Archaeological Resources Technical Report for the City of Santa Ana General Plan Update, Orange County, California

MAY 2020

PREPARED FOR

PlaceWorks

PREPARED BY

SWCA Environmental Consultants

ARCHAEOLOGICAL RESOURCES TECHNICAL REPORT FOR THE CITY OF SANTA ANA GENERAL PLAN UPDATE, ORANGE COUNTY, CALIFORNIA

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EXECUTIVE SUMMARY

Purpose and Scope: In support of the forthcoming City of Santa Ana General Plan Update, PlaceWorks retained SWCA Environmental Consultants (SWCA) to summarize the existing conditions of archaeological resources within the General Plan area, and to provide mitigation measures for potential impacts. The General Plan area includes the entirety of the City of Santa Ana, totaling approximately 17,472 acres (27.3 square miles [70.7 km^2]). Methods include background research, an archaeological resources records search, and a literature review.

Dates of Investigation: SWCA conducted a California Historical Resources Information System (CHRIS) records search at the South Central Coastal Information Center, located at the California State University, Fullerton, on February 19, 2019. SWCA also requested a Sacred Lands File Search from the California Native American Heritage Commission (NAHC) on February 22, 2019, and received the results on March 1, 2019.

Summary of Findings: The CHRIS records search indicates that eight previously-recorded archaeological resources were identified within the General Plan area: four of which are prehistoric, three are historic and one is a multi-component resource. Of these resources, two—CA-ORA-300 and CA-ORA-353—contain, and are on the vicinity of, known prehistoric burials. The vicinity surrounding these resources should be considered highly sensitive. Coordination with the NAHC also indicates that there are tribal cultural resources within the General Plan area. A review of historic and ethnographic maps indicates that there is a moderate likelihood for encountering intact subsurface prehistoric and historic archaeological resources. While almost the entirety of the General Plan area has been extensively developed, redevelopment within the City may expose previously unknown resources. With planning and the implementation of the proposed cultural resources mitigation measures, impacts to archaeological resources can be reduced to less than significant.

Mitigation Measures CUL-1 through CUL-4 (below) were developed to reduce potential individual and cumulative impacts associated with future development and redevelopment. Mitigation Measure CUL-1 requires an archaeological resources assessment be conducted for future development projects to identify any known archaeological resources and sensitivity of the site. Mitigation Measures CUL-2 through CUL-4 detail the next steps required should the archaeological resources assessment identify known resources or determine the site to have high or moderate resource sensitivity. Upon compliance with Mitigation Measures CUL-1 through CUL-4, individual and cumulative impacts to archaeological resources would be reduced to less than significant levels.

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INTRODUCTION

In support of the forthcoming City of Santa Ana General Plan Update, PlaceWorks retained SWCA Environmental Consultants (SWCA) to summarize the existing conditions of cultural resources within all unincorporated lands that are subject to the City of Santa Ana land use jurisdiction. The General Plan area occupies the entirety of the City of Santa Ana (City), Orange County, California. Methods include background research, a cultural resources records search and literature review, and Sacred Lands File search. Cultural Resources Project Manager and Archaeologist Alyssa Newcomb, M.S., Registered Professional Archaeologist (RPA), managed the study, conducted file searches, and coauthored this report. SWCA Archaeologists Amber Johnson, B.A., also contributed to the study and report. SWCA Geographic Information Systems (GIS) Specialist John Walls created the maps for the report, and SWCA Technical Editor Ruthe Smith, M.S., edited and formatted the document. SWCA Cultural Resources Program Director Heather Gibson, Ph.D., RPA, provided quality assurance/quality control.

Project Description

The proposed project is a comprehensive update to the City of Santa Ana's General Plan (1982). The City's General Plan was last updated in 1982, with some updates to the City's Land Use Element, Circulation Element, Urban Design Element, and Economic Development in 1998. In March of 2014, the City Council adopted the Santa Ana Strategic Plan, identifying the need for a comprehensive update to the City's Existing General Plan. The General Plan is the City's principal policy and planning document guiding the development, conservation, and enhancement of Santa Ana. It contains a comprehensive collection of goals and policies related to the physical development of the City, and the General Plan Update is intended to result in a total of 11 elements to guide the physical development, quality of life, economic health, and sustainability of the Santa Ana community.

The City identified five areas suited for new growth and development: South Main Street, Grand Avenue/17th Street, West Santa Ana Boulevard, 55 Freeway/Dyer Road, and South Bristol Street. These five areas are located along major travel corridors, the future OC Streetcar line, and/or linked to the Downtown. In general, many areas currently designated for General Commercial and Professional Office are expanding opportunities for residential development through a proposed change to the Urban Neighborhood or District Center General Plan land use designations. Industrial Flex would be introduced where Industrial land use designations currently exist within each of the five focus areas in order to allow for cleaner industrial and commercial uses with live-work opportunities.

Project Location

The City of Santa Ana is located in the southwest portion of California, bordered by Anaheim to the north, Garden Grove to the west, Huntington Beach and Newport Beach to the southwest, and Irvine to the southeast (Figure 1). As shown in Table 1, the City is plotted in numerous Townships, Ranges, and Sections, as depicted on the U.S. Geological Survey (USGS) Anaheim, Orange, Newport Beach, and Tustin 7.5 minute quadrangles (Figure 2). Encompassing approximately 27.3 square miles (70.7 km^2), Santa Ana is the County Seat and second largest city in Orange County, and eleventh largest in California (Figure 3). The Santa Ana River runs northeast-southwest through the western side of the city. Interstate 5 (I-5), a major north-south route through California, passes through the northern portion of Santa Ana. Another major interstate, Interstate 405 (I-405), is located just south of the City's limits and serves as a major north-south connector between Greater Los Angeles, Orange County, and San Diego County.

Table 1. Locational Information

Quadrangle (7.5’)	Township	Range	Sections
Anaheim, CA	T5S	R10W	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 26, 27, 28, 33, 34, 35, 36,
Anaheim, CA	T4S	R10W	25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
Orange, CA	T4S	R9W	5, 6, 7, 8, 27, 28, 29, 30, 31, 32, 33, 34
Orange, CA	T5S	R9W	3, 4, 5, 6, 7, 8, 9, 10
Newport Beach, CA	T5S	R10W	13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 32, 33, 34, 35, 36
Newport Beach, CA	T6S	R10W	1, 2, 3, 4, 5,
Tustin, CA	T5S	R9W	15, 16, 17, 18, 19, 20, 21, 22, 28, 29 30, 31, 32, 33
Tustin, CA	T6S	R9W	4, 5, 627

Figure 1. General Plan area.

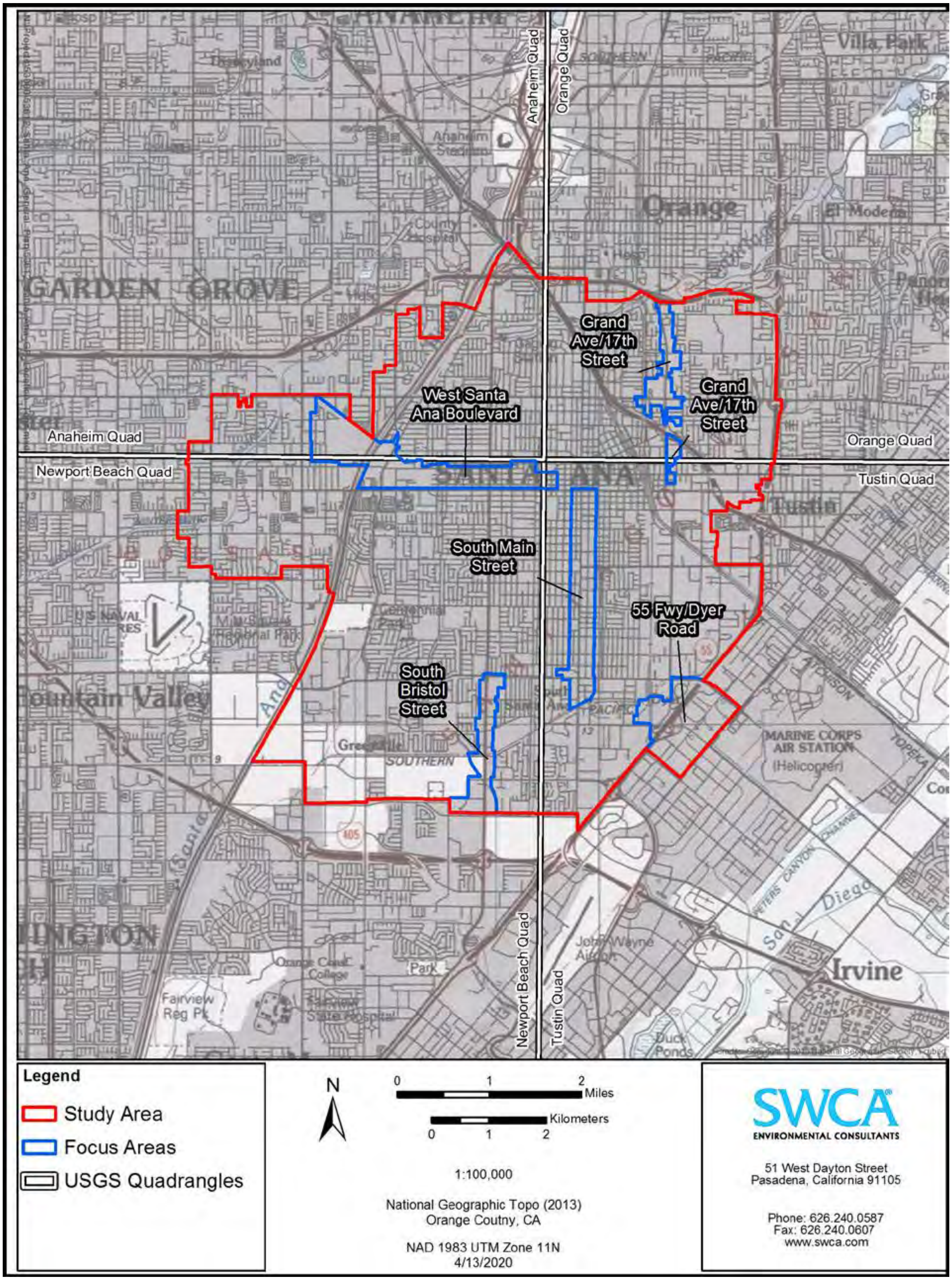


Figure 2. Location of General Plan area.

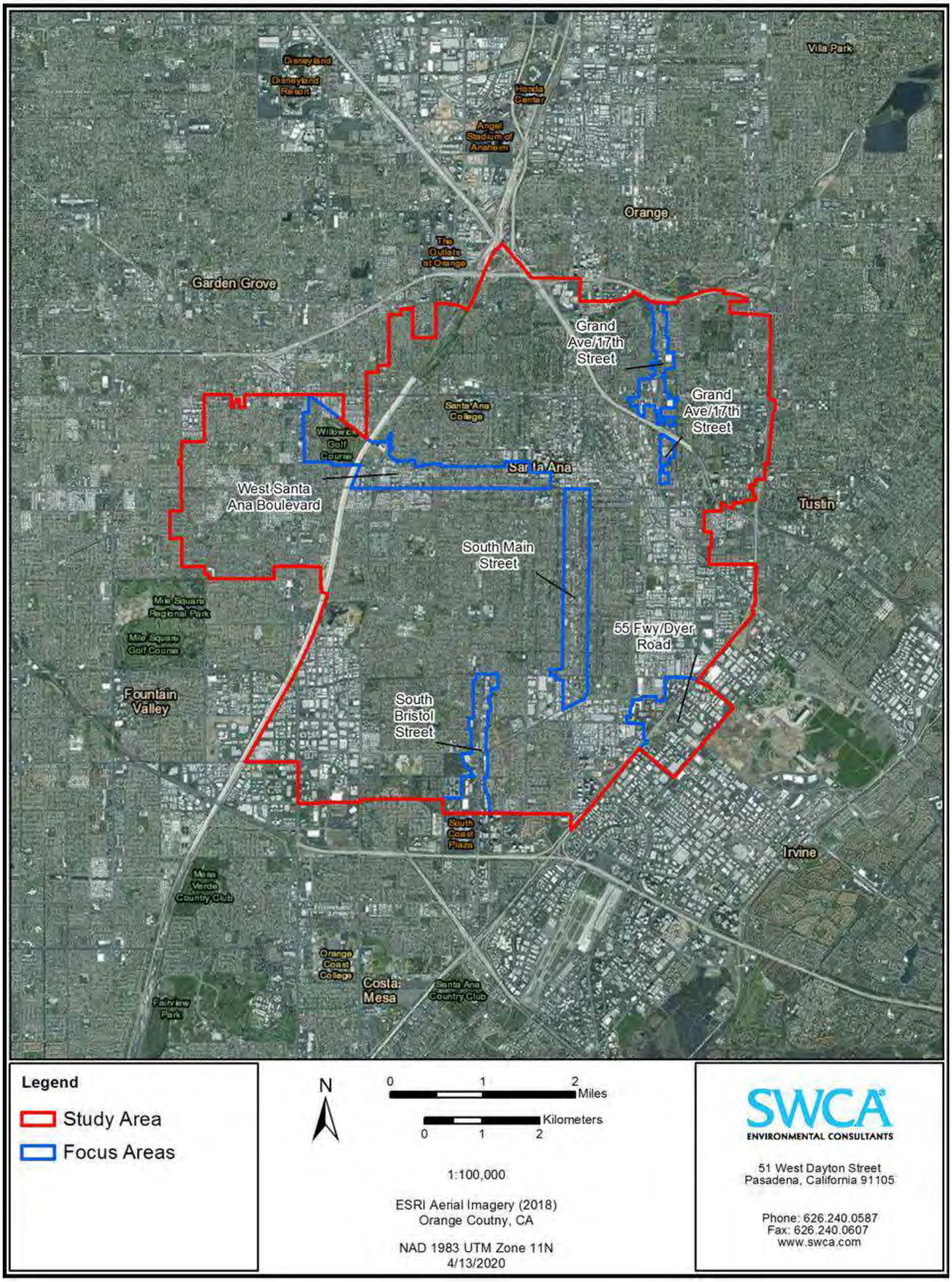


Figure 3. Overview of General Plan area.

REGULATORY SETTING

A complex network of federal, state, and local regulations governs the cultural resources of California. This section is intended as an overview of these regulations rather than an in-depth review. This section reviews the federal, state, and local regulations and policies that may be pertinent to the update of the City's General Plan.

Federal Regulations

National Historic Preservation Act of 1966

Enacted in 1966 and amended most recently in 2014, the National Historic Preservation Act (NHPA; 54 United States Code [USC] 300101 et seq.) instituted a multifaceted program, administered by the Secretary of the Interior, to encourage sound preservation policies of the nation's cultural resources at the federal, state, and local levels. The NHPA authorized the expansion and maintenance of the National Register of Historic Places (NRHP), established the position of State Historic Preservation Officer, and provided for the designation of State Review Boards. The NHPA also set up a mechanism to certify local governments to carry out the goals of the NHPA, assisted Native American tribes to preserve their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP).

NATIONAL REGISTER OF HISTORIC PLACES

The National Register of Historic Places was established by the NHPA of 1966 as "an authoritative guide to be used by Federal, State, and local governments, private groups and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" (36 Code of Federal Regulations [CFR] part 60.2). The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, and association.

Significance

A property is eligible for the NRHP if it is significant under one or more of the following criteria:

- **Criterion A:** It is associated with events that have made a significant contribution to the broad patterns of our history;
- **Criterion B:** It is associated with the lives of persons who are significant in our past;
- **Criterion C:** It embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; and/or
- **Criterion D:** It has yielded, or may be likely to yield, information important in prehistory or history. Ordinarily cemeteries, birthplaces, or graves of historic figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, and properties that are primarily commemorative in nature, are not considered eligible for listing in the NRHP, unless they satisfy certain conditions. In general, a resource must be 50 years of age to be considered for the NRHP, unless it satisfies a standard of exceptional importance.

Integrity

In addition to meeting these criteria, a property must retain historic integrity, which is defined in National Register Bulletin 15 as the "ability of a property to convey its significance" (National Park Service 1990). In order to assess integrity, the National Park Service recognizes seven aspects or qualities that, considered together, define historic integrity. To retain integrity, a property must possess several, if not all, of these seven qualities, which are defined in the following manner in National Register Bulletin 15:

- **Location:** the place where the historic property was constructed or the place where the historic event occurred;
- **Design:** the combination of elements that create the form, plan, space, structure, and style of a property;
- **Setting:** the physical environment of a historic property;
- **Materials:** the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property;
- **Workmanship:** the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;
- **Feeling:** a property's expression of the aesthetic or historic sense of a particular period of time; and/or
- **Association:** the direct link between an important historic event or person and a historic property.

Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC 3001 et seq.) protects human remains, funerary objects, sacred objects, and items of cultural patrimony of indigenous peoples on federal lands. NAGPRA stipulates priorities for assigning ownership or control of such cultural items excavated or discovered on federal or tribal lands, or in the possession and control of an agency that has received federal funding.

NAGPRA also provides for the repatriation of human remains and associated items previously collected from federal lands and in the possession or control of a federal agency or federally funded repository. Implementing regulations are codified in 43 CFR Part 10. In addition to defining procedures for dealing with previously collected human remains and associated items, these regulations outline procedures for negotiating plans of action or comprehensive agreements for treatment of human remains and associated items encountered in intentional excavations, or inadvertent discoveries on federal or tribal lands.

National Historic Landmarks Program

The National Historic Landmarks Program was established to preserve, protect, and maintain U.S. National Historic Landmarks (NHLs). The NHL Program is "a list of nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage" (National Park Service [NPS] 2018) of the U.S. The difference between the NHL Program and the NRHP is that the NHL Program contains properties that are important to the entire nation, rather than properties that can be important to local, state, or federal levels.

Antiquities Act of 1906

The Antiquities Act of 1906 (PL 59-209; 34 Statute 225; 16 USC 431-433) was the first federal law to provide protection of historic and prehistoric resources located on federal land. This act prohibits any excavation on public land without permission of the appropriate department secretary. The Antiquities Act authorizes the Secretaries of the Interior, Agriculture, and Army to grant permission to reputable institutions to conduct research (including excavation) to increase knowledge and the permanent preservation of antiquities in public museums. This act authorizes the President to declare areas of federal lands as national monuments. Preservation of American Antiquities (43 CFR Part 3) implements the Antiquities Act, defining jurisdiction over cultural resources on federal land and the permit process for excavations.

State Regulations

The California Office of Historic Preservation (OHP), a division of the California Department of Parks and Recreation, is responsible for carrying out the duties described in the California Public Resources Code (PRC) and maintaining the California Historic Resources Inventory and California Register of Historical Resources (CRHR). The state-level regulatory framework also includes the California Environmental Quality Act (CEQA), which requires the identification and mitigation of substantial adverse impacts that may affect the significance of eligible historical and archaeological resources.

California Register of Historical Resources

Created in 1992 and implemented in 1998, the CRHR is “an authoritative guide in California to be used by state and local agencies, private groups, and citizens to identify the state’s historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change” (PRC Sections 21083.2 and 21084.1). Certain properties, including those listed in or formally determined eligible for listing in the NRHP and California Historical Landmarks numbered 770 and higher, are automatically included in the CRHR. Other properties recognized under the California Points of Historical Interest program, identified as significant in historical resources surveys, or designated by local landmarks programs may be nominated for inclusion in the CRHR. According to PRC Section 5024.1(c), a resource, either an individual property or a contributor to a historic district, may be listed in the CRHR if the State Historical Resources Commission determines that it meets one or more of the following criteria, which are modeled on NRHP criteria:

- **Criterion 1:** It is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.
- **Criterion 2:** It is associated with the lives of persons important in our past.
- **Criterion 3:** It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
- **Criterion 4:** It has yielded, or may be likely to yield, information important in history or prehistory.

Resources nominated to the CRHR must retain enough of their historic character or appearance to convey the reasons for their significance. Resources whose historic integrity does not meet NRHP criteria may still be eligible for listing in the CRHR.

California Environmental Quality Act

CEQA requires a lead agency to analyze whether historic and/or archaeological resources may be adversely affected by a proposed project. Under CEQA, a "project that may cause a substantial adverse change in the significance of a historic resource is a project that may have a significant effect on the environment" (PRC Section 21084.1). Answering this question is a two-part process: first, the determination must be made as to whether the proposed project involves cultural resources. Second, if cultural resources are present, the proposed project must be analyzed for a potential "substantial adverse change in the significance" of the resource.

HISTORICAL RESOURCES

According to State CEQA Guidelines Section 15064.5, for the purposes of CEQA, historical resources are:

- A resource listed in, or formally determined eligible…for listing in the California Register of Historical Resources (PRC 5024.1, Title 14 California Code of Regulations [CCR], Section 4850 et seq.).
- A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in a historic resources survey meeting the requirements of Section 5024.1(g) of the Public Resources Code.
- Any object, building, structure, site, area, place, record, or manuscript that the lead agency determines to be eligible for national, state, or local landmark listing; generally, a resource shall be considered by the lead agency to be historically significant (and therefore a historic resource under CEQA) if the resource meets the criteria for listing on the California Register (as defined in PRC Section 5024.1, Title 14 CCR, Section 4852).

Resources nominated to the CRHR must retain enough of their historic character or appearance to convey the reasons for their significance. Resources whose historic integrity (as defined above) does not meet NRHP criteria may still be eligible for listing in the CRHR.

According to CEQA, the fact that a resource is not listed in or determined eligible for listing in the CRHR or is not included in a local register or survey shall not preclude the lead agency from determining that the resource may be a historical resource (PRC Section 5024.1). Pursuant to CEQA, a project with an effect that may cause a substantial adverse change in the significance of a historical resource may have a significant effect on the environment (State CEQA Guidelines, Section 15064.5[b]).

Substantial Adverse Change and Indirect Impacts to Historical Resources

State CEQA Guidelines specify that a "substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (State CEQA Guidelines, Section 15064.5). Material impairment occurs when a project alters in an adverse manner or demolishes "those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion" or eligibility for inclusion in the NRHP, CRHR, or local register. In addition, pursuant to State CEQA Guidelines Section 15126.2, the "direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects."

The following guides and requirements are of particular relevance to this study's analysis of indirect impacts to historic resources. Pursuant to State CEQA Guidelines (Section 15378), study of a project under CEQA requires consideration of “the whole of an action, which has the potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment.” State CEQA Guidelines (Section 15064[d]) further define direct and indirect impacts:

1. A direct physical change in the environment is a physical change in the environment which is caused by and immediately related to the project.
2. An indirect physical change in the environment is a physical change in the environment which is not immediately related to the project, but which is caused indirectly by the project. If a direct physical change in the environment in turn causes another change in the environment, then the other change is an indirect physical change in the environment.
3. An indirect physical change is to be considered only if that change is a reasonably foreseeable impact which may be caused by the project.

ARCHAEOLOGICAL RESOURCES

In terms of archaeological resources, PRC Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

If it can be demonstrated that a proposed project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (PRC Sections 21083.2[a], [b], and [c]). CEQA notes if an archaeological resource is neither a unique archaeological resource nor a historical resource, the effects of the project on those resources shall not be considered to be a significant effect on the environment (State CEQA Guidelines Section 15064.5[c][4]).

CALIFORNIA STATE SENATE BILL 18

Signed into law in 2004, Senate Bill (SB) 18 requires that cities and counties notify and consult with California Native American tribes about proposed local land use planning decisions for the purpose of protecting traditional tribal cultural sites. Cities and counties must provide general and specific plan amendment proposals to California Native American tribes that the California Native American Heritage Commission (NAHC) has identified as having traditional lands located within the city’s boundaries. If requested by the Native American tribes, the city must also conduct consultations with the tribes prior to adopting or amending their general and specific plans.

CALIFORNIA STATE ASSEMBLY BILL 52

Assembly Bill 52 of 2014 (AB 52) amended PRC Section 5097.94 and added PRC Sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3.

Consultation with Native Americans

AB 52 formalizes the lead agency–tribal consultation process, requiring the lead agency to initiate consultation with California Native American groups that are traditionally and culturally affiliated with the project, including tribes that may not be federally recognized. Lead agencies are required to begin consultation prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report.

Tribal Cultural Resources

Section 4 of AB 52 adds Sections 21074(a) and (b) to the PRC, which address tribal cultural resources and cultural landscapes. Section 21074(a) defines tribal cultural resources as one of the following:

1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:
   A. Included or determined to be eligible for inclusion in the California Register of Historical Resources.
   B. Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.
2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

Section 1(a)(9) of AB 52 establishes that “a substantial adverse change to a tribal cultural resource has a significant effect on the environment.” Effects on tribal cultural resources should be considered under CEQA. Section 6 of AB 52 adds Section 21080.3.2 to the PRC, which states that parties may propose mitigation measures “capable of avoiding or substantially lessening potential significant impacts to a tribal cultural resource or alternatives that would avoid significant impacts to a tribal cultural resource.” Further, if a California Native American tribe requests consultation regarding project alternatives, mitigation measures, or significant effects to tribal cultural resources, the consultation shall include those topics (PRC Section 21080.3.2[a]). The environmental document and the mitigation monitoring and reporting program (where applicable) shall include any mitigation measures that are adopted (PRC Section 21082.3[a]).

Treatment of Human Remains

The disposition of burials falls first under the general prohibition on disturbing or removing human remains under California Health and Safety Code (CHSC) Section 7050.5. More specifically, remains suspected to be Native American are treated under CEQA at CCR Section 15064.5; PRC Section 5097.98 illustrates the process to be followed in the event that remains are discovered. If human remains are discovered during construction, no further disturbance to the site shall occur, and the County Coroner must be notified (CCR 15064.5 and PRC 5097.98).

CALIFORNIA PUBLIC RESOURCE CODE SECTION 5097.98

The General Plan is subject to California PRC Section 5097.98, which states that if a county coroner notifies the NAHC that human remains are Native American and outside the coroner’s jurisdiction per CHSC Section 7050.5, the NAHC must determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

CALIFORNIA HEALTH AND SAFETY CODE SECTION 7050.5

This code section requires that further excavation or disturbance of land, upon discovery of human remains outside of a dedicated cemetery, cease until a county coroner makes a report. It requires a county coroner to contact the NAHC within 24 hours if the coroner determines that the remains are not subject to his or her authority and if the coroner recognizes the remains to be those of a Native American.

HISTORIC PRESERVATION

The Santa Ana Historic Resources Commission was established to recognize and preserve historic structures important to the heritage of the City. The Program promotes the identification, evaluation, rehabilitation, adaptive use, and restoration of historic structures. In 1998, the City adopted Chapter 30 of the Santa Ana Municipal Code to establish the “Santa Ana Register of Historical Properties,” and created a Historic Resources Commission to oversee Santa Ana’s Historic Preservation Program. The City of Santa Ana has two National Register Districts: Downtown Santa Ana and French Park. Any improvements or alterations to a property on the Santa Ana Register of Historic Properties, as well as those contributing properties located in a historic district, must meet the Secretary of Interior Standards for Rehabilitation and will require a Certificate of Appropriateness. Major alterations, relocations or demolitions are considered for approval by the Historic Resources Commission.

ENVIRONMENTAL SETTING

The City of Santa Ana covers a total surface area of 27.3 square miles (70.7 km^2) and has an elevation of between 83 feet (25.3 m) and 150 feet (45.7 m) above mean sea level. It consists of mixed residential and light commercial developments, with little to no open space areas containing native vegetation and animal communities. The City is located on a sprawling floodplain, and is bounded on all sides by development, including the cities of Garden Grove, Orange, Irvine, and Costa Mesa. Transecting the City of Santa Ana running northeast to southwest is the Santa Ana River, a 96-mile long river located entirely within California, originating in the San Bernardino Mountains and draining into the Pacific Ocean in Orange County. The Santa Ana Mountains are located approximately ten miles (15.3 km) to the east. The Santa Ana Mountains are a disconnected, 61-mile (98.2-km) western segment of the California Peninsular Ranges, extending southeastward from the Whittier Fault in the Los Angeles Basin to the Santa Margarita River. The Peninsular Ranges represent the northernmost extent of mountains making up the Baja California peninsula. Sierra Peak marks the northernmost summit of the Santa Ana Mountains, reaching an elevation of 3,045 feet (928 m). Saddleback Ridge, made up of Modjeska Peak at 5,496 feet (1,675 m) and Santiago Peak at 5,689 feet (1,734 m), is the highest summit in the range.

Prior to the development of the area, the native vegetation of the area was characterized by valley grasslands, coastal sage scrub, chaparral, and southern coast woodland communities. The drought-adapted coastal sage scrub habitats of Southern California were dominated by California sagebrush (*Artemisia californica*) and buckwheat (*Eriogonum fasciculatum*), coast brittle-brush (*Encelia californica*), monkeyflower (*Mimulus* spp.), poison oak (*Toxicodendron diversiloba*) and true sages such as black (*Salvia mellifera*) and purple sages (*Salvia leucophylla*). Further upland, where lower chaparral communities predominate, chamise (*Adenostoma fasciculatum*) and California lilacs (*Ceanothus* spp.) flourished, particularly on south-facing slopes, while California scrub oak (*Quercus berberidifolia*), holly-leaf redberry (*Rhamnus ilicifolia*), and holly-leaf cherry (*Prunus ilicifolia*) were common on north-facing slopes. These communities provided habitat for a wide range of animal species, with reptiles representing one of most conspicuous resident groups. Among them were the side-blotched (*Uta stansburiana*) and western fence lizards (*Sceloporus occidentalis*), as well as the California mountain kingsnake (*Lampropeltis zonata*) and the long-nosed snake (*Chionactis occipitalis*). Birds native to the region include the western scrub jay (*Aphelocoma californica*), California quail (*Callipepla californica*), and the great-horned owl (*Bubo virginianus*). The coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), ringtail (*Bassariscus astutus*), and pinyon mouse (*Peromyscus truei*) make up some of the most abundant mammal species from the region (Schoenherr 1992).

CULTURAL SETTING

Prehistoric Overview

Numerous chronological sequences have been devised to understand cultural changes for various areas within southern California over the past century. Building on early studies and focusing on data synthesis, Wallace (1955, 1978) developed a prehistoric chronology for the southern California coastal region that is still widely used today and is applicable to coastal and many inland areas. Four periods are presented in Wallace's prehistoric sequence: Early Man, Milling Stone, Intermediate, and Late Prehistoric. As noted by Moratto (1984:159), Wallace's (1955) synthesis lacked chronological precision due to the lack of absolute dates at the time of its creation, but remains generally valid today.

In addition to Wallace's classic summary, a regional synthesis developed by Warren (1968) will be referred to in the following discussion. This synthesis is supported by a larger archaeological database for southern California, which includes the advent and increased use of radiocarbon dating after the 1950s. Using the concepts of cultural ecology and cultural tradition, Warren (1968) proposed a series of six prehistoric traditions. Three of these traditions, the San Dieguito Tradition, Encinitas Tradition, and Campbell Tradition, correlate with Wallace's Early Man, Milling Stone, and Intermediate. The Chumash Tradition, Takic Tradition (formerly "Shoshonean"), and Yuman Tradition are represented within Wallace's Late Prehistoric period. As noted further, these ecologically based traditions are applicable to specific regions within southern California.

Some revisions have been made to Wallace's 1955 synthesis using radiocarbon dates and projectile point assemblages (e.g., Koerper and Drover 1983; Mason and Peterson 1994; Koerper et al. 2002). The summary of prehistoric chronological sequences for southern California coastal and near-coastal areas presented below is a composite of information in Wallace (1955) and Warren (1968), as well as more recent studies, including Koerper and Drover (1983). The chronology formulated by Koerper and Drover (1983) is based on the results of their excavations at a multi-component village site (CA-ORA-119-A) near the University of California, Irvine in Orange County. Diagnostic artifacts, particularly projectile points, and other cultural material produced evidence at CA-ORA-119-A from the late Milling Stone, Intermediate, Late Prehistoric, and early Historic periods.

Early Man Period/San Dieguito/Paleo-Coastal (ca. 10,000–6000 B.C.)

When Wallace defined the Early Man period in the mid-1950s, there was little evidence of human presence on the southern California coast prior to 6000 B.C. Archaeological work in the intervening years has identified numerous older sites dating prior to 10,000 years ago, including ones on the coast and Channel Islands (e.g., Erlandson 1991; Rick et al. 2001:609; Johnson et al. 2002; Moratto 1984). The earliest accepted dates for occupation are from two of the northern Channel Islands, located off the coast from Santa Barbara. On San Miguel Island, Daisy Cave clearly establishes the presence of people in this area about 10,000 years ago (Erlandson 1991:105). On Santa Rosa Island, human remains have been dated from the Arlington Springs site to approximately 13,000 years ago (Johnson et al. 2002).

In what is now Orange County, there are sites dating from 9,000–10,000 years ago (Macko 1998a:41; Mason and Peterson 1994:55-57; Sawyer 2006). Known sites dating to the Early Man period are rare in western Riverside County. One exception is the Elsinore site (CA-RIV-2798-B) that has deposits dating as early as 6630 cal B.C. (Grenda 1997:260).

Recent data from coastal, as well as inland, sites during this period indicate that the economy was a diverse mixture of hunting and gathering, with a major emphasis on aquatic resources in many coastal areas (e.g., Jones et al. 2002) and on Pleistocene lakeshores in eastern San Diego County (see Moratto 1984:90-92). A Paleo-Coastal Tradition was proposed and recently referenced to highlight the distinctive marine and littoral focus identified within the southern California coastal archaeological record prior to the emergence of the Encinitas Tradition during the succeeding Milling Stone period (Mason and Peterson 1994:57-58; Moratto 1984:104). At coastal sites, there is abundant evidence that marine resources such as fish, marine mammals, and shellfish were exploited during the Paleo-Coastal period.

At near-coastal and inland sites, it appears that an emphasis on hunting may have been greater during the Early Man period than in later periods, although few Clovis-like or Folsom-like fluted points have been found in southern California (e.g., Erlandson et al. 1987; Dillon 2002). In Riverside County, only one isolated fluted point has been identified on the surface of a site in the Pinto Basin in the central part of the county (Dillon 2002:113). Common elements in many San Dieguito Tradition sites include leaf-shaped bifacial projectile points and knives, stemmed or shouldered projectile points (e.g., Silver Lake and Lake Mojave series), scrapers, engraving tools, and crescents (Warren 1967:174-177; Warren and True 1961:251-254). Use of the atlatl (spear-throwing stick) during this period facilitated launching spears with greater power and distance. Subsistence patterns shifted around 6000 B.C. coincident with the gradual desiccation associated with the onset of the Altithermal, a warm and dry period that lasted for about 3,000 years. After 6000 B.C., a greater emphasis was placed on plant foods and small animals.

Milling Stone Period (ca. 6000–3000/1000 B.C.)

The Milling Stone period of Wallace (1955, 1978) and Encinitas Tradition of Warren (1968) are characterized by an ecological adaptation to collecting, and by the dominance of the principal ground stone implements generally associated with the horizontal motion of grinding small seeds; namely, milling stones (metates, slabs) and handstones (manos, mullers), which are typically shaped. Milling stones occur in large numbers for the first time, and are even more numerous near the end of this period. As testified by their toolkits and shell middens in coastal sites, people during this period practiced a mixed food procurement strategy. Subsistence patterns varied somewhat as groups became better adapted to their regional or local environments.

Milling Stone period sites are common in the southern California coastal region between Santa Barbara and San Diego, and at many inland locations including the Prado Basin in western Riverside County and the Pauma Valley in northeastern San Diego County (e.g., True 1958; Herring 1968; Langenwalter and Brock 1985; Sawyer and Brock 1999; Sutton 1993). Wallace (1955, 1978) and Warren (1968) relied on several key coastal sites to characterize the Milling Stone period and Encinitas Tradition, respectively. These include the Oak Grove Complex in the Santa Barbara region, Little Sycamore in southwestern Ventura County, Topanga Canyon in the Santa Monica Mountains, and at La Jolla in San Diego County. The Encinitas Tradition was proposed to extend southward into San Diego County where it apparently continued alongside the following Campbell Tradition, which occurred primarily in the Santa Barbara-Ventura County region beginning around 3000 B.C.

Of the numerous Milling Stone period sites identified in the region, the most well-known is the Irvine site (CA-ORA-64), which has occupation levels dating between circa 6000–4000 B.C. (Drover et al. 1983; Macko 1998b). Along coastal Orange County, Koerper and Drover (1983:11) mark the transition at the end of the Milling Stone around 1000 B.C., while Wallace's mid-1950s scheme has the period ending at 3000 B.C. Based on radiocarbon dates from the Newport Coast Archaeological Project (NCAP) project, Mason and Peterson (1994) propose a timeline for the Milling Stone similar to that advanced by Koerper and Drover. The chronological schemes advanced for coastal Orange County also apply to many southern California near-coastal and inland areas, including much of western Riverside County.

During the Milling Stone period and Encinitas Tradition, stone chopping, scraping, and cutting tools were abundant, and generally made from locally available raw material. Projectile points, which are rather large and generally leaf-shaped, and bone tools such as awls were generally rare. The large points are associated with the spear, and probably with an atlatl. Items made from shell, including beads, pendants, and abalone dishes, are generally rare as well. Evidence of weaving or basketry is present at a few sites. Kowta (1969) attributes the presence of numerous scraper-planes in Milling Stone sites to the preparation of agave or yucca for food or fiber. The mortar and pestle, associated with the vertical motion of pounding foods, such as acorns, were introduced during the Milling Stone period, but are not common.

Two types of artifacts that are considered diagnostic of the Milling Stone period are the cogged stone and discoidal, most of which have been found within sites dating between 4000–1000 B.C. (Moratto 1984:149). The cogged stone is a ground stone object that has gear-like teeth on the perimeter and is produced from a variety of materials. The function of cogged stones is unknown, but they have been attributed ritualistic or ceremonial uses by several scholars (Eberhart 1961:367; Dixon 1968:64-65). Similar to cogged stones, discoidals are found in the archaeological record subsequent to the introduction of the cogged stone. Cogged stones and discoidals were often purposefully buried or "cached." They are most common in sites along the coastal drainages from southern Ventura County southward and are particularly abundant at some Orange County sites, although a few specimens have been found inland at Cajon Pass (Dixon 1968:63; Moratto 1984:149). Discoidals and cogged stones have been found together at some Orange County sites, such as CA-ORA-83/86/144 (Van Bueren et al. 1989:772), CA-ORA-950 (Ron Bissell, personal communication 1999), and Los Cerritos Ranch (Dixon 1975 in Moratto 1984:150).

Koerper and Drover (1983) suggest that Milling Stone period sites reflect migratory settlement patterns of hunters and gatherers who used marine resources during the winter and inland resources the remainder of the year. More recent research indicates that residential bases or camps were moved to resources in a seasonal round (de Barros 1996; Mason et al. 1997; Koerper et al. 2002), or that some sites were occupied year-round with portions of the village population leaving at certain times of the year to exploit available resources (Cottrell and Del Chario 1981). Regardless of settlement system, it is clear that subsistence strategies during the Milling Stone period included hunting small and large terrestrial mammals, marine mammals, and birds; collecting shellfish and other shore species; extensive use of seed and plant products; the processing of yucca and agave; and near-shore fishing with barbs or gorges (Reinman 1964; Kowta 1969). As evidenced by the abundant milling equipment found at these sites throughout the region, the processing of small seeds was an important component of their subsistence practices.

Characteristic mortuary practices during the Milling Stone period or Encinitas Tradition include extended and loosely flexed burials interred beneath cobble or milling stone cairns. Some burials contain red ochre and few grave goods, such as shell beads and milling stones. “Killed” milling stones, exhibiting holes, may occur in the cairns. Secondary burials are common in the Los Angeles County area, while flexed burials oriented along a north-south axis are common in Orange and San Diego Counties. Evidence of wattle-and-daub structures and walls have been identified at some sites in the San Joaquin Hills and Newport Coast area spanning all cultural periods (Mason et al. 1991, 1992, 1993; Koerper 1995; Strudwick 2004; Sawyer 2006).

A potentially unique trait of the Milling Stone period, isolated to a small region of coastal Orange County, is the presence of a rudimentary ceramic industry involving the creation of fired clay effigies, figurines, and small crude thick-walled pottery vessels (Drover 1971, 1975; Drover et al. 1983; Macko 1998b; Sawyer and Koerper 2006). The figurines have been found at the Irvine site (CA-ORA-64) on Newport Bay, and a collapsed rockshelter site (CA-ORA-1405-B) within Muddy Canyon.

Intermediate Period (ca. 3000/1000 B.C.–A.D. 500/650)

Wallace’s Intermediate period and Warren’s Campbell Tradition in Santa Barbara, Ventura, and parts of Los Angeles Counties date from approximately 3000 B.C. to A.D. 500 (Wallace 1955; Warren 1968). This era is characterized by a shift toward a hunting and maritime subsistence strategy along with a wider use of plant foods. The Campbell Tradition (Warren 1968) incorporates David B. Rogers’ (1929) Hunting Culture and related expressions along the Santa Barbara coast. In the San Diego region, the Encinitas Tradition (Warren 1968) and the La Jolla Culture (Moriarty 1966; Rogers 1939, 1945) persist with little change during this time.

In Orange County, researchers have estimated that the Intermediate period began around 1000 B.C. and lasted until circa A.D. 650 (3000–1300 B.P.) (Koerper and Drover 1983:11; Mason and Peterson 1994). A more recent evaluation, based on some 1,300 calibrated radiocarbon dates from sites in Orange County, suggests a date of 1400 B.C. for the start of the Intermediate, marked by single-piece circular fishhooks and coinciding with the transition from the Middle to Late Holocene (Koerper et al. 2002:67–68). Another researcher sees the Intermediate not as a cultural period, but as a transition between the Milling Stone and the later Late Prehistoric period, based on his investigations at sites in the Bonita Mesa area near upper Newport Bay (Peterson 2000). This idea may simply reflect subregional or area-specific trends at sites in and around Newport Bay rather than a more general depiction of the cultural period dynamics in Orange County and the greater southern California region.

During the Intermediate period, there was a pronounced trend toward greater adaptation to regional or local resources. For example, the remains of fish, land mammals, and marine mammals are increasingly abundant and diverse in sites along the California coast in the referenced region. Related chipped stone tools suitable for hunting are more abundant and diversified, and shell fishhooks became part of the toolkit during this period. Larger knives, a variety of flake scrapers, and drill-like implements are common in deposits dating to this period. Projectile points include large side-notched, stemmed, and lanceolate or leaf-shaped forms. Koerper and Drover (1983) consider Gypsum Cave and Elko series points, which have a wide distribution in the Great Basin and Mojave deserts between circa 2000 B.C. and A.D. 500, to be diagnostic of this period. Bone tools, including awls, were more numerous than in the preceding period, and the use of asphaltum adhesive was common as well.

Mortars and pestles became more common during this period, gradually replacing manos and metates as milling stone implements. In addition, hopper mortars and stone bowls, including steatite vessels, appear to have entered the toolkit at this time. This shift appears to be a correlate of a diversification in subsistence resources. Many archaeologists believe this change in milling stones signals a shift away from the processing and consuming of hard seed resources to the increasing importance of the acorn (e.g., Glassow et al. 1988; True 1993). It has been argued that mortars and pestles may have been used initially to process roots (e.g., tubers, bulbs, and corms associated with marshland plants), with acorn processing beginning at a later point in prehistory (Glassow 1997:86) and continuing to European contact.

Characteristic mortuary practices during the Intermediate period include fully flexed burials placed face down or face up and oriented toward the north or west (Warren 1968:2–3). Red ochre is common, and abalone shell dishes infrequent. Interments sometimes occur beneath cairns or broken artifacts. Shell, bone and stone ornaments, including charmstones, were more common than in the preceding Encinitas Tradition. Some later sites include olive shell (*Olivella* spp.) and steatite beads, mortars with flat bases and flaring sides, and a few small points. The broad distribution of steatite from the Channel Islands and obsidian from distant inland regions, among other items, attest to the growth of trade, particularly during the later part of this period.

Late Prehistoric Period (ca. A.D. 500/650–A.D. 1769)

Wallace (1955, 1978) places the beginning of the Late Prehistoric period around A.D. 500. In Orange County, the start of this period is recognized at a slightly later date, circa A.D. 650 (Koerper and Drover 1983; Mason and Peterson 1994). In all chronological schemes for southern California, the Late Prehistoric period lasts until European contact occurred in A.D. 1769.

During the Late Prehistoric period, there was an increase in the use of plant food resources in addition to an increase in land and marine mammal hunting. There was a concomitant increase in the diversity and complexity of material culture during this period, demonstrated by more classes of artifacts. The recovery of a greater number of small, finely chipped projectile points, usually stemless with convex or concave bases, suggests an increased utilization of the bow and arrow rather than the atlatl and dart for hunting. In Orange County, Cottonwood series triangular projectile points in particular are diagnostic of this period (Koerper and Drover 1983). Other items include steatite cooking vessels and containers, the increased presence of smaller bone and shell circular fishhooks, perforated stones, arrow shaft straighteners made of steatite, a variety of bone tools, and personal ornaments made from shell, bone, and stone. There is also an increased use of asphaltum for waterproofing and as an adhesive.

Late Prehistoric period sites contain beautiful and complex objects of utility, art, and decoration. Ornaments include drilled whole Venus clam (*Chione* spp.) and drilled abalone. Steatite effigies become more common, with scallop (*Pecten* spp. and *Argopecten* spp.) shell rattles common in middens. In Orange County for example, scallop shell rattles are concentrated in the Late Prehistoric midden at CA-ORA-119A, and other time sensitive artifacts including abalone ornaments and drilled Venus clam shells are present (Koerper and Drover 1983:19-20). Much of the rock art found today in the Chumash sphere is thought to date to this period (Whitley 2000:41). Mortuary customs were elaborate, including cremation and interment, with abundant grave goods.

By A.D. 1000, fired clay smoking pipes and ceramic vessels began to appear at some sites (Meighan 1954; Warren 1984). The scarcity of pottery in coastal and near-coastal sites implies ceramic technology was not well developed in that area, or that ceramics were obtained by trade with neighboring groups to the south and east. The lack of widespread pottery manufacture is usually attributed to the high quality of tightly woven and watertight basketry that functioned in the same capacity as ceramic vessels.

Another feature typical of Late Prehistoric period occupation is an increase in the frequency of obsidian imported from the Obsidian Butte source in Imperial County. Obsidian Butte was exploited after circa A.D. 1000 after its exposure by the receding waters of Holocene Lake Cahuilla (Wilke 1978). A Late Prehistoric period component of the Elsinore site (CA-RIV-2798-A) produced two flakes that originated from Obsidian Butte (Grenda 1997:255). Although about 16 percent of the debitage at the Peppertree site (CA-RIV-463) at Perris Reservoir is obsidian, no sourcing study was done (Wilke 1974:61). The site contains a late Intermediate to Late Prehistoric period component and it is assumed that most of the obsidian originated from Obsidian Butte. In the earlier Milling Stone and Intermediate periods, most of the obsidian found at sites within Orange County and many inland areas came from northern sources, primarily the Coso volcanic field. This also appears to be the case within Prado Basin and other interior areas that have yielded obsidian (e.g., Grenda 1995:59; Taşkiran 1997:46). The presence of Grimes Canyon (Ventura County) fused shale at southern California archaeological sites is also thought to be typical of the Late Prehistoric period (Demcak 1981; Hall 1988).

During this period, there was an increase in population size accompanied by the advent of larger, more permanent villages (Wallace 1955:223). Large populations and, in places, high population densities, are characteristic, with some coastal and near-coastal settlements containing as many as 1,500 people. Many of the larger settlements were permanent villages where people resided year-round. The populations of these villages may have also increased seasonally.

In Warren's (1968) cultural ecological scheme, the period between A.D. 500 and European contact is divided into three regional patterns. The Chumash Tradition is present mainly in the region of Santa Barbara and Ventura Counties; the Takic or Numic Tradition in the Los Angeles, Orange, and western Riverside Counties region; and the Yuman Tradition in the San Diego region. The seemingly abrupt changes in material culture, burial practices, and subsistence focus at the beginning of the Late Prehistoric period are considered to be the result of a migration to the coast of peoples from inland desert regions to the east. In addition to the small triangular and triangular side-notched points similar to those found in the desert regions in the Great Basin and Lower Colorado River, Colorado River pottery and the introduction of cremation in the archaeological record are diagnostic of the Yuman Tradition in the San Diego region. This combination certainly suggests a strong influence from the Colorado Desert region.

In Los Angeles, Orange, and western Riverside Counties, similar changes (introduction of cremation, pottery, and small triangular arrow points) are thought to have resulted from Takic migration to the coast from inland desert regions. This Takic or Numic Tradition was formerly referred to as the "Shoshonean wedge" or "Shoshonean intrusion" (Warren 1968). This terminology, used originally to describe a Uto-Aztecan language group, is generally no longer employed in order to avoid confusion with ethnohistoric and modern Shoshonean groups who spoke Numic languages (Heizer 1978:5; Shipley 1978:88, 90). Modern Gabrielino/Tongva, Juaneño, and Luiseño in this region are considered to be the descendants of the prehistoric Uto-Aztecan, Takic-speaking populations that settled along the California coast during this period, or perhaps somewhat earlier.

Ethnographic Overview

Ethnographic boundaries in this part of southern California are loosely defined because of the highly mobile nature of desert and mountain settlement strategies and the variety of alternatives presented by previous researchers. According to available ethnographic maps (Bean and Smith 1978:570; Kroeber 1925; Sutton et al. 2007:232), the City of Santa Ana falls within the traditional territory of the Gabrielino.

Gabrielino

The General Plan Area lies within an area historically occupied by the Gabrielino (Bean and Smith 1978:538; Kroeber 1925:Plate 57). The name Gabrielino (sometimes spelled Gabrieleno or Gabrieleño) denotes those people who were administered by the Spanish from Mission San Gabriel. By the same token, Native Americans in the sphere of influence of Mission San Fernando were historically referred to as Fernandeño (Kroeber 1925). This group is now considered to be a regional dialect of the Gabrielino language, along with the Santa Catalina Island and San Nicolas Island dialects (Bean and Smith 1978). In the post-Contact period, Mission San Gabriel included natives of the greater Los Angeles area, as well as members of surrounding groups such as Kitanemuk, Serrano, and Cahuilla. There is little evidence that the people we call Gabrielino had a broad term for their group; rather, they identified themselves as an inhabitant of a specific community through the use of locational suffixes (e.g., a resident of Yaanga was called a Yabit, much the same way that a resident of New York is called a New Yorker) (Dakin 1978:222).

Native words that have been suggested as labels for the broader group of Native Americans in the Los Angeles region include Tongva (or Tong-v) and Kizh (Kij or Kichereno); although there is evidence that these terms originally referred to local places or smaller groups of people within the larger group that we now call Gabrielino (Heizer 1968). The term Gabrielino, which combines the most commonly used group names, is used in the remainder of this study to designate native people of the Los Angeles Basin and their descendants.

Gabrielino lands encompassed the greater Los Angeles Basin and three Channel Islands: San Clemente, San Nicolas, and Santa Catalina. Their mainland territory was bounded on the north by the Chumash at Topanga Creek, the Serrano at the San Gabriel Mountains in the east, and the Juaneño on the south at Aliso Creek (Bean and Smith 1978:538; Kroeber 1925:636).

The Gabrielino language, as well as that of the neighboring Juaneño/Luiseño, Tatataviam/Alliklik, and Serrano, belongs to the Takic branch of the Uto-Aztecan language family, which can be traced to the Great Basin area (Mithun 2004). This language family's origin differs substantially from that of the Chumash to the north and the Ipai, Tipai, and Kumeyaay farther south. The language of the Ipai, Tipai, and Kumeyaay is derived from the California-Delta branch of the Yuman-Cochimi language family, which originated in the American Southwest (Mithun 2004:577). The Chumash language is unlike both the Yuman-Cochimi and Uto-Aztecan families, and may represent a separate lineage (Mithun 2004:390). Linguistic analysis suggests that Takic-speaking immigrants from the Great Basin area began moving into southern California around 500 B.C. (Kroeber 1925:579). This migration may have displaced both Chumashan- and Yuman-speaking peoples, but the timing and extent of the migrations and their impact on indigenous peoples is not well understood. The Gabrielino language consisted of two main dialects, Eastern and Western; the Western included much of the coast and the Channel Island population (King

2004). Lands of the Western group encompassed much of the western Los Angeles Basin and San Fernando Valley, northward along the coast to the Palos Verdes Peninsula (McCawley 1996:47).

Gabrielino society was organized along patrilineal non-localized clans, a characteristic Takic pattern. Clans consisted of several lineages, each with their own ceremonial leader. The chief, or tómyaar, always came from the primary lineage of the clan/village. One or two clans generally made up the population of a village. Even though the Gabrielino did not have a distinctly stratified society, there were two general classes of individuals: elites and commoners. The elites consisted of primary lineage members, other lineage leaders (who maintained a separate ceremonial language), the wealthy, and the elite families of the various villages who commonly married among themselves. The commoner class contained those from "fairly well-to-do and long-established lineages" (Bean and Smith 1978:543). A third, lower class consisted of slaves taken in war and individuals, unrelated to the inhabitants, who drifted into the village.

The Gabrielino established large, permanent villages in the fertile lowlands along rivers and streams, and in sheltered areas along the coast, stretching from the foothills of the San Gabriel Mountains to the Pacific Ocean. A total tribal population has been estimated of at least 5,000 (Bean and Smith 1978:540), but recent ethnohistoric work suggests that a number approaching 10,000 seems more likely (O'Neil 2002). Several Gabrielino villages appear to have served as trade centers, due in large part to their centralized geographic position in relation to the southern Channel Islands and to other tribes. These villages maintained particularly large populations and hosted annual trade fairs that would bring their population to 1,000 or more for the duration of the event (McCawley 1996:113–114).

Houses constructed by the Gabrielino could hold up to 50 people and were large, circular, domed structures made of willow poles thatched with tule (Bean and Smith 1978). Other structures served as sweathouses, menstrual huts, ceremonial enclosures, and probably communal granaries. Cleared fields for races and games such as lacrosse and pole throwing were created adjacent to Gabrielino villages (McCawley 1996:27).

The Gabrielino subsistence economy was centered on gathering and hunting. The surrounding environment was rich and varied, and the tribe exploited mountains, foothills, valleys, and deserts as well as riparian, estuarine, and open and rocky coastal eco-niches. As with most native Californians, acorns were the staple food (an established industry by the time of the early Intermediate period). Acorns were supplemented by the roots, leaves, seeds, and fruits of a wide variety of flora (e.g., cactus, yucca, sages, and agave). Fresh and saltwater fish, shellfish, birds, reptiles, and insects as well as large and small mammals were also consumed (Bean and Smith 1978:546; Kroeber 1925:631–632; McCawley 1996:119–123, 128–131).

A wide variety of tools and implements was employed by the Gabrielino to gather and collect food resources. These included the bow and arrow, traps, nets, blinds, throwing sticks and slings, spears, harpoons, and hooks. Many plant foods were collected with woven seed beaters, several forms of burden baskets, carrying nets, and sharpened digging sticks, sometimes with stone weights fitted onto them. Groups residing near the ocean used ocean-going plank canoes (known as a ti'at) and tule balsa canoes for fishing, travel, and trade between the mainland and the Channel Islands. The ocean-going canoes were capable of holding six to 14 people and were also used for travel and trade between the mainland and the Channel Islands. The tule balsa canoes were used for near-shore fishing (Blackburn 1963; McCawley 1996:117-127).

Gabrielino people processed food with a variety of tools, including portable and bedrock mortars, pestles, basket hopper mortars, manos and metates, hammer stones and anvils, woven strainers and winnowers, leaching baskets and bowls, woven parching trays, knives, bone saws, and wooden drying racks. Food was consumed from a number of woven and carved wood vessels. The ground meal and unprocessed hard seeds were stored in large, finely woven baskets, and the unprocessed acorns were stored in large granaries woven of willow branches and raised off the ground on platforms. Santa Catalina Island steatite was used to make comals, ollas, and cooking vessels that would not crack after repeated firings. In addition to cooking vessels, steatite was used to make effigies, ornaments, and arrow straighteners (Blackburn 1963; Kroeber 1925:631-639; McCawley 1996:129-138).

The Gabrielino participated in an extensive exchange network, trading coastal goods for inland resources. They exported Santa Catalina Island steatite products, roots, seal and otter skins, fish and shellfish, red ochre, and lead ore to neighboring tribes, as well as people as far away as the Colorado River. In exchange they received ceramic goods, deer skin shirts, obsidian, acorns, and other items. This burgeoning trade was facilitated by the use of craft specialists, a standard medium of exchange (Olivella bead currency), and the regular destruction of valuables in ceremonies that maintained a high demand for these goods (McCawley 1996:112-115).

At the time of Spanish contact, the basis of Gabrielino religious life was the Chinigchinich cult, which centered on the last of a series of heroic mythological figures. Chinigchinich gave instruction on laws and institutions, and also taught the people how to dance, the primary religious act for this society. He later withdrew into heaven, where he rewarded the faithful and punished those who disobeyed his laws (Kroeber 1925:637–638). The Chinigchinich religion seems to have been relatively new when the Spanish arrived. It was spreading south into the Southern Takic groups even as Christian missions were being built, and may represent a mixture of native and Christian belief and practices (McCawley 1996:143–144).

Deceased Gabrielino were either buried or cremated, with inhumation reportedly being more common on the Channel Islands and the neighboring mainland coast, and cremation predominating on the remainder of the coast and in the interior (Harrington 1942; McCawley 1996:157). Remains were buried in distinct burial areas, either associated with villages (Altschul et al. 2007:34-42) or without apparent village association (Applied Earthworks 1999; Frazier 2000:169-176). Cremation ashes have been found in archaeological contexts buried within stone bowls and in shell dishes (Ashby and Winterbourne 1966), as well as scattered among broken ground stone implements (Altschul et al. 2007; Cleland et al. 2007). Archaeological data such as these correspond with ethnographic descriptions of an elaborate mourning ceremony that included a wide variety of offerings, including seeds, stone grinding tools, otter skins, baskets, wood tools, shell beads, bone and shell ornaments, and projectile points and knives (Boscana 1846:314). Offerings varied with the sex and status of the deceased (Dakin 1978:234-235; Johnston 1962:52-54; McCawley 1996:155-165). At the behest of the Spanish missionaries, cremation essentially ceased during the post-Contact period (McCawley 1996:157). For inhumations, the deceased was wrapped in a covering, bound head to foot, with hands crooked upon their breast (Dakin 1978:234). Archaeological examples of human remains in the Gabrielino region dating to the Late Prehistoric and protohistoric periods are dominated by flexed or extended inhumations, with a smaller number of cremations. Grave goods associated with burials/cremations varied in quantity and content and included projectile points, beads, steatite objects, and asphaltum (Frazier 2000:175). Well-preserved burial features have evidence of wrappings of net, hide blanket or cape, or a mat of tule reeds or sea grass (McCawley 1996:157). At least one formal grave marker, an elaborately etched sandstone slab, was reported in 1885 at a site between Los Angeles and the coast, near San Pedro (Blackburn 1963:35).

A review of a number of historic and ethnographic maps was conducted to further identify the archaeological sensitivity of the City of Santa Ana General Plan area. An ethnographic map showing Native American settlements used for the recruitment of neophytes to the San Fernando and San Gabriel Missions based on King (2004:21) shows the General Plan area including the village of Pajebet (Figure 4). A review of the Kirkman (1937) pictorial and historical map of Orange County does not depict any Native American villages within the General Plan area, but a village is noted both to the northeast and southwest along the Santa Ana River (Figure 5) The Santa Ana River was known as Wanaawna by the

Gabrielino, and the settlement of Pasbengna was recorded as being along the Santa Ana River in the vicinity of the City of Santa Ana (McCawley 1996:60; see also Taylor 1864). It is likely that the village of Pajebet from the King (2004) map was in actuality Pasbengna, and Pasbengna is the unnamed village marked to the north of the General Plan area on the Kirkman (1937) map. The village mapped to the south of the General Plan area may be the village of Lukúpa, meaning “silvery,” which was situated on a knoll in the region over the Santa Ana River floodplain (McCawley 1996:71). Lukúpa is believed to be the Newland House Site (CA-ORA-183), which was excavated in the 1930s. The Camino (Nuevo) Real is also mapped by Kirkman (1937) as transecting the General Plan area, and the town of “Oranga” is mapped at the northern border.

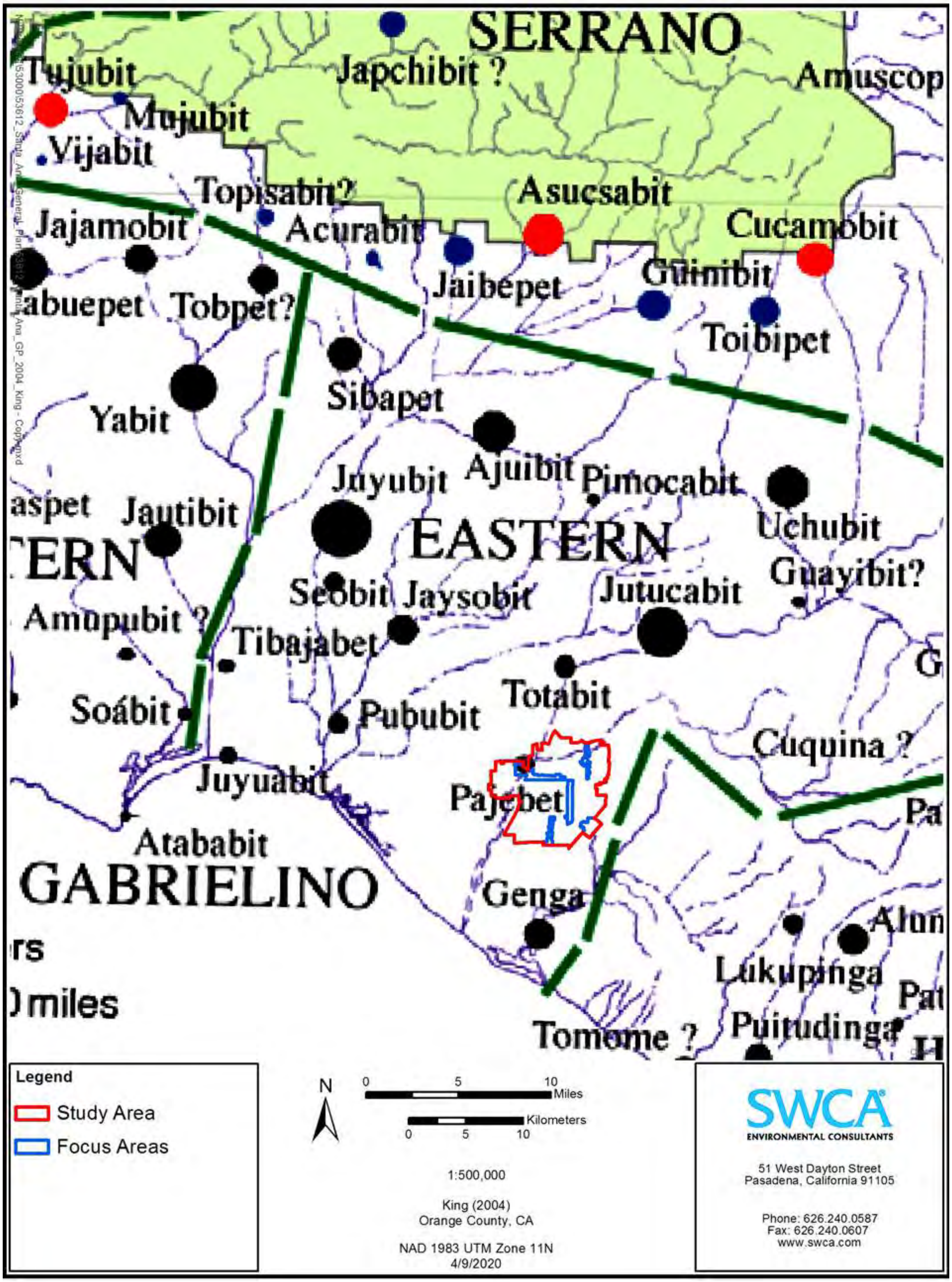


Figure 4. General Plan area plotted on King's (2004:21) map showing the approximate location of Native American villages using names listed in Mission-period registers.

Figure 5. General Plan area plotted on the Kirkman's (1937) pictorial and historical map of Orange County.

Historic Overview

Post-Contact history for the state of California is generally divided into three periods: the Spanish Period (1769–1822), Mexican Period (1822–1848), and American Period (1848–present). Although Spanish, Russian, and British explorers visited the area for brief periods between 1529 and 1769, the Spanish Period in California begins with the establishment in 1769 of a settlement at San Diego and the founding of Mission San Diego de Alcalá, the first of 21 missions constructed between 1769 and 1823. Independence from Spain in 1821 marks the beginning of the Mexican Period, and the signing of the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican-American War, signals the beginning of the American Period when California became a territory of the United States.

Spanish Period (1769–1822)

Spanish explorers made sailing expeditions along the coast of southern California between the mid-1500s and mid-1700s. In search of the legendary Northwest Passage, Juan Rodríquez Cabríllo stopped in 1542 at present-day San Diego Bay. With his crew, Cabríllo explored the shorelines of present Catalina Island as well as San Pedro and Santa Monica Bays. Much of the present California and Oregon coastline was mapped and recorded in the next half-century by Spanish naval officer Sebastián Vizcaíno. Vizcaíno's crew also landed on Santa Catalina Island and at San Pedro and Santa Monica Bays, giving each location its long-standing name. The Spanish crown laid claim to California based on the surveys conducted by Cabríllo and Vizcaíno (Bancroft 1885:96–99; Gumprecht 1999:35).

More than 200 years passed before Spain began the colonization and inland exploration of Alta California. The 1769 overland expedition by Captain Gaspar de Portolá marks the beginning of California's Historic period, occurring just after the King of Spain installed the Franciscan Order to direct religious and colonization matters in assigned territories of the Americas. With a band of 64 soldiers, missionaries, Baja (lower) California Native Americans, and Mexican civilians, Portolá established the Presidio of San Diego, a fortified military outpost, as the first Spanish settlement in Alta California. In July of 1769, while Portolá was exploring southern California, Franciscan Fr. Junípero Serra founded Mission San Diego de Alcalá at Presidio Hill, the first of the 21 missions that would be established in Alta California by the Spanish and the Franciscan Order between 1769 and 1833.

The Portolá expedition first reached the present-day boundaries of Orange County in July 1769, thereby becoming the first Europeans to visit the area (Smith 1965). They named the area *El Valle de Santa Ana* or "The Valley of Santa Ana." Six years later, Friar Junípero Serra returned to the valley to establish a Catholic mission, which was dedicated the following year. The Mission San Juan Capistrano became Orange County's first permanent Euro-American settlement, becoming fully operational by 1776.

Mexican Period (1822–1848)

A major emphasis during the Spanish Period in California was the construction of missions and associated presidios to integrate the Native American population into Christianity and communal enterprise. Incentives were also provided to bring settlers to pueblos or towns, but just three pueblos were established during the Spanish Period, only two of which were successful and remain as California cities (San José and Los Angeles). Several factors kept growth within Alta California to a minimum, including the threat of foreign invasion, political dissatisfaction, and unrest among the indigenous population. After more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. In 1822, the Mexican legislative body in California ended isolationist policies designed to protect the Spanish monopoly on trade, and decreed California ports open to foreign merchants (Dallas 1955:14).

Extensive land grants were established in the interior during the Mexican Period, in part to increase the population inland from the more settled coastal areas where the Spanish had first concentrated their colonization efforts. Nine ranchos were granted between 1837 and 1846 in the future Orange County (Middlebrook 2005). Among the first ranchos deeded within the future Orange County were Manuel Nieto's Rancho Las Bolsas (partially in future Los Angeles County), granted by Spanish Governor Pedro Fages in 1784, and the Rancho Santiago de Santa Ana, granted by Governor José Joaquín Arrillaga to José Antonio Yorba and Juan Pablo Peralta in 1810 (Hallan-Gibson 1986). The secularization of the missions following Mexico's independence from Spain resulted in the subdivision of former mission lands and establishment of many additional ranchos.

During the supremacy of the ranchos (1834–1848), landowners largely focused on the cattle industry and devoted large tracts to grazing. Cattle hides became a primary southern California export, providing a commodity to trade for goods from the east and other areas in the United States and Mexico. The number of nonnative inhabitants increased during this period because of the influx of explorers, trappers, and ranchers associated with the land grants. The rising California population contributed to the introduction and rise of diseases foreign to the Native American population, who had no associated immunities.

American Period (1848–Present)

War in 1846 between Mexico and the United States precipitated the Battle of Chino, a clash between resident Californios and Americans in the San Bernardino area. The Mexican-American War ended with the Treaty of Guadalupe Hidalgo in 1848, ushering California into its American Period.

California officially became a state with the Compromise of 1850, which also designated Utah and New Mexico (with present-day Arizona) as U.S. Territories (Waugh 2003). Horticulture and livestock, based primarily on cattle as the currency and staple of the rancho system, continued to dominate the southern California economy through 1850s. The Gold Rush commenced in 1848, and with the influx of people seeking gold, cattle were no longer desired mainly for their hides, but also as a source of meat and other goods. During the 1850s cattle boom, rancho vaqueros drove large herds from southern to northern California to feed that region's burgeoning mining and commercial boom. Cattle were at first driven along major trails or roads such as the Gila Trail or Southern Overland Trail, then were transported by trains where available. The cattle boom ended for southern California as neighbor states and territories drove herds to northern California at reduced prices. Operation of the huge ranchos became increasingly difficult, and droughts severely reduced their productivity (Cleland 2005:102–103).

Many of the ranchos in the area now known as Orange County remained intact after the U.S. took possession of California; however, a severe drought in the 1860s resulted in many of the ranchos being sold. Many of the lands in this area were consolidated into extensive properties owned by Richard O'Neil, Sr., James Irvine, and others. Silver was discovered in the Santa Ana Mountains in 1887. This drew additional settlers to the region, which was already experiencing a real estate boom based on quality agricultural land (Dumke 1944).

The first towns laid out in the Santa Ana Valley, Anaheim (1857), Santa Ana (1870), and Orange (1870), all experienced rapid growth during the boom years of the late 1880s. Land promoters, or "boomers," moved into the area publicizing new settlements with stories of the bountifulness and beauty of the state. The well-watered Downey Plain of the immediate region was widely advertised as excellent for farming. New towns also appeared along new segments of the Atchison, Topeka & Santa Fe Railroad and the Southern Pacific Railroad (SPRR) (Dumke 1944). On March 11, 1889, the County of Orange was created, occupying 780 square miles (2020 km^2) of former Los Angeles County lands. Euro-American land use patterns differed considerably from those of the Mexicans and Spaniards. Their farms and dairies focused on intensive exploitation of the land, contrasting sharply with the passive exploitation characteristic of the ranchos. Within a decade the county was occupied by several populous American agricultural communities. The hills continued to be used for ranching, although orchards and vineyards were also planted on their slopes.

The population of Orange County grew throughout the twentieth century, yet the county retained its agricultural character. Anaheim, Fullerton and La Habra started as agricultural shipping centers surrounded by cultivated fields. The post-World War II era brought a new wave of growth, transforming most of the fields into suburban housing tracts. Several large freeway construction projects connected Orange County with the rest of the state including the Santa Ana Freeway (I-5), which passed through Anaheim in the 1956, and the Riverside Freeway (State Highway 91), which passed through Fullerton in 1963. Orange County became increasingly residential and by the 1980s was developed with numerous master planned communities, such as Irvine, including most of south county. Today the county is identified with amusement parks, including Disneyland and Knott's Berry Farm, as well as its 40 miles (64.4 km) of beaches. Despite weathering a bankruptcy in the 1990s, Orange County remains a desirable and upscale place to live with a mild Mediterranean climate.

History of the City of Santa Ana

The valley where Santa Ana is located was explored by Spaniard Franciscan Gaspar de Portolá in 1769. The area and adjacent river was named Santa Ana in honor of Saint Anne. In 1801, Juan Pablo Grijalva acquired a land grant to develop for cattle grazing and agriculture, which he named Rancho Santiago de Santa Ana. The Santa Ana River created an ideal place for more ranching, and the area grew into an agricultural center, eventually extending from the foothills of the Santa Ana mountains to the ocean (Encyclopedia Britannica 2019) In 1869, William H. Spurgeon purchased land from the Grijalva family and presented a formal town plan**,** keeping Santa Ana as the town name. Spurgeon worked out deals with Southern Pacific Railroad to extend their line to Santa Ana, offering $10,000 and 90 acres of land on the eastern side of the town. This in turn allowed farm produce to be transported up towards Los Angeles. The line was constructed mostly by Chinese laborers, and service from Santa Ana began in December of 1877 (Brigandi 2019). Pacific Electric extended their southern interurban rail line into Santa Ana in 1904. Their "Red Cars" could be seen entering the West Santa Ana Branch at Fourth Street and Santa Ana Boulevard. After World War II, passenger service declined as people returned to their automobiles (Copeland 1997). Service discontinued to Santa Ana and was pushed back to Bellflower in 1950, and in 1958 the entire route was finally suspended.

Historic maps depict the General Plan area within the Rancho Santa Ana and Rancho Las Bolsas Land Grants (Figure 6-Figure 7). The Rancho Santa Ana Land Grant is located on the eastern side of the Santa Ana River, and is made up of several different parcels of varying acreages. The largest parcel is noted as belonging to James McFadden, totaling 4,576 acres (1851.8 ha). The City of Santa Ana boundary incorporates approximately three quarters of the parcel, and covers the southern portion of the General Plan area. The next largest parcel at 2,455 acres (993.5 ha) is located entirely within the City boundary, and is noted as belonging to F.W. Koll. The Koll parcel, along with a 1,865 acre (754.7 ha) parcel belonging to Asencion Sepulveda de Mott, makes up the center portion of the General Plan area. The northern portion of the General Plan area is made up of 25 smaller parcels ranging in size from 649 acres (262.6 ha) to 25 acres (10.1 ha). The Rancho Santa Ana Land Grant maps do indict some structures and features of note. Within Township 5 South, Range 10 West, Section 24 of the F.W. Koll parcel, two houses, "House of Johnson" and "House of F. Koll," are mapped south of the "Road to San Joaquin" and to the north of an unnamed spring. The "House of Coyote Sepulveda" is mapped within Township 5 South, Range 10 West, Section 23 of the Asencion Sepulveda de Mott parcel, and the "House of Jóse Sepulveda" is mapped within Section 14 southeast of an unnamed spring. Within Township 5 South, Range 10 West, Section 11 of the Julian Chaves parcel, the house of Julian Chaves is mapped adjacent to the "Road to Santa Ana" and to the southwest of the "Old House" within Section 12 of the Jacob Ross parcel. Within the southern portion of the 180 acre parcel of James McFadden, an “Adobe house” is mapped within Township 5 South, Range 10 West, Section 1, south of Santiago Creek. The Las Bolsas Land Grant makes up the entirety of the portion of the General Plan area to the west of the Santa Ana River, and is noted as belonging to “Ramon Yorba et al.” The Las Bolsas Land Grant map does not identify any structures within the General Plan area, though a number of cottonwood trees are noted along the river.

Additional historic maps depict numerous segments of utility and transportation infrastructure as well established housing tracts around the time of the establishment of the City of Santa Ana. An irrigation map of the area from 1888 depicts a number of irrigation ditches within Santa Ana, including with the “Chapman Tract” (Figure 8). Two additional housing tracts are present within the General Plan area, including the “Williams Tract” and the “Ruffel and Fletcher Tract.” A segment of the SPRR is mapped traveling northwest-southeast through the core of the City of Santa Ana. Another railway labeled “Santa Ana, Fairview, and Newport Rail” travels roughly north from the southern boundary of the General Plan area into the core of the City without connecting to the SPRR. A number of features depicted as a small circle and labeled “A.W.” were mapped through the General Plan area, and may represent well features. The construction of the Santa Ana, Fairview, and Newport Rail was completed in 1891 and was a passenger rail line to connect downtown Santa Ana to the Newport Beach wharf (now Newport Pier) (Los Angeles Times 2015). The line became obsolete at the introduction of the Pacific Electric Line to the area. The General Plan area includes the original Santa Ana Red Line, and roughly follows the route of the Santa Ana, Fairview, and Newport Rail, though does not extend as far south (Figure 9).

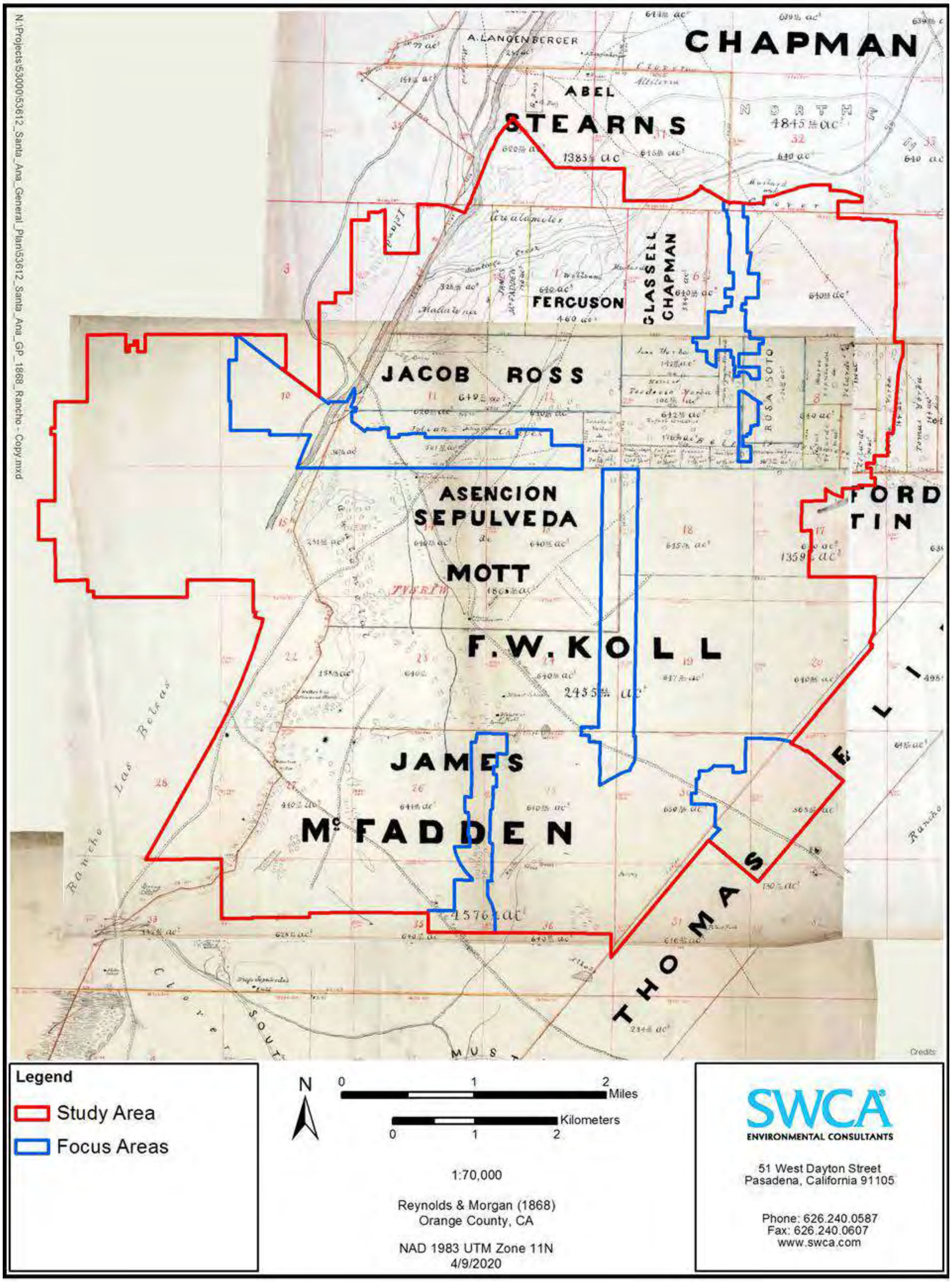


Figure 6. General Plan area plotted on the Rancho Santa Ana Land Grant, circa 1868.

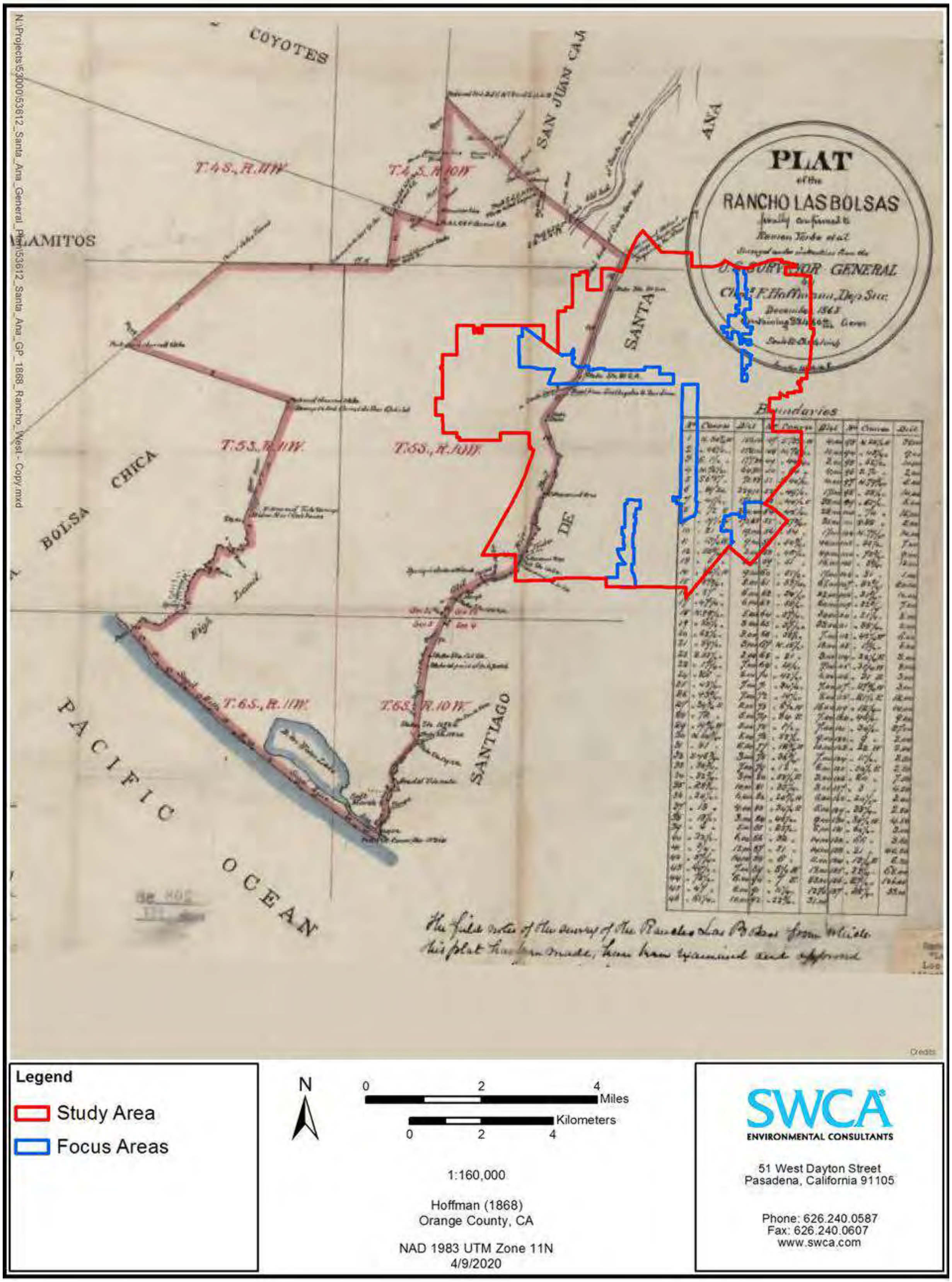


Figure 7. General Plan area plotted on the Rancho Las Bolsas Land Grant, circa 1868.

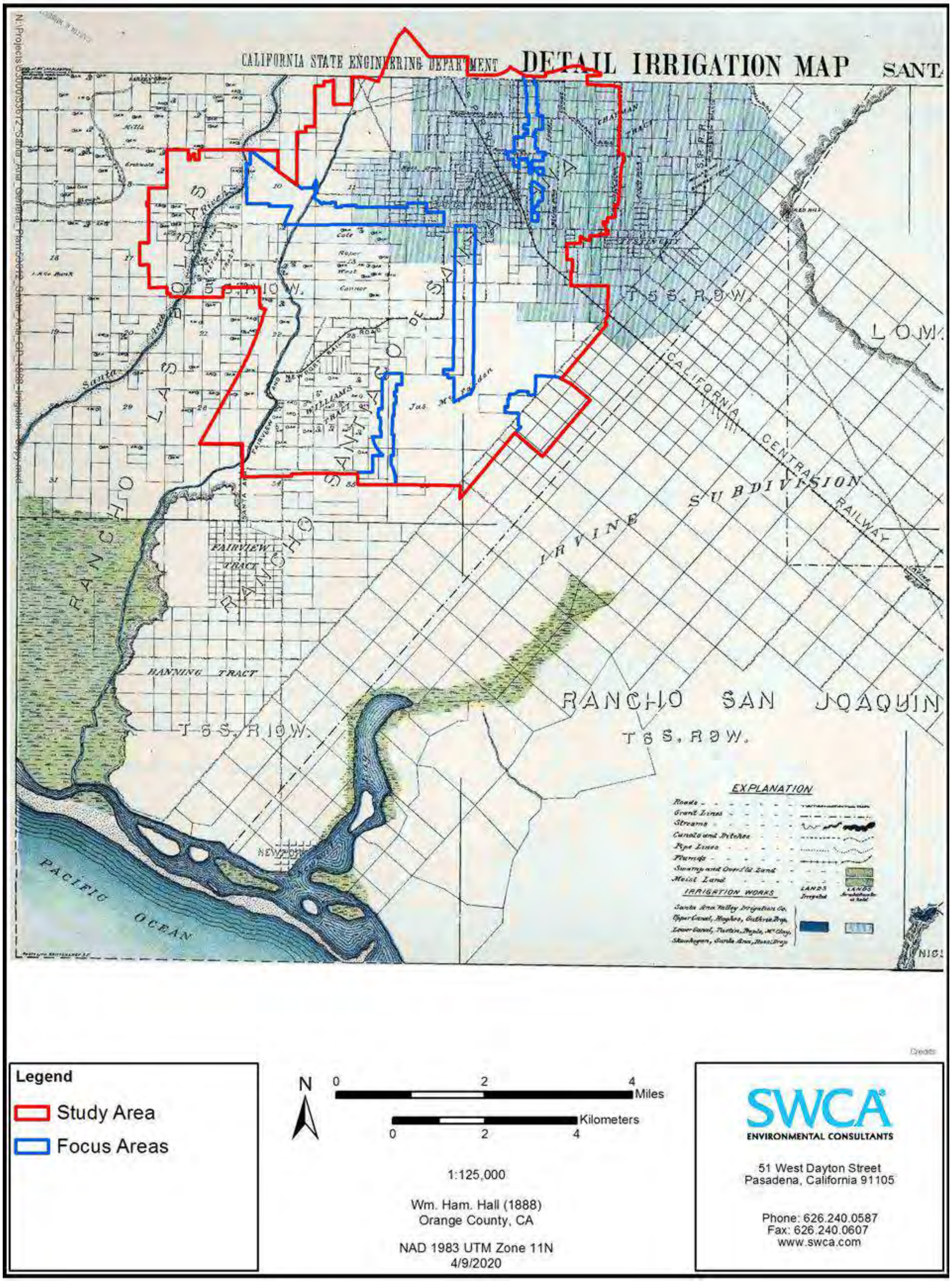
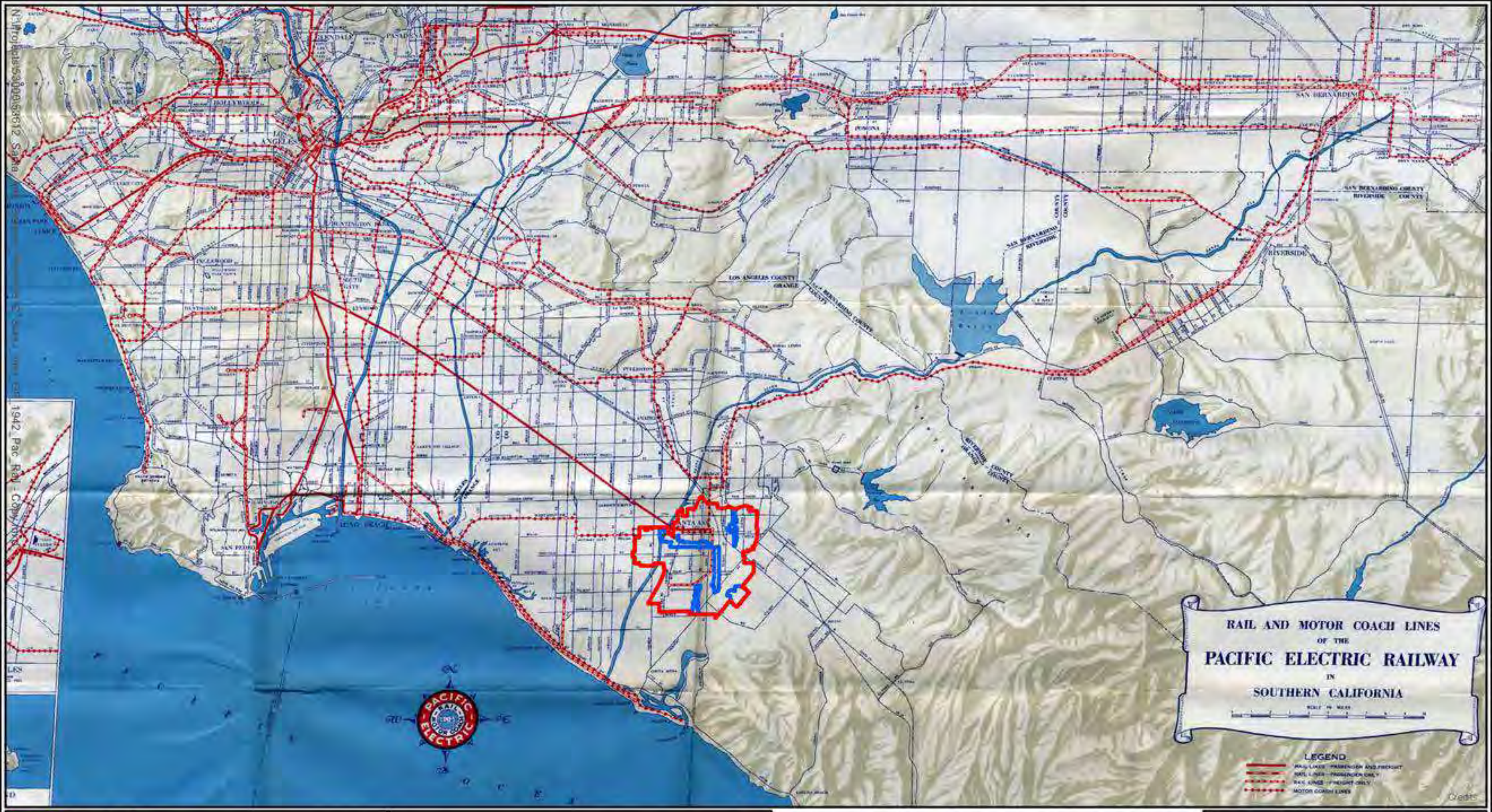


Figure 8. General Plan area plotted on Santa Ana irrigation map (Hall 1888).



