 2016

Source: Ventura County, 2016; California Department of Transportation, 2007; USGS, 2013.

0 5 10 Miles

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Airports

Airport Spheres of Influence

- Camarillo Airport
- Naval Base Ventura County
- Oxnard Airport
- Santa Paula Airport

- Coastal Zone Boundary
- Major Roadways
- Major Waterways
- Water Bodies
- Cities

Implementation of the Comprehensive Land Use Plan for Ventura County promotes compatible urban development and restricts incompatible development in the vicinity of the county's airports, thus allowing for the continued operation of those airports. The three areas of compatibility that are considered in the Plan include:

- Compatibility of surrounding land uses with airport noise levels;
- Compatibility of surrounding land uses with respect to the safety of persons on the ground and persons on board aircraft making controlled crash landings; and
- Protection of airspace needed for safe air navigation near airports.

The Plan applies to all four airports in the county.

Airport Facilities

Oxnard Airport

The Oxnard Airport is 223 acres. Although it is located within the Oxnard city limits, it is owned and operated by the County of Ventura. Oxnard Airport is approximately two miles east of the Pacific Ocean coastline, and is bordered on sides by roads, three of which are major arterials. This airport is situated along the coastal edge of the 200-square mile Oxnard Plain. The City of Oxnard lies equidistant between Santa Barbara to the northwest and Los Angeles to the southeast. Oxnard Airport is classified in the *National Plan of Integrated Airport Systems* (NPIAS) as a primary commercial service airport with inactive status due to not providing scheduled airline service since June 2010. There are 169 aircraft based at the airport. In 2015, there were 75,000 aircraft operations at the Oxnard Airport: 90 percent general aviation, five percent combined air taxi and commuter, and the remaining five percent helicopters.

Camarillo Airport

The Camarillo Airport, owned and operated by the County of Ventura, was formerly known as Oxnard Air Force Base. The airport consists of 654 acres and is located within Camarillo city limits, three miles southwest of the city's central business district. The airport is less than one mile south of the US-101 and seven miles west of the Pacific Ocean coastline. The City of Camarillo lies within the Oxnard Plain, approximately 45 miles northwest of Los Angeles. Camarillo Airport is classified in the *National Plan of Integrated Airport Systems (NPIAS)* as a general aviation reliever for the Los Angeles metropolitan area. Reliever airports provide an alternative to general aviation users in major metropolitan areas. There are 468 fixed-wing aircraft based at the airport. In 2015, there were 136,510 aircraft take-offs and landings at the airport: 93 percent general aviation, four percent air taxi flights, and the remaining three percent helicopters.

Santa Paula Airport

Santa Paula Airport is a privately-owned, public use airport located one mile east of the Santa Paula central business district, south of SR-126. The 24.5-acre airport is owned by the Santa Paula Airport Association, Ltd. and is operated by the owners/stockholders. Santa Paula Airport is classified in the *National Plan of Integrated Airport Systems (NPIAS)* as a general aviation airport. Currently there are several airport-related businesses located at the airport, including the Santa Paula Flight Center, which provides parts, supplies, instruction, fuel and maintenance, plus the airport café and additional aircraft-related businesses. Virtually

all of the estimated 52,400 annual aircraft operations at the airport involve general aviation aircraft. There is no tower, so hours of operation are limited to daytime only. Helicopters also operate out of this facility.

Naval Base Ventura County: Point Mugu

Naval Base Ventura County consists of three operating facilities – Point Mugu, Port Hueneme, and San Nicolas Island – and supports approximately 80 tenant commands that encompass a diverse set of specialties, including three warfare centers (Naval Air Warfare Center – Weapons Division, Naval Surface Water Center – Port Hueneme Division, and Naval Facilities Engineering and Expeditionary Warfare Center). NBVC is also home to deployable units, including the Pacific Seabees and the West Coast E-2 C Hawkeyes.

NBVC Point Mugu occupies 4,486 acres located at the western end of the agricultural lands of the Oxnard Plain, six miles southeast of Oxnard and just over seven miles southwest of Camarillo. The Ventura County and Point Mugu Game preserves (private clubs with no association to the Navy), and Ormond Beach are located to the northwest of the base. California State University Channel Islands is four miles to the northeast. The base is flanked by the Santa Monica Mountains on the east and by the Pacific Ocean to the south. The facility was originally developed during World War II as an extension of the base at Port Hueneme.

The primary mission of NBVC Point Mugu is to provide support for aircraft and test range operations at the installation and surrounding airspace. NBVC Point Mugu is home to the Naval Air Warfare Center – Weapons Division, which manages the 36,000-square mile Point Mugu Sea Range, used for research, development, acquisition, test and evaluation of weapons systems and related devices, and other associated activities. NBVC also manages several special areas, including facilities on Laguna Peak, and the off-shore islands of San Nicholas, Santa Cruz, San Miguel, and Santa Rosa. San Nicolas Island, located approximately 60 miles off the coast of Point Mugu within the Point Mugu Sea Range, serves as an instrumented maritime environment needed for test and evaluation of weapons systems and air-to-sea maneuvering and fleet operations.

NBVC Point Mugu serves a variety of based and transient aircraft. The based military aircraft fleet consists of approximately 75 aircraft. Squadrons based on NBVC Point Mugu include four E-2 Hawkeye squadrons, one test and evaluation squadron and a Reserve C-130T squadron. In 2015, the U.S. Coast Guard announced that two air crews and MH-65D Dolphin helicopters would relocate to NBVC Point Mugu to provide search and rescue operations, homeland security patrols, cargo transport, and drug interdiction operations for the greater Los Angeles region.

NBVC Point Mugu maintains an air traffic control center, which controls all aircraft in southern Ventura County. The air traffic control center provides service seven days a week. Mugu Approach Control provides flight- following service to approximately 125,000 aircraft annually.

Per the 2015 Air Installations Compatible Use Zone (AICUZ) Study, NBVC Point Mugu had 29,493 average total annual flight operations (CY 2009 - 2013). The AICUZ projects 39,500 total annual operations in CY2020. Hours of operation of the airfield are normally between 7 a.m. and 11 p.m. daily and closed on Christmas and New Year's Day. Utilization of the airfield is very low in the early morning and evening hours. Peak hours vary from day to day, depending on changing mission requirements. The least active day is Sunday.

Naval Base Ventura County Joint Land Use Study (JLUS)

The Naval Base Ventura County Joint Land Use Study (JLUS) is a joint, collaborative effort between the cities of Camarillo, Oxnard, and Port Hueneme, the County of Ventura, NBVC, and other stakeholders, to guide planning and land use decisions about development in local governments surrounding NBVC and its operational areas at NBVC Point Mugu, NBVC Port Hueneme, and NBVC San Nicolas Island. The goal of the NBVC JLUS is to protect current and future military training operations while simultaneously guiding community growth, sustaining the environmental and economic health of the region, and protecting public health, safety, and welfare.

Key to the JLUS is the Air Installations Compatible Use Zones (AICUZ) program, which is designed to protect the health, safety, and welfare of civilians and military personnel by encouraging land uses compatible with aircraft operations while protecting the public investment in the installation. The program recommends compatibility measures for both the Navy and surrounding communities, and recommends land uses that are compatible with elevated sound level, accident potential zones, and obstruction clearance criteria associated with military airfield operations.

The JLUS includes diagrams (figures) of Military Compatibility Areas (MCAs), which are used to formally designate a geographic area where military operations may impact local communities, and conversely, where local activities may affect the military's ability to conduct its mission(s). The MCAs include subzones that delineate areas of concern for bird/wildlife aircraft strike hazards, safety, noise, and airfield imaginary surfaces. The MCAs are intended to promote an orderly transition between community and military land uses so that land uses remain compatible; protect public health, safety, and welfare; maintain operational capabilities of military installations and areas; promote an awareness of the size and scope of military training areas to protect areas separate from the actual military installation (e.g., critical air space) used for training purposes; and establish compatibility requirements within the designated area, such as requirements for sound attenuation or avigation easements.

NBVC Point Mugu MCA encompasses four subzones: Bird/Wildlife Aircraft Strike Hazard (BASH), Safety, Noise, and Airfield Imaginary Surfaces.

Bird/Wildlife Aircraft Strike Hazard (BASH) Subzone

The NBVC Point Mugu MCA includes a Bird/Wildlife Aircraft Strike Hazard (BASH) Subzone. The BASH Subzone is a five-mile statutory area from the center of the runway based on Federal Aviation Administration (FAA) recommendations. The BASH Subzone is characterized as an area that could be affected by bird and wildlife strikes due to the lower altitude of flying operations in the area. The following land uses near the NBVC Point Mugu airfield that have the potential to increase BASH incidents include: duck club activities, wetlands, other habitat restorations or new establishments, levees and plantings that attract birds, and changes in land use.

NBVC Point Mugu is located adjacent to the wetlands of Mugu Lagoon, which is an attractive habitat for bird species. There are also two game preserves located immediately west of NBVC Point Mugu. While the Navy's BASH Plan provides a protocol and measurement of management when conditions are high risk for BASH incidents, it does not address or identify the immediate concern of the duck clubs or game preserves adjacent to the airfield. Conversely, the Ventura County Zoning Ordinance does not consider

military compatibility as it relates to BASH incidents, nor does it address concern of duck clubs and game reserves.

Safety Subzone

The Safety Subzone guides compatible land use types, densities, and intensities within the Clear Zones (CZs) and Accident Potential Zones (APZs) I and II of Point Mugu's runways. The purpose of a Safety Subzone is to prevent the development of incompatible land uses in area with the greatest potential for an incident. The location of each Safety Subzone is based on the airfield layout and air operations identified by the Navy.

Noise Subzone

The Noise Subzone is a concern to the public surrounding military installations with flyer missions. NBVC Point Mugu is home to a large airfield that can support many types of aircraft. The area immediately surrounding NBVC Point Mugu is mostly agriculture and open space, which is compatible with military land uses. However, the flight paths could affect population centers and noise sensitive land uses. The Noise Subzone includes all land located off-installation within the 60 dB CNEL noise contour for NBVC Point Mugu.

Imaginary Surfaces Subzone

The Imaginary Surfaces Subzone provides guidance on the height of structures and buildings within the imaginary surfaces areas defined by the FAA and Navy. Imaginary surfaces are 3-D geographic areas comprising approach and departure airspace corridors and safety buffers. The height of structures and buildings are a major concern for flight operations because of the potential for a structure to extend into navigable airspace. Structures of concern include cell towers, power lines, wind turbines, buildings, and trees.

Channel Islands Air National Guard Base

The California Air National Guard 146 Tactical Airlift Wing officially dedicated a 208-acre installation in September of 1990. This property is north of NBVC, at the intersection of Hueneme and Naval Air Roads. This Wing began relocating their C-130 aircraft to this site from Van Nuys Airport in 1989. The Wing uses the NBVC Point Mugu runway and its 2,500-foot taxiway.

The mission of this unit is training for other assigned units once a month with various two-week active duty obligations. This results in over 1,500 personnel during training activities on the base. The Wing operates under the Air Force Mobility Command (AMC). Normal activities average 30 take offs and landings per day between 8 a.m. and 10 p.m. Monday through Friday, with an additional five return flights on weekends. Flight activity increases when the unit performs Fire Support Missions in conjunction with the U.S. Forest Service or the California Department of Forestry.

Aircraft Incidents

The most critical stages of the flight of an aircraft are takeoff and landing where accidents occur more frequently than at other flight stages. This places property in airport approach and departure zones at a higher risk. Hazard zones have been established for the four airports in Ventura County, based on landing

and takeoff patterns, with clear zones (areas that lie immediately beyond the ends of a runway) extending beyond the runway as recommended by the Federal Aviation Administration (FAA).

Oxnard and Camarillo airports had a combined total of over 220,000 annual flights in 2015. With an additional 29,493 average annual aircraft flights at Naval Base Ventura County, Point Mugu, and an estimated 70,000 at Santa Paula Airport, the airspace in this area can be heavily congested. According to Federal Aviation Administration and National Transportation Safety Board databases, since 2010 there have been 12 reported accidents at Camarillo (and one fatality), one accident at Oxnard (one fatality), three accidents at Point Mugu (two fatalities), and seven accidents at Santa Paula (four fatalities). There have been 25 reported incidents at Camarillo (four resulting in substantial aircraft damage, and the rest minor damage), three incidents at Oxnard (all resulting in minor damage), three incidents at Point Mugu (one resulting in substantial aircraft damage, the rest minor damage), and two incidents at Santa Paula (one resulting in substantial aircraft damage, the other minor damage). Only eight near mid-air collisions were reported, all at Camarillo. Air Traffic Control Tower at Camarillo is staffed by FAA personnel and the Tower at Oxnard airport is a Federal Contract Tower. The Towers provide control for aircraft in their respective areas from 7 a.m. to 9 p.m. The tower at Point Mugu is staffed by Navy personnel and is active from 7 a.m. to 10 p.m.

Damage from aircraft accidents varies depending on the weight, speed, and fuel load of the aircraft, as well as the actual land uses (i.e., structures) in the area. The risk to lives would tend to increase with greater density in use (e.g., a school versus a single-family house).

Other effects of aircraft operations include resident concerns over potential aircraft accidents, and aircraft noise.

Regulatory Setting

Federal

FAR 77

Title 14, Regulation 49 of the Code of Federal Regulations (CFR) includes Federal Aviation Regulation, Part 77 (FAR 77). FAR 77 establishes evaluation standards and notification requirements for objects affecting navigable airspace. This includes new construction as well as alterations to existing developments in the vicinity of airports. FAR 77 allows the FAA to identify potential aeronautical hazards in advance, thus preventing or minimizing possible adverse impacts to the safe and efficient use of navigable airspace. The regulation also requires evaluation and determination about potential hazardous effects of proposed construction or alterations, identifies mitigating measures to enhance safe air navigation, and charts new potentially hazardous objects. FAR 77 establishes a series of "Imaginary Surfaces", or horizontal and vertical planes, around airports in order to provide the dimensions within which objects are considered hazardous to airport operating procedures and/or air navigation. These surfaces cover every angle of approach and departure and are based on the specific dimensions, runway types, and operations of a given airport.

State

California Public Utilities Code

The State of California Public Utilities Code (PUC), Sections 21670 et seq., requires the County Board of Supervisors to establish an Airport Land Use Commission (ALUC) in each county with an airport operated for the benefit of the general public. The PUC also sets forth the range of responsibilities, duties, and powers of the Commission. Instead of creating a new body to serve as the ALUC, State law allows the county board of supervisors to authorize an appropriately designated body to fulfill ALUC responsibilities (See Section 21670.1). In Ventura County, the Board of Supervisors has designated the Ventura County Transportation Commission (VCTC) to act as the ALUC for the County. PUC Section 21675 requires the Airport Land Use Commission to formulate a comprehensive land use plan for the area surrounding each public use airport in the County. The Commission is also tasked with formulating a plan for the area surrounding each federal military airport located in the County. Section 21675 specifies that comprehensive land use plans shall provide for the orderly growth of each airport and the area surrounding the airport, and safeguard the welfare of the inhabitants within the vicinity of the airport and the public in general. Section 21676 requires that local general plans conform with the ALUC's comprehensive airport land use plan and grants the ALUC authority to review amendments to general plans, specific plans and zoning ordinances and building regulations that apply within the airport planning boundary.

Senate Bill 1462

Senate Bill 1462 (Chapter 906, Statutes of 2004) expanded the requirements for local governments to notify military installations of proposed development and planning activities. This statute states that "prior to action by a legislative body to adopt or substantially amend a general plan, the planning agency shall refer the proposed action to the branches of the Armed Forces when the proposed project is located within 1,000 feet of a military installation, beneath a low-level flight path, or within Special Use Airspace (SUA)...."

Senate Bill 1468

Senate Bill 1468 (Chapter 971, Statutes of 2002) requires State Office of Planning and Research (OPR) to include guidance concerning incorporating military installation compatibility into a general plan, and how a general plan should consider the impact of civilian growth on readiness activities at military bases, installations, and training areas.

California Aviation System Plan-Policy Element

The California Aviation System Plan (CASP) Policy Element (PE) is the basis for implementing the State Aeronautics Act and identifying the Division of Aeronautics (Division) role in the California Department of Transportation (Caltrans) mission, vision, and values for a multimodal, interregional, transportation system. The PE is updated on approximately a five-year cycle with the last update published in October 2011.

LOCAL

Ventura County Airport Land Use Commission Airport Comprehensive Land Use Plan

Adopted in July 2000, The Airport Comprehensive Land Use Plan (ACLUP) for Ventura County is intended to protect and promote the safety and welfare of residents near the military and public use airports in the County, as well as airport users, while promoting the continued operation of those airports. Specifically, the plan seeks to protect the public from the adverse effects of aircraft noise, to ensure that people and facilities are not concentrated in areas susceptible to aircraft accidents and to ensure that no structures or activities encroach upon or adversely affect the use of navigable airspace.