Study Area
Focus Areas

Rail and Motor Coach Lines of the Pacific Electric Railway In Southern California

N

0 5 10 Miles

0 5 10 Kilometers

1:550,000

California Map Company (1947)

NAD 1983 UTM Zone 11N
4/9/2020

SWCA ENVIRONMENTAL CONSULTANTS

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Figure 9. General Plan area plotted on the Southern California Pacific Electric Railway map (California Map Company 1947).

METHODS

This technical report is based on a desktop review of available literature, historic topographic maps, historic aerial photographs, and records and database searches containing information on archaeological and tribal cultural resources. Data sources include the California Historical Resources Information System, California State databases, and map searches encompassing the General Plan area to provide regional context, and ensure thorough review of potential archaeological and tribal cultural resources within the General Plan area.

The California OHP's system for managing information on archaeological and historic built environment resources and previous studies is known as the California Historical Resources Information System (CHRIS). The CHRIS records are administered through various Archaeological Information Centers responsible for one or more counties. Records for Orange County are managed through the South Central Coastal Information Center (SCCIC), located on the campus of California State University, Fullerton. On February 19, 2019, SWCA archaeologist Amber Johnson, B.A. conducted a records search of the CHRIS at the SCCIC. The search included any previously recorded archaeological resources within a 0.5-mile radius of the General Plan area. Historic built resources, or buildings, structures, and objects that are 45 years or older, were not included in the records search, as they are being addressed in a separate technical report. The results of the records search are presented below.

Additional Background Research

In addition to the CHRIS records search, SWCA conducted a review of all available historic USGS 7.5- and 15-minute quadrangle maps depicting the City of Santa Ana. SWCA also reviewed property-specific historical and ethnographic context research to identify information relevant to the General Plan Area. Archival research focused on a variety of primary and secondary materials relating to the history and development of the City of Santa Ana. Some of the sources consulted included historical maps, aerial and ground photographs, building permits, ethnographic reports, soil reports, and other environmental data.

NAHC Sacred Lands File Search

On February 22, 2019, SWCA requested a search of the Sacred Lands File (SLF) from the NAHC. On March 1, 2019, the NAHC provided the results of the SLF search, as well as a consultation list of tribal governments with traditional lands or cultural places located within the General Plan area. To assist with formal government-to-government consultation with NAHC-listed tribes pursuant to SB 18 and AB 52, this list will be provided to the City.

EXISTING CONDITIONS

Archaeological Resources

The CHRIS records search indicates that 23 archaeological resources were previously recorded within 0.5 mile (0.8 km) of the General Plan area. Of these resources, eight archaeological resources were located within the General Plan area; these include four prehistoric sites, one multicomponent site, and three historic isolates (Table 2). The prehistoric sites include habitation debris sites and lithic scatters. Site CA-ORA-300 (P-30-000300) was recorded in 1971 during the construction of an apartment complex, and the site components identified included five prehistoric burials, a prehistoric midden deposit, and some historic materials associated with a historic walnut grove and a historic residence. Site CA-ORA-301 (P-30-000301) was also recorded in 1971, and consisted of a subsurface lithic deposit, up to 6 feet (1.8 m) below the surface. The site is noted as being completely paved over. Site CA-ORA-353 (P-30-000353) was recorded in 1972, and is located adjacent to CA-ORA-300. The site was recorded as a prehistoric lithic scatter, and the area has been partially developed for housing. Site CA-ORA-392 (P-30-000392) was recorded in 1973 after the development of a housing project, with shell midden visible on the surface around the existing homes. The record notes that lithic artifacts were recovered by the local residents. None of these sites have been updated since their initial recordation, and it is possible that intact subsurface deposits are still present within the site boundaries. The area surrounding CA-ORA-300 and 353 should be considered particularly sensitive due to the previous discovery of Native American burials. Site CA-ORA-1514 (P-30-001514) was recorded in 1999 and consisted of a prehistoric shell scatter with no other associated artifacts. The site was noted to be a disturbed surface scatter in an open lot with buildings in the surrounding area, and no determination of a subsurface component. It is possible that intact subsurface deposits are still present within the site boundary.

While the review of these ethnographic and historic maps do not indicate the presence of any specific Native American archaeological resources, the proximity of mapped locations of these settlements in the vicinity of the General Plan indicate a high sensitivity. The presence of the Santa Ana River, a permanent water source that connects the closest mapped Native American villages, and numerous springs mapped throughout the area on the rancho plat maps indicates that there is likely a high sensitivity for Native American archaeological resources throughout the General Plan area. This is supported by the identification of several prehistoric sites composed of habitation debris and lithic materials. A number of historic features, including structures related to the ranchos, 19th century housing tracts, irrigation features, and heavy and light rail lines, are mapped within the General Plan area. While it is unlikely that some of those features are currently intact, remains of the structures and related subsurface components, such as refuse dumps, privies, etc., may still be present. The irrigation features that were decommissioned may have accumulated residential and commercial refuse prior to being filled in, a common practice observed archaeologically. For the decommissioned light rail features, segments of rail ties may still be intact beneath current road surfaces and remains of features related to the rail line, such as signal foundations, refuse deposits, and depot foundations, may still be present. While confirmation of the continued presence of the structures within the historic housing tracts was not conducted, it is likely that historic deposits related to the historic residences may still be present. Due to these factors, the overall sensitivity of the General Plan area for historic archaeological resources is high.

Table 2. Previously Recorded Cultural Resources within 0.5 mile (0.8 km) of the General Plan Area.

Primary No.	Trinomial	Temporal Affiliation	Resource Type	Resource Description	Recorded by and Year Recorded	Relationship to General Plan Area	NRHP/CRHR Eligibility
P-30-000300	CA-ORA-300H	Multicomponent	Site	Shell midden, lithic scatter, habitation debris, burials, historic refuse materials	Sperry, P. 1971	Within*	Unknown
P-30-000301	CA-ORA-301	Prehistoric	Site	Lithic scatter	Sperry, P. 1971	Within*	Unknown
P-30-000353	CA-ORA-353	Prehistoric	Site	Lithic scatter, habitation debris	Sperry, P. 1972	Within*	Unknown
P-30-000392	CA-ORA-392	Prehistoric	Site	Lithic scatter, habitation debris	Sperry, P. 1973	Within*	Unknown
P-30-001151	CA-ORA-1151H	Historic	Site	Historic refuse trash, walls, standing structures, hearths	Mason, V. 1987, 1988	Outside (within 0.5 mile)	Unknown
P-30-001510	CA-ORA-1510	Prehistoric	Site	Lithic scatter, cairns/rock feature, hearth/pit, habitation debris	King, G. 1999	Outside (within 0.5 mile)	Unknown
P-30-001514	CA-ORA-1514	Prehistoric	Site	Habitation debris (shell)	Duke, C., and Lopez, M. 1999	Within*	Unknown
P-30-001617	CA-ORA-1617	Prehistoric	Site	Habitation debris (shell)	McCormick, S. 2003	Outside (within 0.5 mile)	Unknown
P-30-001629	CA-ORA-1629H	Historic	Site	Historic refuse dump	Herman, R. 2003	Outside (within 0.5 mile)	Unknown
P-30-001725	CA-ORA-1725	Prehistoric	Site	Lithic scatter, caches	Aron, G. 2008	Outside (within 0.5 mile)	Unknown
P-30-001726	CA-ORA-1726H	Historic	Site	Historic refuse dump, well/cistern	Aron, G. 2013	Outside (within 0.5 mile)	Unknown
P-30-100192	-	Historic	Other	Isolated broken metal arrow-shaped object	Aron, G. 2013	Outside (within 0.5 mile)	Not Eligible
P-30-100193	-	Historic	Other	Isolated broken metal arrow-shaped object	Aron, G. 2013	Outside (within 0.5 mile)	Not Eligible
P-30-100194	-	Prehistoric	Other	Isolated bifacial mano	Armstrong, S. 2013	Outside (within 0.5 mile)	Not Eligible
P-30-100195	-	Prehistoric	Other	Isolated bifacial mano	Armstrong, S. 2013	Outside (within 0.5 mile)	Not Eligible
P-30-100196	-	Prehistoric	Other	Isolated bifacial mano (2 pieces)	Aron, G. 2013	Outside (within 0.5 mile)	Not Eligible
P-30-100199	-	Prehistoric	Other	Isolated metate fragment	Aron, G. 2013	Outside (within 0.5 mile)	Not Eligible
P-30-100200	-	Unknown	Other	Isolated metate fragment	Aron, G. 2013	Outside (within 0.5 mile)	Not Eligible

Primary No.	Trinomial	Temporal Affiliation	Resource Type	Resource Description	Recorded by and Year Recorded	Relationship to General Plan Area	NRHP/CRHR Eligibility
P-30-100337	-	Prehistoric	Other	Isolated unifacially flaked, grey limestone core	Sikes, N.E. 2003	Outside (within 0.5 mile)	Not Eligible
P-30-100341	-	Historic	Other	Isolated blue and white porcelain sherd	Hermann, R. 2003	Outside (within 0.5 mile)	Not Eligible
P-30-100342	-	Historic	Other	Two isolated ceramic sherds	Tennyson, M. 2002	Within*	Not Eligible
P-30-100343	-	Historic	Other	Isolated white ceramic sherd	Tennyson, M. 2002	Within*	Not Eligible
P-30-100344	-	Historic	Other	Isolated glass bottle	Tennyson, M. 2002	Within*	Not Eligible

*Within the General Plan Area but not within the Focus Areas.

Sacred Lands File Search

Tribal cultural resources can include archaeological sites, built environment resources, locations of events or ceremonies, resource procurement areas, and natural landscape features with special significance to one or more indigenous groups. SWCA received a response to the SLF search request by electronic mail from the NAHC on March 1, 2019. The SLF returned positive results, indicating that known tribal resources are located within the General Plan area. So that a meaningful consultation with interested Native American groups can be completed, this list will be forwarded to the City of Santa Ana, where all records of this consultation should be kept on file. Confidential Appendix C contains the list of tribal governments and SLF results.

POTENTIAL IMPACTS AND MITIGATION MEASURES

CEQA (Section 21084.1) requires that a lead agency determine whether a project may have a significant effect on cultural resources. Impacts to significant cultural resources that affect the characteristics of the resource that qualify it for the NRHP or adversely alter the significance of a resource listed on, or eligible for, the CRHR are considered a significant effect on the environment.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (Section 21083.2[a], [b], and [c]).

Development of previously undeveloped areas, and redevelopment of previously developed areas have the potential to impact archaeological resources. Surface-level and subsurface archaeological sites and deposits can be affected by ground-disturbing activities associated with most types of construction.

Thresholds of Significance

The City of Santa Ana General Plan provides a framework within which future development projects can be considered. The potential for future proposed projects to result in impacts associated with cultural resources is based on the CEQA thresholds of significance outlined in Appendix G of the State CEQA Guidelines:

- Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?
- Would the project disturb any human remains, including those interred outside of formal cemeteries?
- Is the project site in or near an area containing known archaeological resources or containing features (drainage course, spring, knoll, rock outcroppings, or oak trees) that indicate potential archaeological sensitivity?

The purpose of this analysis is to identify any potential archaeological resources within or adjacent to the General Plan area, and to assist the lead agency in determining whether such resources meet the official definitions of archaeological and tribal cultural resources, as provided in the PRC, in particular CEQA.

Archaeological Resources

A significant prehistoric archaeological impact would occur if grading and construction activities result in a substantial adverse change to archaeological resources determined to be "unique" or "historic." "Unique" resources are defined in PRC Section 21083.2; "historic" resources are defined in PRC Section 21084.1 and CEQA Guidelines Section 15126.4.

PRC Section 21083.2(g) states:

> As used in this section, "unique archaeological resource" means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:
>
> A. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
>
> B. Has a special and particular quality, such as being the oldest of its type or the best available example of its type; or
>
> C. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

CEQA Significance Criteria

Appendix G of the California Environmental Quality Act (CEQA) Guidelines contains the Initial Study Environmental Checklist, which includes questions relating to tribal and cultural resources. The issues presented in the Initial Study Environmental Checklist have been utilized as thresholds of significance in this section. Accordingly, a project may create a significant environmental impact if it would:

Archaeological Resources

- Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5;
- Disturb any human remains, including those interred outside of dedicated cemeteries (as explained in Section 9.0, Effects Found Not to Be Significant, further analysis of this topic is not required in this EIR).

Tribal Cultural Resources

- Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k); or
- A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.

Based on these standards/criteria, the effects of the proposed project have been categorized as either a "less than significant impact" or a "potentially significant impact." If a potentially significant impact cannot be reduced to a less than significant level through the application of mitigation, it is categorized as a significant and unavoidable impact. The standards used to evaluate the significance of impacts are often qualitative rather than quantitative because appropriate quantitative standards are either not available for many types of impacts or are not applicable for some types of projects.

Archaeological Resources

Under CEQA, archaeological resources may meet the definition of a historical resource or unique archaeological resource. Substantial adverse change to the significance of a historical resource is defined as physical demolition, destruction, alteration, or relocation of the resource or immediate surroundings such that its significance would be materially impaired. CEQA states that when a project would cause damage to a unique archaeological resource, reasonable efforts must be made to preserve the resource in place or leave it in an undisturbed state. Mitigation measures are required to the extent that the resource could be damaged or destroyed by a project. Implementation of the mitigation measures presented below would mitigate to the greatest extent feasible the potential for future projects to affect archaeological resources.

Individual and Cumulative Impacts to Archaeological Resources

Development involving ground disturbance within the General Plan area has the potential to impact known and unknown archaeological resources. Typically, surface-level and subsurface archaeological sites and deposits can be affected by ground-disturbing activities associated with most types of construction. Based on literature review and records searches, eight archaeological resources have been previously recorded within the General Plan area, including four prehistoric sites, one multicomponent site, and three historic isolates. The General Plan area includes many locations that would have been favorable for prehistoric Native American occupation. While most of the General Plan area has been developed over the course of the twentieth century, buried resources may remain in areas where developments such as parking lots, parks, or structures with shallow foundations have required only minimal ground disturbance. A review of historic and ethnographic maps indicates that is a moderate likelihood that intact subsurface archaeological resources would be encountered during redevelopment.

Archaeological resources impacts are site specific, but more intensive development can result in cumulative impacts on a regional level and should be considered in addition to individual project impacts on individual sites. A Phase I Cultural Resources Study would be required for all projects before ground disturbances and demolition activities are permitted to occur, as determined by the respective lead agency. The study would identify resources on the affected project sites that are, or appear to be, eligible for listing on the NRHP or CRHR. Such studies would also recommend mitigation measures to protect and preserve archaeological and tribal cultural resources.

As such, Mitigation Measures CUL-1 through CUL-4 (below) were developed to reduce potential individual and cumulative impacts associated with future development and redevelopment. Mitigation Measure CUL-1 requires an archaeological resources assessment be conducted for future development projects to identify any known archaeological resources and sensitivity of the site. Mitigation Measures CUL-2 through CUL-4 detail the next steps required should the archaeological resources assessment identify known resources or determine the site to have high or moderate resource sensitivity. Upon compliance with Mitigation Measures CUL-1 through CUL-4, individual and cumulative impacts to archaeological resources would be reduced to less than significant levels. +

- ## CULTURAL RESOURCES MITIGATION MEASURE 1 (CUL-1)

To ensure identification and preservation of archaeological resources and avoid significant impacts to those resources within the City of Santa Ana, all proposed projects shall be screened by the City to determine whether an Archaeological Resources Assessment study is required. Screening shall consider the type of project and whether ground disturbance will occur. Ground disturbance includes, but is not limited to, activities such as grading, excavation, trenching, boring, or demolition that extend below the current grade. If there will be no ground disturbance, then an Archaeological Resources Assessment shall not be required. If there will be ground disturbance, prior to issuance of any permits required to conduct ground disturbing activities, the City shall require an Archaeological Resources Assessment be conducted under the supervision of an archaeologist that meets the Secretary of the Interior’s (SOI) Professionally Qualified Standards (PQS) in either prehistoric or historic archaeology.

Assessments shall include a CHRIS records search at the SCCIC and of the SLF maintained by the NAHC. The records searches will determine if the proposed project area has been previously surveyed for archaeological resources, identify and characterize the results of previous cultural resource surveys, and disclose any cultural resources that have been recorded and/or evaluated. If unpaved surfaces are present within the project area, and the entire project area has not been previously surveyed within the past 10 years, a Phase I pedestrian survey shall be undertaken in proposed project areas to locate any surface cultural materials that may be present. By performing a records search, consultation with the NAHC, and a Phase I survey, a qualified archaeologist will be able to classify the project area as having high, medium, or low sensitivity for archaeological resources.

- ## CULTURAL RESOURCES MITIGATION MEASURE 2 (CUL-2)

If potentially significant archaeological resources are identified through an archaeological resources assessment, and impacts to these resources cannot be avoided, a Phase II Testing and Evaluation investigation shall be performed by an archaeologist who meets the PQS prior to any construction-related ground-disturbing activities to determine significance. If resources determined significant or unique through Phase II testing, and site avoidance is not possible, appropriate site-specific mitigation measures shall be established and undertaken. These might include a Phase III data recovery program implemented by a qualified archaeologist and performed in accordance with the OHP’s *Archaeological Resource Management Reports (ARMR): Recommended Contents and Format* (OHP 1990) and *Guidelines for Archaeological Research Designs* (OHP 1991).

- ## CULTURAL RESOURCES MITIGATION MEASURE 3 (CUL-3)

If the archaeological assessment did not identify potentially significant archaeological resources within the proposed project area but indicated the area to be highly sensitive for archaeological resources, a qualified archaeologist shall monitor all ground-disturbing construction and pre-construction activities in areas with previously undisturbed soil. The archaeologist shall inform all construction personnel prior to construction activities of the proper procedures in the event of an archaeological discovery. The training shall be held in conjunction with the project’s initial on-site safety meeting, and shall explain the importance and legal basis for the protection of significant archaeological resources. In the event that archaeological resources (artifacts or features) are exposed during ground-disturbing activities, construction activities in the immediate vicinity of the discovery shall be halted while the resources are evaluated for significance by an archaeologist who meets the PQS and tribal consultation shall be conducted, in the case of a tribal resource.. If the discovery proves to be significant, the long-term disposition of any collected materials should be determined in consultation with the affiliated tribe(s), where relevant; this could include curation with a recognized scientific or educational repository, transfer to the tribe, or respectful reinternment in an area designated by the tribe.

- **CULTURAL RESOURCES MITIGATION MEASURE 4 (CUL-4)**

If potentially significant archaeological resources are not identified through an Archaeological Resources Assessment but a project site is identified as having moderate sensitivity for archaeological resources (Mitigation Measure CUL-1), an archaeologist who meets the SOI PQS shall be retained on an on-call basis. The archaeologist shall inform all construction personnel prior to construction activities about the proper procedures in the event of an archaeological discovery. The pre-construction training shall be held in conjunction with the project's initial on-site safety meeting and shall explain the importance and legal basis for the protection of significant archaeological resources. In the event that archaeological resources (artifacts or features) are exposed during ground-disturbing activities, construction activities in the immediate vicinity of the discovery shall be halted while the on-call archaeologist is contacted. The resource shall be evaluated for significance by an archaeologist who meets the SOI PQS, and tribal consultation shall be conducted, in the case of a tribal resource. If the discovery proves to be significant, the long-term disposition of any collected materials should be determined in consultation with the affiliated tribe(s), where relevant; this could include curation with a recognized scientific or educational repository, transfer to the tribe, or respectful reinternment in an area designated by the tribe.

REFERENCES CITED

Altschul, Jeffrey H., John G. Douglass, Richard Ciolek-Torrello, Sarah Van Galder, Benjamin R. Vargas, Kathleen L. Hull, Donn R. Grenda, Jeffrey Homburg, Manuel Palacios-Fest, Steven Shelley, Angela Keller, and David Maxwell

2007 Life at the Nexus of the Wetlands and Coastal Prairie, West Los Angeles. In *Proceedings of the Society for California Archaeology* 20:34–42.

Applied Earthworks, Inc.

1999 The Metropolitan Water District of Southern California Headquarters Facility Project. *The People of Yaanga?: Archaeological Investigations at CA-LAN-1575/H*. Report on file, South Central Coastal Information Center, California State University, Fullerton.

Ashby, G. E., and J. W. Winterbourne

1966 A Study of Primitive Man in Orange County and Some of its Coastal Areas. *Pacific Coast Archaeological Society Quarterly* 2(1):3–52.

Bancroft, Hubert Howe

1885 *History of California, Volume III: 1825-1840*. A.L. Bancroft & Co., San Francisco.

Bean, Lowell J., and Charles R. Smith

1978 Gabrielino. In *California*, edited by Robert F. Heizer, pp. 538–549. Handbook of North American Indians, Vol. 8, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

Blackburn, Thomas

1963 *Ethnohistoric Descriptions of Gabrielino Material Culture.* Annual Report, Archaeological Survey. University of California, Los Angeles.

Boscana, Gerónimo

1846 *Chinigchinich: A Historical Account of the Origin, Customs, and Traditions of the Indians at the Missionary Establishment of St. Juan Capistrano, Alta-California; Called the Acagcahemem Nation.* Wiley & Putnam, New York.

Brigandi, Phil

2019 The Southern Pacific – Orange County's First Railroad. Available at: https://www.ochistoryland.com/sprr. Accessed: March 2019.

California Map Company

1947 Rail and Motor Coach Lines of the Pacific Electric Railway in Southern California.

City of Santa Ana

1982 Current Santa Ana General Plan. Available at: https://www.santa-ana.org/general-plan/current-general-plan. Accessed: March 2019.

Cleland, Robert Glass

2005 *The Cattle on a Thousand Hills: Southern California, 1850-80*, 2nd ed., 6th printing. The Huntington Library, San Marino, California.

Cleland, James H., Andrew L. York, and Lorraine M. Willey

2007 *Piecing Together the Prehistory of Landing Hill: A Place Remembered.* EDAW Cultural Publications No. 3. EDAW, Inc., San Diego, California.

Copeland, P. Allen

1997 *Pacific Electric in Color, Volume 1*. Morning Sun Books, Scotch Plains, New Jersey.

Cottrell, Marie and Kathleen Del Chario

1981 *Archaeological Investigations of the Tomato Springs Sites.* On file, South Central Coastal Information Center, California State University, Fullerton.

Dakin, Susanna Bryant

1978 A Scotch Paisano in Old Los Angeles. Hugo Reid's Life in California, 1832-1852, Derived from His Correspondence. Originally published 1939. University of California Press, Berkeley, Los Angeles, and London.

Dallas, S. F.

1955 The Hide and Tallow Trade in Alta California 1822–1848. Unpublished Ph.D. dissertation, Indiana University, Bloomington.

de Barros, Philip

1996 *San Joaquin Hills Transportation Corridor: Results of testing and data recovery at CA-ORA-1357.* Report on file, South Central Coastal Information Center, California State University, Fullerton

Demcak, Carol R.

1981 Fused Shale As a Time Marker in Southern California: Review and Hypothesis. Unpublished Master's Thesis, Department of Anthropology, California State University, Long Beach.

Dillon, Brian D.

2002 California PalaeoIndians: Lack of Evidence, or Evidence of a Lack? In *Essays in California Archaeology: A Memorial to Franklin Fenenga*, edited by William J. Wallace and Francis A. Riddell, pp. 110–128. Contributions of the University of California Archaeological Research Facility, No. 60. Berkeley.

Dixon, Keith A.

1968 Cogged Stones and Other Ceremonial Cache Artifacts in Stratigraphic Context at ORA-58, a Site in the Lower Santa Ana River Drainage, Orange County. *Pacific Coast Archaeological Society Quarterly* 4(3):57-68.

1975 New Evidence for the Most Important Archaeological Discovery in Long Beach: the Cogged Stones and Discs of Rancho Los Cerritos. *Los Fierros* 12(2):20–31.

Drover, Christopher E.

1971 Three Fired-Clay Figurines from 4-Ora-64, Orange County, California. *Pacific Coast Archaeological Society Quarterly* 7(4):73-86.

1975 Early Ceramics from Southern California. *The Journal of California Anthropology* 2(1):101-107.

Drover, Christopher E., Henry C. Koerper, and Paul E. Langenwalter II

1983 Early Holocene Adaptation on the Southern California Coast: A Summary Report of Investigations at the Irvine Site (CA-ORA-64), Newport Bay, Orange County, California. *Pacific Coast Archaeological Society Quarterly* 19(2 & 3):1-84.

Dumke, Glenn S.

1944 *The Boom of the Eighties in Southern California.* Huntington Library Publications, San Marino, California.

Eberhart, Hal

1961 The Cogged Stones of Southern California. *American Antiquity* 26(3):361-370.

Encyclopaedia Britannica

2019 Santa Ana, California, United States. Available at: https://www.britannica.com/place/Santa-Ana-California. Accessed March 2019.

Erlandson, Jon M.

1991 Early Maritime Adaptations on the Northern Channel Islands. In *Hunter-Gatherers of Early Holocene Coastal California*, edited by J.M. Erlandson and R. H. Colten, pp. 101-112. Perspectives in California Archaeology, Vol. 1. Institute of Archaeology, University of California, Los Angeles.

Erlandson, Jon M., Theodore Cooley, and Richard Carrico

1987 A Fluted Projectile Point Fragment from the Southern California Coast: Chronology and Context at CA-SBA-1951. *Journal of California and Great Basin Anthropology* 9:120-128.

Frazier, Sara

2000 Protohistoric Burial Practices of the Gabrielino as Evidenced by the Comparison of Funerary Objects from Three Southern California Sites. In *Proceedings of the Society for California Archaeology* Vol. 13, edited by Judyth Reed, Greg Greenway, and Kevin McCormick, pp. 169–176. Society for California Archaeology, Fresno.

Glassow, Michael A.

1997 Middle Holocene Cultural Development in the Central Santa Barbara Channel Region. In *Archaeology of the California Coast during the Middle Holocene*, edited by J. M. Erlandson and M. A. Glassow, pp.73-90. Perspectives in California Archaeology, Vol. 4. Institute of Archaeology, University of California, Los Angeles.

Glassow, Michael A., Larry Wilcoxon, and Jon Erlandson

1988 Cultural and Environmental Change During the Early Period of Santa Barbara Channel Prehistory. In *The Archaeology of Prehistoric Coastlines*, edited by G. Bailey and J. Parkington, pp. 64-77. Cambridge University Press.

Grenda, Donn R.

1995 Prehistoric Game Monitoring on the Banks of Mill Creek: Data Recovery at CA-RIV-2804, Prado Basin, Riverside County, California. *Statistical Research Technical Series* No. 52. Statistical Research, Inc., Tucson, Arizona.

1997 *Continuity and Change: 8,500 Years of Lacustrine Adaptation on the Shores of Lake Elsinore*. Statistical Research Technical Series No. 59. Statistical Research, Inc., Tucson, Arizona.

Gumprecht, Blake

1999 *The Los Angeles River: Its Life, Death, and Possible Rebirth*. Johns Hopkins University Press, Baltimore.

Hall, Matthew C.

1988 For the Record: Notes and Comments on "Obsidian Exchange in Prehistoric Orange County." *Pacific Coast Archaeological Society Quarterly* 24(4):34-48.

Hall, William Hammond

1888 Detail Irrigation Map(s) of Los Angeles and San Bernardino Counties, California to Accompany Report on Irrigation and Water Supply. California Department of Engineering, Sacramento, California.

Hallan-Gibson, Pamela

1986 *Orange County - The Golden Promise an Illustrated History.* Windsor Publications, Northridge, California.

Harrington, John P.

1942 Culture Element Distributions: XIX, Central California Coast. *Anthropological Records* 7:1. University of California Press, Berkeley.

Heizer, Robert F.

1968 *Village Names in Twelve California Mission Records.* Reports of the University of California Archaeological Survey, No. 74.

1978 Introduction. In *California*, edited by Robert F. Heizer, pp. 1-6. Handbook of North American Indians, Vol. 8, William G. Sturtevant, general editor, Smithsonian Institution, Washington D.C.

Herring, Alika

1968 Surface Collections from ORA-83, A Cogged Stone Site at Bolsa Chica, Orange County, California. *Pacific Coast Archaeological Society Quarterly* 4(3):3-37.

Johnson, J.R., T.W. Stafford, Jr., H.O. Ajie and D.P. Morris

2002 Arlington Springs Revisited. In *Proceedings of the Fifth California Islands Symposium*, edited by D.R. Brown, K.C. Mitchell and H.W. Chaney, pp. 541–545. Santa Barbara Museum of Natural History, Santa Barbara, California.

Johnston, Bernice E.

1962 *California's Gabrielino Indians.* Frederick Webb Hodge Anniversary Publication Fund 8, Southwest Museum, Los Angeles, California.

Jones, Terry L., Richard T. Fitzgerald, Douglas J. Kennett, Charles Miksicek, John L. Fagan, John Sharp, and Jon M. Erlandson

2002 The Cross Creek Site and Its Implications for New World Colonization. *American Antiquity* 67:213-230.

Kirkman, George W.

1937 Pictorial and Historical Map of Old Los Angeles County.

King, Chester D.

2004 *Japchibit Ethnohistory.* Angeles National Forest, Topanga Anthropological Consultants, California.

Koerper, Henry C.

1995 The Christ College Project: Archaeological Investigations at CA-ORA-378, Turtle Rock, Irvine, California, Vol. 2. Report on file, South Central Coastal Information Center, California State University, Fullerton.

Koerper, Henry C. and Christopher E. Drover

1983 Chronology Building for Coastal Orange County: the Case from CA-ORA-119-A. *Pacific Coast Archaeological Society Quarterl*y 19(2):1–34.

Koerper, Henry C., Roger D. Mason, and Mark L. Peterson

2002 Complexity, Demography, and Change in Late Holocene Orange County. In *Catalysts to Complexity, Late Holocene Societies of the California Coast*, edited by Jon M. Erlandson and Terry L. Jones, pp. 63-81. Perspectives in California Archaeology Vol. 6. Costen Institute of Archaeology, University of California, Los Angeles.

Kowta, Makoto

1969 The Sayles Complex, A Late Milling Stone Assemblage from the Cajon Pass and the Ecological Implications of its Scraper Planes. *University of California Publications in Anthropology* 6:35-69. Berkeley, California.

Kroeber, Alfred J.

1925 *Handbook of the Indians of California.* Bureau of American Ethnology Bulletin 78. Dover Publications, New York, New York.

Langenwalter, Paul E., II, and James Brock

1985 Phase II Archaeological Studies of the Prado Basin and the Lower Santa Ana River. Report on file, U.S. Army Corps of Engineers, Los Angeles District.

Los Angeles Times

2015 A look at the trains that built the O.C. coast. *Los Angeles Times* 12 May. Los Angeles, California.

Macko, Michael E.

1998a The Muddy Canyon Archaeological Project: Results of Phase II Test Excavations and Phase III Data Recovery Excavations at Archaeological Sites within the Crystal Cove Planned Community, Phase IV, Tentative Tract 15447, San Joaquin Hills, Orange County, California. Report on file, South Central Coastal Archaeological Information Center, California State University, Fullerton.

1998b Neolithic Newport. Executive Summary: Results of Implementing Mitigation Measures Specified in the Operation Plan and Research Design for the Proposed Newporter North Residential Development at ORA-64. Report on file, South Central Coastal Archaeological Information Center, California State University, Fullerton.

Mason, Roger E., Brant A. Brechbiel, Mark L. Peterson, Clay A. Singer, Paul E. Langenwalter II, and Robert O. Gibson

1991 Newport Coast Archaeological Project: Results of Data Recovery at the Late Small Rockshelters, CA-ORA-674, CA-ORA-677, CA-ORA-678, CA-ORA-1206, CA-ORA-1210, CA-ORA-676, CA-ORA-682, CA-ORA-679, and CA-ORA-1204. Report on file, South Central Coastal Information Center, California State University, Fullerton.

Mason, Roger D., Brant A. Brechbiel, Clay A. Singer, Patricia A. Singer, Wayne H. Bonner, Robert O. Gibson, Mark L. Peterson, and Lisa Panet Klug

1992 Newport Coast Archaeological Project: Results of Data Recovery at the French Flat Complex Sites, CA-ORA-232, CA-ORA-233, CA-ORA-671, CA-ORA-672, and CA-ORA-1205. Report on file, South Central Coastal Information Center, California State University, Fullerton.

Mason, Roger D., Brant A. Brechbiel, Clay A. Singer, Mark L. Peterson, Linda Panet Klug, Wayne H. Bonner, Robert O. Gibson, and Patricia A. Singer

1993 Newport Coast Archaeological Project: Results of Data Recovery at the Pelican Hills Sites, CA-ORA-662, CA-ORA-677, CA-ORA-678, CA-ORA-1206, CA-ORA-1210, CA-ORA-676 and CA-ORA-1203, Vol. 1. Report on file, South Central Coastal Information Center, California State University, Fullerton.

Mason, Roger D., Henry C. Koerper, and Paul E. Lagenwalter II

1997 Middle Holocene Adaptations on the Newport Coast of Orange County. In *Archaeology of the California Coast during the Middle Holocene*, edited by Jon M. Erlandson and Michael A. Glassow, pp. 35-60. Institute of Archaeology, University of California, Los Angeles.

Mason, Roger D., and Mark L. Peterson

1994 Newport Coast Archaeological Project: Newport Coast Settlement Systems–Analysis and Discussion, Volume 1, part 1 of 2. Prepared by The Keith Companies. Copies on file at the South Central Coastal Information Center, California State University, Fullerton.

McCawley, William

1996 *The First Angelinos: The Gabrielino Indians of Los Angeles*. Malki Museum Press, Banning California, and Ballena Press, Novato, California.

Meighan, Clement W.

1954 A Late Complex in Southern California Prehistory. *Southwestern Journal of Anthropology* 10(2):215-227.

Middlebrook, John-Robin

2019 History of Orange County, California. Electronic document, Available at: https://www.legendsofamerica.com/ca-orangecounty/. Accessed March 2019.

Mithun, Marianne

2004 *The Languages of Native North America*. Reprinted. Cambridge University Press, Cambridge, Massachusetts. Originally published 1999, Cambridge University Press, Cambridge, Massachusetts.

Moratto, Michael

1984 *California Archaeology.* Academic Press, New York.

Moriarty, James R., III

1966 Cultural phase divisions suggested by typological change coordinated with stratigraphically controlled radiocarbon dating in San Diego. *The Anthropological Journal of Canada* 4(4):20-30.

National Park Service

1990 National Register Bulletin 15. *How to Apply the National Register Criteria for Evaluation*. U.S Department of the Interior.

Office of Historic Preservation (OHP)

1990 *Archaeological Resource Management Reports (ARMR): Recommended Contents and Format.* Department of Parks and Recreation, Office of Historic Preservation, Sacramento, California.

1991 *Guidelines for Archaeological Research Designs*. Preservation Planning Bulletin No. 5, Department of Parks and Recreation, Office of Historic Preservation, Sacramento, California.

O'Neil, Stephen

2002 *The Acjachemen in the Franciscan Mission System: Demographic Collapse and Social Change*. Master's thesis, Department of Anthropology, California State University, Fullerton.

Peterson, Mark L.

2000 Bonita Mesa Archaeological Project. The Intermediate: A Non-Traditional Approach to a Revised Interpretation of Human Settlement Systems of the Newport Bay and San Joaquin Hills Region of Orange County, California. Vol. 1. Report on file, South Central Coastal Information Center, California State University, Fullerton.

Reinman, Fred M.

1964 Maritime Adaptations on San Nicolas Island, California. *University of California Archaeological Survey Annual Report 1963-1964*:47-80.

Rick, Torben C., Jon M. Erlandson, and René Vellanoweth

2001 Paleocoastal Marine Fishing on the Pacific Coast of the Americas: Perspectives from Daisy Cave, California. *American Antiquity* 66:595-613.

Rogers, David B.

1929 *Prehistoric Man of the Santa Barbara Coast*. Santa Barbara Museum of Natural History, Santa Barbara, California. Edited by Richard F. Pourade. Union Tribune Publishing Company, San Diego.

Rogers, Malcom J.

1939 Early lithic industries of the lower basin of the Colorado River and adjacent desert areas. *San Diego Museum of Man Papers* 3.

1945 An Outline of Yuman Prehistory. *Southwestern Journal of Anthropology* 1(2):167-198.

Sawyer, William A.

2006 Report of Testing and Data Recovery at Sites within the Muddy Canyon Archaeological District, San Joaquin Hills, Orange County, California (provisional title). Report in progress, LSA Associates, Inc.

Sawyer, William A., and James Brock

1999 Archaeology of Foothill Ranch, El Toro, California. Report on file, South Central Coastal Archaeological Information Center, California State University, Fullerton.

Sawyer, William A., and Henry C. Koerper

2006 The San Joaquin Hills Venus: A Ceramic Figurine from CA-ORA-1405-B. In Contributions from Orange County Presented in Remembrance of John Peabody Harrington, Henry C. Koerper, ed., pp. 13-34. *Coyote Press Archives of California Prehistory*, No. 53. Coyote Press, Salinas, California.

Schoenherr, Allan A.

1992 *A Natural History of California*. California Natural History Guides, 56. Berkeley: University of California Press.

Shipley, William F.

1978 Native Languages of California. In *California*, edited by Robert F. Heizer, pp. 80-90. Handbook of North American Indians, Vol. 8, William G. Sturtevant, general editor, Smithsonian Institution, Washington D.C.

Smith, Helen C.

1965 The Portola Camps Revisited. In *The Portola Expedition 1769*, pp 5-9. Orange County Historic Society, California.

Strudwick, Ivan H.

2004 The Use of Fired Clay Daub from CA-ORA-269 in the Identification of Prehistoric Dwelling Construction Methods, San Joaquin Hills, Orange County, California. Paper presented at the meeting of the Southern California Academy of Sciences, California State University, Long Beach, May 15, 2004.

Sutton, Mark Q.

1993 On the Subsistence Ecology of the "Late Inland Millingstone Horizon" in Southern California. *Journal of California and Great Basin Anthropology* 15(1):134-140.

Sutton, M. Q., M. E. Basgall, J. K. Gardner, and M. W. Allen

2007 Advances in Understanding Mojave Desert Prehistory. In *California Prehistory: Colonization, Culture, and Complexity*, edited by T. L. Jones and K. A. Klar, pp. 229–245. AltaMira Press, New York.

Taşkiran, Ayşe

1997 Lithic Analysis. In *Hunting the Hunters: Archaeological Testing at CA-RIV-653 and CA-RIV-1098, Riverside County, California*, edited by Donn R. Grenda and Deborah W. Gray, pp. 41–53. Statistical Research Technical Series No. 65. Statistical Research, Inc., Tucson, Arizona.

True, Delbert L.

1958 An Early Complex in San Diego County, California. *American Antiquity* 23:255–263.

1993 Bedrock Milling Elements as Indicators of Subsistence and Settlement Patterns in Northern San Diego County, California. *Pacific Coast Archaeological Society Quarterly* 29(2):1–26.

Van Bueren, Thad M., Susan K. Goldberg, Michael J. Moratto, Portia Lee, and Jerrel H. Sorrenson

1989 Inventory and Evaluation of Cultural Resources: Bolsa Chica Mesa and Huntington Beach Mesa, Orange County, California. Prepared by Infotech Research, Inc. Copies on file at the South Central Coastal Information Center, California State University, Fullerton.

Wallace, William. J.

1955 A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11(3):214–230.

1978 Post-Pleistocene Archaeology, 9000 to 2000 B.C. In *California*, edited by Robert F. Heizer, pp. 25-36. Handbook of North American Indians, Vol. 8, William G. Sturtevant, general editor, Smithsonian Institution, Washington D.C.

Warren, Claude N.

1967 The San Dieguito Complex: A Review and Hypothesis. *American Antiquity* 32:233-236.

1968 Cultural Tradition and Ecological Adaptation on the Southern California Coast. *Archaic Prehistory in the Western United States: Symposium of the Society for American Archaeology, Santa Fe, 1968*. Eastern New Mexico University Contributions in Anthropology 1(3):1–14.

1984 The Desert Region. In *California Archaeology*, by Michael J. Moratto, with contributions by D.A. Fredrickson, C. Raven, and C. N. Warren, pp. 339-430. Academic Press, New York.

Warren, Claude N., and D.L. True

1961 The San Dieguito Complex and its Place in California Prehistory. *Archaeological Survey Annual Report for 1960-1961*: 246-337. University of California, Los Angeles.

Waugh, John C.

2003 *On the Brink of Civil War: The Compromise of 1850 and How It Changed the Course of American History*. Scholarly Resources Inc., Wilmington, Delaware.

Whitley, David S.

2000 *The Art of the Shaman: Rock Art of California*. University of Utah Press, Salt Lake City.

Wilke, Philip J.

1974 The Peppertree Site (4-Riv-463). In *Perris Reservoir Archeology: Late Prehistoric Demographic Changes in Southeastern California*, edited by James F. O'Connell, Philip J. Wilke, Thomas F. King, and Carol L. Mix, pp.49–63. California Department of Parks and Recreation Archeology Reports 14.

1978 Late Prehistoric Human Ecology at Lake Cahuilla, Coachella Valley, California. *Contributions of the University of California Archaeological Research Facility* No. 38.

Appendix A

Native American Heritage Commission Sacred Lands Files Search Results

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Appendix F Energy Worksheet

Appendices

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Energy Worksheet

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Operation-Related Annual Vehicle Fuel/Energy Usage Summary

Existing - Baseline Year 2020

Full VMT Scenario

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
Existing Baseline	3,687,441,808	148,001,638	24.91	224,263,378	19,896,581	11.27	5,115,903	1,576,272	3.25	41,450,939	13,850,850	2.99

Existing - Year 2045

Full VMT Scenario

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
Existing Year 2045	3,471,552,120	92,891,225	37.37	291,979,782	17,946,794	16.27	6,570,424	1,928,457	3.41	188,169,702	50,665,611	3.71

Proposed Project

Full VMT Scenario

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
Proposed Project	3,505,587,082	93,801,926	37.37	294,842,340	18,122,744	16.27	6,634,840	1,947,363	3.41	190,014,511	51,162,334	3.71

Net Change

Full VMT Scenario

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
From Existing Baseline	-181,854,726	-54,199,711	12.46	70,578,962	-1,773,837	5.00	1,518,937	371,092	0.16	148,563,572	37,311,485	0.72
From Existing 2045	34,034,962	910,702	0.00	2,862,558	175,950	0.00	64,416	18,907	0.00	1,844,808	496,724	0.00

Notes

** VMT based on VMT data provided by IBI Group.*

*** Fuel consumption rates based on data obtained from EMFAC2017 Web Database, Version 1.0.2. https://www.arb.ca.gov/emfac/2017/*

*****VMT per year based on a conversion of VMT x 347 days per year to account for less travel on weekend, consistent with CARB statewide GHG emissions inventory methodology.*

California Air Resources Board. 2008, October. Climate Change Proposed Scoping Plan: A Framework for Change.

Existing Baseline Year 2020: Full VMT

Vehicle type	Fleet percent	VMT
LDA	55.03%	2,178,266,322
LDT1	5.55%	219,776,692
LDT2	18.89%	747,522,572
MDV	12.81%	507,141,005
LHD1	2.51%	99,270,097
LHD2	0.63%	24,973,023
MHD	2.40%	95,090,699
HHD	1.31%	51,901,428
OBUS	0.05%	1,951,803
UBUS	0.12%	4,567,669
MCY	0.45%	17,689,702
SBUS	0.07%	2,687,820
MH	0.10%	4,114,598
All Other Buses	0.03%	1,217,803
Motor Coach	0.02%	755,930
PTO	0.03%	1,344,865
	100%	3,958,272,028

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent	
LDA	97.46%	0.90%	0.00%	1.64%	
LDT1	99.61%	0.02%	0.00%	0.37%	
LDT2	98.87%	0.63%	0.00%	0.50%	
MDV	97.61%	2.17%	0.00%	0.22%	
LHD1	60.43%	39.57%	0.00%	0.00%	
LHD2	40.22%	59.78%	0.00%	0.00%	
MHD	19.10%	80.90%	0.00%	0.00%	<< Equal to T6 (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
HHD	0.08%	97.21%	2.71%	0.00%	<< Equal to T7 (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
OBUS	49.72%	50.28%	0.00%	0.00%	<< OBUS (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
UBUS	18.82%	0.00%	81.18%	0.00%	
MCY	100.00%	0.00%	0.00%	0.00%	
SBUS	32.93%	67.07%	0.00%	0.00%	
MH	69.88%	30.12%	0.00%	0.00%	
All Other Buses	0.00%	100.00%	0.00%	0.00%	
Motor Coach	0.00%	100.00%	0.00%	0.00%	
PTO	0.00%	100.00%	0.00%	0.00%	

Vehicle type	Gasoline			Diesel			CNG			Electricity		
	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	m/kWh	kWh
LDA	2,122,935,426	30.12	70,475,051	19,563,690	47.42	412,576	0	0	0	35,767,206	2.99	11,951,628
LDT1	218,913,939	25.99	8,421,863	47,790	24.32	1,965	0	0	0	814,963	2.99	272,320
LDT2	739,047,779	23.60	31,312,454	4,735,295	34.32	137,975	0	0	0	3,739,499	2.99	1,249,555
MDV	495,029,954	19.21	25,772,212	10,981,780	26.02	422,030	0	0	0	1,129,270	2.99	377,346
LHD1	59,990,618	10.48	5,723,693	39,279,479	21.02	1,868,989	0	0	0	0	0.00	0
LHD2	10,045,032	9.11	1,102,582	14,927,991	18.96	787,142	0	0	0	0	0.00	0
MHD	18,157,989	5.02	3,614,966	76,932,710	10.30	7,467,865	0	0	0	0	0.00	0
HHD	40,793	4.12	9,906	50,452,860	6.47	7,798,867	1,407,775	2.19	642,071	0	0.00	0
OBUS	970,450	5.00	194,025	981,353	8.58	114,373	0	0	0	0	0.00	0
UBUS	859,541	3.68	233,833	0	0.00	0	3,708,128	3.97	934,200	0	0.00	0
MCY	17,689,702	37.21	475,359	0	0.00	0	0	0	0	0	0.00	0
SBUS	885,149	9.01	98,230	1,802,671	7.33	245,941	0	0	0	0	0.00	0
MH	2,875,436	5.07	567,466	1,239,162	10.28	120,520	0	0	0	0	0.00	0
All Other Buses	0	0	0	1,217,803	9.98	122,070	0	0	0	0	0.00	0
Motor Coach	0	0	0	755,930	6.33	119,395	0	0	0	0	0.00	0
PTO	0	0	0	1,344,865	4.86	276,875	0	0	0	0	0.00	0
	3,687,441,808		**148,001,638**	**224,263,378**		**19,896,581**	**5,115,903**		**1,576,272**	**41,450,939**		**13,850,850**

Existing Year 2045: Full VMT

Vehicle type	Fleet percent	VMT
LDA	56.21%	2,224,789,893
LDT1	6.32%	250,259,751
LDT2	17.62%	697,383,002
MDV	11.31%	447,727,884
LHD1	2.48%	98,040,318
LHD2	0.73%	28,755,750
MHD	2.67%	105,638,199
HHD	1.75%	69,249,077
OBUS	0.04%	1,739,695
UBUS	0.12%	4,692,181
MCY	0.48%	18,846,443
SBUS	0.08%	3,053,067
MH	0.09%	3,617,743
All Other Buses	0.04%	1,647,979
Motor Coach	0.02%	928,316
PTO	0.05%	1,902,731
	100%	3,958,272,028

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent	
LDA	92.54%	1.15%	0.00%	6.30%	
LDT1	96.09%	0.01%	0.00%	3.90%	
LDT2	95.84%	0.99%	0.00%	3.16%	
MDV	93.03%	3.37%	0.00%	3.60%	
LHD1	46.27%	53.73%	0.00%	0.00%	
LHD2	28.00%	72.00%	0.00%	0.00%	
MHD	8.89%	91.11%	0.00%	0.00%	<< Equal to T6 (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
HHD	0.12%	95.89%	3.99%	0.00%	<< Equal to T7 (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
OBUS	40.31%	59.69%	0.00%	0.00%	<<OBUS (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
UBUS	18.82%	0.00%	81.18%	0.00%	
MCY	100.00%	0.00%	0.00%	0.00%	
SBUS	47.04%	52.96%	0.00%	0.00%	
MH	68.78%	31.22%	0.00%	0.00%	
All Other Buses	0.00%	100.00%	0.00%	0.00%	
Motor Coach	0.00%	100.00%	0.00%	0.00%	
PTO	0.00%	100.00%	0.00%	0.00%	

Vehicle type	Gasoline			Diesel			CNG			Electricity		
	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	m/kWh	kWh
LDA	2,058,918,309	42.90	47,995,773	25,663,149	65.39	392,436	0	0	0	140,208,435	3.71	37,751,805
LDT1	240,466,745	36.95	6,507,698	33,177	34.48	962	0	0	0	9,759,828	3.71	2,627,881
LDT2	668,398,842	37.37	17,886,907	6,913,309	49.21	140,486	0	0	0	22,070,851	3.71	5,942,684
MDV	416,522,040	30.68	13,576,742	15,075,255	38.01	396,636	0	0	0	16,130,589	3.71	4,343,240
LHD1	45,359,047	13.18	3,442,181	52,681,271	26.89	1,959,034	0	0	0	0	0.00	0
LHD2	8,050,303	11.46	702,499	20,705,447	24.16	856,965	0	0	0	0	0.00	0
MHD	9,395,785	6.46	1,454,110	96,242,414	14.28	6,738,651	0	0	0	0	0.00	0
HHD	85,945	5.63	15,256	66,401,918	10.04	6,613,068	2,761,214	2.93	942,282	0	0.00	0
OBUS	701,238	6.47	108,357	1,038,456	11.49	90,382	0	0	0	0	0.00	0
UBUS	882,971	4.98	177,335	0	0.00	0	3,809,210	3.86	986,175	0	0.00	0
MCY	18,846,443	36.61	514,793	0	0.00	0	0	0	0	0	0.00	0
SBUS	1,436,238	11.04	130,129	1,616,828	10.50	153,959	0	0	0	0	0.00	0
MH	2,488,213	6.56	379,445	1,129,530	12.89	87,598	0	0	0	0	0.00	0
All Other Buses	0	0	0	1,647,979	13.08	125,946	0	0	0	0	0.00	0
Motor Coach	0	0	0	928,316	8.66	107,222	0	0	0	0	0.00	0
PTO	0	0	0	1,902,731	6.71	283,449	0	0	0	0	0.00	0
	3,471,552,120		**92,891,225**	**291,979,782**		**17,946,794**	**6,570,424**		**1,928,457**	**188,169,702**		**50,665,611**

Project Horizon Year 2045: Full VMT

Vehicle type	Fleet percent	VMT
LDA	56.21%	2,246,601,646
LDT1	6.32%	252,713,288
LDT2	17.62%	704,220,118
MDV	11.31%	452,117,391
LHD1	2.48%	99,001,501
LHD2	0.73%	29,037,670
MHD	2.67%	106,673,872
HHD	1.75%	69,927,992
OBUS	0.04%	1,756,751
UBUS	0.12%	4,738,183
MCY	0.48%	19,031,212
SBUS	0.08%	3,082,999
MH	0.09%	3,653,211
All Other Buses	0.04%	1,664,136
Motor Coach	0.02%	937,417
PTO	0.05%	1,921,386
	100.00%	3,997,078,773

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent	
LDA	92.54%	1.15%	0.00%	6.30%	
LDT1	96.09%	0.01%	0.00%	3.90%	
LDT2	95.84%	0.99%	0.00%	3.16%	
MDV	93.03%	3.37%	0.00%	3.60%	
LHD1	46.27%	53.73%	0.00%	0.00%	
LHD2	28.00%	72.00%	0.00%	0.00%	
MHD	8.89%	91.11%	0.00%	0.00%	<< Equal to T6 (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
HHD	0.12%	95.89%	3.99%	0.00%	<< Equal to T7 (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
OBUS	40.31%	59.69%	0.00%	0.00%	<< OBUS (https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf)
UBUS	18.82%	0.00%	81.18%	0.00%	
MCY	100.00%	0.00%	0.00%	0.00%	
SBUS	47.04%	52.96%	0.00%	0.00%	
MH	68.78%	31.22%	0.00%	0.00%	
All Other Buses	0.00%	100.00%	0.00%	0.00%	
Motor Coach	0.00%	100.00%	0.00%	0.00%	
PTO	0.00%	100.00%	0.00%	0.00%	

Vehicle type	Gasoline			Diesel			CNG			Electricity		
	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	m/kWh	kWh
LDA	2,079,103,864	42.90	48,466,321	25,914,749	65.39	396,284	0	0	0	141,583,033	3.71	38,121,922
LDT1	242,824,272	36.95	6,571,499	33,503	34.48	972	0	0	0	9,855,513	3.71	2,653,645
LDT2	674,951,799	37.37	18,062,270	6,981,087	49.21	141,863	0	0	0	22,287,232	3.71	6,000,946
MDV	420,605,606	30.68	13,709,848	15,223,052	38.01	400,525	0	0	0	16,288,732	3.71	4,385,821
LHD1	45,803,745	13.18	3,475,928	53,197,756	26.89	1,978,240	0	0	0	0	0.00	0
LHD2	8,129,228	11.46	709,387	20,908,442	24.16	865,366	0	0	0	0	0.00	0
MHD	9,487,901	6.46	1,468,366	97,185,971	14.28	6,804,717	0	0	0	0	0.00	0
HHD	86,787	5.63	15,406	67,052,920	10.04	6,677,902	2,788,285	2.93	951,520	0	0.00	0
OBUS	708,113	6.47	109,419	1,048,637	11.49	91,268	0	0	0	0	0.00	0
UBUS	891,628	4.98	179,074	0	0.00	0	3,846,555	3.86	995,844	0	0.00	0
MCY	19,031,212	36.61	519,840	0	0.00	0	0	0	0	0	0.00	0
SBUS	1,450,319	11.04	131,405	1,632,680	10.50	155,468	0	0	0	0	0.00	0
MH	2,512,607	6.56	383,165	1,140,604	12.89	88,457	0	0	0	0	0.00	0
All Other Buses	0	0	0	1,664,136	13.08	127,181	0	0	0	0	0.00	0
Motor Coach	0	0	0	937,417	8.66	108,273	0	0	0	0	0.00	0
PTO	0	0	0	1,921,386	6.71	286,228	0	0	0	0	0.00	0
	3,505,587,082		**93,801,926**	**294,842,340**		**18,122,744**	**6,634,840**		**1,947,363**	**190,014,511**		**51,162,334**

EMFAC Fuel Usage: Year 2020

Vehicle type	Gasoline VMT/day	Gasoline Gallons/day	Gasoline Miles/gallon	Diesel VMT/day	Diesel Gallons/day	Diesel Miles/gallon	Natural Gas VMT/day	Natural Gas Gallons/day	Natural Gas Miles/gallon	Electricity VMT/day
All other buses	0	0	0.00	28,077	2,814	9.98	0	0	0.00	0
LDA	48,945,590	1,624,846	30.12	451,053	9,512	47.42	0	0	0.00	824,635
LDT1	5,047,196	194,171	25.99	1,102	45	24.32	0	0	0.00	18,789
LDT2	17,039,204	721,928	23.60	109,175	3,181	34.32	0	0	0.00	86,216
LHD1	1,383,121	131,963	10.48	905,613	43,091	21.02	0	0	0.00	0
LHD2	231,594	25,421	9.11	344,174	18,148	18.96	0	0	0.00	0
MCY	407,847	10,960	37.21	0	0	0.00	0	0	0.00	0
MDV	11,413,222	594,194	19.21	253,192	9,730	26.02	0	0	0.00	26,036
MH	66,295	13,083	5.07	28,570	2,779	10.28	0	0	0.00	0
Motor coach	0	0	0.00	17,428	2,753	6.33	0	0	0.00	0
OBUS	45,000	8,997	5.00	0	0	0.00	0	0	0.00	0
PTO	0	0	0.00	31,007	6,384	4.86	0	0	0.00	0
SBUS	20,408	2,265	9.01	41,562	5,670	7.33	0	0	0.00	0
T6	418,644	83,345	5.02	1,773,731	172,176	10.30	0	0	0.00	0
T7	941	228	4.12	1,163,222	179,808	6.47	32,457	14,803	2.19	0
UBUS	19,817	5,391	3.68	0	0	0.00	85,493	21,539	3.97	0
Total	**85,038,879**	**3,416,793**	**24.89**	**5,147,905**	**456,091**	**11.29**	**117,950**	**36,342**	**3.25**	**955,677**

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: Sub-Area
Region: Orange (SC)
Calendar Year: 2020
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption. Note 'day' in the unit is operation day.

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	Fuel_Consumption
Orange (SC)	2020	All Other Buses	Aggregated	Aggregated	DSL	481.2016837	28077.19843	4042.094143	2.814388095
Orange (SC)	2020	LDA	Aggregated	Aggregated	GAS	1247860.077	48945590.41	5912594.532	1624.845919
Orange (SC)	2020	LDA	Aggregated	Aggregated	DSL	11164.90346	451052.9772	53022.62326	9.512191554
Orange (SC)	2020	LDA	Aggregated	Aggregated	ELEC	21148.18246	824635.0752	105742.2469	0
Orange (SC)	2020	LDT1	Aggregated	Aggregated	GAS	134019.271	5047196.379	619698.5138	194.1712644
Orange (SC)	2020	LDT1	Aggregated	Aggregated	DSL	55.81897815	1101.830055	186.0090014	0.045307405
Orange (SC)	2020	LDT1	Aggregated	Aggregated	ELEC	490.3524677	18789.48359	2431.492246	0
Orange (SC)	2020	LDT2	Aggregated	Aggregated	GAS	447357.5819	17039204.03	2097730.136	721.9280003
Orange (SC)	2020	LDT2	Aggregated	Aggregated	DSL	2427.17569	109175.1539	12027.12038	3.181091028
Orange (SC)	2020	LDT2	Aggregated	Aggregated	ELEC	2543.998796	86216.46483	12903.12737	0
Orange (SC)	2020	LHD1	Aggregated	Aggregated	GAS	36819.26046	1383120.831	548552.1202	131.9632743
Orange (SC)	2020	LHD1	Aggregated	Aggregated	DSL	21629.92474	905612.7101	272077.2427	43.09068986
Orange (SC)	2020	LHD2	Aggregated	Aggregated	GAS	6427.4198	231594.4301	95758.97816	25.42072092
Orange (SC)	2020	LHD2	Aggregated	Aggregated	DSL	8343.636776	344174.0824	104952.4543	18.14803591

Orange (SC)	2020	MCY	Aggregated	Aggregated	GAS	55868.87126	407847.0245	111737.7425	10.9596883
Orange (SC)	2020	MDV	Aggregated	Aggregated	GAS	312579.7151	11413222.04	1449101.786	594.1942936
Orange (SC)	2020	MDV	Aggregated	Aggregated	DSL	6028.951683	253191.7258	29628.60119	9.730157513
Orange (SC)	2020	MDV	Aggregated	Aggregated	ELEC	735.8961127	26036.03016	3783.732455	0
Orange (SC)	2020	MH	Aggregated	Aggregated	GAS	7043.392017	66294.96462	704.6209374	13.08327083
Orange (SC)	2020	MH	Aggregated	Aggregated	DSL	2901.594303	28569.64554	290.1594303	2.778662443
Orange (SC)	2020	Motor Coach	Aggregated	Aggregated	DSL	136.4898537	17428.42872	1992.751864	2.752736362
Orange (SC)	2020	OBUS	Aggregated	Aggregated	GAS	995.681945	45000.03288	19921.60436	8.996982408
Orange (SC)	2020	PTO	Aggregated	Aggregated	DSL	0	31006.68851	0	6.383529602
Orange (SC)	2020	SBUS	Aggregated	Aggregated	GAS	477.5371807	20407.65759	1910.148723	2.264752129
Orange (SC)	2020	SBUS	Aggregated	Aggregated	DSL	1330.411773	41561.69254	15352.76741	5.670310587
Orange (SC)	2020	T6 Ag	Aggregated	Aggregated	DSL	1.07	8.275469859	4.708	0.001066262
Orange (SC)	2020	T6 CAIRP heavy	Aggregated	Aggregated	DSL	88.66874812	17668.64125	1294.563723	1.577008329
Orange (SC)	2020	T6 CAIRP small	Aggregated	Aggregated	DSL	45.34272879	2389.999147	662.0038403	0.226832642
Orange (SC)	2020	T6 instate construction heavy	Aggregated	Aggregated	DSL	396.2486598	26940.21685	1791.424785	2.743247107
Orange (SC)	2020	T6 instate construction small	Aggregated	Aggregated	DSL	2797.82418	142828.4512	12648.85434	14.31071495
Orange (SC)	2020	T6 instate heavy	Aggregated	Aggregated	DSL	4232.18802	597325.6124	48838.86298	55.593513
Orange (SC)	2020	T6 instate small	Aggregated	Aggregated	DSL	18616.48143	955904.6099	214831.6146	94.35518326
Orange (SC)	2020	T6 OOS heavy	Aggregated	Aggregated	DSL	50.42051047	10072.46003	736.1394529	0.898555975
Orange (SC)	2020	T6 OOS small	Aggregated	Aggregated	DSL	26.8094145	1405.945609	391.4174517	0.133395337
Orange (SC)	2020	T6 Public	Aggregated	Aggregated	DSL	896.5189033	13585.52472	2719.440671	1.739272559
Orange (SC)	2020	T6 utility	Aggregated	Aggregated	DSL	335.5972108	5601.520977	3859.367924	0.597456493
Orange (SC)	2020	T6TS	Aggregated	Aggregated	GAS	7554.979106	418643.6762	151160.022	83.34527002
Orange (SC)	2020	T7 Ag	Aggregated	Aggregated	DSL	1	8.027370796	4.4	0.001553111
Orange (SC)	2020	T7 CAIRP	Aggregated	Aggregated	DSL	936.2960241	169499.5167	13669.92195	24.91503552
Orange (SC)	2020	T7 CAIRP construction	Aggregated	Aggregated	DSL	105.2121264	19351.39179	475.659933	2.689514666
Orange (SC)	2020	T7 NNOOS	Aggregated	Aggregated	DSL	1023.780474	206641.313	14947.19492	29.39860655
Orange (SC)	2020	T7 NOOS	Aggregated	Aggregated	DSL	368.0303383	66594.15025	5373.242939	10.02337714
Orange (SC)	2020	T7 POLA	Aggregated	Aggregated	DSL	1274.10332	155914.1289	9683.185233	25.79021242
Orange (SC)	2020	T7 Public	Aggregated	Aggregated	DSL	1031.473951	20897.43447	3128.804315	3.707980098
Orange (SC)	2020	T7 Single	Aggregated	Aggregated	DSL	2158.378481	156155.881	24907.38842	23.85165432
Orange (SC)	2020	T7 single construction	Aggregated	Aggregated	DSL	680.6801442	48007.24372	3077.328467	7.411667011
Orange (SC)	2020	T7 SWCV	Aggregated	Aggregated	DSL	366.6327907	14980.0218	1429.867884	7.333542571
Orange (SC)	2020	T7 SWCV	Aggregated	Aggregated	NG	797.4174081	32457.1177	3109.927892	14.80335493
Orange (SC)	2020	T7 tractor	Aggregated	Aggregated	DSL	1919.762893	264239.798	24380.98875	38.33414036
Orange (SC)	2020	T7 tractor construction	Aggregated	Aggregated	DSL	563.5221687	39601.74947	2547.661815	6.132328946
Orange (SC)	2020	T7 utility	Aggregated	Aggregated	DSL	65.59670634	1331.254316	754.3621229	0.218093255
Orange (SC)	2020	T7IS	Aggregated	Aggregated	GAS	10.17819751	940.5118702	203.6453757	0.228390326
Orange (SC)	2020	UBUS	Aggregated	Aggregated	GAS	209.7645784	19817.2437	839.0583135	5.391173952
Orange (SC)	2020	UBUS	Aggregated	Aggregated	DSL	0	0	0	0
Orange (SC)	2020	UBUS	Aggregated	Aggregated	NG	738.1509692	85493.1979	2952.603877	21.53856767

EMFAC Fuel Usage: Year 2045

Vehicle type	Gasoline VMT/day	Gasoline Gallons/day	Gasoline Miles/gallon	Diesel VMT/day	Diesel Gallons/day	Diesel Miles/gallon	Natural Gas VMT/day	Natural Gas Gallons/day	Natural Gas Miles/gallon	Electricity VMT/day
All other buses	0	0	0.00	42,508	3,249	13.08	0	0	0.00	0
LDA	53,107,647	1,238,001	42.90	661,954	10,122	65.39	0	0	0.00	3,616,530
LDT1	6,202,589	167,859	36.95	856	25	34.48	0	0	0.00	251,745
LDT2	17,240,650	461,374	37.37	178,322	3,624	49.21	0	0	0.00	569,295
LHD1	1,169,989	88,787	13.18	1,358,858	50,531	26.89	0	0	0.00	0
LHD2	207,649	18,120	11.46	534,075	22,105	24.16	0	0	0.00	0
MCY	486,124	13,279	36.61	0	0	0.00	0	0	0.00	0
MDV	10,743,751	350,198	30.68	388,850	10,231	38.01	0	0	0.00	416,072
MH	64,181	9,787	6.56	29,135	2,259	12.89	0	0	0.00	0
Motor coach	0	0	0.00	23,945	2,766	8.66	0	0	0.00	0
OBUS	44,874	6,934	6.47	0	0	0.00	0	0	0.00	0
PTO	0	0	0.00	49,079	7,311	6.71	0	0	0.00	0
SBUS	37,046	3,357	11.04	41,704	3,971	10.50	0	0	0.00	0
T6	242,354	37,507	6.46	2,482,473	173,816	14.28	0	0	0.00	0
T7	2,217	394	5.63	1,712,768	170,577	10.04	71,223	24,305	2.93	0
UBUS	22,775	4,574	4.98	0	0	0.00	98,255	25,437	3.86	0
Total	**89,571,847**	**2,400,171**	**37.32**	**7,504,528**	**460,588**	**16.29**	**169,477**	**49,743**	**3.41**	**4,853,641**

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: Sub-Area
Region: Orange (SC)
Calendar Year: 2045
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption. Note 'day' in the unit is operation day.

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	Fuel_Consumption
Orange (SC)	2045	All Other Buses	Aggregated	Aggregated	DSL	818.3493021	42507.89751	6874.134138	3.248647956
Orange (SC)	2045	LDA	Aggregated	Aggregated	GAS	1636194.504	53107647.21	7711235.754	1238.000825
Orange (SC)	2045	LDA	Aggregated	Aggregated	DSL	20249.77724	661954.1192	95726.782	10.12248623
Orange (SC)	2045	LDA	Aggregated	Aggregated	ELEC	107201.6929	3616530.129	508992.1903	0
Orange (SC)	2045	LDT1	Aggregated	Aggregated	GAS	203050.6572	6202588.527	931544.7599	167.8592685
Orange (SC)	2045	LDT1	Aggregated	Aggregated	DSL	27.49576857	855.7776777	127.4386435	0.024820205
Orange (SC)	2045	LDT1	Aggregated	Aggregated	ELEC	7805.199848	251744.5689	36492.5545	0
Orange (SC)	2045	LDT2	Aggregated	Aggregated	GAS	543994.5324	17240649.99	2532417.189	461.3740928
Orange (SC)	2045	LDT2	Aggregated	Aggregated	DSL	5562.678232	178321.5884	26072.26861	3.623683049
Orange (SC)	2045	LDT2	Aggregated	Aggregated	ELEC	24807.64973	569294.539	117101.2432	0
Orange (SC)	2045	LHD1	Aggregated	Aggregated	GAS	36156.57729	1169989.23	538679.1284	88.78745874
Orange (SC)	2045	LHD1	Aggregated	Aggregated	DSL	42936.83556	1358858.366	540091.3768	50.53123896
Orange (SC)	2045	LHD2	Aggregated	Aggregated	GAS	6724.123408	207649.1575	100179.4198	18.12023428
Orange (SC)	2045	LHD2	Aggregated	Aggregated	DSL	17568.0703	534075.3782	220984.2237	22.10451024

Orange (SC)	2045 MCY	Aggregated	Aggregated	GAS	88830.95641	486124.3002	177661.9128	13.278552
Orange (SC)	2045 MDV	Aggregated	Aggregated	GAS	349758.5501	10743750.96	1614120.932	350.1978763
Orange (SC)	2045 MDV	Aggregated	Aggregated	DSL	12471.899	388850.4635	58097.45105	10.2308234
Orange (SC)	2045 MDV	Aggregated	Aggregated	ELEC	18242.6852	416071.6903	85925.7018	0
Orange (SC)	2045 MH	Aggregated	Aggregated	GAS	7034.7461	64180.84958	703.7559999	9.787379628
Orange (SC)	2045 MH	Aggregated	Aggregated	DSL	3666.748524	29135.04654	366.6748524	2.259491538
Orange (SC)	2045 Motor Coach	Aggregated	Aggregated	DSL	191.6045363	23944.93064	2797.426231	2.765668758
Orange (SC)	2045 OBUS	Aggregated	Aggregated	GAS	1230.496706	44873.60704	24619.7781	6.933946691
Orange (SC)	2045 PTO	Aggregated	Aggregated	DSL	0	49078.97011	0	7.311279784
Orange (SC)	2045 SBUS	Aggregated	Aggregated	GAS	1034.566392	37046.26844	4138.265569	3.356535149
Orange (SC)	2045 SBUS	Aggregated	Aggregated	DSL	1313.474593	41704.39765	15157.31469	3.97120875
Orange (SC)	2045 T6 CAIRP heavy	Aggregated	Aggregated	DSL	151.6117831	24739.70225	2213.532033	1.574897241
Orange (SC)	2045 T6 CAIRP small	Aggregated	Aggregated	DSL	77.32875483	3249.911743	1128.999821	0.232127663
Orange (SC)	2045 T6 instate construction heavy	Aggregated	Aggregated	DSL	374.3960544	25067.48408	1692.630006	1.909392646
Orange (SC)	2045 T6 instate construction small	Aggregated	Aggregated	DSL	2687.483284	132899.8183	12150.00744	9.564885549
Orange (SC)	2045 T6 instate heavy	Aggregated	Aggregated	DSL	9653.871186	973552.1842	111404.335	65.10501027
Orange (SC)	2045 T6 instate small	Aggregated	Aggregated	DSL	28791.47359	1287713.62	332249.6135	92.7506813
Orange (SC)	2045 T6 OOS heavy	Aggregated	Aggregated	DSL	85.31694752	14016.41424	1245.627434	0.892046638
Orange (SC)	2045 T6 OOS small	Aggregated	Aggregated	DSL	47.5100307	1967.829648	693.6464482	0.140834373
Orange (SC)	2045 T6 Public	Aggregated	Aggregated	DSL	810.1383561	12560.15941	2457.419678	1.123344315
Orange (SC)	2045 T6 utility	Aggregated	Aggregated	DSL	402.4400938	6705.41012	4628.061079	0.523254404
Orange (SC)	2045 T6TS	Aggregated	Aggregated	GAS	5946.324567	242354.4684	118974.0619	37.50724359
Orange (SC)	2045 T7 Ag	Aggregated	Aggregated	DSL	1.153447948	3.727198184	5.075170971	0.000825644
Orange (SC)	2045 T7 CAIRP	Aggregated	Aggregated	DSL	1117.357567	232474.8666	16313.42048	22.45263832
Orange (SC)	2045 T7 CAIRP construction	Aggregated	Aggregated	DSL	103.1096509	18006.19157	466.1547227	1.774774016
Orange (SC)	2045 T7 NNOOS	Aggregated	Aggregated	DSL	1739.696845	283420.9407	25399.57393	28.90977627
Orange (SC)	2045 T7 NOOS	Aggregated	Aggregated	DSL	444.0093396	91341.91531	6482.536359	9.040158647
Orange (SC)	2045 T7 POLA	Aggregated	Aggregated	DSL	1892.379198	394088.7622	14382.0819	38.7175325
Orange (SC)	2045 T7 Public	Aggregated	Aggregated	DSL	1180.837213	23922.76883	3581.872875	2.785239921
Orange (SC)	2045 T7 Single	Aggregated	Aggregated	DSL	3056.670196	247171.5035	35273.55027	26.44915825
Orange (SC)	2045 T7 single construction	Aggregated	Aggregated	DSL	585.6235719	44670.0494	2647.5814	4.725313295
Orange (SC)	2045 T7 SWCV	Aggregated	Aggregated	DSL	27.99965973	1144.02073	109.1986729	0.556569617
Orange (SC)	2045 T7 SWCV	Aggregated	Aggregated	NG	1746.830476	71222.63589	6812.638855	24.30516728
Orange (SC)	2045 T7 tractor	Aggregated	Aggregated	DSL	2714.449827	338075.7044	34473.51281	31.16293497
Orange (SC)	2045 T7 tractor construction	Aggregated	Aggregated	DSL	496.4153679	36848.85796	2244.274578	3.826351357
Orange (SC)	2045 T7 utility	Aggregated	Aggregated	DSL	78.8520692	1598.818533	906.7987958	0.175900282
Orange (SC)	2045 T7IS	Aggregated	Aggregated	GAS	21.48676659	2216.850881	429.9072258	0.393525037
Orange (SC)	2045 UBUS	Aggregated	Aggregated	GAS	241.0757015	22775.32253	964.302806	4.574174268
Orange (SC)	2045 UBUS	Aggregated	Aggregated	DSL	0	0	0	0
Orange (SC)	2045 UBUS	Aggregated	Aggregated	NG	848.333232	98254.59007	3393.332928	25.43736412

Electric Vehicle Energy Consumption Assumptions

Appendix C: Evidence Used to Define the Average Number of KWH Required to Displace a Gallong of Gasoline

Table A 3: Evidence from U.S. Department of Energy and U.S. Environmental Protection Agency's fuel economy website[32]

Vehicle	Model year	Electric consumption	Gasoline fuel economy	Number of kWh that are equivalent to 1 gallon
Ford Fusion Energi & Ford C-Max Energi	2013	0.34 kWh per mile	43 mpg	14.6
Chevrolet Volt	2013	0.35 kWh per mile	37 mpg	12.9
Chevrolet Volt	2012	0.36 kWh per mile	37 mpg	13.3
Fisker Karma	2012	0.62 kWh per mile	20 mpg	12.4
Toyota Prius	2013	0.29 kWh per mile & 0.2 gal	50 mpg	13.1
Average for five models	-	-	-	13.3 +/- 0.8

Table A 5: Average power consumption per mile traveled over time for different PEV categories

Year range	2012- 2020	2020-2030	2030-2040	2040-2050	2050
Efficiency improvement per year	0.3%	0.8%	0.9%	0.9%	
Year	2012	2020	2030	2040	2050
Relative energy efficiency	1.000	0.976	0.901	0.823	0.752

https://www.fhwa.dot.gov/environment/climate_change/mitigation/publications_and_tools/ev_deployment/page08.cfm

Electric Consumption Estimated Average

Vehicle	Electric Consumption (kWh/mi)	One Gal Equivalent
Ford Fusion & Ford C-Max MY 2013	0.34	14.6
Chevy Volt MY 2013	0.35	12.9
Chevy Volt MY 2012	0.36	13.3
Estimated Average	**0.34**	**13.3**

Forecasted Consumption

Year	Electric Consumption (kWh/mi)
2013	0.34
2014	0.34
2015	0.34
2016	0.34
2017	0.34
2018	0.34
2019	0.34
2020	0.33
2021	0.33
2022	0.33
2023	0.33
2024	0.32
2025	0.32
2026	0.32
2027	0.32
2028	0.31
2029	0.31
2030	0.31
2031	0.31
2032	0.30
2033	0.30
2034	0.30
2035	0.29
2036	0.29
2037	0.29
2038	0.29
2039	0.28
2040	0.28
2041	0.28
2042	0.28
2043	0.27
2044	0.27
2045	0.27

Global warming potentials

	CO_2	CH_4	N_2O
AR2	1	21	310
AR4	1	25	298
AR5	1	28	265

CO_2 to CO_2e	1.05263158	<< Use only for on-road vehicle calculations
Grams to metric tons	1,000,000	
MWh to kWh	1000	<< Also GWh to MWh
GWh to kWh	1,000,000	
Metric tons to pounds	2,204.6	
Metric tons to kg	1,000	<< Also kg to grams
kg to pounds	2.20462	
Acre foot to gallons	325,851.428	
Acre to square foot	43,560	
Year to months	12	
Year to days	365	<< Use except in circumstances below
Year to days	347	<< Use only for transportation emissions
Year to days	365.25	<< Use only for water and wastewater emissions
Ton to pounds	2,000	
Mile to feet	5,280	
Square mile to acres	640	
Million gallons to gallons	1,000,000	

Appendix G-a Geological Background Technical Report

Appendices

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May 2020

GEOLOGICAL BACKGROUND TECHNICAL REPORT FOR THE GENERAL PLAN UPDATE

City of Santa Ana

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PLACEWORKS

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1.1 INTRODUCTION

Ensuring public safety is a fundamental goal for any municipality, including Santa Ana. All the benefits and public goods that Santa Ana residents and businesses enjoy are difficult to achieve when health and safety could be compromised. Potential risks to health, life, and property involve man-made and natural hazards. Santa Ana, like much of southern California, is subject to many geologic hazards.

To provide a foundation for the goals, policies, and programs for the General Plan update and the environmental setting for the Environmental Impact Report, this report explores the various geologic hazards in Santa Ana. The key objective is to identify and evaluate geologic hazards that can impact the health, safety, and social well-being of a community.

This report includes an overview of the following hazards in Santa Ana:

» Seismic and geologic hazards, including surface or nonsurface rupture, shaking, liquefaction, landslides, soil hazards, and other similar hazards.

Data and information for this chapter were compiled from a wide variety of state and federal agencies. State agencies include the California Department of Conservation, California Geological Survey, Office of Emergency Services, Department of Water Resources, and others. Federal resources include the Federal Emergency Management Agency, among several others. The analysis contained herein relies on secondary research; no fieldwork was conducted.

1. Introduction

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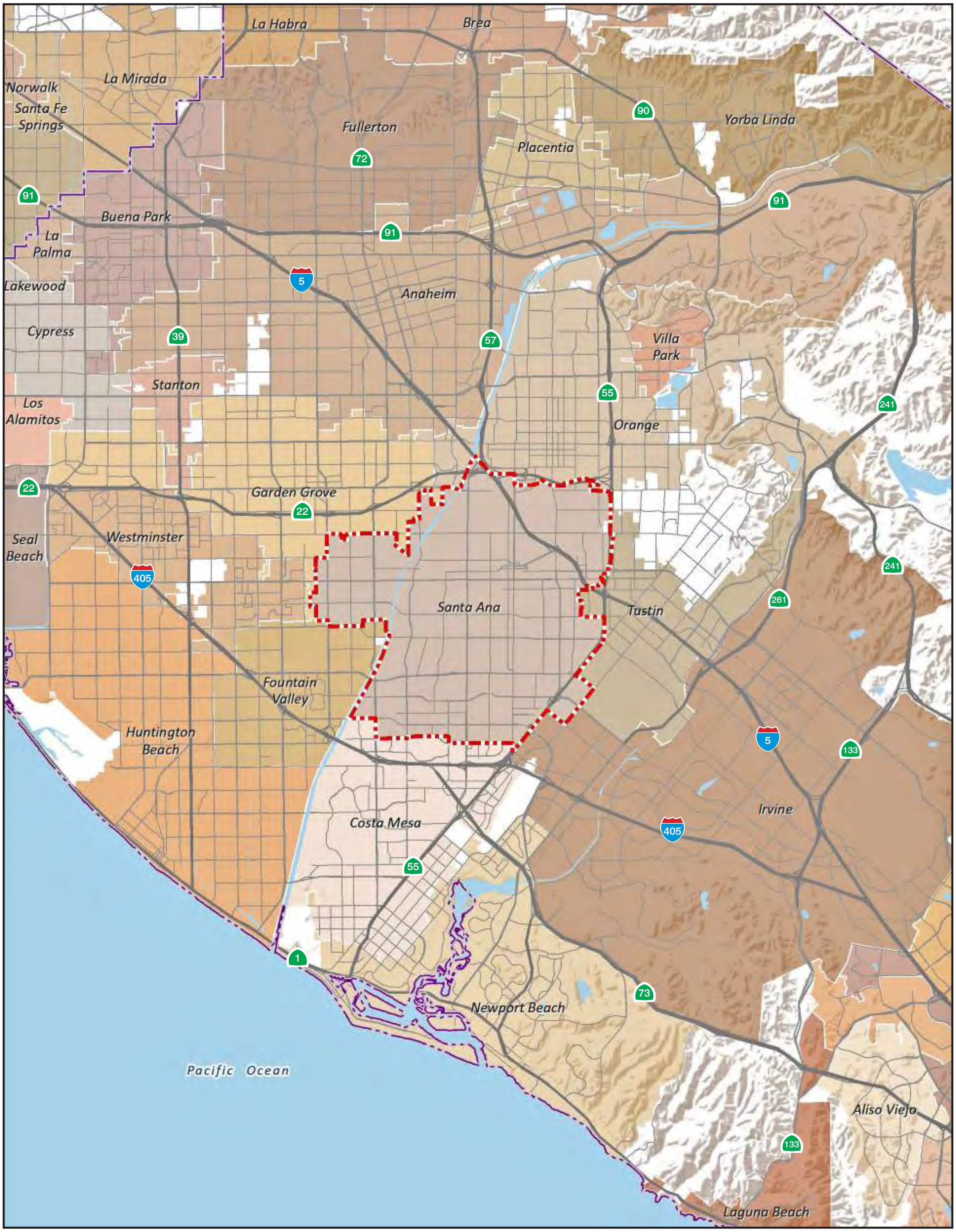
Figure 1 - Regional Location



City of Santa Ana

0 3
Scale (Miles)

Source: ESRI, 2019

PlaceWorks

1. Introduction

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2. Geologic and Seismic Hazards

This section describes the geologic and seismic hazards in Santa Ana, including the various state and local regulations affecting these hazards and then detailing specific geologic and seismic hazards present in Santa Ana.

2.1 REGULATORY FRAMEWORK

Santa Ana's regulatory framework for geologic and seismic hazards includes state law, the general plan, and municipal code requirements. These primary regulations are described as follows.

Alquist-Priolo Earthquake Fault Zone

The Alquist-Priolo (AP) Earthquake Fault Zoning Act of 1972 was intended to mitigate the hazard of surface fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. The act delineates "Earthquake Fault Zones" along faults that are "sufficiently active" and "well defined." The act also requires 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 displacement from future faulting. Pursuant to this act, structures for human occupancy are not allowed within 50 feet of the trace of an active fault. As described later, no AP zones are delineated in Santa Ana.

Seismic Hazard Mapping Act

Earthquakes can cause significant damage even if surface ruptures do not occur. The Seismic Hazard Mapping Act (SHMA) of 1990 was intended to protect the public from the hazards of nonsurface fault rupture from earthquakes, including strong ground shaking, liquefaction, seismically induced landslides, or other ground failure. The California Geological Survey prepares and provides local governments with seismic hazard zone maps that identify areas susceptible to nonsurface fault hazards. SHMA requires responsible agencies to approve projects within seismic hazard zones only after a site-specific investigation to determine if the hazard is present, and the inclusion, if a hazard is found, of appropriate mitigation(s). Orange County has been issued maps showing nonsurface fault hazards, discussed later in this chapter.

California Building Code

Every public agency enforcing building regulations must adopt the provisions of the California Building Code (CBC), which is Title 24, Part 2 of the California Code of Regulations. The most recent version is the 2016 CBC (effective January 1, 2017). The CBC is updated every three years and provides minimum standards to protect property and public safety by regulating the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The CBC also contains provisions for earthquake safety based on factors including occupancy type, the types of soil and rock onsite, and the strength of ground shaking with specified

2. Geologic and Seismic Hazards

probability of occurring at a site. A city may adopt more restrictive codes than state law based on conditions in their community.

Government Codes for Specific Building Types

While the CBC regulates the design and construction of most buildings and structures in a community, certain facilities have additional requirements from state and federal agencies. These include hospitals, schools, essential facilities, and lifeline infrastructure, listed below.

Acute care hospitals. These facilities are required to meet the standards of the Alquist Hospital Seismic Act.

Public schools. Public schools that are being constructed or rehabilitated are required to comply with standards under the Field Act, Division of State Architectural standards, and California Education Code § 17317.

Essential facilities. Essential facilities (police, fire, emergency community facilities, etc.) must comply with the additional standards and requirements of the Essential Services Building Seismic Safety Act.

Lifeline infrastructure. Bridges, utilities, dams/reservoirs, and other infrastructure must adhere to regulations of the Department of Water Resources, Department of Transportation, and Public Utilities Commission.

"Mobile Home Parks" and the "Special Occupancy Parks Act"

Mobile homes are prefabricated homes placed on piers, jackstands, or masonry block foundations. Floors and roofs are usually plywood, and outside surfaces are covered with sheet metal. Severe damage can occur when mobile homes fall off their supports, severing utility lines and piercing the floor with jack stands. The California Health and Safety Code governs mobile homes and special occupancy parks. In 2011, regulations were adopted that address park construction, maintenance, use, occupancy, and design. However, the amendments do not require earthquake-resistant bracing systems. Because the city has nearly 4,000 mobile homes (many of which are occupied by seniors), and mobile homes generally fare poorly in earthquakes, ensuring the safety of mobile home occupants is a concern.

California General Plan Law and OPR General Plan Guidelines

State law (Government Code § 65302) requires cities to adopt a comprehensive long-term general plan that includes a safety element. The safety element is intended to provide guidance for protecting the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence; liquefaction; and other seismic hazards identified by the Public Resources Code §§ 2691 et. seq. and other geologic hazards known to the legislative body. The seismic safety element must also include mapping of known seismic and geologic hazards from the California Geological Survey and a series of responsive goals, policies, and implementation programs to improve public safety.

Santa Ana General Plan

The 1982 Santa Ana General Plan has two goals that address seismic hazards. Goal 1 is established to "provide a safe environment for all Santa Ana residents and workers." Goal 2 is established to "minimize the effects of natural disasters." These goals are supported by three specific policies addressing seismic hazards. Specific measures in the General Plan include, but are not limited to, the following:

» Enforce seismic design provisions of the Uniform Building Code.