The ACLUP for NBVC Point Mugu is based on a 1992 AICUZ Study and is due to be updated to reflect the 2015 AICUZ Study. The 2015 AICUZ Study contains updated compatibility analyses and updated noise contour analysis.

2005 Ventura County General Plan

The General Plan covers aviation hazards in Chapter 2, Hazards. Section 2.14 includes goals, policies, and programs related to aviation hazards.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for aviation hazards. These can be found in Section 19. Aviation Hazards.

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SECTION 11.5 HAZARDOUS MATERIALS

Introduction

This section addresses hazardous materials, which includes any material that, because of its quantity, concentration, physical or chemical characteristics poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material that the administering agency determines to be potentially injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. This section summarizes hazardous materials and hazardous waste programs that exist in Ventura County, the types of materials that are managed, and briefly discusses current hazardous waste cleanup efforts within the county.

Major Findings

- There are over 2,600 facilities within Ventura County that store and use hazardous materials, maintain above-ground and under-ground hazardous substance storage tanks, and generate hazardous wastes. The majority of hazardous waste generated in the county is comprised of used oil, waste solvents and waste batteries.
- As of November 2016, there were 300 Hazardous Materials sites located in the unincorporated area of Ventura County, of these sites:
    - 27 were permitted underground storage tanks.
    - 273 have undergone or are undergoing hazardous materials remediation or may require remediation pending further testing. Of these, 162 have been designated as "Completed-Case Closed" including:
        - 22 Cleanup Program Sites,
        - 10 Landfill Disposal Sites,
        - 130 leaking underground fuel storage tank (LUST) sites,
    - One LUST site is designated “Open--Site Assessment,”

Existing Conditions

General Hazardous Materials Framework

A material is considered hazardous if it appears on a list of hazardous materials prepared by a federal, state, or local agency, or if it has characteristics defined as hazardous by such an agency. A hazardous material is defined in CA HSC Section 25501 as: any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material that meets the definition according to the handler or the administering agency. Chemical and

physical properties of a substance are directly related to the degree of hazard it poses, including properties of toxicity, ignitability, corrosiveness, and reactivity.

These materials can pose a substantial present or future hazard to human health or the environment if improperly handled, stored, disposed, remediated, or otherwise managed. If improperly handled, hazardous materials can result in public health hazards through direct human contact with contaminated soils or groundwater, or through airborne releases in vapors, fumes, or dust. There is also the potential for accidental or unauthorized releases of hazardous materials that would pose a public health concern (e.g., drinking water contamination). The health effects of hazardous materials exposure are influenced by the dose to which a person is exposed, the frequency of exposure, the exposure pathway, and individual susceptibility.

Hazardous material releases can result in both short- and long-term effects on the local population and environment. Hazardous materials are governed by regulations that require proper storage and handling, business and environmental management plans, spill contingency plans, employee and public noticing, and other emergency preventive and response measures to minimize the risk of accidental releases and related environmental impacts. Chemicals and other materials found in soils of agricultural land or industrial sites as a result of current or past activity may also be of concern. When development on such sites is considered, potentially hazardous materials are identified and evaluated through a Phase I and/or Phase II environmental site assessment review conducted by the developer.

Hazardous Materials/Waste Generation and Management

Hazardous materials and hazardous waste is generated by a diverse range of industries in the county including agriculture, aerospace, on-shore and off-shore petroleum exploration, biotech, military, automotive services, public utilities, and various manufacturing and service industries. There are over 2,600 facilities within Ventura County that store and use hazardous materials, maintain above-ground and under-ground hazardous substance storage tanks, and generate hazardous wastes. The majority of hazardous waste generated in the county is comprised of used oil, waste solvents and waste batteries. (J. Wada; VC CUPA)

In addition to hazardous materials stored/handled at many facilities within the county, the county is intersected by numerous major transportation routes for highway, rail, ocean, pipeline, and aircraft travel that all carry hazardous substances. The release of hazardous materials is considered a significant environmental and public health threat. Therefore, substantial resources have been dedicated by a variety of agencies to create effective management programs.

Certified Unified Program Agency – CUPA

Part of the Ventura County Environmental Health Division (EHD) is the Ventura County Certified Unified Program Agency, (CUPA). The CUPA implements state and federal laws, regulations, county codes and local policies related to hazardous materials management. The Ventura County CUPA provides regulatory oversight for the following six statewide environmental programs:

- **Hazardous Waste:** The purpose of the hazardous waste program is to ensure that hazardous wastes are properly managed to protect public health and the environment. Waste is generally considered hazardous if it is ignitable, corrosive, toxic, reactive, or if it can be shown to be detrimental to human health or the environment. The EHD conducts routine inspections of

facilities that generate hazardous waste to verify compliance with State hazardous waste laws and regulations contained in the California Health and Safety Code, Chapter 6.5 and the California Code of Regulations, Title 22, Division 4.5. Ventura County facilities that generate hazardous waste, except those in the city of Oxnard, are required to obtain a hazardous waste producer's permit from EHD.

- **Hazardous Materials Business Plan:** A Hazardous Materials Business Plan (HMBP) provides the CUPA, local fire agencies, and the public with information regarding hazardous materials stored/handled at businesses and government facilities. The law requires facilities that store, use, or handle hazardous materials at or above specified threshold amounts to provide the CUPA with a HMBP. The CUPA has developed a Hazardous Materials Reporting Chart that explains the inventory reporting requirements and conditional exemptions in the California Health & Safety Code (HSC), Chapter 6.95, Article 1. The CUPA provides HMBP data to the local fire agencies. These agencies use the information during hazardous materials emergency responses. The CUPA is responsible for HMBP program compliance for the unincorporated area in Ventura County and within the cities of Simi Valley, Thousand Oaks, Moorpark, Fillmore, Santa Paula, Camarillo, Port Hueneme, and Ojai. However, within the cities of Oxnard and Ventura, the city fire departments are responsible for HMBP program compliance.

  The CUPA conducts routine HMBP inspections to ensure compliance, provide guidance on preventing or minimizing the risk of hazardous materials spills or releases, and to verify hazardous materials inventories, Emergency Response Plans, site maps, and training. The law requires that the HMBP, records of employee training, and updated site maps be available for review as part of the inspection process.

- **California Accidental Release Prevention Program (CalARP):** The objective of the CalARP program is to identify the risks associated with the use of extremely hazardous materials and to reduce the chances and negative effects to the public of an extremely hazardous materials release. To accomplish this, a facility must develop and maintain risk management plans and programs contained in the California Code of Regulations, Title 19, Chapter 4.5. Facilities subject to CalARP are inspected and evaluated to determine the completeness and effectiveness of risk management plans and programs. The CUPA regulates facilities subject to CalARP within Ventura County, with the exception of the cities of Oxnard and Ventura.

- **Underground Hazardous Materials Storage Tanks:** EHD regulates the construction, operation, repair and removals of underground storage tank (UST) systems within Ventura County, with the exception of the cities of Oxnard and Ventura. The goal of the UST Program is to protect public health, the environment and groundwater. To accomplish this goal, EHD ensures that facilities with UST operations are properly permitted and meet applicable monitoring requirements. This is accomplished during plan check and inspection activities. Each UST site is inspected annually to determine if the UST facility is in compliance with all applicable sections of the California Health and Safety Code Chapter 6.7 and California Code of Regulations Title 23.

- **Aboveground Petroleum Storage Tanks:** The CUPA regulates facilities subject to the Aboveground Petroleum Storage Act (APSA) within Ventura County with the exception of the cities of Oxnard and Ventura. In general, facilities storing at least 1,320 gallons of petroleum products in aboveground storage tanks/containers are subject to APSA requirements per California Health and Safety Code, Chapter 6.67. APSA requires the facility to maintain a Spill Prevention, Control, and Countermeasure (SPCC) Plan. This plan includes information on: the stored petroleum products, how the tanks/containers will be maintained and inspected, spill prevention measures, and spill response procedures. Such facilities are also required to annually submit a

Tank Facility Statement or Hazardous Materials Business Plan (HMBP). The program allows for certain types of facilities, such as farms, nurseries and construction sites, to qualify as "conditionally exempt" from certain APSA requirements. CUPA is required to establish a fee in order to administer the inspection and enforcement of APSA and to collect a surcharge for Office of the State Fire Marshall for oversight of the program.

- **Onsite Hazardous Waste Treatment/Tiered Permit:** In most cases, businesses in the county that treat hazardous waste onsite (except those in the City of Oxnard), are required to notify the CUPA of the treatment activity and comply with state laws and regulations pertaining to onsite hazardous waste treatment. Treatment is any process designed to change the physical, chemical or biological characteristic or composition of the hazardous waste. Depending on the treatment process and type and amount of hazardous waste treated, the treatment activity may be allowed under one of three treatment tiers managed by the CUPA.

In addition to these programs, the CUPA is involved with hazardous materials emergency response, investigation of illegal disposal of hazardous waste, and public complaints.

Other County Agencies Involved in Hazardous Materials Management

The Ventura County Fire Protection District is responsible in conjunction with an Automatic Aid Agreement to provide hazardous materials response capability to the cities and unincorporated areas of the county. The FPD also participates on a variety of committees that focus on pre-planning, preparation, and grant coordination for terrorism events and hazardous materials response.

The Sheriff, as Director of the Office of Emergency Services (OES), is responsible for population protection activities. The Sheriff's OES, a non-sworn component of the Sheriff's Department, carries out the functions of emergency management, planning and exercise development for response and recovery activities related to hazardous materials and other natural and man-made disasters.

The county's Public Health Officer enforces and observes all of the following in the unincorporated area of the county: (a) orders and ordinances of the Board of Supervisors pertaining to public health and sanitary matters; (b) orders including quarantine and other regulations prescribed by the department; and (c) statutes related to public health. The Public Health Officer may take any preventive measure that may be necessary to protect and preserve the public health from any public health hazard during any "state of war emergency," "state of emergency," or "local emergency," as defined by Section 8558 of the Government Code, within his or her jurisdiction. "Preventive measure" means abatement, correction, removal or any other protective step that may be taken against any public health hazard that is caused by a disaster and affects the public health.

Household Hazardous Waste Management

Residential households generate hazardous wastes that must be property disposed. These wastes may include latex paint, batteries, electronic waste, fluorescent lights, solvents, cleaners, oils, pool chemicals, and medications. The Ventura County Integrated Waste Management Division administers the Household Hazardous Waste (HHW) collection program and the operation of the Pollution Prevention Center, a permanent HHW collection facility which specifically serves residents of the unincorporated area and from the cities of Ojai, Santa Paula, and Fillmore. The County maintains information on permitted household hazardous waste facilities for residents to find out where to drop off various types of household hazardous waste. The County of Ventura holds monthly household hazardous waste collection

events at the County's Pollution Prevention Center. Most municipal jurisdictions within the county also offer similar monthly collection events.

Tracking Hazardous Materials Sites in Ventura County

Information on hazardous materials and contaminated properties is maintained by both the State of California and the County of Ventura. This section explains the agencies and programs responsible for managing this information and explains the presence of hazardous materials and sites in Ventura County.

The California Environmental Protection Agency (CalEPA) maintains the State of California Hazardous Waste and Substances List (also known as the "Cortese List"). Government Code Section 65962.5 requires CalEPA to annually update the Cortese List. The Department of Toxic Substances Control (DTSC) is responsible for providing a portion of the Cortese List information, while other State and local agencies provide the remaining information. The EnviroStor database, managed by DTSC, lists Brownfield sites (a US EPA program for contaminated properties), sites undergoing hazardous materials mitigation, sites with known contamination that may require further investigation, Federal Superfund sites, State response sites, voluntary cleanup sites, and school cleanup sites.

The California Water Resources Control Board and the State's Regional Water Quality Control Boards maintain "GeoTracker," which is a data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater. GeoTracker contains records for sites that require cleanup, such as Leaking Underground Storage Tank (LUST) Sites, Department of Defense Sites, and Cleanup Program Sites. GeoTracker also contains records for permitted facilities such as Irrigated Lands, Oil and Gas production, operating Permitted USTs, and Land Disposal Sites. GeoTracker portals retrieve and compile records from multiple State Water Board programs and other agencies.

Effective on January 1, 2013, all businesses that submit facility information such as hazardous materials business plans, underground storage tank, and hazardous waste generator forms and related documents, will be required to use the internet to submit this information to their local agency electronically through an electronic information management system known as the California Environmental Reporting System (CERS). CERS will benefit regulated facilities by simplifying the document submittal process, including new information submittals and updating existing information to the CUPA. CERS will allow response agencies quick access to current data during emergency response activities.

According to State-maintained data (i.e., EnviroStor and GeoTracker), as of November 2016, there were 295 Hazardous Materials sites listed in the unincorporated area of Ventura County, 22 of which were permitted underground storage tanks (while the State reported 22 sites, the county was monitoring 27 sites, therefore for purposes of this Background Report, the County is reporting a total of 300 Hazardous Materials sites and 27 permitted underground storage tanks sites), of these sites:

- 273 have undergone or are undergoing hazardous materials remediation or may require remediation pending further testing. Of these, 162 have been designated as "Completed-Case Closed" including:
    - 22 Cleanup Program Sites,
    - 10 Landfill Disposal Sites,
    - 130 leaking underground fuel storage tank (LUST) sites,
- One LUST site is designated "Open--Site Assessment."

Following is a summary of the geographic distribution of sites within the unincorporated county:

- Newbury Park: 71 sites (47 closed or permitted);
- Somis: 47 sites (23 closed or permitted);
- Saticoy: 22 sites (20 closed or permitted),
- Oak View: 19 sites (18 closed or permitted),
- Piru: 19 sites (10 closed or permitted),
- Other Unincorporated Areas : 117 sites (66 closed or permitted)

Updated information on State-maintained data is available through DTSC's EnviroStor at http://www.envirostor.dtsc.ca.gov/public/ and the Water Boards' GeoTracker at http://geotracker.waterboards.ca.gov/.

Through the CUPA, the County maintains records on particular types of sites that are more up-to-date than those maintained by the State. For instance, as of November 2016, the county was monitoring 27 permitted underground storage tanks in the unincorporated area (as opposed to the 22 reported by the State). A full list of Ventura County CUPA facilities and programs, including USTs, can be found at: http://www.vcrma.org/envhealth/EHD_FACILITY_LISTS/cupa_facilities.pdf.

Ongoing Hazardous Waste Cleanup Sites in Ventura County

Halaco Superfund Site

The Halaco site is located in Oxnard at 6200 Perkins Road. The Halaco Engineering Company operated a secondary metal smelter at the site from 1965 to 2004, recovering aluminum, magnesium, and zinc from dross, castings, cans, car parts, and other scrap metal. The Site includes an 11-acre area containing the former smelter, and an adjacent 26-acre waste management area where wastes were deposited. The site includes a portion of the Ormond Beach wetlands, one of the few remaining wetlands in the area and home to several endangered or threatened species.

During its 40 years of operation, Halaco produced a large quantity of waste (i.e., slag) containing residual metals from the smelting process. From about 1965 to 1970, Halaco discharged waste into unlined settling ponds in or adjacent to the Oxnard Industrial Drain. From about 1970 to 2002, Halaco deposited wastes into unlined earthen settling ponds east of the smelter. More than 700,000 cubic yards of waste remain on-site. The U.S. Environmental Protection Agency took over site clean-up activities in 2007 and is currently conducting a Feasibility Study that will analyze options for site cleanup and reuse.

Santa Susana Field Lab (SSFL)

The SSFL site is comprised of 2,850 acres located in rocky terrain above Simi Valley. The facility opened in 1948 and began as a research, development, and testing location for rocket engines. During its history, the site has been managed by North American Aviation, Rocketdyne, Rockwell, and Boeing, in cooperation with the U.S. Army and Air Force. NASA acquired a portion of the site from the Air Force in 1973 and still manages 451.2 acres within the SSFL site today. The Boeing Company manages the remaining 2,398.8 acres. All operations at SSFL ceased in 2006.

For several decades, state and federal agencies have conducted environmental analysis to determine the extent of potential contamination on site. Studies have been conducted on soils, groundwater, and surface water. In addition, certain facilities on site, including the rocket test stands and other related ancillary structures have been found to have historical significance based on the historic importance of the engine testing and the engineering and design of the structures. The NASA-administered areas of SSFL also contain cultural resources not related to rocket development. SSFL is located near the crest of the Simi Hills that are part of the Santa Monica Mountains running east-west across Southern California. The diverse terrain consists of ridges, canyons, and sandstone rock outcrops.

A clean-up plan addressing soil and water contamination has been developed for the site by state and federal regulators, as well as by Boeing and NASA. Remediation activities are ongoing.

USA Petrochem

The USA Petroleum/Petrochem site is located at 4777 Crooked Palm Road in the unincorporated area of Ventura County, approximately 100 feet from the Ventura River. The refinery was built in the late 1970s, operated for less than 10 years, and shut down in 1984. The site contained a number of very large above ground storage tanks, many of which had oily sludge left from when the refinery closed. Since site closure, a number of leaks were observed from the piping throughout the facility. There was also a large amount of asbestos on the pipes and process units.