» Identify all unreinforced masonry buildings.

» Develop seismic standards specifically addressed to architecturally or culturally significant older buildings.

» Develop a risk assessment and strategy for location and seismic protection of key communication, command/control and emergency medical facilities.

Santa Ana Municipal Code

The Santa Ana Municipal Code and other City development policies and procedures provide guidance on addressing specific geologic and seismic hazards in Santa Ana. Among others, these include the following:

Chapter 8, Buildings and Structures. These codes address grading standards, excavation, and fills. This also includes compliance with regulations for unreinforced masonry structures in accordance with "Unreinforced Masonry Law," found in California Government Code §§ 8875 et seq.

The City of Santa Ana Building Official may place additional requirements upon the construction of infrastructure, buildings, and other improvements based on the findings from plan check, soils testing, and geotechnical investigations.

2.2 EXISTING CONDITIONS

This section describes the local geologic setting and associated seismic and geologic hazards associated with the City's location, topography, soils, and faulting.

Geologic Setting

The City of Santa Ana is located on the southern portion of the Downey Plain, which is a broad alluvial plain that covers the northwestern portion of Orange County (Yerkes et al. 1965). Santa Ana is situated within the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin to the southern tip of Baja California. The province varies in width from approximately 30 to 100 miles depending on location. In general, the province consists of a northwest-southeast oriented complex of blocks separated by similarly trending faults.

Santa Ana is underlain by Holocene and Pleistocene alluvial deposits and early Pleistocene marine deposits (Morton 2004). Below these deposits lies Miocene and late Cretaceous sedimentary rocks. The Santa Ana Mountains rising to 5,700 feet above sea level are located to the northeast and east of the City, and the San

2. Geologic and Seismic Hazards

Joaquin Hills are located to the southeast (Google Earth Pro 2019). The Santa Ana River flows through the western portion of the City on its way to the Pacific Ocean, to the southwest. Santa Ana is generally flat with a gentle slope toward the southwest (USGS 2015a; 2015b; 2015c; 2015d).

The Peninsular Ranges Geomorphic Province is traversed by a group of subparallel and fault zones trending roughly northwest. Major active fault systems—San Andreas, San Jacinto, Whittier-Elsinore, and Newport-Inglewood fault zones—form a regional tectonic framework consisting primarily of right-lateral, strike-slip movement (Jennings & Bryant 2010). Santa Ana is situated between two major active fault zones—the Whittier-Elsinore Fault Zone to the northeast and the Newport-Inglewood Fault to the southwest. Other potentially active faults located near the City of Santa Ana include the Elysian Park blind thrust, Chino-Central Avenue, San Joaquin Hills blind thrust, San Jose, Cucamonga, Sierra Madre, and Palos Verdes faults (CGS 2019; Cao et al 2003).

The Richter Scale is used to describe the magnitude (M) of an earthquake. Each one-point increase in magnitude (M) represents a 10-fold increase in earthquake wave size and a 30-fold increase in energy release (strength). For example, an M8 earthquake produces 10 times the ground motion amplitude of an M7 earthquake, 100 times that of an M6 quake, and 1,000 times the motion of a magnitude 5. However, the M8 earthquake is 27,000 times stronger than an M5 quake. Typically, earthquakes of M5 or greater are considered strong earthquakes capable of producing damage.

Table 1 provides a summary of the key faults that could produce significant earthquakes (exceeding M5) that would most impact Santa Ana. The table also includes the maximum associated magnitudes of earthquakes along each fault. Figure 1 follows, showing the location of fault hazards and their proximity to Santa Ana.

Table 1 Earthquake Faults near Santa Ana

Fault	Description of Earthquake Fault Zone	Maximum Hazard
Newport-Inglewood	The Newport-Inglewood Fault Zone consists of a series of disconnected, northwest-trending fault segments which extend from Los Angeles, through Long Beach and Torrance, to Newport Beach and offshore south past Oceanside. Although no major rupture has occurred since the 1933 Long Beach quake (6.4 M), the fault is considered active and is zoned under the Alquist-Priolo Earthquake Fault Zone Act. The fault is located about four miles from the City.	M 7.1
Whittier Fault Zone	The Whittier Fault Zone extends from Whittier Narrows in Los Angeles County, southeasterly to Santa Ana Canyon where it merges with the Elsinore Fault Zone. The Whittier Fault Zone is located about nine miles from the northern edge of the City. The Whittier Fault is active and is zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 6.8

Table 1 Earthquake Faults near Santa Ana

Fault	Description of Earthquake Fault Zone	Maximum Hazard
Elsinore Glen Ivy Segment	The Glen Ivy segment of the Elsinore Fault Zone is located about twelve miles from the City. Dominant movement along this fault is right-lateral strike-slip. The Glen Ivy segment is zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 6.8
San Joaquin Hills Blind Thrust	Located at depth about a mile southeast of the City, the San Joaquin Hills Blind Thrust Fault is approximately 17 miles long and is characterized by reverse dip-slip movement. This fault is responsible for the uplift of the San Joaquin Hills. The San Joaquin Hills Blind Thrust Fault is considered active and is not zoned under the Alquist-Priolo Earthquake Zone Act.	M 6.6
Chino-Central Avenue	The Chino-Central Avenue Fault branches away from the Elsinore (Glen Ivy) Fault and extends northwest 13 miles through the Prado Basin and into the Puente Hills. Dominant movement along the fault is right-lateral reverse oblique slip. The Chino Fault is about 14 miles northeast of the City and is zoned under the Alquist-Priolo Earthquake Zone Act.	M 6.7
Puente Hills Blind Thrust	Located at depth about ten miles northwest of the City, the Puente Hills Blind Thrust Fault is approximately 27 miles long and is characterized by reverse dip-slip movement. The Puente Hills Blind Thrust Fault is considered active and is no zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 7.1
Upper Elysian Park Blind Thrust	The Upper Elysian Park Blind Thrust Fault is located at depth about ten miles north of the City. The fault is approximately 12 miles long and is characterized by reverse dip-slip movement. The Upper Elysian Park Blind Thrust Fault is considered active and is not zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 6.4
San Jose	The San Jose Fault is 12 miles long, extending southwest and west from near the mouth of San Antonio Canyon on the southern front of the San Gabriel Mountains about 21 miles north of the City. The fault is characterized by left-lateral reverse oblique-slip movement, and was responsible for the 1990 M 5.4 Upland earthquake.	M 6.9
Cucamonga	The Cucamonga Fault is the eastward extension of the Sierra Madre Fault Zone and is located 26 miles northeast of the City, extending 17 miles long, from Duncan Canyon to San Antonio Heights along the San Gabriel Mountains. The fault is characterized by reverse dip-slip movement. The Fault is active and within an Alquist-Priolo Earthquake Fault Zone.	M 6.9

2. Geologic and Seismic Hazards

Table 1 Earthquake Faults near Santa Ana

Fault	Description of Earthquake Fault Zone	Maximum Hazard
San Jacinto	The San Jacinto Fault, located about 36 miles northeast of the City, is considered to be the most active fault in southern California. The fault zone extends 130 miles and is characterized by right-lateral strike-slip movement. The San Jacinto Fault is considered active and is capable of a maximum moment magnitude 6.9 earthquake. The fault is zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 6.9
Sierra Madre Fault Zone	Located 24 miles north of the City, this fault zone extends 35 miles long, from Claremont and following the southern front of the San Gabriel Mountains to San Fernando. This fault zone is characterized by reverse dip-slip movement. The western portion of the Sierra Madre Fault is zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 7.2
Palos Verdes	The Palos Verdes Fault is located offshore about 16 miles southwest of the City. The fault zone extends for about 50 miles southeast from the northern front of the Palos Verdes Peninsula. The fault zone is characterized by reverse right-lateral oblique-slip movement. The fault is not zoned under the Alquist-Priolo Earthquake Fault Zone Act.	M 7.3
San Andreas	The San Bernardino and Southern segments of the San Andreas Fault are located about 40 miles northeast of the City. Past work estimates that the recurrence interval for a M 8.0 earthquake along the entire fault zone is 50–200 years, and a 140–200 year recurrence interval for a M 7.0 earthquakes along the southern fault zone segment.	M 7.5+

Source: Cao et al., 2003.

Seismic Hazards

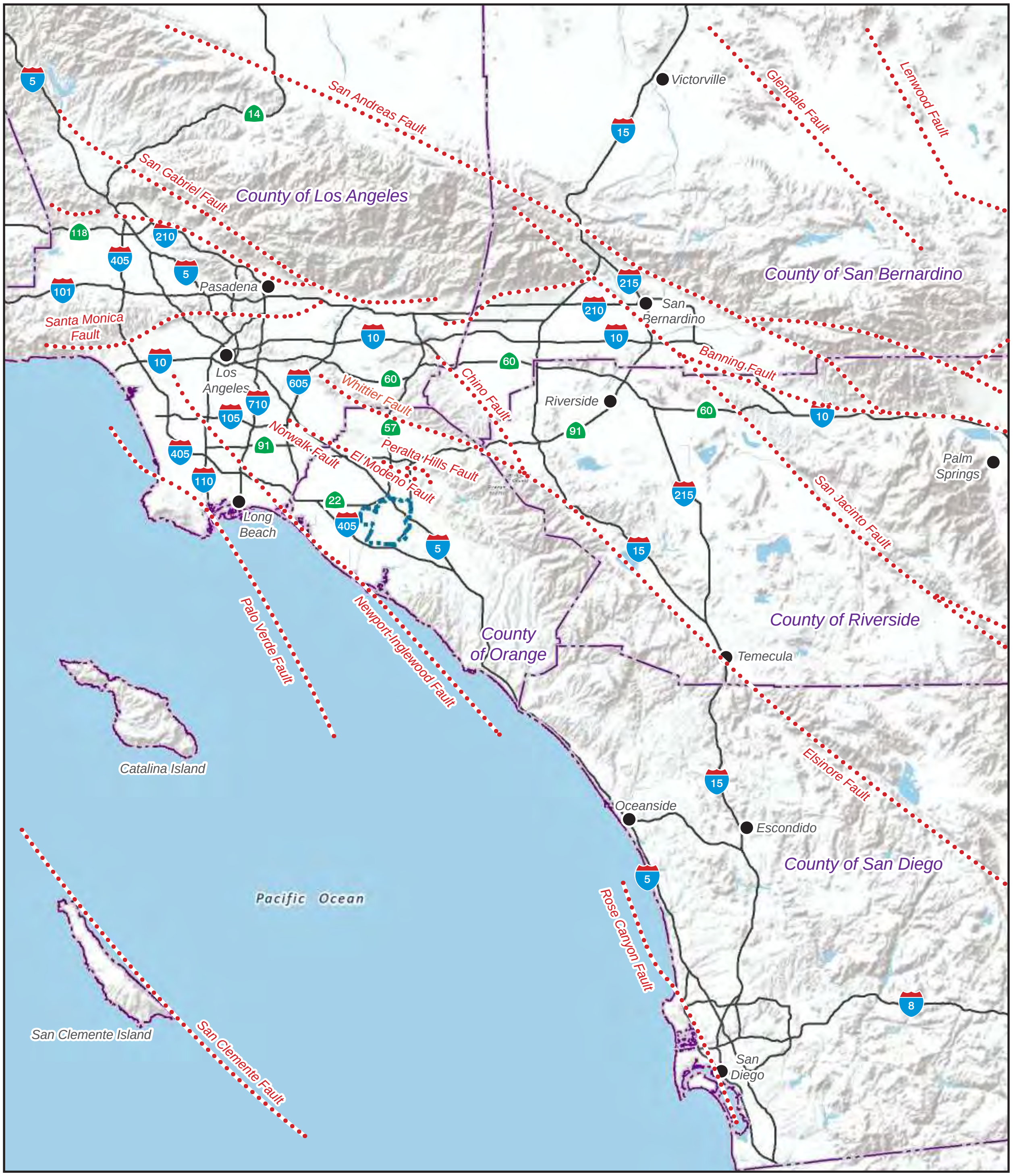
Historically, the City of Santa Ana has not experienced a major destructive earthquake. However, based on a search of earthquake databases of the United States Geological Survey (USGS) National Earthquake Information Center (NEIC), several major earthquakes (magnitude 5.8 or more) have been recorded within approximately 60 miles of the City since 1769 (USGS 2019). The latest of these were the Northridge earthquake and Granada Hills aftershock in 1994, about 60 miles from the City.

The primary seismic hazards related to earthquakes are summarized below:

SURFACE (FAULT) RUPTURE

Seismic activity has been known to cause surface rupture, or ground displacement, along a fault or within the general vicinity of a fault zone. In accordance with the Alquist-Priolo Earthquake Fault Zoning Act (AP

Figure 2 - Regional Fault Location Map



Note: All fault locations and dimensions are approximate and not all faults are shown.
Source: California Department of Mines and Geology. Preliminary fault activity map of California, 1994.

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Zoning Act), the State Geologist has established fault zones along known active faults in California. No active surface faults are mapped and zoned under the AP Zoning Act in Santa Ana (CGS 2019).

Primary ground rupture usually results in a relatively small percentage of the damage caused by an earthquake. Primary fault rupture is rarely confined to one fault; it often spreads out into complex patterns of secondary faulting and ground deformation. Secondary faulting involves a web of interconnected faults that rupture in response to a primary rupture. Secondary ground deformation can include fracturing, shattering, warping, tilting, uplift, and/or subsidence. Such deformation may be relatively confined along the rupturing fault or spread over a large region. Deformation and secondary faulting can also occur without primary ground rupture, as in the case of ground deformation above a blind (buried) thrust fault.

STRONG SEISMIC GROUND SHAKING

Ground shaking refers to vibration of the ground from an earthquake. Shaking above Magnitude 5 on the Richter Scale is known to damage structures. Earthquakes are common to southern California, and geologic evidence is used to determine the likelihood and magnitude of ruptures along a fault. Peak horizontal ground acceleration (PHGA) values that could be expected in Santa Ana are based on types and characteristics of fault sources, distances and estimated maximum earthquake magnitude, and subsurface site geology. The PHGA estimate depends on the method of determination. The maximum magnitude (Mmax) is considered the largest earthquake expected to occur along a fault and is based in part on fault characteristics (length, style of faulting and historic seismicity). The Newport-Inglewood Fault is the dominant active fault that could significantly impact the City.

Ground motion will generally amplify as it passes from the bedrock and through the softer, deep alluvial deposits. The PHGA at the surface of a site depends substantially on the thickness of sedimentary deposits beneath the site. Based on USGS estimates for the Santa Ana area and a 1.0-second spectral acceleration, site effects from the geologic units underlying the City may be three times the effect of crystalline bedrock at the same location.

LIQUEFACTION AND RELATED GROUND FAILURE

Liquefaction happens when strong earthquake shaking causes sediment layers that are saturated with groundwater to lose strength and behave as a fluid. This subsurface process can lead to near-surface or surface ground failure. Surface ground failure is usually expressed as lateral spreading, flow failures, ground oscillation, buoyancy forces on underground structures, increased lateral earth pressure on retaining walls, post-liquefaction settlement and/or general loss of bearing strength. Sand boils (injections of fluidized sediment) commonly accompany these different types of failure. Liquefaction can damage building foundations, structures, and infrastructure, leading to collapse.

Susceptibility to liquefaction typically depends on: 1) the intensity and duration of ground shaking; 2) the age and textural characteristic of the alluvial sediments; and 3) the depth to the groundwater. Loose, granular materials at depths of less than 50 feet, with silt and clay contents of less than 30 percent, and saturated by relatively shallow groundwater table are most susceptible to liquefaction. These geological conditions are typical in parts of southern California, in valley regions and alluvial floodplains. In Santa Ana, most of the

2. Geologic and Seismic Hazards

city is within areas that are susceptible to liquefaction, including the southern half of the city and along the margins of Santiago Creek and the Santa Ana River (CGS 2019) (see Figure 3, *Liquefaction Zones*).

SLOPE FAILURE (LANDSLIDES)

Landslides are perceptible downward movements of soil, debris, rock, or a combination of these under the influence of gravity. Landslide materials are commonly porous and very weathered in the upper portions and margins of the slide. They may also have open fractures or joints. Slope failures can occur during or after periods of intense rainfall or in response to strong seismic shaking. Landslides are distinguished from minor debris flows because in a landslide, the majority of material moved is bedrock materials, and a minor debris flow is the surface slippage of soil. Fire events in areas of high topographic relief can lead to conditions conducive to debris flows.

Landslides, debris flows, or any movement of earth or rock are most common in areas of high topographic relief, such as steep canyon walls or steep hillsides. As the entire City is nearly flat, landslides are not a major hazard in Santa Ana (USGS 2015a; 2015b; 2015c; 2015d).

Geologic Hazards

Based on available studies, the geologic hazards most likely to occur in the City of Santa Ana include expansive soils, corrosive soils, and settlement/collapsible soils (to a lesser degree). Each of these potential hazards is discussed below, followed by maps showing vulnerable locations.

EXPANSIVE SOILS

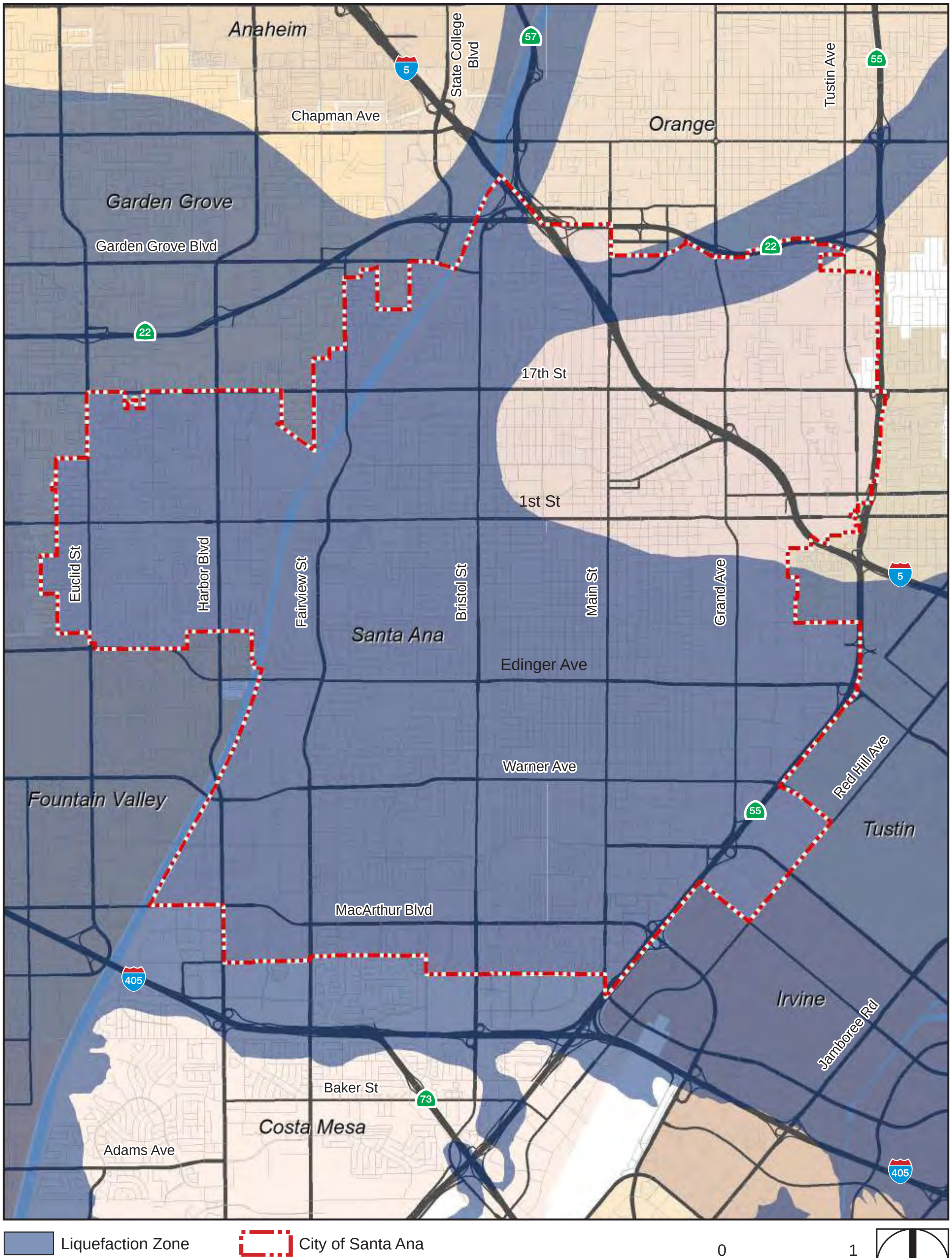
Expansive and collapsible soils are two of the most widely distributed and costly of geologic hazards. Expansive soils will shrink or swell as the moisture content decreases or increases. Expansive soil and rock are typically characterized by clayey material that shrinks as it dries and swells as it becomes wet. Homes, infrastructure, and other structures built on these soils may experience shifting, cracking, and breaking damage as soils shrink and subside or expand. Expansive soils are also known to cause damage to the foundation of structures.

Based on the presence of alluvial materials within the City, there is some potential for expansive soils throughout Santa Ana (Morton 2004; USDA 1978). Expansive soils are possible wherever clays and elastic silts may be present, including alluvial soils and weathered granitic and fine-grained sedimentary rocks. Expansive soils are tested prior to grading as part of a soil engineering report—as required by the CBC and the City of Santa Ana—and are mitigated as necessary.

CORROSIVE SOILS

Corrosive soils contain chemical constituents that may cause damage to construction materials such as concrete and ferrous metals. One such constituent is water-soluble sulfate, which, if in high enough concentrations, can react with and damage concrete. Electrical resistivity, chloride content, and pH level are all indicators of a soil's tendency to corrode ferrous metals. High chloride concentrations from saline

Figure 3 - Liquefaction Zones



Source: California Geological Survey, 1997 (Newport Beach Quadrangle), 1998a (Anaheim Quadrangle), 1998b (Orange Quadrangle) and 2001 (Tustin Quadrangle). Seismic Hazard Zone Maps.

2. Geologic and Seismic Hazards

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minerals can corrode metals (carbon steel, zinc, aluminum, and copper). Low pH and/or low resistivity soils could corrode buried or partially buried metal structures.

Soils throughout the majority of Santa Ana have been found to be highly corrosive to metals and marginally to moderately corrosive to concrete (USDA 1978). Typical mitigation for corrosive soil includes corrosion-resistant coatings. Corrosive soils for concrete and/or metals are often addressed through techniques that include cathodic protection, use of specialty concrete overlays, and other techniques. The City's Engineering Standards require that proposed projects include soil investigations and cathodic protection for metal piping when corrosive soils are encountered.

LAND SUBSIDENCE

Land sinking or subsidence is generally related to substantial overdraft of groundwater reserves from underground reservoirs. Santa Ana has shown historical subsidence and is considered to be a potential hazard on the City (Riel et al 2018). Historically, subsidence in Santa Ana does not show a pattern of widespread irreversible permanent lowering of the ground surface. The probability of subsidence effects is generally low in the majority of Santa Ana, with the most susceptible areas along the margins of the Santa Ana River and Santiago Creek. Groundwater storage by Orange County Water District and statutory commitments to sustainable groundwater management practices reduce the potential for future land subsidence, and ongoing surveying of the ground surface by Orange County Water District provides a way to verify that their efforts in preventing subsidence are effective (OCWD 2015).

SETTLEMENT AND/OR COLLAPSE

The potential hazard posed by seismic settlement and/or collapse in the City is considered to be moderate based on the compressibility of the underlying alluvial soils and the presence of shallow groundwater (CGS 2019). Strong ground shaking can cause settlement of alluvial soils and artificial fills if they are not adequately compacted. Because unconsolidated soils and undocumented fill material are present in the City, seismically induced settlement and/or collapse are possible (Morton 2004). Site-specific mass grading and compaction, which would occur as part of future development, would mitigate any potential impacts from compressible soils within the City.

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3. Implications for the General Plan Update

Santa Ana has many environmental hazards that present potential risks to the safety of residents, commerce, and personal property. While the risks vary according to whether development is located near industrial and transportation land uses, or on the periphery, every neighborhood is subject to potential hazards. Since a fundamental mission of the City is to protect public health and safety, understanding the changing nature of seismic and geologic safety hazards is a key part of that effort.

3.1 ISSUES FOR CONSIDERATION

» **Seismic and Geologic Hazards.** Santa Ana is located between the Elsinore Fault Zone and the Newport-Inglewood Fault. These fault zones along with regional faults can produce earthquakes of Magnitude 7.0 or greater. As a result of earthquakes, the City is subject to liquefaction and seismic ground shaking. Geologic hazards, such as corrosive soils, are more of an everyday concern with large swaths of Santa Ana underlain by soils corrosive to steel. The City has adopted state-mandated safety codes to address these concerns, which are acknowledged as some of the most stringent codes and regulations in the nation.

However, concern remains. Of particular concern is vulnerable structures—hospitals, health care facilities, schools, and mobile homes—built decades ago in accordance with standards at that time. Not all of these land uses have been upgraded to meet current building codes or are required to be retrofitted to withstand high-magnitude earthquakes or geologic hazards. For instance, mobile home units typically perform poorly in natural hazards, but they are not required to have bracing to permanent foundations. Similarly, hospitals statewide have been slow to complete upgrades mandated by the Alquist Hospital Facilities Seismic Safety Act.

3.2 OPPORTUNITIES

Santa Ana faces a wide range of natural hazards—like most cities in the state. Many of these hazards cannot be completely mitigated or prevented. They remain part of the fabric of Santa Ana. The best defense for keeping Santa Ana safe from hazards is to focus on prevention, preparedness, risk reduction, and control measures while maintaining the capability to respond in an effective manner during a disaster. The general plan update can further these objectives.

» **General Plan Vision.** Seismic safety is a principal theme of the general plan's vision. Given the change in general plan safety legislation, the principle could be broadened to address geologic and seismic safety concerns beyond the normal purview of safety related to seismic events. This would provide the framework for an enhanced discussion of seismic safety in the general plan.

» **General Plan Implementation.** The general plan could also contain new programs for addressing seismic safety issues in the community. These programs should be coordinated with the recently adopted hazard mitigation plan. Specific programs could be proposed or designed to:

3. Implications for the General Plan Update

- Encourage the retrofit of mobile homes with bracing and other devices to protect seniors and lower income families living in those units.
- Encourage compliance with new safety requirements for health care facilities promulgated by the Office of Statewide Health Planning and Development.
- Study measures to improve safety for soft-story construction, concrete tilt-up construction, and other vulnerable structures.
- Develop and publish evacuation routes that can be incorporated into the hazard mitigation plan and general plan update.

4. Environmental Impacts

This chapter describes the impacts of the project on geotechnical, geologic and seismic conditions within the city. The analysis of impacts addresses direct and indirect impacts and cumulative impacts.

4.1 IMPACTS

This section describes the long-term impacts of the General Plan Update. The City is subject to a number of geotechnical, geologic and seismic risk hazards. Compliance with building and design codes would include design measures to minimize impacts so that they are less than adverse for strong ground shaking, liquefaction, slope stability, and compressible, corrosive and expansive soils.

4.1.1 Surface (Fault) Rupture

The city is not within a recognized area of active faulting, and no active faults have been observed within the city. The absence of active faults within the city means that there would be no impact from surface fault rupture hazards.

4.1.2 Strong Seismic Ground Shaking

Strong seismic shaking from a local event on the Newport-Inglewood Fault or another regional fault is considered a hazard for this project. The proximity of active faults that are capable of generating large magnitude earthquakes means that structures within the city could be affected by strong seismic ground shaking. Structures could be damaged or destroyed and people could be harmed during a major seismic event.

All structures that would be constructed in accordance with the General Plan Update would be designed to meet or exceed current design standards as found in the latest California Building Code (CBC). Therefore, new structures are expected to remain standing, but may suffer damage requiring closure and replacement. These project design measures would reduce the exposure of people and structures to harm from strong ground shaking hazards such that there would not be a significant impact.

4.1.3 Liquefaction and Related Ground Failure

Liquefaction and related ground failure hazards exist within most of the city, including the southern half of the city and along the margins of Santiago Creek and the Santa Ana River (CGS 2019). This subsurface process can lead to near-surface or surface ground failure. Surface ground failure is usually expressed as lateral spreading, flow failures, ground oscillation, buoyancy forces on underground structures, increased lateral earth pressure on retaining walls, post-liquefaction settlement and/or general loss of bearing strength. Sand boils (injections of fluidized sediment) commonly accompany these different types of failure. Liquefaction can damage or destroy building foundations, structures, and infrastructure, that could lead to the harm of people.

4. Environmental Impacts

All structures constructed following the General Plan Update would be designed in accordance with current seismic design standards as found in the California Building Code (CBC). Design measures would be implemented according to the most recent CBC that would reduce the impact of liquefaction and seismic settlement, including, but not limited to, ground improvement techniques such as in-situ densification, load transfer to underlying non-liquefiable bearing layers and over-excavation and recompaction with engineered fill method. These design measures would reduce the potential exposure of people and structures to the hazard from liquefaction and seismic settlement such that there would not be a significant impact.

4.1.4 Slope Failure (Landslides)

There are no substantial hazards with respect to slope stability, as the city is mostly flat. As such, there would not be a significant impact from slope stability.

4.1.5 Expansive Soils

Based on the presence of alluvial materials within the City, there is some potential for expansive soils throughout Santa Ana (Morton 2004; USDA 1978). Expansive soils are possible wherever clays and elastic silts may be present, including alluvial soils and weathered granitic and fine-grained sedimentary rocks. The presence of expansive soils in the City represents a hazard to structures and people.

CBC design code has been adopted within the City which requires that structures be designed to mitigate expansive soils. Methods that could be used to reduce the impact of expansive soils include drainage control devices to limit water infiltration near foundations, over-excavation and recompaction of engineered fill method, or support of the foundation with piles. These project design measures, or a combination of them, would reduce the impact of expansive soils to less than significant.

4.1.6 Corrosive Soils

Corrosive soils have been found throughout the majority of Santa Ana to be highly corrosive to metals and marginally to moderately corrosive to concrete (USDA 1978). The potential impacts of corrosive soils are corrosion of concrete, preventing complete curing, reducing concrete strength, and corroding buried or partially buried metal components and structures. The weakening of structures from corrosive soils could result in some structural damage or failure of underground utilities, which could expose people to harm. The presence of corrosive soils within the City represents a hazard to structures and people.

CBC design code has been adopted within the City which requires that structures be designed to mitigate corrosive soils. Typical mitigation for corrosive soil includes using a low water-to-cement ratio to decrease the permeability of concrete, using sulfate-resistant cement, and corrosion-resistant coatings. Corrosive soils for concrete and/or metals are often addressed through techniques that include cathodic protection, use of specialty concrete overlays, and other techniques. The City's Engineering Standards require that proposed projects include soil investigations and cathodic protection for metal piping when corrosive soils are encountered. These design measures, or a combination of them, would reduce the impact of corrosive soils to less than significant.

4. Environmental Impacts

4.1.7 Land Subsidence

Santa Ana has shown historical subsidence and is considered to be a potential hazard on the City (Riel et al 2018). Historically, subsidence in Santa Ana does not show a pattern of widespread irreversible permanent lowering of the ground surface. The probability of subsidence impacts is generally low in the majority of Santa Ana, with the most susceptible areas along the margins of the Santa Ana River and Santiago Creek. Groundwater storage by Orange County Water District and statutory commitments to sustainable groundwater management practices reduce the potential for future land subsidence, and ongoing surveying of the ground surface by Orange County Water District provides a way to verify that their efforts in preventing subsidence are effective. The statutorily required sustainable groundwater management practices by Orange County Water District reduce the impact of subsidence to less than significant.

4.1.8 Settlement and/or Collapse

Settlement and collapse are likely to exist in areas with alluvial soils. Areas of large settlement can damage, or in extreme cases, destroy structures. The presence of compressible soils within the city represents a hazard to structures and people.

CBC design code has been adopted within the city which requires that structures be designed to mitigate compressible soils. Methods that could be used to reduce the impact of compressible soils include in-situ densification, transferring the load to underlying non-compressible layers with piles and overexcavation of compressible soil and recompaction with engineered fill. These design measures, or a combination of them, would reduce the impact of compressible soils to less than significant.

4. Environmental Impacts

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5. References

5.1 PRINTED REFERENCES

Cao, T., W. A. Bryant, B. Rowshandel, D. Branum and C. J. Wills, 2003. "The Revised 2002 California Probabilistic Seismic Hazard Maps." June 2003.

Jennings, C. W., and W. A. Bryant, 2010. Fault Activity Map of California, California Geological Data Map Series, Map No. 6, scale 1:750,000.

Morton, D. M., 2004. Preliminary Digital Geologic Map of the Santa Ana 30' X 60' Quadrangle, Southern California, Version 2.0. U.S. Geological Survey Open-File Report 99-172. Scale 1:100,000.

United States Department of Agriculture Soil Conservation Service and Forest Service, 1978. Soil Survey of Orange County and Western Part of Riverside County, California.

United States Geological Survey, 2015a. 7.5' Topographic Series, Anaheim, California Quadrangle Map, scale 1:24,000.

United States Geological Survey, 2015b. 7.5' Topographic Series, Newport Beach, California Quadrangle Map, scale 1:24,000.

United States Geological Survey, 2015c. 7.5' Topographic Series, Orange, California Quadrangle Map, scale 1:24,000.

United States Geological Survey, 2015d. 7.5' Topographic Series, Tustin, California Quadrangle Map, scale 1:24,000.

Yerkes, R. F., T. H. McCulloch, J. E. Schoellhamer, and J. G. Vedder, 1965. Geology of the Los Angeles Basin, California – An Introduction, United States Geological Survey Professional Paper 420-A.

5.2 WEB SITES

California Geological Survey (CGS), 2019. CGS Information Warehouse: Regulatory Maps. http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps.

California State Water Resources Control Board (SWRCB), 2018. GeoTracker website. http://geotracker.waterboards.ca.gov.

Google Earth Pro, 2019.

5. References

Orange County Water District (OCWD), 2015. Groundwater Management Plan, 2015 Update, Final Draft dated June 17, 2015. https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2016_05-02_OCWD_Groundwater_Management_Plan_2015_Update.pdf.

Riel, B., M. Simons, D. Ponti, P. Agram, and R. Jolivet, 2018. Quantifying ground deformation in the Los Angeles and Santa Ana Coastal Basins due to groundwater withdrawal. Water Resources Research. http://web.gps.caltech.edu/~simons/publications/pdfs/Riel_et_al-2017-Water_Resources_Research.pdf.

United States Geological Survey (USGS), 2019. Earthquake Catalog database. https://earthquake.usgs.gov/earthquakes/search/.

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Appendix G-b Paleontological Existing Conditions Technical Report

Appendices

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PALEONTOLOGICAL RESOURCES TECHNICAL REPORT FOR THE CITY OF SANTA ANA GENERAL PLAN UPDATE, ORANGE COUNTY, CALIFORNIA

APRIL 2020

PREPARED FOR

PlaceWorks

PREPARED BY

SWCA Environmental Consultants

PALEONTOLOGICAL RESOURCES TECHNICAL REPORT FOR THE CITY OF SANTA ANA GENERAL PLAN UPDATE, ORANGE COUNTY, CALIFORNIA

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May 2020

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ABSTRACT/EXECUTIVE SUMMARY

Purpose and Scope: In support of the forthcoming City of Santa Ana General Plan update, Placeworks retained SWCA Environmental Consultants (SWCA) to summarize the existing conditions of paleontological resources within the General Plan Area. The study area corresponds with the approximately 17,472 acres (27.3 square miles [70.7 km^2]) city limits. Methods include a records search from the Natural History Museum of Los Angeles County (LACM) as well as a search of the online records of the San Diego Natural History Museum and the University of California Museum of Paleontology, and a review of geologic mapping and the scientific literature.

Dates of Investigation: The records search results were received from the LACM on March 4, 2019. Online museum records were searched on March 6, 2019. The first draft of this report was authored in March 2019, and updated as the final draft in May 2020.

Summary of Findings: The review of online museum records indicates thousands of fossil specimens have been collected from geologic formations within and in the vicinity of the City of Santa Ana. A review of the scientific literature provided context for these and other fossil discoveries. Geologic mapping shows the surficial geology of the City consists of alluvial deposits that range in age from the Holocene to early Pleistocene, with older geologic units likely present in the subsurface. Analysis of these data allowed the assignment of both Society of Vertebrate Paleontology sensitivity rankings to the geologic units present in Santa Ana. Paleontological sensitivity varies across the study area, with younger sedimentary units having low sensitivity at the surface and sensitivity increasing with the age of the sediments. Growth and development will inevitably lead to impacts on paleontological resources, but with the implementation of planning and mitigation measures, impacts to paleontological resources can be reduced to less than significant.

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CONTENTS

FIGURES

TABLES

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1 INTRODUCTION

PlaceWorks retained SWCA Environmental Consultants (SWCA) to provide paleontological resources services in support of the City of Santa Ana General Plan Update (project) for the City of Santa Ana in Orange County, California (the City). SWCA performed a desktop analysis to assess paleontological conditions throughout the project area and reviewed relevant technical documents and agency-maintained databases on paleontological resources. The desktop research is summarized in this paleontological resources technical report (PRTR) that documents reported paleontological resources within the project area and assesses paleontological sensitivity across the City. This interim technical update to the General Plan, last updated in 1982, will ensure that all technical data and policies remain current, and will guide decisions carried out by the City. The General Plan addresses an area encompassing the 27.3 square miles (70.7 km^2) of the city.

SWCA relied upon three main sources of data to conduct this paleontological assessment: 1) geologic mapping, 2) scientific literature, and 3) museum records from the Natural History Museum of Los Angeles County (LACM), University of California Museum of Paleontology (UCMP), and the San Diego Natural History Museum (SDNHM). Data from these sources were used to assign paleontological sensitivity rankings following the guidelines of the Society of Vertebrate Paleontology (SVP 1995, 2010).

1.1 Project Description

The proposed project is a comprehensive update to the City of Santa Ana’s General Plan (1982). The City’s General Plan was last updated in 1982, with some updates to the City’s Land Use Element, Circulation Element, Urban Design Element, and Economic Development in 1998. In March of 2014, the City Council adopted the Santa Ana Strategic Plan, identifying the need for a comprehensive update to the City’s Existing General Plan. The General Plan is the City’s principal policy and planning document guiding the development, conservation, and enhancement of Santa Ana. It contains a comprehensive collection of goals and policies related to the physical development of the City, and the General Plan Update is intended to result in a total of 11 elements to guide the physical development, quality of life, economic health, and sustainability of the Santa Ana community.

The City identified five areas suited for new growth and development: South Main Street, Grand Avenue/17th Street, West Santa Ana Boulevard, 55 Freeway/Dyer Road, and South Bristol Street. These five areas are located along major travel corridors, the future OC Streetcar line, and/or linked to the Downtown. In general, many areas currently designated for General Commercial and Professional Office are expanding opportunities for residential development through a proposed change to the Urban Neighborhood or District Center General Plan land use designations. Industrial Flex would be introduced where Industrial land use designations currently exist within each of the five focus areas in order to allow for cleaner industrial and commercial uses with live-work opportunities.

1.2 Project Location

The City of Santa Ana is located in the southwest portion of California, bordered by Anaheim to the north, Garden Grove to the west, Huntington Beach and Newport Beach to the southwest, and Irvine to the southeast (Figure 1). As shown in Table 1, the City is plotted in numerous Townships, Ranges, and Sections, as depicted on the U.S. Geological Survey (USGS) Anaheim, Orange, Newport Beach, and Tustin 7.5 minute quadrangles (Figure 2). Encompassing approximately 27.3 square miles (70.7 km^2), Santa Ana is the County Seat and second largest city in Orange County, and eleventh largest in California. The Santa Ana River runs northeast-southwest through the western side of the city. Interstate 5 (I-5), a major north-south route through California, passes through the northern portion of Santa Ana.

Figure 1. Project Vicinity.

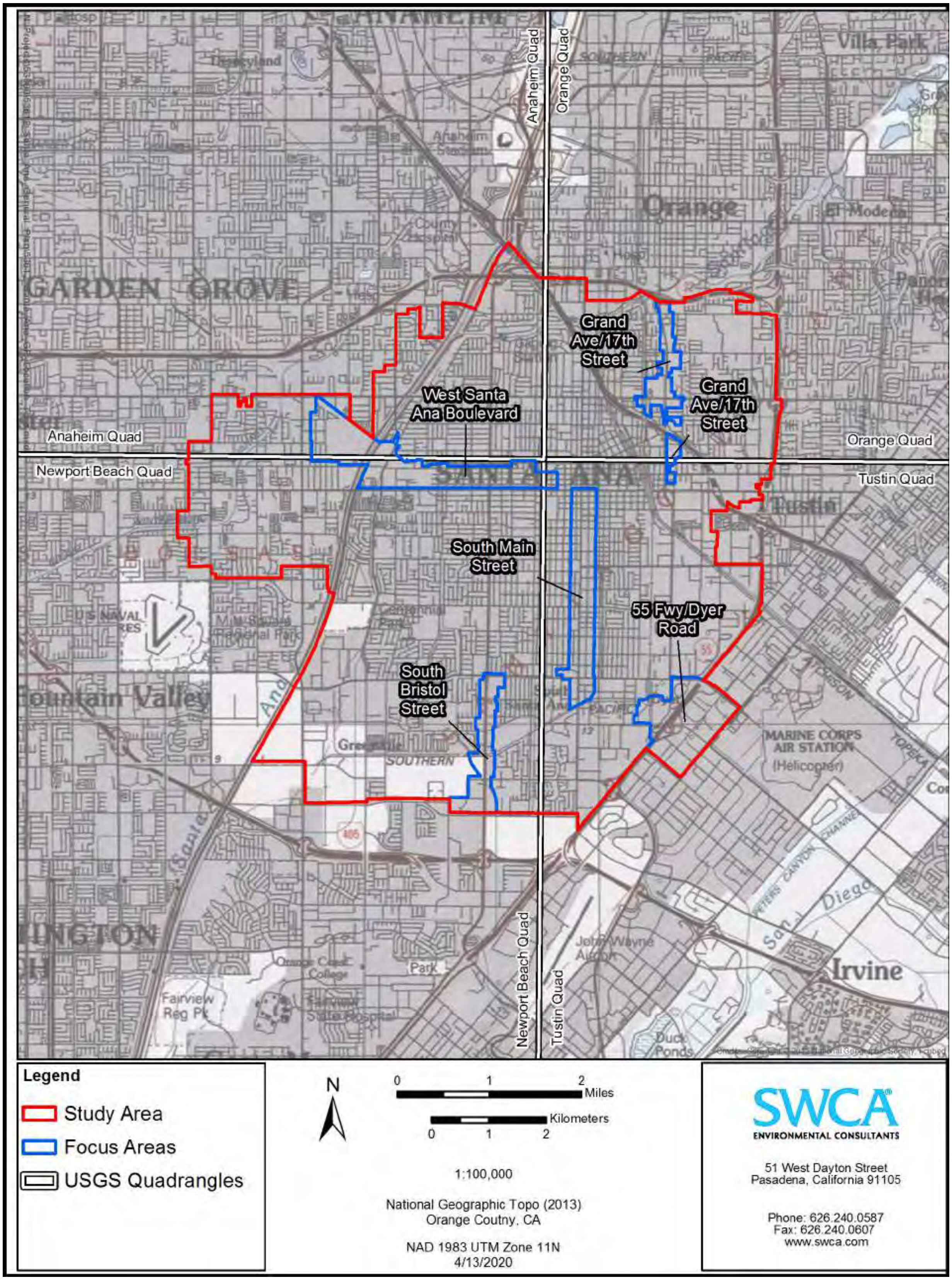

Figure 2. Project Location.

Another major interstate, Interstate 405 (I-405), is located just south of the City's limits and serves as a major north-south connector between Greater Los Angeles, Orange County, and San Diego County. Within the City, five focus areas are present: South Main Street, located in the central portion of the city along Main Street; Grand Avenue/17th Street, located in the northeastern corner of the city; West Santa Ana Boulevard, located along the Santa Ana Boulevard in the northern half of the city; 55 Freeway / Dyer Road, located in the southeastern corner of the city; and South Bristol Street, located in the southern-most part of the city along Bristol Street.

1.3 Definition and Significance of Paleontological Resources

Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or un-mineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only the fossils themselves, but also the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that indicates life on earth has existed for more than 3.6 billion years. Fossils are considered nonrenewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced (Murphey and Daitch 2007). Fossils are important scientific and educational resources and can be used to:

- study the phylogenetic relationships among extinct organisms, as well as their relationships to modern groups;
- elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- reconstruct ancient environments, climate change, and paleoecological relationships;
- provide a measure of relative geologic dating, which forms the basis for biochronology and biostratigraphy, and is an independent and corroborating line of evidence for isotopic dating;
- study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- study patterns and processes of evolution, extinction, and speciation; and
- identify past and potential future human-caused effects to global environments and climates (Murphey and Daitch 2007).

2 REGULATORY SETTING

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value, and are afforded protection under federal and state laws and regulations. This study satisfies project requirements in accordance with both federal and state regulations. This analysis also complies with guidelines and significance criteria specified by the SVP (1995, 2010).

2.1 State Regulations

2.1.1 California Environmental Quality Act (CEQA)

CEQA is the principal statute governing environmental review of projects occurring in the state and is codified at Public Resources Code (PRC) Section 21000 et seq. CEQA requires lead agencies to determine if a proposed project would have a significant effect on the environment, including significant effects on paleontological resources. Guidelines for the implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations 15000 et seq.), define procedures, types of activities, persons, and public agencies required to comply with CEQA, and include as one of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section XIV, Part a) the following: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

2.1.2 Public Resources Code (PRC) Section 5097.5

Requirements for paleontological resource management are included in the PRC Division 5, Chapter 1.7, Section 5097.5, and Division 20, Chapter 3, Section 30244, which states:

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

These statutes prohibit the removal, without permission, of any paleontological site or feature from lands under the jurisdiction of the state or any city, county, district, authority, or public corporation, or any agency thereof. As a result, local agencies are required to comply with PRC 5097.5 for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others. PRC Section 5097.5 also establishes the removal of paleontological resources as a misdemeanor, and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) lands.

2.2 Resource Assessment Guidelines

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be a significant environmental impact. Direct impacts on paleontological resources primarily concern the potential destruction of nonrenewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains. If potentially fossiliferous bedrock or surficial sediments are disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information (a significant impact). At the project-specific level, direct impacts can be reduced to a less than significant level through the implementation of paleontological mitigation.

The CEQA threshold of significance for an impact to paleontological resources is reached when a project is determined to "directly or indirectly destroy a significant paleontological resource or unique geologic feature" (Appendix G, State CEQA Guidelines). In general, for project areas underlain by paleontologically sensitive geologic units, the greater the amount of ground disturbance, the higher the potential for significant impacts to paleontological resources. For project areas that are directly underlain by geologic units with no paleontological sensitivity, there is no potential for impacts on paleontological resources unless sensitive geologic units that underlie the non-sensitive unit are also affected.

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g., Eisentraut and Cooper 2002; Murphey and Daitch 2007; Scott and Springer 2003). In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life; or
5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

2.2.1 Professional Standards

The SVP (1995, 2010) has established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological laws, ordinances, regulations, and standards accept and use the professional standards set forth by the SVP to meet the requirements of CEQA.

As defined by the SVP (2010:11), significant paleontological resources are:

> …fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).

A geologic unit known to contain significant fossils is considered sensitive to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains directly or indirectly. This definition of sensitivity differs fundamentally from the definition for archaeological resources as follows:

> It is extremely important to distinguish between archaeological and paleontological resources when discussing the paleontological potential of rock units. The boundaries of an archaeological resource site define the areal/geographic extent of an archaeological resource, which is generally independent from the rock unit on which it sits. However, paleontological sites indicate that the containing rock unit or formation is fossiliferous. Therefore, the limits of the entire rock unit, both areal and stratigraphic, define the extent of paleontological potential (SVP 2010).

Many archaeological sites contain features that are visually detectable on the surface. In contrast, fossils are often contained within surficial sediments or bedrock, and are therefore not observable or detectable unless exposed by erosion or human activity.

In summary, paleontologists cannot know either the quality or quantity of fossils prior to natural erosion or human-caused exposure. As a result, even in the absence of fossils on the surface, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment that is known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if these remains are significant, successful mitigation and salvage efforts may be undertaken in order to prevent adverse impacts to these resources.

2.2.1.1 SVP SENSITIVITY RANKINGS

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources*, the SVP (2010:1–2) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential:

> **High Potential.** Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rock units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

> **Low Potential.** Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus, only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

> **Undetermined Potential.** Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have

undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

No Potential. Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection or impact mitigation measures relative to paleontological resources.

3 GEOLOGIC SETTING

The City of Santa Ana is located in the northwestern Peninsular Ranges Geomorphic Province, one of the largest geologic regions in western North America (Norris and Webb 1990). The Peninsular Ranges extend from the Mexican border in the south to the Transverse Ranges in the north and northeast and are bordered by the Pacific Ocean on the west and the Colorado Desert on the east. The Peninsular Ranges are a series of northwest trending mountain ranges extending approximately 149 miles (240 km) to the Mexican border, where they then continue for an additional 746 miles (1,200 km) along the Baja Peninsula (Harden 2004). The core of the Peninsular Ranges is made up of Mesozoic plutonic rocks and represents the roots of a magmatic arc formed by active subduction along the Pacific Plate boundary (Harden 2004). Two main batholiths form the core of the Peninsular Ranges. The western batholith, where the project area is located, is 140–105 million years old (Ma) and consists of mafic plutonic rocks, while the eastern batholith is 99–92 Ma and is more silica-rich granodiorites and tonalities (Kimbrough et al. 2001). These plutonic rocks intruded into the older rocks of a Paleozoic carbonate platform and early Mesozoic marine sequences, heavily metamorphosing them (Harden 2004). Above these plutonic rocks, around 130–120 Ma, the Santiago Peak Volcanics were deposited as primarily andesitic and silicic flows, and then metamorphosed by the batholith emplacement (Fife et al. 1967). Cretaceous sedimentary rocks deposited as turbidity currents overlie the plutons and volcanic rocks (Kimbrough et al. 2001). These rocks are in turn overlain by more recent sedimentary deposits leading up to the present day. These deposits were marine through the Eocene and then shifted to terrestrial volcanic and sedimentary strata by the Oligocene and lower Miocene (Powell 1993).

Locally, the project area lies within the alluvial valley of the Santa Ana River on the Perris Block. The Perris Block is an area of low topographic relief bounded by the San Jacinto and Elsinore fault zones (Morton and Miller 2006). This region is characterized by widespread alluvial fan deposits originating from the San Gabriel Mountains to the east of the project area and dating to the late Pleistocene.

4 METHODS

This PRTR is based on a desktop review of available scientific literature, geologic maps, a records search from the LACM, and a review of the online collections databases of the UCMP and the SDNHM. The purpose of this report is to assess the paleontological sensitivity of the geologic units found within the City of Santa Ana. The guidelines of the SVP (2010) were used to assign paleontological sensitivity rankings and develop recommended mitigation measures.

4.1 Project Personnel

SWCA Lead Paleontologist Alyssa Bell, Ph.D., conducted the paleontological analysis and authored this report. Geographic Information Systems (GIS) Specialist John Walls produced the figures. SWCA Principal Investigator Paleontologist Russell Shapiro, Ph.D. reviewed this report. SWCA Project Manager Alyssa Newcomb, M.S., RPA provided oversight on this project.

5 RESULTS (EXISTING CONDITIONS)

5.1 Geology and Paleontology in the City of Santa Ana

Geologic mapping by Morton and Miller (2006) indicates the surficial geology of the City of Santa Ana is composed of alluvial sediments that range in age from the Holocene to early Pleistocene. These sediments are subdivided into recognized geologic units on the basis of their age and lithology as follows (as shown on Figure 3):

> **Young Alluvial Fan Deposits (Qyf).** These sediments date from the Holocene to the late Pleistocene (near recent times to 12,600 years ago), and consist of unconsolidated to moderately consolidated silt, sand, and gravel with slightly to moderately dissected surfaces (Morton and Miller 2006). These sediments cover the majority of the city (Figure 3). As relatively recent sediments at the surface, upper layers of this unit are not old enough to preserve fossil resources (5,000 years, as defined by the SVP [2010]). However, these sediments increase in age with depth, such that in the subsurface they may be old enough to preserve fossils similar to those described below for old alluvial fan deposits. Moreover, these units may overlie older sediments with high paleontological sensitivity. The depth at which Holocene sediments are old enough to preserve fossil resources (i.e., more than 5,000 years old) or transitions to old alluvial fan deposits is highly variable and often unknown for any specific area. One study of inland valley fossil deposits in Riverside and San Bernardino Counties identifies this transition as relatively shallow in many areas, with fossil-bearing sediments occurring as little as 5 feet (1.5 m) below the surface (Reynolds and Reynolds 1991).
>
> **Young Axial-Channel Deposits (Qya).** These sediments also date from the Holocene to the late Pleistocene (near recent times to 126,000 years ago), and consist of clay, silt, and sand deposited along river channels and valleys (Morton and Miller 2006). Like the young alluvial fan deposits described above, these sediments are too young in the surficial layers to preserve fossil resources, but increase in age with depth, such that in the subsurface they may be old enough to preserve fossils similar to those described below for old alluvial fan deposits. These sediments are restricted to outcrops in the southern portion of the city (Figure 3).
>
> **Old Alluvial Fan Deposits (Qof).** Old alluvial fan deposits are very similar to young alluvial fan deposits in terms of lithology and depositional setting; however, they are much older, dating to the late to middle Pleistocene (roughly 780,000–11,700 years old) (Morton and Miller 2006). As such, these sediments are of an appropriate age to preserve fossil resources. These sediments are only found at the surface in the northeastern-most portion of the city but occur extensively in this area outside the city limits. These sediments are likely present in the subsurface throughout the city at an undetermined depth that may be quite shallow in the northeastern parts of city.

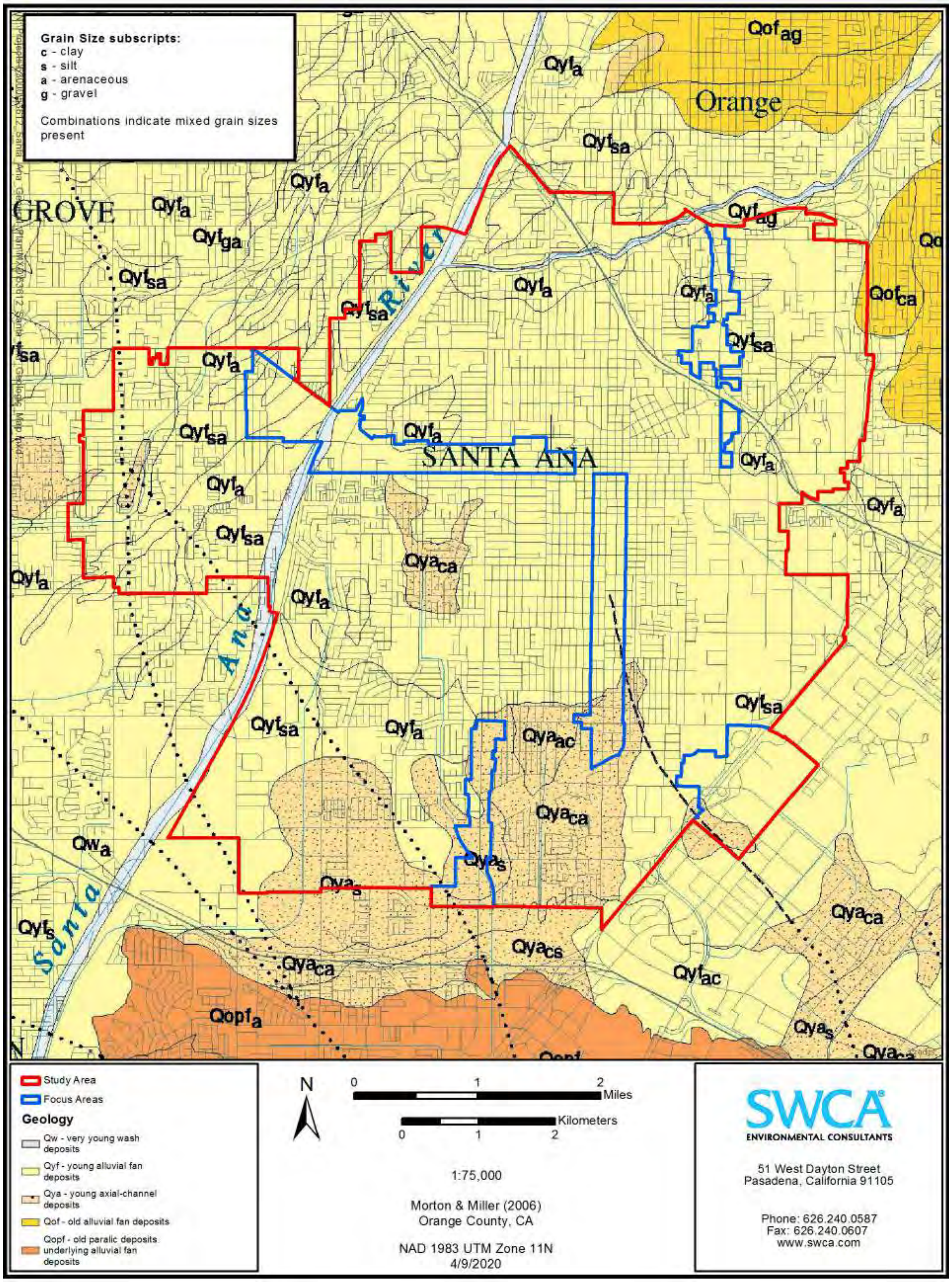

Figure 3. Geologic Map of the Project Area.

Pleistocene sediments have a rich fossil history in southern California (Hudson and Brattstrom 1977; Jefferson 1991a, 1991b; McDonald and Jefferson 2008; Miller 1941, 1971; Roth 1984; Scott 2010; Scott and Cox 2008; Springer et al. 2009). The most common Pleistocene terrestrial mammal fossils include the bones of mammoth, horse, bison, camel, and small mammals, but other taxa, including lion, cheetah, wolf, antelope, peccary, mastodon, capybara, and giant ground sloth, have been reported (Graham and Lundelius 1994), as well as birds, amphibians, and reptiles such as frogs, salamanders, snakes, and turtles (Hudson and Brattstrom 1977). In addition to illuminating the striking differences between Southern California in the Pleistocene and today, this abundant fossil record has been vital in studies of extinction (e.g., Sandom et al., 2014; Scott 2010), ecology (e.g., Connin et al. 1998), and climate change (e.g., Roy et al. 1996).

The LACM has records of 16 fossil localities within a five-mile radius of the city (Table 1). The closest fossil locality from these sediments known to the LACM is approximately 2.5 miles south of the City, where LACM 1339 produced fossil specimens of mammoth (*Mammuthus*) and camel (Camelidae) from sands approximately 15 feet below ground surface (bgs) along Adams Avenue east of the Santa Ana River (McLeod 2019). Also in this area, LACM 4219 produced specimens of sea turtle (*Chelonia*) and camel, LACM 3267 produced a specimen of a fossil elephant (Proboscidea), and LACM 6370 produced a specimen of horse (*Equus*), all from unrecorded depths (McLeod 2019). North of the city, a fossil sheep (*Ovis*) was discovered near the intersection of Lincoln Avenue and South Rio Vista Avenue at LACM 1652, approximately four miles from the project area (McLeod 2019). Just to the east of this locality, along Fletcher Avenue east of the Santa Ana River LACM 4943 produced a specimen of fossil horse at a depth of 8–10 feet bgs (McLeod 2019). Just over five miles to the west of the City, near the intersection of Warner Avenue and Bolsa Chica Street, LACM 65113 produced specimens of mammoth between six and eight feet bgs and specimens of fossil bison (*Bison*) between 14 and 20 feet bgs (McLeod 2019). To the southeast of the City, LACM has records of nine fossil localities around MacArthur Boulevard east of Upper Newport Bay that produced a rich suite of fossil vertebrates detailed by Miller (1971) and included specimens of sea otter (*Enhydra lutris*), pallid bat (*Antrozous pallidus*), shrews (*Notiosorex crawfordi* and *Sorex ornatus*), and pocket gopher (*Thomomys bottae*).

Table 1. LACM Pleistocene-aged Fossil Localities in the Vicinity of the City of Santa Ana

Locality Number	Depth	Specimens
LACM 1339	15 feet bgs	Mammoth, camel
LACM 4219	NA	Sea turtle, camel
LACM 3267	NA	elephant
LACM 6370	NA	horse
LACM 1652	NA	sheep
LACM 4943	8–10 feet bgs	horse
LACM 65113	6–20 feet bgs	Mammoth, bison
LACM multiple (9)	NA	sea otter, pallid bat, shrews, pocket gopher

The online collections databases from the UCMP (2019) and SDNHM (2019) do not provide precise locality information, but indicate that numerous specimens have been recovered from Pleistocene-aged deposits in Orange County (Table 2). The majority of these specimens are invertebrates, with vertebrates such as fish, birds, and mammals also recovered.

Table 2. Pleistocene-aged Fossils from Orange County

Museum	Specimens
UCMP (multiple)	Invertebrate fossils (4,732 specimens); Vertebrate fossils (bird: 2 specimens, fish: 29 specimens, mammals: 7 specimens)
SDNHM (multiple)	Invertebrate fossils (2,432 specimens); Vertebrate fossils (bird: 14 specimens, fish: 24 specimens, mammals: 460 specimens)

5.2 Paleontological Sensitivity Analysis

The results of the desktop analysis presented above were used to assign SVP paleontological sensitivity rankings (SVP 2010) to each geologic unit present in the City of Santa Ana (Table 3, Figure 4).

Low-to-High Sensitivity, increasing with depth. Both young alluvial fan deposits (Qyf) and young axial-channel deposits (Qya) are too young to preserve fossil resources at the surface or in the shallow subsurface (i.e., sediments younger than 5,000 years before present), but may preserve fossils at depth or overlie older units that have high paleontological sensitivity. These units are widespread across the city, making up the majority of the surficial sediments. In assessing the sensitivity and determining mitigation measures for areas mapped as these units, it is important to establish the thickness of these surficial, low-sensitivity sediments (those less than 5,000 years old that have low sensitivity). The museum records search from the LACM notes several fossil localities at depths of as little as 6–10 feet bgs, indicating the transition to high sensitivity sediments can be quite shallow in this area. Geotechnical studies specific to individual projects may also be able to help determine the depth of this change in specific locations within the city.

High Sensitivity. Old alluvial fan deposits are present at the surface in the most northeastern part of the City and are likely present in the subsurface throughout the City. The records of the LACM, UCMP, and SDNHM as well as the review of the scientific literature all indicate Pleistocene-aged sediments have a strong history of fossil preservation in this area, and therefore these sediments are assigned high paleontological sensitivity.

Table 3. Paleontological Sensitivity of Geologic Units in Santa Ana

Geologic Unit	Map Symbol	Age	Occurrence	Focus Areas	SVP Sensitivity
Young alluvial fan deposits	Qyf	Holocene – late Pleistocene	Surface, majority of city	Grand Avenue / 17th Street; 55 Freeway / Dyer Road; South Main Street; South Bristol Street; West Santa Ana Boulevard	Low-to-High, increasing with depth
Young axial-channel deposits	Qya	Holocene – late Pleistocene	Surface, southern part of city	55 Freeway / Dyer Road; South Main Street; South Bristol Street	Low-to-High, increasing with depth
Old alluvial fan deposits	Qof	Late – middle Pleistocene	Surface, northeastern-most city; Subsurface, throughout city	None	High

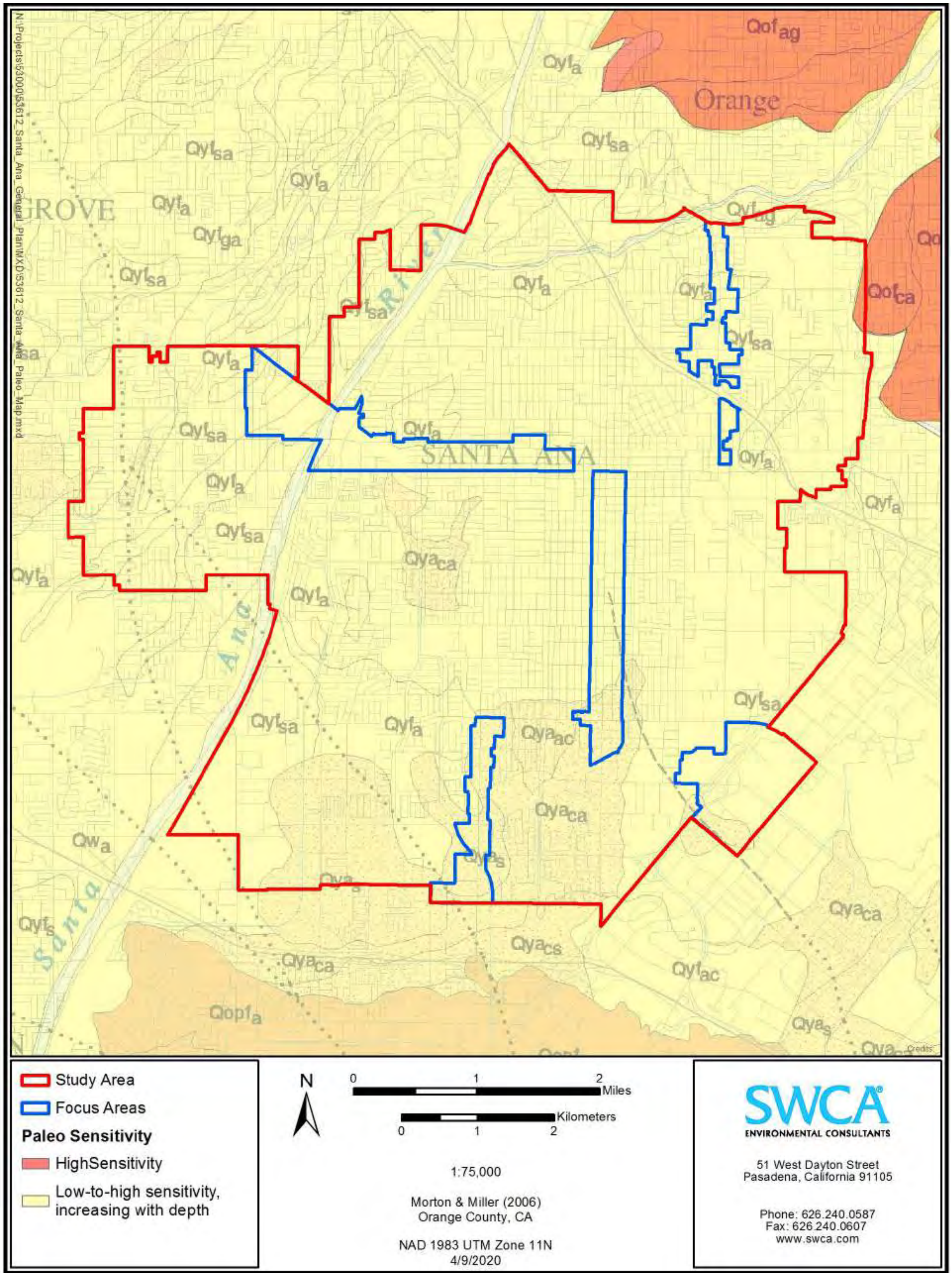

Figure 4. Paleontological Sensitivity of the Project Area.

6 POTENTIAL IMPACTS AND MITIGATION MEASURES

As discussed above, numerous federal and state regulations have been established to protect paleontological resources. If it can be demonstrated that a project will cause damage to a unique paleontological resource, mitigation measures are required (CEQA, Appendix G). Impacts to paleontological resources most commonly occur from damage or destruction during ground-disturbing activities. Fossils are most commonly buried in sediment or rock, and so are often undetectable from surface observations until excavations uncover them. This can result in damage to the fossil if measures are not taken during ground-disturbing activities to identify and protect fossils as they are encountered. The mitigation measures presented in this section are designed to reduce impacts to less than significant.

6.1 Thresholds of Significance

The General Plan provides a framework within which future development projects can be considered. The potential for future proposed projects to result in impacts associated with paleontological resources is based on the CEQA thresholds of significance outlined in Appendix G of the State CEQA Guidelines, which asks the question, "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

6.1.1 Impacts to Paleontological Resources

The review of the LACM records search, the UCMP and SDNHM online paleontological collections, geologic mapping, and the scientific literature presented here indicate that the General Plan Area contains areas with sediments of high paleontological sensitivity, either at the surface or in the subsurface. Future development or improvements related to changes in land use could potentially affect and cause significant adverse impacts to paleontological resources. The following measures are recommended to assist in the avoidance and mitigation of potential impacts to paleontological resources from future projects in the General Plan Area.

The guidelines of the SVP (1995, 2010) have been used to develop general recommendations for proposed projects in the City of Santa Ana. With the implementation of the following mitigation measures, construction projects in Santa Ana will be mitigated against directly or indirectly destroying unique paleontological resources or sites or unique geologic features. The intent of these recommendations is to ensure that potential adverse impacts to paleontological resources as a result of project implementation are reduced to a less-than-significant level. These mitigation measures are only general guidelines, and all projects should develop a project-specific paleontological mitigation and monitoring plan, as discussed below.

6.1.2 Paleontological Resources Mitigation Measure 1

A Qualified Paleontologist meeting the standards of the SVP (2010) will be designated to conduct all paleontological mitigation measures associated with construction activities and develop a project-specific paleontological resources monitoring and mitigation plan (PRMMP). This plan will address monitoring and mitigation measures specific to that project area and construction plan, and will take into account updated geologic mapping, geotechnical data, updated paleontological records searches, and any changes to the regulatory framework. This PRMMP should usually meet the standards of the SVP (2010). The following provisions should be made, based on the paleontological sensitivity of the geologic units impacted by specific projects:

High Sensitivity — All projects involving ground disturbances in previously undisturbed areas mapped as having high paleontological sensitivity will be monitored by a qualified paleontological monitor (SVP 2010) on a full-time basis under the supervision of the Qualified Paleontologist. This monitoring will include inspection of exposed sedimentary units during active excavations within sensitive geologic sediments. The monitor will have authority to temporarily divert activity away from exposed fossils to evaluate the significance of the find and, should the fossils be determined to be significant, professionally and efficiently recover the fossil specimens and collect associated data. Paleontological monitors will use field data forms to record pertinent location and geologic data, will measure stratigraphic sections (if applicable), and collect appropriate sediment samples from any fossil localities.

Low-to-High Sensitivity—All projects involving ground disturbance in previously undisturbed areas mapped with low-to-high paleontological sensitivity will only require monitoring if construction activity will exceed the depth of the low sensitivity surficial sediments. The underlying sediments may have high paleontological sensitivity, and therefore work in those units might require paleontological monitoring, as determined by the Qualified Paleontologist in the PRMMP. When determining the depth at which the transition to high sensitivity occurs and monitoring becomes necessary, the Qualified Paleontologist should take into account: a) the most recent local geologic mapping, b) depths at which fossils have been found in the vicinity of the project area, as revealed by the museum records search, and c) geotechnical studies of the project area, if available.

6.1.3 Paleontological Resources Mitigation Measure 2

In the event of any fossil discovery, regardless of depth or geologic formation, construction work will halt within a 50-ft. radius of the find until its significance can be determined by the Qualified Paleontologist. Significant fossils will be recovered, prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and deposited in a designated paleontological curation facility, such as the LACM, in accordance with the standards of the SVP (2010). A repository will be identified, and a curatorial arrangement will be signed prior to collection of the fossils.

7 LITERATURE CITED

Connin, S., J. Betancourt, and J. Quade. 1998. Late Pleistocene C4 plant dominance and summer rainfall in the Southwestern United States from isotopic study of herbivore teeth. *Quaternary Research 50:179–193.*

Eisentraut, P. and J. Cooper. 2002. *Development of a model curation program for Orange County's archaeological and paleontological collections*. Prepared by California State University, Fullerton and submitted to the County of Orange Public Facilities and Resources Department/Harbors, Parks and Beaches (PFRD/HPB)

Fife, D. L., J. A. Minch, and P. J. Crampton. 1967. Late Jurassic age of the Santiago Peak Volcanics, California. *GSA Bulletin* 78: 299-304

Graham, R. W., and E. L. Lundelius. 1994. FAUNMAP: a database documenting the late Quaternary distributions of mammal species in the United States. *Illinois State Museum Scientific Papers* XXV(1).

Harden, D. 2004. *California Geology*, 2nd edition. Pearson Prentice Hall, 552 p.

Hudson, D., and B. Brattstrom. 1977. A small herpetofauna from the late Pleistocene of Newport Beach Mesa, Orange County, California. *Bulletin of the Southern California Academy of Sciences* 76:16–20.

Jefferson, G. T. 1991a. *A catalogue of Late Quaternary vertebrates from California: part one, nonmarine lower vertebrate and avian taxa*. Natural History Museum of Los Angeles County Technical Reports No. 5.

———. 1991b. *A catalogue of Late Quaternary vertebrates from California: part two, mammals*. Natural History Museum of Los Angeles County Technical Reports No. 7.

Kimbrough, D. L., T. E. Moore, M. Grove, R. G. Gastil A. Ortega-Rivera, and C. M. Fanning. 2001. Forearc-basin sedimentary response to rapid Late Cretaceous batholith emplacement in the Peninsular Ranges of southern and Baja California. *Geology* 29: 491-494

McDonald, H. G., and G. T. Jefferson. 2008. Distribution of Pleistocene *Nothrotheriops* (Xenartha, Nothrotheriidae) in North America; pp. 313–331 in X. Wang and L. Barnes (eds.), *Geology and Vertebrate Paleontology of Western and Southern North America*. Natural History Museum of Los Angeles County Science Series 41.

McLeod, S. 2019. Records search of the Los Angeles County Natural History Museum. Letter response to A. Bell on March 4, 2019

Miller, W. E. 1941. A new fossil bird locality. *Condor* 44:283–284.

———. 1971. *Pleistocene vertebrates of the Los Angeles Basin and vicinity: exclusive of Rancho La Brea*. Los Angeles County Museum of Natural History 10.

Morton, D. M., and F. K. Miller. 2006. Geologic map of the San Bernardino and Santa Ana 30' × 60' quadrangles, California. Scale 1:100,000. U.S. Geological Survey Open File Report 2006-1217.

Murphey, P. C., and D. Daitch. 2007. Paleontological overview of oil shale and tar sands areas in Colorado, Utah and Wyoming. Scale 1:500,000. U.S. Department of Energy, Argonne National Laboratory. Report prepared for the U.S. Department of Interior Bureau of Land Management.

Norris, R. M., and R. W. Webb. 1990. *Geology of California*. 2nd ed. New York: John Wiley & Sons.

Powell, R. E. 1993. Balanced palinspastic reconstruction of pre-late Cenozoic paleogeology, southern California: Geologic and kinematic constraints on evolution of the San Andreas fault system. *GSA Memoirs* 178: 1-106.

Reynolds, R. E., and R. L. Reynolds. 1991. The Pleistocene beneath our feet: near-surface Pleistocene fossils in inland southern California basins; pp. 41–43 in M. O. Woodburne, R. E. Reynolds, and D. P. Whistler (eds.), *Inland Southern California: the last 70 million years*. Redlands, CA: San Bernardino County Museum Association.

Roth, V. L. 1984. How elephants grow: heterochrony and the calibration of developmental stages in some living and fossil species. *Journal of Vertebrate Paleontology* 4:126–145.

Roy, K., J. Valentine, D. Jablonski, and S. Kidwell. 1996. Scales of climatic variability and time averaging in Pleistocene biotas: implications for ecology and evolution. *Trends in Ecology and Evolution* 11:458–463.

San Diego County Natural History Museum (SDNHM). 2019. Online search of collections database. Available at: http://www.sdnhm.org/science/paleontology/resources/collection-database/. Accessed February 12, 2018.

Sandom, C., S. Faurby, B. Sandel, and J.-C. Svenning. 2014. Global late Quaternary megafauna extinctions linked to humans, not climate change. *Proceedings of the Royal Society B* 281, 9 pp.

Scott, E. 2010. Extinctions, scenarios, and assumptions: changes in latest Pleistocene large herbivore abundance and distribution in western North America. *Quaternary International* 217:225–239.

Scott, E., and S. Cox. 2008. Late Pleistocene distribution of Bison (Mammalia; Artiodactyla) in the Mojave Desert of Southern California and Nevada; pp. 359–382 in X. Wang and L. Barnes (eds.), *Geology and Vertebrate Paleontology of Western and Southern North America*. Natural History Museum of Los Angeles County, Science Series 41.

Scott, E. and Springer, K. 2003. CEQA and fossil preservation in southern California. *The Environmental Monitor* 2003: 4-10.

Society of Vertebrate Paleontology (SVP). 1995. Assessment and mitigation of adverse impacts to nonrenewable paleontologic resources: standard guidelines. *Society of Vertebrate Paleontology News Bulletin* 163:22–27.

———. 2010. *Standard procedures for the assessment and mitigation of adverse impacts to paleontological resources*. Available at: http://vertpaleo.org/Membership/Member-Ethics/SVP_Impact_Mitigation_Guidelines.aspx. Accessed January 26, 2016.

Springer, K., E. Scott, J. Sagebiel, and L. Murray. 2009. The Diamond Valley Lake local fauna: late Pleistocene vertebrates from inland southern California; pp. 217–237 in L. Albright (ed.), *Papers on Geology, Vertebrate Paleontology, and Biostratigraphy in Honor of Michael O. Woodburne*. Museum of Northern Arizona Bulletin 65.

United States Department of the Interior (USDI). 2000. *Assessment of Fossil Management on Federal and Indian Lands*. Washington, D.C.: USDI.

University of California Museum of Paleontology (UCMP). 2019. Online search of collections database. Available at: http://ucmpdb.berkeley.edu/. Accessed February 12, 2018.

Appendix A.

Confidential - Paleontological Records from the Natural History Museum of Los Angeles County

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

4 March 2019

SWCA Environmental Consultants
51 West Dayton Street
Pasadena, CA 91105

Attn: Alyssa Bell, Ph.D., Lead Paleontologist

re: Paleontological resources for the proposed Santa Ana General Plan Update Project, SWCA Project # 53612, in the City of Santa Ana, Orange County, project area

Dear Alyssa:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed Santa Ana General Plan Update Project, SWCA Project # 53612, in the City of Santa Ana, Orange County, project area as outlined on the portions of the Anaheim, Orange, Newport Beach, and Tustin USGS topographic quadrangle maps that you sent to me via e-mail on 26 February 2019. We do not have any vertebrate fossil localities that lie directly within the proposed project area boundaries, but we do have vertebrate fossil localities nearby from sedimentary deposits similar to those that occur in the proposed project area, either at the surface or at depth.

In the entire proposed project area the surficial deposits consist of younger Quaternary Alluvium, derived as alluvial fan deposits from the Santa Ana Mountains to the east and northeast, partly via Santiago Creek that currently flows through the northern portion of the proposed project area, but especially from the Santa Ana River that currently flows through the western portion of the proposed project area. These younger Quaternary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but we have a vertebrate fossil locality, LACM 1652, north of the proposed project area on the western side of the Santa Ana River along Rio Vista Avenue south of Lincoln Avenue, that produced a fossil specimen of sheep, *Ovis*. Almost due east of locality LACM 1652, along Fletcher Avenue east of Glassell

Street east of the Santa Ana River, our vertebrate fossil locality from older Quaternary deposits, LACM 4943, produced a specimen of fossil horse, *Equus*, at a depth of 8-10 feet below the surface.

To the southwest of the proposed project area our closest fossil vertebrate locality from these deposits is LACM 4018, southwest of the proposed project area at the intersection of Warner Avenue and Golden West Street, that produced specimens of invertebrates, reptiles, birds, rodents, horses and deer in peat between four and eight feet below the surface, but these specimens were later determined to be of very late Holocene age. Further west along Warner Avenue, close to Bolsa Chica Street, our fossil vertebrate locality LACM 65113 from these deposits produced Pleistocene age specimens of mammoth, *Mammuthus*, between six and eight feet below the soil and specimens of fossil bison, *Bison*, between fourteen and twenty feet below the soil. A little further southwest of the proposed project area, along Ellis Avenue east of Beach Boulevard, our vertebrate fossil localities LACM 7657-7659 from the underlying Pleistocene San Pedro Sand produced fossil shark and fish specimens including soupfin shark, *Galeorhinus galeus*, skate, *Raja*, ray, *Myliobatis*, angel shark, *Squatina californica*, cusk eel, *Otophidium*, toadfish, *Porichthys notatus*, queenfish, *Seriphus politus*, sculpin, *Leptocottus*, goby, *Lepidogobius lepidus*, and sanddabs, *Citharichthys sordidus* and *Citharichthys stigmaeus*, from well cores over 100 feet below the surface.

To the south of the western portion of the proposed project area our closest older Quaternary locality is LACM 1339, east of the Santa Ana River near the top of the mesa bluffs along Adams Avenue, that produced fossil specimens of mammoth, *Mammuthus*, and camel, Camelidae, from sands approximately 15 feet below the top of the mesa that is overlain by shell bearing silts and sands. Further to the south and east, along the Newport Freeway near Santa Isabel Avenue, our locality LACM 4219 produced fossil specimens of sea turtle, *Chelonia*, and camel, Camelidae. Further south, near the intersection of 19th Street and Anaheim Avenue, our older Quaternary locality LACM 3267 produced a specimen of a fossil elephant, Proboscidea. Due south farther still from the proposed project area, our locality LACM 6370, from the Hoag Hospital lower campus parcel near the intersection of Superior Avenue and the Pacific Coast Highway, produced a specimen of a fossil horse, *Equus*, in older Quaternary deposits.

To the south of the eastern portion of the proposed project area, just east of Upper Newport Bay around MacArthur Boulevard, we have several vertebrate fossil localities from older Quaternary deposits including LACM 1066, 1068-1069, 1086, 1240, 3407, 3877, 4426 and 6732. These localities, and many more closer to Upper Newport Bay, produced a rich suite of Quaternary fossil vertebrates. In his 1971 publication (Pleistocene vertebrates of the Los Angeles basin and vicinity (exclusive of Rancho La Brea). Los Angeles County Museum Science Bulletin 10:1-124) W.E. Miller documented many of these taxa from localities LACM 1066 and 3877 and figured specimens of sea otter, *Enhydra lutris*, pallid bat, *Antrozous pallidus*, shrews, *Notiosorex crawfordi* and *Sorex ornatus*, and pocket gopher, *Thomomys bottae*.

Shallow excavations in the uppermost layers of the younger Quaternary alluvial fan sediments in the proposed project site area are unlikely to uncover significant fossil vertebrate remains. Deeper excavations in the proposed project area, however, may well encounter significant vertebrate fossils in older Quaternary sediments. Any substantial excavations below the uppermost layers, therefore, should be closely monitored to quickly and professionally collect any specimens without impeding development. Also, sediment samples should be collected and processed to determine the small fossil potential in the proposed project area. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

Appendix H-a Infrastructure Technical Report for Hydrology, Sewer, Water, and Water Quality

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CITY OF SANTA ANA GENERAL PLAN UPDATE

INFRASTRUCTURE TECHNICAL REPORT FOR HYDROLOGY, SEWER, WATER, & WATER QUALITY

City of Santa Ana
Orange County, California

Prepared For

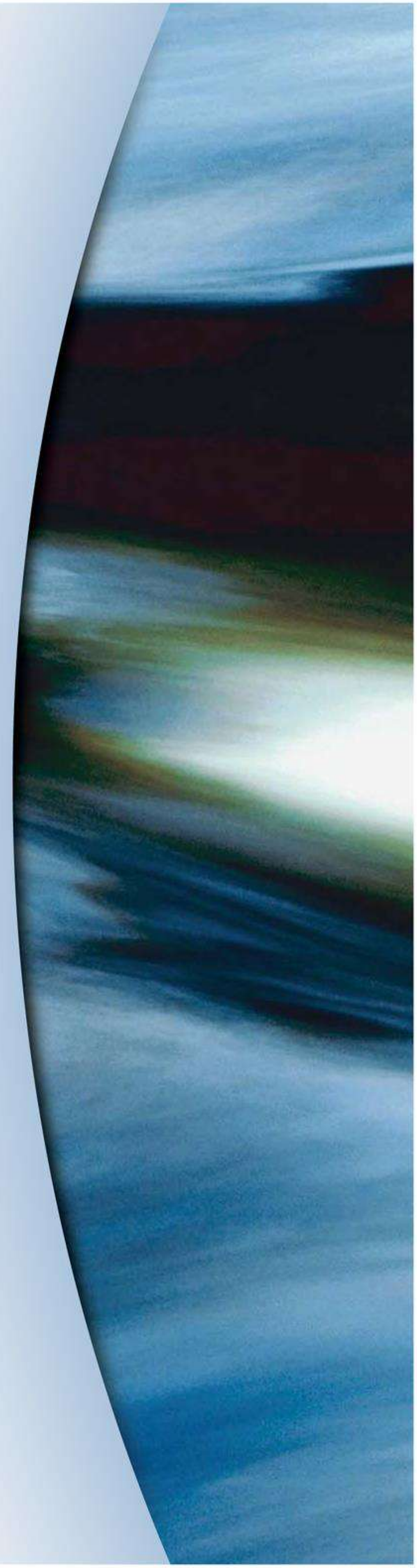
PLACEWORKS
3 MacArthur Place, Suite 1100
Santa Ana, CA 92707
714.966.9220

Prepared By

Fuscoe Engineering, Inc.
16795 Von Karman, Suite 100
Irvine, California 92606
949.474.1960

Project Manager:
Ian Adam
Principal / Stormwater Manager

Date Prepared: May 5, 2020
Updated: June 3, 2020



full circle thinking®

CITY OF SANTA ANA
GENERAL PLAN UPDATE

INFRASTRUCTURE REPORT FOR
HYDROLOGY, SEWER, WATER, AND WATER QUALITY

CITY OF SANTA ANA
ORANGE COUNTY, CALIFORNIA

PREPARED FOR:

PLACEWORKS
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Santa Ana, CA 92707

PREPARED BY:

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DATE PREPARED: MAY 5, 2020 *(UPDATED 6/3/2020)*

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APPENDICES

1. INTRODUCTION & BACKGROUND

The City of Santa Ana ("City") is currently undergoing a General Plan Update (GPU) which is intended to shape development in the City over the next 30-plus years. A General Plan is the principal long-range policy and planning document for guiding the physical development, conservation, and enhancement of California cities and counties. As part of the California Environmental Quality Act (CEQA) process associated with General Plan Updates, infrastructure such as drainage, sewer, water systems and water quality that support the existing and proposed land uses will be analyzed at a level consistent with the city-wide program-level planning of an EIR. This report will focus on the existing conditions of these infrastructure systems that serve the City (referred to the Santa Ana GPU area).

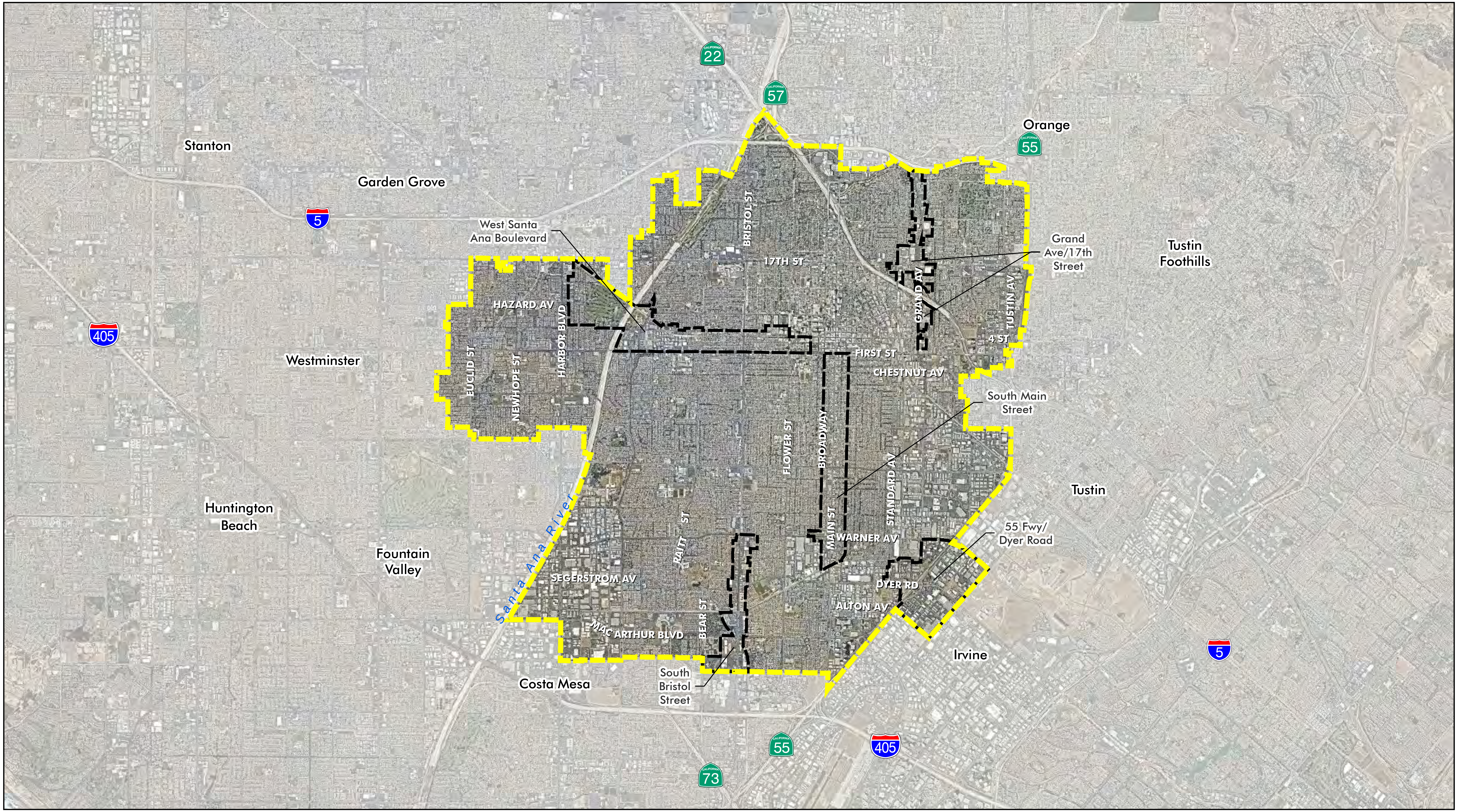
The City is located in the center of Orange County and is bounded by the City of Orange to the north, the cities of Irvine and Tustin to the east, Fountain Valley and Westminster to the west, and Costa Mesa to the south. The GPU includes five "Focus Areas" throughout the City. Focus Areas will feature the majority of land use changes and proposed increases in land use density in addition to Citywide land use changes also proposed outside of the Focus Areas. Details of these Focus Areas are listed below and shown in Figure 1:

Table 1 City of Santa Ana GPU Focus Areas

Focus Area	Acreage	Location within the City	Primary Existing Land Uses
West Santa Ana Boulevard	604 acres	Central portion of the City between 1st Street and 5th Street	• Low density residential • Industrial • Open Space
South Bristol Street	236 acres	South central portion of City along Bristol Street	• General Commercial • South Bristol Street
Grand Avenue/17th Street	202 acres	North east portion of City along 17th Street	• General Commercial • Professional/Admin Office
South Main Street	408 acres	Central portion of City along the Main Street corridor	• Low density residential • General commercial
55 Freeway/Dyer Road	438 acres	South east portion of City off the 55 Freeway	• General Commercial • Professional/Admin Office

The proposed land use changes will increase residential land uses and commercial square footage. An estimated growth of 36,261 dwelling units is anticipated across the City as compared to existing land use, concentrated mainly among the five Focus Areas and additional specific plan and special zoning areas. Approximately 5.8 million square feet of additional commercial land uses are anticipated across the City as compared to existing land use, and a corresponding increase of 11,436 Citywide jobs is anticipated.

This report analyzes the existing infrastructure systems that serve the City and the Focus Areas. The analysis includes a review and summary of the baseline conditions of the storm drainage system, water and wastewater systems, and existing water quality regulations currently in place, and provides a comparison to proposed conditions under final buildout conditions of the GPU. The analysis also utilizes assumptions made under the current General Plan as this document was utilized to inform many of the regional infrastructure planning documentation and associated master plans. Any significant impacts will be identified by analyzing the CEQA thresholds of significance as they relate to storm drain, water, sewer and water quality. The analysis also includes the utilization of GIS tools and data and ongoing communication with City staff.



Aerial Date: 09/26/2018

Santa Ana GPU and Focus Areas Aerial Extent

Figure 1

City of Santa Ana General Plan Update

4/10/2020

FUSCOE ENGINEERING

Santa Ana City Boundary

Focus Area

0 0.5 1 2 Miles

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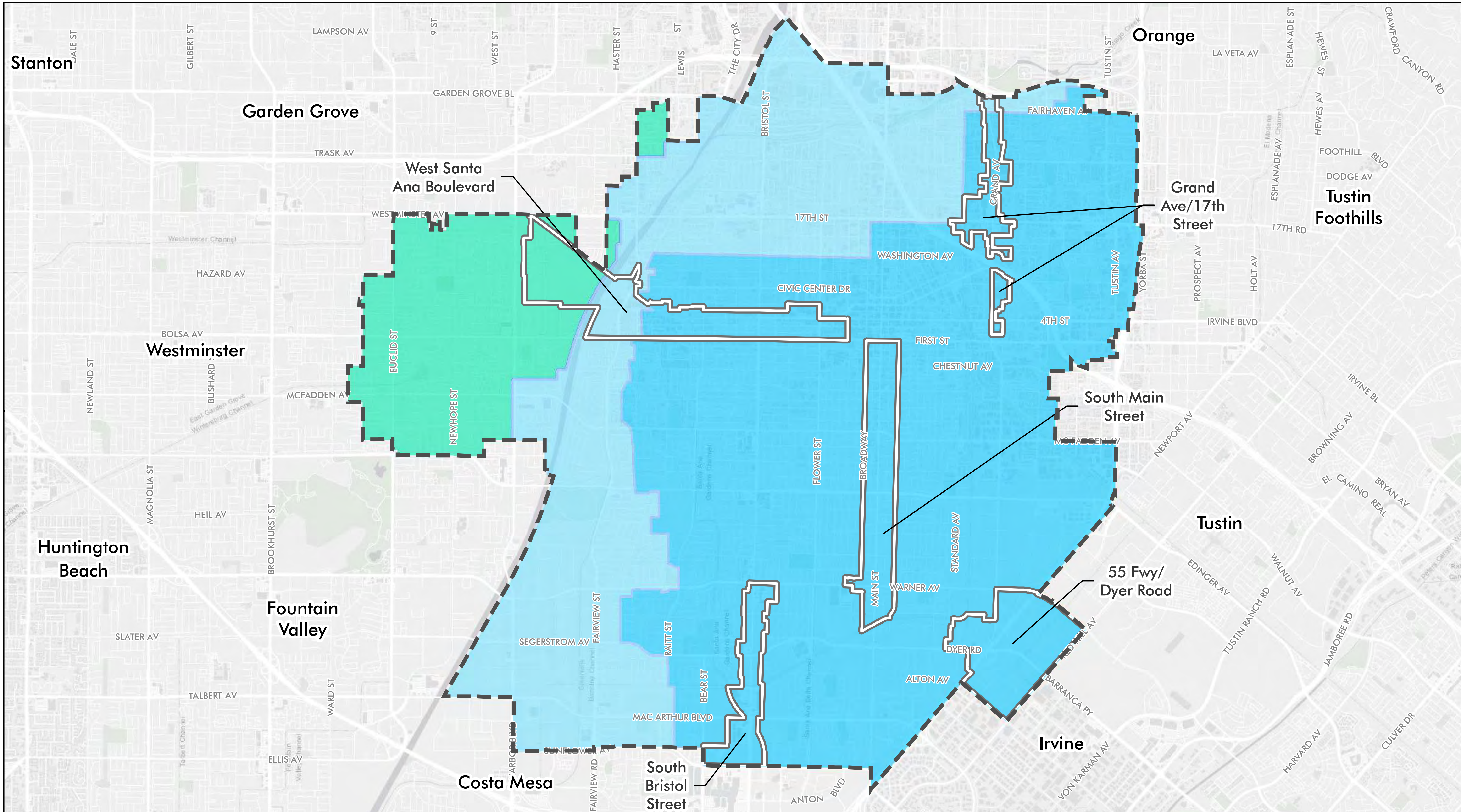
Table 2 Existing Drainage Facilities within Focus Areas

Focus Area	Acreage	Primary Drainage Facilities
West Santa Ana Boulevard	604 acres	12"-60" City Storm Drain Lines OCFCD Drainage Channels Santa Ana River (OCFCD Maintained)
South Bristol Street	236 acres	12"-72" City Storm Drain Lines OCFCD Drainage Channel (Gardens)
Grand Avenue/17th Street	202 acres	36"-81" City Storm Drain Lines
South Main Street	408 acres	12"-84" City Storm Drain Lines
55 Freeway/Dyer Road	438 acres	12"-48" City Storm Drain Lines OCFCD Drainage Channel (Lane-Barranca)

See Figure 2 below that shows the watersheds within the City and Figure 4 that shows existing storm drain system throughout the City and the Focus Areas.



City of Santa Ana Watersheds

Figure 2

City of Santa Ana

4/10/2020

FUSCOE ENGINEERING

Santa Ana Boundary

Focus Area

Watersheds

Anaheim Bay-Huntington Harbour

Newport Bay

Santa Ana River

0 4,000 8,000 Feet

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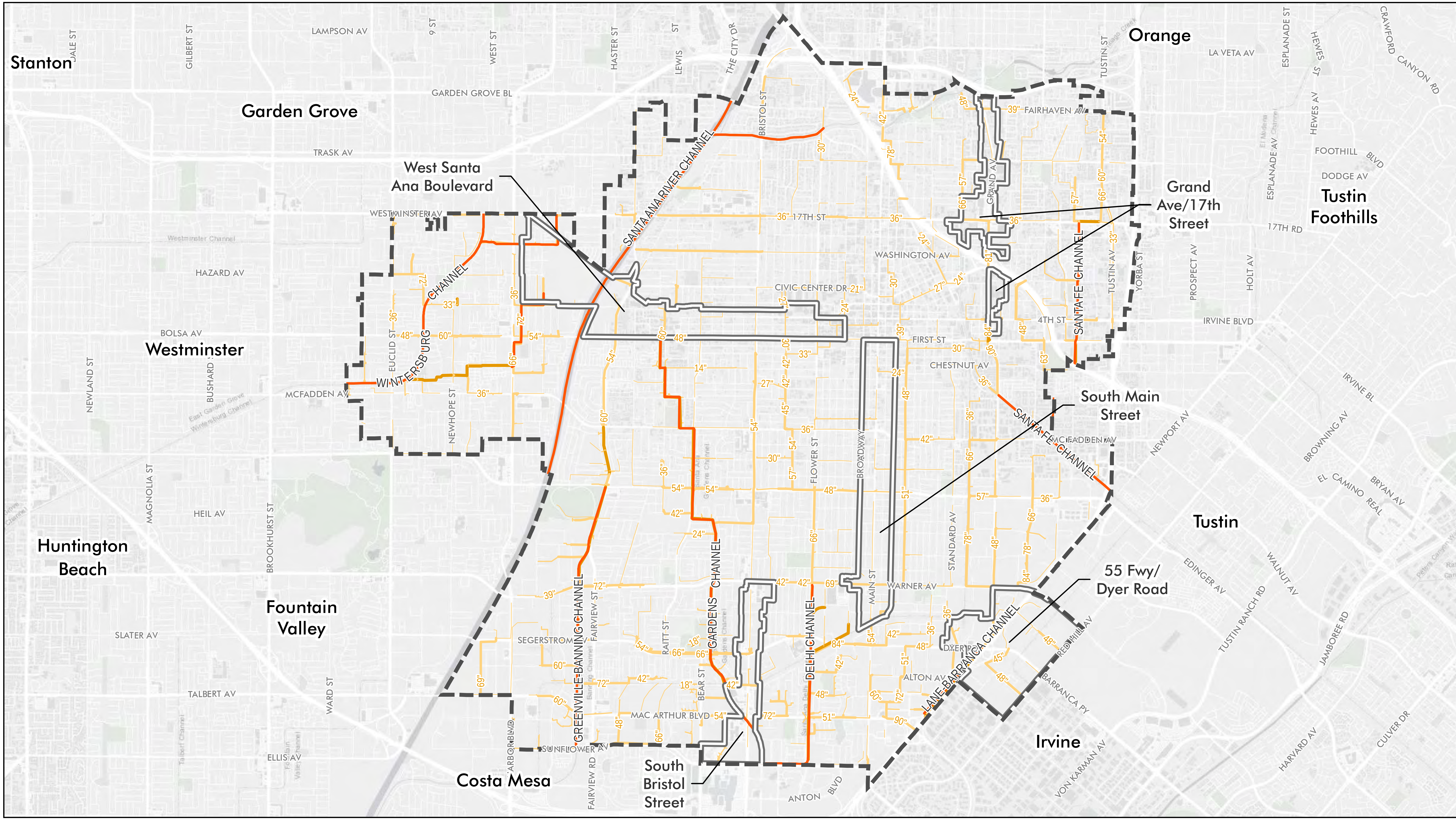

City of Santa Ana Existing Storm Drain Facilities

Figure 3

City of Santa Ana

FUSCOE ENGINEERING

4/10/2020

Santa Ana City Boundary

Focus Area

City Storm Drain Facilities

Trapezoidal Channel

12"-42" Storm Drain Pipe

42"-96" Storm Drain Pipe

Storm Drain Pipe (Diameter Undetermined)

OCFCD Facilities

Storm Drain Lines

0 4,000 8,000 Feet

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2.1.2 Storm Drain Master Plan

City of Santa Ana Master Plan of Storm Drainage

The City of Santa Ana's Master Plan of Storm Drainage (MPD) prepared in December 2015 by Michael Baker International. The purpose of the MPD is to analyze existing storm drain infrastructure capacity and provide recommendations on any flooding issues for all lines 36" or larger throughout the City. In order to perform this analysis, the Bentley CivilStorm program was used for hydrodynamic modeling of storm drain infrastructure. In addition, hydrology calculations for the entire City were conducted using GIS General Plan data. Flooding results for the 10-, 25-, and 100-year storm conditions were compared to County of Orange design protection levels for streets and properties in order to determine deficient segments and locations.

After identifying deficiencies, proposed condition (post-improvement) runs were conducted in CivilStorm in order to determine the extent of upsizing necessary for the various facilities (catch basins, conduits, pipe inverts and diameters) present in the deficient segments. Based on model results and extent of improvements necessary, recommended improvements were prioritized for each regional watershed within the City. Top recommended improvements are shown in Table 3 below.

Table 3 City of Santa Ana Recommended Storm Drain Improvements

Improvement Number	Regional Watershed	Improvement
1	Delhi	Improve County Delhi Channel between Alton and Sunflower
2	Gardens	Improve County Gardens Channel between Edinger and Sunflower
3	Santa Ana	Improve City system along 17th Street between Santa Ana River and west of Flower St
4	Santa Fe	Improve City system along Grand Avenue between Santa Clara and the Santa Fe Channel
5	Santa Fe	Improve City system along Tustin Avenue between 17th Street and the Santa Fe Channel
6	Greenville Banning	Improve City system between Macarthur and Sunflower
7	Lane Barranca	Improve the City system between Alton and Macarthur connecting to the Lane Channel
8	Santa Ana	Improve City system along Flower between Santa Clara and Santiago Creek
9	Santa Ana	Improve City system along Fairview between Trask and the Santa Ana River
10	Wintersburg	Improve City system along Rosita between Hazard Avenue and the Wintersburg Channel

Source: 2015 City of Santa Ana Master Plan of Drainage

The MPD recommends that all improvements are implemented beginning at the most downstream portion of the target area. All recommendations made in the MPD are done so at a master planning level. For individual projects, specific modeling/analysis may be necessary. Of the 10 improvement projects identified in the MPD, one project (Improvement 7) was included in the 2018/2019 City of Santa Ana Capital Improvement Plan (CIP). Figure 4 illustrates recommended storm drain improvement areas in the City and their associated improvement numbers.

The 2018/2019 CIP includes a stormwater capture project located at Mabury Park. This project includes the construction of a large bioretention basin to slow and treat flows draining the Newport Bay.

In addition, the City provides frequent updates to the status of their CIP projects for sewer, water and storm drain systems. The following projects are listed on the October – March 2020 CIP quarterly executive summary schedule:

- D-03 Channel Improvements at Alton Ave
- Civic Center Storm Drain Lift Station
- C-5-F channel Repair between Newhope and Harbor
- First Street Undercrossing Stormwater Lift Station
- Warner Avenue Storm Drain Improvements (Ph 1) (Main St to Oak St)

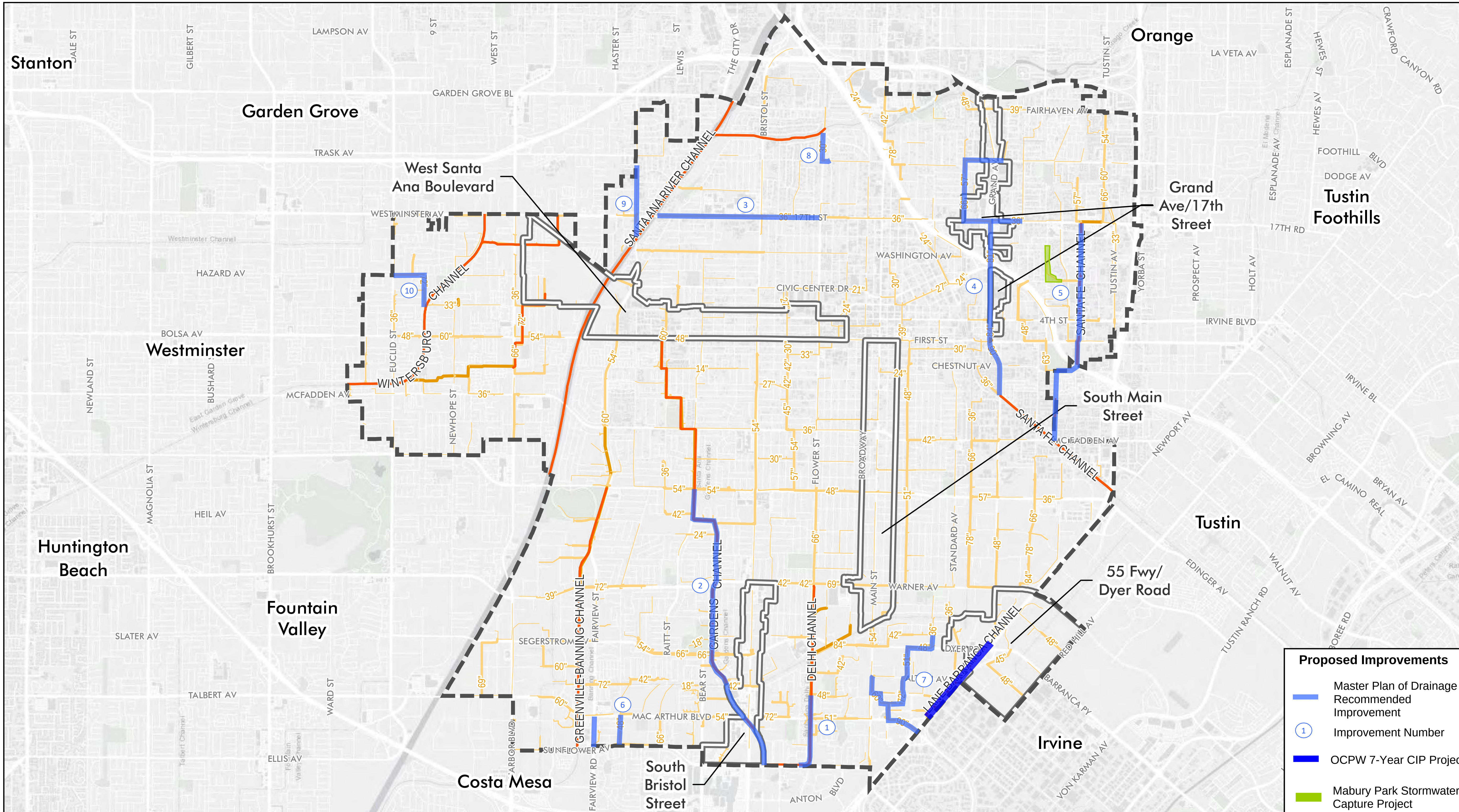
The majority of the projects listed above are either going through the design phase or construction phase as of March 2020.[2]

2.1.3 Orange County Public Works 7-Year CIP

Orange County Public Works' (OCPW) 7-Year Capital Improvement Plan covers OCFCD drainage facilities, Road, Bridge, Flood, and Bikeway Projects for Fiscal Years 2019/20 – 2025/26. There was one project within the GPU area downstream of the 55 Freeway/Dyer Road Focus Area included in the 2018/19 CIP that is estimated to be concluded in June 2020[3]:

Lane Channel (FY 18/19) – Demolish existing damaged concrete-lined channel and replace with channel lining constructed with current design standard criteria.

[2] City of Santa Ana – Public Works Agency. Capital Improvement Program – Quarterly Executive Summary Schedule (October – March 2020). Found here: https://www.santa-ana.org/sites/default/files/pw/documents/Executive-Monthly-CIP-Update-Oct-to-March-2020.pdf
[3] Personal communication with OCFCD Staff, April 8, 2020.



City of Santa Ana Existing Storm Drain Recommended Improvements

Figure 4

4/10/2020

City of Santa Ana

FUSCOE ENGINEERING

Santa Ana City Boundary

Focus Area

City Storm Drain Facilities

Trapezoidal Channel

12"-42" Storm Drain Pipe

42"-96" Storm Drain Pipe

Storm Drain Pipe (Diameter Undetermined)

OCFCD Facilities

Storm Drain Lines

0 4,000 8,000 Feet

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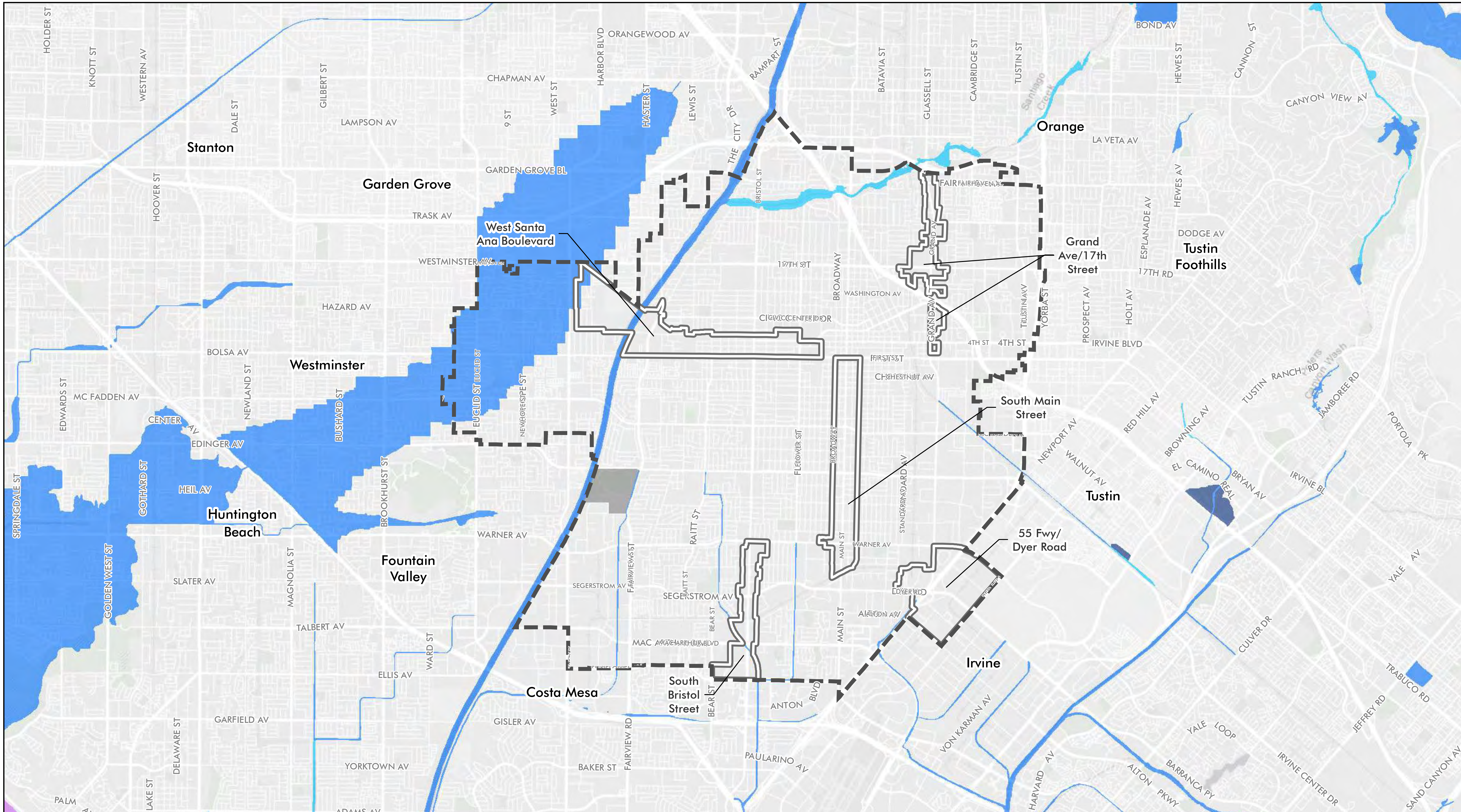
2.1.4 Existing Floodplain Mapping

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for flood plain management and is designed to minimize flood damage within Special Flood Hazard Areas. The Federal Emergency Management Agency (FEMA) is the agency that administrates the National Flood Insurance Program. Special Flood Hazard Areas (SFHA) are defined as areas that have a 1 percent chance of flooding within a given year, also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

According to the Flood Zone determination covering the Santa Ana GPU Area, the majority of the City lies within Zone X. Zone X is designated as the area determined to be outside the 500-year flood, protected by levee from 100-year flood, and with a minimal or 0.2% chance of flooding. The western portion of the City is protected by levee from flood events or features a 0.2% chance of flooding, while the eastern portion features a minimal risk of flooding. There are small areas surrounding the various drainage channels throughout the City including the Delhi Channel that are listed as Zone A, which represents areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. These areas are immediately adjacent to the drainage channels in question, with surrounding developments and neighborhoods protected by levee. The drainage area within and surrounding Santiago Creek, located in the northern portion of the City, is listed as both Zone AE and as a Regulatory Floodway. Zone AE represents a 1% annual chance of flooding with a base flood elevation. In addition, a small segment of the City located between the Santa Ana River and the Greenville-Banning Channel is designated as Flood Zone D, representing areas where no flood analysis has been conducted, or where recent incorporation into a larger community has resulted in no map being prepared.

See Figure 5 below for a map of the FEMA flood zones within the Santa Ana GPU.



Aerial Date: 09/26/2018

City of Santa Ana Flood Zones

City of Santa Ana General Plan Update

FUSCOE ENGINEERING

Figure 5

4/10/2020

Santa Ana City Boundary

Focus Area

FEMA Flood Zones

Zones A

Zones AE

Zones AH

Zones D

Zones VE

Zones X

0 0.5 1 2 Miles

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2.2 SEWER & WASTEWATER INFRASTRUCTURE

2.2.1 Existing Sewer System and Facilities

The City operates and maintains the City's sewer system which serves the entire City as well as portions of Garden Grove and Orange. The City's sewer collection system consists of approximately 390/450 miles of sewer mains, including approximately 60 miles of Orange County Sanitation District (OCSD) regional trunk facilities within the City. The system operates largely by gravity and discharges at several locations into OCSD gravity trunk sewers for conveyance to OCSD Treatment Plant #1.

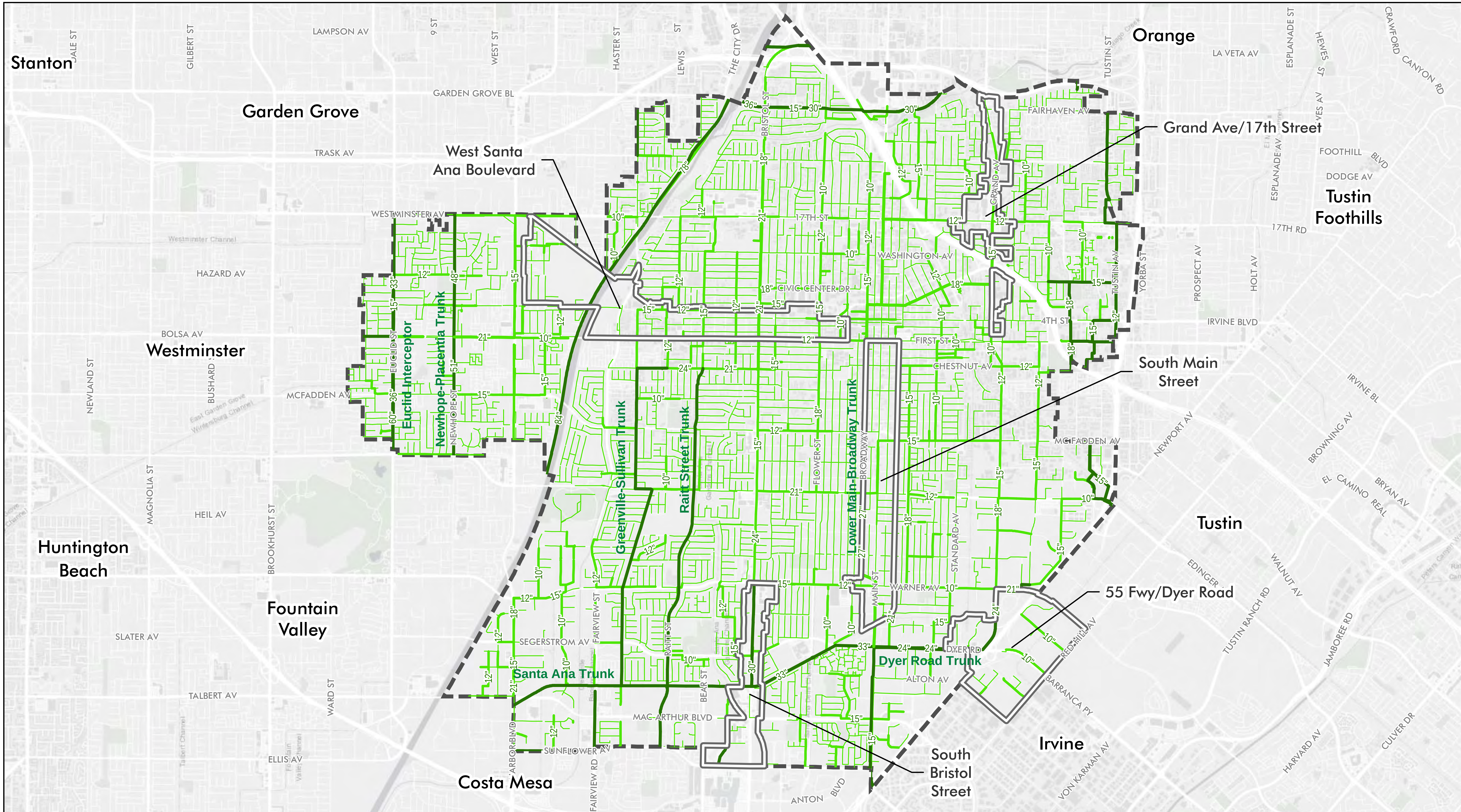
The sewer system is divided into minor sewers (6"-8" in diameter) serving an area no greater than 25 miles and major sewers that are larger sewer systems that convey greater than 25 miles of sewer discharges.[4] See below for summary of sewer facilities within the Focus Areas.

Table 4 Existing Sewer Facilities within the Focus Areas

Focus Area	Acreage	Primary Sewer System Facilities
West Santa Ana Boulevard	604 acres	10"-15" City Lines 21" City Trunk Line
South Bristol Street	236 acres	8"-15" City Lines 30"-33" OCSD Trunk Line
Grand Avenue/17th Street	202 acres	8"-12" City Lines 15" City Trunk Line
South Main Street	408 acres	8"-15" City Lines 21"-27" City Trunk Line
55 Freeway/Dyer Road	438 acres	8"-10" City Lines 21"-24" OCSD Trunk Line

Figure 6 illustrates existing City and OCSD sewer infrastructure in the City.

[4] City of Santa Ana 2016 Sewer Master Plan Update Final Report. December 2016.



City of Santa Ana Existing Sewer Facilities

Figure 6

City of Santa Ana

5/5/2020

FUSCOE ENGINEERING

full circle thinking

Santa Ana Boundary

City Sewer Pipelines

8" and Below in Diameter

9" - 84" in Diameter

OCSD Sewer Pipelines

OCSD Sewer Lines

0 4,000 8,000 Feet

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2.2.2 Existing Sewer Flows

For each land use in the City of Santa Ana and the five Focus Areas, a total sewer generation was estimated to provide a baseline condition and to allow for comparison against proposed land use changes. Acreages of the existing development (i.e. residential & non-residential) were utilized along with their corresponding flow/generation factors to develop existing condition flow rates. Commercial sewer generation factors were provided from the Orange County Sanitation District Design and Construction Standards for Sanitary Sewers (2016). Residential sewer generation factors were derived from the Municipal Water District of Orange County (MWDOC) Orange County Water Reliability Study (2016) water flow factors for single and multi-family residences for 2015 multiplied by a 0.95 sewer factor as indoor water flows and sewer flows are similar. This sewer factor per land use is the recommended approach by sewer agencies to determine any impacts to sewer infrastructure at a level consistent with a general plan update. This method allows for a conservative understanding of sewer flow depths, velocities, diurnal patterns, surcharges and peak capacities which are ultimately used to evaluate capacity issues under existing conditions and in the future. The generation factors are typically conservative in nature and tend to over-represent sewer flows as a means to incorporate a safety factor into pipe network design and hydraulic capacity assessments.

Table 5 provides a summary of the existing wastewater flows for the City and Focus Areas. See Appendix A for detailed sewer flow calculations.

Table 5 Existing Condition Average Daily Sewer Flows

Area	Number of Dwelling Units	Commercial Square Footage	Average Sewer Flows (GPD)
Focus Areas			
West Santa Ana Boulevard	2,658	3,090,472	827,553
South Bristol Street	220	1,577,511	125,918
Grand Avenue/17th Street	561	1,400,741	188,358
South Main Street	1,720	1,685,978	565,500
55 Freeway/Dyer Road	1,221	5,666,453	538,450
Focus Area Total	**6,380**	**13,421,155**	**2,245,779**
Remainder of City			
All Other Areas of City	72,412	53,697,441	27,786,561
Citywide Total	**78,792**	**67,118,596**	**30,032,340**
Notes: *GPD – Gallons per day SF – Square Feet* *Land use data supplied by Placeworks, 2020*			

Under the existing conditions, average daily sewer flows are estimated at 30 million gallons per day (MGD) throughout the City of Santa Ana. Under existing conditions, the Focus Areas represent approximately 7.5% of the City's sewer flows. These conservative flow estimates are for land planning purposes only.

2.2.3 Existing Sewer Capacity Assessment

City of Santa Ana 2016 Sewer Master Plan

The City's most recent Sewer Master Plan update was performed in December 2016 by RMC consultants. The 2016 Sewer Master Plan Update Final Report ("2016 SMP") was an update to a sewer capacity analysis performed in 2003. The 2016 SMP analyzed the age of the sewer infrastructure, and the capacity of the City's sewer collection system for existing and future peak flow conditions under both dry and wet weather conditions. In addition, the 2016 summarized the rankings of the condition of the sewer pipes/manholes and the recommended rehabilitation and replacement of these sewers based on the most recent CCTV inspection reports. The results of the capacity analysis and condition assessment are summarized below.

City Sewer Capacity Assessment

The capacity of the City's sewer system was assessed through use of an InfoWorks™ ICM hydraulic model. The model includes all major trunk lines with diameters ranging from 10"-39" in size. In total, the model network includes approximately 97 miles of City pipelines, 20 miles of OCSD trunk lines and a total of 1,799 manholes. The capacity of the system was assessed for existing and future (2040) base flow scenarios in addition to peak wet-weather flows (PWWF) derived for a 10-year storm event.

For Santa Ana, since the design storm PWWF represents a relatively infrequent return period event, the City considers it acceptable to allow surcharging over the pipe crown, provided the hydraulic grade line (water level) remains at least five feet below the ground surface. During peak dry weather conditions, however, sewers should be able to convey the peak flow without surcharge. The following summarizes the trigger and design criteria:

- Manning's n friction factor of 0.013 for all pipes
- Allowable depth of flow (PDWF) before triggering an improvement project
  - $d/D<0.5$ for less than 12"
  - $d/D<0.75$ for 12" and greater
- Allowable depth of flow before triggering an improvement project
  - 2-feet of surcharge for sewers over 12" in diameter
  - Full pipe for sewers smaller than 12"
- Freeboard depth >5-feet (depth from rim elevation to maximum water level)
- Design depth of flow for sizing improvements
  - 75% of full pipe for all sewers

The results were based on the following Likelihood to Failure (LOF) scores below:

- Score 1 (Low): No surcharge or not in model
- Score 3: Model predicts surcharge resulting from backwater conditions
- Score 5: Model shows surcharging due to throttle pipe
- Score 8: Model shows surcharging due to throttle pipe resulting in spills or less than 5-feet freeboard
- Score 10 (High): Model shows surcharging due to throttle pipe resulting in spills or less than 5-feet freeboard for current (2015) flows

The hydraulic model was used to simulate flows for the design storm event and identify areas of the Santa Ana trunk sewer system that fail to meet specified performance criteria during existing and future PWWF. The model identified four areas of the City where "surcharged" sewers were identified. A surcharge condition occurs when the full pipe capacity is less than the predicted peak flow. In these conditions, the hydraulic grade line exceeds the pipe slope indicating the pipe has insufficient capacity to convey peak flows. These surcharged pipes can increase the risk of sewer overflows occurring during significant rainfall events.

The most significant areas of potential wet weather capacity deficiencies are between Fairhaven Avenue and 17th Street running through Old Grand Street, to Santa Clara Avenue, and then onto Wright Street in the northeastern area of the City. Predicted peak flows result in surcharging with depths ranging from 2 to 5-feet above pipe crown, with some manholes less than desired 5-feet of freeboard.

City Sewer Condition Assessment

In addition to the sewer capacity assessment, the City uses a specialist CCTV contractor to inspect the condition of the City's sewer system. The 2016 SMP included a review of the CCTV inspection data to provide an independent assessment of the accuracy and consistency of the condition scores provided by the CCTV contractor. Similar to the capacity assessment, the LOF matrix was used to score the condition of the sewer system as shown below.

Table 6 Sewer System Condition Assessment Rating Score

Likelihood Category	Indicator	Likelihood Score				
		1 (Low)	3	5	8	10 (High)
Condition	Pipe Age	<20 years	20 to <40 years	40 to <60 years	60 to <80 years	>=80 years
Notes Source: 2016 Sewer Master Plan Update, RMC						

The review identified several defects in the condition in the sewer system primarily in the central part of the City including the downtown area. This area is known to have older pipes compared to the outer neighborhoods and consequently has more defect issues.

For purposes of grouping pipes into sewer rehabilitation projects, the improvement projects identified through the decision process were assigned to "mini-basins" delineated by Traffic Area Zone (TAZ) areas. The TAZ areas provide a mechanism for bundling pipe improvements into manageable projects which benefit from efficient cost savings through combined construction mobilization, collective and organized street closures, bulk cost savings for materials and equipment rentals and overall design and construction cost savings. The combined deficiencies and recommended improvement areas found by the capacity assessment and the condition assessment are portrayed below in Figure 7. Individual sewer capacity and sewer condition deficiency maps from the 2016 SMP are included in Appendix B.

Capital improvement projects are prioritized to allocate available funds to critical projects based on risk of failure and level of impact to economic, social and environment issues. Similar to many public agencies, the City has an annual budget for replacing or rehabilitating aging infrastructure and therefore requires a systematic and defensible method for prioritizing both capacity and condition-based improvement projects. The SMP has aided in prioritizing projects on each years CIP. The SMP references 20 projects for FY2016/17 – FY2020/21. The current 2018/19 CIP sewer projects are listed below[5]:

- #43 Bristol Street Sewer Main Improvements
- #44 Santa Ana Memorial Neighborhoods Sewer Main Improvements
- #45 Warner Garnsey Sewer Main Diversion Improvements (Project listed in SMP as CIP-CAP-006A)
- #46 Willard Neighborhood Sewer Main Improvements

In addition, the current CIP projects currently under design or construction are listed below:

- Citywide Sewer Main Improvements Phase II
- Columbine Sewer Main Improvements
- Washington Square Neighborhood Sewer Main Improvements
- Flower St Sewer Main Improvements (Washington St – 17th)
- Segerstrom/San Lorenzo Sewer List Station

In addition to the SMP and CIP sewer system management procedures, the City currently requires sewer monitoring studies for all projects that go through the entitlement process. After submittal and review of these studies by City staff, if the sewer system is found to be deficient, the developer will be required to upsize the portion of the sewer pipe within the frontage of their property. There may be options depending on the condition of the sewer infrastructure for the developers to enter into a Joint Cost Sharing Agreement with the City to cover a portion of the cost for required upsizing that may be done by the City at a later date. If improvements are needed to infrastructure downstream of the project site, the developer may be required to participate and pay into the Fair Share Agreement currently employed by the City. The Fair Share Agreement will allow the developer to fund a percentage of the downstream improvement that will be carried out by the City in the future. Therefore, the City has a robust process in place on a project-by-project basis to ensure the sewer system is functioning efficiently.

<u>Orange County Sanitation District Master Plan Update Report No. 3</u>

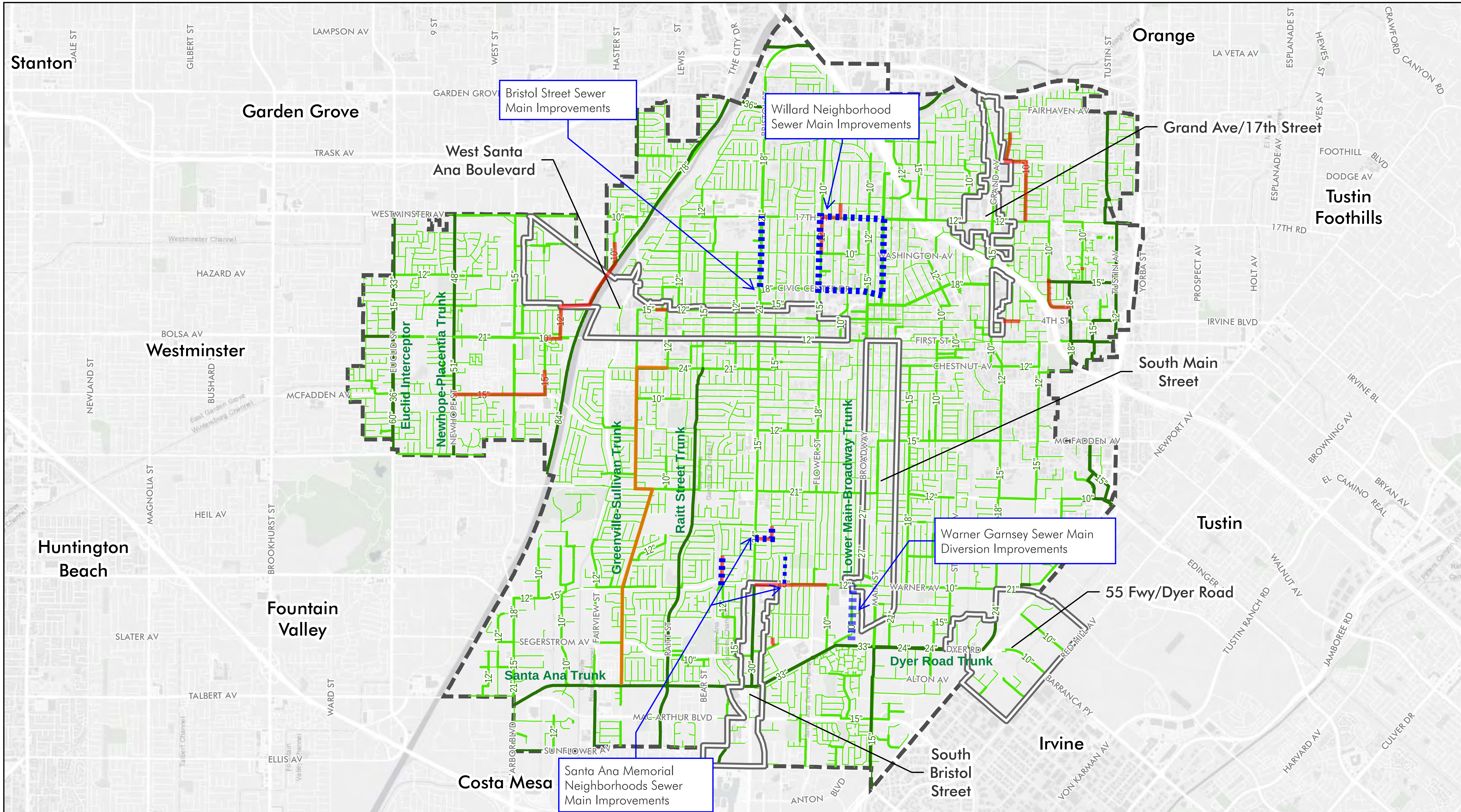
OCSD, in coordination with Woodard & Curran, prepared an update to its Master Plan in December 2019. The purpose of this Update Report was to evaluate collections system capacity throughout the OCSD service area. A new model was developed to replace the previous 2006 model, based on Center for Demographic Research (CDR) population and employment data and growth estimates. The updated capacity assessment was conducted between 2016 and 2017.

The 2019 Update Report determined a series of trunk line segments that exhibited hydraulic deficiencies or potential hydraulic deficiencies under existing (2017) and buildout (2040)

[5] City of Santa Ana Capital Improvement Program 2018/2019. Found here: https://www.santa-ana.org/sites/default/files/FY18-19-CIP.pdf

conditions. Hydraulic deficiencies were assessed for both peak dry weather flow and peak wet weather flow scenarios. Of the assessed segments, the Greenville-Sullivan Trunk Line within the GPU boundary was shown to exhibit surcharge conditions for peak wet weather flows. The Greenville-Sullivan Trunk line was shown to have potential surcharge above the crown from 2' to over 5' for both existing and proposed buildout conditions.

A capacity improvement project for the Greenville-Sullivan Trunk line has been included in OCSD's proposed projects and is currently under review. The project will upsize all 33" segments within the trunk line to a 39" diameter, addressing all surcharge concerns.



City of Santa Ana Existing Sewer System Improvement Projects

Figure 7

City of Santa Ana

5/5/2020

Santa Ana Boundary

City Sewer Pipelines
- 8" and Below in Diameter
- 9" - 84" in Diameter

OCSD Sewer Pipelines
- OCSD Sewer Lines

Proposed Improvements
- Sewer Master Plan Recommended 5-Year CIP Improvements for City Sewer Facilities
- Proposed OCSD Trunk Line Capacity Improvement Project
- 2018/19 City Capital Improvement Plan Project

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2.3 WATER DISTRIBUTION SYSTEM

2.3.1 Existing Water System

The City's Water Utility provides water service within a 27-square mile service area. The service area includes the City of Santa Ana and a small neighborhood in the City of Orange, near Tustin Avenue and Fairhaven by the northeast corner of Santa Ana.[6] There are also Irvine Ranch Water District (IRWD) water lines that serve portions of the City. In addition, Orange County Water District (OCWD) provides recycled water service to portions of the City. Metropolitan Water District of Southern California (Metropolitan) also has delivery/conveyance lines that run through the City.

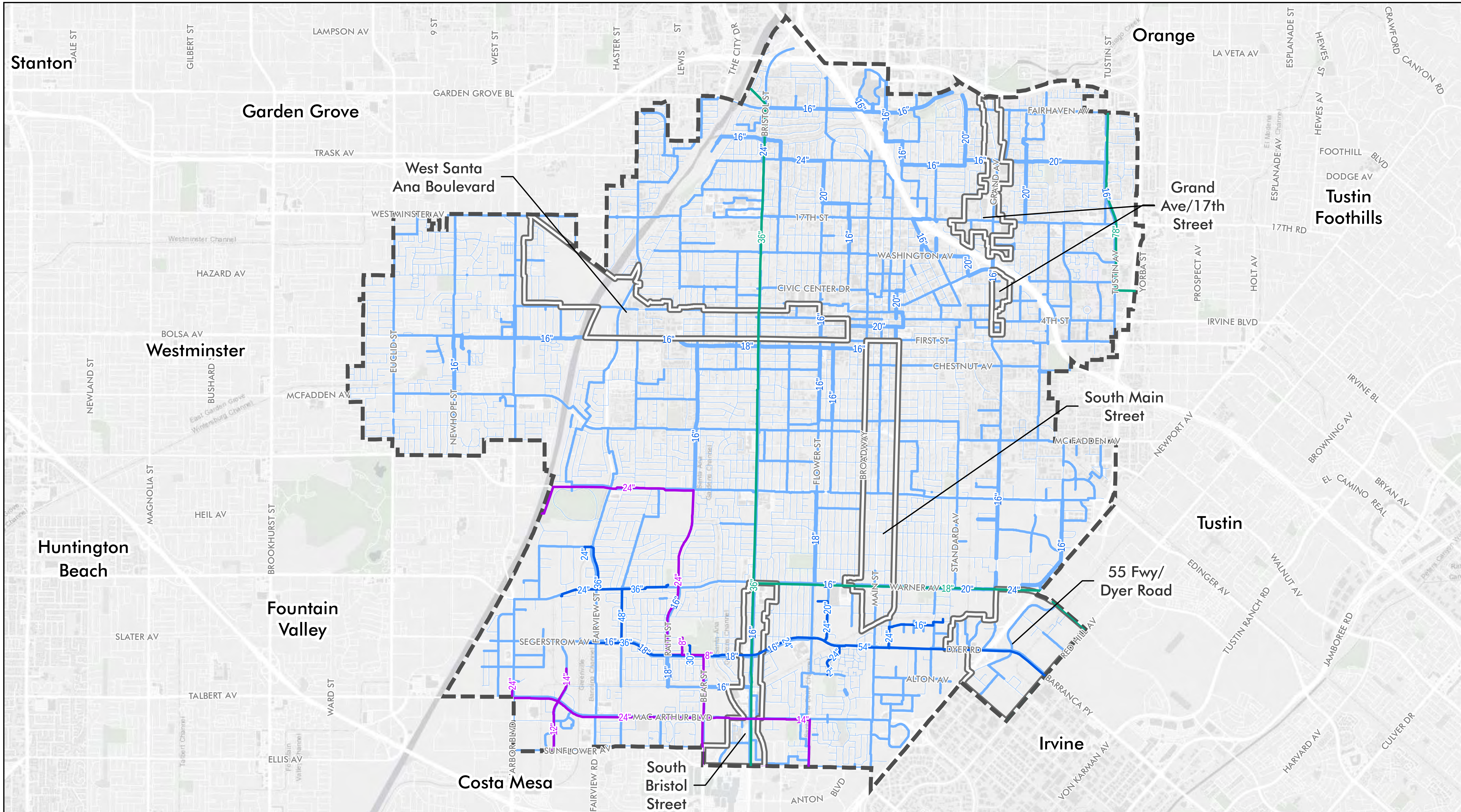
The City obtains water from two primary sources: local groundwater from the Orange County Groundwater Basin (OC Basin), which is managed by OCWD and imported water from Metropolitan. The City is a member agency of Metropolitan. Groundwater production accounts for roughly 70-75% of the water supply and Metropolitan imported water supplies provide the remaining 25-30%. The City's water system has a total of nine reservoirs with a storage capacity of 49.3 million gallons, 21 groundwater wells, and seven imported water connections.[7] The seven imported water connections that receive water through Metropolitan's Orange County and East Orange County Feeder pipelines have a total capacity of 60,580 gallons per minute (gpm) to transfer water into the City's distribution system.

The City's water system consists of two pressure zones (High Zone and Low Zone). Each of these pressure zones have groundwater wells, reservoirs and booster pump stations which supplies potable water to the City's customers. In general, the facilities are consolidated into several stations consisting of multiple groundwater wells, a storage reservoir, and a booster pump station. At each station, the wells pump groundwater into the storage reservoir and the booster pump station pumps water from the storage reservoir to the distribution system. The City's water distribution system is comprised of approximately 480 miles of transmission/distribution mains ranging from 4"-30" in diameter. The majority of the City's water lines were constructed in the 1960s. The primary water facilities within the Focus Areas are summarized below in Table 7 and shown in Figure 8.

[6] 2015 City of Santa Ana Urban Water Management Plan, June 2016. City of Santa Ana.
[7] 2017 Water Master Plan, January 2018. City of Santa Ana.

Table 7 Existing Water System within Focus Areas

Focus Area	Acreage	Primary Water Facilities
West Santa Ana Boulevard	604 acres	6"-12" City water lines 36" MWD conveyance water line
South Bristol Street	236 acres	8" – 36" City water lines 36" MWD conveyance line 16"-18" IRWD water lines 14" OCWD reclaimed water lines
Grand Avenue/17th Street	202 acres	6"-12" City water lines
South Main Street	408 acres	4"-24" City water lines 16"-18" MWD conveyance line 24"-54" IRWD water lines
55 Freeway/Dyer Road	438 acres	8"-12" City water lines 24" MWD conveyance line 54" IRWD water line



City of Santa Ana Existing Water System Facilities

Figure 8

City of Santa Ana

4/10/2020

Santa Ana City Boundary	
Focus Area	
Santa Ana Municipal Utilities Water Lines	
8" and Below in Diameter	
9" - 14" in Diameter	
15" - 30" in Diameter	
Other Water Lines	
IRWD Water Lines	
MWD Water Lines	
OCWD Reclaimed Water Lines	

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2.3.2 Existing Water Flow

For each land use in the City of Santa Ana and its Focus Areas, water flow estimates were developed to provide a baseline condition and to allow for comparisons against any proposed land use changes. Acreages and units of development (i.e. residential & non-residential) were utilized along with their corresponding flow factors to identify changes in water flow. Commercial water flow factors were provided from the City of Santa Ana Guidelines for Water and Sewer Facilities (2017). Residential water flow factors were provided from the MWDOC Orange County Water Reliability Study (2016), and utilized Water Use Factors from Survey of Water Agencies in Orange County (FY 2013-14) for single family and multifamily water flow estimates. Similar to the methodology employed to estimate sewer flows as described in Section 2.2.2, the generation factors for estimating water flows are typically conservative in nature and tend to over-represent water flows as a means to incorporate a safety factor into pipe network design and hydraulic capacity assessments specifically for infrastructure.

Table 8 provides a summary of the existing condition water flow for the City and Focus Areas. Detailed calculations are provided in Appendix C.

Table 8 Existing Condition Average Daily Water Flow

Area	Number of Dwelling Units	Commercial Square Footage	Average Water Flows (GPD)
Focus Areas			
West Santa Ana Boulevard	2,658	3,090,472	880,807
South Bristol Street	220	1,577,511	136,957
Grand Avenue/17th Street	561	1,400,741	202,362
South Main Street	1,720	1,685,978	600,682
55 Freeway/Dyer Road	1,221	5,666,453	582,841
Focus Area Total	**6,380**	**13,421,155**	**2,403,648**
Remainder of City			
All Other Areas of City	72,412	53,697,441	29,403,648
Citywide Total	**78,792**	**67,118,596**	**31,833,589**
Notes: GPD – Gallons per day SF – Square Feet Land use data supplied by Placeworks, 2020			

Under the existing conditions, average daily water flows are estimated at 31.83 MGD through the City of Santa Ana. Focus Area water flows represent approximately 7.5% of existing Citywide water flows. These conservative flow estimates are for infrastructure capacity planning purposes only.

2.3.3 Existing Water Capacity Assessment

City of Santa Ana Water Master Plan

The 2017 Santa Ana Water Master Plan (WMP) was prepared by Tetra Tech to document a multi-year capital improvement program to maintain the City's water utility infrastructure systems in sound operable condition and to meet the level of service expectations of the City over the proposed planning period from 2017/18 to 2039/40. The goal of the 2017 WMP was to identify needed system improvements, define typical refurbishment and replacement requirements, recommend the prioritization of these improvements/replacements, and establish an overall general implementation schedule and budget for these future capital improvement projects.

The WMP analyzed several components of the City's water system including groundwater well rehabilitation needs, reservoir and pump station status, distribution system upgrade needs and other miscellaneous improvements. Maintaining groundwater wells has been given the highest priority as groundwater supply is more affordable as compared the water supplies purchased from Metropolitan. The WMP referenced a study by IDModeling, Inc. that developed and calibrated a computerized water system model of the City's existing water system for the evaluation and analysis of the City's water system for reliability and system hydraulic operations/capacity.

The results of the water supply analysis indicated that the City's water system has adequate capacity and distribution capabilities to supply the entire water system demands using only groundwater wells. However, as discussed in the WMP, as of 2017, based on age of the existing pipe, 20% (about 560,000 feet of pipe) of the City's distribution system has already past the pipe materials typical useful life. By the end of the proposed planning period (fiscal year 2039/40), 70% (about 1,870,000 feet of pipe) of the City's distribution system will be past the materials lifetime. In summary, while the City's distribution system is robust and hydraulically sound, the system is old and needs to be systematically replaced. The recommended proposed pipeline replacement program from the WMP is summarized below in addition to updates from the City's most recent CIP Update list referenced above and discussions with the City on the status of improvement projects.

Table 9 Water System Projects

Project Type	Project Description	March 2020 CIP Updates
Groundwater	Replace Groundwater Well 22 in High Zone	N/A
	Construct 1-2 new wells near elevated tank to resolve low pressures	N/A
	Replace Groundwater Wells W16, W18, W24 due to age	N/A
	Rehabilitation of W32 due to elevated nitrate levels at W29	Well #29 rehab is 79% through the design phase of the project.
	Install emergency generators for groundwater wells W31, W35, W37, W40, W41 in short term and W28, W32, W36 and W38 in long term	Well #32 rehab is 41% through the design phases of the project.
Pump Station	Walnut Pump Station Rehabilitation	The Walnut Pump Station rehab has been completed.
	Cambridge Pump Station[1] and East Pump Station Facilities	N/A
	Emergency generator at Crooke and Cambridge Pump Station facilities due to criticalness of these facilities in the High Zone	N/A
Distribution Systems / Water Main Improvements	(1) 17th Street	Improvement project completed
	(2) Riverview Phase 2	Riverview Neighborhood improvements are 86% through the design phase of the project. Southern portion of the project is under construction.
	(3) Bristol Phase 3	Bristol Street Phase 3A is 75% through the design phase; Bristol Street Phase 3B is 42% through the warranty phase.
	(4) West Grove Valley	Improvement project completed
	(5) Grand Avenue	Grand Avenue (fourth St to 17th St) is pending.
	(6) St Gertrude and Grand	St Gertrude and Grand Ave Improvements are 85% through the design phase of the project. Construction estimated to begin late Spring 2020.
	(7) Thornton Park	Improvement project completed
	(8) **Bristol Phase 4**	N/A
	(9) Warner Widening	Warner Avenue (Bristol St – Main St) Improvement planning is anticipated to start in early 2020.

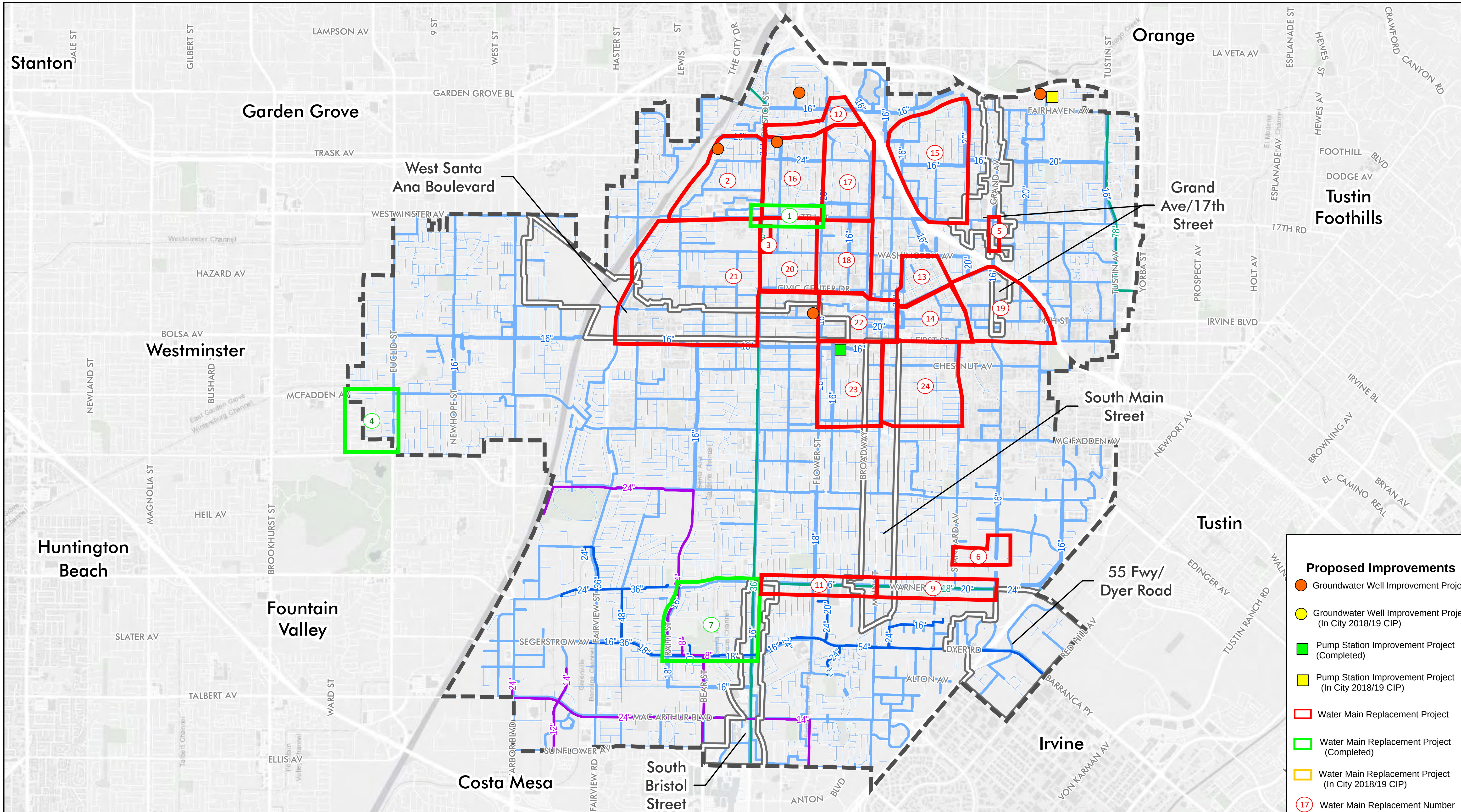
		Warner Avenue (Main St – Oak St) Improvements is 100% through design as of July 2019.
	(10) Walnut Discharge Main Lining	N/A
	(11) Warner Avenue	N/A
	(12) Fisher Park	Fisher Park NH Improvements are 16% through the design phase of the project.
	(13) French Court	
	(14) French Park	French Park NH Improvements are 18% through the design phase of the project.
	(15) Park Santiago	N/A
	(16/17) West Floral	N/A
	(18) Willard Neighborhood	N/A
	(19) Saddleback View	N/A
	(20) Washington Square	N/A
	(21) Artesia Pilar	N/A
	(22) Downtown;	N/A
	(23) Heninger Park;	N/A
	(24) Eastside Neighborhood.	N/A
Miscellaneous Improvements	Various new wellhead treatment facilities	N/A
	Remote control to four pressure reducing/sustaining facilities	N/A
	Automated meter infrastructure to access real-time water consumption data	N/A
	Upgrade SCADA and install fiber-optic backbone facility from each key facility to the City Yard	N/A
	Consideration of solar panels at Jon Garthe and West Reservoir facilities	N/A
	Intrusion alarms at reservoir sites	N/A

Notes
[1] Bolded text highlights WMP projects currently listed in the 2018/19 CIP.
[2] See Figure 8 for locations of Groundwater, Pump Station and Distribution System Projects.

As shown above, due to the importance and lower cost of groundwater resources for water supply as compared to imported water purchased from Metropolitan, groundwater projects have been allocated the largest CIP budget through 2040. Ensuring water distribution lines are functioning effectively is the second largest CIP budget allocation. The remaining budget is for pump station and reservoir projects and other miscellaneous water system needs. The projects below have been prioritized within the City's current 2018/19 CIP.

- #51 Bristol Street Water Main Improvements Phase 4
- #52 Cambridge Pump Station Entry Improvements
- #53 Washington Well Site Improvements

The 2018/19 CIP projects and the projects summarized above in Table 9 are shown below in Figure 9.



City of Santa Ana Water System Improvement Projects

Figure 9

City of Santa Ana

4/10/2020

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Santa Ana City Boundary
Focus Area

Santa Ana Municipal Utilities Water Lines
8" and Below in Diameter
9" - 14" in Diameter
15" - 30" in Diameter

Other Water Lines
IRWD Water Lines
MWD Water Lines
OCWD Reclaimed Water Lines

0 4,000 8,000 Feet

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2.4 WATER QUALITY

2.4.1 Existing Regulations

Basin Plan for the Santa Ana Region

In addition to its permitting programs, the State Water Resources Control Board (SWRCB), through its nine Regional Water Quality Control Boards (RWQCBs), developed Regional Water Quality Control Plans (or Basin Plans) that designate beneficial uses and water quality objectives for California's surface waters and groundwater basins, as mandated by both the CWA and the state's Porter-Cologne Water Quality Control Act. Water quality standards are thus established in these Basin Plans and provide the foundation for the regulatory programs implemented by the state. The Santa Ana RWQCB's Basin Plan, which covers the GPU area, specifically (i) designates beneficial uses for surface waters and ground waters, (ii) sets narrative and numerical objectives that must be met in order to protect the beneficial uses and conform to the state's antidegradation policy, and (iii) describes implementation programs to protect all waters in the Region. In other words, the Santa Ana RWQCB Basin Plan provides all relevant information necessary to carry out federal mandates for the antidegradation policy, 303(d) listing of impaired waters, and related Total Maximum Daily Loads (TMDLs), and provides information relative to National Pollutant Discharge Elimination System (NPDES) and Waste Discharge Requirement (WDR) permit limits.

Total Maximum Daily Loads (TMDLs)

Under Section 303(d) of the Clean Water Act (CWA), states are required to identify water bodies that do not meet their water quality standards. Once a water body has been listed as impaired on the 303(d) list, a TMDL for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL. In general terms, Municipal Separate Storm Sewer System (MS4) and other dischargers within each watershed are collectively responsible for meeting the required reductions and other TMDL requirements by the assigned deadline.

TMDLs have been established for pesticides, pathogens, sediment, and nutrients for the Upper and Lower Newport Bay. The remaining 303(d) listed impairments shown in Table 10 have not yet been established and are pending approval for TMDL establishments for 2019 to 2029.

Table 10 List of 303(d) Impairments and TMDLs

Water Body/Channel	List of 303(d) Impairments[1]	TMDL
East Garden Grove Wintersburg Channel	Ammonia (Unionized),	Pending 2021 TMDL Establishment for Ammonia
Bolsa Chica Ecological Reserve	Toxicity	Pending 2027 TMDL Establishment for Toxicity
Bolsa Chica State Beach	Copper, Nickel	Pending 2019 TMDL Establishment for Copper and Nickel
Huntington City Beach	No Impairments	N/A
Huntington Beach State Park	Polychlorinated Biphenyls (PCBs)	Pending 2019 TMDL Establishment for PCBs
Talbert Channel	Toxicity	Pending 2029 TMDL Establishment for Toxicity
Santa Ana River, Reach 1	No Impairments	N/A
Newport Slough	Indicator Bacteria	Pending 2021 TMDL Establishment for Indicator Bacteria
Newport Beach	No Impairments	N/A
Balboa Beach	DDT, Dieldrin, PCBs	Pending 2019 TMDL Establishment for DDT, Dieldrin, and PCBs
Santa Ana River Delhi Channel	No Impairments	N/A

Costa Mesa Channel	No Impairments	N/A
Newport Bay, Upper	Chlordane, Copper, DDT, Indicator Bacteria, Malathion, Nutrients, PCBs, Sedimentation, Toxicity	TMDLs for Chlordane, DDT, and PCBs established 2013 TMDL for Chlorpyrifos/Diazinon established 2004 TMDL for Lead established 2000 TMDLs for Nutrients and Sedimentation established 1999 Pending 2019 TMDL Establishment for Copper Pending 2027 TMDL Establishment for Malathion and Toxicity
Lower Newport Bay	Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs, Sedimentation, Toxicity	TMDLs for Chlordane, DDT, and PCBs established 2013 TMDL for Chlorpyrifos/Diazinon established 2004 TMDL for Lead established 2000 TMDLs for Nutrients and Sedimentation established 1999 Pending 2019 TMDL Establishment for Copper Pending 2027 TMDL Establishment for Toxicity
Newport Beach West Jetty	No Impairments	N/A
Corona Del Mar State Beach	No Impairments	N/A

Notes:
Source:
2014-2016 California 303(d) List of Water Quality Limited Segments. Retrieved January 2019:
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2014_2016.shtml

In addition, the California State Water Resources Control Board (State Board) has adopted the statewide Trash Provisions that requires implementation of Best Management Practices (BMPs) that mitigate or abate trash within Priority Land Use Areas (PLUs). PLUs are defined as, "high density residential, industrial, commercial, mixed urban, and public transportation stations." The purpose of the Trash Provisions is to establish a statewide water quality objective that ensures the quality of surface waters that enter storm drains and eventually lead out to major water ways are free of trash. The City is currently undergoing the process to comply with these new Trash Provisions.

County of Orange MS4 Permit, Drainage Area Management Plan (DAMP) & Local Implementation Plans (LIP)

In May 2009, the Santa Ana RWQCB re-issued the North Orange County MS4 Storm Water Permit as WDR Order R8-2009-0030 (NPDES Permit No. CAS618030) to the County of Orange, the incorporated cities of Orange County, and the Orange County Flood Control District within the Santa Ana Region. Pursuant to this "Fourth-Term" MS4 Permit, the Co-permittees were required to update and implement a Drainage Area Management Plan (DAMP) for its jurisdiction, as well as Local Implementation Plans (LIPs), which describe the Co-permittees' urban runoff management programs for their local jurisdictions.

Under the City's LIP, land development policies pertaining to hydromodification and low impact development (LID) are regulated for new developments and significant redevelopment projects. The term "hydromodification" refers to the changes in runoff characteristics from a watershed caused by changes in land use condition. More specifically, hydromodification refers to "the change in the natural watershed hydrologic processes and runoff characteristics (i.e., interception, infiltration, overland flow, interflow and groundwater flow) caused by urbanization or other land use changes that result in increased stream flows and sediment transport." The use of LID Best Management Practices (BMPs) in project planning and design is to preserve a site's predevelopment hydrology by minimizing the loss of natural hydrologic processes such as infiltration, evapotranspiration, and runoff detention. LID BMPs try to offset these losses by introducing structural and non-structural design components that restore these water quality functions into the project's land plan. These land development requirements are detailed in the County-wide Model Water Quality Management Plan (WQMP) and Technical Guidance Document (TGD), approved in May 2011, which Cities have incorporated into their discretionary approval processes for new development and redevelopment projects.

The LID hierarchy requires new developments and re-developments to implement BMPs under the LID hierarchy as described in the TGD. The LID hierarchy requires new projects to first infiltrate, then harvest and reuse, then biofilter stormwater runoff from their project site depending on site constraints. New projects and redevelopments within the City will follow the set hierarchy of BMP selection, and more runoff throughout the City will be effectively treated as development occurs.

2.4.2 Existing Surface Water Conditions

According to the Santa Ana Region Water Action Plan (WAP), the channels with existing beneficial uses that serve the GPU area include San Diego Creek, the Santa Ana River, and coastal wetlands, bays, and tidal prisms.

Table 11 List of Receiving Waters and Beneficial Uses

Lower Santa Ana River Basin– Santa Ana River Reach 1	
MUN – Municipal and Domestic Supply GWR – Groundwater Recharge REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation	WARM – Warm Freshwater Habitat WILD – Wildlife Habitat RARE – Rare, Threatened, or Endangered Species
Lower Santa Ana River Basin – Santa Ana-Delhi Channel	
REC 2 – Non-Contact Water Recreation WARM – Warm Freshwater Habitat	WILD – Wildlife Habitat RARE – Rare, Threatened, or Endangered Species
Lower Santa Ana River Basin – San Diego Creek Reach 1	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation	WARM – Warm Freshwater Habitat WILD – Wildlife Habitat
Lower Newport Bay	
NAV – Navigation REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation COMM – Commercial and Sportfishing	RARE – Rare, Threatened, or Endangered Species WILD – Wildlife Habitat SPWN – Spawning, Reproduction, and Development MAR – Marine Habitat SHEL – Shellfish Harvesting
Upper Newport Bay	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation COMM – Commercial and Sportfishing BIOL – Biological Habitat of Significance EST – Estuarine Habitat	RARE – Rare, Threatened, or Endangered Species WILD – Wildlife Habitat SPWN – Spawning, Reproduction, and Development MAR – Marine Habitat SHEL – Shellfish Harvesting
Bolsa Chica Ecological Reserve	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation BIOL – Biological Habitat of Significance EST – Estuarine Habitat	RARE – Rare, Threatened, or Endangered Species WILD – Wildlife Habitat SPWN – Spawning, Reproduction, and Development MAR – Marine Habitat
Huntington Beach Wetlands	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation BIOL – Biological Habitat of Significance	RARE – Rare, Threatened, or Endangered Species WILD – Wildlife Habitat SPWN – Spawning, Reproduction, and Development MAR – Marine Habitat
Santa Ana River Salt Marsh	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation BIOL – Biological Habitat of Significance	RARE – Rare, Threatened, or Endangered Species WILD – Wildlife Habitat MAR – Marine Habitat EST – Estuarine Habitat

Tidal Prisms of Flood Control Channels Discharging to Coastal or Bay Waters	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation COMM – Commercial or Sport Fishing	WILD – Wildlife Habitat MAR – Marine Habitat
Tidal Prism of Santa Ana River and Newport Slough	
REC 1 – Water Contact Recreation REC 2 – Non-Contact Water Recreation COMM – Commercial or Sport Fishing	WILD – Wildlife Habitat RARE – Rare, Threatened, or Endangered Species MAR – Marine Habitat
Tidal Prism of Santa Ana-Delhi Channel	
REC 2 – Non-Contact Water Recreation WILD – Wildlife Habitat	RARE – Rare, Threatened, or Endangered Species MAR – Marine Habitat

Notes:
Sources:
-California Regional Water Quality Control Board, Santa Ana Region. 1995 Water Quality Control Plan for the Santa Ana River Basin (Updated 2016). Retrieved September 2018 from https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/docs/2016/Chapter_3_Feb_2016.pdf

General water quality objectives have been prescribed in the Basin Plan for all surface waters within the Santa Ana River Region. In order to maintain the beneficial uses listed in the previous section, inland surface waters must achieve these water quality objectives. The following numeric objectives have been established by the Basin Plan for the following surface streams that may receive flows from the GPU area:

Table 12 Numeric Water Quality Objectives

Santa Diego Creek, Reach 1	
Water Quality Objective	**Numeric Objective (mg/L)**
Total Dissolved Solids	1500
Total Inorganic Nitrogen	13
Chemical Oxygen Demand	90

Water Quality Objectives

General water quality objectives have been prescribed for the upstream portions of the Santa Ana River Watershed and its inland surface streams. However, site-specific objectives have not been determined for the reaches surrounding and fed by the GPU area. These areas are often impaired (by high levels of minerals) and there is not sufficient historic data to designate objectives based on natural background conditions.

2.4.3 Existing Groundwater Conditions

Regional Groundwater Conditions

The GPU area lies within the Orange County Groundwater Basin (OC Basin). The OC Basin is the source of approximately 60 to 70 percent of the water supply for 2.3 million people.

OCWD is responsible for managing the OC Basin. To maintain groundwater quality, OCWD conducts an extensive monitoring program that serves to manage the OC Basin's groundwater production, control groundwater contamination, and comply with all required laws and regulations. A network of nearly 700 wells provides OCWD a source for samples, which are tested for a variety of purposes. OCWD collects 600 to 1,700 samples each month to monitor Basin water quality. These samples are collected and tested according to approved federal and state procedures as well as industry-recognized quality assurance and control protocols.

The OC Basin also has prescribed beneficial uses and water quality objectives as stated in the Santa Ana RWQCB Basin Plan that are described below.

Beneficial Uses

According to the Santa Ana RWQCB Basin Plan, beneficial uses have been established for the Orange Groundwater Management Zone which underlies the Santa Ana GPU area. These are listed below.

Table 13 Beneficial Uses of the OC Basin

Lower Santa Ana River Basin– Orange Groundwater Management Zone	
MUN – Municipal and Domestic Supply	IND – Industrial Service Supply
AGR – Agricultural Supply	PROC – Industrial Process Supply

Water Quality Objectives

Numeric water quality objectives within the Basin Plan have been established for the OC Basin and are listed below[8]:

Table 14 Numeric Water Quality Objectives

Basin Plan – Orange Groundwater Management Zone	
Water Quality Objective	**Numeric Objective (mg/L)**
Total Dissolved Solids	580
Nitrate as Nitrogen	3.4

Salinity is a significant water quality problem in many parts of southern California, including Orange County. Salinity is a measure of the dissolved minerals in water including both TDS and nitrates. The portions of the OC Basin with the highest levels are generally located in the Cities of Irvine, Tustin, Yorba Linda, Anaheim, Placentia, and Fullerton. OCWD continually monitors the levels of TDS in wells throughout the OC Basin. The TDS concentration in the OC Basin is

[8] Santa Ana RWQCB Basin Plan. Orange Groundwater Management Zone. Found here: https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/docs/2016/Chapter_4_Feb_2016.pdf

expected to decrease over time as the TDS concentration of Groundwater Replenishment System (GWRS) water used to recharge the OC Basin is approximately 50 mg/L.

Nitrates are one of the most common and widespread contaminants in groundwater supplies, originating from fertilizer use, animal feedlots, wastewater disposal systems, and other sources. The MCL for nitrate in drinking water is set at 10 mg/L. OCWD regularly monitors nitrate levels in groundwater and works with producers to treat wells that have exceeded safe levels of nitrate concentrations. OCWD manages the nitrate concentration of water recharged by its facilities to reduce nitrate concentrations in groundwater.

Other contaminants that OCWD monitors within the OC Basin include:

- Methyl Tertiary Butyl Ether (MTBE)
- Volatile Organic Compounds (VOC)
- NDMA
- 1-4-Dioxane
- Perchlorate
- Selenium
- Constituents of Emerging Concern (CEC)

Sustainable Groundwater Management Act
The California Sustainable Groundwater Management Act ("SGMA"), a three-bill package signed into law in 2014, creates a framework for the management of groundwater sources throughout the state. Under SGMA, local agencies form Groundwater Sustainability Agencies ("GSAs") and create Groundwater Sustainability Plans (GSPs). If a GSA is not formed, special act districts, such as OCWD, can submit "Alternative Plans" to GSPs. Timelines and requirements are based upon basin priority. Under SGMA, the Orange County Groundwater Basin (Basin 8-1) is considered a medium-priority basin.

In January 2017 OCWD, the city of La Habra, and Irvine Ranch Water District submitted the Basin 8-1 Alternative Plan. The Alternative Plan incorporates the requirements of GSPs and is considered to be "functionally equivalent" to a GSP. The Alternative Plan analyzes existing basin conditions and demonstrates that the Basin has been operated within its sustainable yield for more than 10 years without degrading water quality, reducing storage, or lowering groundwater levels. The Alternative Plan will be updated and resubmitted every 5 years as part of SGMA requirements. The Alternative Plan was approved by the California Department of Water Resources (DWR) in July 2019.

Under the Alternative Plan, four management areas have been created for the Orange County Groundwater Basin. Each of these management areas has slightly different management goals and strategies based on the government bodies that serve them. The management areas are as follows:

- *La Habra-Brea Management Area* – Includes the northern portion of the Basin located outside of the OCWD service area.
- *OCWD Management Area* – Includes OCWD's service area, covering approximately 89% of the Basin. This area encompasses the City of Santa Ana.

- *South East Management Area* – Includes the southern and southeastern portions of the Basin that are outside of OCWD's service area.
- *Santa Ana Canyon Management Area* – Includes the eastern portion of the Basin outside of OCWD's service area.

3. THRESHOLDS OF SIGNIFICANCE

California Environmental Quality Act (CEQA) significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as hydrology and water quality. According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would impact any of the items listed below.

3.1 HYDROLOGY & WATER QUALITY THRESHOLDS (CEQA CHECKLIST SECTION X)

Would the Project:

A. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?
B. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.
C. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

    (i) Result in a substantial erosion or siltation on- or off-site;
    (ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;
    (iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
    (iv) Impede or redirect flood flows?

D. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?
E. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold.

3.2 UTILITIES AND SERVICE SYSTEMS THRESHOLDS (CEQA CHECKLIST SECTION XIX)

Would the Project:

A. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

C. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold.

4. ENVIRONMENTAL IMPACTS

The purpose of the proposed conditions evaluation is to determine potential impacts related to the proposed land use zoning associated with the Santa Ana GPU and hydrology, sewer and water infrastructure systems.

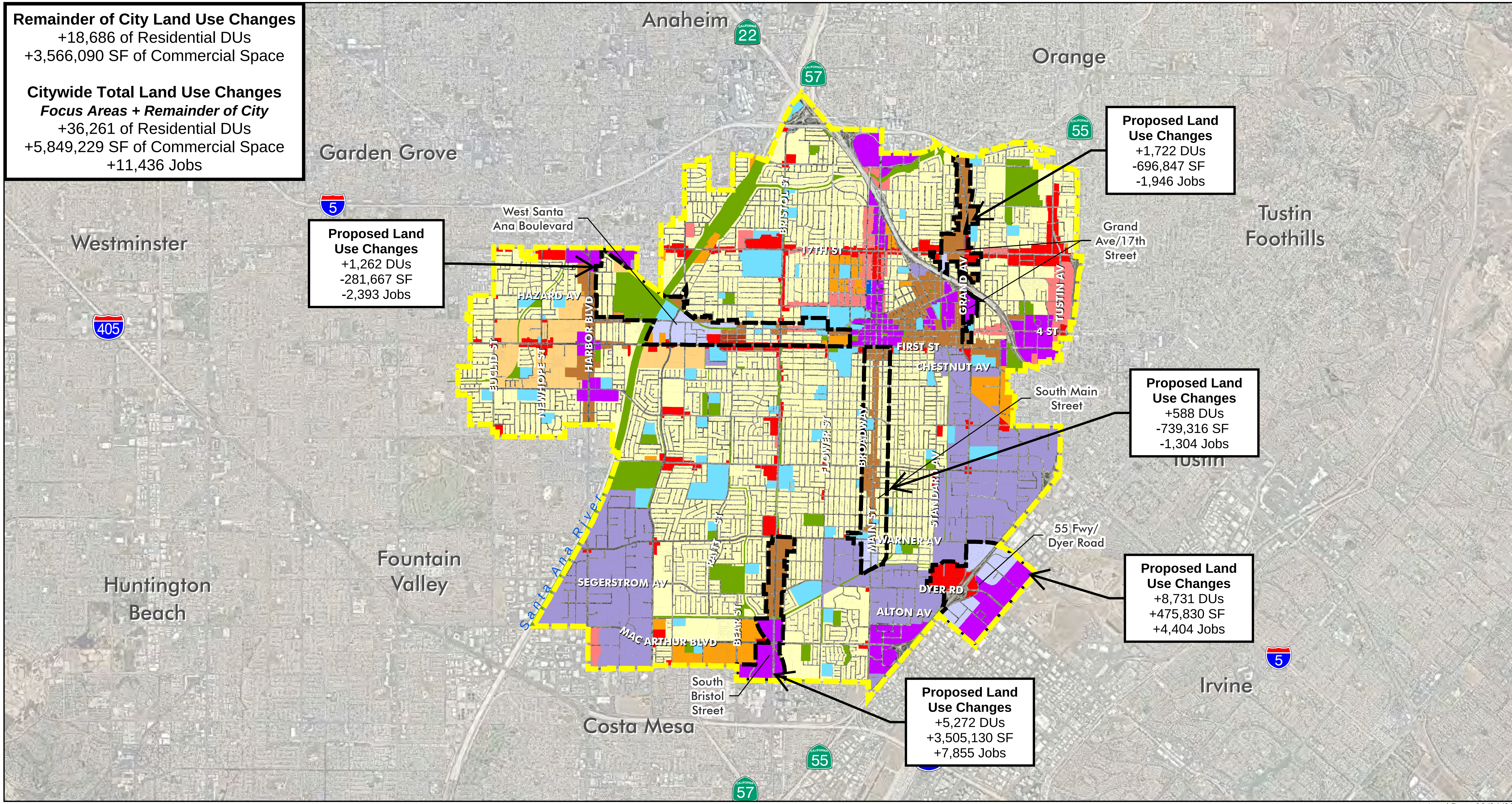
4.1 PROPOSED LAND USE CHANGES

The proposed land use changes that will largely increase mixed use land uses including single and multi-family homes, commercial, industrial, and retail of varying density. An estimated growth of 36,261 dwelling units is anticipated across the City as compared to existing land use, concentrated mainly among the five Focus Areas and additional specific plan and special zoning areas. Approximately 5.8 million square feet of additional commercial land uses are anticipated across the City, and a corresponding increase of 11,436 jobs is anticipated. Land use changes as compared to the current General Plan occur exclusively in the Focus Areas. An increase of 13,195 dwelling units and a decrease in commercial square footage of -2,665,857 square feet is proposed across all of the Focus Areas in comparison to the current General Plan. Comparison of the current General Plan to the proposed GPU is important for understand any additional impacts to sewer and water infrastructure as described in Sections 4.3.2 and 4.4.2. Table 13 provides an overview of proposed land use changes across the City. Figure 10 illustrates the proposed buildout of land uses under full implementation of the GPU.

Table 15 City of Santa Ana GPU Land Use Changes

Focus Area	Acreage	Change in Housing Units	Change in Commercial Areas
Focus Areas			
West Santa Ana Boulevard	604 acres	+ 1,262 DUs	- 281,667SF
South Bristol Street	236 acres	+ 5,272 DUs	+ 3,505,130 SF
Grand Avenue/17th Street	202 acres	+ 1,722 DUs	- 696,847 SF
South Main Street	408 acres	+ 588 DUs	-739,316 SF
55 Freeway/Dyer Road	438 acres	+ 8,731 DUs	+ 475,830 SF
Focus Area Total	**1,888 acres**	**+17,575 DUs**	**+2,263,130 SF**
Remainder of City			
All Other Areas of City	15,642 acres	+ 18,686 DUs	+3,586,090 SF
Citywide Total	**17,530 acres**	**+ 36,261 DUs**	**+ 5,849,229 SF**

Under proposed conditions, 17,575 DUs and approximately 2.3 million sf of commercial space will be created throughout the Focus Areas, representing approximately half of the proposed growth as a result of GPU buildout. Based on the proposed land use changes, sewer and water flows are anticipated to increase while runoff within existing built out areas is anticipated to decrease due to minimum landscaping requirements as well as LID features associated with storm water requirements as compared to existing conditions. Runoff increases will occur within areas of new development where previous land uses were vacant. Additional details are provided below for hydrology, sewer and water.



Aerial Date: 09/26/2018

Santa Ana GPU Proposed Zoning **Figure 10**

City of Santa Ana General Plan Update

4/10/2020

- Santa Ana City Boundary
- Focus Area

Proposed General Plan Zoning

- LR-7, Low Density Residential
- LMR-11, Low-Medium Density Residential
- MR-15, Medium Density Residential
- UN, Urban Neighborhood
- CR, Corridor Residential
- GC, General Commercial
- IND, Industrial
- FLEX, Industrial/Flex
- INS, Institutional
- OS, Open Space
- DC, District Center
- PAO, Professional and Administrative Office
- OBPDC, One Broadway Plaza District Center
- ROW

FUSCOE ENGINEERING

0 0.5 1 2 Miles

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4.2 HYDROLOGY

The purpose of the proposed conditions evaluation is to evaluate impacts associated with the proposed land use changes at a city-wide program-level EIR, characterize changes as compared to the existing runoff conditions and identify where either additional storm drain facilities are required to improve runoff conditions or where conformance to master plans of drainage are required for long-term planning and protection of downstream receiving waters.

4.2.1 Proposed Hydrology Conditions

As described in Section 2.1.1, under existing conditions, the City is largely built out and there are no major areas within the City undeveloped. Therefore, impacts to hydrology and storm drain systems will be minimal and peak flows will likely be decreased overall due to the implementation of minimum landscaping requirements as well as LID features associated with water quality regulations. These features will increase pervious areas throughout the City which will decrease stormwater flows.

As shown in Figure 4, it has been identified that there are two Focus Areas that may result in an increase of stormwater runoff peak flow rates due to the potential for single family homes and vacant lots to be redeveloped into higher intensity uses. These are summarized below:

- West Santa Ana Boulevard Focus Area:
  Description: The West Santa Ana Boulevard Focus Area has some existing single family residences that may be converted to multi family residences or commercial land uses in the future. This could result in increased imperviousness within these areas and therefore increased stormwater runoff peak flows.