Since August 2012, at the request of EHD, the U.S. EPA assumed oversight of cleanup operations at the site. Cleanup activities are ongoing and include, but are not limited to removal of contaminated soil and structures, spill cleanup, and removal of all remaining fuel, sludge, and refining chemicals. The property owner has already located and closed off all outfalls and drainages from the site to the Ventura River.

Talley Facility – Telair International (TFX Aviation site)

The Talley Facility is located at 3085 Old Conejo Road, in Newbury Park. The Facility originally was built in the early 1950s on approximately 12.85 acres of property. The Facility was used by Talley Corporation for manufacturing civilian and military aircraft components from approximately 1956 to 1989. Seven buildings were located on the Facility supporting various manufacturing processes including metal casting, degreasing, pickling, and plating. During the manufacturing process, the Facility generated hazardous wastes, which included the following hazardous constituents: hexavalent chromium (Cr+6), other metals, cyanide, Trichloroethylene (TCE), miscellaneous chlorinated solvents, and waste oils, some of which contained low concentrations of polychlorinated biphenyls (PCBs). On-site waste disposal practices included the use of a surface impoundment and a leachfield.

In 1983 it was discovered that the surface impoundment had leaked. Subsequent investigations revealed that soil and groundwater were contaminated with solvents and heavy metals (mainly TCE and Cr+6). In 1984 the Facility submitted a closure plan to Department of Toxic Substances Control (DTSC) for the surface impoundment. The impoundment was closed in 1984 and a total of 3,200 cubic yards of contaminated soil were later removed. An engineered cap was then installed over the impoundment area.

A final post-closure permit was issued by DTSC on November 24, 1992 which addressed water quality monitoring of the former surface impoundment, closure of the solid waste management units, and post-closure care of the former surface impoundment. Operation of the groundwater treatment plan was subsequently taken out of the final post-closure permit and covered by DTSC's Permit by Rule process. The groundwater treatment plant was authorized by Ventura County under Permit by Rule and is not part

of this permit. The Post-Closure Permit was renewed/ reissued in October 7, 2005, with an expiration date of October 7, 2015.

Corrective action at the Facility has been conducted pursuant to the requirements of the Administrative Order on Consent issued by U.S. EPA in 1988 and the Post-Closure Permit issued by DTSC in 1992. In 1993, U.S. EPA selected extraction and treatment as the remedy for groundwater contamination. The remediation is currently ongoing, treating about 2.5 million gallons of groundwater a month and involving a total of 40 wells used for extraction and monitoring. Continuation of the pumping and treating of the groundwater is necessary to eliminate further migration and prevent future exposure. The groundwater remedy is ongoing and is expected to continue throughout the period of this permit.

Commonly Found Hazardous Materials

Commonly found hazardous materials can occur in structural building components, particularly in older buildings, which sometimes contain hazardous materials such as asbestos, polychlorinated biphenyls (PCBs), lead, and mercury. Businesses that store, use, or handle hazardous materials at or above specified threshold amounts are required to prepare a Hazardous Materials Business Plan and submit it to the County's Certified Unified Program Agency (CUPA). Also, households can generate hazardous materials, and the County of Ventura holds monthly events for the collection of household hazardous waste on an appointment basis at the Pollution Prevention Center.

Structural Building Components

Asbestos. "Asbestos" is a general name for a group of naturally occurring minerals composed of small fibers. Structures built or remodeled between 1930 and 1981 could contain asbestos-containing building materials (ACBM), such as floor coverings, drywall joint compounds, acoustic ceiling tiles, piping insulation, electrical insulation, and fireproofing materials. The presence of ACBM in a building does not mean that the building is itself a health hazard; as long as ACBM remains in good condition and are not disturbed or damaged, exposure is unlikely. Exposure is most likely to result during demolition. Many buildings in Ventura County were constructed prior to 1981 and, therefore, have the potential to contain ACBM.

Regulations formulated by the Ventura County Air Pollution Control District (VCAPCD) and California Division of Occupational Safety and Health (CalOSHA) restrict asbestos emissions from building demolition and renovation activities, and specify safe work practices to minimize release of asbestos fibers. These regulations prohibit emissions of asbestos from asbestos-related manufacturing, demolition, and construction activities; require medical examinations and monitoring of employees engaged in activities that could disturb asbestos; specify precautions and safe work practices that must be followed to minimize the potential for release of asbestos; and require notice to Federal and local government agencies prior to beginning building demolition or renovation activity that could disturb asbestos. CalOSHA and the U.S. EPA define any material with one percent or more asbestos by weight as an ACBM.

PCBs. The manufacture and import of polychlorinated biphenyls (PCBs) have been banned in the U.S. since 1978. Sources of PCBs often include fluorescent light ballasts, electric transformers, and televisions, all of which are presumed to be present in Ventura County. Such items are regulated as hazardous waste and must be transported and disposed of accordingly. DTSC classifies PCBs as hazardous waste when concentrations exceed 5 parts per million (ppm) in liquids or 50 ppm in non-liquids.

Lead. Lead is a highly toxic metal that was used in products found in and around residences. Lead exposure from paint is possible when paint peels or is removed, and the lead can contaminate dust and soil. Construction workers can be exposed to airborne lead during demolition, renovation, or maintenance work. Although lead-based paints were banned from production in the 1970s, many buildings in Ventura County were constructed prior to that and may still contain lead. In addition to residences, areas along older, major roadways may contain aerially deposited lead (ADL), which could have been deposited from vehicle exhaust prior to 1996 when the sale of lead-based gasoline was banned.

CalOSHA standards establish a maximum safe exposure level for types of construction work where lead exposure may occur, including demolition of structures where materials containing lead are present; removal or encapsulation of materials containing lead; and new construction, alteration, repair, or renovation of structures with materials containing lead. Inspection, testing, and removal of lead-containing building materials must be performed by State-certified contractors who comply with applicable health and safety and hazardous materials regulations.

Mercury. Mercury is another toxic metal considered hazardous. It can be found in fluorescent light tubes and bulbs, thermostats, and other electrical equipment. If these items are disposed of in landfills mercury could leach into the soil or groundwater. The mercury typically found in lighting tubes has been known to exceed regulatory thresholds and therefore must be managed in accordance with hazardous waste regulations. Mercury can also be present in traps in the plumbing of older buildings, where mercury-containing equipment has been used. Any items that contain mercury must be disposed of according to applicable hazardous waste regulations.

Business Hazardous Waste

Businesses are required to safely dispose of hazardous waste. Illegal disposal of hazardous waste, such as dumping in the trash, down storm drains, or abandoning it in alleyways, can result in serious legal ramifications for business owners such as fines and/or jail time. Legal disposal for businesses can become complicated, time-consuming, and expensive, since businesses are required to pay for disposal, and business owners will often hire a contractor to dispose of the waste. Ventura County offers several options for certain businesses that make disposal of hazardous waste easier and/or less expensive.

Household Hazardous Waste

Residential households are another source of hazardous materials. The Ventura County Integrated Waste Management Division administers the Household Hazardous Waste (HHW) collection program and the operation of the Pollution Prevention Center, a permanent HHW collection facility which specifically serves residents of the unincorporated area and from the cities of Ojai, Santa Paula, and Fillmore. The County maintains information on permitted household hazardous waste facilities for residents to find out where to drop off various types of household hazardous waste. These wastes may include latex paint, batteries, electronic waste, fluorescent lights, solvents, cleaners, oils, pool chemicals, medications, and more, depending on the location. The County of Ventura holds monthly household hazardous waste collection events at the County's Pollution Prevention Center. Most municipal jurisdictions within the County also offer similar monthly collection events.

Regulatory Setting

This section describes the Federal, State, and local regulatory setting related to existing and potential hazardous materials.

Federal

Federal agencies that regulate hazardous materials include the U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), the United States Department of Transportation (DOT), and the National Institutes of Health (NIH). The following Federal laws and guidelines govern hazardous materials storage, handling, and remediation in Ventura County:

- Occupational Safety and Health Act
- Federal Insecticide, Fungicide, and Rodenticide Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Guidelines for Carcinogens and Biohazards
- Superfund Amendments and Reauthorization Act Title III
- Resource Conservation and Recovery Act
- Toxic Substances Control Act

U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and local government responsibility for issuing permits, and monitoring and enforcing compliance. EPA Region IX has authority over the Ventura County region, regulating chemical and hazardous materials use, storage, treatment, handling, transport, and disposal practices; protects workers and the community (along with CalOSHA, see below); and integrates the federal Clean Water Act and Clean Air Act into California legislation.

Federal Occupational Safety and Health Administration

The Federal Occupational Health and Safety Administration (OSHA) establishes and enforces Federal regulations related to health and safety of workers exposed to toxic and hazardous materials. In addition, OSHA sets health and safety guidelines for construction activities and manufacturing facility operations.

State

California passed the Hazardous Waste Control Act (HWCA) in 1972, which created the California Hazardous Waste Control Program. The program surveyed existing hazardous waste generation to determine the need for new or expanded facilities for meeting future waste management demands. The facility permitting program, designed to protect public health and the environment through the issuance of operating permits for facilities that treat, store, or dispose of hazardous wastes, provided a mechanism for in-depth inspections and a permit review of each hazardous waste facility at least every ten years.

California Environmental Protection Agency

In 1991, the California Environmental Protection Agency (CalEPA) was established to oversee and coordinate the activities of the Air Resources Board, Integrated Waste Management Board (succeeded by the Department of Resources Recycling and Recovery), Department of Pesticide Regulation, Department

of Toxic Substances Control, Office of Environmental Health Hazard Assessment, and State Water Resources Control Board.

Certified Unified Program Agency Program

In 1992, Senate Bill 1082 created the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program), to ensure consistency throughout the state regarding hazardous waste and materials standards. Cal EPA oversees the entire Unified Program and certifies local government agencies, known as Certified Unified Program Agencies (CUPA), to implement the program standards.

A local agency, such as a county or city, applies to Cal/EPA for certification as the Unified Program Agency, responsible for implementing the Unified Program within its jurisdiction. A Certified Unified Program Agency must establish a program that consolidates, coordinates and makes consistent the administrative requirements, permits, inspection activities, enforcement activities, and hazardous waste and hazardous materials fees. The implementation of the Unified Program must not result in more fragmentation between jurisdictions than existed before the Unified Program, and the Unified Program must be consistent throughout the entire county.

The Unified Program is implemented at the local level, but the program is certified by the Secretary of California Environmental Protection Agency (CalEPA). The Governor's Office of Emergency Services, Department of Toxic Substances Control, Office of the State Fire Marshal, and State Water Resources Control Board are also involved with the Unified Program.

California Governor's Office of Emergency Services

The California Governor's Office of Emergency Services (OES) supports and enhances emergency management, including preparedness, response, recovery, and mitigation needs, and assists local and tribal governments with hazard mitigation planning. The OES also develops the State Hazard Mitigation Plan, and respond to and aids in the recovery from emergencies within the State. In addition, the OES is responsible for providing technical assistance and evaluation of the Hazardous Material Release Response Plan (Business Plan) and the Area Plan Programs.

California Department of Toxic Substances Control

The California Department of Toxic Substances Control (DTSC) regulates hazardous substances and wastes, oversees remedial investigations, protects drinking water from toxic contamination, and warns public exposed to listed carcinogens. DTSC also provides technical assistance and evaluation for the hazardous waste generator program including onsite treatment (tiered permitting).

CAL FIRE- Office of the State Fire Marshal (CAL FIRE-OSFM)

The Office of the State Fire Marshal (OSFM) is responsible for ensuring the implementation of the Hazardous Material Management Plan (HMMP) and Hazardous Materials Inventory Statement (HMIS) and the Aboveground Petroleum Storage Act (APSA) Programs. The HMMP and HMIS Program is closely tied to the Business Plan Program. In addition, Cal FIRE-OSFM also handle the oversight and enforcement for the aboveground storage tank program. The OSFM is also responsible for ensuring the implementation of the California Fire Code HMMP/HMIS and the APSA program elements.

California Highway Patrol/ California Department of Transportation

The California Highway Patrol (CHP) and California Department of Transportation (Caltrans) have primary regulatory responsibility for the transportation of hazardous wastes and materials.

California Occupational Safety and Health Administration

The California Occupational Safety and Health Administration (CalOSHA) is responsible for promulgating and enforcing State health and safety standards, and implementing Federal OSHA laws. CalOSHA has authority to set and enforce standards to minimize the potential for release of asbestos and lead during construction and demolition activities.

State Water Resources Control Board/Regional Water Quality Control Board

The State Water Resources Control Board provides technical assistance and evaluation for the underground storage tank program. The Los Angeles Regional Water Quality Control Board (RWQCB) is one of nine regional boards in the state charged with protecting surface and groundwater quality from pollutants discharged or threatened to be discharged to the Waters of the State. The RWQCB issues and enforces National Pollutant Discharge Elimination System (NPDES) permits and regulates leaking underground storage tanks and other sources of groundwater contamination.

Local

Local agencies that coordinate and implement hazardous materials regulations and protocols in Ventura County include the Ventura County Air Pollution Control District (VCAPCD), Ventura County CUPA, and the Ventura County Fire Protection District.

Ventura County Air Pollution Control District

The Ventura County Air Pollution Control District (VCAPCD) regulates the demolition of buildings and structures that may contain asbestos through both inspection and law enforcement The VCAPCD is to be notified 10 days in advance of any proposed demolition or abatement work. The provisions that cover these operations are found in VCAPCD Regulation 1, Rule 62 and 62-1: Hazardous Materials and Airborne Toxics; Hazardous Materials. Individual project contractors are required to implement standard State and Federal procedures for asbestos containment and worker safety. The rule requires special handling of asbestos-containing building materials (ACBM) (e.g., by keeping materials continuously wetted). The Rule prohibits any visible emissions of ACBM to outside air. Individual project applicants are required to consult with the VCAPCD Enforcement Division prior to commencing demolition of a building containing ACBM.

Ventura County Environmental Health Division, CUPA Program

Ventura County Environmental Health Division, Certified Unified Program Agency (VC CUPA) is the CUPA for all incorporated and unincorporated areas of Ventura County, with the exception of the City of Oxnard., This means VC CUPA has been certified by the CalEPA to implement the following six state environmental programs:

- Hazardous Waste
- Hazardous Materials Business Plan (HMBP)

- California Accidental Release Prevention Program (CalARP)
- Underground Hazardous Materials Storage Tanks (UST)
- Aboveground Petroleum Storage Tanks /Spill Prevention Control & Countermeasure Plans (APSA)
- Onsite Hazardous Waste Treatment / Tiered Permit

The Hazardous Materials Business Plan (HMBP) is required to include a summary of business activities, owner and operator information including emergency contacts, the type and quantity of reportable hazardous materials, a site map, emergency response procedures, and an employee training program. In general, the submittal of a HMBP is required if a business handles and/or stores a hazardous material equal to or greater than the minimum reportable quantities. These quantities are 55 gallons for liquids, 500 pounds for solids, and 200 cubic feet (at standard temperature and pressure) for compressed gases. Exemptions to filing a HMBP are listed in the Health and Safety Code.

The Ventura County Environmental Health Division also administers the Medical Waste Program, Body Art Program, and has emergency on-call staff available to respond to hazardous and medical waste incidents/releases.

Ventura County Fire Protection District (VCFPD)

The Ventura County Fire Protection District serves the communities of Camarillo, Moorpark, Ojai, Port Hueneme, Simi Valley, and Thousand Oaks. Formed in May 1928, the VCFPD provides all-risk services including Fire Suppression, Rescue, Emergency Medical, Hazardous Materials, Urban Search and Rescue (USAR), Water Rescue, Operational Training, Fire Prevention, Investigation, Community Education, Community Emergency Response Teams (CERT) and Public Information. The VCFPD service area encompasses approximately 484 square miles and serves a population of more than 480,000. All VCFPD fire stations have a staffed fire engine in service. At strategic fire stations throughout the county, the VCFPD staffs a ladder truck along with a fire engine. Fire engines attack a fire; ladder trucks provide support to the fire attack crew. All apparatus are equipped to deliver emergency medical care. Some apparatus staffed with personnel EMTs to provide basic life support (BLS). While other apparatus are staffed with paramedics to deliver advance life support (ALS). In addition the department provides ALS services through the use of staffed paramedic squads.

The VCFPD also maintains other pieces of specialized apparatus throughout the county. The on-duty crew at the station will staff and operate these specialized units when needed. The Department responds to approximately 35,000 calls for service annually.

Ventura County Certified Unified Program Agency Program

The Ventura County CUPA implements Federal and State laws and county regulations related to hazardous waste use, storage, transport, and disposal. The CUPA activities include education on proper handling, storage, and disposal of hazardous wastes; inspections of hazardous waste generators; the investigation of illegal disposal and public complaints; and emergency response to hazardous materials. Additionally, the CUPA provides oversight and regulation of statewide environmental programs, which include the following:

- Hazardous Waste,
- Hazardous Materials Business Plan,
- California Accidental Release Prevention Program,

- Underground Hazardous Materials Storage Tanks,
- Aboveground Petroleum Storage Tanks/ Spill Prevention Control & Countermeasure Plans
- Onsite Hazardous Waste Treatment/ Tiered Permit

For emergency response services, the City of Ventura Fire Department and the Oxnard Fire Department are Participating Agencies of the CUPA and implement the programs in their respective jurisdictions. The remainder of CUPA responsibilities in the county rest with the County Environmental Health Division.

2005 Ventura County General Plan

The General Plan covers hazardous materials in Chapter 2, Hazards. Section 2.15 includes goals, policies, and programs related to hazardous materials.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for hazardous materials. These can be found in Sections 20a. Hazardous Materials/Waste-Materials and 20b. Hazardous Materials/Waste-Waste.

Key Terms

Biohazard. An infectious agent or hazardous biological material that presents a risk or potential risk to the health of humans, animals, or the environment. The risk can be direct through infection or indirect through damage to the environment.

Brownfield. Abandoned, idled, or under-used real property where expansion or redevelopment is complicated by the presence or potential presence of environmental contamination.

Carcinogen. Any substance that can cause or aggravate cancer.

Corrosiveness. The ability to eat away materials and destroy human and animal tissue by chemical action (e.g., oven cleaner).

Exposure Pathway. The route through which a chemical can enter the body (e.g., through the skin, inhaling, ingesting).

Groundwater. Water that exists beneath the land surface in openings (space) between soil and rock. Does not include water residue from underground mining.

Heavy Metal. An individual metal or metal compound that can negatively affect people's health. Though in very small amounts certain heavy metals are necessary to support life (e.g., iron, copper, manganese, zinc), when heavy metals are not metabolized by the body, they can accumulate in the soft tissues and become toxic.

Ignitability. The ability to catch fire; flammable (e.g., lighter fluid, paint remover).

Leach. The process by which soluble substances are dissolved and transported through the soil, which may result in hazardous substances entering surface water, groundwater, or nearby soil.

Petroleum Hydrocarbons. The primary constituents in oil, gasoline, and diesel, plus a variety of solvents.

Polychlorinated Biphenyls (PCBs). Chemicals formerly manufactured for use as coolants and lubricants in transformers, and in other electrical equipment (e.g., fluorescent light ballasts, old televisions). In 1978, PCB production was banned in the U.S. because accumulation in the environment can cause harmful health effects, including cancer.

Reactivity. The ability to create an explosion or produce deadly vapors (e.g., bleach mixed with an ammonia-based cleaner).

Release/Occurrence. Any means by which a substance could harm the environment (e.g., spilling, leaking, dumping).

Remediate. The act or process of removing pollution or contaminants from the soil, groundwater, sediment, or surface water to protect human health and the environment.

Solvent. A substance that dissolves another substance (or substances) to form a solution. Solvents are usually, but not always, liquids. Liquid solutions that do not have water as a solvent are called non-aqueous solutions. For example, solvents can be used to dissolve greases, oils, and paints or thin or mix pigments, paints, glues, pesticides, and epoxy resins.

Toxicity. The ability to produce injury, illness, or damage to people, domestic animals, or wildlife through ingestion, inhalation, or absorption through the body (e.g., cleaning fluids, pesticides, bleach, drain cleaner).

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SECTION 11.6 NOISE AND VIBRATION

Introduction

This section includes a description of relevant acoustical background information, including fundamental principles of acoustics, a description of the existing community noise environment in Ventura County, applicable federal, state and local regulations, and key terms.

Major Findings

The major findings with respect to noise are as follows:

- Based on ambient noise level measurements throughout unincorporated areas of the county, the predominant sources of noise include traffic noise on major roadways, transit and freight trains, and aircraft.
- Roadway traffic is the predominant source of noise affecting sensitive land uses in the county. Freeways and major arterial roadways are the primary sources of traffic noise. Based on traffic-noise modeling, the roadways in unincorporated Ventura County with the greatest modeled traffic-noise levels are US-101 and State Routes 23, 118, and 126.
- Of the roadway segments modeled, the 60 A-weighted decibels (dBA) traffic noise contour ranges from 4 to 1,792 feet from the centerline of the roadway. Residential land uses located within the 60 dBA contour along these roadway segments are currently exposed to noise levels above the 60 dBA Community Noise Equivalent Level (CNEL) standard for residential land uses.
- In addition to traffic noise on local roadways and state highways, passenger and freight trains operating within the unincorporated areas of the county contribute to community noise levels. Based on the modeling conducted, the 60 dBA CNEL railroad noise contour is between approximately 154 to 165 feet from the centerline of the rail line. Residential land uses located within the 60 dBA contour along these railroad lines are currently exposed to noise levels above the 60 dBA CNEL standard for residential land uses.
- The Airport Comprehensive Land Use Plan (CLUP) for Ventura County establishes noise compatibility policies for sensitive land uses within the 60 dBA and higher CNEL noise contours. The plan restricts extremely sensitive land uses (e.g., mobile home parks) within the 60 dBA CNEL contour and requires mitigation measures for moderately sensitive land uses within the 60 dBA CNEL contour.
- Noise generated by industrial facilities and other stationary sources contribute to the ambient noise environment in their immediate vicinities.

Existing Conditions

Acoustics Fundamentals

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a

solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise. Common sources of environmental noise and noise levels are presented in Table 11-5.

TABLE 11-5
TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet	100	
Gas lawnmower at 3 feet	90	
Diesel truck moving at 50 mph at 50 feet	80	Food blender at 3 feet, Garbage disposal at 3 feet
Noisy urban area, Gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet, Normal speech at 3 feet
Commercial area, Heavy traffic at 300 feet	60	
Quiet urban daytime	50	Large business office, Dishwasher in next room
Quiet urban nighttime	40	Theatre, Large conference room (background)
Quiet suburban nighttime	30	Library, Bedroom at night, Concert hall (background)
Quiet rural nighttime	20	Broadcast/Recording Studio
Threshold of Human Hearing	0	Threshold of Human Hearing

Notes: dB=decibel
Source: California Department of Transportation [Caltrans] 2013.

Sound Properties

A sound wave is initiated in a medium by a vibrating object (e.g., vocal chords, the string of a guitar, or the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz.

Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel scale was introduced. A sound level expressed in decibels (dB) is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure. For sound pressure in air the standard reference quantity is generally considered to be 20 micropascals, which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive. A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly summed. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy.

The loudness of sound perceived by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and

A-weighted sound levels (dBA). For this reason, the dBA can be used to predict community response to noise from the environment, including noise from transportation and stationary sources. All sound levels discussed in this section are A-weighted decibels unless otherwise noted.

Noise can be generated by a number of sources, including: mobile (i.e., transportation) sources such as automobiles, trucks, and airplanes; and stationary (i.e., non-transportation) sources such as construction sites, machinery, and commercial and industrial operations. As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (i.e., decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers. Noise generated from mobile sources generally attenuate at a rate of 4.5 dB per doubling of distance. Stationary noise sources spread with more spherical dispersion patterns that generally attenuate at a rate of 6 to 7.5 dB per doubling of distance.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a large object (e.g., barrier, topographic features, and intervening building façades) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction (i.e., shielding) provided by a barrier primarily depends on the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural (e.g., berms, hills, and dense vegetation) and human-made features (e.g., buildings and walls) may be used as noise barriers.

All buildings provide some exterior-to-interior noise reduction. A building constructed with a wood frame and a stucco or wood sheathing exterior typically provides a minimum exterior-to-interior noise reduction of 25 dB with its windows closed, whereas a building constructed of a steel or concrete frame, a curtain wall or masonry exterior wall, and fixed plate glass windows of one-quarter-inch thickness typically provides an exterior-to-interior noise reduction of 30–40 dB with its windows closed (Caltrans 2009).

Effects of Noise on Humans

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory impacts to humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance, and dissatisfaction, which lead to interference with activities such as communications, sleep, and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The mass of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic environmental and physical factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing noise environment. The greater the change in the noise levels that are attributed to a new noise

source, relative to the environment an individual has become accustom to, the less tolerable the new noise source will be perceived.

With respect to how humans perceive and react to changes in noise levels, a 1 dB increase is imperceptible, a 3 dB increase is barely perceptible, a 6 dB increase is clearly noticeable, and a 10 dB increase is subjectively perceived as approximately twice as loud (Egan 2007). These subjective reactions to changes in noise levels was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dB, as this is the usual range of voice and interior noise levels. For these reasons, a noise level increase of 3 dB or more is typically considered substantial for humans in terms of the degradation of the existing noise environment.

Negative effects of noise exposure include physical damage to the human auditory system, interference, and disease. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time; traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period of time. Gradual and traumatic hearing loss both may result in permanent hearing damage. In addition, noise may interfere with or interrupt sleep, relaxation, recreation, and communication. Although most interference may be classified as annoying, the inability to hear a warning signal may be considered dangerous. Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease. The degree to which noise contributes to such diseases depends on the frequency, bandwidth, level of the noise, and the exposure time (Caltrans 2009).

Noise levels can also have adverse impacts on animals. (See Section 8.2, "Biological Resources," for more detail.)

Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include non-human-caused phenomena (e.g., earthquakes, volcanic eruptions, sea waves, and landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, and construction equipment). Vibration sources may be continuous (e.g., operating factory machinery) or transient (e.g., explosions). Vibration levels can be depicted in terms of amplitude and frequency (relative to displacement), velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV and RMS vibration velocity are normally described in inches per second (in/sec).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (Federal Transit Association [FTA] 2006). This is based on a reference value of 1 micro (μ) in/sec.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Groundborne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a

vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2006).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction activities can generate ground vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2006).

Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by events such as blasting, impact pile driving, and wrecking balls. Continuous vibrations result from activities such as vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. Table 11-6 describes the general human response to different levels of ground vibration-velocity levels.

TABLE 11-6
HUMAN RESPONSE TO DIFFERENT LEVELS OF GROUND NOISE AND VIBRATION

Vibration-Velocity Level (VdB)	Human Reaction
65	Approximate threshold of perception.
75	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85	Vibration acceptable only if there are an infrequent number of events per day.

Notes: VdB=vibration decibels referenced to 1 µ inch per second and based on the root mean squared velocity.
Source: FTA 2006

Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, schools, historic sites, cemeteries, sensitive habitats, and recreation areas are also generally considered sensitive to increases in exterior noise levels. Places of worship, hotels and other short-term lodging, libraries, and other places where low interior noise levels are desirable are also considered noise-sensitive. These noise-sensitive uses are also considered vibration-sensitive land uses in addition to commercial and industrial buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

The following sensitive land uses have been identified in Ventura County (Ventura County 2015a):

- Residential land uses
- Schools;
- Historic Sites;
- Cemeteries;
- Parks, Recreation, and Open Space Areas;
- Hospitals and Care Facilities;

- Sensitive wildlife habitats, including the habitat of rare, threatened, or endangered species;
- Hotels and other short-term lodging (e.g., bed and breakfasts, motels);
- Places of Worship; and
- Libraries.

Existing Community Noise Environment

The predominant noise sources within Ventura County are mobile sources, including motor vehicles on roadways, freight and passenger trains, and aircraft. Stationary sources from existing land uses such as industrial and agricultural operations also contribute to the existing noise environment. A total of 15 ambient noise level measurements consisting of fourteen 30-minute short-term (ST) measurements and one 24-hour long-term (LT) measurement, were conducted to characterize the existing noise environment at different locations throughout the unincorporated county. Figure 11-13 shows the locations of each sound level measurement and Table 11-7 summarizes the measured sound level at each location.

TABLE 11-7
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS
Ventura County

Measurement Location	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dB)			Nearby Noise-Sensitive Land Uses
Short-Term			L_{eq}	L_{max}	L_{min}	
ST-1: Intersection of SR 33 and Valley Mead Road	August 8, 2016/10:22 AM	August 8, 2016/10:52 AM	48.0	73.5	40.9	Residential
ST-2: Holser Canyon Road near the Wes Thompson Piru Rifle Range	August 8, 2016/11:24 AM	August 8, 2016/11:54 AM	64.8	83.9	49.0	Open Space
ST-3: Intersection of SR 126 and Hooper Canyon Road	August 8, 2016/12:12 PM	August 8, 2016/12:42 PM	68.5	84.3	41.6	Open Space
ST-4: Near intersection of 3rd Street and F Avenue	August 8, 2016/2:01 PM	August 8, 2016/2:31 PM	70.9	83.2	46.8	Residential
ST-5: Intersection of SR 1 and Yerba Buena Road, near Neptune's Net Restaurant	August 8, 2016/3:35 PM	August 8, 2016/4:05 PM	75.4	100.1TBD	46.6	Recreation Area
ST-6: Intersection of Vista Del Rincon Drive and	August 8, 2016/4:48 PM	August 8, 2016/5:18 PM	73.2	84.5	48.8	Residential, Open Space

TABLE 11-7
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS
Ventura County

Measurement Location	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dB)			Nearby Noise-Sensitive Land Uses
Short-Term			L_{eq}	L_{max}	L_{min}	
Carpinteria Avenue near SR 1						
ST-7: Intersection of North Ventura Avenue and Holt Street Near SR 33	August 8, 2016/5:37 PM	August 8, 2016/6:07 PM	66.9	85.2	49.2	Residential
ST-8: Intersection of Santa Clara Avenue and Friedrich Road	August 9, 2016/10:26 AM	August 9, 2016/10:56 AM	49.7	69.3	36.2	Open Space, Residential
ST-9: Intersection of Tapo Canyon Road and Bennett Road	August 9, 2016/11:10 AM	August 9, 2016/11:40 AM	62.1	70.8	49.2	Open Space
ST-10: Along Lower Lake Road on Lake Sherwood	August 9, 2016/12:09 PM	August 9, 2016/12:39 PM	64.7	69.9	45.9	Residential, Recreation, Open Space
ST-11: Intersection of Lindero Canyon Road and Lakeview Canyon Road	August 9, 2016/1:17 PM	August 9, 2016/1:47 PM	62.1	83.4	34.5	Residential
ST-12: Along SR 23 at the intersection of Happy Camp Road and Broadway	August 9, 2016/3:12 PM	August 9, 2016/3:42 PM	63.6	84.7	44.0	Open Space
ST-13: Along SR 118, north of the Arch Street / North Street intersection	August 10, 2016/1:23 PM	August 10, 2016/1:53 PM	64.9	83.0	45.4	Residential
ST-14: Santa Rose Road and Yucca Drive	August 10, 2016/2:06 PM	August 10, 2016/2:36 PM	58.8	76.5	41.2	Open Space
Measurement Location	**Start (Date/Time)**	**Stop (Date/Time)**	**CNEL/L_{dn}**	**Daytime**	**Nighttime**	

TABLE 11-7
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS
Ventura County

Measurement Location	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dB)							Nearby Noise-Sensitive Land Uses
Short-Term			L_{eq}		L_{max}		L_{min}			
Long-Term				L_{eq}	L_{max}	L_{min}	L_{eq}	L_{max}	L_{min}	
LT-1: near SR 118 in open space area south of Riverbank Drive, north east of Santa Clara River	August 8, 2016/1:43 PM	August 9, 2016/2:35 PM	59.3[1]/58.7	56.8	69.6	45.0	48.6	63.5	35.7	Open Space, Commercial Office Buildings

Notes: CNEL=community noise equivalent level, dB=decibel, Leq=equivalent sound level, L_{max}=maximum noise level, L_{min}=minimum noise level, LT= long term, ST= short term. See Figure 11-13 for map of locations.
[1] The LT measurement does not exceed the applicable 60 dB CNEL for the noise-sensitive land uses near this location.
Source: Field data collected by Ascent Environmental, Inc., August and October 2016.

As shown in Table 11-7, the L_{eq} for ST measurement-2, 3, 4, 5, 6,7, 8, 9, 10, 11, and 12 exceed 60 dB. Sensitive receptors near these measurements include residential land use, open space, and recreational areas. It should be noted that these values were taken over the duration of 30 minutes and are intended to reflect ambient noise levels during that period alone; therefore, these values do not indicate CNEL levels at these locations. LT measurement-1, taken over a 24-hour period, provides the CNEL values for that location of 59.3 dB, which does not exceed the applicable threshold of 60 dB.