  There are some downstream improvements to the Gardens Channel between Edinger and Sunflower as mentioned in Section 2.1.2 and in the City's MPD to alleviate some local flooding issues near Thorton Park. These improvements are also listed on the current OCPW 7-year CIP as a qualified future project. Therefore, based on these findings, prioritizing the Gardens Channel improvements may be beneficial to ensure no hydrology impacts result from the future developments proposed under the Santa Ana GPU.

- Grand Avenue / 17th Street Focus Area:
  Description: The Grand Avenue/17th Street Focus Areas also has some existing single family residences that may be converted to multi family residences or commercial land uses in the future. This could result in increased imperviousness within these areas and therefore increased stormwater runoff peak flows.

  There are several identified improvements along Grand Avenue between Santa Clara and the Santa Fe Channel within the regional Santa Fe Watershed. The majority of these improvements are to upsize various storm drain pipes to convey the 10-year storm event. Based on these findings, prioritizing the Santa Fe Grand storm drain improvements may be beneficial to ensure no hydrology impacts results from the future developments proposed under the Santa Ana GPU.

- <u>South Main Street Focus Area</u>:
  Description: The South Main Street Focus Areas also has some existing single family residences that may be converted to multi family residences or commercial land uses in the future. This could result in increased imperviousness within these areas and therefore increased stormwater runoff peak flows.

  There are currently no improvements within this Focus Area identified within the City's MPD or the OCPW 7-year CIP.

- <u>55 Fwy/Dyer Road Focus Area</u>:
  Description: Within the 55 Fwy/Dyer Road Focus Area, there are some large vacant parcels in the that may also result in increases in stormwater runoff.

  As mentioned in Section 2.1.3, the OCPW 7-Year Capital Improvement Plan includes the Lane Channel improvements which includes demolishing and replacing a portion of damaged concrete-lined channel. These improvements are anticipated to be finished in June 2020 and will serve to improve the hydrologic capacity of downstream areas.

Additionally, the South Bristol Street Focus Area also discharge to a number of the improvement projects covered in the Santa Ana Master Plan of Drainage and discussed in Section 2.1.2. Although this area is not anticipated to have an increase in peak runoff rates due to the likely increase in pervious areas associated with new development design features, these improvement projects should be considered for prioritization. The improvement projects within or downstream of the Focus Areas are summarized below.

- Improvement #2 – Gardens Channel Improvements receives runoff from West Santa Ana Boulevard and South Bristol Street Focus Areas and also drains through South Bristol Street Focus Area.

Prioritizing this improvement may be important to ensuring no hydrologic impacts exist in the future under buildout of the Santa Ana GPU.

Despite these potential increases in runoff from the GPU and recommended improvement projects, the City and County have policies in place for reviewing and permitting new developments as they are proposed as part of the GPU. As part of the development process, detailed hydrology studies will be required and if necessary, on-site detention systems within the development can be required to match existing peak flows, thereby eliminating any potential increase in runoff.

4.2.2 Hydrology Impacts

The following impact assessments are based on the significance criteria established in Section 3.1 for hydrology.

Impact B: Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.

Impact Analysis: As a built out City, any proposed land use changes and development will occur within areas that are already built out and will not result in interference with groundwater recharge or management of the groundwater basin. The City of Santa Ana area relies on local groundwater resources for approximately 70% of its water supply. Therefore, increases in population could generate a higher demand for groundwater resources. However, the City of Santa Ana updates its UWMP every five years, quantifying existing and projected water supplies and demands to ensure there will not be any water supply shortages or significant groundwater depletion. The 2015 UWMP highlighted sufficient surface and underground water supplied through 2040 concluding no risk of a net deficit in aquifer volume or lowering of the groundwater table. In addition, the 2018-19 OCWD Engineer's Report also concluded sufficient groundwater supplies into the future to serve it's member agencies. OCWD has multiple mechanisms to prevent groundwater overdraft. The basin is covered by Alternative Plan 8-1, and the groundwater management strategies laid out in the Plan have been approved by DWR. Impacts related to the depletion of groundwater are considered less than significant.

Impact C: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

(i) Result in a substantial erosion or siltation on- or off-site;

(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;

(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or

(iv) Impede or redirect flood flows?

Impact Analysis:

i) *Result in a substantial erosion or siltation on- or off-site:* Under the existing conditions and proposed conditions, drainage patterns will largely be maintained and will utilize the existing drainage facilities within the public right of way. Current runoff is captured and conveyed by existing storm drain infrastructure throughout the City before discharging to County drainage channels and to the Pacific Ocean. The City is built out with the exception of a small number of vacant parcels which are stabilized and will likely be developed under buildout conditions. The majority of streams and channels that drain the City are concrete lined and not susceptible to scour or erosion. For those areas that are tributary to streams that may be susceptible to scour, hydromodification requirements as part of the regional MS4 permit will ensure that impacts are minimized. Overall impacts to erosion and siltation as a result of GPU buildout are anticipated to be less than significant.

ii) *Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite:* Under the proposed condition, overall drainage patterns, flow rates and flow volumes will be largely be maintained based on the high level of impervious condition under the existing condition. Hydromodification requirements and standards flood control requirements for new development will minimize impacts of increased flows and volumes on downstream receiving waters. Both hydromodification and flood control requirements are currently enforced successfully throughout the City's review of various development projects through their Public Works department. As mentioned above, any increases in stormwater runoff and peak flows will be managed on a project-by-project basis by the City and County to implement detention systems where needed. Based on these provisions, impacts related to increased runoff rates are considered less than significant.

iii) *Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff:* The 2015 City of Santa Ana MPD identified a number of recommended and prioritized storm drain improvement projects throughout the City's service area. One of the projects identified was included in the 2018/19 CIP, and subsequent projects will be included in future CIP's based on priority. As identified in Section 4.2.1, there are some recommended downstream improvements to stormwater conveyance systems that may experience an increase in runoff from the conversion of single family residences to higher density uses as well as the development of vacant parcels. These areas primarily include the West Santa Ana Boulevard, the Grand Avenue/17th Street, South Main Street and the 55 Fwy/Dyer Road Focus Areas. The identified improvements within and downstream of these Focus Areas may be prioritized to be implemented to ensure no hydrology impacts results from the GPU land use changes. However, the City has policies in place to eliminate exacerbating any downstream flooding through existing flood control requirements associated with development projects and the implementation of detention systems. In addition, the City will continue monitoring its storm drain system for any segments that need immediate improvements and will regularly update its Master Plan of Drainage to adequately plan for future drainage needs. OCPW also updates their CIP each year to ensure regional drainage facilities are functioning. Redevelopment projects that will occur under implementation of the GPU will provide additional opportunities for capital improvements to occur. As new developments across the City are anticipated to reduce peak flows from existing conditions as discussed in Impact Analysis C.ii, impacts to drainage infrastructure are not anticipated.

iv) *Impede or redirect flood flows:* Under proposed buildout conditions, general drainage and flood control patterns will be maintained. As discussed in Impact Analysis C.ii and C.iii above, the City regularly updates its Master Plan of Drainage and the City and County both utilize a CIP program to prioritize and fund drainage improvement projects. Impediments to or redirection of flood flows as a result of project buildout are anticipated to be less than significant.

4.3 SEWER & WASTEWATER INFRASTRUCTURE

4.3.1 Proposed Wastewater Flows

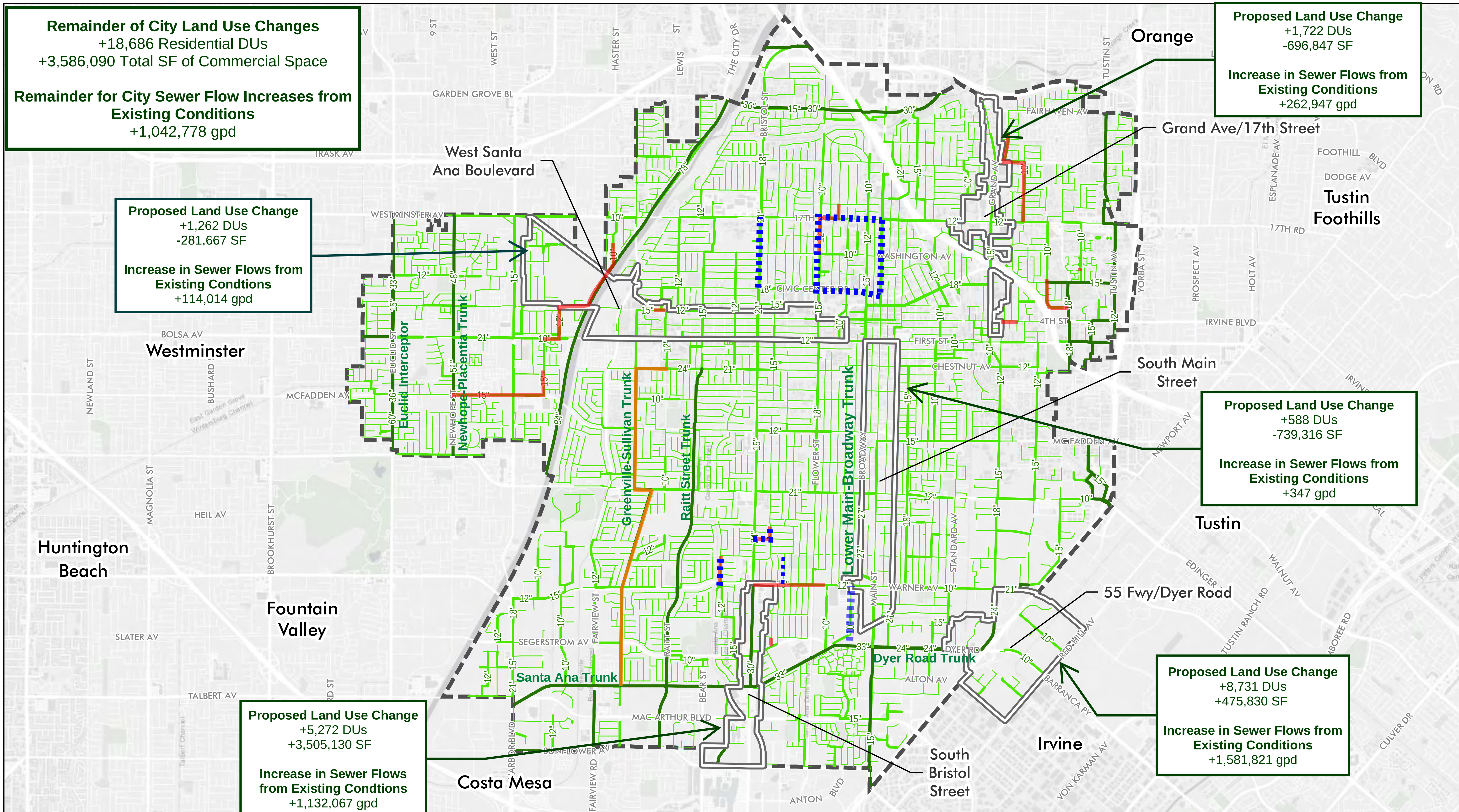
Under the proposed land use changes, sewer flows will increase across the City of Santa Ana. A total increase of 36,261 dwelling units and increase of approximately 5,849,220 sf of non-residential uses are proposed. Increases under proposed conditions implements the same methodology as existing sewer flows, however flow factors for residential land uses are based on 2025-2040 flow factors from the MWDOC Orange County Water Reliability Study to reflect buildout conditions. Table 16 provides a summary of the proposed increases in sewer flows under implementation of the General Plan land use changes.

Table 16 Proposed Condition Average Sewer Flows

Area	Number of Dwelling Units	Non-Residential SF[1]	Proposed Sewer Flows (GPD)	Existing Sewer Flows (GPD)	Change in Sewer Flows (GPD)	% Increase
Focus Areas						
West Santa Ana Boulevard	3,920	2,808,805	941,567	827,553	+114,014	13.8%
South Bristol Street	5,492	5,082,641	1,257,985	125,918	+1,132,067	899%
Grand Avenue/17th Street	2,283	703,894	451,305	188,358	+262,947	140%
South Main Street	2,308	946,662	565,847	565,500	+347	0.1%
55 Freeway/Dyer Road	9,952	6,142,283	2,120,271	538,450	+1,581,821	294%
Focus Area Total	**23,955**	**15,684,285**	**5,336,974**	**2,245,779**	**+3,091,195**	**138%**
Remainder of City						
All Other Areas of City	91,098	57,283,531	28,829,359	27,786,561	+1,042,778	3.75%
City of Santa Ana Total	**115,053**	**72,967,816**	**34,166,333**	**30,032,340**	**+4,133,993**	**13.8%**

Notes:
GPD – Gallons per day SF – Square Feet
Land use data supplied by Placeworks, 2020

Full implementation of the proposed land use changes has the potential to increase sewer flows by 4.13 MGD within the City and by 3.09 MGD throughout the Focus Areas. Therefore, the Focus Areas represent approximately 75% of the proposed increases in sewer flows throughout the GPU area. These flow estimates are for infrastructure planning purposes only and are considered conservative.



City of Santa Ana Proposed Sewer Flows

Figure 11

City of Santa Ana

5/5/2020

FUSCOE ENGINEERING

Santa Ana Boundary

City Sewer Pipelines
8" and Below in Diameter
9" - 84" in Diameter

OCSD Sewer Pipelines
OCSD Sewer Lines

Proposed Improvements
Sewer Master Plan Recommended 5-Year CIP Improvements for City Sewer Facilities
Proposed OCSD Trunk Line Capacity Improvement Project
2018/19 City Capital Improvement Plan Project

0 4,000 8,000 Feet

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4.3.2 Proposed Sewer/Wastewater System

City of Santa Ana Proposed Sewer System

The City of Santa 2016 Sewer Master Plan (SMP) noted a number of deficient segments and improvement projects throughout the City. These projects have been included in the City CIP based on priority. Three of the Focus Areas have recommended improvements from the SMP either within the Focus Area boundary of immediately adjacent to the Focus Area boundaries as shown in Figure 11. When analyzing existing recommended improvements identified in the SMP that utilized previous population estimates as well as information from the City of Santa Ana General Plan (current GP), it is important to understand how the proposed GPU may impact these recommended improvements. See below for additional details.

Existing wastewater capacity analysis, including the 2016 Sewer Master Plan, is based on existing water meter data to establish baseline conditions and utilizes several resources including population projections and development projects associated with the current GP and its final buildout estimates. Therefore, it is helpful to understand how sewer flows under the current GP compare to the proposed GPU to refine the identification of impacts. The proposed GPU modifies buildout numbers within the GPU Focus Areas. From current GP to proposed GPU, 13,195 additional DUs, consisting primarily of multi-family units, are proposed, as well as a decrease in commercial square footage of approximately -2.7 million square feet. Table 17 below shows land use changes between the current GP buildout and the proposed GPU buildout. This analysis is based on total DU count and commercial square footage only and does not differentiate between single family and multifamily sewer flow factors. These increases in flows under the proposed GPU as compared to the current GP may have implications for capacity assessments that can be helpful for future planning and sewer monitoring.

Table 17 Sewer Flow Changes, Current GP to Proposed GPU

Focus Area	Change in Housing Units, Current GPU to Proposed	Change in Commercial Areas, Current GPU to Proposed	Change in Sewer Flows
Focus Areas			
West Santa Ana Boulevard	+ 1,308 DUs	- 38,106 SF	+ 234,115 GPD
South Bristol Street	+ 2,232 DUs	+ 946,213 SF	+ 452,011 GPD
Grand Avenue/17th Street	+ 1,766 DUs	- 1,715,794 SF	+ 226,655 GPD
South Main Street	+ 667 DUs	- 1,481,837 SF	+ 43,444 GPD
55 Freeway/Dyer Road	+ 7,222 DUs	- 376,333 SF	+ 1,284,029 GPD
Focus Area Total	**+ 13,195 DUs**	**- 2,665,857 SF**	**+ 2,243,264 GPD**
Remainder of City			
All Other Areas of City	+ 0 DUs	+ 0 SF	+ 0 GPD
Citywide Total	**+ 13,195 DUs**	**-2,665,857 SF**	**+ 2,243,264 GPD**

As shown in the table above, increases in sewer flows under the proposed GPU will be spread across the five Focus Areas, with no deviations from the current General Plan elsewhere in the City. As the 2016 Sewer Master Plan capacity analysis was completed utilizing current GP buildout scenarios, increased flows from the Focus Areas will alter the outcome of the capacity assessment as well as the suggested upsizing requirements to achieve optimal hydraulic capacity. Additional flows beyond those modeled using the current GP are anticipated to impact the five Focus Areas as follows:

- West Santa Ana Boulevard Focus Area:
  Hydraulic Deficiency: There are two recommended hydraulic improvements (CIP-CAP-003 of SMP) within the West Santa Ana Boulevard Focus Area as identified in the SMP. The recommended improvements along the CIP-CAP-003 segment are to upsize the pipes from 10"-12" in diameter to 15" in diameter.
  Analysis: An additional 234,115 GPD is anticipated across the Focus Area under the proposed GPU compared to the modeled land use buildout from the current GP. This is likely conservative as it does not include the reduction of single family residences in this area under the proposed GPU as shown by the increase of only 114,014 gpd from existing land use to proposed GPU in Table 16.As a result of the proposed land uses under the GPU, the recommended improvement to a 15" line may need to be increased to an 18" line and will require additional flow monitoring and sewer modeling to confirm final pipe size.

- South Bristol Street Focus Area:
  Hydraulic Deficiency: Two improvements immediately adjacent to the Focus Area were identified in the 2016 SMP.
  Analysis: Under proposed GPU buildout, an additional 452,011 GPD of flows are anticipated through the Focus Area as compared to current GP; or an additional 1.13 MGD as compared to existing land use. While it is unlikely that the two improvement areas adjacent to the Focus Area will be exacerbated by the increase in flows, the magnitude of flows may result in additional improvements or deficiencies within or adjacent to the Focus Area. The sewer master plan demonstrated there is sufficient capacity under current and future conditions with the ability to accommodate significant growth over time. A primary reason is that the entire area is directly adjacent to large OCSD trunk lines which results in greater capacity. Based on the sewer flow monitoring requirements for local City lines and OCSD's separate detailed capacity assessment of their trunk lines, the system will be managed and updated to accommodate the full buildout of the proposed GPU over time.

- Grand Avenue / 17th Street Focus Area:
  Hydraulic Deficiency: There are two nearby deficiency areas, however the Focus Area is not directly tributary to any recommended improvements (identified capacity issues are upstream).
  Analysis: The additional 226,655 GPD under the proposed GPU as compared to the current GP, or additional 262,947 from existing land use to proposed GPU, will not exacerbate existing adjacent upstream capacity issues within the 15" and 18" trunk lines.

- South Main Street Focus Area:
  Hydraulic Deficiency: None.
  Analysis: The proposed GPU will result in a 43,444 GPD increase in flows spread across the Focus Area from current GP to proposed GPU; or only 347 gpd from existing land use (which takes into account a reduction of single family residences) as compared to

the proposed GPU. Given the relatively small increase in flows (0.04 MGD) spread across the Focus Area and the lack of deficiencies identified in the SMP, it is not anticipated that any new deficiencies will arise from the proposed GPU land uses.

- 55/Dyer Focus Area:
  Hydraulic Deficiency: None
  Analysis: While there were no capacity issues or recommended improvement projects within or adjacent to the Focus Area identified in the 2016 SMP, buildout of the proposed GPU as compared to the current GP will result in an additional 1,284,029 GPD (1.3 MGD) across the Focus Area; or approximately 1.6 MGD from existing land use to the proposed GPU. The sewer master plan demonstrated there is sufficient capacity under current and future conditions with the ability to accommodate significant growth over time. A primary reason is that the entire area is directly adjacent to large OCSD trunk lines which results in greater capacity. Based on the sewer flow monitoring requirements for local City lines and OCSD's separate detailed capacity assessment of their trunk lines, the system will be managed and updated to accommodate the full buildout of the proposed GPU over time.

Recommendation: It is recommended that increases be shared with appropriate City staff so that they may re-analyze sewer segments as needed to ensure adequate capacity basis. This will also occur on a project by project basis, as confirmed by the City, as new development projects are proposed within the Focus Areas.

Any subsequent recommended improvements can be added to the City's CIP and prioritized at the City's discretion. Due to the proposed land use changes under the GPU, the improvements noted in the bullet points above may be prioritized in the future to eliminate any impacts to the sewer system. The City will continue to regularly update its Sewer Master Plan and CIP, allowing for deficient areas to be identified and improved.

OCSD Proposed Sewer System

The OCSD Master Plan Update Report No. 3 (2019) notes a surcharge conditions through the Greenville-Sullivan Trunk Line. A capacity improvement project for the trunk line has been proposed and is currently under review. The Greenville-Sullivan Trunk Line is not within a Focus Area but is downstream of the West Santa Ana Boulevard Focus Area that is anticipating an increase in sewer flows of 114,014 gpd or 0.01 MGD. This anticipated increase from the West Santa Ana Boulevard Focus Area will happen over a series of several years as new developments and redevelopments come online. The CIP project planned will be upsizing the Greenville-Sullivan Trunk Line from a 33" diameter line to a 39" diameter line which is more than adequate to handle the increase of 0.01 MGD proposed under the Santa Ana GPU.

OCSD bases its long-term sewer capacity assessments on CDR population estimates in coordination with all cities in their service area and does not generally utilize City-specific General or Specific Plans to plan or conduct capacity analysis. For improvement projects associated with new developments and redevelopments, OCSD manages required upgrades based on detailed population growth models and on a project by project basis. In cases where a trunk line requires upsizing as a result of a specific project and the project is not included in the CIP or any planning documents, OCSD allows the project applicant to conduct the trunk line upsize and follow a reimbursement agreement process. Therefore, OCSD has a functioning and effective process in place to ensure the regional sewer infrastructure will support future developments under the Santa Ana GPU.

4.3.3 Sewer/Wastewater Impacts

The following impact assessments are based on the significance criteria established in Section 3.2 for wastewater.

Impact A. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Impact Analysis: The estimated increase of 4.13MGD over the 30.03 MGD of existing flows is not anticipated to exceed the projected future capacity of the City of Santa Ana's wastewater infrastructure or OCSD's regional infrastructure or WWTP. The City maintains a regularly updated Sewer Master Plan and CIP and has a process in place to assess local sewer impacts on a project-by-project basis.

As noted above, there are some recommended improvements within or near Focus Areas where the majority of sewer flow increases are anticipated to occur. Additional studies using updated buildout numbers are recommended for the West Santa Ana Boulevard, South Bristol Street, and 55 Fwy/Dyer Road Focus Areas. At a citywide scale, the City's Sewer Master Plan and CIP process adequately prioritizes necessary projects as developments under the GPU come online. However, this process can likely be achieved at the local level as future development comes online and ties into the existing City infrastructure

As referenced, similar to existing protocols employed within the City, any project within the City and under the proposed GPU that goes through the entitlement process will be required to perform a sewer monitoring study. After submittal and review of the study by City staff, if the sewer system is found to be deficient, the developer will be required to upsize the portion of the sewer pipe within the frontage of their property. There may be options depending on the condition of the sewer infrastructure for the developers to enter into a Joint Cost Sharing Agreement with the City to cover a portion of the cost for required upsizing that may be done by the City at a later date. If improvements are needed to infrastructure downstream of the project site, the developer may be required to participate and pay into the Fair Share Agreement currently employed by the City. The Fair Share Agreement will allow the developer to fund a percentage of the downstream improvement that will be carried out by the City in the future. In the case of sewer line improvements, construction will follow the Construction General Permit and all pertinent City and County codes, minimizing environmental impact.

In addition, OCSD regularly updates long-term planning documents which include provisions for improving regional treatment plant and conveyance infrastructure capacity. OCSD has identified an improvement needed to the Greenville-Sullivan Trunk line within the GPU area which is currently under review. Through planning and management processes currently in place, OCSD is able to ensure the regional sewer infrastructure will support future developments under the Santa Ana GPU.

Impact C. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Impact Analysis: See Impact Analysis A regarding wastewater treatment capacity. The City of Santa Ana has mechanisms to create adequate capacity within its sewage conveyance facilities to handle the proposed increases in flows from the GPU. OCSD's wastewater treatment plants have a total combined capacity of 390 MGD with the ability to route flows to either of the two WWTPs as needed. 2018-19 flows were estimated to be 185 MGD, indicating adequate capacity (205 MGD) for the proposed increase in flows of 4.13 MGD as compared to existing land use. OCSD utilizes a robust CIP process and relies on internal capacity modeling, population projects and land use projections, independent of General Plan update buildout estimates. OCSD is currently planning a CIP project along the Greenville-Sullivan trunk line within the City of Santa Ana to ensure sewer diversions are functioning effectively and to reduce surcharge conditions. As referenced in Section 4.3.2, the proposed upsizing of the trunk line from a 33" to 39" diameter pipe is more than adequate to handle the increase of 0.01 MGD from the West Santa Ana Boulevard Focus Area upstream. Through updating appropriate master plans, long-term capital improvement budgets, and plant capacity assessments, it is anticipated OCSD will be able to receive increases in flows consistent with the buildout proposed under implementation of the GPU. No impacts are anticipated to service provider capacities.

4.4 WATER INFRASTRUCTURE

4.4.1 Proposed Water Flows

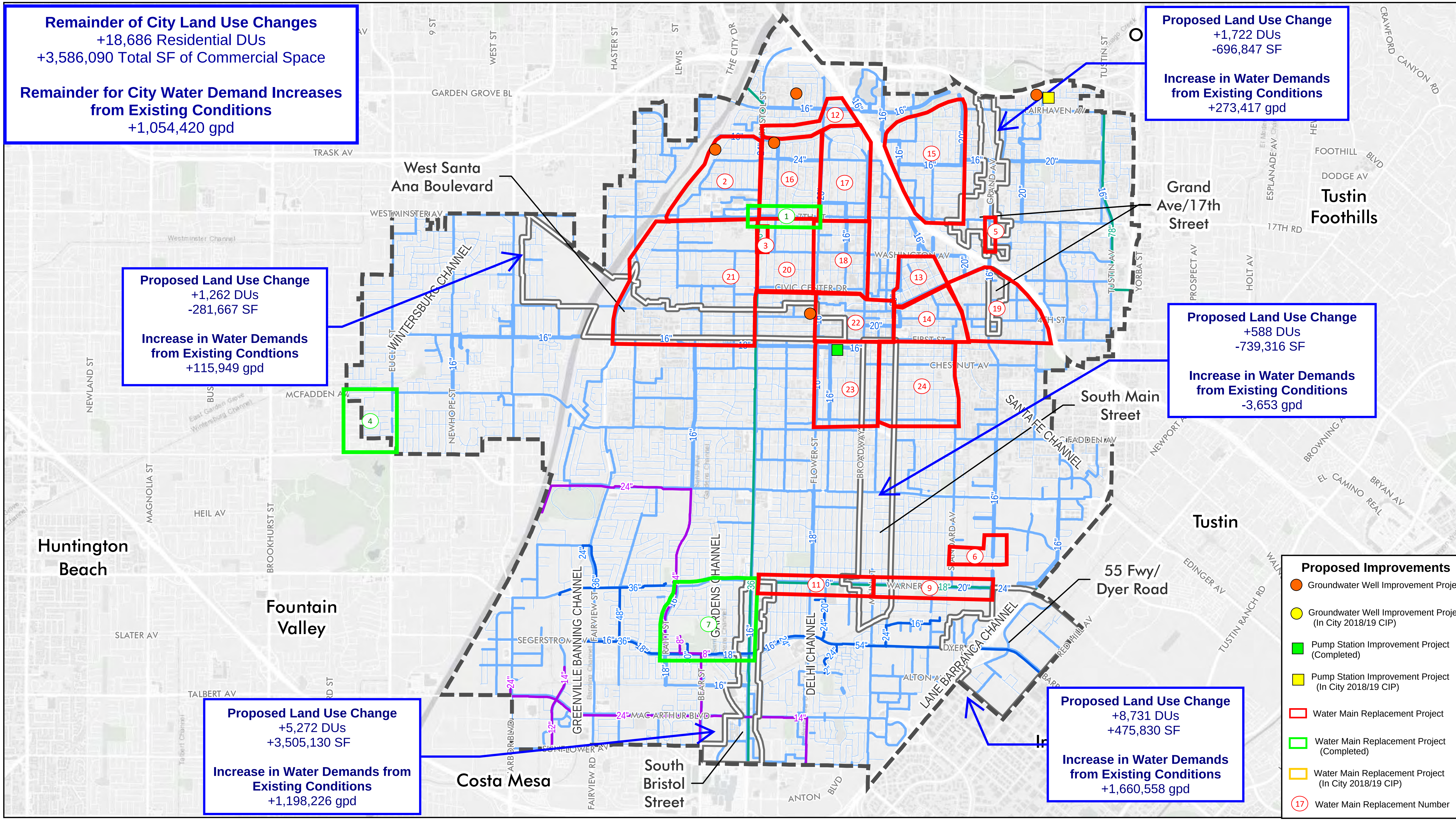
Under the proposed land use changes, water flows will increase throughout the City of Santa Ana and its Focus Areas due to increases in dwelling units and commercial land uses. A total increase of 36,261 dwelling units and increase of approximately 5,849,220 sf of non-residential uses are proposed. Table 18 shows the proposed water flows associated with each land use change, using the same methodology as for the existing conditions. Increases in water flows under proposed conditions implements the same methodology as existing waterflows, however flow factors for residential land uses are based on 2025-2040 flow factors from the MWDOC Orange County Water Reliability Study to reflect buildout conditions. Detailed calculations and associated exhibits are included in Appendix C.

Table 18 Proposed Condition Water Flows

Area	Number of Dwelling Units	Commercial SF	Proposed Water Flow (GPD)	Existing Water Flow (GPD)	Change in Flow (GPD)	% Increase
Focus Areas						
West Santa Ana Boulevard	3,920	2,808,805	996,756	880,807	+115,949	13.6%

South Bristol Street	5,492	5,082,641	1,335,183	136,957	+1,198,226	857%
Grand Avenue/17th Street	2,283	703,894	475,779	202,362	+273,417	135%
South Main Street	2,308	946,662	597,029	600,682	- 3,653	-0.6%
55 Freeway/Dyer Road	9,952	6,142,283	2,243,399	582,841	+1,660,558	666%
Focus Area Total	**23,955**	**15,684,285**	**5,648,146**	**2,403,648**	**+3,244,498**	**135%**
Remainder of City						
All Other Areas of City	91,098	57,283,531	30,458,068	29,403,648	+1,054,420	3.6%
City of Santa Ana Total	**115,053**	**72,967,816**	**36,106,214**	**31,833,589**	**+4,272,625**	**13.4%**
Notes: *GPD – Gallons per day SF – Square Feet* *Land use data supplied by Placeworks, 2020*						

Full implementation of the proposed increases has the potential to increase water flow by 4.27 MGD within the City. Water flows across all Focus Areas are anticipated to increase by 3.24 MGD, representing approximately 75% of the projected Citywide increase in water flows. Water flows will primarily come from additional dwelling units within the Focus Areas and specific plan/special zoning areas. These water flow estimates are for infrastructure capacity purposes only and are considered conservative. Figure 12 summarizes proposed increases in water flows across the City under buildout conditions.



City of Santa Ana Proposed Water Flows

Figure 12

City of Santa Ana

5/28/2020

Santa Ana City Boundary
Focus Area

Santa Ana Municipal Utilities Water Lines
8" and Below in Diameter
9" - 14" in Diameter
15" - 30" in Diameter

Other Water Lines
IRWD Water Lines
MWD Water Lines
OCWD Reclaimed Water Lines

0 4,000 8,000 Feet

X:\Projects\511\31\MXD\12_Proposed_Water200406.mxd

4.4.2 Proposed Water System

The City currently has 19 remaining identified water main replacement projects, 6 groundwater well improvement projects, and 1 pump station improvement project throughout the City as identified in the 2017 Water Master Plan. These improvement projects are intended to increase the City water system's capacity and functionality to keep up with population and non-residential growth throughout the service area. Of these projects, one water main replacement, one pump station improvement, and one groundwater well improvement project were included in the City's 2018/19 CIP. Four of the five Focus Areas each have water main improvements identified as summarized below:

- West Santa Ana Boulevard Focus Area: West Santa Ana Boulevard Focus Area includes #10 and #21 water main replacement projects as well as one groundwater well improvement project.
- Grand Ave/17th Street Focus Area: The Grand Ave/17th Street Focus Area includes #5 and #19 water main replacement projects.
- South Main Street Focus Area: The South Main Street Focus Area includes #9, #11, #23 and #24 water main replacement projects.
- South Bristol Street Focus Area: The South Bristol Street Focus Area includes #8and #11 water main replacements projects.

The projects noted above and other future projects will be included in subsequent CIP's based on priority. The status of these projects, as well as the list of constructed or completed projects, will be updated upon releases of subsequent CIPs and water planning documents.

Similar to determining additional sewer impacts from the proposed GPU as it compares to the current GP which is utilized in water infrastructure planning efforts, the table below highlights the increases in water flows from the proposed GPU as compared to the current GP. This analysis is based on total DU count and commercial square footage only and does not differentiate between single family and multifamily water flow factors.

Table 19 Water Flow Changes, Current GP to Proposed GPU

Focus Area	Change in Housing Units, Current GPU to Proposed	Change in Commercial Areas, Current GPU to Proposed	Change in Water Flow
Focus Areas			
West Santa Ana Boulevard	+ 1,308 DUs	- 38,106 SF	+ 246,333 GPD
South Bristol Street	+ 2,232 DUs	+ 946,213 SF	+ 478,385 GPD
Grand Avenue/17th Street	+ 1,766 DUs	- 1,715,794 SF	+ 237,067 GPD
South Main Street	+ 667 DUs	- 1,481,837 SF	+41,684 GPD
55 Freeway/Dyer Road	+ 7,222 DUs	- 376,333 SF	+ 1,350,381 GPD
Focus Area Total	**+ 13,195 DUs**	**- 2,665,857 SF**	**+2,354,041 GPD**
Remainder of City			
All Other Areas of City	+ 0 DUs	+ 0 SF	+ 0 GPD
Citywide Total	**+ 13,195 DUs**	**-2,665,857 SF**	**+2,354,041 GPD**

Under buildout of the proposed GPU, water flows will increase across all Focus Areas, potentially creating deficiencies or necessitating the need for improvement projects not identified in the 2017 Water Master Plan. However, major deficiencies as a result of increased flow are not anticipated, as the 2017 WMP found that the distribution system was largely hydraulically sound. Improvement projects as a result of deteriorated or aged pipes are anticipated to constitute the majority of future water infrastructure projects. Therefore, the findings of the 2017 WMP stand and additional impacts as a result of proposed GPU buildout are not anticipated.

Through its planning and CIP mechanisms, the City of Santa Ana will have adequate capacity for the proposed increases in water flows across the City under implementation of the GPU and will be able to serve the additional dwelling units and commercial square footage proposed. This has been confirmed with City staff.[9]

4.4.3 Water Impacts

The following impact assessments are based on the significance criteria established in Section 3.2 for water systems.

Impact A **Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?**

Impact Analysis: The City of Santa Ana maintains a regularly updated Water Master Plan that identifies deficiencies and necessary improvement projects throughout its service area. Improvement projects are regularly incorporated into the City's CIP based on priority; including the improvements projects identified within or adjacent to Focus Areas as shown in Section 4.4.2. Major capacity deficiencies are not anticipated as the City has mechanisms in place to accommodate the proposed increases in water flows under implementation of the GPU as confirmed by City Staff. Improvement projects based on pipe age and condition may be required throughout GPU implementation, however the status or prioritization of these projects is not anticipated to be impacted by GPU buildout. Individual projects will be subject to City permits, fees, and applications in order to ensure that they will not place an undue burden on existing infrastructure. In instances where infrastructure is expanded or relocated, construction will follow the Construction General Permit and City and County specific regulations to minimize environmental impacts. No significant impacts from the construction or expansion of water facilities are anticipated.

4.5 WATER QUALITY

4.5.1 Construction Activities

Clearing, grading, excavation and construction activities associated with the proposed project may impact water quality due to sheet erosion of exposed soils and subsequent deposition of particulates in local drainages. Grading activities, in particular, lead to exposed areas of loose soil, as well as sediment stockpiles, that are susceptible to uncontrolled sheet flow. Although

[9] Phone call with City Staff. April 30, 2020.

erosion occurs naturally in the environment, primarily from weathering by water and wind action, improperly managed construction activities can lead to substantially accelerated rates of erosion that are considered detrimental to the environment.

General Construction Permit

Prior to the issuance of grading permits, the project applicants shall provide evidence that the development of the projects one acre or greater of soil disturbance shall comply with the most current General Construction Permit (GCP) and associated local National Pollutant Discharge Elimination System (NPDES) regulations to ensure that the potential for soil erosion is minimized on a project-by-project basis. In accordance with the updated GCP (Order No. 2009-0009-DWQ), the following Permit Registration Documents are required to be submitted to the SWRCB prior to commencement of construction activities:

- Notice of Intent (NOI)
- Risk Assessment (Standard or Site-Specific)
- Particle Size Analysis (if site-specific risk assessment is performed)
- Site Map
- SWPPP
- Post-Construction Water Balance Calculator (not required – project is covered under the North Orange County MS4 permit Order No. R8-2009-0030)
- Active Treatment System (ATS) Design Documentation (if ATS is determined necessary)
- Annual Fee & Certification

Construction Best Management Practices (BMPs)

In accordance with the existing and updated GCP, a construction SWPPP must be prepared and implemented at all construction projects with 1 acre or greater of soil disturbance, and revised as necessary, as administrative or physical conditions change. The SWPPP must be made available for review upon request, shall describe construction BMPs that address pollutant source reduction, and provide measures/controls necessary to mitigate potential pollutant sources. These include, but are not limited to: erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices.[10]

Prior to commencement of construction activities within the GPU area, the project-specific SWPPP(s) will be prepared in accordance with the site specific sediment risk analyses based on the grading plans, with erosion and sediment controls proposed for each phase of construction for the individual project. The phases of construction will define the maximum amount of soil disturbed, the appropriate sized sediment basins and other control measures to accommodate all active soil disturbance areas and the appropriate monitoring and sampling plans.

[10] California Stormwater Quality Association. (2003, January). *Stormwater Best Management Practices Handbook for New Development and Redevelopment*. Retrieved March 20, 2020, from http://www.cabmphandbooks.com

4.5.2 Post-Construction Activities

With the proposed land use changes, development resulting from the General Plan Update may result in long-term impacts to the quality of storm water and urban runoff, subsequently impacting downstream water quality. Developments can potentially create new sources for runoff contamination through changing land uses. As a consequence, developments within individual Focus Areas and the City as a whole may have the potential to increase the post-construction pollutant loadings of certain constituent pollutants associated with the proposed land uses and their associated features, such as landscaping and plaza areas.

To help prevent long-term impacts associated with land use changes and in accordance with the requirements of the City of Santa Ana LIP and consistency with OC DAMP and Fourth-Term MS4 permit, new development and significant redevelopment projects must incorporate LID/site design and source control BMPs to address post-construction storm water runoff management. In addition, projects that are identified as Priority Projects are required to implement site design/LID and source control BMPs applicable to their specific priority project categories, as well as implement treatment control BMPs where necessary. Selection of LID and additional treatment control BMPs is based on the pollutants of concern for the specific project site and the BMP's ability to effectively treat those pollutants, in consideration of site conditions and constraints. Further, both Priority and Non-Priority projects must develop a project-specific Water Quality Management Plan (WQMP) that describes the menu of BMPs chosen for the project, as well as include operation and maintenance requirements for all structural and any treatment control BMPs.

Since the GPU does not include a specific or detailed development plan, project-specific WQMP(s) will not be required at this time. Future project-specific WQMPs, preliminary and/or final, will be prepared consistent with the prevailing terms and conditions of the City's LIP, OC DAMP, and Model WQMP at the time of project application. Moreover, LID and water quality treatment solutions prescribed in project specific WQMPs shall be designed to support or enhance the regional BMPs and efforts implemented by the City as part of their City-wide efforts to improve water quality.

LID Design Approach

The overall approach to water quality treatment for the individual projects within the GPU area will include incorporation of site design/LID strategies and source control measures throughout the sites in a systematic manner that maximizes the use of LID features to provide treatment of storm water and reduce runoff. In accordance with the MS4 Permit, the use of LID features will be consistent with the prescribed hierarchy of treatment provided in the Permit: infiltration, evapotranspiration, harvest/reuse and biotreatment. Where applicable, LID features will be analyzed to demonstrate their ability to treat portions of the required design capture volume (DCV) and reduce the size of downstream on-site treatment control BMPs.

Consistent with regulatory requirements and design guidelines for water quality protection, the following principles will be followed for new projects associated with the General Plan Plan and will be supported by construction level documents in the final LID Design Plans prior to grading permit(s) issuance by the City of Santa Ana:

- LID features will be sized for water quality treatment credit according to local Regional Board sizing criteria as defined in the Fourth-Term MS4 Permit for either flow-based or volume-based BMPs.
- LID techniques within the internal development areas (site design objectives), thereby providing treatment of low-flow runoff directly at the source and runoff reduction of small (i.e., more frequent) storm event runoff (first-flush). In most instances, LID features will be sized by volume-based analyses to demonstrate compliance with the required design capture volume for the new projects under the General Plan.
- Detailed field investigations, drainage calculations, grading, and BMP sizing to occur during the detailed design phase and future project-specific WQMP documentation.
- Where feasible, LID features will be designed to infiltrate and/or reuse treated runoff on-site in accordance with feasibility criteria as defined in the 2013 Countywide Model WQMP and Technical Guidance Document (TGD).[11] [12]
- For those areas of the City where infiltration is not recommended or acceptable and harvest/reuse landscaping demands are insufficient, biotreatment LID features will be designed to treat runoff and discharge controlled effluent flows to downstream receiving waters.

Unlike flood control measures that are designed to handle peak storm flows, LID BMPs and treatment control BMPs are designed to retain, filter or treat more frequent, low-flow runoff or the "first-flush" runoff from storm events. In accordance with the Fourth-Term MS4 Permit for North Orange County, the LID BMPs shall be sized and designed to ensure on-site retention of the volume of runoff produced from a 24-hour 85th percentile storm event, as determined from the County of Orange's 85th Percentile Precipitation Map.[13] This is termed the "design capture volume", or DCV. The City is split between an an 85th Percentile storm depth of 0.75 and 0.8 inches. The 2013 Model WQMP and its companion Technical Guidance Document provides design criteria, hydrologic methods and calculations for combining use of infiltration, retention, and biofiltration BMPs to meet the required design capture volume.

Consistency with the State-wide Trash TMDL

As part of the state-wide mandate to reduce trash within receiving waters, the City of Santa Ana will be required to adhere to the requirements of the amended CA Trash Total Maximum Daily Load (TMDL) from July 2016 onwards. The requirements will include the installation and maintenance of trash screening devices at all public curb inlets, grate inlets and catch basin inlets. The trash screening devices must be approved by the local agency and consistent with the minimum standards of the Trash TMDL. The City of Santa Ana has selected Track 1 as its compliance option. By selecting Track 1, the City has agreed to install, operate, and maintain full capture systems in storm drains that capture runoff from one or more priority land use areas.

Sustainable On-Lot and Public Right of Way Infrastructure Opportunities

As part of an on-going sustainable effort to improve water conservation, reduce potable water usage, support green infrastructure features within the Public R/W and reduce environmental

[11] County of Orange Planning Division. (December 20, 2013). Exhibit 7.III - Model Water Quality Management Plan
(WQMP).
[12] County of Orange Planning Division. (December 20, 2013). Technical Guidance Document (TGD).
[13] Figure XVI-1 in the Technical Guidance Document (County of Orange, December 20, 2013).

"footprint" within the City, there are several emerging trends and technologies that should be considered and incorporated where feasible within the future redevelopment opportunities within the GPU area. These include the following:

- **Gray Water Systems** – The use of gray water systems to collect and reuse gray water from various new developments and redevelopments can greatly reduce on-site potable water usage. The process typically includes routing water from showers, sinks and washing machines, treating the water to NSF 350 standards[14] (or equivalent) and reusing the treated gray water within the building for toilet flushing or exterior landscaping. Gray water systems are especially opportune and cost effective within new hotel developments and multi-family residential developments where the constant use of water from showers, sinks and washing machines can be reused for toilet flushing and/or landscape irrigation. Reuse of gray water can help reduce both potable water and sewer generation fees.

- **Small-scale and Large-scale Cistern and Reuse Systems** – Both small- and large-scale harvest and reuse systems may be feasible based on certain project types. Depending on the type of potable demand for landscape irrigation and toilet flushing of a new development of redevelopment, the implementation of a harvested rainwater BMP would provide a multi-benefit solution that could satisfy both water quality regulations and provide for a sustainable water quantity solution that would offset potable water costs. The efficiency and cost-effectiveness for harvest and reuse systems increases when combined with on-site gray water recycling systems.

- **Green Street Features** – Green streets are sustainable design features with many benefits. Green street design components include stormwater infiltration planters within parkways to treat lot runoff and roadway runoff; bulb out planters that provide traffic calming along with runoff treatment, tree boxes and light reflective paving surfaces which reduce heat island effects.

- **Green Roofs and Green Walls** – Green roofs and green walls offer up some of the most advanced ways to reduce stormwater runoff volumes and common pollutants. As open space becomes more limited within high density areas, green roofs provide a solution with many additional benefits including stormwater treatment, internal and external cooling effects for the building and aesthetic benefits, all within a shared footprint. Green roofs are most feasible when there is a sturdy building structure included in a project. On the other hand, green walls require less structural stability and can be implemented on almost any vertical surface. Some opportunities include implementing green walls on the sides of large, above-ground parking structures. Green roof/wall design can be combined with harvest and reuse cisterns and gray water systems to provide a constant source of treated water for irrigation without increasing demands on local and regional potable water supplies.

Each of these opportunities should be evaluated to determine feasibility and appropriateness for the proposed development and redevelopment projects within the GPU area.

[14] NSF/ANSI 350 and 350-1: Onsite Water Reuse Specifications. Found here: http://www.nsf.org/services/by-industry/water-wastewater/onsite-wastewater/onsite-reuse-water-treatment-systems

4.5.3 Water Quality Impacts

The impact assessments are based on the significance criteria established in Section 3.2for water quality.

Impact A *Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?*

Impact Analysis:
Construction activities within the GPU area would potentially result in soil erosion and temporary adverse impacts to surface water quality from construction materials and wastes if left unregulated or unmitigated.

Both State and Local regulations will effectively mitigate construction storm water runoff impacts from the proposed land use changes under the GPU. Standard erosion control practices shall be implemented for all construction within the City. Additionally, construction sites will be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the requirements of the Statewide General Construction Permit and subject to the oversight of the Santa Ana Regional Water Quality Control Board. The SWPPP must include BMPs to reduce or eliminate erosion and sedimentation from soil disturbing activities, as well as proper materials and waste management. Implementation of these State and Local requirements would effectively protect projects from violating any water quality standards or waste discharge requirements from construction activities.

In terms of post-construction related impacts, the incorporation of site design, LID features and BMPs as required under the North Orange County MS4 Permit, the individual development and redevelopment projects within the GPU will effectively retain or treat the 85th percentile 24-hour storm water runoff for pollutants such as bacteria, metals, nutrients, oil & grease, organics, pesticides, sediment, trash, and oxygen demanding substances prior to discharge off their property. As properties within the City undergo redevelopment, existing properties that do not have water quality BMPs will be replaced with project incorporating LID BMPs. Therefore, long-term surface water quality of runoff from the GPU area would be expected to improve over existing conditions as more LID BMPs are implemented. This is considered an overall beneficial effect of the proposed land use changes associated with implementation of the GPU. Impacts to surface and groundwater quality will be less than significant.

Impact E *In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?*

Impact Analysis:

It is the City's policy to avoid placing new housing within 100-year flood hazard areas based on FEMA's floodplain maps. All existing housing within Flood Zone A's and AE's require flood insurance. As noted in Impact Analysis C, the City and County regularly maintain and improve storm drain and flood control infrastructure based on priority. New developments will comply with all pertinent flood control regulation. It is not anticipated that pollutants will be mobilized in the event of flooding or inundation.

Impact E *Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?*

Impact Analysis:

New development and redevelopment within the City of Santa Ana will not impact implementation of local or regional water quality control plans or sustainable groundwater management plans. All development within the City will follow the North Orange County MS4 permit. Groundwater levels are managed by OCWD, and development projects will be reviewed for conformance with OCWD's groundwater management goals. Impacts to water quality and groundwater management will be less than significant.

5. CONCLUSION

The proposed land use changes under buildout of the Santa Ana GPU will increase the flow within water and sewer infrastructure over existing conditions while largely maintaining existing runoff conditions. The City of Santa Ana, OCPW, and OCSD each have methods in place for prioritizing, funding, and correcting deficient infrastructure. In all cases, specific analyses will be required during final design stages of final development projects to evaluate storm drain, water and sewer infrastructure condition and capacity. Impacts to sewer, water, and storm drain infrastructure are anticipated to be less than significant.

Based on the existing built out condition of the City and the proposed land use changes under the GPU including the implementation of low impact development features, no substantial additional sources of pollutants or significant Citywide increases in runoff for the 85th percentile storm event are anticipated. Based on the findings of this technical report, the incorporation of site design/LID features, and infiltration/biotreatment BMPs as required under the MS4 Permit and local LID requirements, the individual projects will adequately reduce project related impacts to hydrology and water quality to a level less than significant.

6. TECHNICAL APPENDICES

Appendix A Sewer Flow Calculations

Appendix B City and OCSD Sewer Improvements

Appendix C Water Flow Calculations

APPENDIX A

SEWER FLOW CALCULATIONS

Santa Ana GPU Area Existing Condition Sewer Flows

	Building(s)		Parcel	Flow	Unit of Measure	Total Flow
	Units	Square Feet	Acres	GPD		GPD
55 Freeway/Dyer Road						
Residential						
Single Family Residential	-	--	0.00	390	/DU	0
Multi Family Residential	1,221	--	0.00	200	/DU	244,200
Business and Commerce						
Commercial	-	5,666,453	130.08	2262	/acre	294,250
55/Dyer Total	**1,221**	**5,666,453**	**130.08**	**--**	**--**	**538,450**
Grand Avenue/17th Street						
Residential						
Single Family Residential	18	--	0.00	390	/DU	7,020
Multi Family Residential	543		0.00	200	/DU	108,600
Business and Commerce						
Commercial	-	1,400,741	32.16	2262	/acre	72,738
17th and Grand Total	**561**	**1,400,741**	**32.16**	**--**	**--**	**188,358**
South Bristol Street						
Residential						
Single Family Residential	-	--	0.00	390	/DU	0
Multi Family Residential	220		0.00	200	/DU	44,000
Business and Commerce						
Commercial	-	1,577,511	36.21	2262	/acre	81,918
South Bristol Total	**220**	**1,577,511**	**36.21**	**--**	**--**	**125,918**
South Main Street						
Residential						
Single Family Residential	705	--	0.00	390	/DU	274,950
Multi Family Residential	1,015		0.00	200	/DU	203,000
Business and Commerce						
Commercial	-	1,685,978	38.70	2262	/acre	87,550
South Main Total	**1,720**	**1,685,978**	**38.70**	**--**	**--**	**565,500**
West Santa Ana Boulevard						
Residential						
Single Family Residential	713	--	0.00	390	/DU	278,070
Multi Family Residential	1,945		0.00	200	/DU	389,000
Business and Commerce						
Commercial	-	3,090,472	70.95	2262	/acre	160,483
West Santa Ana Total	**2,658**	**3,090,472**	**70.95**	**--**	**--**	**827,553**
Remaining Citywide						
Residential						
Single Family Residential	55,346	--	0.00	390	/DU	21,584,940
Multi Family Residential	17,066		0.00	200	/DU	3,413,200
Business and Commerce						
Commercial	-	53,697,441	1232.72	2262	/acre	2,788,421
Remaining Citywide Total	**72,412**	**53,697,441**	**1232.72**	**--**	**--**	**27,786,561**
Focus Area Total	**6,380**	**13,421,155**	**308.11**			**2,245,779**
Grand Total	**78,792**	**67,118,596**	**1540.83**			**30,032,340**

*Residential flow factors based on water demand factors multiplied by a 0.95 sewer factor

**Commercial flow factors based on OCSD Design and Construction Standards for Sanitary Sewers

Santa Ana GPU Area Proposed Condition Sewer Flow Increases

	Building(s)		Parcel	Flow	Unit of Measure	Total Flow
	Units	Square Feet	Acres	GPD		GPD
55 Freeway/Dyer Road						
Residential						
Single Family Residential	-	--	0.00	351	/DU	0
Multi Family Residential	9,952			181	/DU	1,801,312
Business and Commerce						
Commercial	-	6,142,283	141.01	2262	/acre	318,959
55/Dyer Total	**9,952**	**6,142,283**	**141.01**	--	--	**2,120,271**
Grand Avenue/17th Street						
Residential						
Single Family Residential	9	--	0.00	351	/DU	3,159
Multi Family Residential	2,274			181	/DU	411,594
Business and Commerce						
Commercial	-	703,894	16.16	2262	/acre	36,552
17th and Grand Total	**2,283**	**703,894**	**16.16**	--	--	**451,305**
South Bristol Street						
Residential						
Single Family Residential	-	--	0.00	351	/DU	0
Multi Family Residential	5,492			181	/DU	994,052
Business and Commerce						
Commercial	-	5,082,641	116.68	2262	/acre	263,933
South Bristol Total	**5,492**	**5,082,641**	**116.68**	--	--	**1,257,985**
South Main Street						
Residential						
Single Family Residential	582	--	0.00	351	/DU	204,282
Multi Family Residential	1,726			181	/DU	312,406
Business and Commerce						
Commercial	-	946,662	21.73	2262	/acre	49,159
South Main Total	**2,308**	**946,662**	**21.73**	--	--	**565,847**
West Santa Ana Boulevard						
Residential						
Single Family Residential	507	--	0.00	351	/DU	177,957
Multi Family Residential	3,413			181	/DU	617,753
Business and Commerce						
Commercial	-	2,808,805	64.48	2262	/acre	145,857
West Santa Ana Total	**3,920**	**2,808,805**	**64.48**	--	--	**941,567**
Remaining Citywide						
Residential						
Single Family Residential	55,094	--	0.00	351	/DU	19,337,994
Multi Family Residential	36,004			181	/DU	6,516,724
Business and Commerce						
Commercial	-	57,283,531	1315.05	2262	/acre	2,974,641
Remaining Citywide Total	**91,098**	**57,283,531**	**1315.05**	--	--	**28,829,359**
Focus Area Total	**23,955**	**15,684,285**	**360.06**			**5,336,974**
Grand Total	**115,053**	**72,967,816**	**1675.11**			**34,166,333**

*Residential flow factors based on water demand factors multiplied by a 0.95 sewer factor

**Commercial flow factors based on OCSD Design and Construction Standards for Sanitary Sewers

Santa Ana Changes in Sewer Flows, Current GP to Proposed GPU

	Change in Building(s) Units	Change in Building(s) Square Feet	Parcel Acres	Flow GPD	Unit of Measure	Total Flow GPD
55 Freeway/Dyer Road						
Residential						
Residential Total	7,222	--	0.00	180.5	/DU	1,303,571
Business and Commerce						
Commercial	-	-376,333	-8.64	2262	/acre	-19,542
55/Dyer Total	**7,222**	**-376,333**	**-8.64**	--	--	**1,284,029**
Grand Avenue/17th Street						
Residential						
Residential Total	1,766	--	0.00	180.5	/DU	318,763
Business and Commerce						
Commercial	-	-1,715,794	-39.39	2262	/acre	-89,098
17th and Grand Total	**1,766**	**-1,715,794**	**-39.39**	--	--	**229,665**
South Bristol Street						
Residential						
Residential Total	2,232	--	0.00	180.5	/DU	402,876
Business and Commerce						
Commercial	-	946,213	21.72	2262	/acre	49,135
South Bristol Total	**2,232**	**946,213**	**21.72**	--	--	**452,011**
South Main Street						
Residential						
Residential Total	667	--	0.00	180.5	/DU	120,394
Business and Commerce						
Commercial	-	-1,481,837	-34.02	2262	/acre	-76,949
South Main Total	**667**	**-1,481,837**	**-34.02**	--	--	**43,444**
West Santa Ana Boulevard						
Residential						
Residential Total	1,308	--	0.00	180.5	/DU	236,094
Business and Commerce						
Commercial	-	-38,106	-0.87	2262	/acre	-1,979
West Santa Ana Total	**1,308**	**-38,106**	**-0.87**	--	--	**234,115**
Remaining Citywide						
Residential						
Residential Total	-	--	0.00	180.5	/DU	0
Business and Commerce						
Commercial	-	0	0.00	2262	/acre	0
Remaining Citywide Total	**-**	**0**	**0.00**	--	--	**-**
Focus Area Total	**13,195**	**-2,665,857**	**-61.20**			**2,243,264**
Grand Total	**13,195**	**-2,665,857**	**-61.20**			**2,243,264**

*Residential flow factors based on water demand factors multiplied by a 0.95 sewer factor

**Commercial flow factors based on OCSD Design and Construction Standards for Sanitary Sewers

APPENDIX B

CITY AND OCSD SEWER IMPROVEMENTS

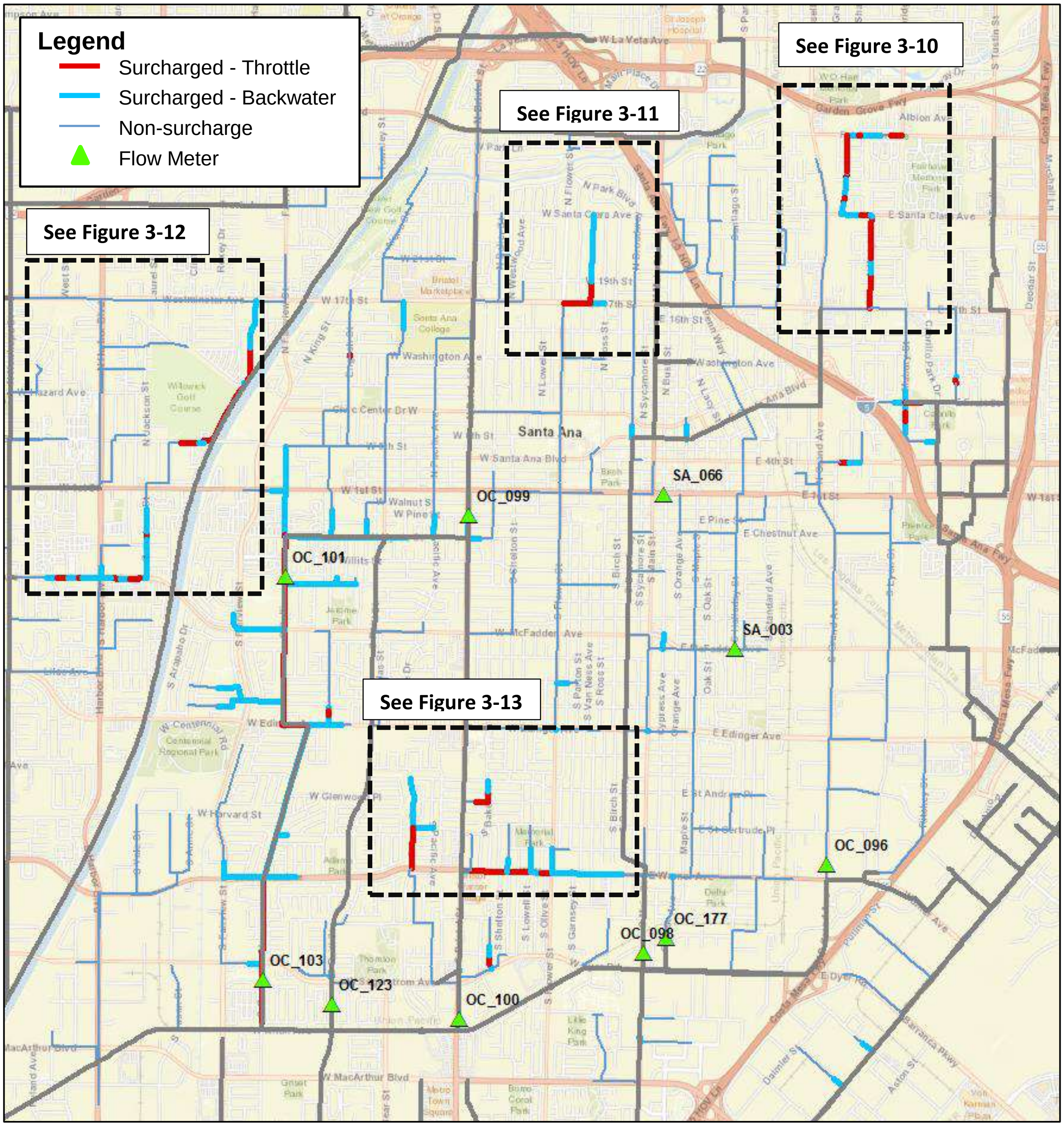


Figure ES4-1: Predicted Surcharge Pipes for Future Flows (2040) and PWWF

ES-5 Condition Assessment

CCTV inspection is the basic method used by the City to gather the data required to assess sewer condition. The City uses a specialist CCTV contractor to inspect pre-defined portions of the City's sewer system with the target of inspecting the entire system over a 5 to 8-year period. The CCTV contractor

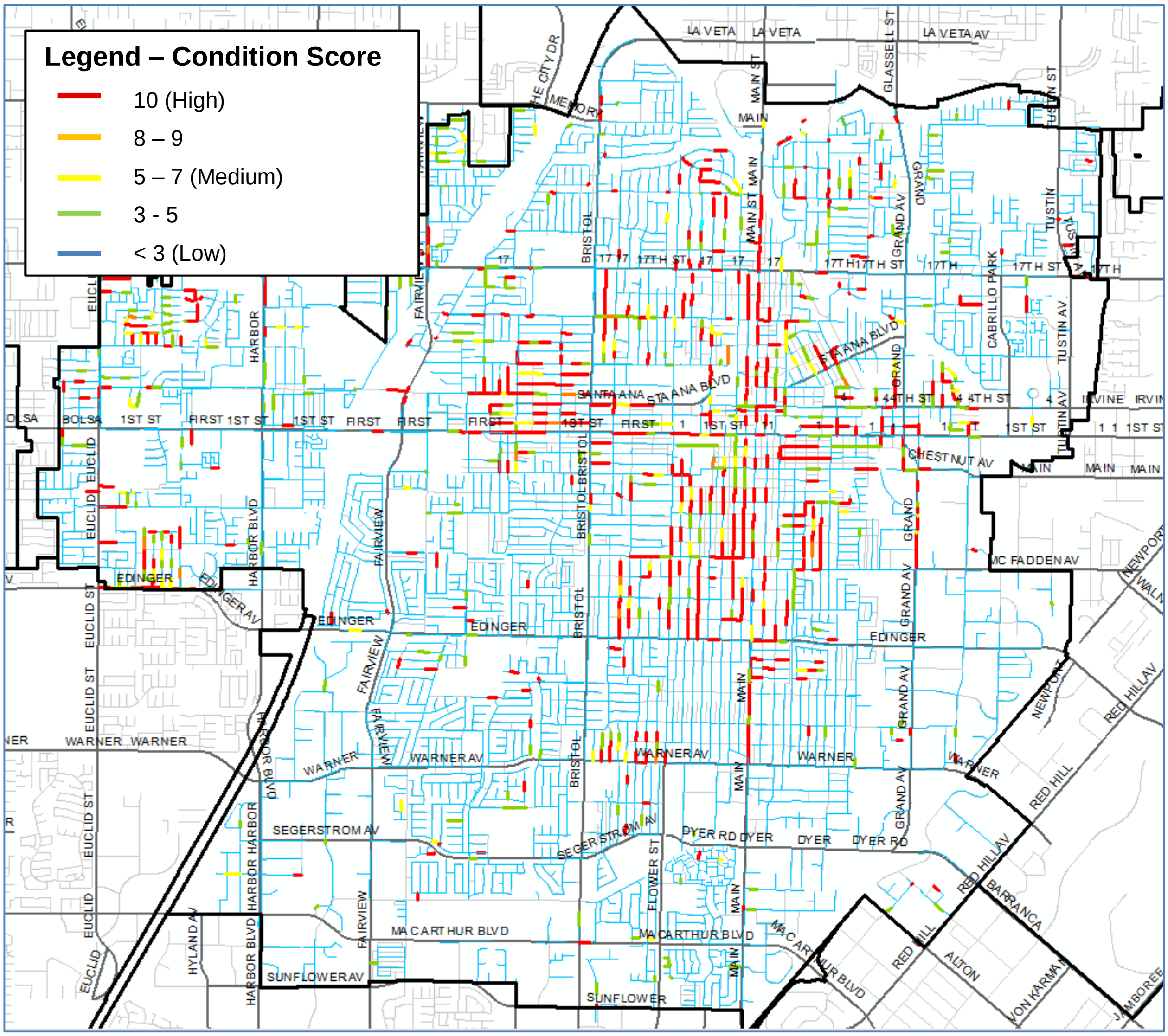
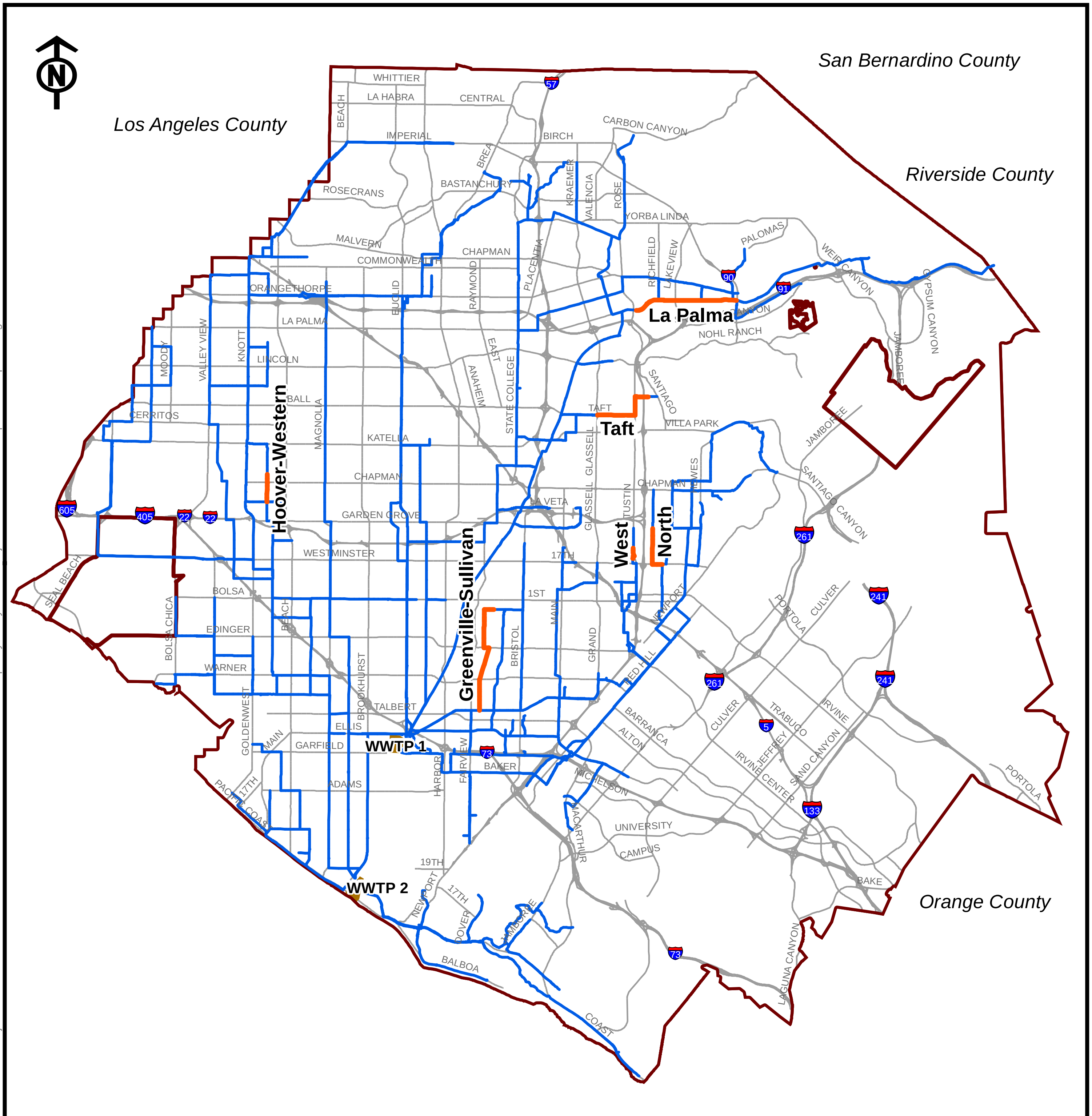


Figure ES5-1: Condition Assessment Map showing Composite Condition Scores

Capital improvement projects for sewer infrastructure are typically divided into two categories: 1) condition-based improvement projects utilizing replacement or rehabilitation (R&R) strategies, and 2) capacity improvement projects utilizing pipe upsizing or flow diversions (if applicable). Projects are triggered when; 1) existing pipe condition indicates risk of structural failure, and 2) existing and future flow projections exceed current hydraulic capacities. For this study, both condition and capacity projects were developed using a systematic process based on the following logical steps:

- Is the pipe surcharged resulting from insufficient capacity? If so, upsize pipe to convey future peak wet-weather flow (PWWF) projections.
- Has the pipe recently been lined? If so, then no project required but recommend on-going pipe inspection (CCTV).



Legend

- Capacity Improvement Project
- Major OCSD Sewers
- Major Streets and Highways
- OCSD Wastewater Treatment Plants
- OCSD Service Area

OCSD Collections Capacity Evaluation Master Plan Update

Capacity Improvement Projects

FIGURE 6-9

WOODARD &CURRAN

	DOC: Figure6-9.mxd
DATE: DECEMBER 2019	PROJECT #: 0172-022.00
DRAWN BY: KH	SOURCE:

APPENDIX C

WATER FLOW CALCULATIONS

Santa Ana GPU Area Existing Condition Water Flows

	Building(s)		Parcel	Flow	Unit of Measure	Total Flow
	Units	Square Feet	Acres	GPD		GPD
55 Freeway/Dyer Road						
Residential						
Single Family Residential	-	--	0.00	411	/DU	0
Multi Family Residential	1,221	--	0.00	211	/DU	257,631
Business and Commerce						
Commercial	-	5,666,453	130.08	2500	/acre	325,210
55/Dyer Total	**1,221**	**5,666,453**	**130.08**	--	--	**582,841**
Grand Avenue/17th Street						
Residential						
Single Family Residential	18	--	0.00	411	/DU	7,398
Multi Family Residential	543		0.00	211	/DU	114,573
Business and Commerce						
Commercial	-	1,400,741	32.16	2500	/acre	80,391
17th and Grand Total	**561**	**1,400,741**	**32.16**	--	--	**202,362**
South Bristol Street						
Residential						
Single Family Residential	-	--	0.00	411	/DU	0
Multi Family Residential	220		0.00	211	/DU	46,420
Business and Commerce						
Commercial	-	1,577,511	36.21	2500	/acre	90,537
South Bristol Total	**220**	**1,577,511**	**36.21**	--	--	**136,957**
South Main Street						
Residential						
Single Family Residential	705	--	0.00	411	/DU	289,755
Multi Family Residential	1,015		0.00	211	/DU	214,165
Business and Commerce						
Commercial	-	1,685,978	38.70	2500	/acre	96,762
South Main Total	**1,720**	**1,685,978**	**38.70**	--	--	**600,682**
West Santa Ana Boulevard						
Residential						
Single Family Residential	713	--	0.00	411	/DU	293,043
Multi Family Residential	1,945		0.00	211	/DU	410,395
Business and Commerce						
Commercial	-	3,090,472	70.95	2500	/acre	177,369
West Santa Ana Total	**2,658**	**3,090,472**	**70.95**	--	--	**880,807**
Remaining Citywide						
Residential						
Single Family Residential	55,346	--	0.00	411	/DU	22,747,206
Multi Family Residential	17,066		0.00	211	/DU	3,600,926
Business and Commerce						
Commercial	-	53,697,441	1232.72	2500	/acre	3,081,809
Remaining Citywide Total	**72,412**	**53,697,441**	**1232.72**	--	--	**29,429,941**
Focus Area Total	**6,380**	**13,421,155**	**308.11**			**2,403,648**
Grand Total	**78,792**	**67,118,596**	**1540.83**			**31,833,589**

*Residential demand factors based on MWDOC Orange County Water Reliability Study, 2015 Demand Factors (2016)

**Commercial demand factors based on City of Santa Ana Guidelines for Water and Sewer Facilities (2017)

Santa Ana Changes in Water Flow, Current GPU to Proposed

	Change in Building(s)		Parcel	Demand	Unit of Measure	Total Demand
	Units	Square Feet	Acres	GPD		GPD
55 Freeway/Dyer Road						
Residential						
Residential Total	7,222	--	0.00	190	/DU	1,372,180
Business and Commerce						
Commercial	-	-376,333	-8.64	2500	/acre	-21,599
55/Dyer Total	**7,222**	**-376,333**	**-8.64**	--	--	**1,350,581**
Grand Avenue/17th Street						
Residential						
Residential Total	1,766	--	0.00	190	/DU	335,540
Business and Commerce						
Commercial	-	-1,715,794	-39.39	2500	/acre	-98,473
17th and Grand Total	**1,766**	**-1,715,794**	**-39.39**	--	--	**237,067**
South Bristol Street						
Residential						
Residential Total	2,232	--	0.00	190	/DU	424,080
Business and Commerce						
Commercial	-	946,213	21.72	2500	/acre	54,305
South Bristol Total	**2,232**	**946,213**	**21.72**	--	--	**478,385**
South Main Street						
Residential						
Residential Total	667	--	0.00	190	/DU	126,730
Business and Commerce						
Commercial	-	-1,481,837	-34.02	2500	/acre	-85,046
South Main Total	**667**	**-1,481,837**	**-34.02**	--	--	**41,684**
West Santa Ana Boulevard						
Residential						
Residential Total	1,308	--	0.00	190	/DU	248,520
Business and Commerce						
Commercial	-	-38,106	-0.87	2500	/acre	-2,187
West Santa Ana Total	**1,308**	**-38,106**	**-0.87**	--	--	**246,333**
Remaining Citywide						
Residential						
Residential Total	-	--	0.00	190	/DU	0
Business and Commerce						
Commercial	-	0	0.00	2500	/acre	0
Remaining Citywide Total	**-**	**0**	**0.00**	--	--	**-**
Focus Area Total Change in Demand	**13,195**	**-2,665,857**	**-61.20**			**2,354,051**
Grand Total Change in Demand	**13,195**	**-2,665,857**	**-61.20**			**2,354,051**

*Residential demand factors based on MWDOC Orange County Water Reliability Study (2016)

**Commercial demand factors based on City of Santa Ana Guidelines for Water and Sewer Facilities (2017)

Santa Ana GPU Area Proposed Condition Water Flow Increases

	Building(s)		Parcel	Flow	Unit of Measure	Total Flow
	Units	Square Feet	Acres	GPD		GPD
55 Freeway/Dyer Road						
Residential						
Single Family Residential	-	--	0.00	369	/DU	0
Multi Family Residential	9,952			190	/DU	1,890,880
Business and Commerce						
Commercial	-	6,142,283	141.01	2500	/acre	352,519
55/Dyer Total	**9,952**	**6,142,283**	**141.01**	--	--	**2,243,399**
Grand Avenue/17th Street						
Residential						
Single Family Residential	9	--	0.00	369	/DU	3,321
Multi Family Residential	2,274			190	/DU	432,060
Business and Commerce						
Commercial	-	703,894	16.16	2500	/acre	40,398
17th and Grand Total	**2,283**	**703,894**	**16.16**	--	--	**475,779**
South Bristol Street						
Residential						
Single Family Residential	-	--	0.00	369	/DU	0
Multi Family Residential	5,492			190	/DU	1,043,480
Business and Commerce						
Commercial	-	5,082,641	116.68	2500	/acre	291,703
South Bristol Total	**5,492**	**5,082,641**	**116.68**	--	--	**1,335,183**
South Main Street						
Residential						
Single Family Residential	582	--	0.00	369	/DU	214,758
Multi Family Residential	1,726			190	/DU	327,940
Business and Commerce						
Commercial	-	946,662	21.73	2500	/acre	54,331
South Main Total	**2,308**	**946,662**	**21.73**	--	--	**597,029**
West Santa Ana Boulevard						
Residential						
Single Family Residential	507	--	0.00	369	/DU	187,083
Multi Family Residential	3,413			190	/DU	648,470
Business and Commerce						
Commercial	-	2,808,805	64.48	2500	/acre	161,203
West Santa Ana Total	**3,920**	**2,808,805**	**64.48**	--	--	**996,756**
Remaining Citywide						
Residential						
Single Family Residential	55,094	--	0.00	369	/DU	20,329,686
Multi Family Residential	36,004			190	/DU	6,840,760
Business and Commerce						
Commercial	-	57,283,531	1315.05	2500	/acre	3,287,622
Remaining Citywide Total	**91,098**	**57,283,531**	**1315.05**	--	--	**30,458,068**
Focus Area Total	**23,955**	**15,684,285**	**360.06**			**5,648,146**
Grand Total	**115,053**	**72,967,816**	**1675.11**			**36,106,214**

*Residential demand factors based on MWDOC Orange County Water Reliability Study, 2025 to 2040 Demand Factors (2016)

**Commercial demand factors based on City of Santa Ana Guidelines for Water and Sewer Facilities (2017)

Appendix H-b Water Supply & Demand Technical Report

Appendices

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CITY OF SANTA ANA GENERAL PLAN UPDATE

WATER SUPPLY & DEMAND TECHNICAL REPORT

City of Santa Ana
Orange County, California

Prepared For

PLACEWORKS
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Santa Ana, CA 92707
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Prepared By

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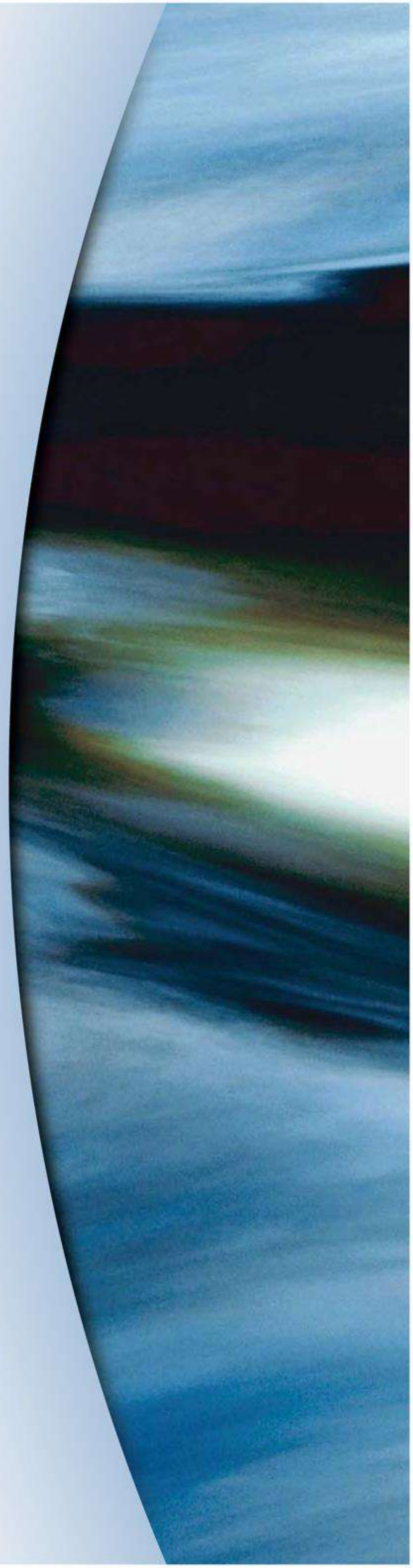
Principal / Stormwater Manager

Date Prepared: May 29, 2020



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CITY OF SANTA ANA
GENERAL PLAN UPDATE

WATER SUPPLY & DEMAND TECHNICAL REPORT

CITY OF SANTA ANA
ORANGE COUNTY, CALIFORNIA

PREPARED FOR:

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DATE PREPARED: MAY 29, 2020

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APPENDICES

1. INTRODUCTION & BACKGROUND

The City of Santa Ana ("City") is currently undergoing a General Plan Update (GPU) which is intended to shape development in the City over the next 30-plus years. A General Plan is the principal long-range policy and planning document for guiding the physical development, conservation, and enhancement of California cities and counties. As part of the California Environmental Quality Act (CEQA) process associated with General Plan Updates, water supplies that support the existing and proposed land uses will be analyzed at a level consistent with the city-wide program-level planning of an EIR.

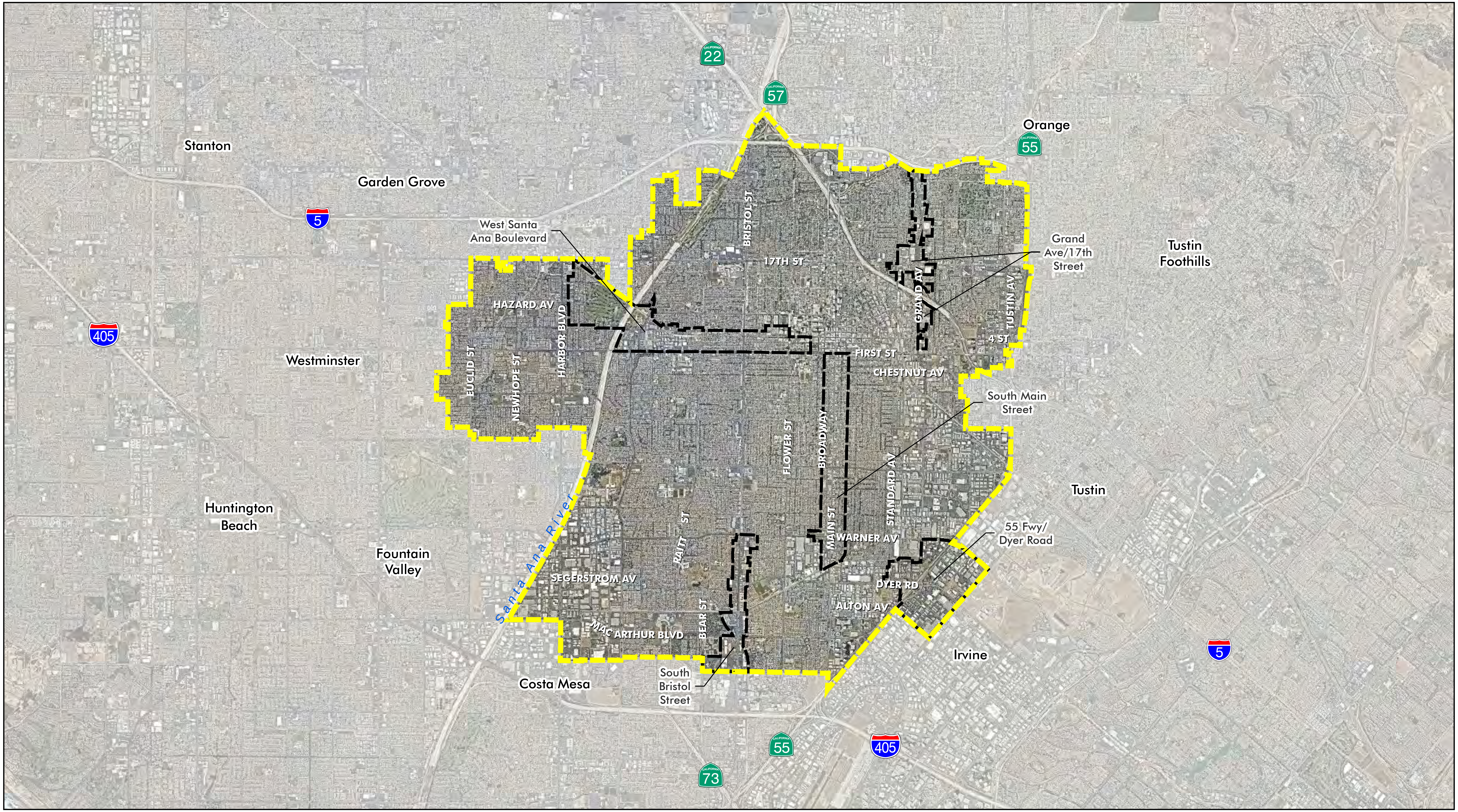
The City is located in the center of Orange County and is bounded by the City of Orange to the north, the cities of Irvine and Tustin to the east, Fountain Valley and Westminster to the west, and Costa Mesa to the south. The GPU includes five "Focus Areas" throughout the City. Focus Areas will feature the majority of land use changes and proposed increases in land use density in addition to Citywide land use changes also proposed outside of the Focus Areas. Details of these Focus Areas are listed below and shown in Figure 1:

Table 1 City of Santa Ana GPU Focus Areas

Focus Area	Acreage	Location within the City	Primary Existing Land Uses
West Santa Ana Boulevard	604 acres	Central portion of the City between 1st Street and 5th Street	• Low density residential • Industrial • Open Space
South Bristol Street	236 acres	South central portion of City along Bristol Street	• General Commercial • South Bristol Street
Grand Avenue/17th Street	202 acres	North east portion of City along 17th Street	• General Commercial • Professional/Admin Office
South Main Street	408 acres	Central portion of City along the Main Street corridor	• Low density residential • General commercial
55 Freeway/Dyer Road	438 acres	South east portion of City off the 55 Freeway	• General Commercial • Professional/Admin Office

The proposed land use changes will increase residential land uses and commercial square footage. An estimated growth of 36,261 dwelling units is anticipated across the City as compared to existing land use, concentrated mainly among the five Focus Areas and additional specific plan and special zoning areas. Approximately 5.8 million square feet of additional commercial land uses are anticipated across the City as compared to existing land use, and a corresponding increase of 11,436 Citywide jobs is anticipated.

This report analyzes the impacts the proposed GPU will have on existing water supplies from anticipated increases in demands from residential and commercial land use increases. The report will include relevant details on the City's existing and projected water demands, how these demands will be met with the City's portfolio of various sources of water supply, and how the Santa Ana GPU will impact these available supplies. As water is supplied on a Citywide scale and is consistent throughout the entire City as well as the Focus Areas, the analysis within this report focuses only on Citywide water demands and supplies. Any significant impacts will be identified by analyzing the CEQA thresholds of significance as they relate to water supply. The main documents to support this analysis include the City's 2015 Urban Water Management Plan, the Metropolitan Water District of Southern California (Metropolitan) 2015 UWMP, the 2018/19 Orange County Water District (OCWD) Engineer's Report and internal communication with City staff.



Aerial Date: 09/26/2018

Santa Ana GPU and Focus Areas Aerial Extent

Figure 1

City of Santa Ana General Plan Update

4/10/2020

Santa Ana City Boundary

Focus Area

FUSCOE ENGINEERING

0 0.5 1 2 Miles

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2. CITY WATER SUPPLIES AND DEMAND

2.1 CITY WATER SUPPLIES

The City's water supply comes from a combination of imported water, local groundwater and recycled water to satisfy water demands. The City receives water supplies from Metropolitan Water District of Southern California (Metropolitan) and the Orange County Water District (OCWD). The City is a member agency of Metropolitan and receives imported water from the State Water Project and the Colorado River under agreements with Metropolitan. OCWD manages the Orange County Groundwater Basin ("OC Basin" or "Basin") and provides groundwater resources to the City.

The City maintains 444 miles of transmission and distribution mains, nine reservoirs with a storage capacity of 49.3 million gallons, seven pumping stations, 20 wells, and seven imported water connections. The seven imported water connections to the Metropolitan System are described in Table 2 below.

Table 2 City of Santa Ana Connections to Metropolitan Facilities

MWD Connection	Name of Connection	Normal Operating Capacity (MGD)	Design Capacity (MGD)
SA-1	Bristol	5.17	6.46
SA-2	First	5.17	9.69
SA-3	McFadden	5.17	6.46
SA-4	Warner	4.85	6.46
SA-5	Alton	4.85	12.93
SA-6	Santa Clara	7.76	12.93
SA-7	Red Hill	4.85	32.31

From 2005-2015, Metropolitan delivered between 3,000 AF or 2.6 MGD (2015, lowest delivery) to 13,000 AF or 11.6 MGD (2005, highest delivery) to the City.[1] The design capacity of the Metropolitan connections is more than adequate to deliver imported to the City as shown in the table above.

The City's Water Utility provides water service within a 27-square mile service area. The service area includes the City of Santa Ana and a small neighborhood in the City of Orange, near Tustin Avenue and Fairhaven by the northeast corner of Santa Ana. See Table 3 which shows the City's recent water supply to satisfy demands from 2015.

Table 3 2015 Projected and Actual Water Supply and Demand (Acre-feet)

Land Use Type	2010 UWMP Projected 2015 Demand	Actual 2015 Demand
Single Family	18,368	14,084
Multi-Family	13,563	10,399

[1] 2015 Metropolitan UWMP.