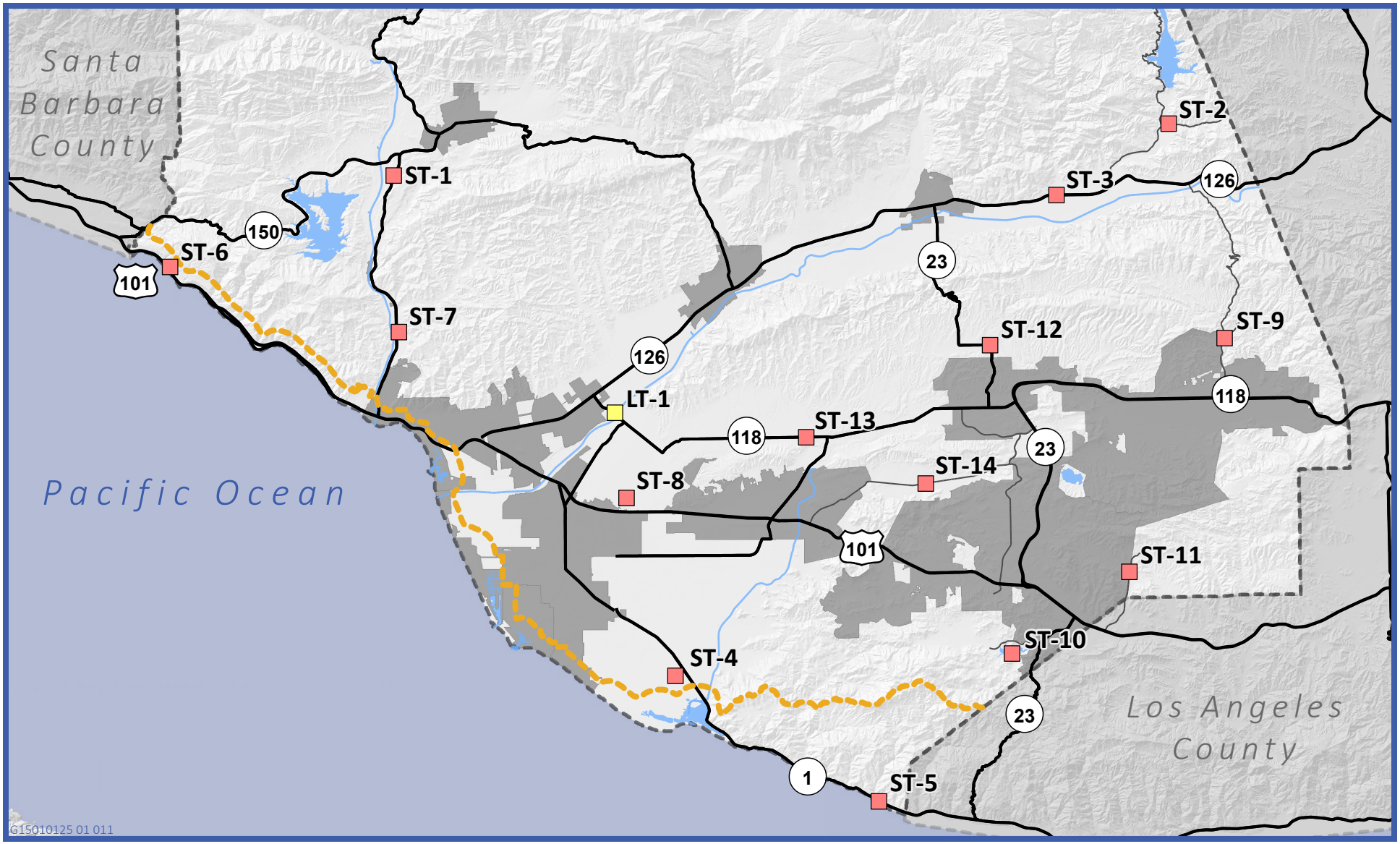


Figure 11-13:
Ambient Noise Measurement Locations

Map Date: November 16, 2016
Source: Ascent Environmental, 2016; Ventura County, 2016; California Department of Transportation, 2007; USGS, 2013.

0 5 10 Miles

N

Noise Monitoring Locations
- Long-term
- Short-term

Coastal Zone Boundary
Major Roadways
Major Waterways

Water Bodies
Cities

Existing Traffic Noise

Major highways in Ventura County include US 101, SR 1, SR 33, SR 150, SR 126, and SR 118. There is also a network of rural roadways throughout the county.

Traffic noise was modeled for 131 County-operated roadways segments and 82 state highway segments within the unincorporated county and adjacent areas. Table 11-8 summarizes the modeled existing traffic noise levels at 50 feet from the centerline of each major roadways and lists distances from each roadways centerline to the 70, 65, 60, and 55 dBA CNEL/L_{dn} traffic noise contours. Ascent Environmental performed noise modeling in 2016 based on existing average daily traffic (ADT) volumes and speeds as indicated by a 2015 traffic volumes report provided by the County of Ventura Public Works Agency and supplemented by Caltrans data for freeway segments (Ventura County 2015b; Caltrans 2014). Traffic noise modeling was conducted based on Caltrans' traffic noise analysis protocol and the technical noise supplement (Caltrans 2006, 2013). The modeling does not account for any natural or human-made shielding (e.g., the presence of topography, vegetation, berms, walls, or buildings) and, consequently, represents worst-case noise levels on a horizontal plane.

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
County Operated Roadways						
Aggen Rd.	n/o L.A. Ave. (SR 118)	55.0	3	10	32	101
Balcom Canyon Rd.	s/o South Mountain Rd.	54.6	3	9	32	101
Balcom Canyon Rd.	n/o L.A. Ave. (SR 118)	56.1	4	13	41	129
Bardsdale Ave.	e/o Sespe St.	56.4	4	14	44	139
Beardsley Rd.	n/o Central Ave.	61.2	13	42	133	420
Bennett Rd.	n/o Tapo Canyon Rd.	47.4	1	2	6	17
Box Canyon Rd.	s/o Santa Susana Pass Rd.	57.7	6	18	58	184
Bradley Rd.	n/o L.A. Ave. (SR 118)	61.2	13	42	133	420
Briggs Rd.	s/o Telegraph Rd.	62.8	19	61	191	605
Briggs Rd.	n/o Telegraph Rd.	58.4	7	22	69	218
Bristol Rd.	w/o Montgomery Ave.	64.8	30	96	302	956
Broadway Rd.	w/o Grimes Canyon Rd. (SR 23)	58.8	8	24	76	241
Burnham Rd.	s/o Baldwin Rd. (SR 150)	55.1	3	10	32	101
Burnham Rd.	e/o Santa Ana Rd.	54.4	3	9	28	88

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Calle Yucca	n/o Camino Manzanas	54.2	3	8	26	83
Camino Dos Rios	w/o Lynn Rd.	56.6	5	14	45	143
Canada Larga Rd.	e/o Ventura Ave.	54.3	3	8	27	85
Carne Rd.	n/o Ojai Ave. (SR 150)	50.7	1	4	12	37
Casitas Vista Rd.	w/o Ojai Fwy. (SR 33)	55.6	4	12	36	115
Cawelti Rd.	w/o Lewis Rd.	60.0	10	32	101	319
Center School Rd.	s/o L.A. Ave. (SR 118)	55.8	4	12	38	119
Center St. (Piru)	w/o Telegraph Rd. (SR 126)	54.2	3	8	26	84
Central Ave.	w/o Ventura Fwy. (US 101)	66.3	42	134	423	1137
Central Ave.	w/o Santa Clara Ave.	66.9	49	156	494	1563
Central Ave.	e/o Vineyard Ave. (SR 232)	62.9	20	62	197	624
Channel Islands Blvd.	w/o Rice Ave.	67.7	58	185	585	1849
Creek Rd.	e/o Country Club Dr.	52.5	2	6	18	56
Creek Rd.	e/o Ventura Ave. (SR 33)	59.4	9	28	88	279
Deer Creek Rd.	n/o Pacific Coast Hwy. (SR 1)	43.1	<1	1	2	6
Deerhill Rd.	n/o Kanan Rd.	59.2	8	26	83	263
Del Norte Rd.	s/o Rancho Dr.	47.7	1	2	6	18
Donlon Rd.	n/o La Cumbre Rd.	50.6	1	4	12	37
Doris Ave.	e/o Victoria Ave.	63.6	23	72	229	723
El Roblar Dr.	w/o Maricopa Hwy. (SR 33)	57.3	5	17	54	170
Etting Rd.	e/o Dodge Rd.	61.6	14	45	144	454
Fairview Rd.	e/o Maricopa Hwy. (SR 33)	50.7	1	4	12	37
Fairway Dr.	n/o Valley Vista Dr.	56.7	5	15	47	148
West Fifth St.	e/o North Harbor Blvd.	58.7	7	14	74	235
Foothill Rd.	w/o Peck Rd.	59.3	9	27	85	269
Foothill Rd.	w/o Briggs Rd.	56.0	4	13	40	126

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Foothill Rd.	e/o North Wells Rd.	61.1	13	40	128	403
Foothill Rd.	e/o Saticoy Ave.	63.4	22	69	218	689
Gonzales Rd.	e/o North Harbor Blvd.	63.4	22	69	218	689
Grand Ave.	e/o Fordyce Rd.	60.3	11	34	106	336
Grand Ave.	w/o Fordyce Rd.	53.0	2	6	20	63
Grimes Canyon Rd.	n/o L.A. Ave (SR 118)	60.5	11	35	112	354
Guiberson Rd.	e/o Chambersburg Rd. (SR 23)	56.8	5	15	48	151
Harbor Blvd.	n/o Gonzales Rd.	70.2	106	334	1058	3345
Harbor Blvd.	s/o Gonzales Rd.	0	0	0	0	0
Hitch Blvd.	s/o L.A. Ave. (SR 118)	54.0	2	8	25	79
Howe Rd.	e/o Torrey Rd.	48.6	1	2	7	23
Hueneme Rd.	e/o Las Posas Rd.	66.5	45	142	448	1417
Hueneme Rd.	e/o Nauman Rd.	66.2	42	133	420	1328
Hueneme Rd.	e/o Wood Rd.	66.2	42	132	416	1315
Hueneme Rd.	w/o Olds Rd.	66.9	49	156	492	1556
Kanan Rd.	e/o Lindero Canyon Rd.	66.2	41	131	414	1309
Kanan Rd.	e/o Hollytree Dr./Oak Hills Dr.	66.0	40	126	399	1263
Kanan Rd.	s/o Tamarind St.	67.9	62	197	623	1969
La Luna Ave.	s/o Lomita Ave.	56.1	4	13	41	129
La Vista Ave.	n/o L.A. Ave (SR 118)	57.3	5	17	53	168
Laguna Rd.	e/o Pleasant Valley Rd.	60.7	12	37	117	370
Laguna Rd.	n/o Hueneme Rd.	60.5	11	35	112	353
Las Posas Rd.	n/o East Fifth St. (SR 34)	66.5	45	141	446	1414
Las Posas Rd.	s/o East Fifth St. (SR 34)	66.7	47	150	473	1496
Las Posas Rd.	s/o Hueneme Rd.	65.1	32	103	324	1025
East Las Posas Rd.	n/o Santa Rosa Rd.	58.8	8	24	76	241
Lewis Rd.	s/o Pleasant Valley Rd.	67.9	62	196	620	1961
Lewis Rd.	n/o Potrero Rd.	67.0	50	160	505	1597
Lockwood	w/o Kern	56.3	4	12	43	134

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Valley Rd.	County Line					
Lockwood Valley Rd.	e/o Maricopa Hwy. (SR 33)	53.3	2	7	21	67
Lomita Ave.	e/o Tico Rd.	57.8	6	19	60	189
Main St. (Piru)	n/o Telegraph Rd. (SR 126)	56.2	4	13	42	132
McAndrew Rd.	n/o Reeves Rd.	48.6	1	2	7	23
Moorpark Rd.	n/o Santa Rosa Rd.	69.6	91	287	909	2874
Old Telegraph Rd.	w/o Grand Ave.	57.9	6	19	61	194
Olds Rd.	n/o Hueneme Rd.	59.8	10	30	96	303
Olivas Park Dr.	w/o Victoria Ave.	69.0	64	202	638	2017
Panama Dr.	s/o Lake Shore Dr.	44.4	<1	1	3	9
Pasadena Ave.	e/o Sespe St.	49.4	1	3	9	28
Patterson Rd.	s/o Doris Ave.	51.6	1	5	15	46
Piru Canyon Rd.	n/o Orchard St.	48.6	1	2	7	23
Pleasant Valley Rd.	s/o East Fifth St. (SR 34)	69.3	85	267	845	2672
Pleasant Valley Rd.	w/o Las Posas Rd.	67.6	58	182	576	1821
Potrero Rd.	e/o Lake Sherwood Dr.	62.6	18	57	180	571
Potrero Rd.	w/o Stafford Rd.	58.5	7	23	71	226
Potrero Rd.	w/o Hidden Valley Rd.	50.6	1	4	12	37
Potrero Rd.	Milepost 2.75	57.0	5	16	50	157
Potrero Rd.	e/o Lewis Rd.	62.8	19	61	192	607
Price Rd.	n/o L.A. Ave. (SR 118)	55.0	3	10	32	101
Rice Ave.	s/o East Fifth St. (SR 34)	71.0	127	401	1268	4010
Rice Ave.	n/o Channel Islands Blvd.	70.2	105	331	1048	3314
Rice Ave.	n/o Hueneme Rd.	61.6	14	46	144	455
Rice Rd. (Meiners Oaks)	s/o Lomita Ave.	59.2	8	27	84	266
Riverside Ave.	w/o Chambersburg Rd. (SR 23)	53.1	2	6	21	65
Rose Ave.	s/o L.A. Ave.	62.4	17	55	174	551

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
	(SR 118)					
Rose Ave.	s/o Central Ave.	63.4	22	70	220	697
Rose Ave.	n/o Collins Ave.	65.9	39	124	392	1241
Santa Ana Blvd.	e/o Ventura River	58.1	6	20	65	204
Santa Ana Rd.	s/o Baldwin Rd. (SR 150)	54.7	3	9	29	93
Santa Ana Rd.	s/o Santa Ana Blvd.	57.5	6	18	56	176
Santa Clara Ave.	n/o Friedrich Rd.	68.4	69	217	686	2168
Santa Clara Ave.	s/o L.A. Rd (SR 118)	69.1	82	256	819	2588
Santa Rosa Rd.	w/o Moorpark Rd.	70.2	105	331	1047	3311
Santa Rosa Rd.	w/o East Las Posas Rd.	69.4	88	277	877	2773
Santa Susana Pass Rd.	e/o Katherine Rd.	58.5	7	22	70	221
Sespe St.	n/o South Mountain Rd.	60.0	10	32	101	319
Sespe St.	s/o Pasadena Ave.	55.0	3	10	32	101
South Mountain Rd.	e/o Balcom Canyon Rd.	54.4	3	9	28	88
South Mountain Rd.	s/o Santa Clara River	57.2	6	18	57	180
Stockton Rd.	e/o Balcom Canyon Rd.	52.4	2	6	18	55
Sturgis Rd.	w/o Pleasant Valley Rd.	63.1	20	64	202	639
Tapo Canyon Rd.	s/o Bennet Rd.	53.9	2	8	25	78
Telegraph Rd.	w/o Briggs Rd.	63.0	20	63	200	632
Telegraph Rd.	w/o Hallock Dr.	0	0	0	0	0
Telegraph Rd.	w/o Olive Rd.	63.4	22	70	220	696
Telephone Rd.	n/o Olivas Park Dr.	67.4	54	172	544	1720
Tico Rd.	n/o Ventura Ave (SR 150)	56.6	5	14	45	143
Tierra Tejada Rd.	e/o Moorpark Frwy. (SR 23)	69.4	87	274	866	2740
Torrey Rd.	s/o Telegraph Rd. (SR 126)	54.2	3	8	27	84
Valley Vista Dr.	s/o Calle Aurora	59.1	8	26	82	258

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Ventura Ave.	n/o Canada Larga Rd.	56.3	4	13	43	134
Ventura Ave.	n/o Shell Rd.	59.4	9	28	88	277
Victoria Ave.	s/o Olivas Park Dr.	73.8	239	755	2386	7547
Villanova Rd.	e/o Ventura Ave. (SR 33)	55.4	4	11	35	111
Walnut Ave.	n/o L.A. Ave. (SR 118)	53.3	2	7	21	67
Wendy Dr.	n/o Gerald Dr.	62.8	19	60	191	604
Wood Rd.	s/o Hueneme Rd.	60.0	10	32	101	319
Wood Rd.	s/o East Fifth St. (SR 34)	58.0	6	20	64	202
Wooley Rd.	w/o Rice Ave.	67.0	52	163	516	1630
Wright Rd.	e/o Santa Clara Ave.	58.7	7	24	74	235
Yerba Buena Rd.	n/o Pacific Coast Hwy. (SR 1)	50.1	1	3	10	32
State Highways within Ventura County[1]						
Route 1	Callegus Creek	70.6	114	361	1143	3614
Route 1	Oxnard, Pleasant Valley Rd./Rice Ave.	64.7	30	94	295	943
Route 1	Oxnard, Saviers Rd.	65.7	37	117	369	1166
Route 1	Oxnard, Jct. Rte. 34, Fifth Rd. (West)	64.6	29	92	290	917
Route 1	Oxnard, Jct. Rte. 34, Fifth Rd. (East)	65.1	32	100	316	1001
Route 1	Oxnard, Jct. Rte. 232, Vineyard Ave. (West)	70.7	117	369	1166	3688
Route 1	Oxnard, Jct. Rte. 232, Vineyard Ave. (East)	69.3	86	272	860	2720
Route 1	Oxnard, Jct. Rte. 101 (South)	70.7	117	369	1168	3692
Route 1	Oxnard, Jct. Rte. 101 (North)	63.6	23	73	232	732
Route 1	Seacliff Colony, Jct. Rte. 101	58.3	7	21	68	214
Route 1	Las Cruces, Jct. Rte. 101, Mobil Oil Pier	59.0	8	25	80	252

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 23	Thousand Oaks, Triunfo Canyon Rd. (Back)	71.1	128	403	1276	4035
Route 23	Thousand Oaks, Triunfo Canyon Rd. (Ahead)	73.0	197	624	1973	6241
Route 23	Thousand Oaks, Jct. Rte. 101 (South)	74.8	301	953	3013	9527
Route 23	Thousand Oaks, Jct. Rte. 101 (North)	79.9	984	3112	9842	31,123
Route 23	Moorpark, Jct. Rte. 118, Ronald Reagan Fwy.	73.1	204	644	2038	6445
Route 23	Moorpark, Jct. Rte. 118, New Los Angeles Ave. (West)	72.4	173	547	1729	5467
Route 23	Moorpark, Jct. Rte. 118, New Los Angeles Ave. (East)	68.1	65	205	647	2046
Route 23	Spring Rd. (Back)	59.0	8	25	79	249
Route 23	Spring Rd. (Ahead)	68.0	63	199	629	1990
Route 23	Grimes Canyon Rd.	68.6	73	229	726	2295
Route 23	Fillmore, Jct. Rte. 126, Ventura Rd.	67.1	51	161	508	1607
Route 33	Ventura, Jct. Rte. 101, Ventura Fwy.	75.4	343	1085	3430	10,846
Route 33	Ventura, Ventura Ave.	67.3	54	171	541	1711
Route 33	West Jct. Rte. 150, Baldwin Rd. (West)	66.5	45	142	450	1424
Route 33	West Jct. Rte. 150, Baldwin Rd. (East)	57.1	5	16	51	162
Route 33	El Roblar Dr.	57.4	5	17	54	172
Route 33	Los Padres National Forest Boundary	55.6	4	11	36	115
Route 33	Sespe Gorge Maint. Station	50.2	1	3	10	33
Route 33	Ventura/Sant Barbara County Line	53.4	2	7	22	69
Route 34	Oxnard, Jct. Rte. 1, Oxnard Blvd.	62.4	17	55	174	549
Route 34	Oxnard, Rice Ave.	66.5	44	140	443	1399

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 34	Camarillo, Jct. Rte. 101, Ventura Fwy. (South)	70.0	99	313	990	3132
Route 34	Camarillo, Jct. Rte. 101, Ventura Fwy. (North)	70.6	116	366	1158	3660
Route 34	Somis, Jct. Rte. 101, Ventura Fwy.	67.4	55	175	554	1751
Route 101	Thousand Oaks, Jct. Rte. 23 South (South)	82.1	1625	5137	16,245	51,372
Route 101	Thousand Oaks, Jct. Rte. 23 South (North)	82.1	1626	5142	16,262	51,424
Route 101	Thousand Oaks, Jct. Rte. 23 North (South)	82.3	1713	5416	17,126	54,158
Route 101	Thousand Oaks, Jct. Rte. 23 North (North)	82.0	572	4972	15,725	49,723
Route 101	Thousand Oaks, Wendy Dr. (Back)	80.8	1199	3790	11,985	37,900
Route 101	Thousand Oaks, Wendy Dr. (Ahead)	80.8	1213	3836	12,130	38,359
Route 101	Camarillo, Pleasant Valley Rd. (Back)	80.8	1201	3802	12,024	38,025
Route 101	Camarillo, Pleasant Valley Rd. (Ahead)	80.8	1193	3774	11,933	37,735
Route 101	Camarillo, Jct. Rte. 34, Lewis Rd. (West)	81.0	1262	3992	12,623	39,916
Route 101	Camarillo, Jct. Rte. 34, Lewis Rd. (East)	81.3	1350	4268	13,495	42,684
Route 101	Oxnard, Jct. Rte. 232, Vineyard Ave.	81.0	1271	4019	12,711	40,195
Route 101	Oxnard, Jct. Rte. 1 South, Pacific Coast Hwy.	81.2	133	4216	13,333	42,161
Route 101	Ventura, Victoria Ave.	80.3	1082	3421	10,820	34,215
Route 101	Ventura, Jct. Rte. 126, Santa Paula Fwy. (West)	79.4	873	2760	8727	27,597

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 101	Ventura, Jct. Rte. 126, Santa Paula Fwy. (East)	80.7	1179	3729	11,791	37,286
Route 101	Ventura, Jct. Rte. 33, Ojai Fwy. (South)	79.8	956	3024	9561	30,236
Route 101	Ventura, Jct. Rte. 33, Ojai Fwy. (North)	78.7	739	2336	7386	23,355
Route 101	Ventura/Santa Barbara County Line	78.4	694	2196	6943	21,957
Route 118	Ventura, Jct. Rte. 126, Santa Paula Fwy.	74.3	272	861	2722	8608
Route 118	Jct. Rte. 232, Vineyard Ave. (West)	74.6	288	912	2882	9115
Route 118	Jct. Rte. 232, Vineyard Ave. (East)	72.9	796	621	1963	6206
Route 118	Jct. Rte. 34, Somis Rd. (West)	71.7	149	472	1492	4718
Route 118	Jct. Rte. 34, Somis Rd. (East)	71.9	156	492	1557	4923
Route 118	Grimes Canyon Rd.	72.3	169	535	1691	5346
Route 118	Moorpark, West Jct. Rte. 23, Moorpark Ave.	71.7	147	466	1475	4663
Route 118	Moorpark, East Jct. Rte. 23, at Spring Rd.	72.5	178	462	1781	5627
Route 118	Moorpark, Jct. Rte. 23, Moorpark Fwy.	74.1	255	806	2548	8056
Route 118	Tapo Rd.	80.9	1125	3874	12,250	38,739
Route 126	EB on from Main St. and Ventura, Jct. Rte. 101	76.8	481	1520	4808	15,203
Route 126	Ventura, Jct. Rte. 118 (West)	76.1	407	1287	4070	12,869
Route 126	Ventura, Jct. Rte. 118 (East)	77.1	510	1613	5100	16,127
Route 126	Laurie Lane Ped OC; e/o Peck Rd.	76.4	434	1373	4342	13,729
Route 126	Santa Paula, Jct. Rte. 150, 10th Rd. (West)	76.1	408	1289	4075	12,888
Route 126	Santa Paula, Jct. Rte. 150, 10th Rd. (East)	75.4	347	1097	3468	10,966

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 126	Fillmore, Jct. Rte. 23, A Rd. (South)	73.2	209	659	2085	6594
Route 126	Fillmore, Jct. Rte. 23, A Rd. (North)	72.9	197	623	1970	6230
Route 126	Piru	73.1	202	640	2023	6396
Route 150	Santa Barbara/Ventura County Line	57.2	5	17	53	168
Route 150	Jct. Rte. 33 South, Ventura Ave. (South)	62.9	20	62	196	618
Route 150	Jct. Rte. 33 South, Ventura Ave. (North)	65.8	38	122	385	1216
Route 150	Ojai, Jct. Rte. 33 North, Maricopa Hwy. (South)	65.8	38	121	382	1207
Route 150	Ojai, Jct. Rte. 33 North, Maricopa Hwy. (North)	66.7	47	149	470	1487
Route 150	Ojai East City Limits	60.9	12	39	122	386
Route 150	Santa Paula, North City Limit	57.7	6	18	58	185
Route 150	Santa Paula, Jct. Rte. 126, Santa Paula Fwy.	63.5	22	70	222	703
Route 232	Oxnard, Jct. Rte. 1, Oxnard Blvd.	66.1	41	129	409	1293
Route 232	Oxnard, Jct. Rte. 101	65.4	34	109	344	1089
Route 232	Jct. Rte. 118, Los Angeles Ave.	64.7	29	93	293	926

Notes: CNEL=community noise equivalent level, dB=decibel, Ave.=avenue, Rd.=Road, Blvd.=boulevard, Dr.=drive, Jct.=junction, Rte.=route, Fwy.=freeway, Hwy=highway, n/o=north of, s/o=south of, e/o=east of, w/o=west of

[1] Where applicable, direction of travel is specified based on Caltrans' nomenclature for traffic counts. Even route numbers are assumed to follow an east-to-west pattern and odd route numbers are assumed to follow a north-to-south pattern. ADT values for unnumbered roadways where direction is unclear are labeled either "back" or "ahead." Back typically represents traffic movement south or west of the count location; ahead usually represents traffic north or east of the count location.

Source: Modeling performed by Ascent Environmental, Inc. in 2017 based on Caltrans Annual Average Daily Truck Traffic on California State Highways, 2014; and Traffic Volumes of Ventura County Roadways, 2015.

Existing Railroad Noise

Noise from railroads is generated primarily by diesel locomotive engines, warning horns, and gate bells at railroad crossings. Other components of noise include diesel exhaust, cooling fans, and railroad car wheel/rail interaction. Amtrak, Metrolink, Fillmore and Western Railway, Union Pacific Railroad, and Ventura County Railroad Company all affect portions of the county.

Railroad data (e.g., engine type, trains per day) for the county were obtained from Amtrak (2016), Metrolink (2014), and the Multi-County Goods Movement Action Plan (2008). Using this data, railroad noise generated by Amtrak and Metrolink commuter diesel locomotives and general freight movement was modeled based on Noise Impact Assessment Guidelines for assessing railroad and transit noise (FTA 2006; Amtrak 2016; Metrolink 2014; Los Angeles County Metropolitan Transportation Authority et. al 2008). Table 11-9 summarizes the modeled existing railroad noise levels at 50 feet from the railroad centerline, along with approximate distances from the railroad centerlines to the 70 dB, 65 dB, 60 dB, and 55 dB CNEL/L_{dn} noise contours. The values shown in Table 11-9 assume that the receiver category is residential with no natural or human-made noise shielding or barriers (e.g., topography, vegetation, berms, walls, or buildings, or other attenuation measures), and are therefore considered "worst case" railroad noise conditions along the length of each corridor. The contours shown in Table 11-15 may be used to estimate noise levels at potential sensitive receptors near railroad lines. It is possible that existing or future sensitive receptors (e.g., residential land uses, recreation and open space, hospitals) could be located within the vicinity of a railroad. It should be noted that these contours are not based on data from specific railroad segments and therefore can be used to represent the expected noise levels for areas adjacent to these railroads throughout the unincorporated county.

TABLE 11-9
SUMMARY OF MODELED EXISTING RAILROAD NOISE LEVELS
Ventura County

Railroad Line	CNEL (dB) at 50 feet from Roadway Centerline	Distance (feet)			
		70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Amtrak	64.1	35	71	154	321
Metrolink	68.5	38	76	164	343
Freight Trains	68.7	38	76	165	344

Notes: CNEL=community noise equivalent level, dB=decibel
Source: Modeling conducted by Ascent Environmental, Inc. 2016 based on FTA, 2006.

Existing Airport Noise

Ventura County contains the Camarillo Airport, Santa Paula Airport, Oxnard Airport, and the Naval Base Ventura County Point Mugu. Camarillo Airport is located within the City of Camarillo, three miles southwest of the city's central business's district. The airport is situated less than one mile south of US-101 and seven miles east of the Pacific Ocean coastline. The Oxnard Airport is located one and a half miles from the Pacific Ocean coastline, four miles south of US-101 and one mile west of the SR 1. The Santa Paula Airport lies within the City of Santa Paula between SR 126 and the Santa Clara River. NBVC Point Mugu is located approximately six and a half miles southeast of Oxnard on the Pacific Coast and is bounded by SR 1 on the east.

The operations and land-use compatibility of these airports are covered by the Ventura County Airport Comprehensive Land Use Plan. A complete discussion of existing and future airport-related noise as described in this plan is discussed in detail below under the Regulatory Setting.

Existing Stationary Source Noise

The primary sources of stationary noise in unincorporated Ventura County consist of industrial and agricultural operations, and miscellaneous sources such as a shooting range in Holser Canyon, and a motocross facility near Piru. Major industrial noise sources include concrete and rock batch plants, sand and gravel mines, and Pepsi Cola and oil supply facilities. Noise from agricultural activities are generated from cultivation and harvesting equipment, irrigation and domestic water pumps, and anti-frost equipment (e.g., wind generators). Noise measurements and modeling were conducted for existing stationary noise sources at the Pepsi Cola supply facility, a batch plant, and a shooting range. See the data presented for Short-Term Measurement 1 (ST-1) for ambient noise levels at the Pepsi Cola supply facility taken in October 2016, ST-2 for ambient noise levels at the Wes Thompsons Shooting Range taken in August 2016, and ST-9 for ambient noise levels at the batch plant taken in August 2016, all contained in Table 11-7, "Summary of Ambient Noise Level Measurements."

Regulatory Setting

Federal

The Federal Noise Control Act of 1972

The Federal Noise Control Act of 1972 established a requirement that all federal agencies must comply with applicable federal, state, interstate, and local noise control regulations. Federal agencies also are directed to administer their programs in a manner that promotes an environment free from noise that jeopardizes public health or welfare.

U.S. Department of Transportation

To address the human response to groundborne vibration, the FTA of the U.S. Department of Transportation (DOT) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. Among these guidelines are the following:

- 65 vibration velocity decibels (VdB), referenced to 1 μin/sec and based on the RMS velocity amplitude, for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, and laboratory facilities);
- 80 VdB for residential uses and buildings where people normally sleep; and
- 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, and offices) (FTA 2006).

State

California requires each local government to implement a noise element as part of its general plan. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure.

Title 24 of the California Code of Regulations

California's noise insulation standards became effective in 1974. In 1988, the Building Standards Commission approved revisions to these standards (Title 24, Part 2, California Code of Regulations). The ruling established that interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric is measured in either CNEL or L_{dn}, consistent with the noise element of the local general plan. The commission also specifies that residential buildings or structures proposed to be located within exterior L_{dn} contours of 60 dB or greater, generated by an existing or planned freeway, expressway, parkway, major street, thoroughfare, rail line, rapid transit line, or industrial noise source, shall require an acoustical analysis showing that the building has been designed to limit intruding noise to an interior L_{dn} of 45 dB.

California Governor's Office of Planning and Research

The California Governor's Office of Planning and Research (OPR) publishes the State of California General Plan Guidelines (OPR 2003), which provide recommended standards for the acceptability of various types of land uses within specific Community Noise Equivalent Level (CNEL) contours. The noise standards are intended to provide guidelines for the development of noise elements. These basic guidelines may be tailored to reflect the existing noise and land use characteristics of a particular community. The Noise Compatibility Guidelines in Table 11-10 show the exterior noise standards recommended by the State for new development projects according to land use.

TABLE 11-10
STATE LAND USE COMPATIBILITY STANDARDS FOR COMMUNITY NOISE ENVIRONMENT

Land Use Category	Community Noise Exposure - L_{dn} or CNEL (db)						
	50	55	60	65	70	75	80
Residential – Low-Density Single Family, Duplex, Mobile							
Residential - Multi-Family							
Transient Lodging – Motels, Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Arenas, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
	Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: California Governor's Office of Planning and Research 2003

Caltrans

In 2004, Caltrans published the Transportation- and Construction-Induced Vibration Manual (Caltrans 2004), which provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage.

Table 11-11 presents recommended levels of vibration that could result in damage to structures exposed to continuous vibration.

TABLE 11-11
CALTRANS RECOMMENDED VIBRATION LEVELS

PPV (in/sec)	Effect on Buildings
0.4-0.6	Architectural damage and possible minor structural damage
0.2	Risk of architectural damage to normal dwellings
0.1	Virtually no risk of architectural damage to normal buildings
0.08	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.006-0.019	Vibration unlikely to cause damage of any type

Notes: PPV=peak particle velocity, in/sec=inches per second
Source: Caltrans 2004

In May 2011, Caltrans adopted the Traffic Noise Analysis Protocol (Protocol) for New Highway Construction, Reconstruction, and Retrofit Barrier Projects pursuant to Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772). The Protocol applies to any highway projects or multimodal project that: 1) require FHWA approval regardless of funding sources; or 2) is funded with federal-aid highway funds. Application of the Protocol and the procedures it provides ensures compliance with FHWA noise standards (Caltrans 2011).

Local

2005 General Plan

The Hazards Element in the Ventura County General Plan contains goal and policies that apply to noise in the county under Goals 2.16.1 and 2.16. 2. Table 11-12 summarizes the County's noise compatibility standards that apply to noise-sensitive uses and noise generators during discretionary review, as outlined in Policies 2.16.2.

The Ventura County General Plan also includes several area plans where local issues and concerns are dealt with in greater detail than the countywide elements of the Ventura County General Plan. The area plans with goals and policies differing from those contained in the General Plan are listed below. The Coastal Area and Local Coastal, El Rio/Del Norte, and North Ventura Avenue plans do not contain supplemental noise policies beyond those set forth in the General Plan.