Other (CII)	15,684	12,025
Landscape	185	147
Total	**47,800**	**36,656**
Notes: Source: 2010 and 2015 City of Santa Ana UWMPs		

As shown in Table 3 above, there was a decrease in water supplied to the City in 2015 as to what was predicted to be delivered in the 2010 UWMP[2] (47,800 AF) by approximately 23%. This is likely due to Senate Bill (SB) x7-7 which requires the State of California to reduce urban water use by 20% by the year 2020 as described in more detail below. Similarly, the Executive Order mandated by California Governor Edmund "Jerry" Brown in April 2015 in response to the drought that started in 2011 further required a collective reduction in statewide urban water use of 25% which would also reduce Citywide demands. In addition, UWMPs are typically developed in a conservative manner and tend to overestimate future water demands.

As of 2018-19, 77% of the City's water supply is from OC Basin groundwater and 23% is from Metropolitan imported water and recycled water.[3]

OCWD Groundwater

The primary source of water for the City is the Orange County Groundwater Basin ("OC Basin") which is managed by the Orange County Water District (OCWD). The OC Basin underlies the north half of Orange County beneath broad lowlands. The OC Basin covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, the Pacific Ocean to the southwest, and terminates at the Orange County line to the northwest, where its aquifer systems continue into the Central Basin of Los Angeles County.

The OC Basin storage capacity is estimated to be 66 million AF[4], of which only a fraction is available for use to prevent against physical damage to the Basin such as seawater intrusion or land subsidence. To ensure the Basin is not overdrawn, OCWD recharges the Basin with local and imported water. The Basin is recharged primarily by four sources including local rainfall, storm and base flows from the Santa Ana River (SAR), purchased Metropolitan imported water; and highly treated recycled water. Basin recharge occurs largely in the following recharge basins that are located in or adjacent to the City of Anaheim:

- Warner Basin: A 50-foot-deep recharge basin located next to the SAR at the intersection of the 55 and 91 freeways;
- Burris Basin: Located between Lincoln Avenue and Ball Road in the City of Anaheim;
- Kraemer Basin: Located adjacent to Burris Pit;
- Santiago Creek: Located in the City of Orange between Villa Park Road and E. Bond Avenue.

[2] 2010 City of Santa Ana Urban Water Management Plan. Found here: https://water.ca.gov/LegacyFiles/urbanwatermanagement/2010uwmps/Santa%20Ana,%20City%20of/Santa%20Ana%20Final%202010%20UWMP.pdf
[3] 2018/2019 OCWD Engineer's Report.
[4] OCWD Groundwater Management Plan 2015 Update. June 17, 2015.

The OC Basin (also referred to as Basin 8-1) has been designated as a medium-priority basin. As mentioned, SGMA provides authority for agencies like OCWD to develop and implement Groundwater Sustainability Plans or alternative plans ("Alternatives") that demonstrate the basin has operated within its sustainable yield over a period of at least 10 years. OCWD decided to submit an Alternative for evaluation by the California Department of Water Resources (DWR). An Alternative is required to be submitted to DWR for review no later than January 1, 2017, and every 5 years thereafter. In general, Alternatives must be consistent with one of the following (Water Code §10733.6(b)):

- A plan developed pursuant to Part 2.75 (commencing with Section 10750) or other law authorizing groundwater management.
- Management pursuant to an adjudication action.
- An analysis of basin conditions that demonstrates that the basin has operated within its sustainable yield over a period of at least 10 years. The submission of an alternative described by this paragraph shall include a report prepared by a registered professional engineer or geologist who is licensed by the state and submitted under that engineer's or geologist's seal.

OCWD prepared an Alternative that satisfies the third bullet point above to prove the OC Basin has operated within its sustainable yield over a period of at least 10 years. The Basin 8-1 Alternative can be found on OCWD's website. The Alternative states that Basin 8-1 has operated within its sustainable yield for more than 10 years without experiencing significant and unreasonable (1) lowering of groundwater levels, (2) reduction in storage, (3) water quality degradation, (4) seawater intrusion, (5) inelastic land subsidence, or (6) depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water. In addition, Basin 8-1 has not been in conditions of critical overdraft. DWR has one year to evaluate the Basin 8-1 Alterative. The paragraphs below will further explain how OCWD successfully manages the OC Basin to meet these new groundwater monitoring and management requirements.

OCWD manages the Basin through the Basin Production Percentage (BPP) which is determined each water year. The BPP is set based on groundwater conditions, availability of imported water supplies, water year precipitation, SAR runoff, and basin management objectives. The BPP represents an established percentage identifying the amount of groundwater all pumpers in the Basin can pump without paying a "pumping tax" or Basin Equity Assessment (BEA) to OCWD. For example, if the BPP is set to 75%, all pumpers within the Basin, including the City, can supply 75% of their water needs from groundwater supplies at a cost significantly less than the cost of imported water. If groundwater production is equal to or less than the BPP (i.e. less than 75% in the example above), all producers within the Basin pay a replenishment assessment (RA) fee which is used to fund groundwater replenishment and recharge programs aimed at ensuring the long-term viability and stability of the Basin. If groundwater production is greater than the established BPP for that water year (i.e. greater than 75% in the example above), the BEA is determined for the producer of that amount of groundwater provided in excess of the BPP. The BEA is an additional fee paid on each AF of water pumped above the BPP, making the total cost of that additional water equal to the higher cost of imported water from Metropolitan.

According to OCWD's Engineer's Report for fiscal year 2018/19, total water demands within the OCWD jurisdiction were 393,222 AF for the 2018-19 water year, and estimated to be 415,000 for the 2019-20 water year. Groundwater production totaled 303,496 AF. As shown in Table 4 below, the City utilized 25,512.4 AF of groundwater and 7,743.0 AFY of supplemental water in the 2018-19 water year.

Table 4 City of Santa Ana Groundwater Production Data 2018-19

Groundwater Producer	Groundwater	Supplemental Water (AF)	(AF)	Actual BPP
	Total	Deliveries	Grand Total	Non-Irrigation Only
City of Santa Ana	25,512.4	7,743.0	33,255.4	76.7
Source: OCWD 2018-19 Engineer's Report				

Over the recent past, production capability of the Basin has increased as a result of increased wastewater reclamation at the Groundwater Replenishment System (GWRS) located in Fountain Valley. The GWRS, which is designed to turn wastewater into drinking water, is one of the most technologically advanced wastewater treatment plants in the world. A treatment plant expansion of 30 million gallons per day was recently put on line by OCWD increasing the recharge capacity of the GWRS to 100 million gallons per day. This equates to the recycling of over 110,000 AFY of wastewater back into the Basin for future extraction and potable use. A final expansion of the treatment system has been designed and currently under construction to expand to a capacity of 130 million gallons per day. Expansion projects to the GWRS increase local water supply reliability and ensure low-cost water supplies throughout northern Orange County, including the City of Santa Ana.

Metropolitan Imported Water

The City of Santa Ana is one of only three retail member agencies of Metropolitan in Orange County. As a member agency, pursuant to the Metropolitan Act, the City has preferential rights to a certain percentage of water delivered to Metropolitan each year primarily from the State Water Project and/or the Colorado River Aqueduct as well as other Metropolitan storage programs. Being a member agency of Metropolitan puts the City in a better position relative to receiving water directly from Metropolitan, as opposed to other agencies in Orange County which obtain their imported Metropolitan water through MWDOC. The main sources of water Metropolitan provides to the City include water from northern California delivered via the State Water Project (SWP) and water from the Colorado River Basin delivered via the Colorado River Aqueduct. More details on these sources of imported water are explained below.

<u>Colorado River</u>

The Colorado River was Metropolitan's original source of water after Metropolitan's establishment in 1928. Lake Mead and Lake Powell, the two largest reservoirs in the United States, can store four times the annual flow of the Colorado River. River flows are primarily generated from snowpack in the Rocky Mountains. Colorado River water is allocated and delivered to seven states in the US including Colorado, Utah, Wyoming, New Mexico, Arizona, Nevada and California. Mexico also has an allocation of 1.5 million acre-feet (MAF) along the Colorado River each year.

California's urban water allocation is managed by Metropolitan and imported from the Colorado River via the Colorado River Aqueduct (CRA) which is stored at Diamond Valley Lake and Lake Mathews in Riverside County. The CRA includes supplies from the implementation of the Quantification Settlement Agreement (QSA) and related agreements to transfer water from agricultural agencies in Imperial County to urban uses throughout Southern California including Los Angeles, Orange County and San Diego. The 2003 QSA enabled California to implement major Colorado River water conservation and transfer programs, stabilizing water supplies for 75 years and reducing the state's demand on the river to its 4.4 MAF entitlement. Colorado River transactions are potentially available to supply additional water up to the CRA capacity of 1.25 MAF on an as-needed basis.

California is apportioned the largest allocation on the River of 4.4 MAF of water from the Colorado River each year plus one-half of any surplus that may be available for use collectively in Arizona, California, and Nevada. In addition, California has historically been allowed to use Colorado River water apportioned to but not used by Arizona or Nevada. Metropolitan has a basic entitlement of 550,000 AFY of Colorado River water, plus surplus water up to an additional 662,000 AFY if certain conditions exist. The remainder of California's allocation goes to Imperial County, primarily to the Imperial Irrigation District, and is used mainly for agriculture production.

Over the past 19 years (2000-2018), there have only been three years when the Colorado River flow has been above average.[5] On May 20, 2019, the Department of the Interior, Bureau of Reclamation and representatives from all seven Colorado River Basin states and signed completed drought contingency plans for the Upper and Lower Colorado River basins. These completed plans are designed to reduce risks from ongoing drought and protect the single most important water resource in the western United States. In addition to the voluntary reductions and other measures to which the basin states agreed, Mexico has also agreed to participate in additional measures to protect the Colorado River Basin.[6]

<u>State Water Project</u>
The State Water Project (SWP) collects water from rivers in Northern California and redistributes it to the water-scarce but populous central and southern portions of California through a network of aqueducts, pumping stations and power plants. Approximately 70% of the water provided by the SWP is used for urban areas and industry in Southern California and the San Francisco Bay Area, and 30% is used for irrigation in the Central Valley. The availability of water supplies from the SWP can be highly variable. A wet water year may be followed by a dry water year which restricts the amount of water that can be delivered throughout California. Metropolitan's SWP imported water is stored at Castaic Lake on the western side of Metropolitan's service area and at Silverwood Lake near San Bernardino, as well as in Diamond Valley Lake.

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[5] USBR Lake Mead at Hoover Dam Water Elevation Data. Found here: https://usbr.gov/lc/region/g4000/hourly/mead-elv.html
[6] USBR News Releases. Found here: https://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=66103

The Sacramento-San Joaquin River Delta (Delta) is key to the SWP's ability to deliver water to its agricultural and urban contractors. The Delta faces many challenges concerning its long-term sustainability such as climate change posing a threat of increased variability in floods and droughts. Sea level rise complicates efforts in managing salinity levels and preserving water quality in the Delta to ensure a suitable water supply for urban and agricultural use. Furthermore, other challenges include continued subsidence of Delta islands, many of which are below sea level, and the related threat of a catastrophic levee failure as the water pressure increases, or as a result of a major seismic event.

Metropolitan's Board approved a Delta Action Plan in June 2007 that provides a framework for staff to pursue actions with other agencies and stakeholders to build a sustainable Delta and reduce conflicts between water supply conveyance and the environment. The Delta action plan aims to prioritize immediate short-term actions to stabilize the Delta while an ultimate solution is selected, and mid-term steps to maintain the Delta while a long-term solution is implemented. Currently, Metropolitan is working towards addressing three basic elements: Delta ecosystem restoration, water supply conveyance, and flood control protection and storage development.

In April 2015, the Brown Administration announced California WaterFix, as well as a separate ecosystem restoration effort called California EcoRestore. Together, the California WaterFix and California EcoRestore will make significant contributions toward achieving the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The WaterFix is aimed at making physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, south-of-Delta SWP water supplies, and water quality. The WaterFix includes the construction of two tunnels up to 150 feet below ground and three new intakes, each with 3,000 cubic-feet per second (cfs) capacity and an average annual yield of 4.9 million acre-feet designed to protect California's water supplies. These proposed upgrades would provide protection against water supply disruption from failure of aging levees due to sea-level rise, earthquakes and flood events.

In May 2019, the Newsom Administration revised their stance on the WaterFix in response to multiple legal challenges. The revised project would include the construction of one tunnel instead of the previously proposed two-tunnel system. At this time, the DWR and the US Bureau of Reclamation (BOR) have withdrawn their water rights petition (the WaterFix Petition) and the project has been postponed indefinitely.

Recycled Water

The City depends on OCWD for its recycled water supply for non-potable uses such as irrigation. OCWD provided 352 AF of recycled water to the City of Santa Ana in 2015 as part of the Green Acres Project (GAP). OCWD owns and operates the GAP, a water recycling system that provides up to 8,400 AFY of recycled water as an alternate source of water that is mainly delivered to parks, golf courses, greenbelts, cemeteries, and nurseries in the cities of Costa Mesa, Fountain Valley, Newport Beach, in addition to Santa Ana. The City maintains an agreement with OCWD to supply GAP water to customers where available. It is anticipated that recycled water supplied to the City will maintain around 300 AFY through 2040.

2.2 CITY WATER DEMANDS

The City's Water Utility provides water service within a 27-square mile service area to a population of approximately 335,299 as of 2015.[7] . The City is almost completely built-out. Approximately 67% of the City's water demand is residential including single family and multi-family residential units. Commercial land uses, including dedicated landscape, accounts for the remaining 33% of the total demand. The 2015 UWMP[8] highlighted that water demands throughout the City were 36,656 AF from July 2014 to June 2015. The 2010 UWMP anticipated water demands in 2015 to be much larger at 47,800 AF. As mentioned, the difference is likely because of the mandatory water restrictions from the Governor's Executive Order and the fact that UWMPs are typically developed in a conservative manner and tend to overestimate future water demands.

In April 2015 Governor Brown issued an Executive Order as a result of one of the most severe droughts in California's history, requiring a collective reduction in statewide urban water use of 25% by February 2016, with each agency in the state given a specific reduction target by DWR. In response to the Governor's mandate, the City began to track its water wasting prohibition enforcement activities. On June 2, 2015, the City declared a Phase 2 water supply shortage in Resolution No. 2015-025 by formally requiring all water consumers to reduce use by 12% relative to their 2013 consumption. Additionally, on August 4, 2015, a water wasting penalty rate was established by Resolution No. 2015-047. This new penalty rate permits City staff to penalize those users not meeting their water use reduction targets of 12%. The City of Santa Ana as a whole met its State mandated target; and as a result the City did not have to impose any monetary penalties on any of its users.

As of April 7, 2017, Governor Brown ended the drought State of Emergency in most of California, while maintaining water reporting requirements and prohibitions on wasteful practices such as watering during or right after rainfall.[9] The City continues to promote water use efficiency and currently has a goal to continue to reduce water demands by 3% compared to 2013 consumption. In addition, the City only allows outdoor watering to every other day or Monday, Thursday, and Saturday and only between the hours of 6 PM and 6 AM.[10]

Such restrictions have significantly reduced water demands throughout California. In addition to these mandated restrictions, cities must follow the Water Conservation Act of 2009, also known as Senate Bill (SB) x7-7. This law required the State of California to reduce urban water use by 20% by the year 2020. The City must determine baseline water use during their baseline period and water use targets for the years 2015 and 2020 to meet the state's water reduction goal. The City's 2015 target was 123 gallons per capita per day (GPCD) and the 2020 target is 116 GPCD. The 2015 UWMP reported that the City has already met both the 2015 and 2020 water use targets with an actual use in 2015 of 83 GPCD. This is likely due to increased

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[7] Center of Demographics Research (CDR) at California State University, Fullerton

[8] 2015 City of Santa Ana Urban Water Management Plan. Found here: https://www.santa-ana.org/sites/default/files/Documents/urban_water_management_plan.pdf

[9] SWRCB Water Conservation Portal – Emergency Conservation Regulation, accessed on 10/01/2019. Found here: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/emergency_regulation.shtml

[10] City of Santa Ana – Water Conservation Website, accessed 10/01/2019. Found here: https://www.santa-ana.org/sites/default/files/Documents/Drought_Flyer_Final_Eng_No_Cropmarks.pdf

conservation as required by the Governor's Executive Order during severe drought conditions throughout California.

The City's water demand has been decreasing in recent years due to the combination of the Governor's Executive Order and SBx7-7 goals. More recently, the City has documented a per capita usage of 66 gpcd[11] which highlights the continued conservation efforts.

The City's water demands are then expected to increase by approximately 8% from 2015 to 2040 as shown in the table below.

Table 5 City of Santa Ana Projected Total Water Demands

Water Demand Type	2015	2020	2025	2030	2035	2040
Potable and Raw Water	36,656	36,678	39,397	39,669	39,658	39,716
Recycled Water	352	320	320	320	320	320
Total Water Demand	**37,008**	**36,998**	**39,717**	**39,989**	**39,978**	**40,036**
Source: 2015 City of Santa Ana UWMP						

As shown above, it is projected that water demands will increase from 37,008 AF in 2015 to 40,036 AF in year 2040 representing an increase of 3,028 AF. These estimates are approximately 10,000 AF less than what was predicted in the 2010 UWMP further highlighting the conservative nature of UWMP preparation.

The 2015 Metropolitan UWMP stated that Metropolitan would be able to meet the demands of its member agencies, including the City of Santa Ana, through 2040. Therefore, imported water demands for the City are projected to be met through the 20-year requirements of SB 610 and beyond. The City of Santa Ana 2015 UWMP also confirmed the ability of the local supplies and the OC Basin to meet the growing demands of the City. The ability for the City to meet these growing demands in multiple climate scenarios is explained in the sections below.

[11] City of Santa Ana Website: Water Conservation. Found here: https://www.santa-ana.org/pw/water-conservation

3. SANTA ANA GPU CURRENT WATER DEMANDS

As UWMPs typically overestimate water demand projections, as identified above, the City provided water use data to update water demands estimates since the 2015 UWMP. This assisted in developing an updated estimate for current water demands throughout the City.

For each land use in the City of Santa Ana and its Focus Areas, water demand estimates were developed to provide a baseline condition and to allow for comparisons against any proposed land use changes. Water demands were estimated using the average gallons per capita water use estimate of 66 gallons per capita per day (gpcd).[12] This gpcd estimate was then multiplied by dwelling unit buildout estimates and residents per dwelling unit assumptions provided by Placeworks. Commercial water demand factors were provided from the City of Santa Ana Guidelines for Water and Sewer Facilities (2017). In addition, the City provided data for 2018/2019 water use from irrigation that was also used to establish a total baseline existing condition water demand for 2020.

Table 6 provides a summary of the existing condition water demand for the City. Detailed calculations are provided in Appendix A.

Table 6 Existing Condition Average Daily Water Demand

Land Use	Land Use Count	Residents Per Dwelling Unit	Water Demand Factor	Water Demands (AFY)
Single Family Residential	56,782 DUs	4.60	66 gpcd	19,323
Multifamily Residential	22,010 DUs	3.60	66 gpcd	5,862
Commercial	1,541 acres (67 million sf)	--	2,500 gpd/acre	4,318
Potable and Recycled Irrigation	--	--	--	1,648
Citywide Total	**78,792**	**--**	**67,118,596**	**31,151**
Notes: *Land use data supplied and dwelling unit residence assumptions provided by Placeworks, 2020*				

Under the existing conditions, average daily water demands are estimated at 31,151 AFY through the City. Based on correspondence with City staff, the existing water demand estimate is within range of actual water use based on 2018/19 data thereby confirming this methodology is appropriate in estimating water demands.

It is important to note that the 2015 UWMP projected water demands to be 36,998 AFY in 2020 based on previous population projections. This is nearly 6,000 AFY greater than actual water use within the City within the same time frame. This is likely due to the conservative nature of UWMPs as well as ongoing water conservation efforts employed by the City to reduce potable water demands.

[12] City of Santa Ana Website: Water Conservation. Found here: https://www.santa-ana.org/pw/water-conservation

Existing water demands for the City can be compared to proposed increases in land uses under the Santa Ana GPU to determine if adequate supplies are available to meet increased water demands. See below for the proposed water demand calculations, ability of the City to meet projected water demand increases and the CEQA impact assessment.

4. THRESHOLDS OF SIGNIFICANCE

California Environmental Quality Act (CEQA) significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as water supply reliability. According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would impact any of the items listed below.

4.1 UTILITIES AND SERVICE SYSTEMS THRESHOLDS (CEQA CHECKLIST SECTION XIX)

Would the Project:

B. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold.

5. CEQA IMPACT ASSESSMENT

The purpose of the proposed conditions evaluation is to determine potential impacts under CEQA related to water supply from the proposed Santa Ana GPU.

5.1 PROPOSED WATER DEMANDS

Under the proposed land use changes, water demands will increase throughout the City of Santa Ana due to increases in dwelling units and commercial land uses. A total increase of 36,261 dwelling units and increase of approximately 5,849,220 sf of non-residential uses are proposed.

Methodology to estimate increases in water demands is similar to the methodology utilized for establishing the existing condition baseline. However, a 20% reduction factor was employed to the gpcd multi-family residential water demands to account for required reductions in water demands associated with new developments including the California Green Building Code standards (e.g. mandatory low flow toilets and efficient fixtures) as well as model efficiency landscape guidelines. A factor of 53 gpcd was utilized to project multi-family water demands into the future associated with the Santa Ana GPU. A slight decrease in single family residences is anticipated; this decrease assumed 66 gpcd associated with higher usage, older homes. The City has noted that the reduction in per capita water use proposed here has already been observed during recent years (2019-2020) and ranges between 44 gpcd – 58 gpcd based on water usage reporting requirements the City must send to the California Department of Water Resources each month. The commercial water demand factor of 2,500 gpd/acre remained consistent with existing water demand factors although this approach is likely overestimated and therefore conservative.

Table 7 shows the proposed water demands associated with each land use change. Detailed calculations and associated exhibits are included in Appendix A.

Table 7 Existing Condition to Proposed Condition Water Demand Increases

Land Use	Land Use Count	Residents Per Dwelling Unit	Water Demand Factor	Water Demands (AFY)
Single Family Residential	-590 DUs	4.30	66 gpcd	-188
Multifamily Residential	+36,851 DUs	3.10	53 gpcd	6,761
Commercial	+134 acres (+5.85 million sf)	--	2,500 gpd/acre	376
Citywide Total Projected Increase in Demands				+6,950
Existing Condition Total Demands				31,151
Proposed Condition Total Demands				38,101
Notes: Land use data supplied and dwelling unit residence assumptions provided by Placeworks, 2020				

Full implementation of the Santa Ana GPU has the potential to increase water demand by 6,950 AFY within the City.

5.2 WATER SUPPLY FINDINGS

As shown above, the proposed GPU will likely increase demands on existing water supplies. As part of proposed GPU impact analysis, existing and proposed water demands were estimated using a combination of City of Santa Ana commercial water demand factors and City-specific per capita water demand data as shown in Table 7. As shown, an increase in 6,950 AFY was estimated from existing land use to the land use under the proposed GPU. The following section highlights the ability of the City to adequate supply water resources to support the increases in demands proposed under the GPU.

5.2.1 City of Santa Ana 2015 UWMP

The findings of the proposed increases in water demands as compared to current water demands were compared to the 2015 UWMP findings for normal, single dry year and multiple dry year water supply/demand scenarios. To determine increases in water supply needed to support anticipated increases in water demands through 2040, the 2015 UWMP utilizes best available buildout data and population projections from a variety of planning documents, including data from Center for Demographic Research, and water supply and climate models.

Forecast Year	2020	2025	2030	2035	2040
Normal Year					
Supply totals	36,998	39,717	39,989	39,978	40,036
Demand totals	36,998	39,717	39,989	39,978	40,036
Single -Dry Year					
Supply totals	39,218	42,100	42,388	42,377	42,438
Demand totals	39,218	42,100	42,388	42,377	42,438
Multiple-Dry Year					
First year					
Supply totals	39,218	42,100	42,388	42,377	42,438
Demand totals	39,218	42,100	42,388	42,377	42,438
Second year					
Supply totals	39,218	42,100	42,388	42,377	42,438
Demand totals	39,218	42,100	42,388	42,377	42,438
Third year					
Supply totals	39,218	42,100	42,388	42,377	42,438
Demand totals	39,218	42,100	42,388	42,377	42,438
Source: 2015 City of Santa Ana UWMP					

As shown above, in all climate scenarios analyzed in the 2015 UWMP, available water supplies are projected to meet demands. Reliability of local water supplies will be ensured through continued implementation of the City, OCWD and Metropolitan water supply and demand management strategies.

See below for a summary of 2015 UWMP findings as well as water demands calculated as part of this EIR technical report for existing and proposed GPU water use.

Table 8 Water Demand Planning Document Comparison

Source	Water Demand Scenario	Water Demand Estimate
EIR Tech Report	Existing Water Demands Estimate	31,151 AFY
EIR Tech Report	Proposed GPU Water Demand Estimate	36,377 AFY
2015 UWMP	Projected 2020 Water Demands (Normal – Multiple Dry Year)	36,998 – 39,218 AFY
2015 UWMP	Projected 2040 Water Demands (Normal – Multiple Dry Year)	40,036 – 42,438 AFY

As shown above, the projected water demands from the proposed GPU is well within the projected total water demands for 2040 in the 2015 UWMP for normal, dry year and multiple dry year scenarios. It is not anticipated that implementation of the GPU will exceed projected long term water supplies. This is further supported by OCWD and Metropolitan regional water projections and purchase agreements as summarized below.

5.2.2 OCWD 2018-19 Engineer's Report

The 2018-19 OCWD Engineer's report provides data on groundwater usage across its service area, including the City of Santa Ana. Water production for the City consisted of 77% groundwater for the 2018-19 year, with the remaining 23% consisting of imported and recycled water. Total groundwater production for the 2018-19 year was 302,756 AF, which falls within OCWD's sustainable groundwater management goals. Population within OCWD's service area is expected to increase from the current 2.28 million people (based on Census 2010 demographic data) to approximately 2.59 million people by the year 2035. This population growth is expected to increase water demands from the current 393,222 AF per year to 447,000 AF per year in 2035 (a water demand projection that takes into consideration future water conservation savings). This yields an anticipated increase in water demand of 53,779 AFY. The proposed increase of 6,950 AFY under implementation of the Santa Ana GPU is well within the planned increase in water demands from OCWD projections.

5.2.3 Metropolitan Water District Purchase Agreement

In addition to Metropolitan's 2015 UWMP statement that Metropolitan would be able to meet the demands of its member agencies, including the City of Santa Ana, through 2040, a 2014 Purchase Order between the City of Santa Ana and Metropolitan Water District further establishes adequate water supplies to meet current and future demands. The Purchase Order sets terms for maximum deliveries of imported water over a 10 year period, from January 1 2015 through December 31, 2024. Among the stipulations of the purchase agreement was a maximum annual delivery of 19,617 AFY. As noted in the OCWD 2018-19 Engineer's Report, the City of Santa Ana utilized 25,512.4 AF of groundwater further supporting the ~75% groundwater to ~25% imported water supply portfolio for the City. As noted in the City's

UWMP, this ratio of groundwater and imported water is anticipated to continue through 2040. Therefore, an available 11,874 AF of water delivered by Metropolitan is still available if ever needed. This surplus alone is sufficient to meet the proposed increase in demands of 6,950 AFY under implementation of the proposed GPU. When combined with anticipated increases in OCWD groundwater supply capacity, it is not anticipated that the proposed increase in water demands will adversely impact regional water supplies.

5.2.4 Water Supply Impacts

The following impact assessments are based on the significance criteria established in Section 4.1 for water systems.

Impact B **Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?**

Impact Analysis: Under full buildout of the proposed land use changes as part of the GPU, water demands would increase from approximately 31,151 AFY to 38,101 AFY. The 2015 UWMP projected a 2040 total water demand of 40,036– 42,438 AFY (depending on climate conditions) which is greater than the total of 38,101 AFY associated with the implementation of the proposed GPU. OCWD and Metropolitan both have concluded adequate supplies to meet the growing demands of their member agencies, including the City of Santa Ana. The proposed water demand increases documented in this report as a result of the Santa Ana GPU are within the planned supplies from the City, OCWD and Metropolitan during normal dry and multiple dry year scenarios.

6. CONCLUSION

The City of Santa Ana works together with OCWD and Metropolitan to provide water supply to its various customers. The City, OCWD and Metropolitan have managed regional and local water supplies successfully for decades and water management documentation summarized above conclude that there are adequate supplies to meet increased water demands from the proposed Santa Ana GPU. There are adverse supply effects anticipated related to water supply in normal, single dry and multiple dry year climate scenarios associated with the implementation of the Santa Ana GPU.

7. TECHNICAL APPENDICES

Appendix A Water Demand Calculations

APPENDIX A

WATER DEMAND CALCULATIONS

Santa Ana GPU Area Existing Condition Water Demands

	Building(s)		Building	Flow	Unit of Measure	Total Demands	Total Demands
	Units	People Per Household	Acres	GPD		GPD	AFY
Residential							
Single Family Residential	56,782	4.6	0.00	66	/capita	17,239,015	19,323
Multi Family Residential	22,010	3.6	0.00	66	/capita	5,229,576	5,862
Business and Commerce							
Commercial	-		1540.83	2500	/acre	3,852,077	4,318
Other Water Demands							
Potable and Recycled Irrigation							1,648
Citywide Total	**78,792**	**-**	**1540.83**	**--**	**--**	**26,320,669**	**31,151**

*Residential demand factors based on average per capita water use estimates

**Commercial demand factors based on City of Santa Ana Guidelines for Water and Sewer Facilities (2017)

Santa Ana GPU Area Proposed Condition Water Demand Increases

	Building(s)		Building	Flow	Unit of Measure	Total Demands	Total Demands
	Units	People Per Household	Acres	GPD		GPD	AFY
Residential							
Single Family Residential	(590)	4.3	0.00	66	/capita	-167,442	-188
Multi Family Residential	36,851	3.1	0.00	53	/capita	6,031,772	6,761
Business and Commerce							
Commercial	-		134.28	2500	/acre	335,699	376
Citywide Increases	**36,261**	**-**	**134.28**	**--**	**--**	**6,200,029**	**6,950**
						Existing Condition Total Demands	**31,151**
						Proposed Condition Total Demands	**38,101**

*Proposed residential demand factors based on average per capita water use estimates with a 20% efficiency demand reduction

**Commercial demand factors based on City of Santa Ana Guidelines for Water and Sewer Facilities (2017)

Appendix I-a Noise Existing Condition Report

Appendices

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TECHNICAL MEMORANDUM

DATE	July 26, 2019
TO	City of Santa Ana Planning and Building Agency
ADDRESS	20 Civic Center Plaza, M-20 Santa Ana, CA 92701
CONTACT	Melanie McCann, AICP, Senior Planner
FROM	Joshua Carman, Senior Associate, Noise and Vibration Isabel Garcia, Project Planner, Noise and Vibration
SUBJECT	Santa Ana Noise Existing Conditions Report
PROJECT NUMBER	SNT-20

This memorandum presents existing noise and vibration conditions for the City of Santa Ana, California, and its sphere of influence. Long-term noise monitoring data, traffic and rail noise modeling inputs and outputs, common noise and vibration definitions, and local regulations are included in Attachment A.

Sound Fundamentals

Sound is a pressure wave transmitted through the air. It is described in terms of loudness or amplitude (measured in decibels), frequency or pitch (measured in Hertz [Hz] or cycles per second), and duration (measured in seconds or minutes). The standard unit of measurement of the loudness of sound is the decibel (dB). Changes of 1 to 3 dB are detectable under quiet, controlled conditions and changes of less than 1 dB are usually indiscernible. A 3 dB change in noise levels is considered the minimum change that is detectable with human hearing in outside environments. A change of 5 dB is readily discernable to most people in an exterior environment whereas a 10 dB change is perceived as a doubling (or halving) of the sound.

The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all and are “felt” more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by weighting frequencies in a manner approximating the sensitivity of the human ear.

Noise is defined as unwanted sound, and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. Based on these known adverse effects of noise, the federal government, the State of California, and many local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

SOUND MEASUREMENT

Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. On a logarithmic scale, an increase of 10 dBA is 10 times more intense than 1 dBA, while 20 dBA is 100 times more intense, and 30 dBA is 1,000 times more intense. A sound as soft as human breathing is about 10 times greater than 0 dBA. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. This phenomenon is known as "spreading loss." For a single point source, sound levels decrease by approximately 6 dBA for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by on-site operations from stationary equipment or activity at a project site. If noise is produced by a line source, such as highway traffic, the sound decreases by 3 dBA for each doubling of distance in a hard site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases by 4.5 dBA for each doubling of distance.

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called L_{eq}), or alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. For example, the L_{50} noise level represents the noise level that is exceeded 50 percent of the time. Half the time the noise level exceeds this level and half the time the noise level is less than this level. This level is also representative of the level that is exceeded 30 minutes in an hour. Similarly, the L_2, L_8 and L_{25} values represent the noise levels that are exceeded 2, 8, and 25 percent of the time, or 1, 5, and 15 minutes per hour. These "L_n" values are typically used to demonstrate compliance for stationary noise sources with a city's noise ordinance, as discussed below. Other values typically noted during a noise survey are the L_{min} and L_{max}. These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period.

Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law and the County require that, for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL) or Day-Night Noise Level (Ldn). The CNEL descriptor requires that an artificial increment of 5 dBA be added to the actual noise level for the hours from 7:00 p.m. to 10:00 p.m. and 10 dBA for the hours from 10:00 p.m. to 7:00 a.m. The Ldn descriptor uses the same methodology but only adds a 10 dBA increment between 10:00 p.m. and 7:00 a.m. Both descriptors give roughly the same 24-hour level, with the CNEL being only slightly more restrictive (i.e., higher).

PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF NOISE

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions and thereby affecting blood pressure, the heart, and the nervous system. Extended periods of noise exposure above 90 dBA could result in permanent hearing damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure—this is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by pain in the ear, and this is called the threshold of pain. Table 1 shows typical noise levels from familiar noise sources.

Table 1 Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Onset of physical discomfort	120+	
	110	Rock Band (near amplification system)
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, at 50 mph		Food Blender at 3 feet
	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal speech at 3 feet
Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Nighttime		
	30	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (background)
	20	
		Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

Source: Caltrans 2013a.

Vibration Fundamentals

Vibration is an oscillating motion in the earth. Like noise, vibration is transmitted in waves, but in this case through the earth or solid objects. Unlike noise, vibration is typically of a frequency that is felt rather than heard. Vibration can be either natural, such as from earthquakes, volcanic eruptions, or landslides, or man-made, such as from explosions, heavy machinery, or trains. Both natural and man-made vibration may be continuous, such as from operating machinery, or impulsive, as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude can be characterized in three ways—displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position; for the purposes of soil displacement, it is typically measured in inches or millimeters. Particle velocity is the speed at which soil particles move, in inches per second or millimeters per second. Particle acceleration is the rate of change in velocity over time and is measured in inches per second per second or millimeters per second per second. Vibration amplitudes are usually described in terms of either the peak particle velocity (PPV) or the root mean square (RMS) velocity. PPV is the maximum instantaneous peak of the vibration signal, and RMS is the square root of the average of the squared amplitudes of the signal. PPV is more appropriate for evaluating potential building damage, and RMS is typically more suitable for evaluating human response.

The units for PPV are normally inches per second (in/sec), but in order to compress the range of numbers, RMS vibration levels are often discussed in dB units relative to 1 micro-inch per second (abbreviated as VdB). Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Table 2 presents the human reaction to various levels of peak particle velocity.

Table 2 Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of “architectural” (i.e., not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to “architectural” damage to normal dwellings, i.e., houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause “architectural” damage and possibly minor structural damage

Source: Caltrans 2013b.

The way in which vibration is transmitted through the earth is called propagation. As vibration waves propagate from a source, the energy is spread over an ever-increasing area so that the energy level striking a given point is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and void spaces. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Regulatory Framework

To limit population exposure to physically and/or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, and local governments have established standards and ordinances to control noise.

FEDERAL REGULATIONS

Federal Highway Administration

Proposed federal or federal-aided highway construction projects at a new location, or the physical alteration of an existing highway that significantly changes the horizontal or vertical alignment or increases the number of through-traffic lanes, require an assessment of noise and consideration of noise abatement per 23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." The Federal Highway Administration (FHWA) has adopted noise abatement criteria (NAC) for sensitive receivers—such as picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals—when "worst-hour" noise levels approach or exceed 67 dBA L_{eq} (Caltrans 2011).

US Environmental Protection Agency

In addition to FHWA standards, the EPA has identified the relationship between noise levels and human response. The EPA has determined that over a 24-hour period, an L_{eq} of 70 dBA will result in some hearing loss. Interference with activity and annoyance will not occur if exterior levels are maintained at an L_{eq} of 55 dBA and interior levels at or below 45 dBA. These levels are relevant to planning and design and useful for informational purposes, but they are not land use planning criteria because they do not consider economic cost, technical feasibility, or the needs of the community, and are, therefore, not mandated.

The EPA also set 55 dBA Ldn as the basic goal for exterior residential noise intrusion. However, other federal agencies, in consideration of their own program requirements and goals, as well as the difficulty of actually achieving a goal of 55 dBA Ldn, have settled on the 65 dBA Ldn level as their standard. At 65 dBA Ldn, activity interference is kept to a minimum, and annoyance levels are still low. It is also a level that can realistically be achieved.

Occupational Health and Safety Administration

The federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the EPA. Such limitations would apply to the operation of construction equipment and could also apply to any proposed industrial land uses. Noise exposure of this type is dependent on work conditions and is addressed through a facility's Health and Safety Plan, as required under OSHA, and is therefore not addressed further in this analysis.

US Department of Housing and Urban Development

The US Department of Housing and Urban Development (HUD) has set the goal of 65 dBA Ldn as a desirable maximum exterior standard for residential units developed under HUD funding. (This level is also generally accepted within the State of California.) Although HUD does not specify acceptable interior noise levels, standard construction of residential dwellings typically provides 20 dBA or more of attenuation with the windows closed. Based on this premise, the interior Ldn should not exceed 45 dBA.

STATE REGULATIONS

General Plan Guidelines

The State of California, through its General Plan Guidelines, discusses how ambient noise should influence land use and development decisions and includes a table of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable uses at different noise levels, expressed in CNEL. A conditionally acceptable designation implies new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements for each land use and needed noise insulation features are incorporated in the design. By comparison, a normally acceptable designation indicates that standard construction can occur with no special noise reduction requirements. The general plan guidelines provide cities with recommended community noise and land use compatibility standards that can be adopted or modified at the local level based on conditions and types of land uses specific to that jurisdiction.

California Building Code

The California Building Code (CBC), Title 24, Part 2, Volume 1, Chapter 12, Interior Environment, Section 1207.11.2, Allowable Interior Noise Levels, requires that interior noise levels attributable to exterior sources not exceed 45 dBA in any habitable room. The noise metric is evaluated as either the day-night average sound level (Ldn) or the community noise equivalent level (CNEL), whichever is consistent with the noise element of the local general plan.

The California Green Building Standards Code (CALGreen), Chapter 5, Division 5.5, has additional requirements for insulation that affect exterior-interior noise transmission for nonresidential structures. Pursuant to CALGreen Section 5.507.4.1, Exterior Noise Transmission, an architectural acoustics study may be required when a project site is within a 65 dBA CNEL or Ldn noise contour of an airport, freeway or expressway, railroad, industrial source, or fixed-guideway source. Where noise contours are not readily available, if buildings are exposed to a noise level of 65 dBA L_{eq} during any hour of operation, specific wall and ceiling assembly and sound-rated windows may be necessary to reduce interior noise to acceptable levels. A performance method may also be used per Section 5.507.4.2 to show compliance with state interior noise requirements.

LOCAL REGULATIONS

City of Santa Ana General Plan Noise Element

The Noise Element of the Santa Ana General Plan contains objectives, policies, and programs to prevent significant increases in noise levels in the community and minimize the adverse effects of existing noise sources. Table 3 summarizes the City's noise and land use compatibility standards when siting new noise-sensitive development. The General Plan is currently in the process of being updated.

Table 3 Noise and Land Use Compatibility Standards

Categories	Land Use Categories	Interior CNEL[1]	Exterior CNEL[2]
Residential	Single-family, duplex, multi-family	45[3]	65
Institutional	Hospital, school classroom/playgrounds	45	65
	Church, library	45	--
Open Space	Parks	--	65

Source: Santa Ana General Plan.
Notes:
1 Interior areas (to include but are not limited to: bedrooms, bathrooms, kitchens, living rooms, dining rooms, closets, corridors/hallways, private offices, and conference rooms.
2 Exterior areas shall mean: private yards of single family homes, park picnic areas, school playgrounds, common areas, private open space, such as atriums on balconies, shall be excluded form exterior areas provided sufficient common area is included within the project.
3 Interior noise level requirements contemplate a closed window condition. Mechanical ventilation system or other means of natural ventilation shall be provided per Chapter 12, Section 1305 of the Uniform Building Code.

City of Santa Ana Municipal Code

Chapter 18, Article VI, Noise Control, of the municipal code provides criteria for ambient noise measurements as well as noise standards for residential, school, hospital, and church uses. When nontransportation (stationary) noise is the noise source of concern, the City applies performance standards from Section 18.312 of the municipal code to ensure that noise producers do not adversely affect noise-sensitive land uses. Table 4, *Exterior Noise Standards*, summarizes the City's exterior noise standards.

Table 4 Exterior Noise Standards

Time Period	Noise Level (dBA)				
	L_{50}	L_{25}	L_8	L_2	L_{max}
7:00 a.m.–10:00 p.m.	55	60	65	70	75
10:00 p.m.–7:00 a.m.	50	55	60	65	70

Source: City of Santa Ana Municipal Code.
Note: A 5 dBA penalty shall be applied in the event of an alleged offensive noise such as impact noise, simple tones, speech, music, or any combination of thereof.
If the measured ambient level exceeds any of the first four noise limit categories, the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

CONSTRUCTION

The City of Santa Ana's noise ordinance exempts noise from construction activities that occur during the daytime. No construction is permitted outside of the hours specified in Section 18-314(e) of the Santa Ana Municipal Code, which restricts construction activities to the daytime hours of 7:00 AM to 8:00 PM Monday through Saturday.

VIBRATION

The City of Santa Ana does not have specific limits or thresholds for construction vibration. The Federal Transit Administration (FTA) provides criteria for acceptable levels of groundborne vibration for various types of buildings. Structures amplify groundborne vibration; wood-frame buildings, such as typical residential structures, are more affected by ground vibration than heavier buildings. The level at which groundborne vibration is strong enough to cause architectural damage has not been determined conclusively, but the standards recommended by the FTA are shown in Table 5.

Table 5 Building Architectural Damage Limits

Building Category		PPV (in/sec)
I.	Reinforced concrete, steel, or timber (no plaster)	0.5
II.	Engineered concrete and masonry (no plaster)	0.3
III.	Non-engineered timber and masonry buildings	0.2
IV.	Buildings extremely susceptible to vibration damage	0.12

Source: FTA 2018.

Existing Conditions

AMBIENT NOISE MONITORING

To determine a baseline noise level at different environments within the planning area, ambient noise monitoring was conducted in the City of Santa Ana by PlaceWorks staff in May 2019. Measurements were made during the weekday morning and evening commutes, that is, 7:00 am to 10:00 am and 3:00 pm to 7:00 pm. Long-term (48-hour) measurements were conducted at 5 locations, and short-term (15-minute) measurements were conducted at 16 locations in the planning area. The monitoring locations were generally chosen in the five focus areas. All measurements were conducted Monday, May 13, through Wednesday, May 15, 2019.

The primary noise sources during measurements were traffic, aircraft overflights, and railroad noise. Commercial, industrial and government operations, and animal activity (such as dogs barking and birds chirping) also contributed to the overall noise environment at some locations. Meteorological conditions during the measurement periods were favorable for outdoor sound measurements and were noted as representative of the typical conditions for the season. Generally, conditions included mostly cloudy, partly cloudy, and clear skies with daytime temperatures from 64 to 73 degrees Fahrenheit (°F), and average wind speeds between 1 to 5 miles per hour (mph). All sound level meters were equipped with a windscreen during measurements.

All sound level meters used for noise monitoring satisfy the American National Standards Institute (ANSI) standard for Type 1 instrumentation (Larson Davis LxT and 820 sound level meters were used). The sound level meters were set to “slow” response and “A” weighting (dBA). The meters were calibrated prior to and after the monitoring period. All measurements were at least five feet above the ground and away from reflective surfaces. Noise measurement locations are described below and shown in Figure 1, *Approximate Noise Monitoring Locations*.

» Long-Term Location 1 (LT-1) was in front of 2944 Fernwood Drive at the end of the street, south of State Route 22 (SR-22). A 48-hour noise measurement began at 8:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by highway traffic on SR-22 and traffic on local roadways.

» Long-Term Location 2 (LT-2) was in front of 1406 N. Harbor Boulevard next to the Sunset Ridge Apartments. A 48-hour noise measurement began at 9:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on Harbor Boulevard.

» Long-Term Location 3 (LT-3) was across from 1507 N. Fairmont Street. A 48-hour noise measurement began at 7:00 PM Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on Lincoln Avenue, Fairmont Street, and railroad activity adjacent to Lincoln Avenue.

» Long-Term Location 4 (LT-4) was at the southeast corner of Normandy Place and Lyon Street. A 48-hour noise measurement began at 4:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on Lyon Street and nearby railroad activity. While on-site, PlaceWorks staff observed several train pass-bys—two Amtrak Surfliners and one Metrolink.

» Long-Term Location 5 (LT-5) was southeast of 7 Hutton Center Drive (DoubleTree by Hilton) next to SR-55. A 48-hour noise measurement began at 3:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on SR-55 and traffic on local roadways.

- » Short-Term Location 1 (ST-1) was off Bristol Street south of Park Lane behind 2530 N. Greenbrier Street, approximately 45 feet east of the Bristol Street northbound centerline. A 15-minute noise measurement began at 7:17 AM on Tuesday, May 14, 2019. The noise environment of this site is characterized primarily by traffic on Bristol Street. Traffic noise levels generally ranged from 75 dBA to 83 dBA. Buses, work trucks, and garbage trucks were observed to be loudest, ranging from 79 dBA to 88 dBA. The background noise level was noted as low as 62 dBA during moments of slower speeds due to traffic signals and congestion.

- » Short-Term Location 2 (ST-2) was outside of Main Place Mall off Main Street, approximately 35 feet west of the southbound centerline. A 15-minute noise measurement began at 7:54 AM on Tuesday, May 14, 2019. The noise environment of this site is characterized primarily by traffic noise. Secondary noise sources included distant landscape maintenance. Traffic noise levels generally ranged from 72 dBA to 80 dBA. Buses, work trucks, and semi-trailers were observed to be loudest, ranging from 78 dBA to 83 dBA. The background noise level was noted as low as 53 dBA during intermittent periods of little to no traffic.

- » Short-Term Location 3 (ST-3) was near 13962 Nautilus Drive, off Westminster Avenue, approximately 42 feet north of the westbound centerline. A 15-minute noise measurement began at 4:59 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic. Traffic noise levels generally ranged from 68 dBA to 78 dBA. Buses, trucks, semis, and vehicles with modified mufflers were observed to be loudest, ranging from 76 dBA to 89 dBA. The background noise level was noted as low as 55 dBA during intermittent periods of little to no traffic.

- » Short-Term Location 4 (ST-4) was outside Santa Ana Community College off West 17th Street, approximately 37 feet south of the eastbound centerline. A 15-minute noise measurement began at 3:16 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 70 dBA to 77 dBA. Buses, motorcycles, and vehicles with modified mufflers were observed to be loudest, ranging from 81 dBA to 91 dBA. The background noise level was noted as low as 51 dBA during the few intermittent periods of little to no traffic due to traffic signals.

- » Short-Term Location 5 (ST-5) was across from the Santa Ana Regional Transportation Center off Santiago Street, approximately 30 feet west of the southbound centerline. A 15-minute noise measurement began at 8:29 AM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 70 dBA to 72 dBA. Buses and work trucks were observed to be loudest, ranging from 78 dBA to 80 dBA. The background noise level was noted as low as 50 dBA during periods of little to no traffic.

- » Short-Term Location 6 (ST-6) was in front of 330 Euclid Street approximately 45 feet west of the southbound centerline. A 15-minute noise measurement began at 5:58 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 76 dBA to 82 dBA. Vehicles such as motorcycles, buses, and sports cars were observed to be loudest, ranging from 83 dBA to 87 dBA. The background noise level was noted as low as 61 dBA during intermittent periods of little to no traffic.

- » Short-Term Location 7 (ST-7) was in front of 2335 1st Street approximately 45 feet north of the westbound centerline. A 15-minute noise measurement began at 4:03 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 72 dBA to 78 dBA. Vehicles such as buses, work trucks, and semis were observed to be loudest, ranging from 75 dBA to 87 dBA. The background noise level was noted as low as 59 dBA during intermittent periods of little to no traffic.

- **Short-Term Location 8 (ST-8)** was near 412 Flower Street approximately 45 feet west of the southbound centerline. A 15-minute noise measurement began at 9:36 AM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 69 dBA to 76 dBA. Vehicles such as motorcycles and sport cars were observed to be loudest, ranging from 75 dBA to 80 dBA. The background noise level was noted as low as 48 dBA.

- **Short-Term Location 9 (ST-9)** was outside the Advanced Learning Academy off 1st Street near the southwest corner of 1st and Maple Street, approximately 40 feet south from the eastbound centerline. A 15-minute noise measurement began at 8:59 AM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 78 dBA to 80 dBA. Vehicles such as buses, work trucks, and semi-trailers were observed to be loudest, ranging from 81 dBA to 88 dBA. The background noise level was noted as low as 59 dBA during intermittent moments of little to no traffic.

- **Short-Term Location 10 (ST-10)** was at Centennial Park. A 15-minute noise measurement began at 3:19 PM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by bird calls and park users. Noise levels generally ranged from 46 dBA to 74 dBA. Bird calls were up to 74 dBA when in flight overhead. Secondary noise sources were distant traffic noise from adjacent roadways and dogs barking in the distance.

- **Short-Term Location 11 (ST-11)** was across from 218 Edinger Street approximately 40 feet north of the westbound centerline. A 15-minute noise measurement began at 4:03 PM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 75 dBA to 80 dBA. Vehicles such as motorcycles, buses, and sports cars were observed to be loudest, ranging from 81 dBA to 87 dBA. The background noise level was noted as low as 50 dBA during moments of congestion.

- **Short-Term Location 12 (ST-12)** was in front of 2620 S. Bristol Street, approximately 40 feet west of southbound centerline. A 15-minute noise measurement began at 8:49 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 63 dBA to 76 dBA. Vehicles such as buses and sports cars were observed to be loudest, ranging from 75 dBA to 87 dBA. The background noise level was noted as low as 53 dBA during intermittent moments of little to no traffic.

- **Short-Term Location 13 (ST-13)** was in front of 2519 Main Street, approximately 42 feet west of the southbound centerline. A 15-minute noise measurement began at 9:27 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 68 dBA to 78 dBA. Buses were observed to be loudest at 80 dBA. The background noise level was noted as low as 51 dBA.

- **Short-Term Location 14 (ST-14)** was in front of 1821 Dyer Street, approximately 42 feet north of the westbound centerline. A 15-minute noise measurement began at 4:41 PM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise and aircraft overflights. The John Wayne Airport is approximately 2 miles southwest of this location. Traffic noise levels generally ranged from 57 dBA to 72 dBA, and aircraft overflights ranged from 78 dBA to 83 dBA. Overflights were all observed to be commercial aircraft. Traffic noise levels were lower than at other, similar locations due to congestion and low travel speeds. The background noise level was noted to be 57 dBA, characterized by idling traffic.

» Short-Term Location 15 (ST-15) was in front of 2500 MacArthur Boulevard, approximately 45 feet south of the eastbound centerline. A 15-minute noise measurement began at 7:31 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 79 dBA to 82 dBA. Vehicles such as buses, work trucks, and semi-trailers were observed to be loudest, ranging from 82 dBA to 84 dBA. The background noise level was noted as low as 59 dBA during intermittent moments of light traffic.

» Short-Term Location 16 (ST-16) was in front of 3650 Bristol Street, approximately 55 feet west of the southbound centerline. A 15-minute noise measurement began at 8:11 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 74 dBA to 83 dBA. Vehicles such as buses, garbage trucks, and semi-trailers were observed to be loudest, ranging from 81 dBA to 87 dBA. The background noise level was noted as low as 55 dBA during intermittent moments of little to no traffic.

Ambient Noise Monitoring Results

During the ambient noise survey, the CNEL noise levels at monitoring locations ranged from 69 to 80 dBA CNEL. The long-term noise measurement results are summarized in Table 6, *Long-Term Noise Measurements Summary*. A graphical summary of the daily trend during long-term noise measurements is provided in Attachment A. The short-term noise measurement results are summarized in Table 7, *Short-Term Noise Measurements Summary*.

Table 6 Long-Term Noise Measurements Summary (dBA)

Monitoring Location	Description	CNEL	Lowest $L_{eq, 1\text{-}hr}$	Highest $L_{eq, 1\text{-}hr}$
LT-1	2944 Fernwood Drive	69	56.5	72.9
LT-2	1406 N Harbor Boulevard	78	64.8	79.0
LT-3	1507 North Fairmont Street	73	58.6	73.4
LT-4	Normandy and Lyon Street	79	52.9	78.4
LT-5	7 Hutton Center Drive, east of Double Tree Hotel	80	66.4	77.5

See Attachment A for a graphical display of long-term noise monitoring data.

Table 7 Short-Term Noise Measurements Summary (dBA)

Monitoring Location	Description	15-minute Noise Level, dBA						
		L_{eq}	L_{max}	L_{min}	L_2	L_8	L_{25}	L_{50}
ST-1	Bristol Street south of Park Lane ≈ 45 ft east of NB centerline 7:17 AM, 5/14/2019	78.5	87.9	62.4	83.5	82.1	79.8	77.5
ST-2	Main Street north of Memory Lane ≈ 35 ft west of SB centerline 7:54 AM, 5/14/2019	73.2	82.6	52.5	79.9	77.9	75.0	69.4
ST-3	Westminster near Nautilus Drive ≈ 42 ft north of WB centerline 4:59 PM, 5/14/2019	70.1	89.0	55.1	77.3	73.1	70.5	67.5
ST-4	17th Street west of Bristol Street ≈ 37 ft south of EB centerline 3:16 PM, 5/14/2019	73.3	90.9	51.2	79.6	77.2	74.5	70.5
ST-5	Santiago Street, Near Santa Ana Regional Transportation Center ≈ 30 ft west of SB centerline 8:29 AM, 5/14/2019	65.0	79.8	50.4	73.3	69.6	64.1	60.1
ST-6	Near 330 Euclid Street ≈ 45 ft west of SB centerline 5:58 PM, 5/14/2019	76.9	87.6	60.7	83.3	80.7	77.8	74.9
ST-7	Near 2335 1st Street ≈ 45 ft north of WB centerline 4:03 PM, 5/14/2019	73.6	87.5	59.0	80.5	77.3	74.3	71.6
ST-8	412 Flower Street ≈ 45 ft west of SB centerline 9:36 AM, 5/14/2019	68.7	80.2	48.3	75.9	73.7	70.0	64.7
ST-9	1st Street near Maple Street ≈ 40 ft south of EB centerline 8:59 AM, 5/14/2019	75.5	88.3	59.4	82.3	80.1	76.6	71.8
ST-10	Centennial Regional Park 3:19 PM, 5/15/2019	54.6	73.5	46.1	60.9	57.4	54.2	52.0
ST-11	Near 218 Edinger Street ≈ 40 ft north of WB centerline 4:03 PM, 5/15/2019	72.2	87.2	49.7	78.5	76.1	73.3	70.4
ST-12	Near 2620 South Bristol Street ≈ 40 ft west of SB centerline 8:49 AM, 5/15/2019	69.8	88.0	53.2	75.9	73.6	70.8	67.1
ST-13	Near 2519 Main Street ≈ 42 ft west of SB centerline 9:27 AM, 5/15/2019	70.8	80.7	51.0	77.1	75.2	72.4	68.9
ST-14	Near 1821 Dyer Street ≈ 42 ft north of WB centerline 4:41 PM, 5/15/2019	70.0	83.9	56.8	77.3	74.1	70.8	65.4
ST-15	Near 2500 MacArthur Boulevard ≈ 45 ft south of EB centerline 7:31 AM, 5/15/2019	76.4	84.3	59.3	81.8	80.5	78.0	75.0
ST-16	Near 3650 South Bristol Street ≈ 55 ft west of SB centerline 8:11 AM, 5/15/2019	76.1	86.9	55.2	82.3	80.5	78.0	73.1

Notes: ft = feet, NB = northbound, SB = southbound, EB = eastbound, WB = westbound

Summary of Ambient Noise Monitoring

The noise environment within the planning area is variable depending on location. However, freeway, rail, and local roadway traffic noise tends to dominate the noise environment, with the exception of ST-10 (Centennial Park) and ST-8 (412 Flower Street). The majority of Centennial Park is set back from adjacent roadways, and Flower Street is a lower-capacity roadway.

EXISTING TRAFFIC NOISE

On-road vehicles represent the most prominent source of noise in the plan area. Existing traffic noise conditions were modeled using the FHWA Highway Traffic Noise Prediction Model and average daily traffic volumes, vehicle mix, time of day splits, speed, and number of travel lanes data provided by IBI for highway and roadway segments in the plan area. Table 8 summarizes the calculated existing noise levels from roadways in the plan area at a distance of 50 feet from the roadway centerline, and shows the distances to the 60 dBA CNEL, 65 dBA CNEL, and 70+ dBA CNEL noise contours. The distances, conservatively, do not account for any noise reduction from topography or intervening features. Figures 2 through 5 illustrate the modeled roadways and existing noise contours for 60 dBA CNEL, 65 dBA CNEL, and 70+ dBA CNEL. Attachment A contains the inputs and outputs used in existing traffic noise modeling.

Table 8 Existing Roadway Noise Levels and Distances to Contour Lines

		Distance to Noise Contours (Feet)		
Roadway Segment	CNEL (dBA) at 50 Feet	70+ dBA CNEL	65 dBA CNEL	60 dBA CNEL
1st Street – Euclid Street to Newhope Street	72.6	75	162	348
Euclid Street – 1st Street to McFadden Avenue	75.0	107	231	497
Westminster Avenue – Harbor Boulevard to Fairview Street	74.2	95	205	442
Harbor Boulevard – Westminster Avenue/17th Street to Hazard Avenue	76.6	137	294	634
Edinger Avenue – Harbor Boulevard to Fairview Street	73.7	89	191	412
Warner Avenue – Harbor Boulevard to Fairview Street	74.8	104	224	483
Harbor Boulevard – Segerstrom Avenue to MacArthur Boulevard	76.6	138	297	641
Fairview Street – 1st Street to Willits Street	76.6	138	296	639
1st Street – Sullivan Street to Raitt Street	74.2	96	206	443
Bristol Street – 17th Street to Santa Clara Avenue	76.7	140	302	651
17th Street – College Avenue to Bristol Street	74.0	93	199	430
Bristol Street – 17th Street to Washington Avenue	75.7	119	257	554
Fairview Street – Trask Avenue to 17th Street	76.5	136	292	630
Bristol Street – 1st Street to Bishop Street	75.2	111	239	515
Civic Center Drive – Bristol Street to Flower Street	69.1	43	93	201
Flower Street – 1st Street to Bishop Street	68.9	42	91	195

Table 8 Existing Roadway Noise Levels and Distances to Contour Lines

Roadway Segment	CNEL (dBA) at 50 Feet	Distance to Noise Contours (Feet)		
		70+ dBA CNEL	65 dBA CNEL	60 dBA CNEL
Main Street – 17th Street to 20th Street	72.6	75	162	348
Main Street – Washington Street to Civic Center Drive	71.4	62	133	286
Civic Center Drive – Flower Street to Broadway	66.0	27	59	127
Santa Ana Boulevard – Flower Street to Broadway	67.3	33	71	153
1st Street – Main Street to Standard Avenue	75.2	111	240	517
Main Street – 1st Street to Bishop Street	72.2	70	150	323
Grand Avenue – Santa Clara Avenue to 17th Street	72.2	70	151	325
Grand Avenue – Santa Ana Boulevard to 4th Street	74.3	97	209	451
17th Street – Cabrillo Park Drive to Tustin Avenue	72.9	78	168	362
Tustin Avenue – Fruit Street to 4th Street	70.7	55	119	257
1st Street – Cabrillo Park Drive to Tustin Avenue	71.3	61	132	284
Fairview Street – Edinger Avenue to Harvard Street	76.6	138	297	640
Fairview Street – Warner Avenue to Segerstrom Avenue	76.0	125	269	579
Edinger Avenue – Fairview Street to Greenvile Street	72.2	70	151	325
McFadden Avenue – Fairview Street to Raitt Street	70.9	57	123	265
MacArthur Boulevard – Fairview Street to Raitt Street	72.3	72	154	333
Segerstrom Avenue – Fairview Street to Raitt Street	71.4	62	133	286
Bristol Street – Edinger Avenue to Warner Avenue	74.5	100	215	464
Bristol Street – Warner Avenue to Segerstrom Avenue	74.4	98	211	455
Warner Avenue – Raitt Street to Bristol Street	75.1	109	235	505
Bristol Street – MacArthur Boulevard to Sunflower Avenue	74.7	103	223	480
Flower Street – Warner Avenue to Segerstrom Avenue	70.0	50	107	231
Edinger Avenue – Flower Street to Main Street	73.5	86	184	397
Main Street – McFadden Avenue to Edinger Avenue	71.9	67	143	309
Main Street –Warner Avenue to Segerstrom Avenue	73.8	89	193	415
Dyer Road – Main Street to Halladay Street	74.8	104	225	484
MacArthur Boulevard – Flower Street to Main Street	74.1	93	201	434
Main Street – MacArthur Boulevard to Sunflower Avenue	72.9	78	168	362
Grand Avenue – Edinger Avenue to Saint Andrews Place	74.2	95	205	442

Table 8 Existing Roadway Noise Levels and Distances to Contour Lines

Roadway Segment	CNEL (dBA) at 50 Feet	Distance to Noise Contours (Feet)		
		70+ dBA CNEL	65 dBA CNEL	60 dBA CNEL
Edinger Avenue – Richie Street to Newport Avenue	76.0	126	271	585
Warner Avenue – Grand Avenue to Red Hill Avenue	73.0	79	169	365
Warner Avenue – Main Street to Standard Avenue	73.0	79	170	366
McFadden Avenue – Standard Avenue to Grand Avenue	71.0	58	125	269
1st Street – Bristol Street to Flower Street	75.0	108	233	502
I-5 – Chapman Avenue to Katella Avenue	87.2	700	1,508	3,249
I-5 – SR-22 to Main Street	88.6	868	1,869	4,028
I-5 – 17th Street /Penn Way to Grand Avenue	88.5	857	1,847	3,979
I-5 – 1st Street to SR-55	88.0	796	1,714	3,693
I-5 – Newport Avenue to Red Hill Avenue	88.0	787	1,696	3,654
I-405 – Brookhurst Avenue to Euclid Street	87.0	678	1,461	3,148
I-405 – Euclid Street to Harbor Boulevard	87.3	711	1,531	3,298
I-405 – Harbor Boulevard to SR-73	87.0	680	1,465	3,156
I-405 – Bristol Street to SR-55	86.3	608	1,310	2,821
I-405 – SR-55 to MacArthur Boulevard	86.9	674	1,452	3,128
SR-55 – 4th Street to 17th Street	87.1	694	1,495	3,221
SR-55 – Edinger Avenue to Dyer Road	87.6	750	1,615	3,480
SR-55 – Dyer Road to MacArthur Boulevard	86.9	669	1,442	3,106
SR-55 – MacArthur Boulevard to I-405	85.9	577	1,244	2,680
SR-55 – I-405 to SR-73	84.4	454	978	2,108
SR-22 – Euclid Street to Harbor Boulevard	85.9	578	1,245	2,683
SR-22 – The City Drive to Bristol Street	86.1	596	1,284	2,766
SR-22 – I-5 to Main Street	84.1	435	937	2,018
SR-22 – Glassell Street to Tustin Avenue	83.8	413	890	1,918

Source: Calculated using FHWA RD-77-108 model based on traffic data provided by IBI. See Attachment A.

AIRCRAFT NOISE

Aircraft noise is typically characterized as "occasional" throughout the City, but can be intrusive to nearby sensitive receptors closer to take-off and landing. There is one airport in the City of Santa Ana, John Wayne

Airport, for which existing noise contours are shown in Figure 6. The John Wayne Airport services commercial and private aircraft.

John Wayne Airport participates in a noise abatement program as part of California Airport Noise Standards and generates quarterly reports of long-term CNEL dB values. The noise abatement program has 10 noise monitoring sites (NMS) within the airport's neighboring cities, and one of them, NMS-9N, is at 1300 S Grand Avenue in Santa Ana.

RAILROAD NOISE

Railroad operations in the City are also a substantial source of noise in some areas. Day-night average noise levels vary throughout the county depending on the number of trains per day along a given rail line, the timing and duration of train pass-by events, and whether or not trains must sound their warning whistles near "at-grade" crossings. Noise levels commonly range from 65 to 75 dBA CNEL at land uses adjoining a railroad right-of-way. When trains approach a passenger station or at-grade crossing, they are required to sound their warning whistle within ¼ mile. Train warning whistles typically generate maximum noise levels of 105 to 110 dBA at 100 feet. The day-night average noise level at locations immediately adjacent to at-grade crossings and exposed to multiple train pass-by events per day can exceed 85 dBA Ldn/CNEL.

Existing railroad noise levels were projected using the FTA CREATE rail noise model and the Federal Rail Administration (FRA) Grade Crossing Horn Model, the average number of pass-bys, time of day, number of locomotives and type, number of rail cars and type, and speed. Santa Anta currently has two sets of rail lines that run within and through the City, owned by the Union Pacific (UP) and Southern California Regional Rail Authority (SCRRA). The SCRRA Orange subdivision services a mix of freight and passenger trains, such as Metrolink (Orange County and Inland Empire lines), Amtrak (Pacific Surfliner), and BNSF freight trains. The UP Santa Ana industrial lead services freight only. There are several crossings in Santa Ana that are designated "quiet zones," from 4th Street north to Santa Clara Avenue. In these locations, trains are not required to sound their warning whistle (though still may if the conductor deems it necessary for safety reasons). Table 9 contains the calculated distances to the 65 dBA CNEL contours from existing railroad noise, both from the mainline and within ¼ mile of grade crossings where horn warnings are required. The noise contours are displayed graphically in Figures 3 through 5.

Table 9 Existing Railroad Noise Levels

Operator	Subdivision	Distance (feet) to 65 dBA CNEL Contour (Mainline)	Distance (feet) to 65 dBA CNEL Contour (Within ¼ Mile of Grade Crossing)
UP	Santa Ana Industrial Lead	30	361
SCRRA	Orange Subdivision	210	978

Source: Calculated using the FTA CREATE Model and FRA Grade Crossing Horn Model. See Attachment A.

STATIONARY SOURCE NOISE

Stationary sources of noises may occur from all types of land uses. Residential uses would generate noise from landscaping, maintenance activities, and air conditioning systems. Commercial uses would generate noise from heating, ventilation, and air conditioning (HVAC) systems; loading docks; and other sources. Industrial uses may generate noise from HVAC systems, loading docks, and possibly machinery. Noise generated by residential or commercial uses is generally short and intermittent. Industrial uses may generate noise on a more continual basis. Nightclubs, outdoor dining areas, gas stations, car washes, fire stations, drive-throughs, swimming pool pumps, school playgrounds, athletic and music events (such as at the Santa Ana Stadium), and public parks are other common noise sources.

EXISTING VIBRATION

Commercial and industrial operations in the City can generate varying degrees of ground vibration, depending on the operational procedures and equipment. Such equipment-generated vibrations spread through the ground and diminish with distance from the source. The effect on buildings in the vicinity of the vibration source varies depending on soil type, ground strata, and receptor-building construction. The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight structural damage at the highest levels. In addition, future sensitive receptors could be placed within close proximity to existing railroad lines through buildout in the General Plan Area. Screening distances for new vibration-sensitive development in the plan area will be addressed in the EIR.

References

California Department of Transportation (Caltrans), 2011. *Traffic Noise Analysis Protocol*.

———. 2013a, September. *Technical Noise Supplement ("TeNS")*.

———. 2013b. *Transportation and Construction Vibration Guidance Manual*.

Federal Highway Administration (FHWA). 1978, December. Federal Highway Traffic Noise Prediction Model. United States Department of Transportation Report No. FHWA-RD77-108.

Federal Transit Administration (FTA). 2018, September. *Transit Noise and Vibration Impact Assessment Manual.* US Department of Transportation.

Governor's Office of Planning and Research. 2003, October. *State of California General Plan Guidelines*.

Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control*. 3rd edition. Woodbury, NY: Acoustical Society of America.

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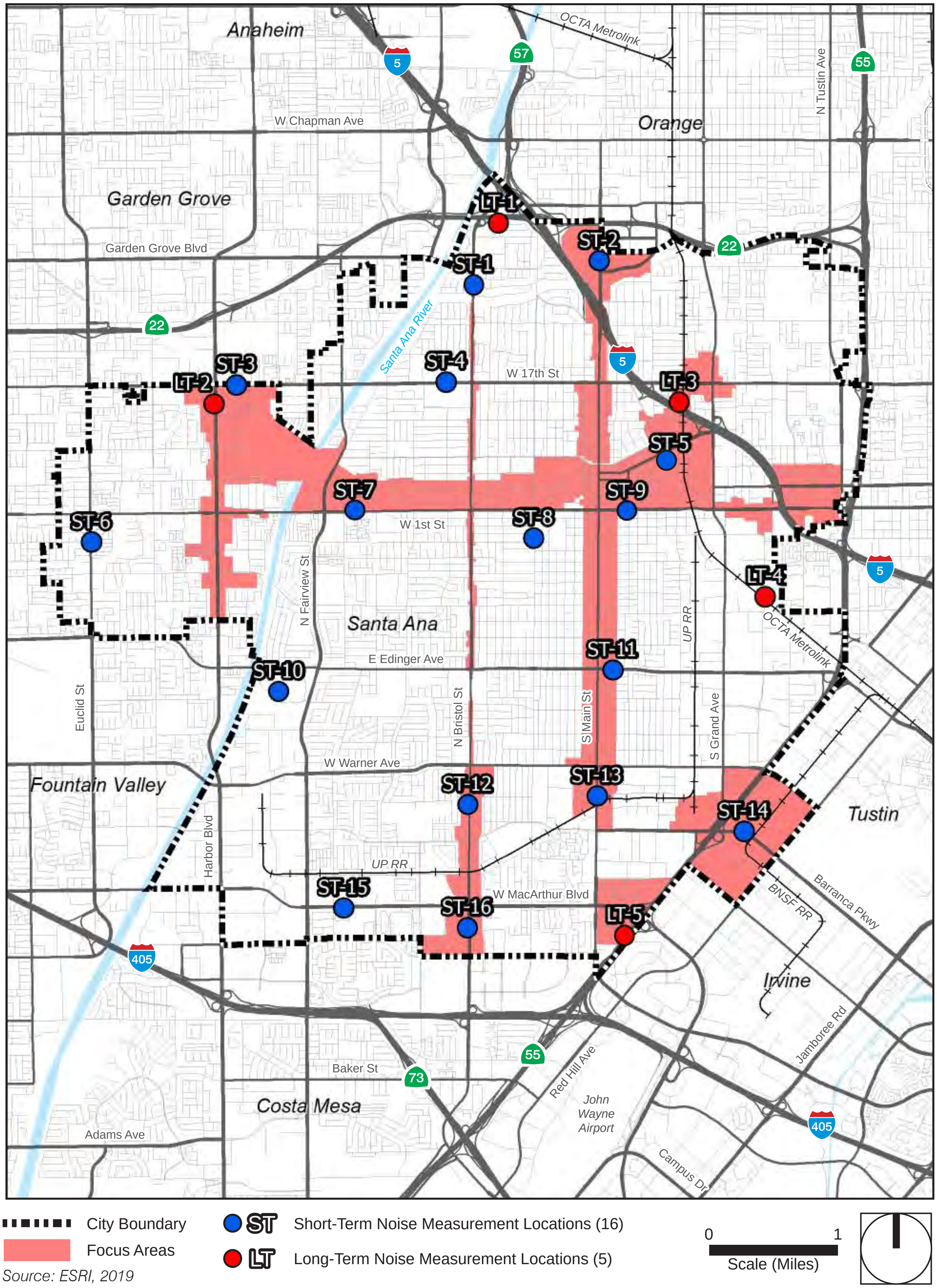
Figure 1 - Approximate Noise Monitoring Locations



Source: ESRI, 2019

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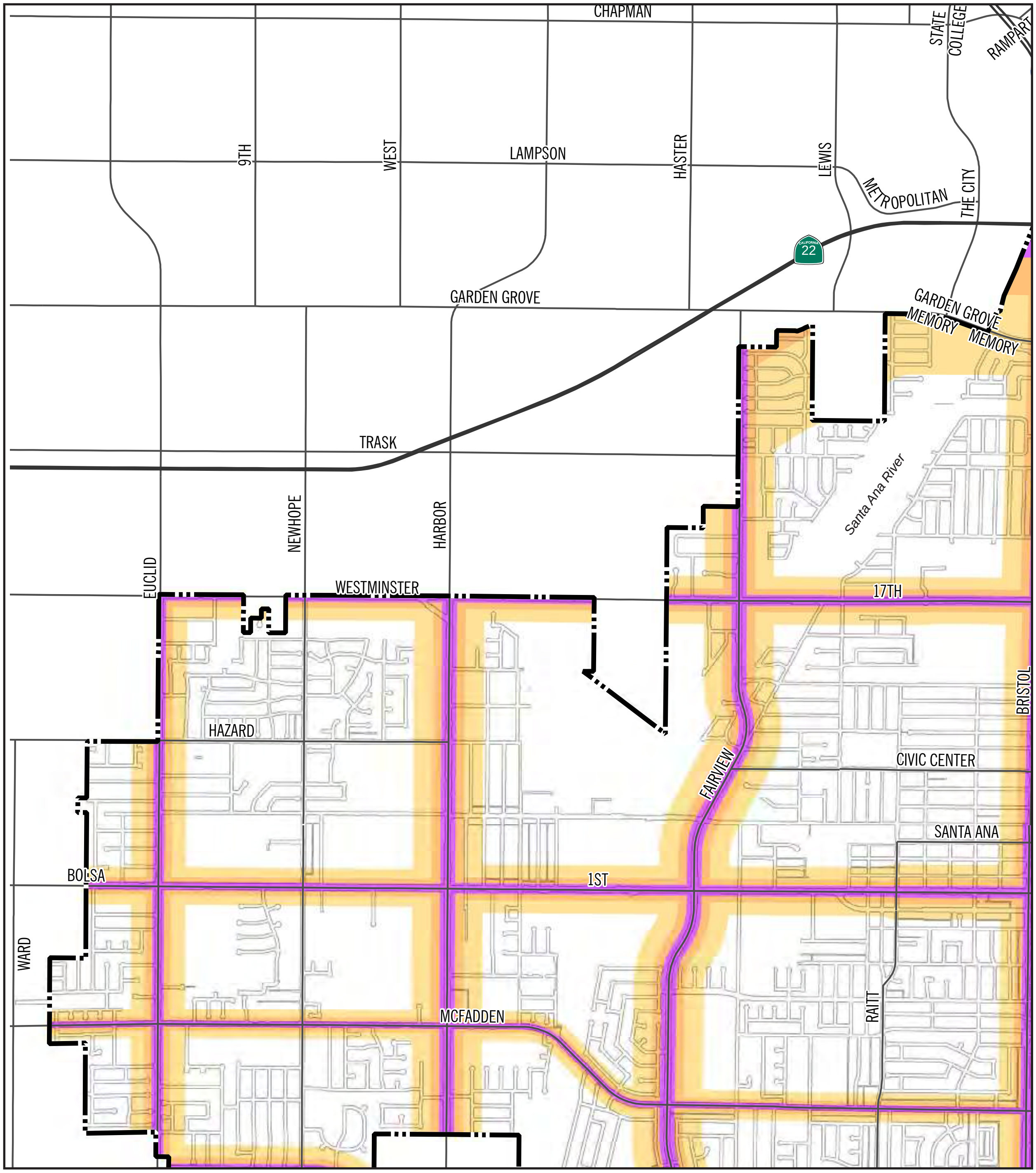
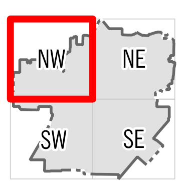
Figure 2 - Existing Transportation CNEL Noise Levels (Northwest Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway



Key Map

0 3,000
Scale (Feet)

Source: ESRI, 2019

PlaceWorks

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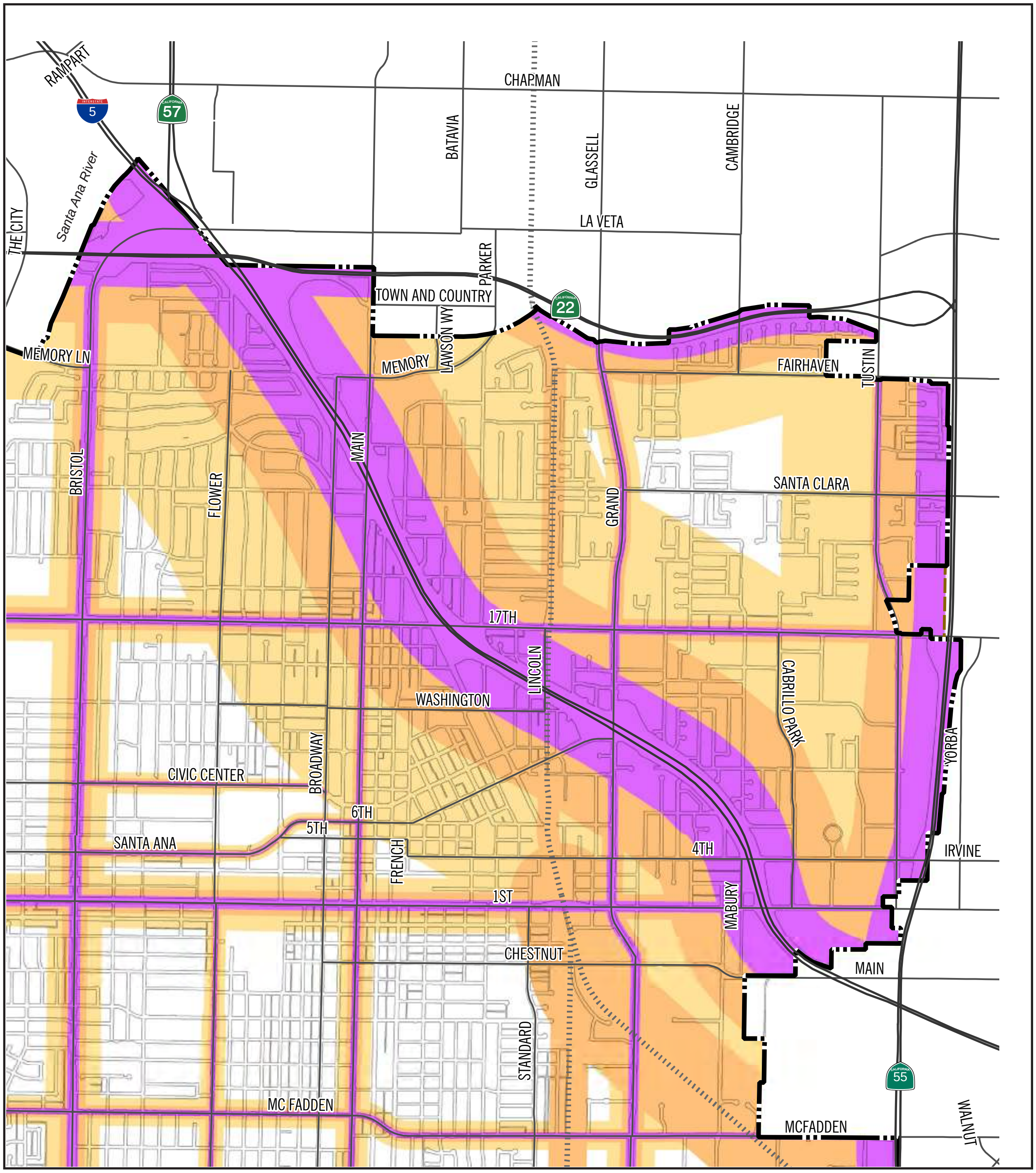
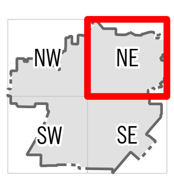
Figure 3 - Existing Transportation CNEL Noise Levels (Northeast Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway



Key Map

0 3,000
Scale (Feet)

Source: ESRI, 2019

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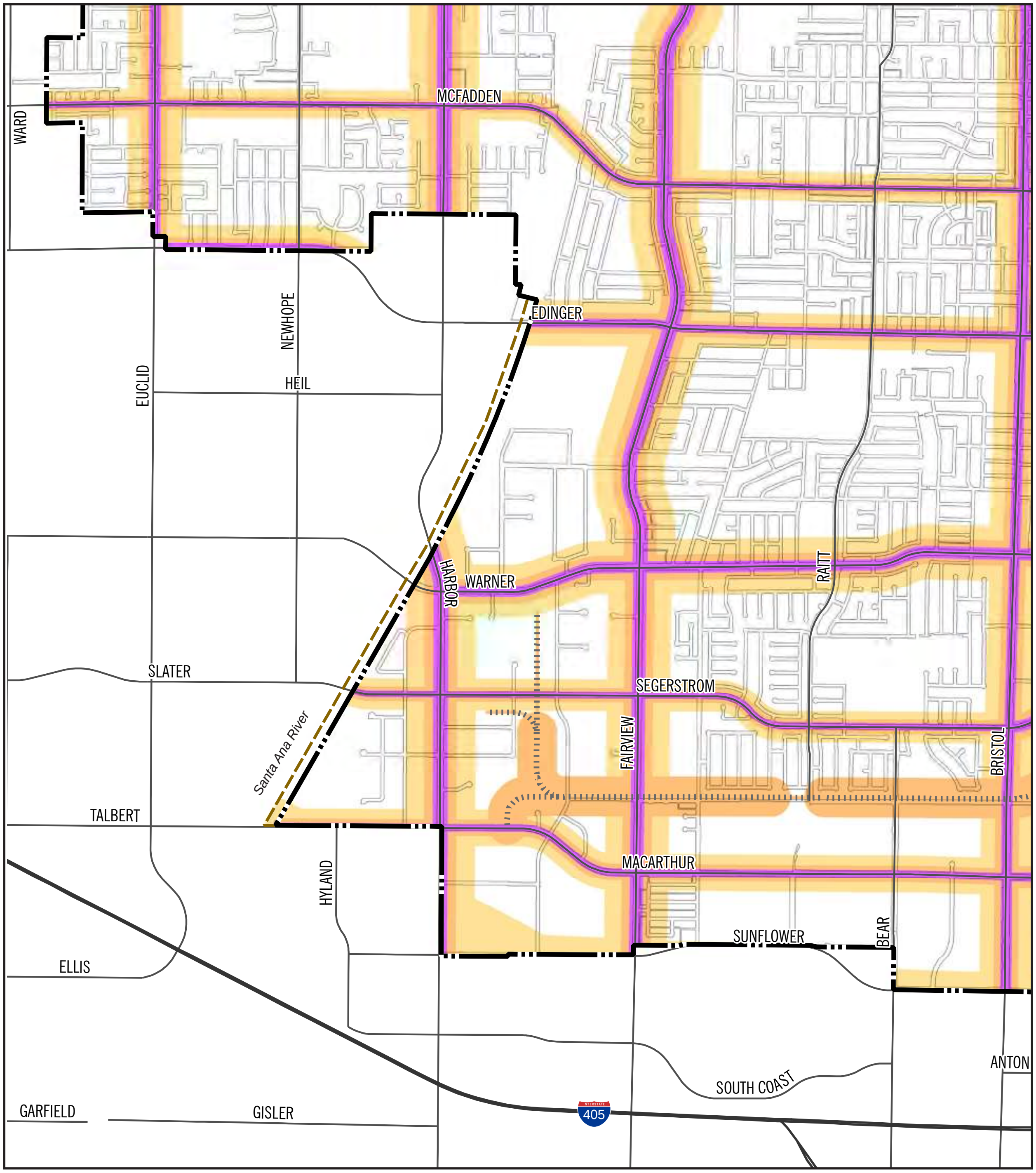
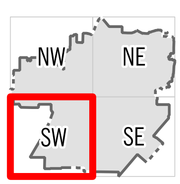
Figure 4 - Existing Transportation CNEL Noise Levels (Southwest Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway



Key Map

0 3,000
Scale (Feet)

Source: ESRI, 2019

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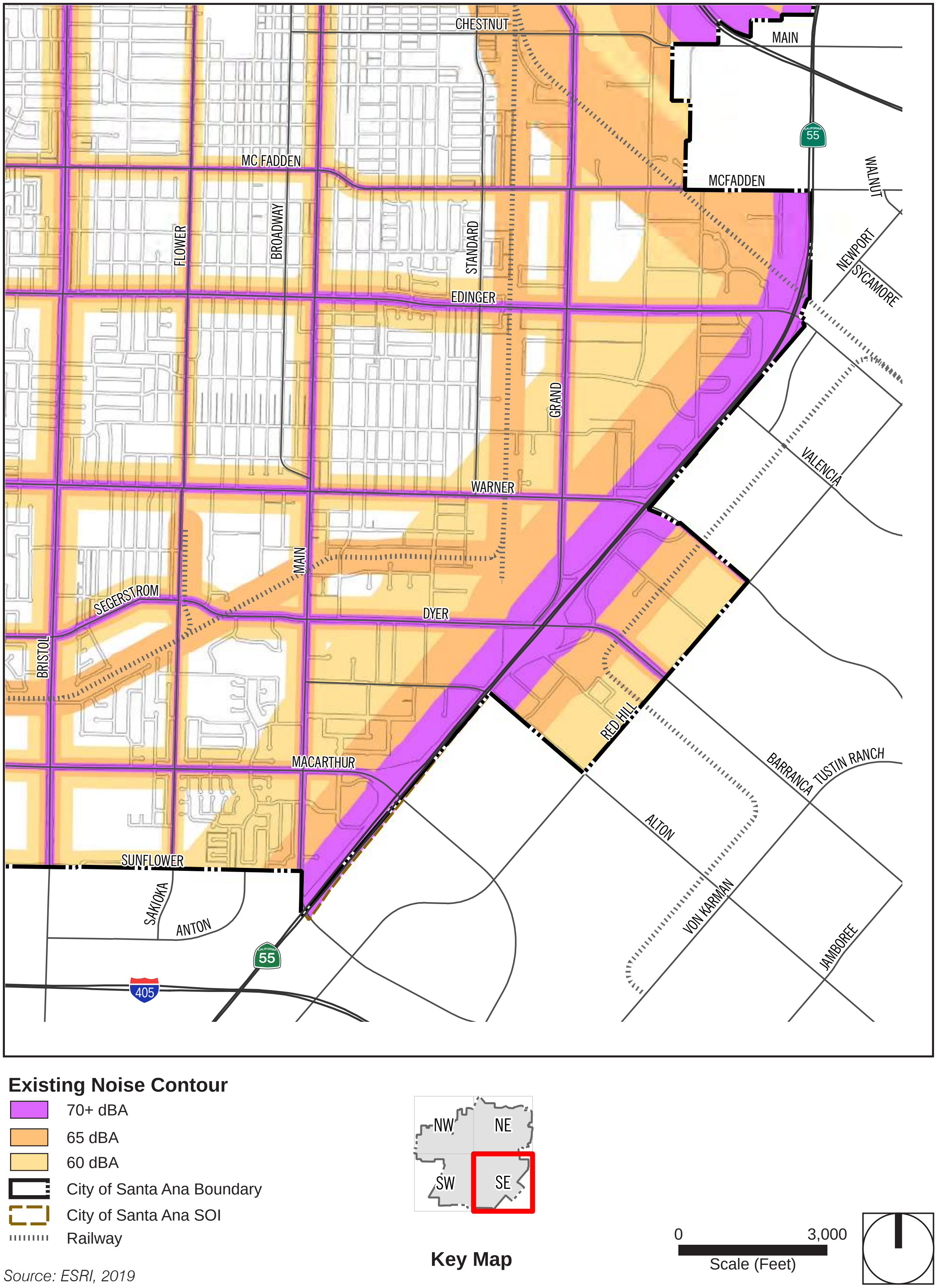
Figure 5 - Existing Transportation CNEL Noise Levels (Southeast Quadrant)



Source: ESRI, 2019

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Figure 6 - Existing John Wayne Airport Noise Contours

0 1
Scale (Miles)

Source: John Wayne Airport, 2019

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PLACEWORKS

Attachment A

Noise and Vibration Descriptors

The following are brief definitions of terminology used in this memo:

- **Sound.** A disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

- **Decibel (dB).** A unitless measure of sound, expressed on a logarithmic scale and with respect to a defined reference sound pressure. The standard reference pressure is 20 micropascals (20 μPa).