TABLE 11-12 2005 VENTURA COUNTY GENERAL PLAN NOISE COMPATIBILITY STANDARDS (POLICIES 2.16.2)	
Type of Use or Activity, and Location	**Standards**
(1) Noise sensitive uses proposed to be located near highways, trucks routes, heavy industrial activities, and other relatively continuous noise sources	Incorporate noise control measures so that: a. Indoor habitable rooms do not exceed CNEL 45 b. Outdoor noise levels do not exceed CNEL 60 or $L_{eq}1H$ of 65 dB(A) during any hour.
(2) Noise sensitive uses proposed to be located near railroads	Incorporate noise control measures so that: a. Indoor habitable rooms do not exceed CNEL 45 b. Outdoor noise levels do not exceed L_{10} of 60 dB(A)
(3) Noise sensitive uses proposed to be located near airports	a. Prohibited in CNEL 65 or greater noise contour b. Permitted in CNEL 60 to 65 only if measures are taken to ensure interior noise levels of CNEL 45 or less
(4) Noise generators proposed to be located near any noise sensitive use	Noise control measures must ensure that ongoing outdoor noise levels received by sensitive receptors, as measured as the exterior wall of the building, does not exceed any of the following standards: a. $L_{eq}1H$ of 55 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 6:00 a.m. to 7:00 p.m. b. $L_{eq}1H$ of 50 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 7:00 p.m. to 10:00 p.m. c. $L_{eq}1H$ of 45 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 10:00 p.m. to 6:00 a.m.
(5) Construction noise	Shall be evaluated and, if necessary, mitigated in accordance with the County Construction Noise Threshold Criteria and Control Plan

Notes: CNEL = Community Noise Equivalent Level; dB(A) = A-weighted decibel; $L_{eq}1H$ = equivalent noise level for a one-hour period; L_{10} = noise level exceeded for 10 percent of the measurement duration
Source: County of Ventura 2005.

Oak Park Area Plan

The Hazards Element of the Oak Park Area Plan (2005) contains policies related to noise under Goals 2.4.1-1 and 2.4.1-2. (Ventura County 2005)

Ojai Valley Area Plan

The Hazards Element of the Ojai Valley Area Plan (1995) contains policies related to noise under Goals 2.4.1-1 and 2.4.1-2. (Ventura County 2015c)

Piru Area Plan

The Hazards Element of the Piru Area Plan (2011) contains policies related to noise under Goals 2.4.1-1 and 2.4.1-2. (Ventura County 2011)

Saticoy Area Plan

The Land Use and Mobility elements of the Saticoy Area Plan (2015) contain policies related to noise under LU Goal 3 and MOB Goal 1. (Ventura County 2015d)

Thousand Oaks Area Plan

The Hazards Element of the Thousand Oaks Area Plan (2015) contains policies related to noise Goals 2.3.1.-1 and 2.3.1-2 (Ventura County 2015e)

Lake Sherwood/Hidden Valley Area Plan

The Hazards Element of the Lake Sherwood/Hidden Valley Area Plan (2010) contains policies related to noise under Goals 3.3.1.-1 and 3.3.1-2 and their associated policies. (Ventura County 2010a)

Construction Noise Threshold Criteria and Control Plan

Standardized federal or State criteria have not been adopted for assessing construction noise impacts; therefore, municipal planning criteria are generally developed and applied on a project-specific basis. Construction project noise criteria take into account the existing noise environment, the time-varying noise during the various phases of construction activities, the duration of the construction, and the adjacent land use.

As specific construction noise limits for noise-sensitive locations are not currently specified in the general plan or administrative code of Ventura County, the Construction Noise Threshold Criteria and Control Plan establishes construction noise thresholds and standard noise monitoring and control measures. These threshold criteria, monitoring, and control measures are required for all discretionary development projects. Projects that exceed the noise threshold criteria at sensitive receptor sites are required to implement effective noise mitigation measures recommended by manufacturers (Ventura County 2010b).

Noise sensitive-receptors that would be affected by construction activities within the county are listed in Table 11-13, along with their corresponding periods of greatest sensitivity to construction noise.

TABLE 11-13
NOISE-SENSITIVE RECEPTORS
Ventura County

Sensitive Receptor	Typical Sensitive Time Period
Hospitals, Nursing Homes (quasi-residential)	24 hours
Single-Family and Multi-Family Dwellings (residential)	Evening/Night
Hotels/Motels (quasi-residential)	Evening/Night
Schools, Churches, Libraries (when in use)	Daytime/Evening

Source: Ventura County 2010b

Noise-Sensitive Receptors

Normally, no evening or nighttime construction activity is permitted in areas having noise-sensitive receptors; however, in the event that an activity is deemed necessary and is permitted (e.g., emergency situations or roadway repairs that are timed to avoid peak hour traffic conditions), reduced noise threshold

criteria are provided for construction that must occur during those hours. The County of Ventura construction noise threshold criteria for daytime, evening, and nighttime hours is shown in Table 11-14.

TABLE 11-14
DAYTIME[1] CONSTRUCTION ACTIVITY NOISE THRESHOLD CRITERIA
Ventura County

Construction Duration Affecting Noise-Sensitive Receptors[2]	Noise Threshold Criteria[1]	
	Fixed L_{eq}(h) (dB)	Hourly L_{eq} (dB)[2,3]
Daytime (Mon. to Fri. from 7:00 a.m. to 7:00 p.m.; Sat., Sun., and Holidays from 9:00 a.m. to 7:00 p.m.)		
0 to 3 days	75	Ambient L_{eq}(h) + 3
4 to 7 days	70	Ambient L_{eq}(h) + 3
1 to 2 weeks	65	Ambient L_{eq}(h) + 3
2 to 8 weeks	60	Ambient L_{eq}(h) + 3
Longer than 8 weeks	55	Ambient L_{eq}(h) + 3
Evening (7:00 p.m. to 10:00 p.m.)		
Any Duration	50	Ambient L_{eq}(h) + 3
Nighttime (Mon. to Fri. from 10:00 p.m. to 7:00 a.m.; Sat., Sun., and Holidays from 10:00 p.m. to 9:00 a.m.)		
Any Duration	45	Ambient L_{eq}(h) + 3

Notes: L_{eq}=equivalent noise level, L_{eq}(h)=hourly equivalent noise level, dB= decibel, L_{max}=maximum sound level
[1] The applicable noise threshold criteria shall be the greater of the noise levels presented in the table at the nearest receptor area or 10 feet from the nearest noise sensitive building.
[2] The instantaneous L_{max} shall not exceed the noise threshold criteria by 20 dB more than eight times per daytime hour, six times per evening hour, or four times per nighttime hour.
[3] Local ambient L_{eq} measurements shall be made on any mid-week day prior to project work.
Source: Ventura County 2010b

Ventura County Noise Ordinance

The Ventura County Noise Ordinance was adopted by the County Board of Supervisors to protect residential communities from loud or raucous nighttime noise. The Ordinance prohibits the creation of loud or raucous noise from within a residential zone, which is audible to the human ear during the hours of 9:00 p.m. to 7:00 a.m. at a distance of 50 feet from the property line of the noise source or 50 feet from any such noise source if the noise source is in a public right-of-way. The Ordinance defines "loud or raucous noise" as sounds from (1) the use or operation of any radio, musical instrument, phonograph, television receiver, video cassette recorder, or any machine or device for the production, reproduction, or amplification of the human voice or any other sound, or (2) the use or operation of any lawn mower, backpack blower, blower, lawn edger, riding tractor, or other mechanical or electrical device or hand tool.

Airport Comprehensive Land Use Plan for Ventura County

The State Aeronautics Act (Public Utilities Code, Section 21670 et seq.) requires the preparation of an airport land use compatibility plan (ALUCP) for nearly all public-use airports in the State. The intent of an ALUCP is to encourage compatibility between and airport and the various land uses surrounding it (Caltrans 2011).

California State law requires the County Board of Supervisors to establish an airport land use commission (ALUC) in each county with an airport operated for the benefit of the general public. The Code also sets forth a range of responsibilities, duties, and powers of the ALUC. These include reviewing general plans,

proposed changes to zoning code and ordinances, land use actions and development projects, and airport development plans for consistency with compatibility policies. California State law also dictates that the county and affected cities modify their general and specific plans to be consistent with the ALUC's plan, or to take steps to overrule the ALUC. State law allows the County Board of Supervisors to authorize and appropriately designated body to fulfill ALUC responsibilities. For Ventura County, the Board of Supervisors has designated the Ventura County Transportation Commission (VCTC) to act as the ALUC for the County (Ventura County ALUC 2000).

The Ventura County Airports Comprehensive Land Use Plan (CLUP) serves as a complete plan for the County's three public-use airports and one military airport (i.e., Camarillo, Oxnard, Santa Paula, and Naval Base Ventura County Point Mugu). The CLUP is the primary document used by the Ventura County ALUC to help promote compatibility between the four airports and their environs. Included in the CLUP are a series of compatibility factors, zones and policies related to noise, safety, airspace protection, and over-flight activity (Ventura County ALUC 2000). For the purposes of this section, noise-related impact zones and compatibility policies in the CLUP are discussed below.

The CLUP includes four maps (depicted in Figure 11-14, Figure 11-15, Figure 11-16, Figure 11-17 of this document) showing noise contours depicting the greatest annualized noise impact, measured in terms of CNEL. The mapped noise contours for Oxnard Airport and NBVC Point Mugu are shown for the year 1991, Santa Paula Airport for 2015, and Camarillo Airport for the composite years 2003 and 2018. According to the CLUP, all proposed land use changes beyond the 60 CNEL contour are considered consistent with the noise compatibility policies set forth by the CLUP. For any proposed land-use changes within the 60 CNEL or greater, specific noise compatibility criteria apply based on corresponding land use categories and subcategories. Design and construction mitigation to attenuate noise must be applied to certain land uses to achieve consistency with the CLUP. The CLUP noise compatibility criteria are shown in Table 11-15.

TABLE 11-15
VENTURA COUNTY AIRPORT CLUP: NOISE COMPATIBILITY CRITERIA

Land Use Category1	Exterior Noise Exposure (dB CNEL)				
	60-65	65-70	70-75	75-80	>80
Residential					
Single Family	C[1]	U	U	U	U
Multi-Family	C[1]	U	U	U	U
Mobile Home Parks	U	U	U	U	U
Public/Institutional					
Hospitals/Convalescent Homes	C[1]	C[2]	U	U	U
Schools	C[1]	C[2]	U	U	U
Churches/Synagogues	C[1]	C[2]	U	U	U
Auditoriums/Theatres	C[1]	C[2]	C[3]	U	U
Transportation Terminals	A	A	C[4]	C[5]	C[6]
Communication/Utilities	A	A	C[4]	C[5]	C[6]
Automobile Parking	A	A	C[4]	C[5]	C[6]
Commercial					
Hotels and Motels	C[1]	C[2]	C[3]	U	U
Offices and Business/Professional Services	A	A	C[7]	C[8]	U
Wholesale	A	A	C[4]	C[5]	C[6]
Retail	A	A	C[7]	C[h]	U
Industrial					
Manufacturing—General/Heavy	A	A	C[4]	C[5]	C[6]
Light Industrial	A	A	C[4]	C[5]	C[5]
Research and Development	A	A	C[4]	C[5]	C[5]
Business Parks/Corporate Offices	A	A	C[4]	C[5]	C[5]
Recreation/Open Space					
Outdoor Sports Arenas	A	C	C	U	U
Outdoor Amphitheaters	U	U	U	U	U
Parks	A	A	A	U	U
Outdoor Amusement	A	A	A	U	U
Resorts and Camps	A	A	A	U	U
Golf Course and Water Recreation	A	A	A	U	U
Agriculture	A	A	A	A	A

Notes: A=Acceptable land use, C=Land use is conditional upon meeting compatibility criteria (see footnotes), U=Unacceptable land use, CNEL=community noise equivalent level, dB=decibel, NLR=noise level reduction, dBA=A-weighted decibels

[1] New construction or development may be undertaken only after an analysis of noise reduction requirements and necessary noise insulation is included in the design.

[2] NLR from outdoors to indoor of at least 25 dBA must be achieved by incorporation of noise attenuation into the design and construction of the structure.

[3] NLR from outdoor to indoor of at least 30 dBA must be achieve by incorporation of noise attenuation into the design and construction of the structure.

[4] Measures to achieve NLR of 25 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[5] Measures to achieve NLR of 30 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[6] Measures to achieve NLR of 35 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[7] NLR of 25 dBA is required.

[8] NLR of 30 dBA is required.

Notes: A=Acceptable land use, C=Land use is conditional upon meeting compatibility criteria (see footnotes), U=Unacceptable land use, CNEL=community noise equivalent level, dB=decibel

Source: Ventura County ALUC 2000.

As shown in Figure 11-14 through Figure 11-17, residential, commercial, and/or industrial land uses are located within the 60 CNEL noise contour. Any proposed land use changes in this vicinity may be subject to the Noise Compatibility Criteria. As demonstrated in Table 11-15, land use subcategories within the 60-65 CNEL range identified as "Conditional" would be subject to design and/or construction standards to attenuate airport-related noise on such land uses.

Ventura County Department of Aviation Noise Abatement Procedures

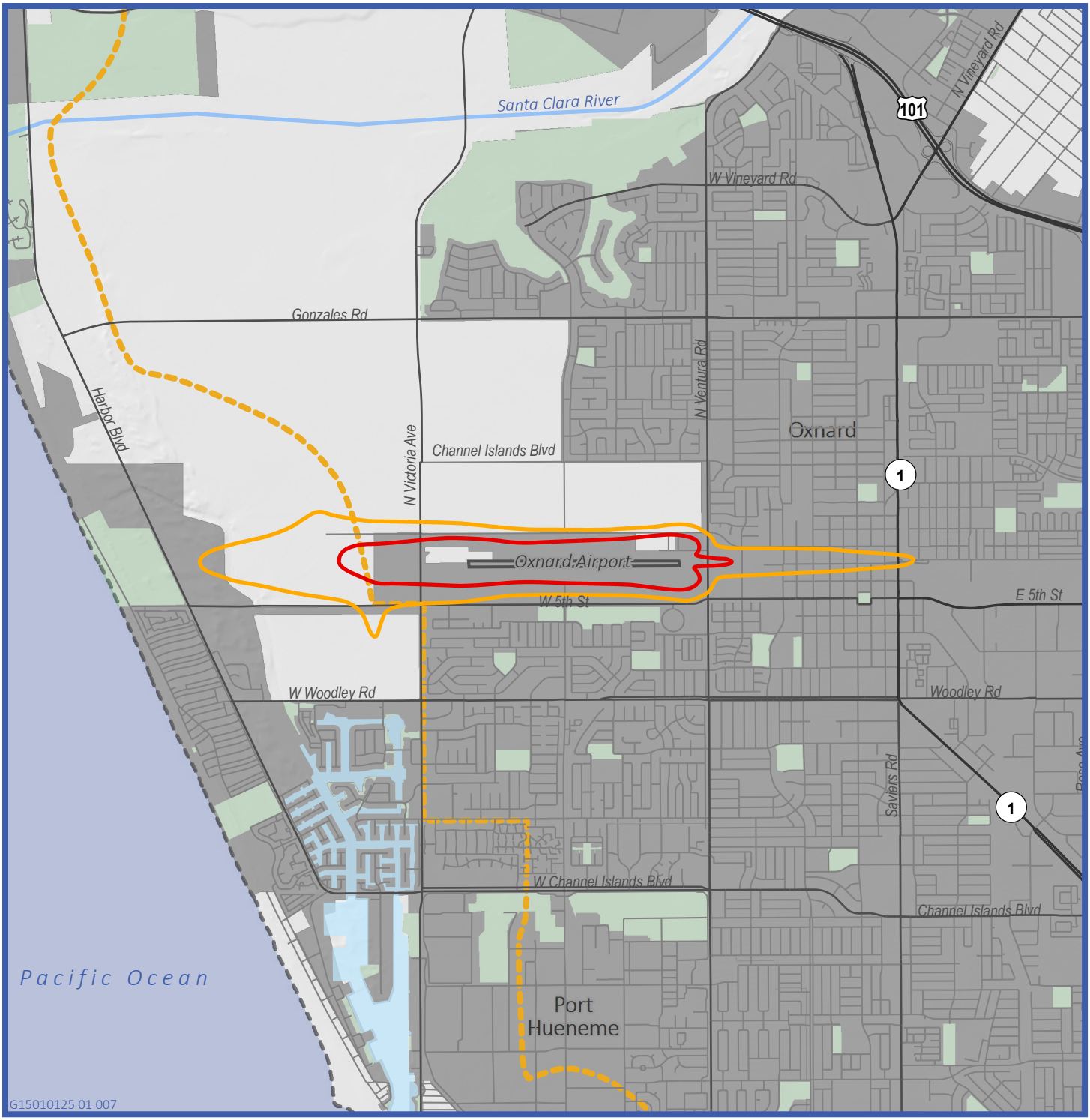
The Ventura County Department of Airports (collectively, "the Department") has adopted noise abatement procedure for visual flight rules (VFR) for Oxnard and Camarillo airports. The Department provides instructions outlining departures, arrivals, and pattern procedures at each airport that are aimed at minimizing noise exposure over noise-sensitive areas without compromising safety. Pilots are requested to follow the published procedures unless circumstances render them unsafe, weather conditions do not allow, or they are otherwise instructed to deviate by the airport traffic control tower.