- **Vibration Decibel (VdB).** A unitless measure of vibration, expressed on a logarithmic scale and with respect to a defined reference vibration velocity. In the U.S., the standard reference velocity is 1 micro-inch per second (1×10^{-6} in/sec).

- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.

- **Equivalent Continuous Noise Level (L_{eq}); also called the Energy-Equivalent Noise Level.** The value of an equivalent, steady sound level which, in a stated time period (often over an hour) and at a stated location, has the same A-weighted sound energy as the time-varying sound. Thus, the L_{eq} metric is a single numerical value that represents the equivalent amount of variable sound energy received by a receptor over the specified duration.

- **Statistical Sound Level (L_n).** The sound level that is exceeded "n" percent of time during a given sample period. For example, the L_{50} level is the statistical indicator of the time-varying noise signal that is exceeded 50 percent of the time (during each sampling period); that is, half of the sampling time, the changing noise levels are above this value and half of the time they are below it. This is called the "median sound level." The L_{10} level, likewise, is the value that is exceeded 10 percent of the time (i.e., near the maximum) and this is often known as the "intrusive sound level." The L_{90} is the sound level exceeded 90 percent of the time and is often considered the "effective background level" or "residual noise level."

- **Day-Night Sound Level (L_{dn} or DNL).** The energy-average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the sound levels occurring during the period from 10:00 PM to 7:00 AM.

- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added from 7:00 PM to 10:00 PM and 10 dB from 10:00 PM to 7:00 AM. NOTE: For general community/environmental noise, CNEL and L_{dn} values rarely differ by more than 1 dB (with the CNEL being only slightly more restrictive – that is, higher than the L_{dn} value). As a matter of practice, L_{dn} and CNEL values are interchangeable and are treated as equivalent in this assessment.

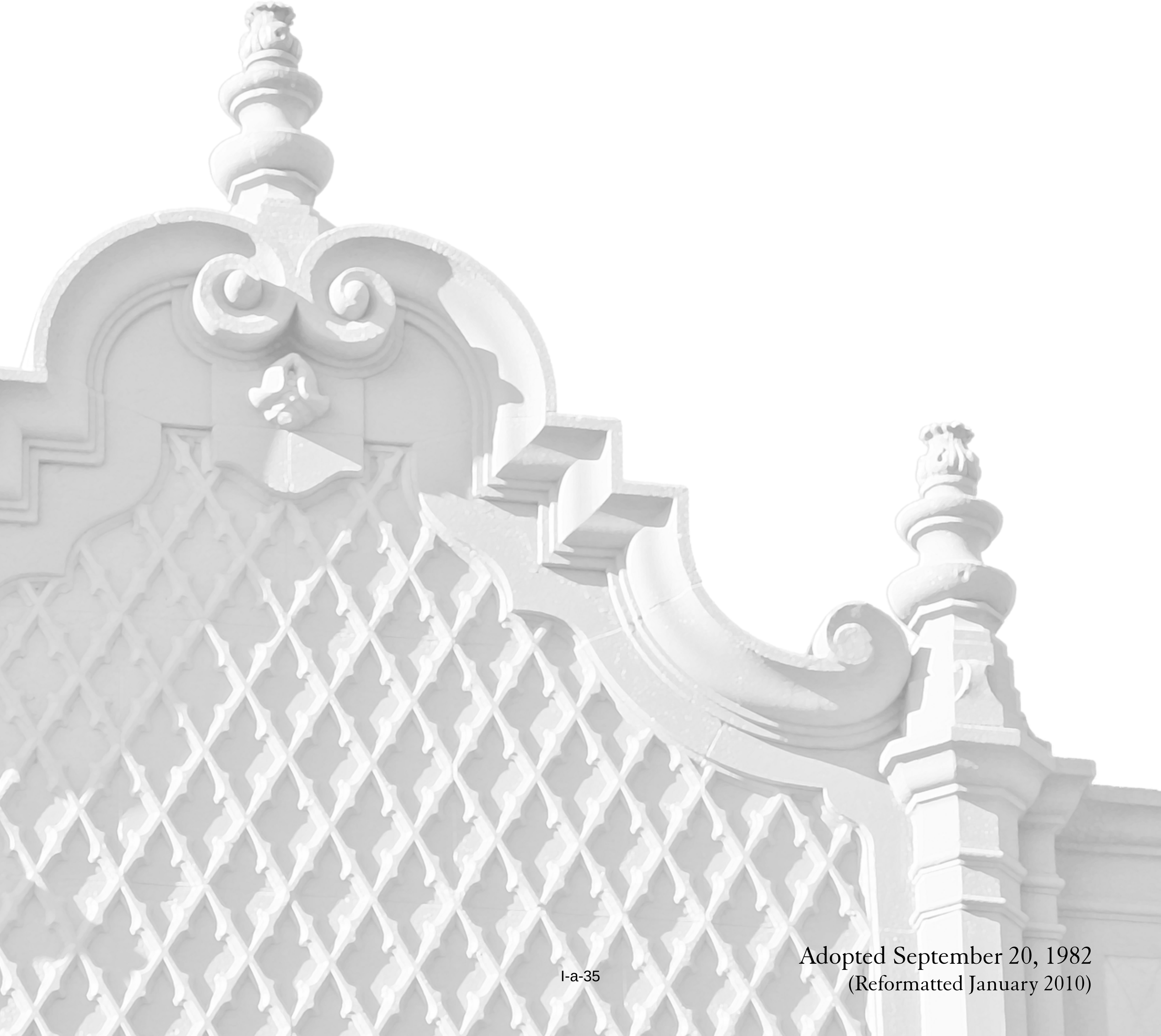
- **Peak Particle Velocity (PPV).** The peak rate of speed at which soil particles move (e.g., inches per second) due to ground vibration.

- **Sensitive Receptor.** Noise- and vibration-sensitive receptors include land uses where quiet environments are necessary for enjoyment and public health and safety. Residences, schools, motels and hotels, libraries, religious institutions, hospitals, and nursing homes are examples.

LOCAL NOISE STANDARDS

City of Santa Ana General Plan

Noise Element



Adopted September 20, 1982

(Reformatted January 2010)

City of Santa Ana General Plan

Noise Element

1982

City of Santa Ana
Planning Division

Adopted

September 20, 1982
(Reformatted January 2010)

This document includes revisions adopted by Santa Ana City Council February 2, 2009 (GPA 2004-03).

REL:adg
8/24/82

RESOLUTION NO. 82-122

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SANTA ANA CERTIFYING THE COMPLETION OF A FINAL ENVIRONMENTAL IMPACT REPORT FOR THE REVISION OF THE GENERAL PLAN OF THE CITY OF SANTA ANA AND ADOPTING THE SAID REVISED GENERAL PLAN

WHEREAS, a proposed revision of the General Plan of the City of Santa Ana (hereinafter referred to as the "Revised General Plan") has been approved by the Planning Commission after public hearing in the manner required by law, and is now on file in the office of the Clerk of the Council; and

WHEREAS, the Revised General Plan includes a draft environmental impact report which has been duly noticed for public review and comment; and

WHEREAS, this Council has held a public hearing on the Revised General Plan, including the said draft environmental impact report, after notice in the manner required by law;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SANTA ANA AS FOLLOWS:

1. The City Council has evaluated all comments and recommendations written and oral, received from persons who have reviewed the draft environmental impact report, and all responses thereto, including those made at the public hearing. The Clerk of the Council is hereby directed to attach all such written comments and responses and the minutes of the said public hearing to the draft environmental impact report, together with a list of persons, organizations and public agencies commenting on the draft environmental impact report. The said comments, responses, and list are hereby incorporated herein as part of the record and, together with the draft environmental impact report, are declared to constitute the final environmental impact report for the Revised General Plan.

2. The City Council hereby certifies that the final environmental impact report for the Revised General Plan has been completed in accordance with the California Environmental Quality Act, the State CEQA Guidelines and local procedures, and that the City Council has reviewed and considered the information contained in the final environmental impact report.

3. The City Council hereby finds, on the basis of the final environmental impact report and other substantial evidence in the record, that changes or alterations have been incorporated into the Revised General Plan which mitigate or avoid the following significant environmental effects identified in the final environmetal impact report: (1) additional traffic (2) reduced air quality (3) increases in noise levels, and (4) increases in energy consumption, and that such significant environmental effect have thereby been substantially lessened. This finding is supported by the following statement of facts:

(a) Although identified as significant effects of the project in the environmental impact report, such effects are not in fact caused by the adoption of the Revised General Plan, but rather by the expected growth and development of the City of Santa Ana and the surrounding region. Such effects would occur to an equal or greater extent under the previously adopted general plan or in the absence of any general plan.

(b) The Revised General Plan contains "Circulation," "Conservation," "Energy" and "Noise" elements of which the policies and programs are specifically designed to mitigate the said identified significant effects in a rational, coordinated manner so as to achieve minimal adverse effects consistent with reasonable growth and development.

4. The City Council hereby finds, on the basis of the final environmental impact report and other substantial evidence in the record, that specific economic, social and other consideration make infeasible the alternatives to the Revised General Plan identified in the final environmental impact report. This finding is supported by the following statement of facts:

(a) The Revised General Plan represents the best balance of competing goals and objectives: preservation of residential community integrity; maintenance of affordable housing; encouragement of economic development; avoidance of unacceptable levels of congestion and disruption.

(b) Greater restriction of residential development would discourage the new development of housing available to persons of low or moderate income. Increasing population, with its consequent increased demand for housing, would result in increasing the cost of the existing housing supply. Less restriction of residential development would result in the disruption of established residential communities.

(c) Greater restriction of commercial-industrial development would reduce employment opportunities in the City of Santa Ana; would deny to City government a tax revenue base sufficient to meet the demand for governmental services; and would lead to stagnation and blight conditions in established commercial areas. Less restriction of commercial-industrial development would allow the intermixture of incompatible land uses and development which is beyond the capacity of streets and other public improvements to serve.

5. The City Council hereby finds, on the basis of the final environmental impact report and other substantial evidence in the record, that the changes in planned land use for areas of the City of Santa Ana accomplished by the adoption of the Revised General Plan are acceptable. Such changes are necessary for the general welfare of the people of the City of Santa Ana over the long-term, in order to achieve a balance between competing needs, as referenced in Section 4 herein, and in order to channel new development into areas in which it will be both financially feasible and compatible with existing uses.

6. The City Council hereby approves and adopts the Revised General Plan. Said Revised General Plan, together with the Revised Housing Element of the General Plan, adopted by the City Council by its Resolution No. 82-7 on January 18, 1982, shall constitute the General Plan of the City of Santa Ana required by Section 65300 of the Government Code of the State of California and the master plan required by Chapter 27 of the Santa Ana Municipal Code. All elements of the general or master plan or amendments thereto previously adopted or approved by the City Council, excepting only the aforesaid Revised Housing Element of the General Plan, are hereby repealed.

7. The Clerk of the Council is hereby directed to endorse the Revised General Plan to show that it has been adopted by the City Council and to retain the same on file in her office.

8. The Director of Planning and Development Services is hereby directed to:

(a) Send a copy of the Revised General Plan to the Planning Agency of Orange County.

(b) File a Notice of Determination with the County Clerk of Orange County pursuant to Section 21152 of the Public Resources Code and the State CEQA Guidelines.

ADOPTED this 20th day of September, 1982.

Gordon Bricken

Gordon Bricken, Mayor

ATTEST:

Janice C. Guy

Janice C. Guy, Clerk of the Council

COUNCILMEMBERS:

Bricken	Aye
Luxembourger	Aye
Acosta	Aye
Serrato	Aye
Griset	Aye
Markel	Nay
McGuigan	Aye

Approved as to Form:

Edward J. Cooper by REL

Edward J. Cooper, City Attorney

Acknowledgments

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Exhibits

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Noise Element

SUMMARY

The new City of Santa Ana General Plan was developed through an extensive process of public participation involving citizens, elected and appointed City officials and City Staff.

The General Plan has been developed to conform to state law and to meet local planning needs through the year 2000. Periodic updates of the new General Plan are anticipated.

The General Plan builds upon Santa Ana's historical assets including the City's heritage as the governmental and financial center of Orange County and the buildings, districts and streetscapes which reflect this heritage.

The General Plan anticipates two major potentials that can shape Santa Ana over the next several decades. The plan anticipates and maximizes the probability of the Countywide rapid transit system to be located in Santa Ana and encourages mixed use development and preservation m corridors and centers relating to this new access and visibility.

The General Plan has three major sections: the Framework Plan, Policy Plan, and Environmental Impact Report.

1. The Framework Plan describes Santa Ana's overall planning strategy and program. This strategy reorganizes the City's land use and urban design structure to take maximum advantage of:

    - the economic development advantages offered by Santa Ana's historic regional location and functions
    - an improved multi-modal transportation system including:
        - Countywide rapid transit access to Santa Ana
        - improved local transit
        - improved auto access to major activity centers
        - a new Amtrak station
        - a downtown multi-modal transportation and bus center

- a downtown shuttle system
- new pedestrian connections within and between land use districts and to public transportation facilities.

The Framework Plan provides an overview of the City's implementation program which includes:

- continuing involvement of the community in developing the detailed implementation plans that will be developed for subareas of the Framework Plan
- efficient processing of development and rehabilitation proposals by means of a Development Review Team
- a carefully coordinated development program to foster and assist private investment through:
    - land assembly
    - coordinated provision of public improvements
    - Specific Plans
    - citizen participation coordination
    - low interest loans and grants
    - project promotion

2. The Policy Plan spells out the:

    - goals and objectives which underlie the Framework Plan
    - greater detail regarding implementation policies and programs supporting the Framework Plan.

    Together, the Framework Plan and Policy Plan envision a new image for Santa Ana consisting of:

    - increased economic activity to provide jobs and maintain a solid financial base for city services
    - improvement of Santa Ana's housing stock for a full range of income groups and lifestyles
    - the finest multi-modal transportation system in Orange County
    - a new physical environment consisting of:
        - preserved and enhanced viable Neighborhoods
        - District Centers combining new shopping facilities with recreational, cultural, education, employment and special housing types
        - improvement of Santa Ana's major Industrial Districts
        - Mixed Use Corridors with a range of uses similar to the District Centers but with more facilities related to regional transit and auto access.

Exhibit 1 Framework Concept

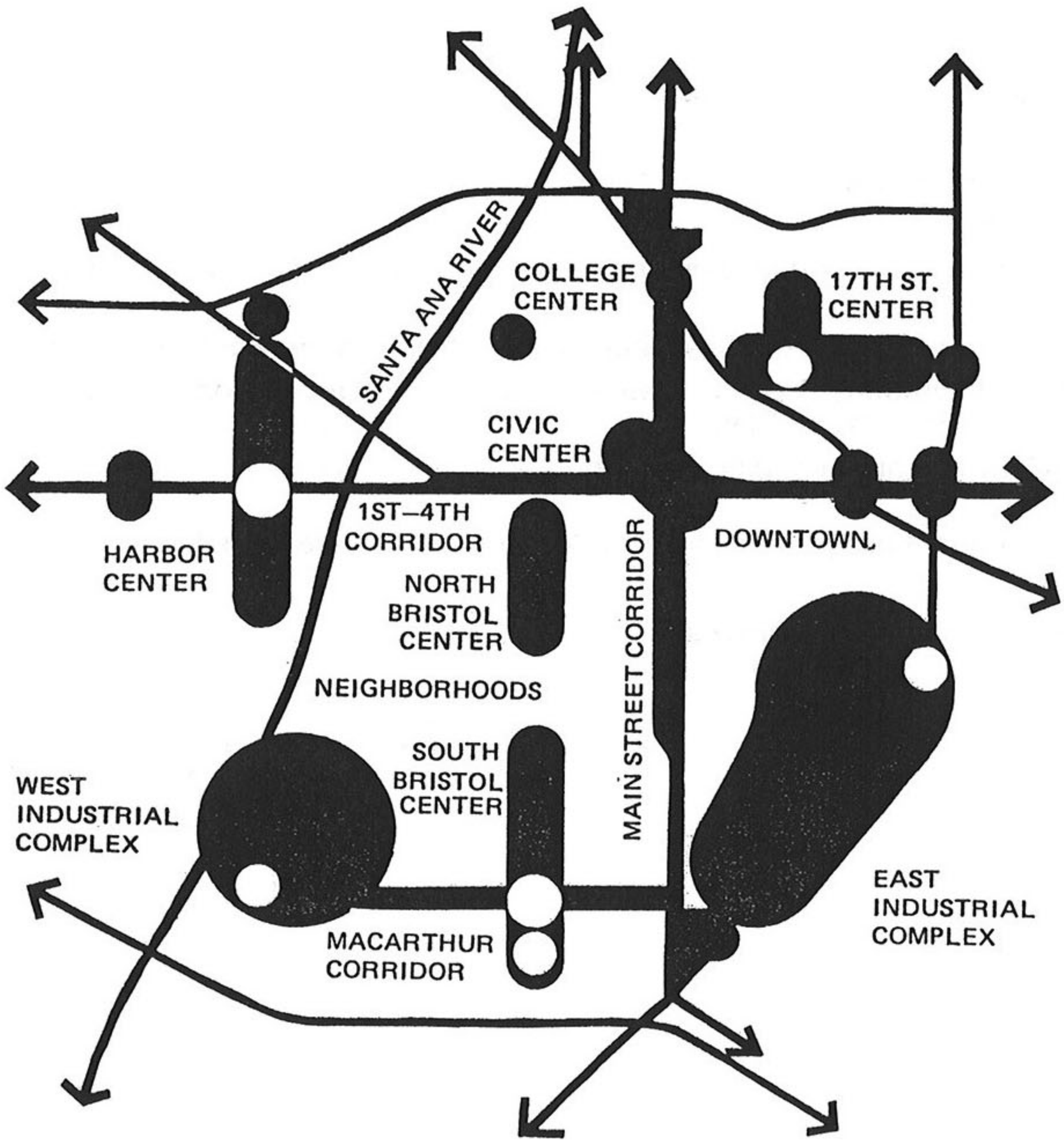

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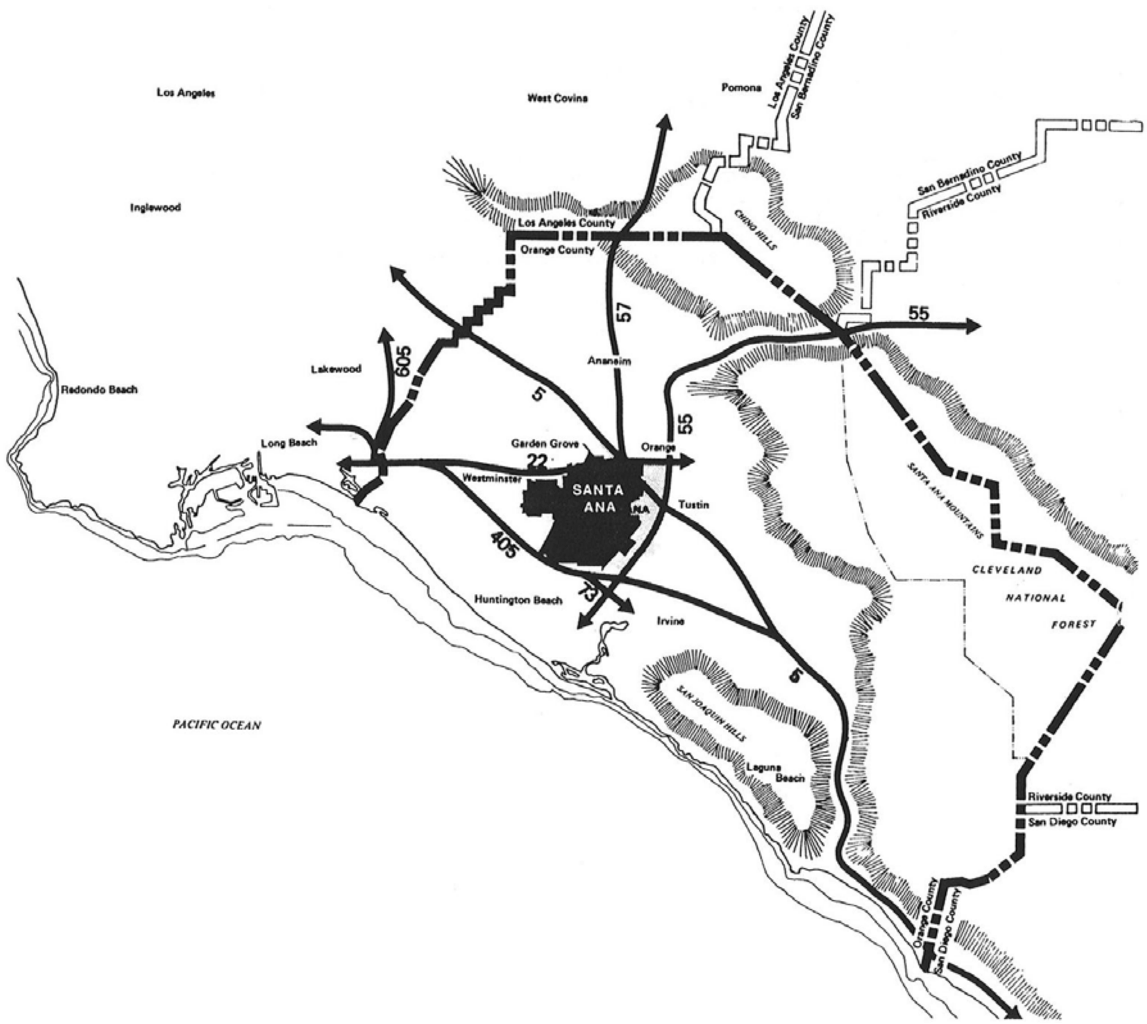
Exhibit 2 Regional Context



3. The Environmental Impact Report contains:

   - an analysis of the impacts of implementation of the General Plan
   - an evaluation of alternative strategies and
   - mitigation means to insure compatibility of the proposed plans and policies.

PLANNING CONTEXT

HISTORICAL

Santa Ana's rich history provides a legacy for community planning and revitalization in the 1980's. Santa Ana was founded in 1869 by William Spurgeon. The original town, laid out by Mr. Spurgeon, consisted of 24 blocks. The town served as a shopping center and post office for surrounding agricultural areas.

In 1878 the Southern Pacific Railroad arrived and the Santa Fe Railroad followed in 1886. This encouraged development of the City. In 1889 the County seat was located in Santa Ana and this further stimulated the development of businesses, stores, financial institutions and hotels serving the metropolitan population. Citrus and walnut farms were still plentiful and buying and selling land became the number one enterprise. The First to 17th Street area was subdivided during the building boom of the 1880's. Many of the structures in downtown and the surrounding bungalow homes were built in the early 1900's and 1920's.

The City is retaining and building upon its important governmental, retailing and employment roles in the County and the rich architectural and streetscapes heritage associated with the City's history.

REGIONAL

Santa Ana is geographically central to the developable land within Orange County. The City has excellent relationships to freeways, rail services via Amtrak and air transportation at the John Wayne Airport. Because of Santa Ana's geographic centrality and functional importance to the County, the Orange County Transit District is planning major fixed rail transit corridors in the Main Street and Pacific Electric right-of-ways. These regional transportation improvements, combined with improvements to freeway access points and local streets, provide Santa Ana with abundant development opportunities for the 1980's.

PLANNING PROCESS

The Planning Process used in creating the Santa Ana General Plan is summarized in Exhibit 3 and related photographs. The process involved:

- a 150-person Citizen Advisory Committee (CAC) to which all citizens applying were appointed by the City Council
- the Planning Commissioners who served as chairpersons of five CAC subcommittees: Land Use and Urban Design, Circulation, Housing, Economic Development and Environmental Factors
- the City Council who participated in goal setting and policy making workshops
- the public-at-large who participated in a series of Town Forums and Public Hearings
- City Staff who worked with The Arroyo Group (TAG) in conducting the planning process and who evaluated the program as it evolved.

The six key steps in the planning process were:

1. **Data Collection and Analysis.** The data base for the previous General Plan was outdated and up-to-date census data was not available. Emphasis was placed on community definition of problems and opportunities through CAC and Staff Steering Committee workshops and mapping. TAG subcontractors also gathered key data in areas such as market demand, traffic, seismic, etc. This data was summarized and analyzed in a separate Problems and Opportunities Report.

2. **Formulation of Goals and Objectives.** Initial goals and objectives were developed through workshops, with the CAC and City staff. Several cycles of refinement were done by TAG based on input from the Planning Commission, City Council, CAC and staff.

3. **Formulation of Subarea Alternatives.** Santa Ana has a large number of fixed elements such as streets and land uses. Therefore, subarea plans were developed to provide alternative land use patterns in different parts of the City. Each subarea plan was related to an urban design framework previously approved by the CAC, Planning Commission and City staff.

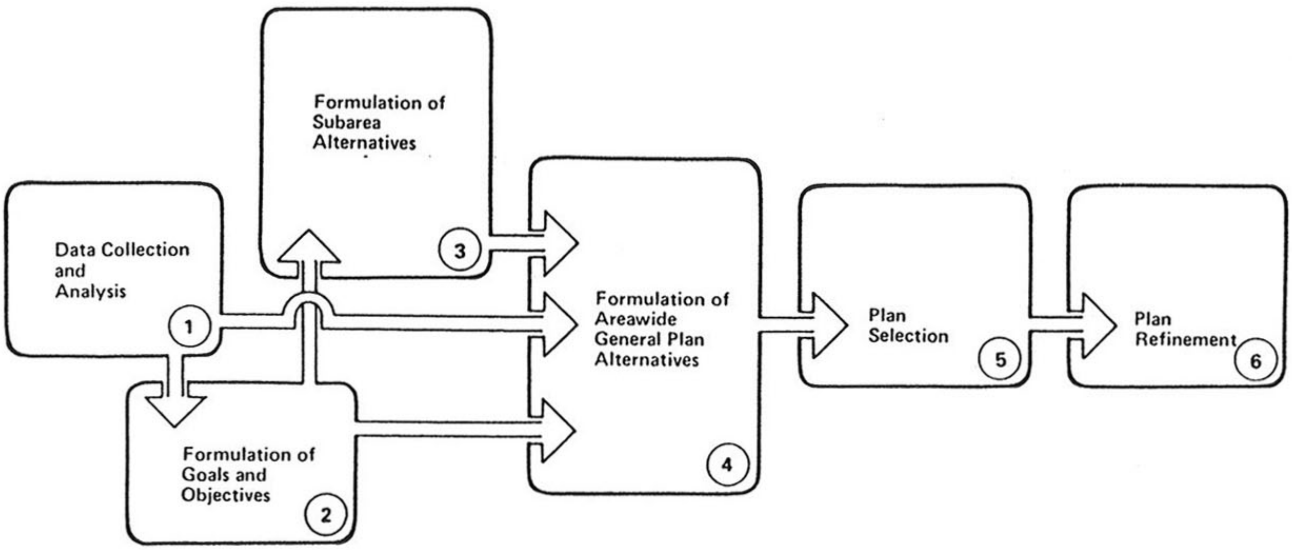
4. **Formulation of Areawide General Plan Alternatives.** Areawide General Plan alternatives focused on different combinations of subarea plans.

5. **Plan Selection Plan.** Selection was done through a series of meetings with the CAC, Planning Commission and City staff.

6. **Plan Refinement.** Plan refinement was accomplished by staff review of a Preliminary Draft, and CAC, Planning Commission and Public-at-Large comments on a Public Hearing Draft.

Exhibit 3 illustrates some of the materials utilized during the planning process.

Exhibit 3 Planning Process



POLICY PLAN

INTRODUCTION

The Policy Plan section of the General Plan sets forth the detailed policies of the City relative to the framework Plan described in Section 1.

Each element of the Policy Plan contains goals, objectives, implementation policies and implementation programs.

Each element also contains a Planning Factors section which reflects the major issues identified through the citizen participation process.

The Plan Components section of each element describes the planning and design concepts illustrated in the maps and provides an overview of implementation considerations.

Noise has many sources, including industrial processes, vehicular transportation, use of amplified sound, construction, and human speech. Through careful land use planning, Santa Ana can ensure that the activities which produce result in minimal interference with the activities which are sensitive to noise.

The City's goal is to minimize noise problems in areas sensitive to noise because Santa Ana is almost fully developed, the main focus of the Noise section is on remedial measures to deal with existing noise problems, prevention of new noise problems through proper arrangement of noise sensitive land uses in relationship to circulation systems and establishment of appropriate noise emission or insulation standards for the various land uses.

PLANNING FACTORS

Definition of undesirable or unhealthful noise levels must precede the goal of minimizing noise problems. The City adopts the following standards and guidelines for noise levels for land uses:

Table 1
Interior and Exterior Noise Standards

Categories	*Land Use Categories*	*Interior*[1]	*Exterior*[2]
Residential	Single-family, duplex, multi-family	45[3]	65
Institutional	Hospital, school classroom/playgrounds	45	65
	Church, library	45	--
Open Space	Parks	--	65

Notes:
1 Interior areas (to include but are not limited to: bedrooms, bathrooms, kitchens, living rooms, dining rooms, closets, corridors/hallways, private offices, and conference rooms.
2 Exterior areas shall mean: private yards of single family homes, park picnic areas, school playgrounds, common areas, private open space, such as atriums on balconies, shall be excluded form exterior areas provided sufficient common area is included within the project.
3 Interior noise level requirements contemplate a closed window condition. Mechanical ventilation system or other means of natural ventilation shall be provided per Chapter 12, Section 1305 of the Uniform Building Code.

All Residential uses should be protected with sounds insulation over and above that provided by normal building construction when constructed in areas exposed to greater than 60 dB CNEL.

The above standards and guidelines represent an appreciation that higher intensity land uses bring with them higher noise levels simply because more people are using these areas. Insuring low noise levels will help to insure that housing is kept will-maintained and keeps value over time, reducing municipal expenditures and maintaining revenues.

NOISE ABATEMENT

Some areas of Santa Ana are exposed to levels of freeway or rail noise that are considered unacceptable for new residential development. Noise conflicts in such cases can be mitigated by providing barriers between the noise source and the residential use, or by providing sound insulation in existing residences. Generally, barriers should be provided to protect residential uses.

Exhibit 4 illustrates transportation noise sources in the City and classifies arterial streets by the expected distance from the arterial where the noise level will exceed 60 dB CNEL or Ldn and sound insulation or barriers should be provided to protect residential uses.

NOISE PREVENTION

Potential noise problems may be prevented by ensuring that planning for residential uses carefully considers proximity to major transportations corridors and other noise generators. Adherence to proper noise-related setbacks for noise sensitive uses can reduce noise to acceptable or desirable levels for those uses. The distance required varies with the expected volume of traffic. The distance may be reduced by providing walls or berms between the noise source and the use.

The graph below indicates the required distance from transportation noise sources to achieve desired noise levels for a range of traffic flows. At the time development takes place, developments proposed in zones that would be incompatible under standards of the noise abatement plan are required to include a report indicating how these standards will be achieved.

GOALS, OBJECTIVES, POLICIES AND PROGRAMS

GOALS

Goal 1

Prevent significant increases in noise levels in the community and minimize the adverse effects of currently-existing noise sources.

OBJECTIVES

1.1 Prevent creation of new and additional sources of noise.

1.2 Reduce current noise levels to acceptable standards.

POLICIES

- Require consideration of noise generation potential and susceptibility to noise impacts in the sitting, design and construction of new developments.
- Require mitigating site and building design features, traffic circulation alternatives, insulation, and other noise prevention

measures of those new developments which generate high noise levels.

- Sound insulate and/or buffer sensitive land uses such as housing from adverse noise impacts in noise-prone areas.
- Minimize noise generation in residential neighborhoods through control or elimination of truck traffic and through-traffic from these areas.

PROGRAMS

- Restrict new zoning in noise impact or abatement areas to non-residential uses.
- Review zoning ordinances and modify as necessary to assure appropriate insulation and/or other noise reduction actions with respect to interior and exterior power and mechanical equipment.
- Utilize the development approval process to assure that buildings are sited and internal and external traffic circulation systems designed so as to minimize the impact of noise-generating activities on nearby neighborhoods and noise-sensitive land uses.
- Work with the California Department of Transportation to develop a freeway noise mitigation program.
- Prohibit truck traffic in residential neighborhoods.
- Alleviate through-vehicular traffic in residential neighborhoods via implementation of recommendations in the Circulation section.

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Exhibit 4 Noise Abatement Areas

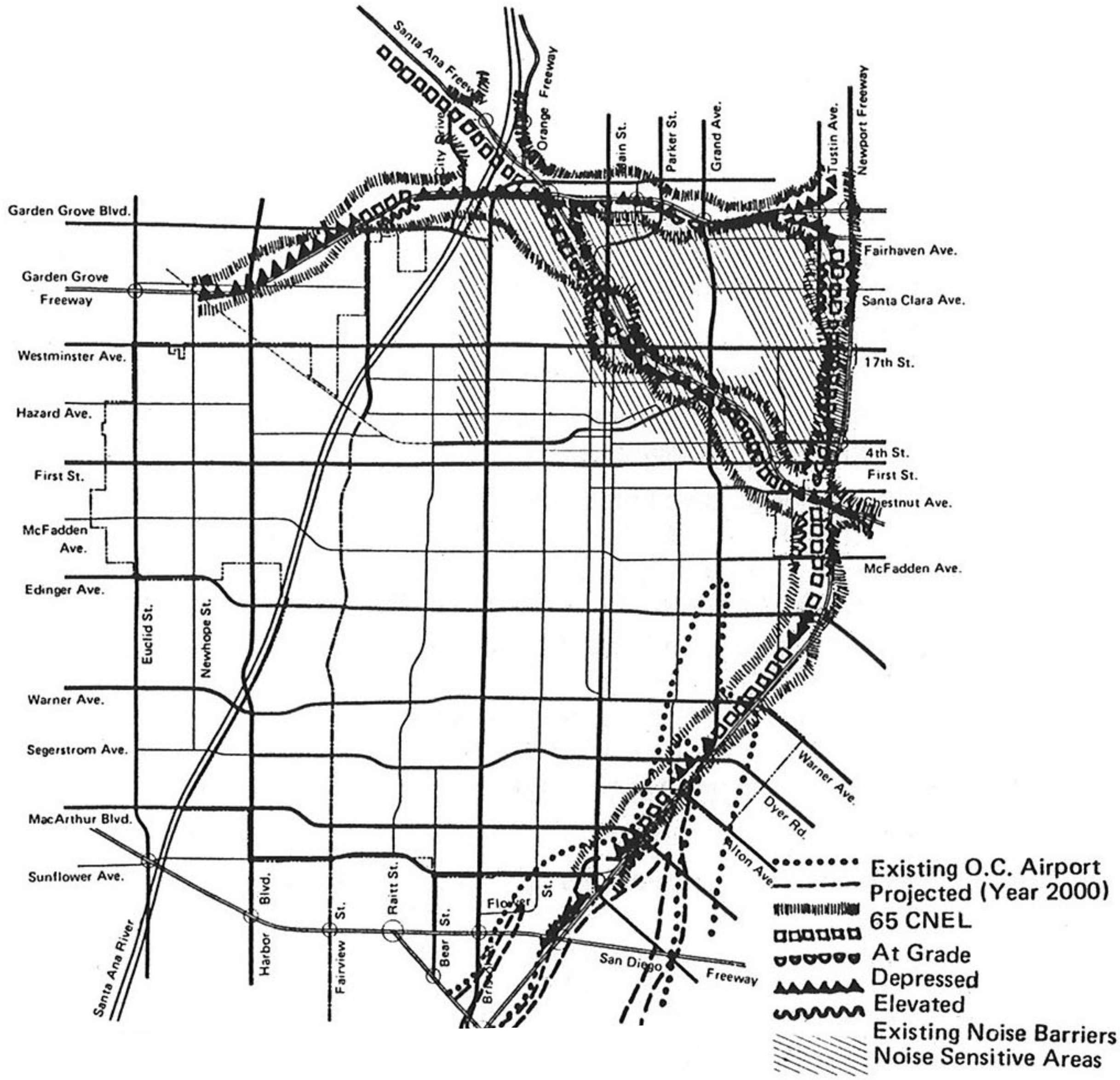

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Exhibit 5 Transportation Noise Sources

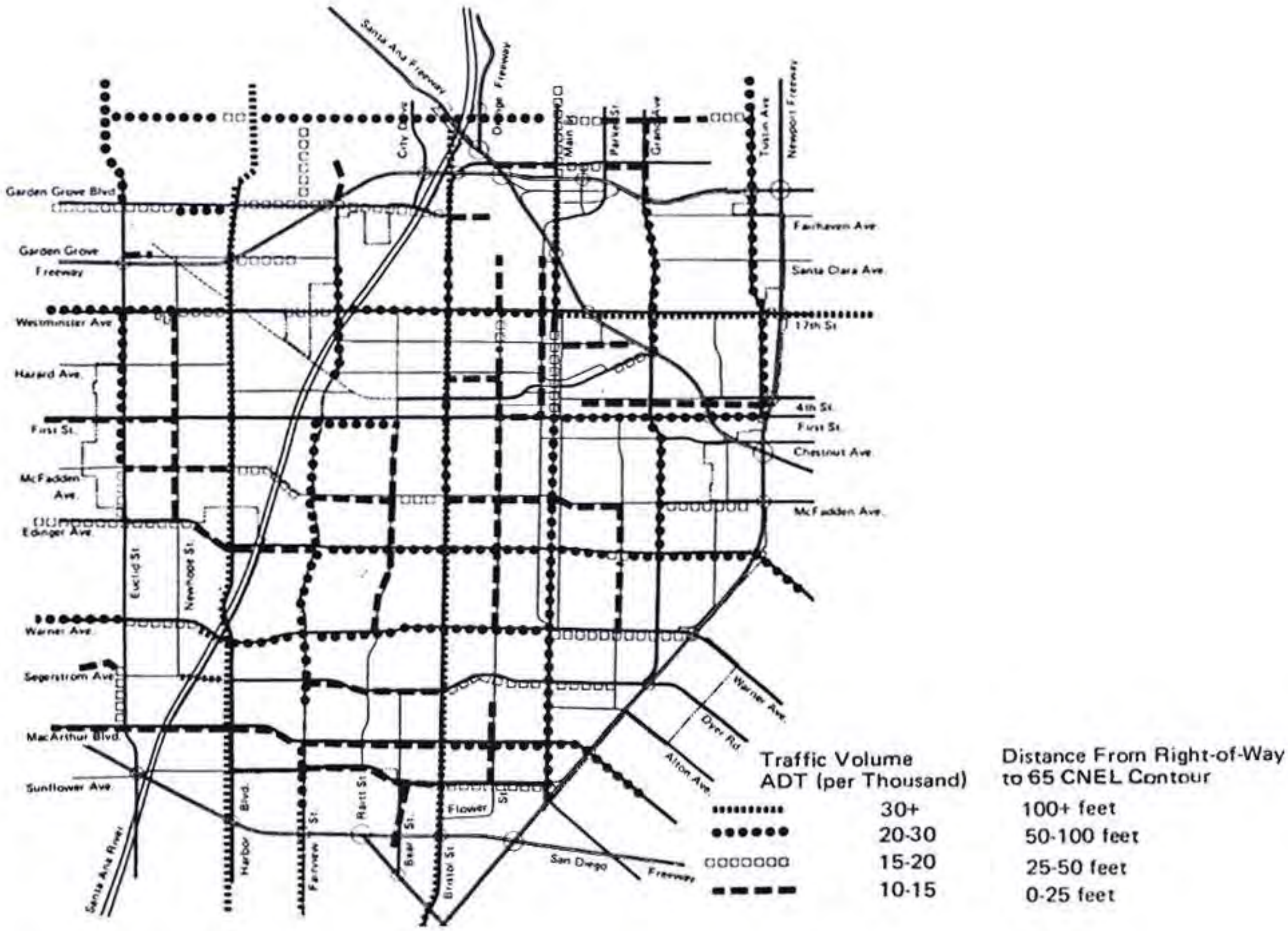

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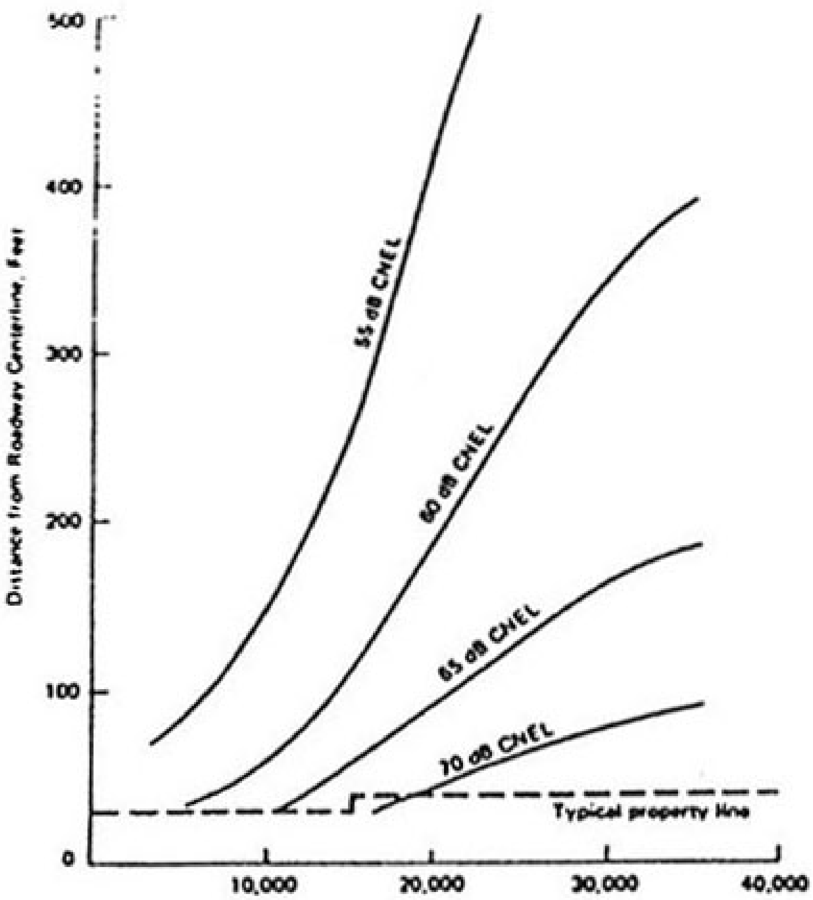
Exhibit 6 Required Distances from Transportation Noise Sources



Traffic Volumes, Vehicles per Day

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ARTICLE VI. - NOISE CONTROL

Sec. 18-308. - Declaration of policy.

In order to control unnecessary, excessive and annoying sounds emanating from areas of the city, it is hereby declared to be the policy of the city to prohibit such sounds generated from all sources as specified in this article.

It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest.

(Ord. No. NS-1441, 1, 8-21-78)

Sec. 18-309. - Definitions.

The following words, phrases and terms as used in this article shall have the meaning as indicated below:

Ambient noise level shall mean the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

Cumulative period shall mean an additive period of time composed of individual time segments which may be continuous or interrupted.

Decibel (dB) shall mean a unit which denotes the ratio between two (2) quantities which are proportional to power: The number of decibels corresponding to the ratio of two (2) amounts of power is ten (10) times the logarithm to the base ten (10) of this ratio.

Dwelling unit shall mean a single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation.

Emergency machinery, vehicle or work shall mean any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

Fixed noise source shall mean a stationary device which creates sounds while fixed or motionless, including, but not limited to, industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

Grading shall mean any excavating or filling of earth material, or any combination thereof, conducted at a site to prepare said site for construction or other improvements thereon.

Impact noise shall mean the noise produced by the collision of one mass which may be either in motion or at rest.

Mobile noise source shall mean any noise source other than a fixed noise source.

Noise level shall mean the "A" weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dB (A).

Person shall mean a person, firm, association, copartnership, joint venture, corporation or any entity, public or private in nature.

Residential property shall mean a parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

Simple tone noise shall mean a noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

Sound level meter shall mean an instrument meeting American National Standard Institute's Standard S1.4-1971 for Type 1 or Type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

Sound pressure level of a sound, in decibels, shall mean twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-310. - Noise level measurement criteria.

Any noise level measurements made pursuant to the provisions of this article shall be performed using a sound level meter as defined in section 18-309.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-311. - Designated noise zone.

The entire City of Santa Ana is hereby designated as "Noise Zone 1."

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-312. - Exterior noise standards.

(a) The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dB(A)	7:00 a.m.—10:00 p.m.
	50 dB(A)	10:00 p.m.— 7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB (A).

(b) It shall be unlawful for any person at any location within the City of Santa Ana to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, to exceed:

(1) The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or

(2) The noise standard plus five (5) dB(A) for a cumulative period of more than fifteen (15) minutes in any hour; or

(3) The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or

(4) The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one minute in any hour; or

(5) The noise standard plus twenty (20) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds any of the first four (4) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-313. - Interior noise standards.

(a) The following interior noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

INTERIOR NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dB(A)	7:00 a.m.—10:00 p.m.
	45 dB(A)	10:00 p.m.—7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB(A).

(b) It shall be unlawful for any person at any location within the City of Santa Ana to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured within any other dwelling unit on any residential property, to exceed:

(1) The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or

(2) The interior noise standard plus five (5) dB(A) for a cumulative period of more than one minute in any hour; or

(3) The interior noise standard plus ten (10) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds either of the first two (2) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the third noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-314. - Special provisions.

The following activities shall be exempted from the provisions of this article:

(a) Activities conducted on the grounds of any public or private nursery, elementary, intermediate or secondary school or college.

(b) Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a license issued by the City of Santa Ana.

(c) Activities conducted on any park or playground, provided such park or playground is owned and operated by a public entity.

(d) Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.

(e) Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or any time on Sunday or a federal holiday.

(f) All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

(g) Mobile noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

(h) Mobile noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the agricultural commissioner.

(i) Noise sources associated with the maintenance of real property, provided said activities take place between 7:00 a.m. and 8:00 p.m. on any day except Sunday or a federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a federal holiday.

(j) Any activity to the extent regulation thereof has been preempted by state or federal law.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-315. - Schools, hospitals and churches; special provisions.

It shall be unlawful for any person to create any noise which causes the noise level at any school, hospital or church while the same is in use to exceed the noise limits as specified in section 18-312 prescribed for the assigned noise zone in which the school, hospital or church is located, or which noise level unreasonably interferes with the use of such institutions or which unreasonably disturbs or annoys patients in the hospital, provided conspicuous signs are displayed in three (3) separate locations within one-tenth (1/10) of a mile of the institution indicating the presence of a school, church or hospital.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-316. - Air conditioning and refrigeration; special provisions.

During the five-year period following the effective date of this article, the noise standards enumerated in sections 18-312 and 18-313 shall be increased eight (8) dB(A) where the alleged offensive noise source is an air conditioning or refrigeration system or associated equipment which was installed prior to the effective date of this article.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-317. - Noise level measurement.

The location selected for measuring exterior noise levels shall be at any point on the affected property. Interior noise measurements shall be made within the affected dwelling unit. The measurement shall be made at a point at least four (4) feet from the wall, ceiling, or floor nearest the alleged offensive noise source and may be made with the windows of the affected unit open.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-318. - Manner of enforcement.

The chief of police, the Orange County health officer and their duly authorized representatives are directed to enforce the provisions of this article. The chief of police, the Orange County health officer and their duly authorized representatives are authorized, pursuant to Penal Code Section 836.5, to arrest any person without a warrant when they have reasonable cause to believe that such person has committed a misdemeanor in their presence.

No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this article while such person is engaged in the performance of his duty.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-319. - Variance procedure.

The owner or operator of a noise source which violates any of the provisions of this article may file an application with the Orange County health officer for a variance from the provisions thereof wherein said owner or operator shall set forth all actions taken to comply with said provisions, the reasons why immediate compliance cannot be achieved, a proposed method of achieving compliance, and a proposed time schedule for its accomplishment. Said application shall be accompanied by a fee as established by resolution of the city council. A separate application shall be filed for each noise source; provided however, that several mobile sources under common ownership, or several fixed sources on a single property may be combined into one application. Upon receipt of said application and fee, the health officer shall refer it with his recommendation thereon within thirty (30) days to the Orange County Noise Variance Board for action thereon in accordance with the provisions of applicable law.

An applicant for a variance shall remain subject to prosecution under the terms of this article until a variance is granted.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-320. - Appeals.

Within fifteen (15) days following the decision of the Orange County Variance Board on an application, the applicant, the health officer, or any member of the city council, may appeal the decision to the city council by filing a notice of appeal with the secretary of the Orange County Variance Board. In the case of an appeal by the applicant for a variance, the notice of appeal shall be accompanied by a fee to be computed by the secretary of the Orange County Variance Board on the basis of the estimated cost of preparing the materials required to be forwarded to the city council as discussed hereafter. If the actual cost of such preparation differs from the estimated cost appropriate payments shall be made either to or by the secretary of the Orange County Variance Board.

Within fifteen (15) days following receipt of a notice of appeal and the appeal fee, the secretary of the Variance Board shall forward to the city council copies of the application for variance; the recommendation of the health officer; the notice of appeal; all evidence concerning said application received by the variance board and its decision thereon. In addition, any person may file with the clerk of the city council written arguments supporting or attacking said decision and the city council may in its discretion hear oral arguments thereon. The clerk of the city council shall mail to the applicant a notice of the date set for hearing of the appeal. The notice shall be mailed at least ten (10) days prior to the hearing date.

Within sixty (60) days following its receipt of the notice of appeal, the city council shall either affirm, modify or reverse the decision, of the variance board. Such decision shall be based upon the city council's evaluation of the matters submitted to the city council in light of the powers conferred on the variance board and the factors to be considered, both as enumerated in section 18-319 and Orange County Ordinance section 4-6-13.

As part of its decision, the city council may direct the variance board to conduct further proceedings on said application. Failure of the city council to affirm, modify or reverse the decision of the variance board within said sixty-day period shall constitute an affirmance of the decision.

(Ord. No. NS-1441, § 1, 8-21-78)

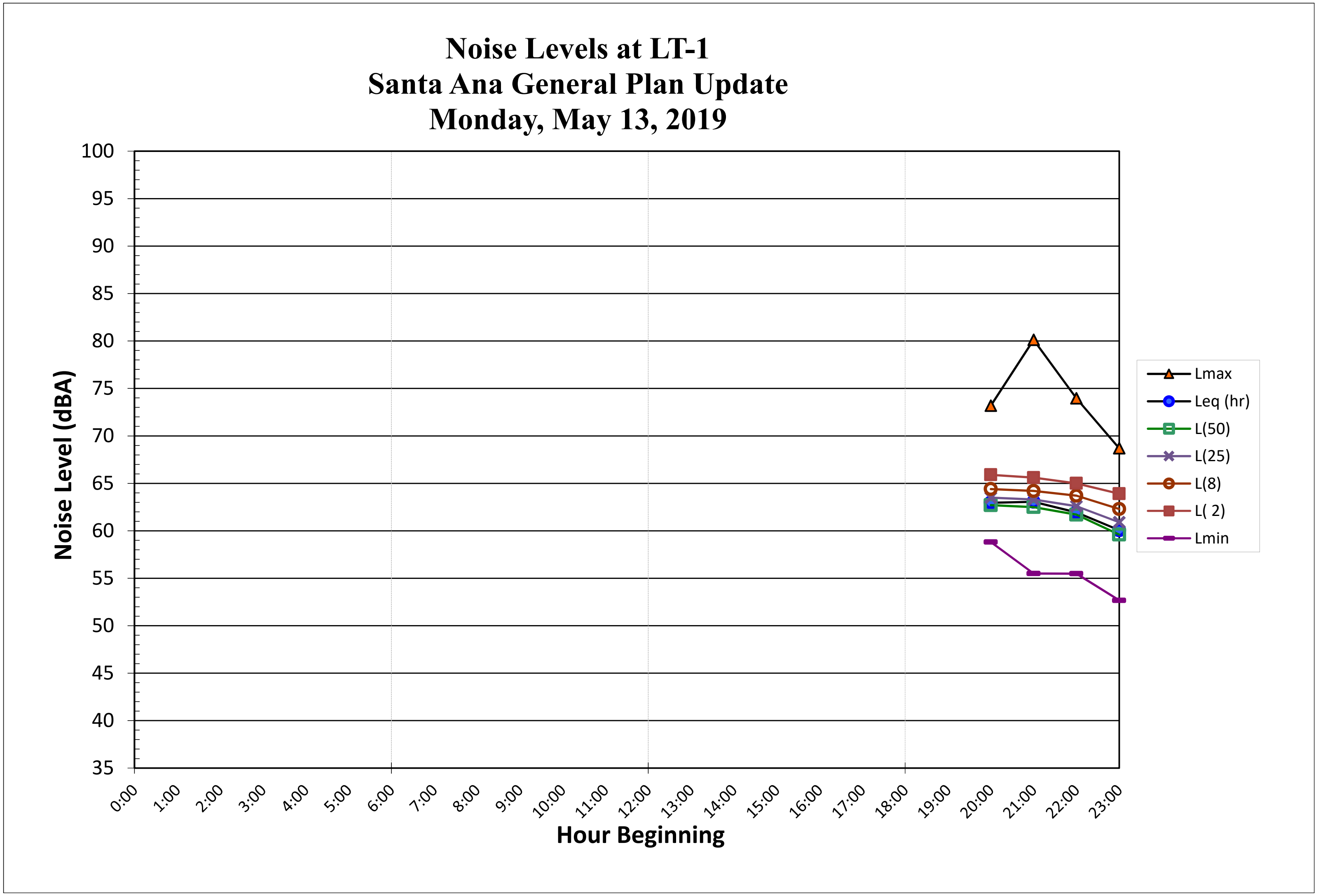
Sec. 18-321. - Violations; misdemeanors.

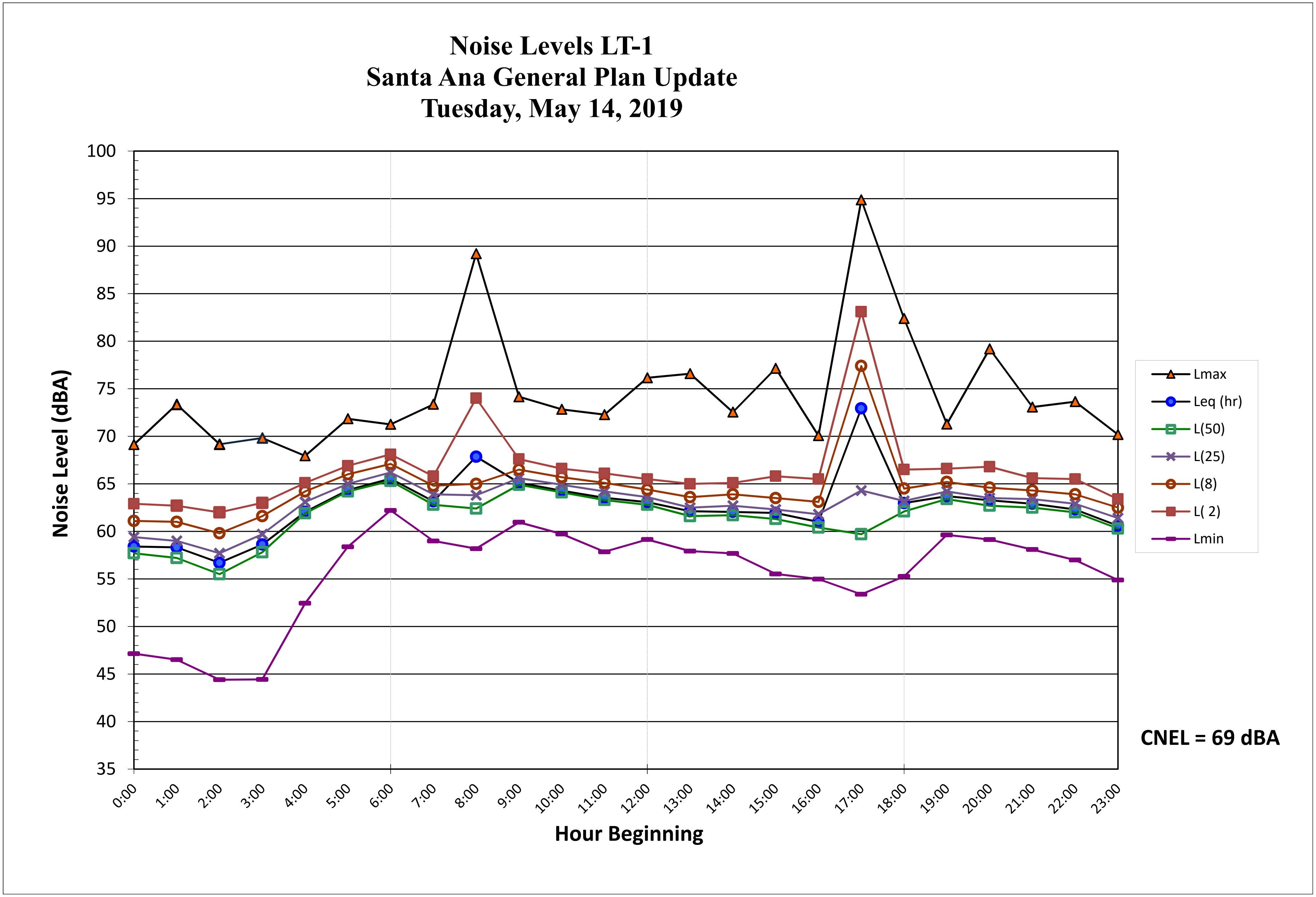
Any person violating any or the provisions of this article shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. The provisions of this article shall not be construed as permitting conduct not prescribed herein and shall not affect the enforceability of any other applicable provisions of law.

(Ord. No. NS-1441, § 1, 8-21-78)

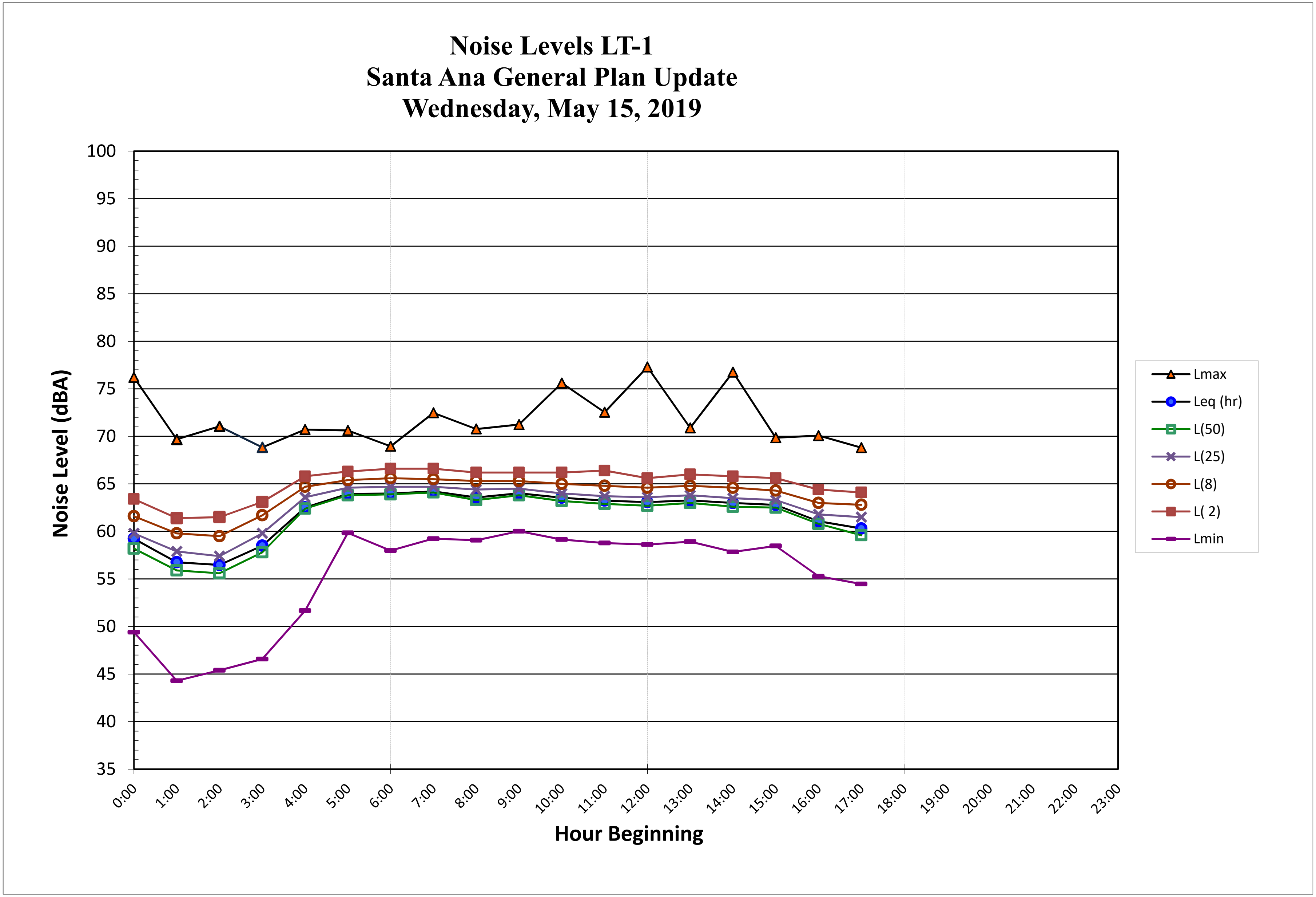
Secs. 18-322—18-350. - Reserved.

AMBIENT NOISE MONITORING RESULTS


Noise Levels at LT-1
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels LT-1
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 69 dBA


Noise Levels LT-1
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
Hour Beginning
100
95
90
85
80
75
70
65
60
55
50
45
40
35
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
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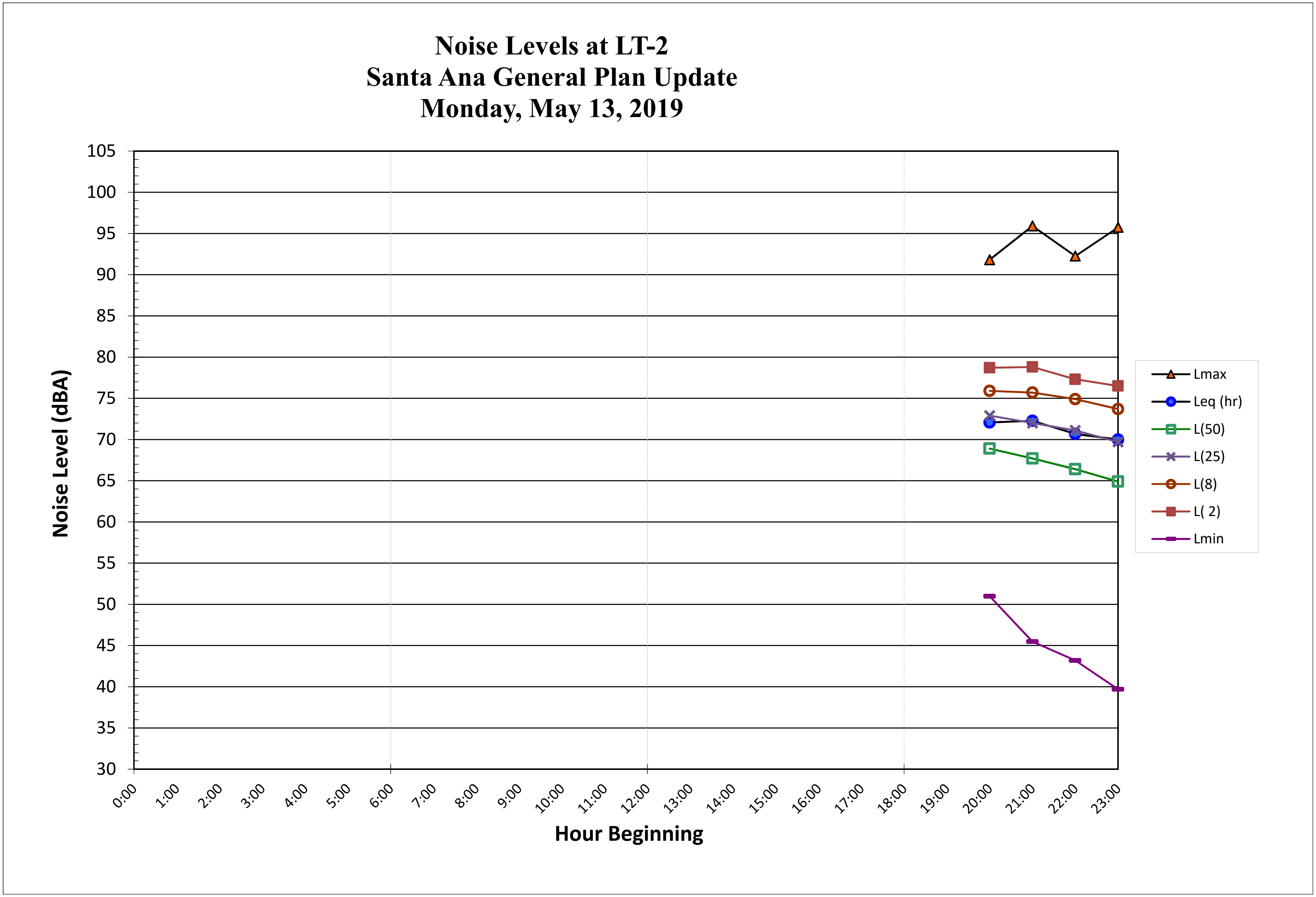
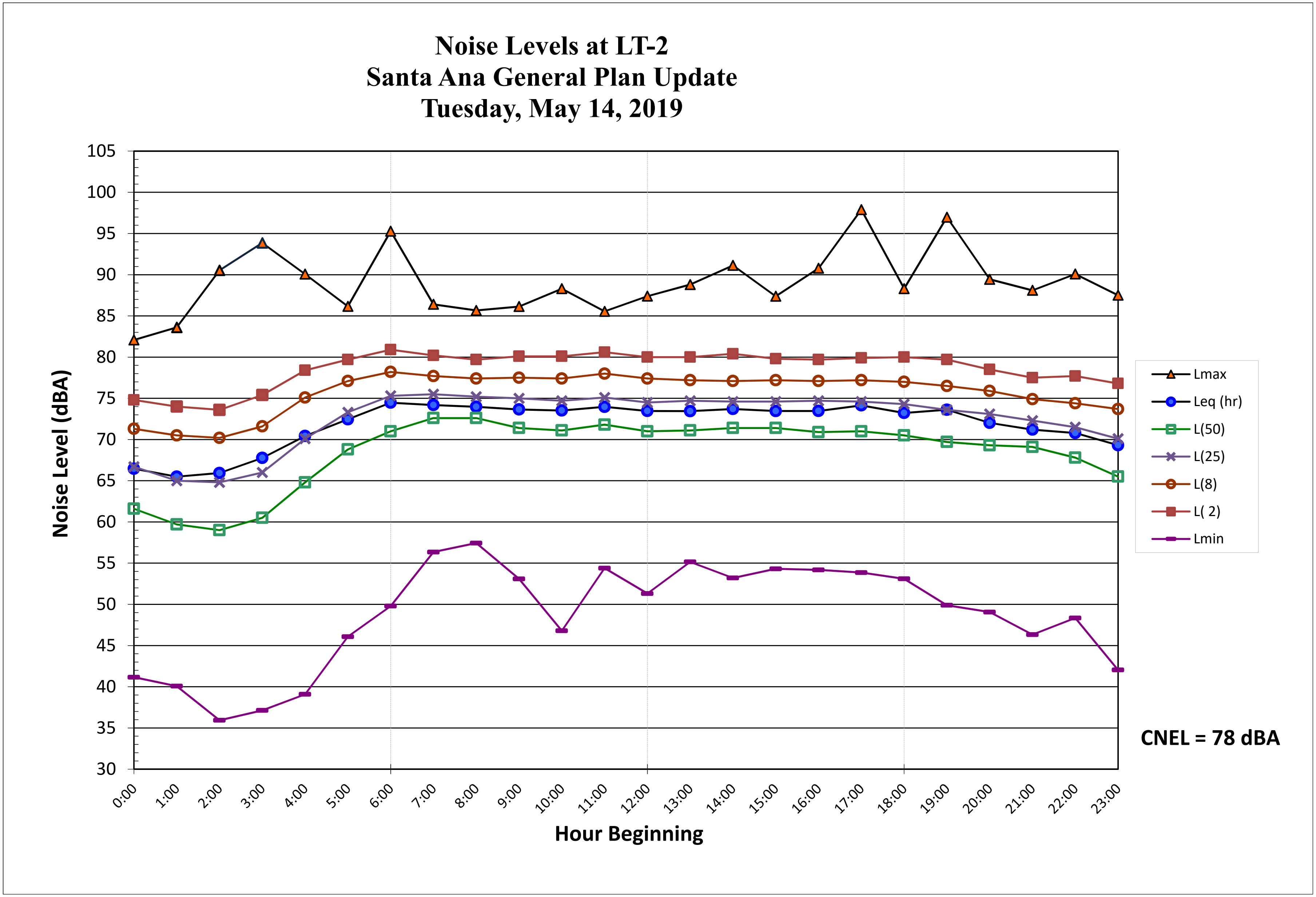
23:00
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-2
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-2
Santa Ana General Plan Update
Tuesday, May 14, 2019
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
Noise Level (dBA)
0:00
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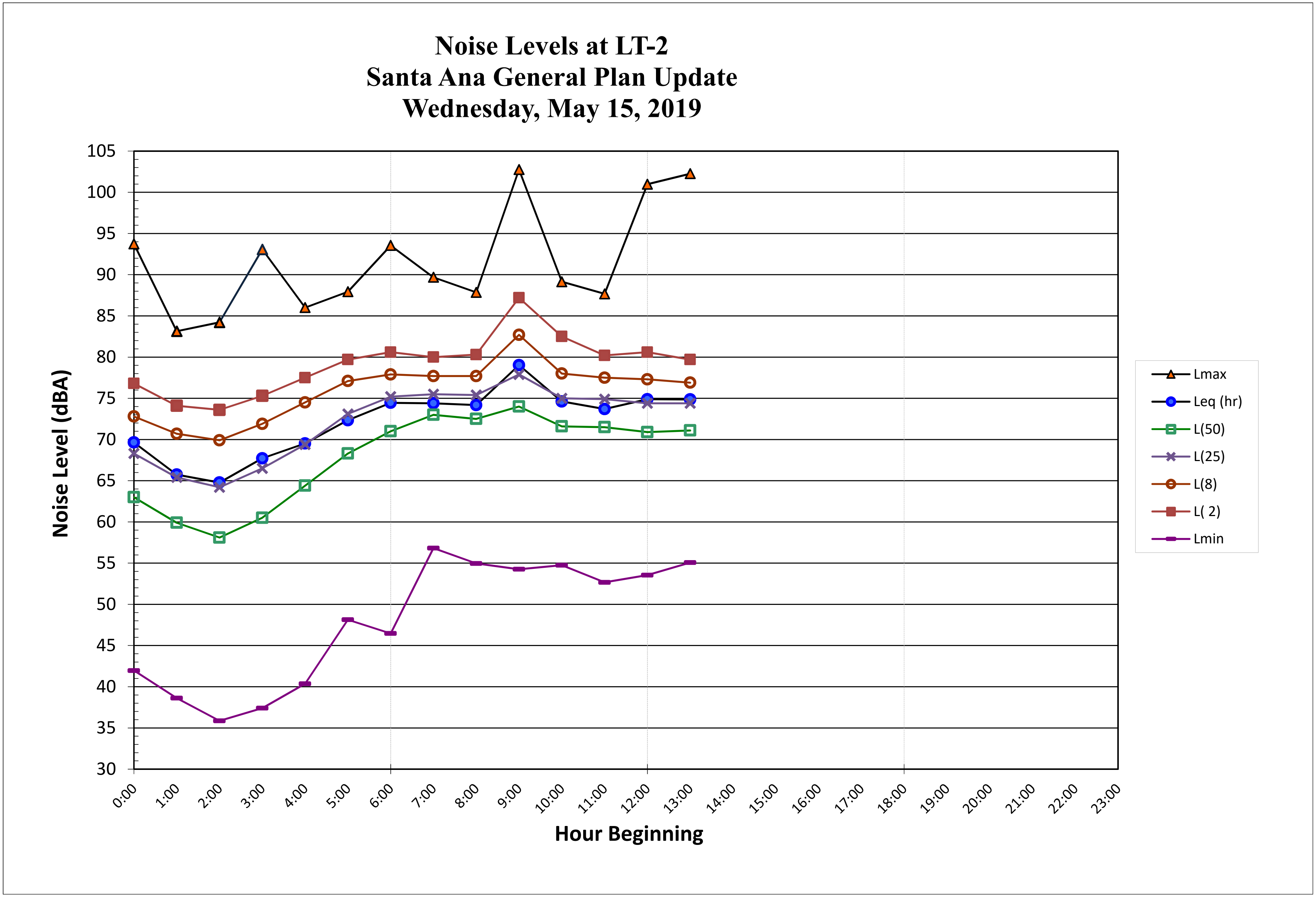
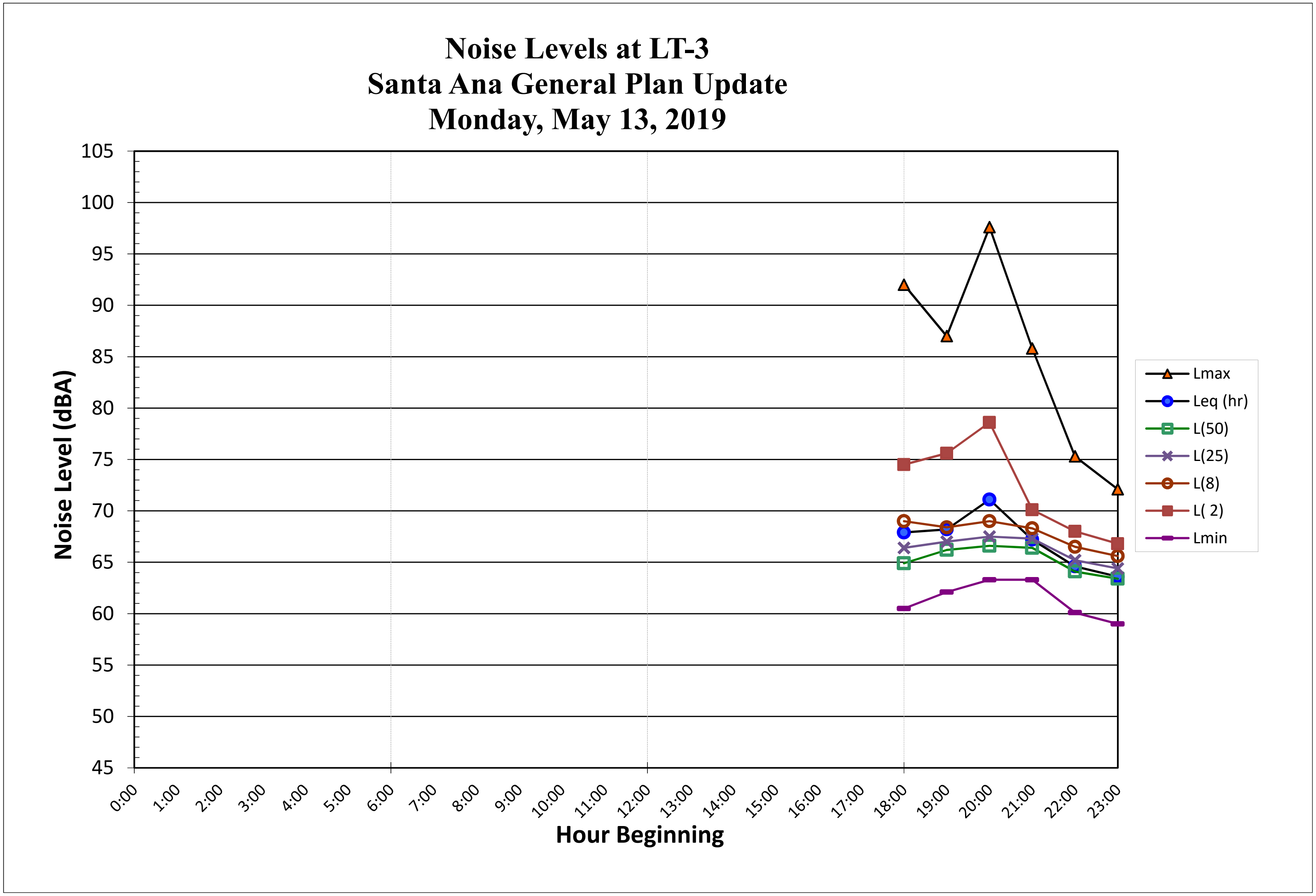
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 78 dBA


Noise Levels at LT-2
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-3
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
100
95
90
85
80
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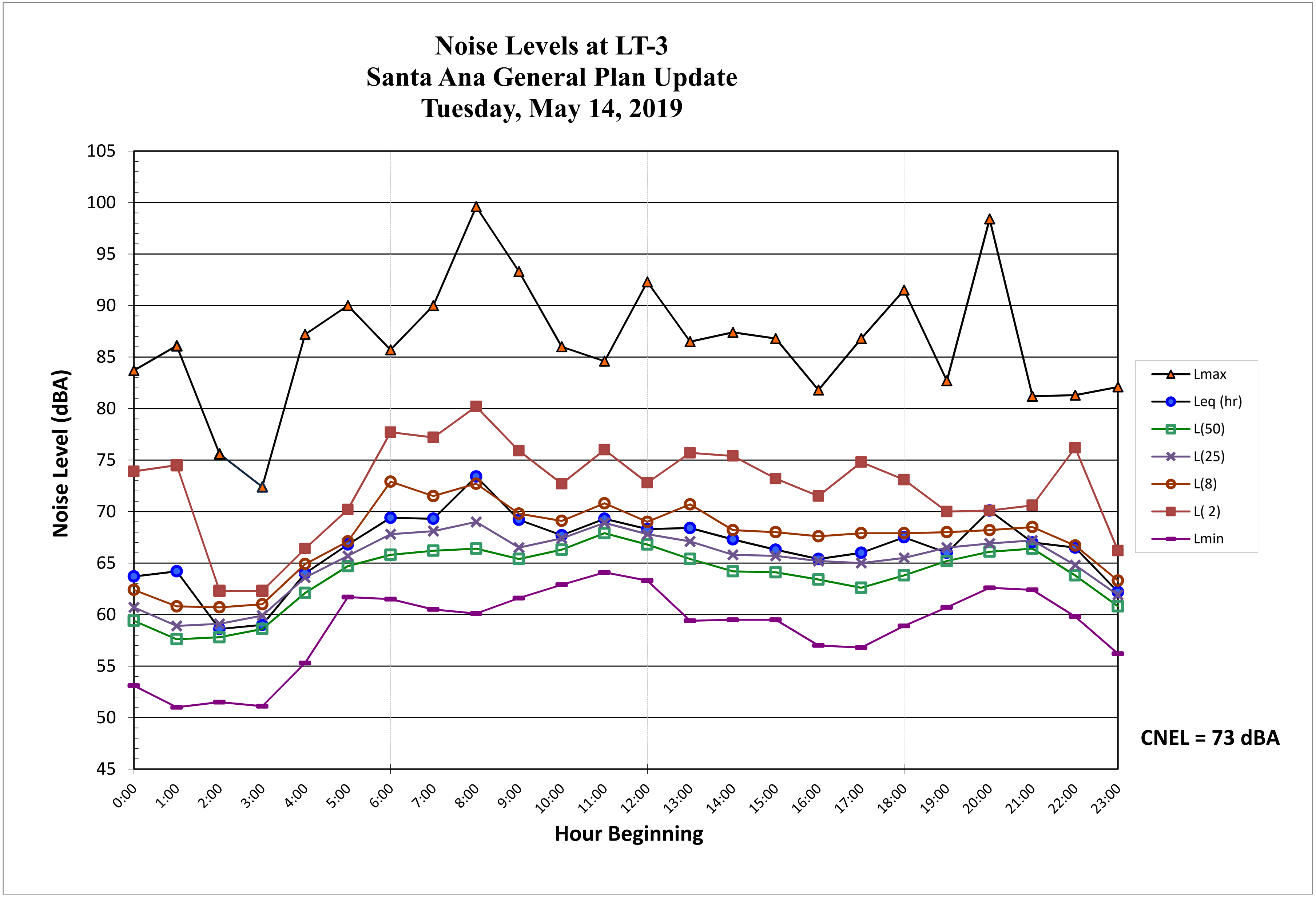
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-3
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
105
100
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60
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50
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0:00
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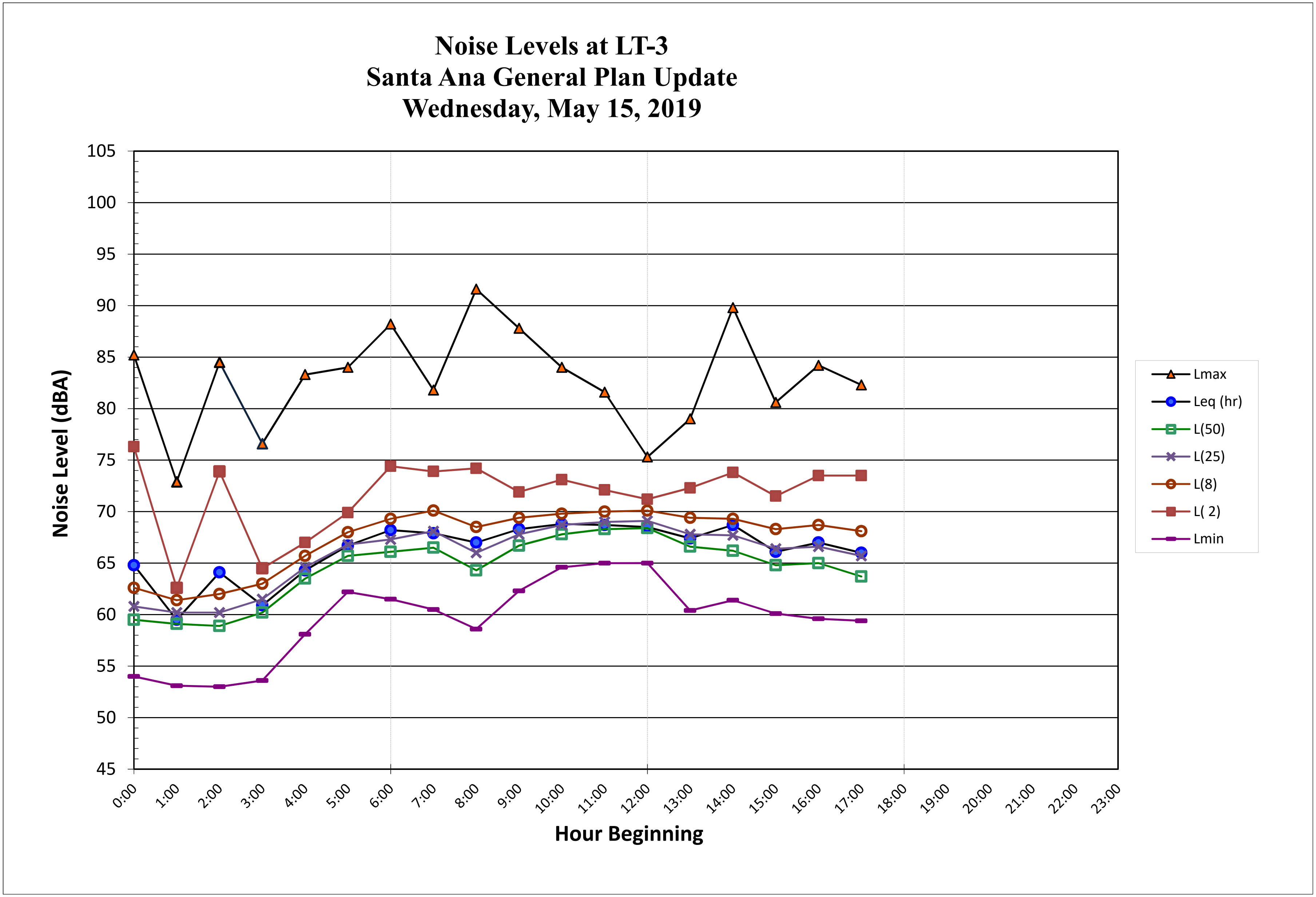
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 73 dBA