The following noise abatement procedures apply to all aircrafts departing and/or approaching the Oxnard Airport (Ventura County 2016a):

- Voluntary curfew from 11:00 p.m. to 6:00 a.m.;
- Remain as high as practical over residential areas during overflight, approaches, and departures;
- Use best rate of climb when departing any runway;
- No formation takeoff or landings without prior permissions of the Airport Director;
- Touch-and-go's (i.e., landing on a runway and taking off again without coming to a complete stop) and stop-and-go's are prohibited between the hours of 8:00 p.m. and 7:00 a.m. from Monday to Friday, and from 8:00 p.m. to 8:00 a.m. on the weekends;
- Full stop/taxi back operations will be permitted only if the aircraft plans to depart the airport traffic area; and
- No high-power engine run-ups for maintenance between 7:00 p.m. and 7:00 a.m.

The following noise abatement procedures apply to all aircrafts departing and/or approaching the Camarillo Airport (Ventura County 2016b):

- No aircraft departures between 12:00 a.m. and 5:00 a.m. without prior approval from the Airport director;
- Remain as high as practical over residential areas during overflight, approaches, and departures;
- Use best rate of climb when departing any runway;
- No formation takeoffs or landings without prior permission of the Airport Director;
- Utilize low energy approaches;
- Avoid residential overflights ("Fly Friendly," Air Craft Owners and Pilots Association Guidelines); and
- North traffic fly downwind over US-101.



Ventura County 2040 GENERAL PLAN

Figure 11-14:
Oxnard Airport Noise Contours

Map Date: November 16, 2016

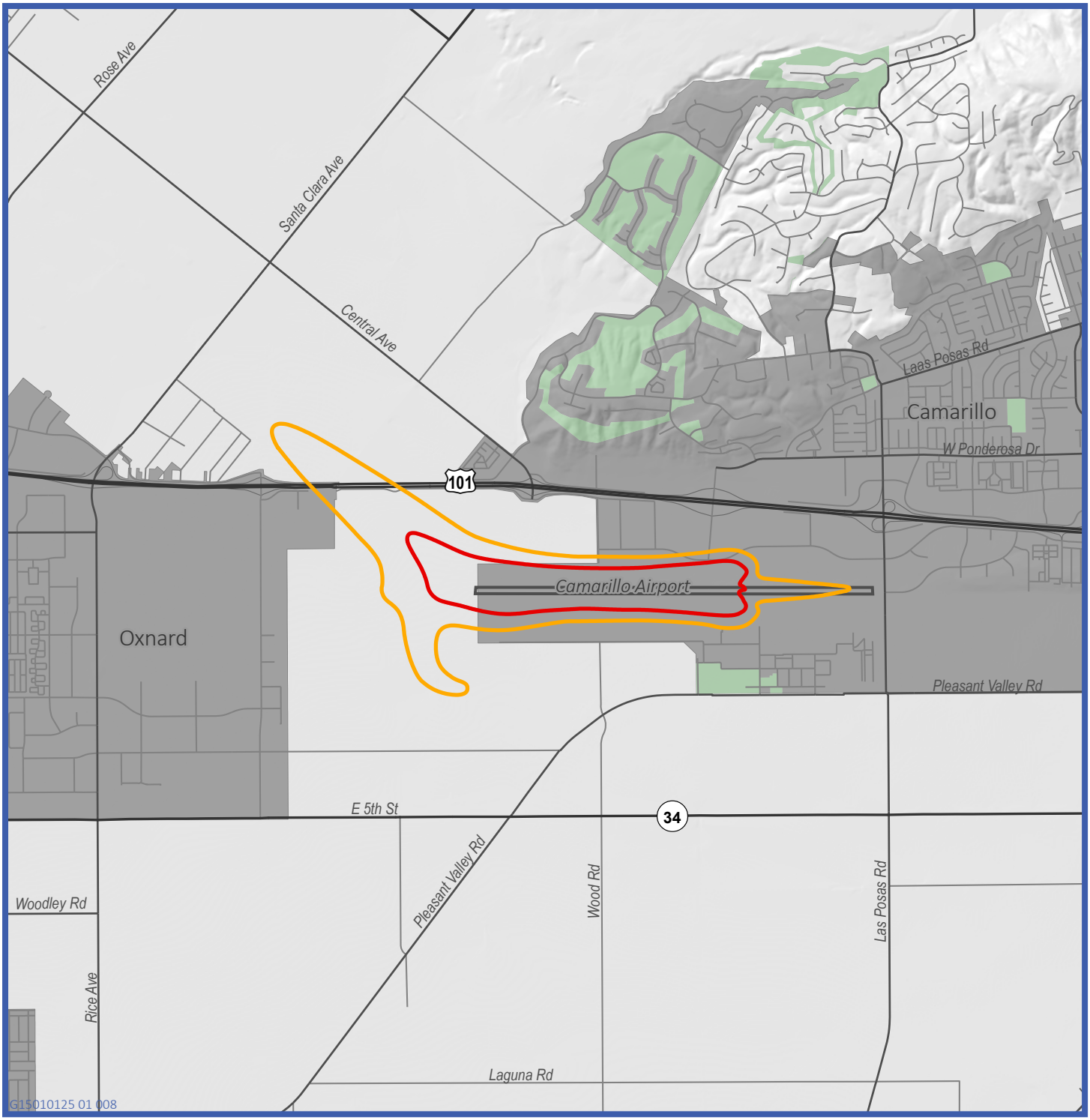
Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 0.7 1.4 Miles

N

Coastal Zone Boundary
Major Roadways
Water Bodies
Cities

Noise Contours
60 dBA CNEL
65 dBA CNEL



Ventura County 2040 GENERAL PLAN

Figure 11-15:
Camarillo Airport Noise Contours

Map Date: November 16, 2016

Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 0.7 1.4 Miles

N

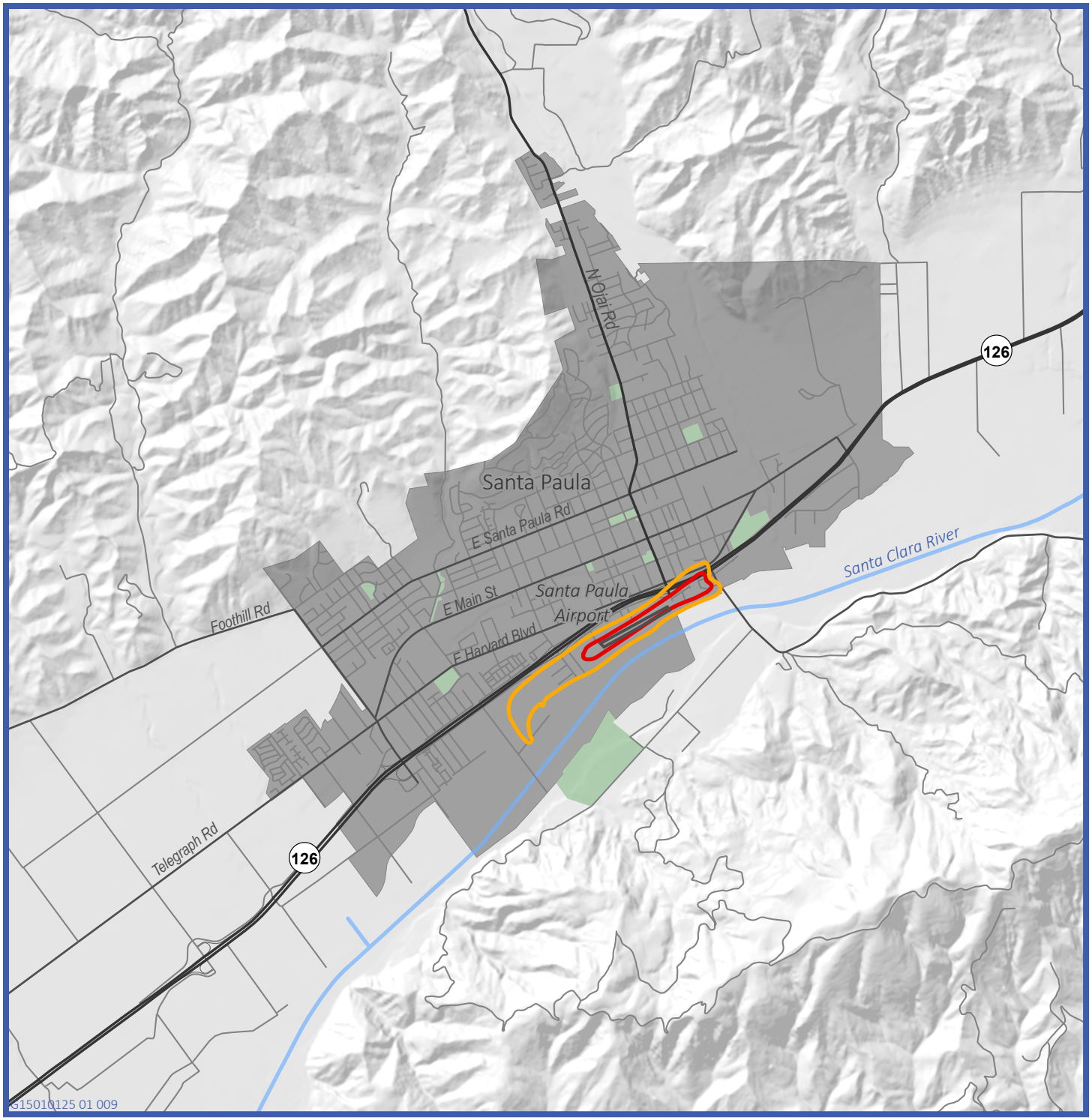
Major Roadways

Cities

Noise Contours

60 dBA CNEL

65 dBA CNEL



Ventura County 2040 GENERAL PLAN

Figure 11-16:
Santa Paula Airport Noise Contours

Major Roadways
Major Waterways
Cities

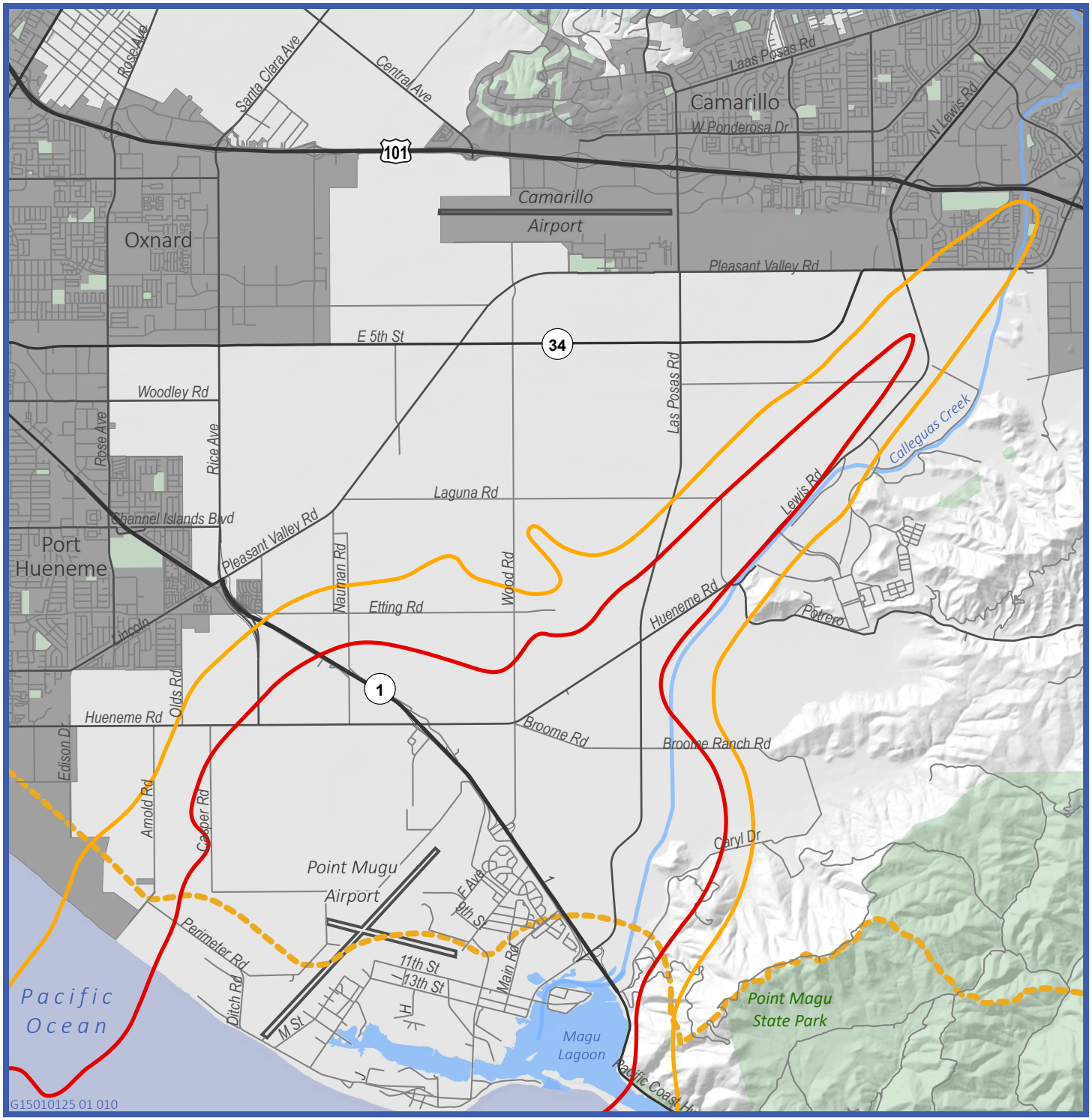
Noise Contours
60 dBA CNEL
65 dBA CNEL

Map Date: November 16, 2016

Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 0.7 1.4 Miles

N



Ventura County 2040 GENERAL PLAN

Figure 11-17: NAWS at Point Mugu Noise Contours

Map Date: November 16, 2016

Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 1 2 Miles

N

- Coastal Zone Boundary
- Major Roadways
- Major Waterways
- Water Bodies
- Cities

Noise Contours

- 60 dBA CNEL
- 65 dBA CNEL

Key Terms

A-Weighted Sound Level. An A-weighted sound level is the frequency-response adjustment of a sound level meter that conditions the output signal to approximate human hearing response.

Airport Land Use Compatibility Plan (ALUCP). The California State Aeronautics Act (Public Utilities Code, Section 21670 et seq.) requires the preparation of an airport land use compatibility plan (ALUCP) for nearly all public-use airports in the state. The intent of the ALUCP is to encourage compatibility between airports and the various land uses that surround them.

Community Noise Equivalent Level (CNEL). A CNEL is similar to the L_{dn} with an additional 5 dB penalty applied during the noise-sensitive hours from 7 p.m. to 10 p.m., which are typically reserved for relaxation, conversation, reading, and watching television.

Day-Night Noise Level (L_{dn}). L_{dn} is the 24-hour L_{eq} with a 10 dB penalty applied during the noise-sensitive hours from 10 p.m. to 7 a.m., which are typically reserved for sleeping.

Decibel (dB). A dB is a sound level expressed in decibels which is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure.

Equivalent Noise Level (L_{eq}). An L_{eq} is the equivalent steady-state noise level in a stated period of time that would contain the same acoustic energy as the time-varying noise level during the same period (i.e., average noise level).

Maximum Noise Level (L_{max}). The L_{max} is the highest instantaneous noise level during a specified time period.

Minimum Noise Level (L_{min}). The L_{min} is the lowest instantaneous noise level during a specified time period.

Noise Exposure Contours. Noise exposure contours are noise exposure levels as a function of distance from the noise source.

Noise-Sensitive Area. A noise-sensitive place in a place where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Examples include residences, cemeteries, churches, and hospitals.

Peak Particle Velocity (PPV). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings.

Root-Mean-Square (RMS). RMS is the average of the squared amplitude of a vibration signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration. Because the human body responds to average vibration amplitude, RMS velocity values as measured in VdB are used to estimate vibration effects on humans.

Single-Event Noise Exposure Level (SENEL). The single event noise exposure level, in decibels (dB), is the noise exposure level of a single event, such as an aircraft flyby, measured over the time interval

between the initial and final times for which the noise level of a single event exceeds a given threshold noise level.

Vibration Decibels (VdB). Average vibration amplitude is a more appropriate measure for human response as it takes time for the human body to respond. Average particle velocity over time is zero, so the root-mean-square (RMS) amplitude velocity level, measured in VdB, is used to quantify annoyance.

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