Noise Levels at LT-3
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
Hour Beginning
105
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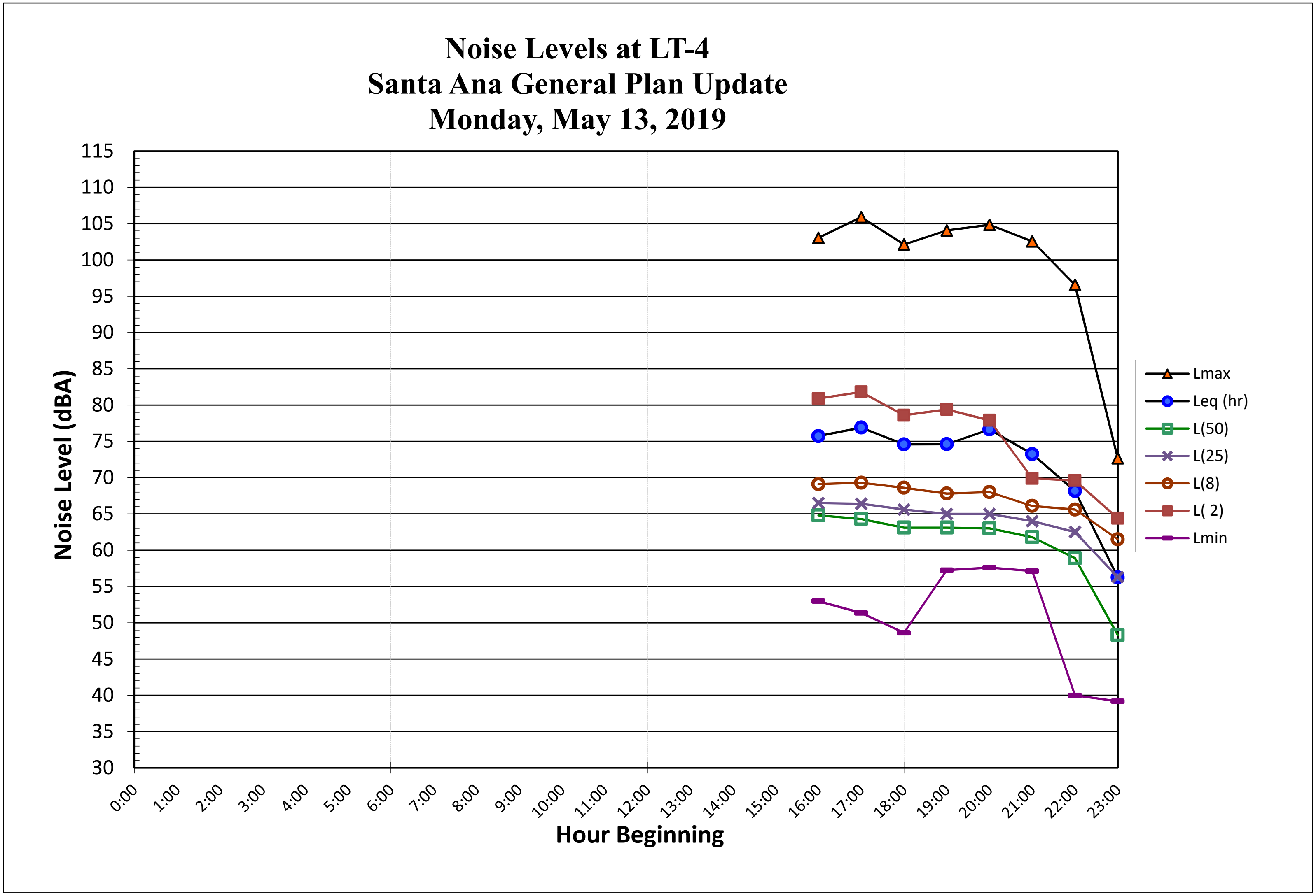
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-4
Santa Ana General Plan Update
Monday, May 13, 2019
115
110
105
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Noise Level (dBA)
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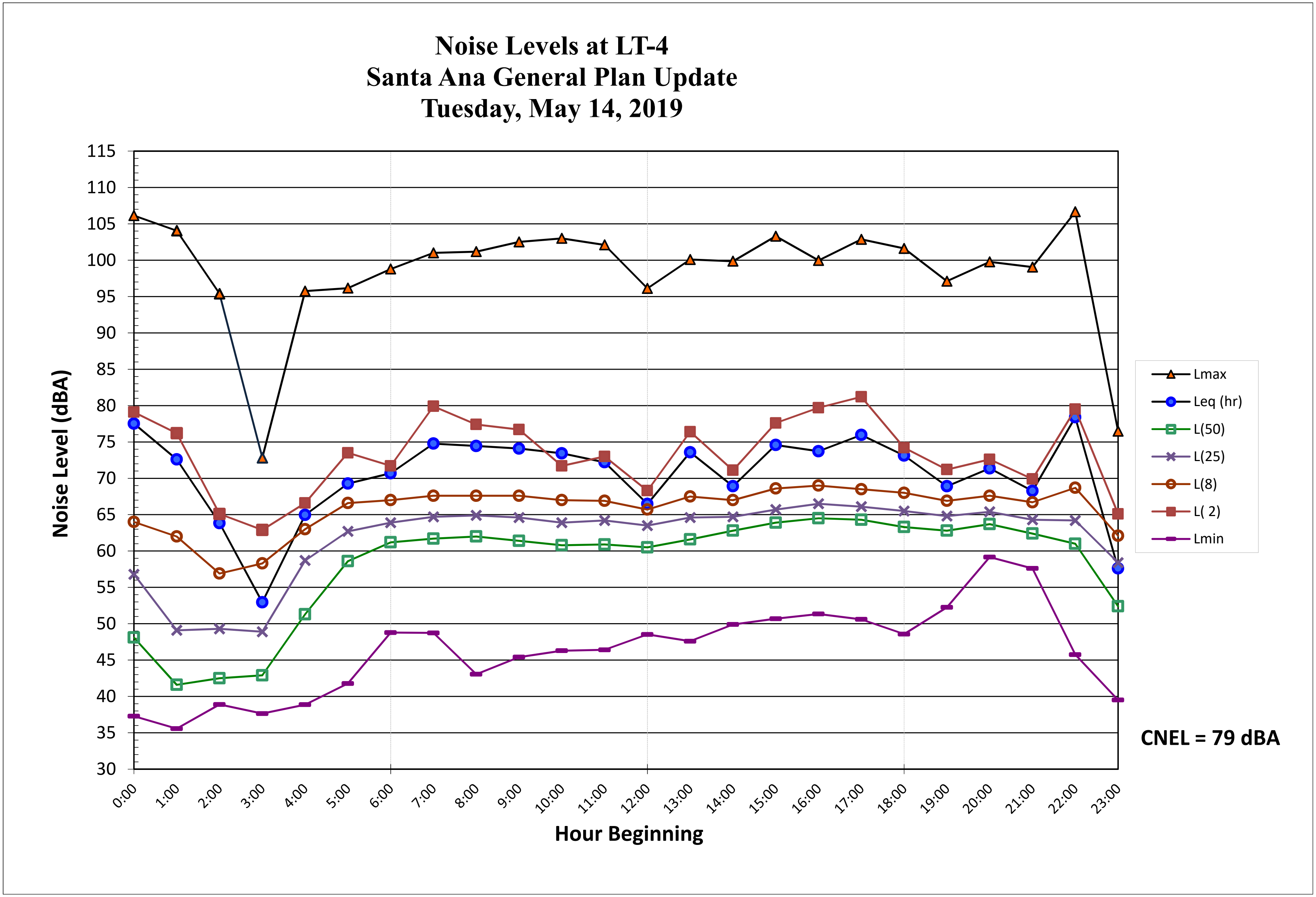
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-4
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
115
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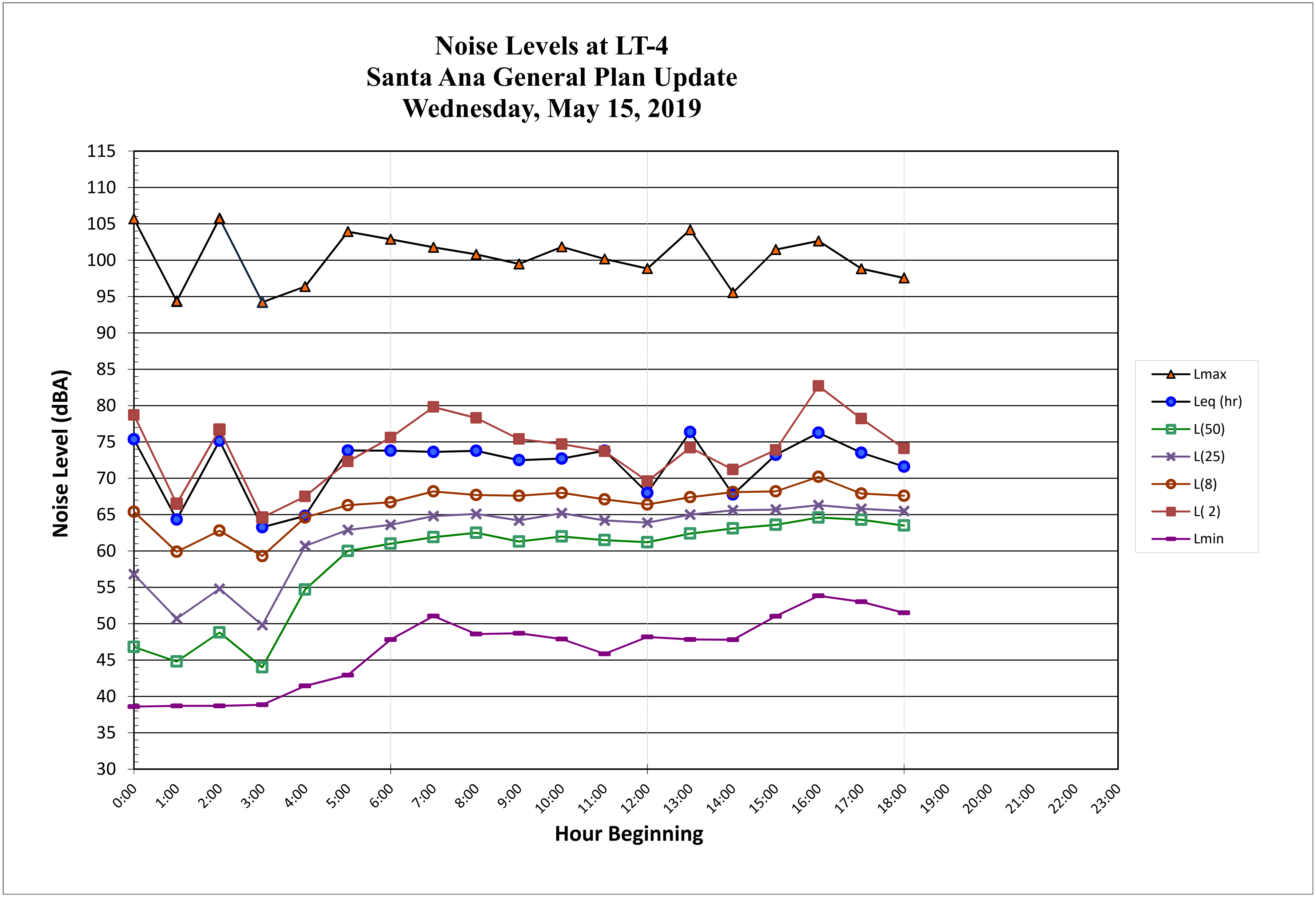
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 79 dBA


Noise Levels at LT-4
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
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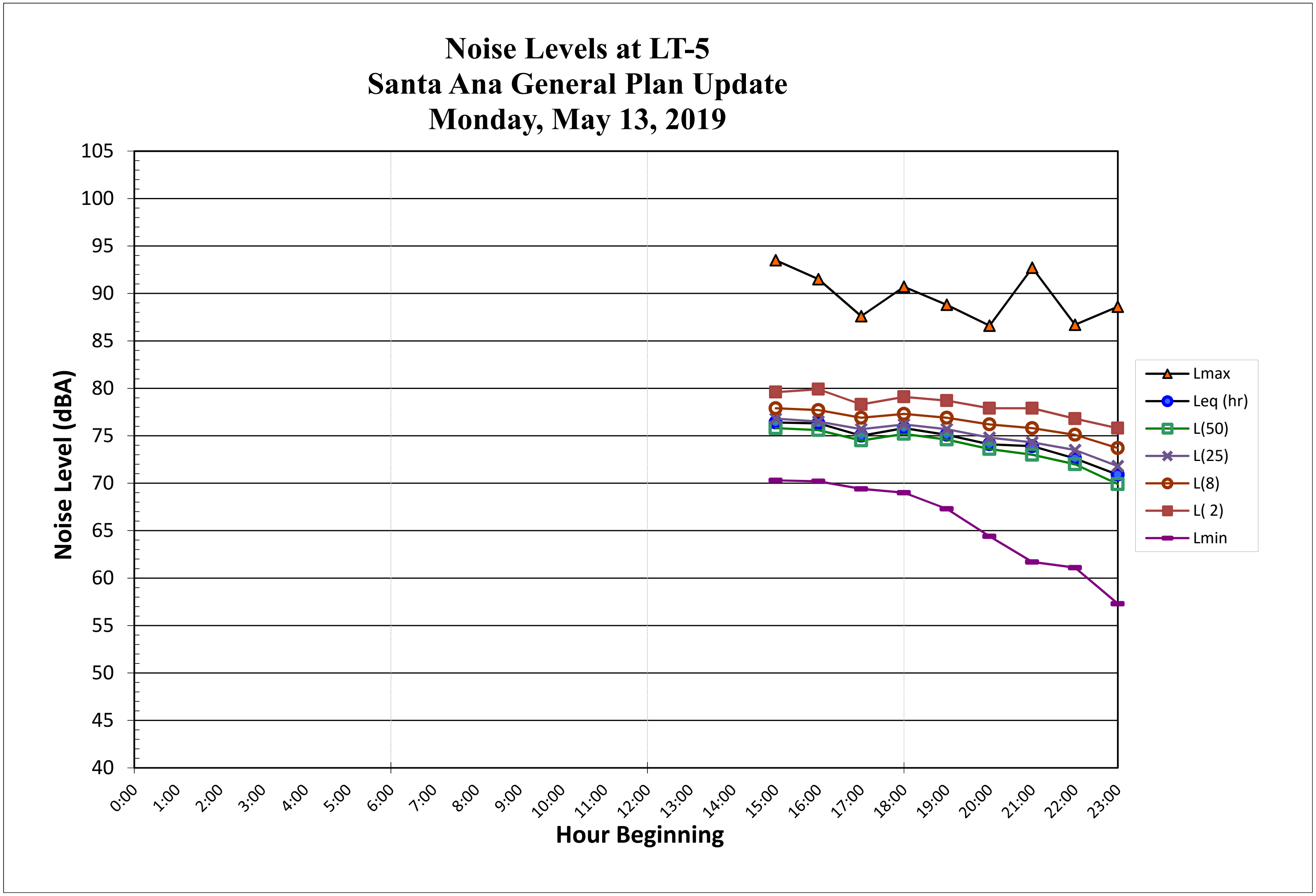
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-5
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
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Hour Beginning
Lmax
Leq (hr)
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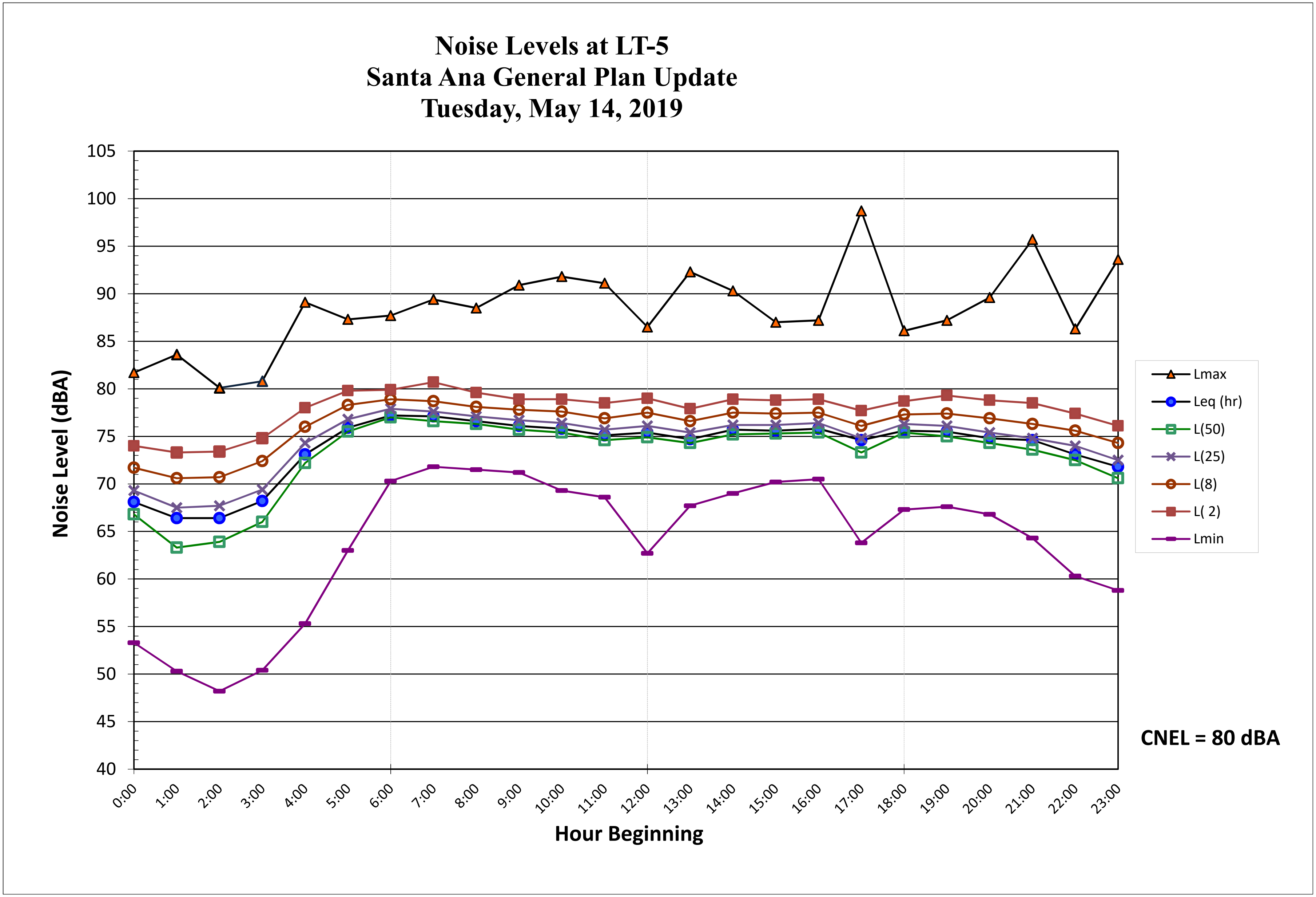
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-5
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
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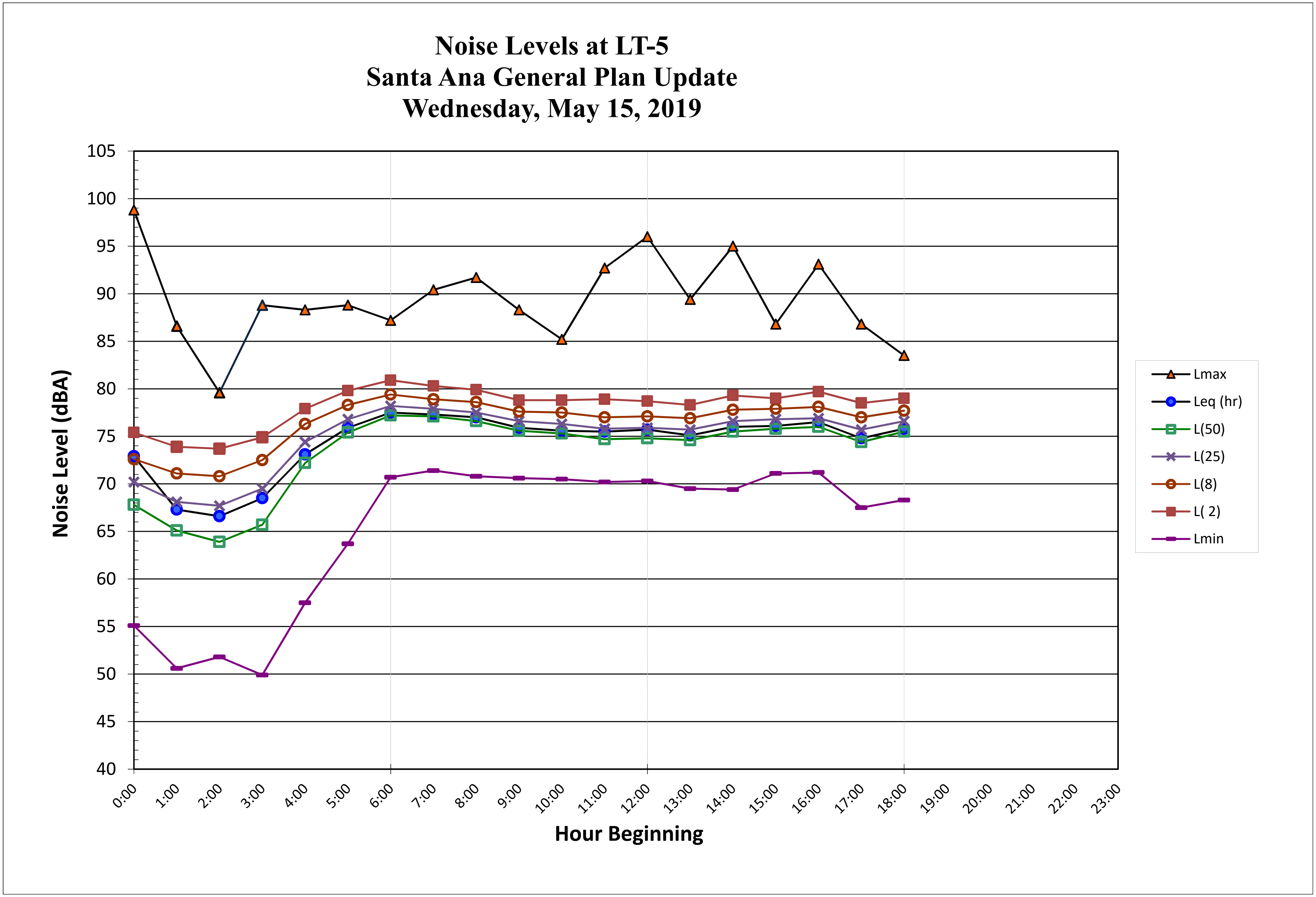
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 80 dBA


Noise Levels at LT-5
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
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23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin

TRAFFIC NOISE INCREASE CALCULATIONS

Traffic Noise Calculator: FHWA 77-108 **Project Title: SNA-20**

ID	Output: dBA at 50 feet $L_{eq\text{-}24hr}$	L_{dn}	CNEL	Output: Distance to CNEL Contour 70 dBA	65 dBA	60 dBA	Inputs: Roadway	Segment	ADT	Posted Speed Limit	Grade	% Autos	% Med Trucks	% Heavy Trucks	% Daytime	% Evening	% Night	Number of Lanes	Site Condition	Distance to Reciever	Auto Inputs: Ground Absorption	Lane Distance
1	69.3	72.1	72.6	75	162	348	1st Street	Street to Newpo	28219	40	0	94.9%	2.9%	2.2%	79%	11%	10%	6	Soft	50	0.5	68
2	71.0	74.5	75.0	107	231	497	Euclid Street	eet to McFadden	40832	40	0	94.9%	2.9%	2.2%	74%	12%	14%	6	Soft	50	0.5	68
3	70.9	73.6	74.2	95	205	442	Westminster Avenue	oulevard to Fairvi	30994	45	0	94.9%	2.9%	2.2%	78%	12%	10%	6	Soft	50	0.5	68
4	72.0	76.1	76.6	137	294	634	Harbor Boulevard	nue/17th Street	51467	40	0	94.9%	2.9%	2.2%	70%	12%	18%	6	Soft	50	0.5	68
5	69.8	73.2	73.7	89	191	412	Edinger Avenue	oulevard to Fairvi	24396	45	0	94.9%	2.9%	2.2%	73%	14%	13%	6	Soft	50	0.5	68
6	71.0	74.4	74.8	104	224	483	Warner Avenue	oulevard to Fairvi	32360	45	0	94.9%	2.9%	2.2%	78%	9%	13%	6	Soft	50	0.5	68
7	72.5	76.2	76.6	138	297	641	Harbor Boulevard	venue to MacArt	45135	45	0	94.9%	2.9%	2.2%	74%	11%	15%	6	Soft	50	0.5	68
8	72.3	76.2	76.6	138	296	639	Fairview Street	Street to Willits St	43090	45	0	94.9%	2.9%	2.2%	72%	12%	16%	6	Soft	50	0.5	68
9	70.4	73.8	74.2	96	206	443	1st Street	an Street to Raitt	35964	40	0	94.9%	2.9%	2.2%	76%	11%	13%	6	Soft	50	0.5	68
10	72.4	76.2	76.7	140	302	651	Bristol Street	eet to Santa Clara	46452	45	0	94.9%	2.9%	2.2%	71%	13%	16%	4	Soft	50	0.5	44
11	70.6	73.4	74.0	93	199	430	17th Street	Avenue to Bristo	37885	40	0	94.9%	2.9%	2.2%	77%	13%	10%	6	Soft	50	0.5	68
12	71.1	75.2	75.7	119	257	554	Bristol Street	eet to Washingto	44010	40	0	94.9%	2.9%	2.2%	69%	14%	17%	5	Soft	50	0.5	56
13	72.0	76.0	76.5	136	292	630	Fairview Street	Avenue to 17th S	42808	45	0	94.9%	2.9%	2.2%	70%	13%	17%	4	Soft	50	0.5	44
14	70.8	74.7	75.2	111	239	515	Bristol Street	Street to Bishop S	39847	40	0	94.9%	2.9%	2.2%	71%	13%	16%	6	Soft	50	0.5	68
15	65.6	68.6	69.1	43	93	201	Civic Center Drive	l Street to Flower	16615	35	0	94.9%	2.9%	2.2%	79%	10%	11%	4	Soft	50	0.5	44
16	65.6	68.4	68.9	42	91	195	Flower Street	Street to Bishop S	17101	35	0	94.9%	2.9%	2.2%	80%	10%	10%	2	Soft	50	0.5	20
17	68.5	72.2	72.6	75	162	348	Main Street	Street to 20th St	32053	35	0	94.9%	2.9%	2.2%	73%	12%	15%	4	Soft	50	0.5	44
18	67.2	70.9	71.4	62	133	286	Main Street	n Street to Civic C	31850	30	0	94.9%	2.9%	2.2%	72%	13%	15%	4	Soft	50	0.5	44
19	62.8	65.6	66.0	27	59	127	Civic Center Drive	er Street to Broa	16285	25	0	94.9%	2.9%	2.2%	81%	9%	10%	4	Soft	50	0.5	44
20	63.9	66.9	67.3	33	71	153	Santa Ana Boulevard	er Street to Broa	14191	30	0	94.9%	2.9%	2.2%	80%	9%	11%	6	Soft	50	0.5	68
21	71.1	74.8	75.2	111	240	517	1st Street	treet to Standard	41765	40	0	94.9%	2.9%	2.2%	73%	12%	15%	6	Soft	50	0.5	68
22	67.7	71.7	72.2	70	150	323	Main Street	Street to Bishop S	26772	35	0	94.9%	2.9%	2.2%	71%	12%	17%	4	Soft	50	0.5	44
23	68.8	71.7	72.2	70	151	325	Grand Avenue	ara Avenue to 17	25988	40	0	94.9%	2.9%	2.2%	79%	10%	11%	4	Soft	50	0.5	44
24	70.2	73.9	74.3	97	209	451	Grand Avenue	na Boulevard to 4	36526	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
25	69.7	72.3	72.9	78	168	362	17th Street	Park Drive to Tusti	32600	40	0	94.9%	2.9%	2.2%	79%	12%	9%	4	Soft	50	0.5	44
26	67.4	70.1	70.7	55	119	257	Tustin Avenue	it Street to 4th St	17862	40	0	94.9%	2.9%	2.2%	79%	11%	10%	6	Soft	50	0.5	68
27	68.1	70.8	71.3	61	132	284	1st Street	Park Drive to Tusti	20946	40	0	94.9%	2.9%	2.2%	80%	10%	10%	6	Soft	50	0.5	68
28	72.2	76.2	76.6	138	297	640	Fairview Street	Avenue to Harva	42145	45	0	94.9%	2.9%	2.2%	72%	11%	17%	6	Soft	50	0.5	68
29	71.8	75.5	76.0	125	269	579	Fairview Street	venue to Segerstr	38754	45	0	94.9%	2.9%	2.2%	74%	11%	15%	6	Soft	50	0.5	68
30	68.1	71.6	72.2	70	151	325	Edinger Avenue	Street to Greenv	29375	35	0	94.9%	2.9%	2.2%	72%	14%	14%	4	Soft	50	0.5	44
31	66.6	70.3	70.9	57	123	265	McFadden Avenue	ew Street to Raitt	20921	35	0	94.9%	2.9%	2.2%	71%	14%	15%	4	Soft	50	0.5	44
32	69.3	71.9	72.3	72	154	333	MacArthur Boulevard	ew Street to Raitt	27767	40	0	94.9%	2.9%	2.2%	81%	10%	9%	6	Soft	50	0.5	68
33	67.4	70.4	71.4	62	133	286	Segerstrom Avenue	ew Street to Raitt	19018	40	0	94.9%	2.9%	2.2%	66%	23%	11%	4	Soft	50	0.5	44
34	70.5	74.0	74.5	100	215	464	Bristol Street	Avenue to Warne	38527	40	0	94.9%	2.9%	2.2%	73%	13%	14%	4	Soft	50	0.5	44
35	70.5	73.8	74.4	98	211	455	Bristol Street	venue to Segerstr	36397	40	0	94.9%	2.9%	2.2%	73%	14%	13%	6	Soft	50	0.5	68
36	71.1	74.7	75.1	109	235	505	Warner Avenue	Street to Bristol S	34084	45	0	94.9%	2.9%	2.2%	76%	10%	14%	5	Soft	50	0.5	56
37	70.8	74.2	74.7	103	223	480	Bristol Street	oulevard to Sunfl	39737	40	0	94.9%	2.9%	2.2%	74%	13%	13%	6	Soft	50	0.5	68
38	66.5	69.5	70.0	50	107	231	Flower Street	venue to Segerstr	15420	40	0	94.9%	2.9%	2.2%	78%	11%	11%	4	Soft	50	0.5	44
39	69.2	73.1	73.5	86	184	397	Edinger Avenue	er Street to Main	28733	40	0	94.9%	2.9%	2.2%	72%	12%	16%	4	Soft	50	0.5	44
40	67.8	71.4	71.9	67	143	309	Main Street	Avenue to Eding	27724	35	0	94.9%	2.9%	2.2%	74%	12%	14%	4	Soft	50	0.5	44
41	69.4	73.5	73.8	89	193	415	Main Street	venue to Segerstr	29713	40	0	94.9%	2.9%	2.2%	74%	9%	17%	5	Soft	50	0.5	56
42	70.7	74.4	74.8	104	225	484	Dyer Road	Street to Halladay	29938	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
43	70.5	73.6	74.1	93	201	434	MacArthur Boulevard	er Street to Main	36466	40	0	94.9%	2.9%	2.2%	78%	10%	12%	6	Soft	50	0.5	68
44	69.5	72.5	72.9	78	168	362	Main Street	oulevard to Sunfl	22916	45	0	94.9%	2.9%	2.2%	81%	8%	11%	6	Soft	50	0.5	68
45	70.4	73.8	74.2	95	205	442	Grand Avenue	enue to Saint An	27838	45	0	94.9%	2.9%	2.2%	76%	11%	13%	6	Soft	50	0.5	68
46	71.8	75.7	76.0	126	271	585	Edinger Avenue	treet to Newport	38974	45	0	94.9%	2.9%	2.2%	76%	8%	16%	6	Soft	50	0.5	68
47	69.3	72.7	73.0	79	169	365	Warner Avenue	venue to Red Hill	21848	45	0	94.9%	2.9%	2.2%	81%	6%	13%	6	Soft	50	0.5	68
48	68.9	72.6	73.0	79	170	366	Warner Avenue	treet to Standard	26712	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
49	66.8	70.5	71.0	58	125	269	McFadden Avenue	d Avenue to Gran	21737	35	0	94.9%	2.9%	2.2%	73%	12%	15%	4	Soft	50	0.5	44
50	71.1	74.6	75.0	108	233	502	1st Street	l Street to Flower	41798	40	0	94.9%	2.9%	2.2%	75%	11%	14%	6	Soft	50	0.5	68
51	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!															0	#N/A
52	83.4	86.7	87.2	700	1508	3249	I-5	nan Ave. to Katell	240900	60	0	90.4%	6.0%	3.6%	76%	11%	13%	6	Soft	50	0.5	68
53	84.8	88.1	88.6	868	1869	4028	I-5	SR-22 to Main St.	366000	60	0	93.7%	3.1%	3.2%	76%	11%	13%	6	Soft	50	0.5	68
54	84.7	88.1	88.5	857	1847	3979	I-5	/Penn Way to Gra	359400	60	0	93.7%	3.1%	3.2%	76%	11%	13%	6	Soft	50	0.5	68
55	84.2	87.6	88.0	796	1714	3693	I-5	1st St. to SR-55	329500	60	0	94.5%	2.4%	3.1%	76%	11%	13%	6	Soft	50	0.5	68
56	84.1	87.5	88.0	787	1696	3654	I-5	ort Ave. to Red Hi	324300	60	0	94.5%	2.4%	3.1%	76%	11%	13%	6	Soft	50	0.5	68
57	83.2	86.5	87.0	678	1461	3148	I-405	khurst Ave. to Euc	291300	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
58	83.5	86.8	87.3	711	1531	3298	I-405	lid St. to Harbor B	312400	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
59	83.2	86.6	87.0	680	1465	3156	I-405	arbor Blvd. to SR-	292400	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
60	82.5	85.8	86.3	608	1310	2821	I-405	Bristol St. to SR-5	239200	60	0	95.7%	2.3%	2.0%	76%	11%	13%	6	Soft	50	0.5	68
61	83.1	86.5	86.9	674	1452	3128	I-405	55 to MacArthur B	279200	60	0	95.7%	2.3%	2.0%	76%	11%	13%	6	Soft	50	0.5	68
62	83.3	86.7	87.1	694	1495	3221	SR-55	th St to 17th Stre	259400	60	0	93.0%	4.0%	3.0%	76%	11%	13%	6	Soft	50	0.5	68
63	83.8	87.2	87.6	750	1615	3480	SR-55	giner Ave. to Dyer	288600	60	0	92.8%	4.1%	3.1%	76%	11%	13%	6	Soft	50	0.5	68

64	83.1	86.4	86.9	669	1442	3106	SR-55	Rd. to MacArthur	277250	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
65	82.1	85.5	85.9	577	1244	2680	SR-55	cArthur Blvd. to I-	222150	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
66	80.6	83.9	84.4	454	978	2108	SR-55	I-405 to SR-73	155000	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
67	82.1	85.5	85.9	578	1245	2683	SR-22	lid St. to Harbor B	216500	60	0	94.3%	4.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
68	82.3	85.7	86.1	596	1284	2766	SR-22	: City Dr. to Bristo	235500	60	0	95.5%	2.9%	1.6%	76%	11%	13%	6	Soft	50	0.5	68
69	80.3	83.6	84.1	435	937	2018	SR-22	I-5 to Main St.	146700	60	0	95.5%	2.9%	1.6%	76%	11%	13%	6	Soft	50	0.5	68
70	79.9	83.3	83.8	413	890	1918	SR-22	ssell St. to Tustin /	141800	60	0	96.6%	2.0%	1.4%	76%	11%	13%	6	Soft	50	0.5	68

RAILROAD NOISE MODELING

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	50
Future Train Speed (mph)	50
Number of Existing Trains in one Direction	39
Number of Future Trains in one Direction	39
Existing Number of Day Trains (7 am to 10 p.m.)	31.5
Future Number of Day Trains (7 am to 10 p.m.)	31.5
Existing Number of Night Trains (10 p.m. to 7 am)	7.5
Future Number of Night Trains (10 p.m. to 7 am)	7.5
Existing Average Number of Cars	10.5
Future Average Number of Cars	10.5
Existing Average Number of Locomotives	1.5
Future Average Number of Locomotives	1.5

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive	
National Average (50% front, 50% middle)	1
All Front Mounted	2
All Middle Mounted	3
User Defined 80 % front mounted horns	4

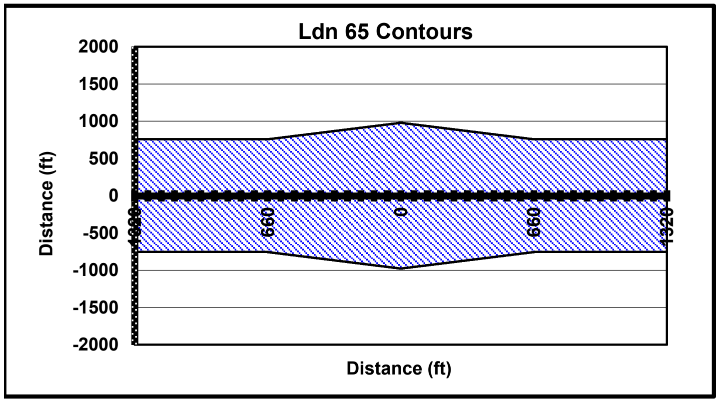
Non Train Noise Environment	
Urban	1
Suburban	2
Rural	3
User Defined Ldn = 50 dBA	4

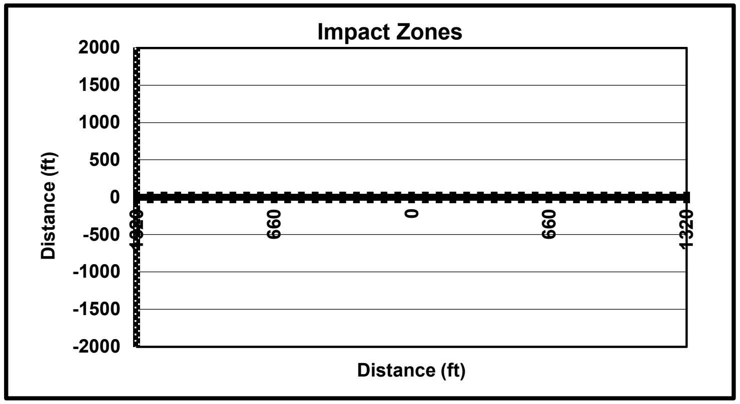
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	978
Future 65 Ldn Contour at X-ing	978
Existing 65 Ldn Contour at 1/2 zone length	756
Future 65 Ldn Contour at 1/2 zone length	756
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: SCRRA Orange Subdivision

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	58	59
Source 1	62	54	56
Source 2	59	51	53
Source 3	54	51	46
Source 4	51	49	44
Source 5	51	48	44
Source 6	49	46	41
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS												
Parameter	**Source 1**		**Source 2**		**Source 3**		**Source 4**		**Source 5**		**Source 6**	
Source Num.	Freight Locomotive	9	Freight Cars	10	Commuter Diesel Locomotive	2	Commuter Rail Cars	3	Commuter Diesel Locomotive	2	Commuter Rail Cars	3
Distance (source to receiver)	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210
Daytime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(7 AM - 10 PM)	trains/hour	0.267	trains/hour	0.267	trains/hour	2.6	trains/hour	2.6	trains/hour	1.333	trains/hour	1.333
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Nighttime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(10 PM - 7 AM)	trains/hour	0.444	trains/hour	0.444	trains/hour	0.778	trains/hour	0.778	trains/hour	0.444	trains/hour	0.444
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%
Jointed Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Embedded Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Aerial Structure?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Barrier Present?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Intervening Rows of of Buildings	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	10
Future Train Speed (mph)	10
Number of Existing Trains in one Direction	2
Number of Future Trains in one Direction	2
Existing Number of Day Trains (7 am to 10 p.m.)	1.25
Future Number of Day Trains (7 am to 10 p.m.)	1.25
Existing Number of Night Trains (10 p.m. to 7 am)	0.75
Future Number of Night Trains (10 p.m. to 7 am)	0.75
Existing Average Number of Cars	15
Future Average Number of Cars	15
Existing Average Number of Locomotives	2
Future Average Number of Locomotives	2

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive	
National Average (50% front, 50% middle)	1
All Front Mounted	2
All Middle Mounted	3
User Defined 80 % front mounted horns	4

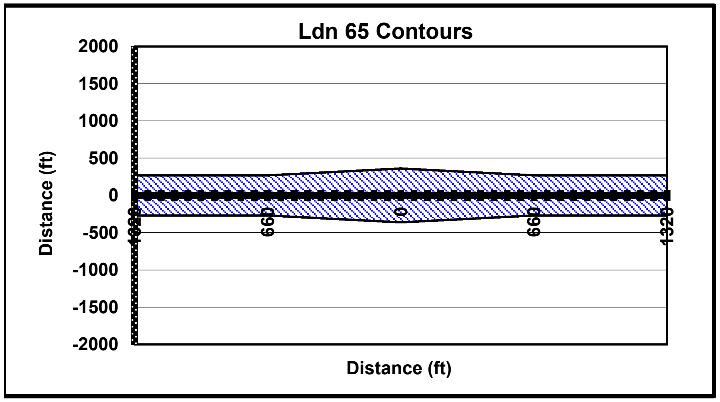
Non Train Noise Environment	
Urban	1
Suburban	2
Rural	3
User Defined Ldn = 50 dBA	4

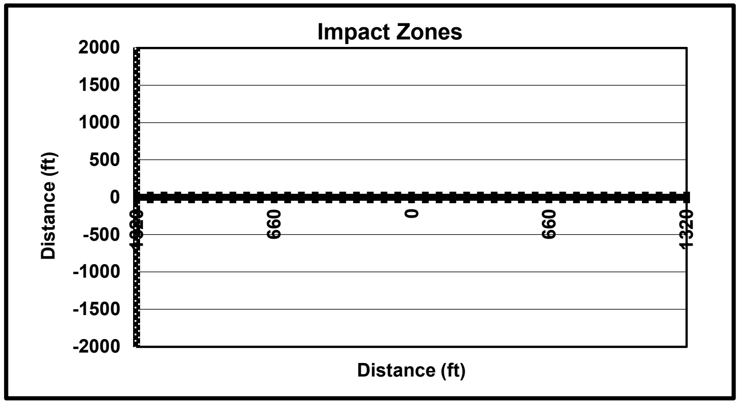
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	361
Future 65 Ldn Contour at X-ing	361
Existing 65 Ldn Contour at 1/2 zone length	269
Future 65 Ldn Contour at 1/2 zone length	269
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: UP Santa Ana Industrial Lead

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	57	59
Source 1	64	56	58
Source 2	58	49	52
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Freight Locomotive	9	Freight Cars	10		
Distance (source to receiver)	distance (ft)	30	distance (ft)	30		
Daytime Hours	speed (mph)	10	speed (mph)	10		
(7 AM - 10 PM)	trains/hour	0.133	trains/hour	0.133		
	locos/train	2	length of cars (ft) / train	900		
Nighttime Hours	speed (mph)	10	speed (mph)	10		
(10 PM - 7 AM)	trains/hour	0.222	trains/hour	0.222		
	locos/train	2	length of cars (ft) / train	900		
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		
Jointed Track?	Y/N	n	Y/N	n		
Embedded Track?	Y/N	n	Y/N	n		
Aerial Structure?	Y/N	n	Y/N	n		
Barrier Present?	Y/N	n	Y/N	n		
Intervening Rows of of Buildings	number of rows	0	number of rows	0		

Appendix I-b Noise Monitoring and Modeling Data

Appendices

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LOCAL NOISE STANDARDS

ARTICLE VI. - NOISE CONTROL

Sec. 18-308. - Declaration of policy.

In order to control unnecessary, excessive and annoying sounds emanating from areas of the city, it is hereby declared to be the policy of the city to prohibit such sounds generated from all sources as specified in this article.

It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest.

(Ord. No. NS-1441, 1, 8-21-78)

Sec. 18-309. - Definitions.

The following words, phrases and terms as used in this article shall have the meaning as indicated below:

Ambient noise level shall mean the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

Cumulative period shall mean an additive period of time composed of individual time segments which may be continuous or interrupted.

Decibel (dB) shall mean a unit which denotes the ratio between two (2) quantities which are proportional to power: The number of decibels corresponding to the ratio of two (2) amounts of power is ten (10) times the logarithm to the base ten (10) of this ratio.

Dwelling unit shall mean a single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation.

Emergency machinery, vehicle or work shall mean any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

Fixed noise source shall mean a stationary device which creates sounds while fixed or motionless, including, but not limited to, industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

Grading shall mean any excavating or filling of earth material, or any combination thereof, conducted at a site to prepare said site for construction or other improvements thereon.

Impact noise shall mean the noise produced by the collision of one mass which may be either in motion or at rest.

Mobile noise source shall mean any noise source other than a fixed noise source.

Noise level shall mean the "A" weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dB (A).

Person shall mean a person, firm, association, copartnership, joint venture, corporation or any entity, public or private in nature.

Residential property shall mean a parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

Simple tone noise shall mean a noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

Sound level meter shall mean an instrument meeting American National Standard Institute's Standard S1.4-1971 for Type 1 or Type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

Sound pressure level of a sound, in decibels, shall mean twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-310. - Noise level measurement criteria.

Any noise level measurements made pursuant to the provisions of this article shall be performed using a sound level meter as defined in section 18-309.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-311. - Designated noise zone.

The entire City of Santa Ana is hereby designated as "Noise Zone 1."

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-312. - Exterior noise standards.

(a) The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dB(A)	7:00 a.m.—10:00 p.m.
	50 dB(A)	10:00 p.m.— 7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB (A).

(b) It shall be unlawful for any person at any location within the City of Santa Ana to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, to exceed:

(1) The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or

(2) The noise standard plus five (5) dB(A) for a cumulative period of more than fifteen (15) minutes in any hour; or

(3) The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or

(4) The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one minute in any hour; or

(5) The noise standard plus twenty (20) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds any of the first four (4) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-313. - Interior noise standards.

(a) The following interior noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

INTERIOR NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dB(A)	7:00 a.m.—10:00 p.m.
	45 dB(A)	10:00 p.m.—7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB(A).

(b) It shall be unlawful for any person at any location within the City of Santa Ana to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured within any other dwelling unit on any residential property, to exceed:

(1) The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or

(2) The interior noise standard plus five (5) dB(A) for a cumulative period of more than one minute in any hour; or

(3) The interior noise standard plus ten (10) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds either of the first two (2) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the third noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-314. - Special provisions.

The following activities shall be exempted from the provisions of this article:

(a) Activities conducted on the grounds of any public or private nursery, elementary, intermediate or secondary school or college.

(b) Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a license issued by the City of Santa Ana.

(c) Activities conducted on any park or playground, provided such park or playground is owned and operated by a public entity.

(d) Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.

(e) Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or any time on Sunday or a federal holiday.

(f) All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

(g) Mobile noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

(h) Mobile noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the agricultural commissioner.

(i) Noise sources associated with the maintenance of real property, provided said activities take place between 7:00 a.m. and 8:00 p.m. on any day except Sunday or a federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a federal holiday.

(j) Any activity to the extent regulation thereof has been preempted by state or federal law.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-315. - Schools, hospitals and churches; special provisions.

It shall be unlawful for any person to create any noise which causes the noise level at any school, hospital or church while the same is in use to exceed the noise limits as specified in section 18-312 prescribed for the assigned noise zone in which the school, hospital or church is located, or which noise level unreasonably interferes with the use of such institutions or which unreasonably disturbs or annoys patients in the hospital, provided conspicuous signs are displayed in three (3) separate locations within one-tenth (1/10) of a mile of the institution indicating the presence of a school, church or hospital.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-316. - Air conditioning and refrigeration; special provisions.

During the five-year period following the effective date of this article, the noise standards enumerated in sections 18-312 and 18-313 shall be increased eight (8) dB(A) where the alleged offensive noise source is an air conditioning or refrigeration system or associated equipment which was installed prior to the effective date of this article.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-317. - Noise level measurement.

The location selected for measuring exterior noise levels shall be at any point on the affected property. Interior noise measurements shall be made within the affected dwelling unit. The measurement shall be made at a point at least four (4) feet from the wall, ceiling, or floor nearest the alleged offensive noise source and may be made with the windows of the affected unit open.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-318. - Manner of enforcement.

The chief of police, the Orange County health officer and their duly authorized representatives are directed to enforce the provisions of this article. The chief of police, the Orange County health officer and their duly authorized representatives are authorized, pursuant to Penal Code Section 836.5, to arrest any person without a warrant when they have reasonable cause to believe that such person has committed a misdemeanor in their presence.

No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this article while such person is engaged in the performance of his duty.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-319. - Variance procedure.

The owner or operator of a noise source which violates any of the provisions of this article may file an application with the Orange County health officer for a variance from the provisions thereof wherein said owner or operator shall set forth all actions taken to comply with said provisions, the reasons why immediate compliance cannot be achieved, a proposed method of achieving compliance, and a proposed time schedule for its accomplishment. Said application shall be accompanied by a fee as established by resolution of the city council. A separate application shall be filed for each noise source; provided however, that several mobile sources under common ownership, or several fixed sources on a single property may be combined into one application. Upon receipt of said application and fee, the health officer shall refer it with his recommendation thereon within thirty (30) days to the Orange County Noise Variance Board for action thereon in accordance with the provisions of applicable law.

An applicant for a variance shall remain subject to prosecution under the terms of this article until a variance is granted.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-320. - Appeals.

Within fifteen (15) days following the decision of the Orange County Variance Board on an application, the applicant, the health officer, or any member of the city council, may appeal the decision to the city council by filing a notice of appeal with the secretary of the Orange County Variance Board. In the case of an appeal by the applicant for a variance, the notice of appeal shall be accompanied by a fee to be computed by the secretary of the Orange County Variance Board on the basis of the estimated cost of preparing the materials required to be forwarded to the city council as discussed hereafter. If the actual cost of such preparation differs from the estimated cost appropriate payments shall be made either to or by the secretary of the Orange County Variance Board.

Within fifteen (15) days following receipt of a notice of appeal and the appeal fee, the secretary of the Variance Board shall forward to the city council copies of the application for variance; the recommendation of the health officer; the notice of appeal; all evidence concerning said application received by the variance board and its decision thereon. In addition, any person may file with the clerk of the city council written arguments supporting or attacking said decision and the city council may in its discretion hear oral arguments thereon. The clerk of the city council shall mail to the applicant a notice of the date set for hearing of the appeal. The notice shall be mailed at least ten (10) days prior to the hearing date.

Within sixty (60) days following its receipt of the notice of appeal, the city council shall either affirm, modify or reverse the decision, of the variance board. Such decision shall be based upon the city council's evaluation of the matters submitted to the city council in light of the powers conferred on the variance board and the factors to be considered, both as enumerated in section 18-319 and Orange County Ordinance section 4-6-13.

As part of its decision, the city council may direct the variance board to conduct further proceedings on said application. Failure of the city council to affirm, modify or reverse the decision of the variance board within said sixty-day period shall constitute an affirmance of the decision.

(Ord. No. NS-1441, § 1, 8-21-78)

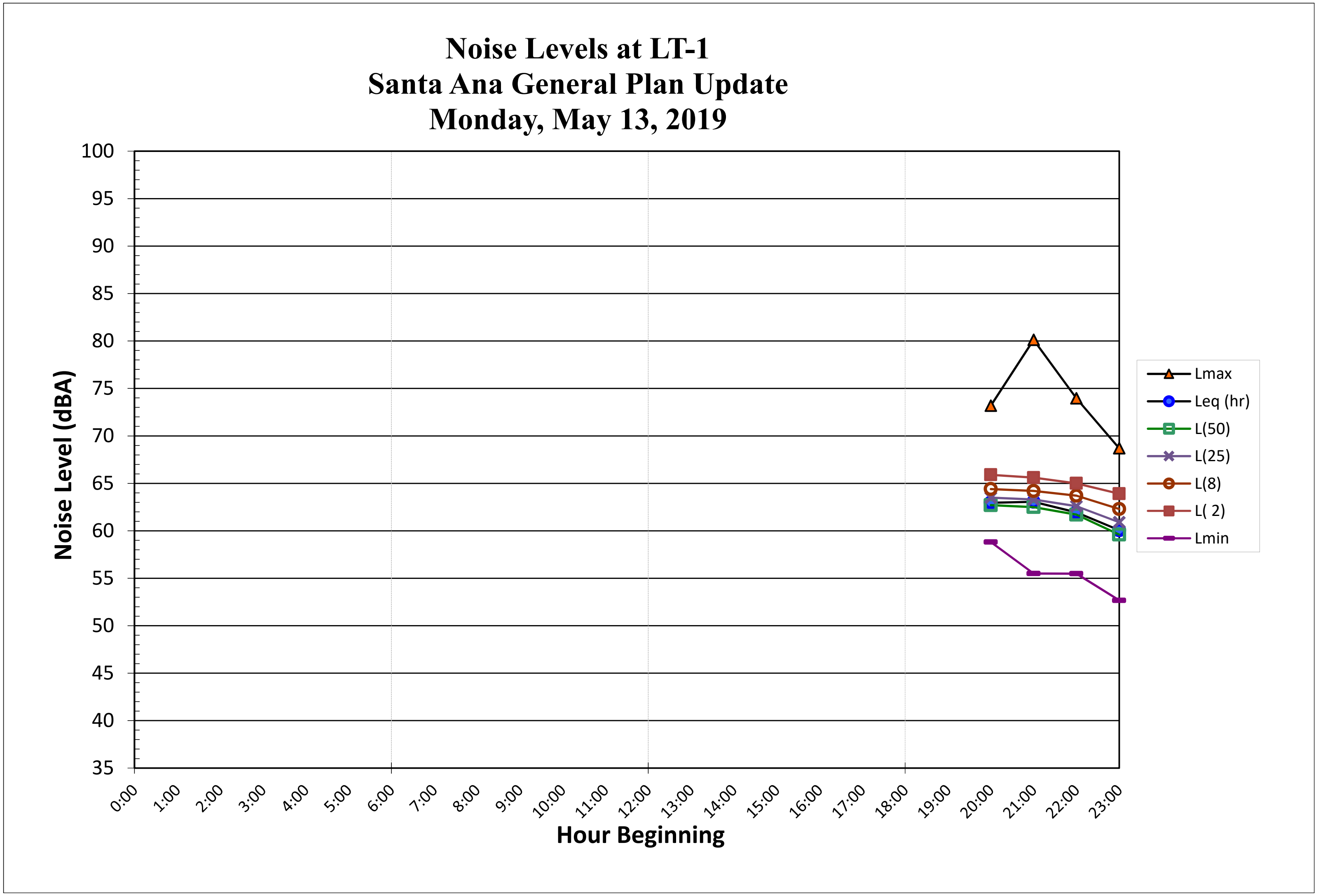
Sec. 18-321. - Violations; misdemeanors.

Any person violating any or the provisions of this article shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. The provisions of this article shall not be construed as permitting conduct not prescribed herein and shall not affect the enforceability of any other applicable provisions of law.

(Ord. No. NS-1441, § 1, 8-21-78)

Secs. 18-322—18-350. - Reserved.

AMBIENT NOISE MONITORING RESULTS



Noise Levels at LT-1
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
0:00
1:00
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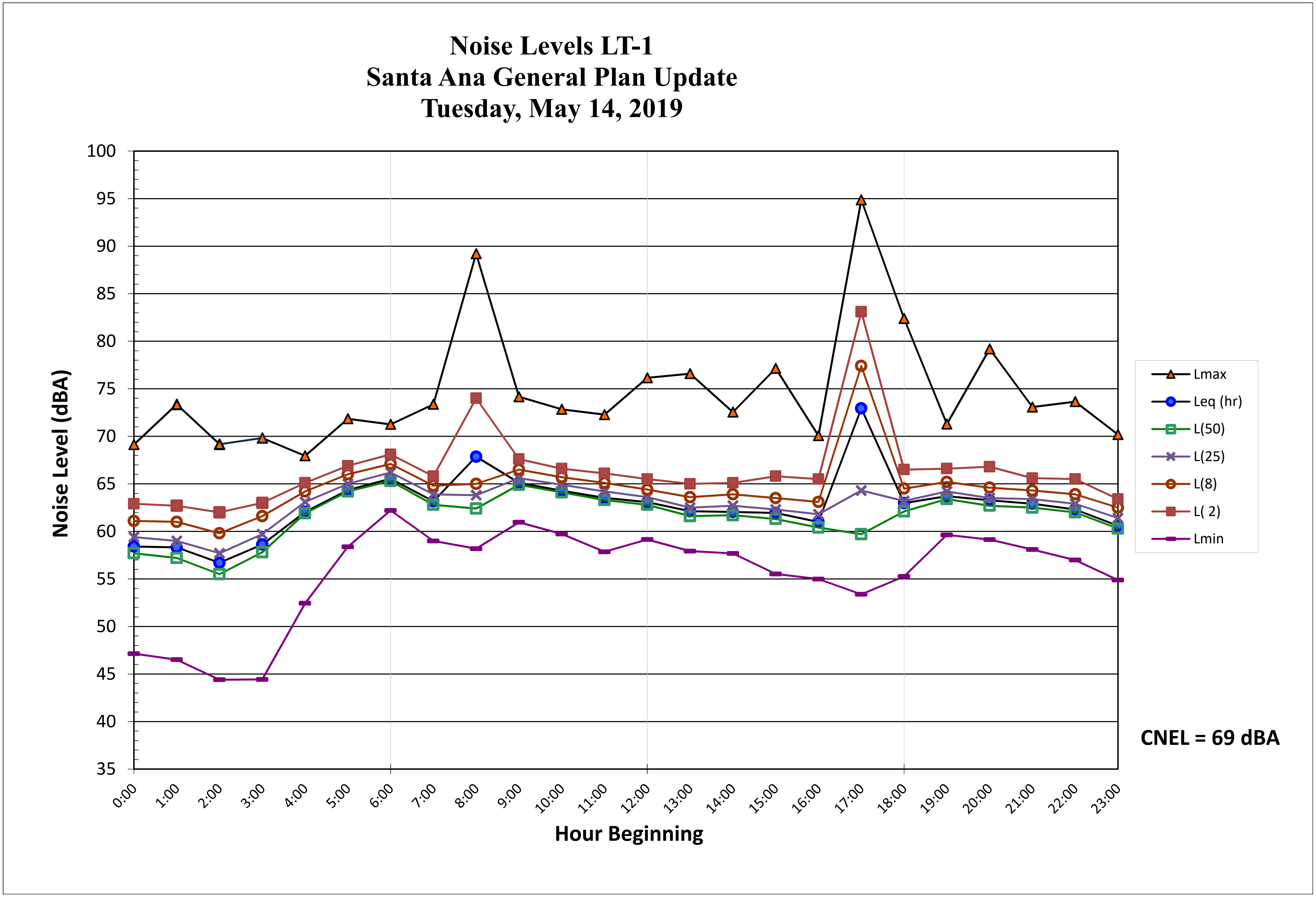
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels LT-1
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
0:00
1:00
2:00
3:00
4:00
5:00
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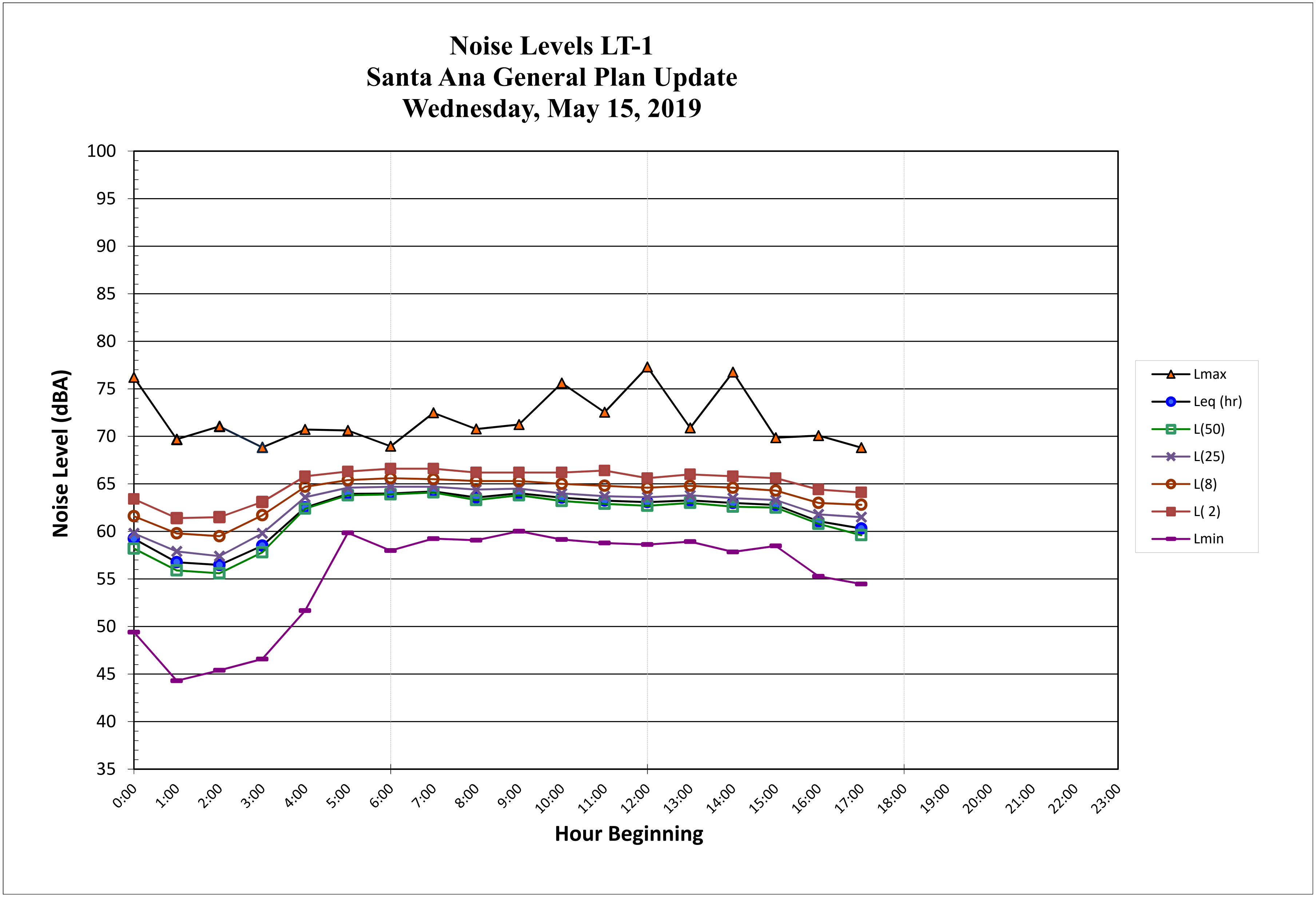
20:00
21:00
22:00
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 69 dBA



Noise Levels LT-1
Santa Ana General Plan Update
Wednesday, May 15, 2019
100
95
90
85
80
75
70
65
60
55
50
45
40
35
Noise Level (dBA)
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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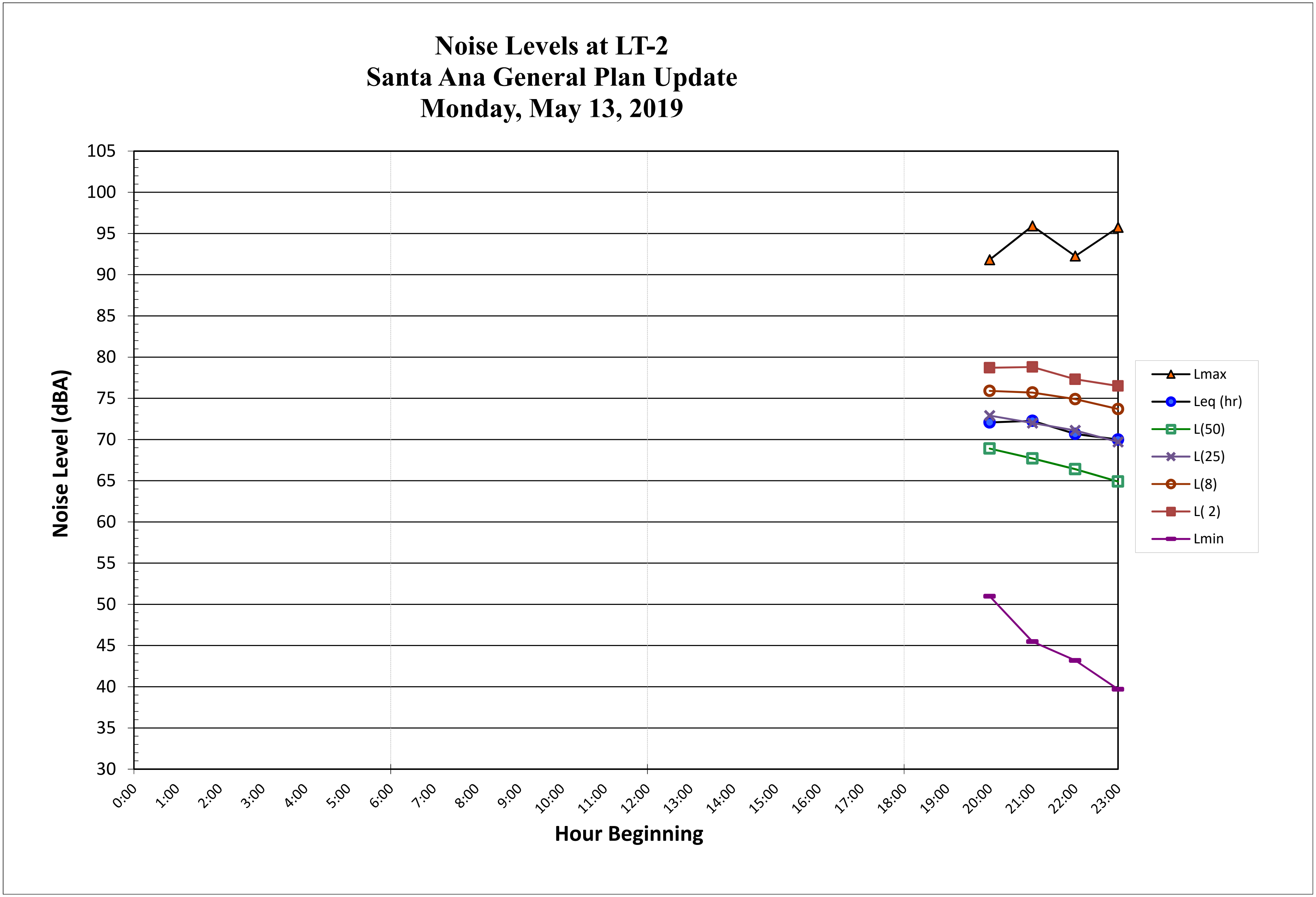
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-2
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
100
95
90
85
80
75
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65
60
55
50
45
40
35
30
0:00
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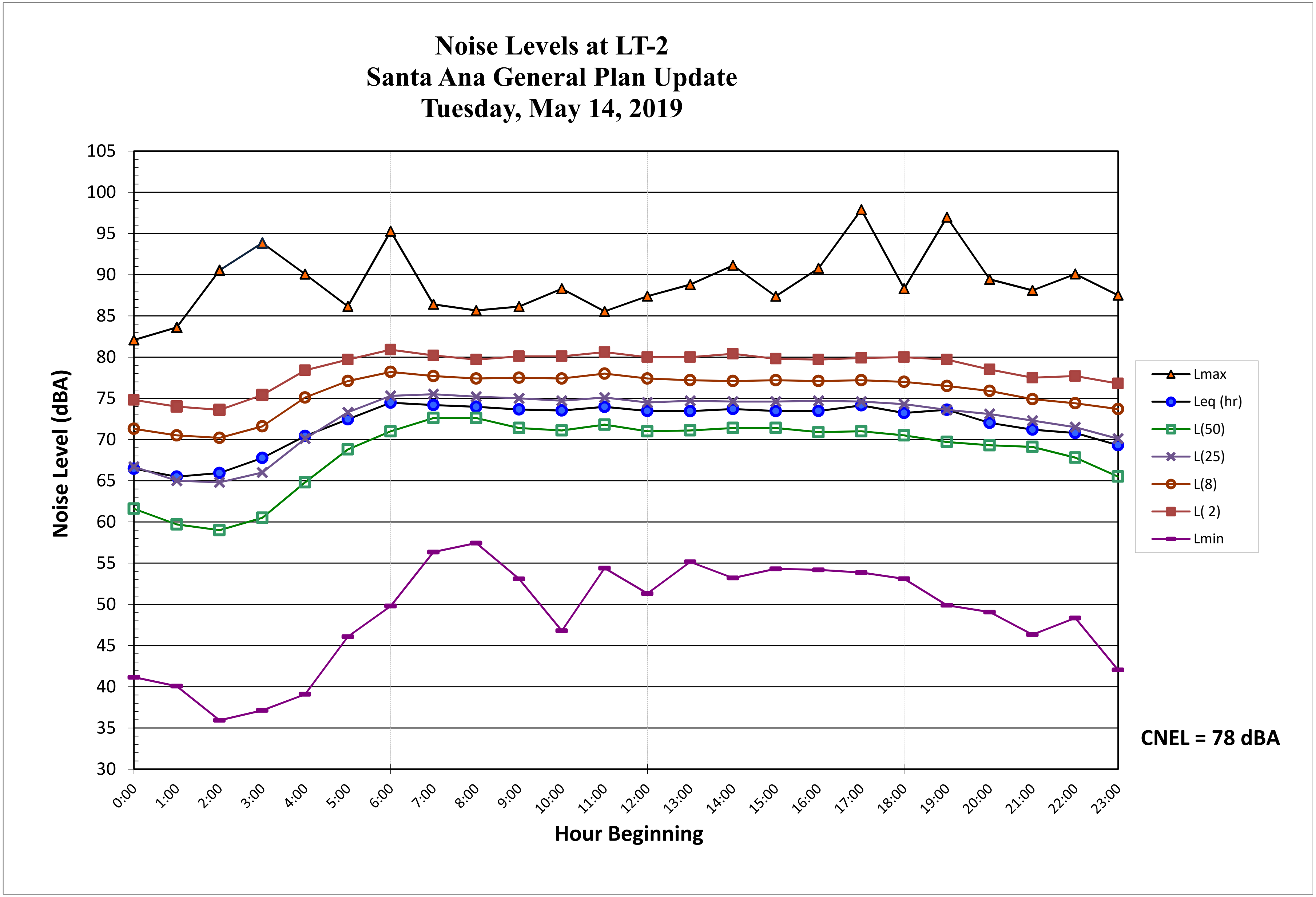
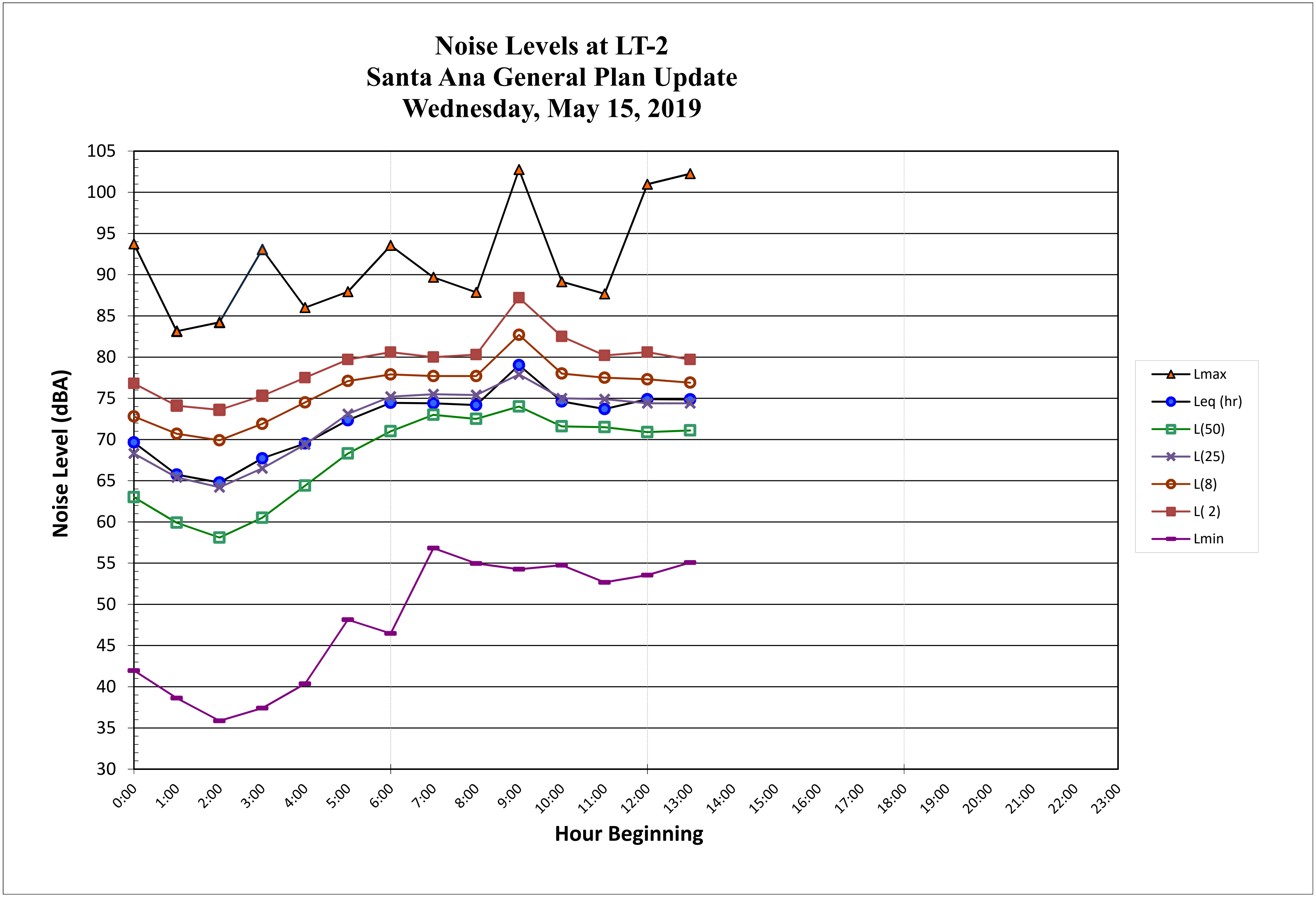
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-2
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 78 dBA


Noise Levels at LT-2
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
105
100
95
90
85
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75
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55
50
45
40
35
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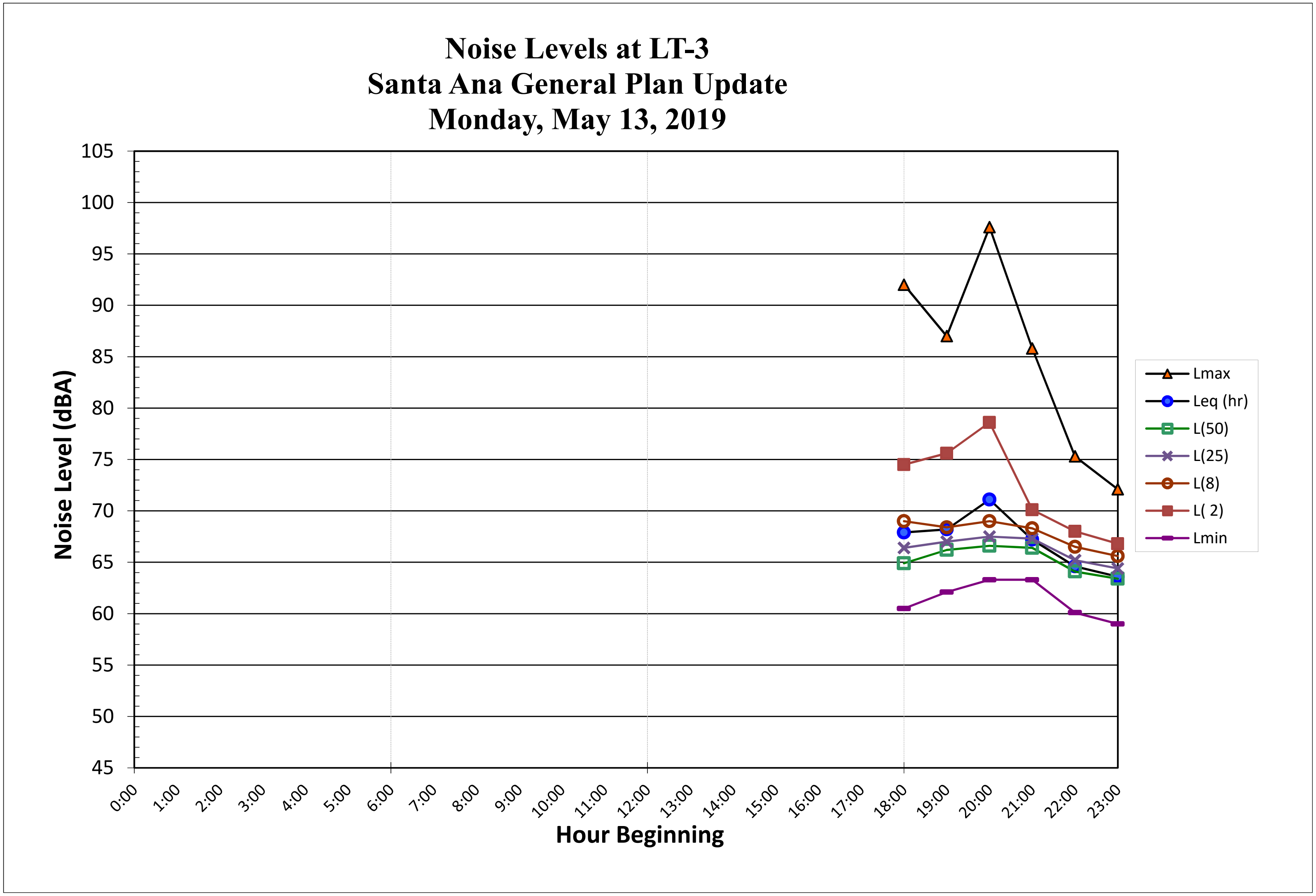
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-3
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
100
95
90
85
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75
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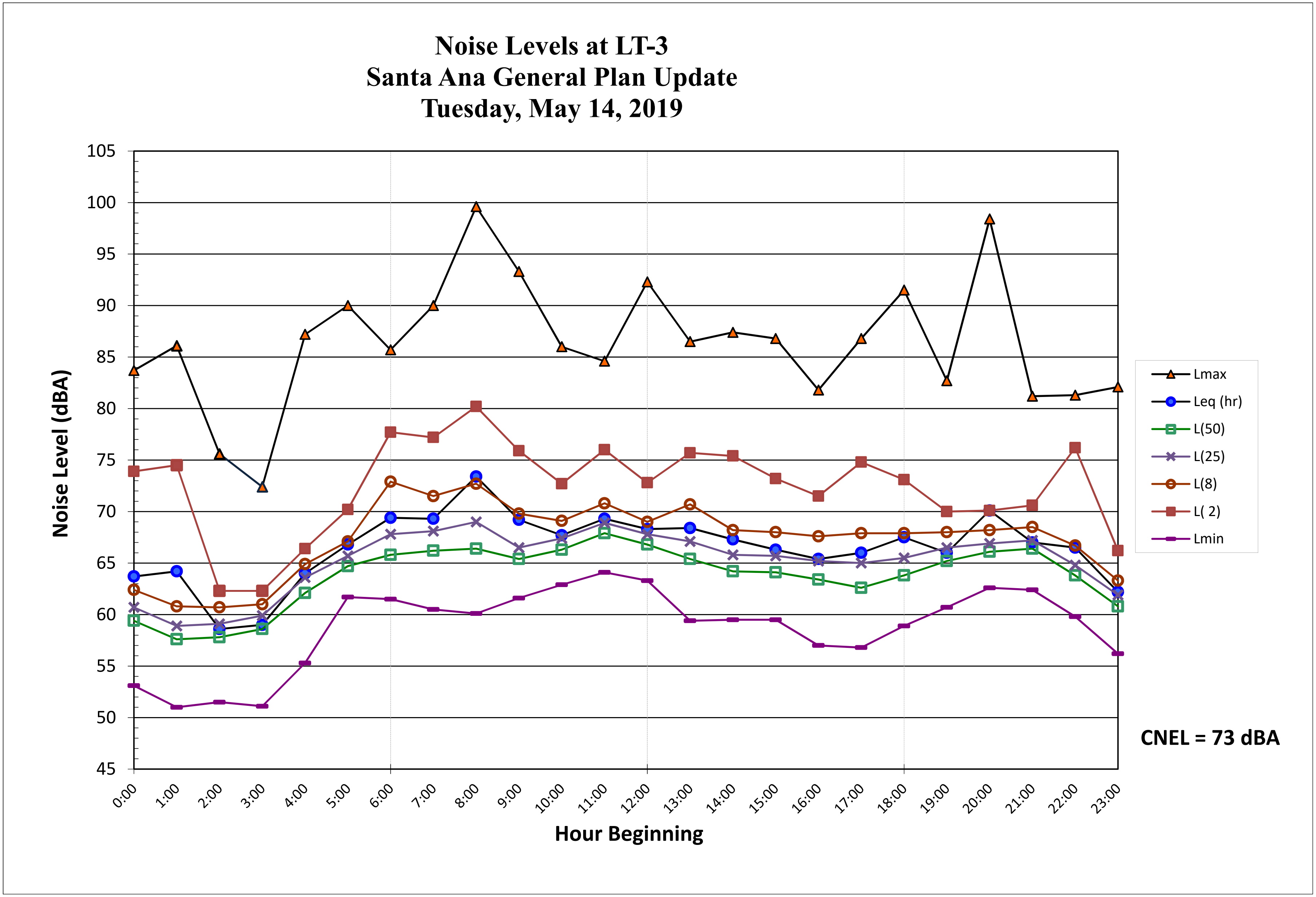
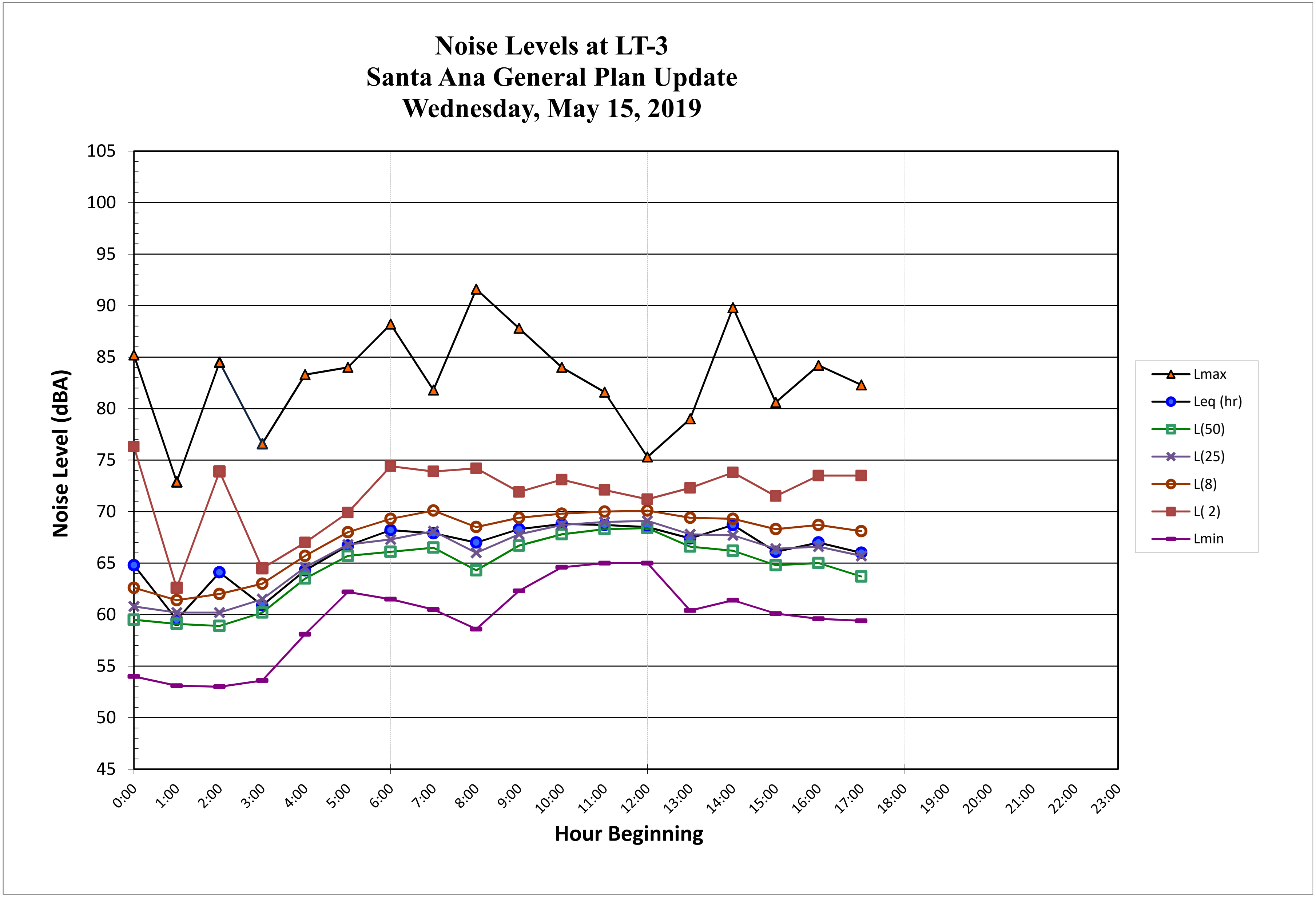
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-3
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 73 dBA



Noise Levels at LT-3
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
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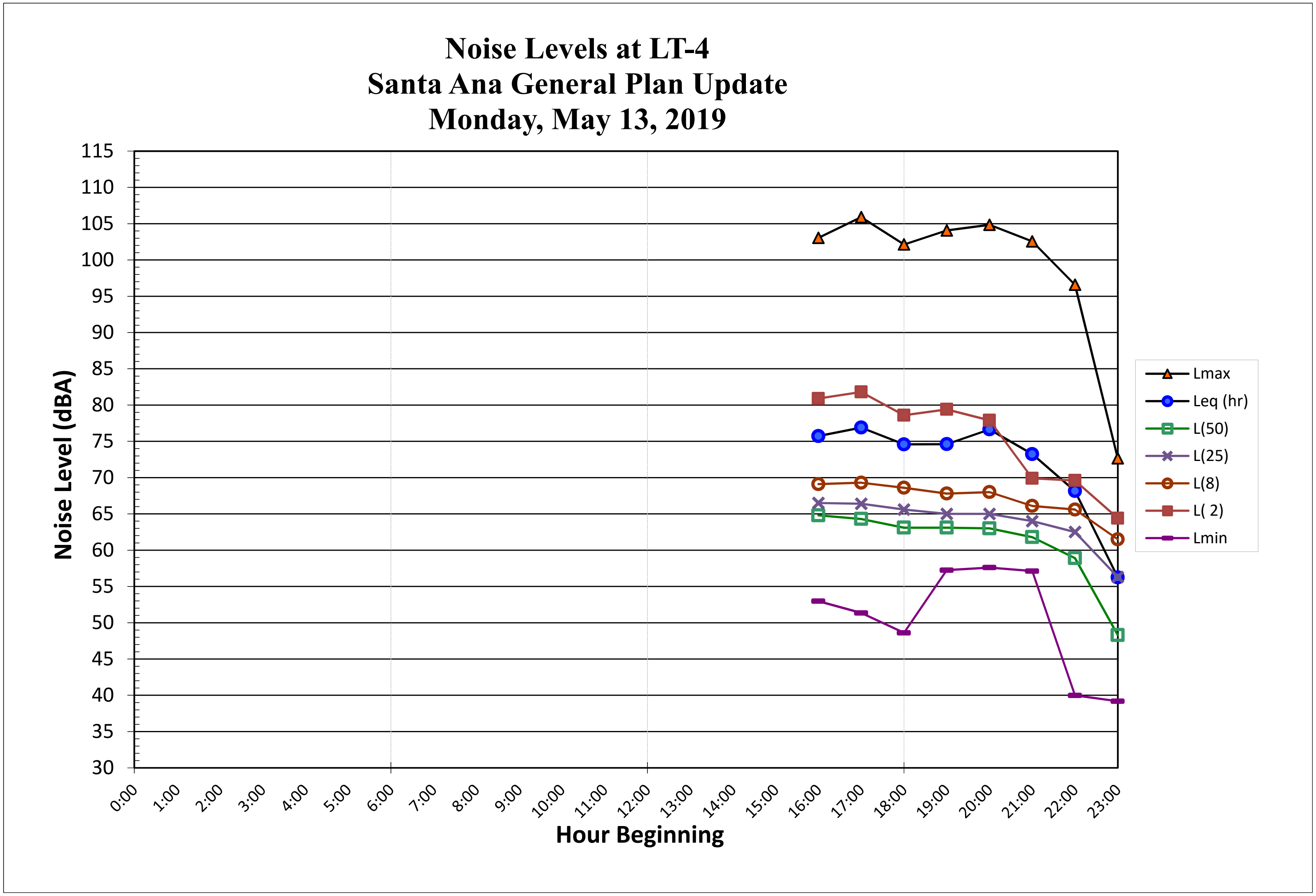
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-4
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
115
110
105
100
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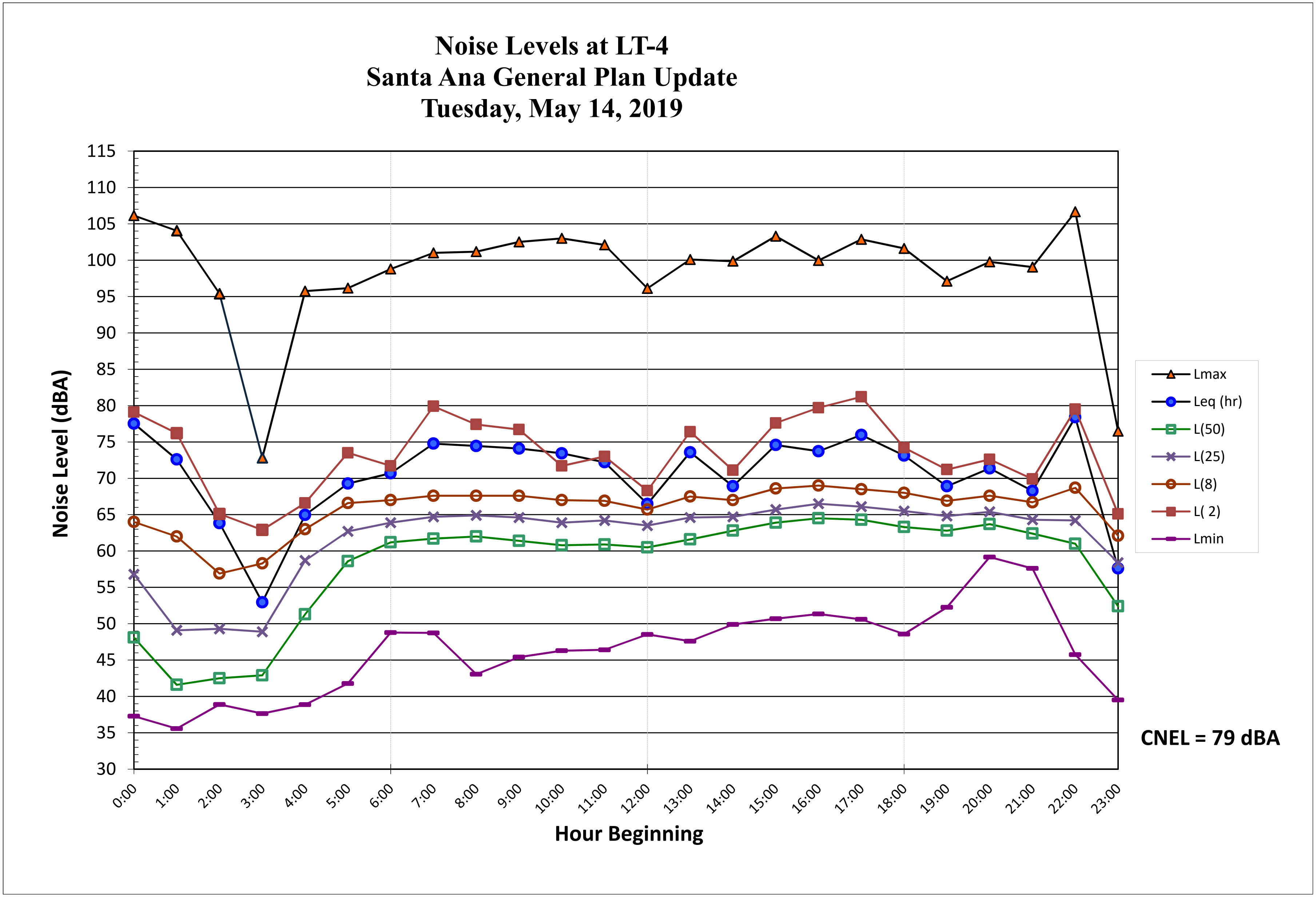
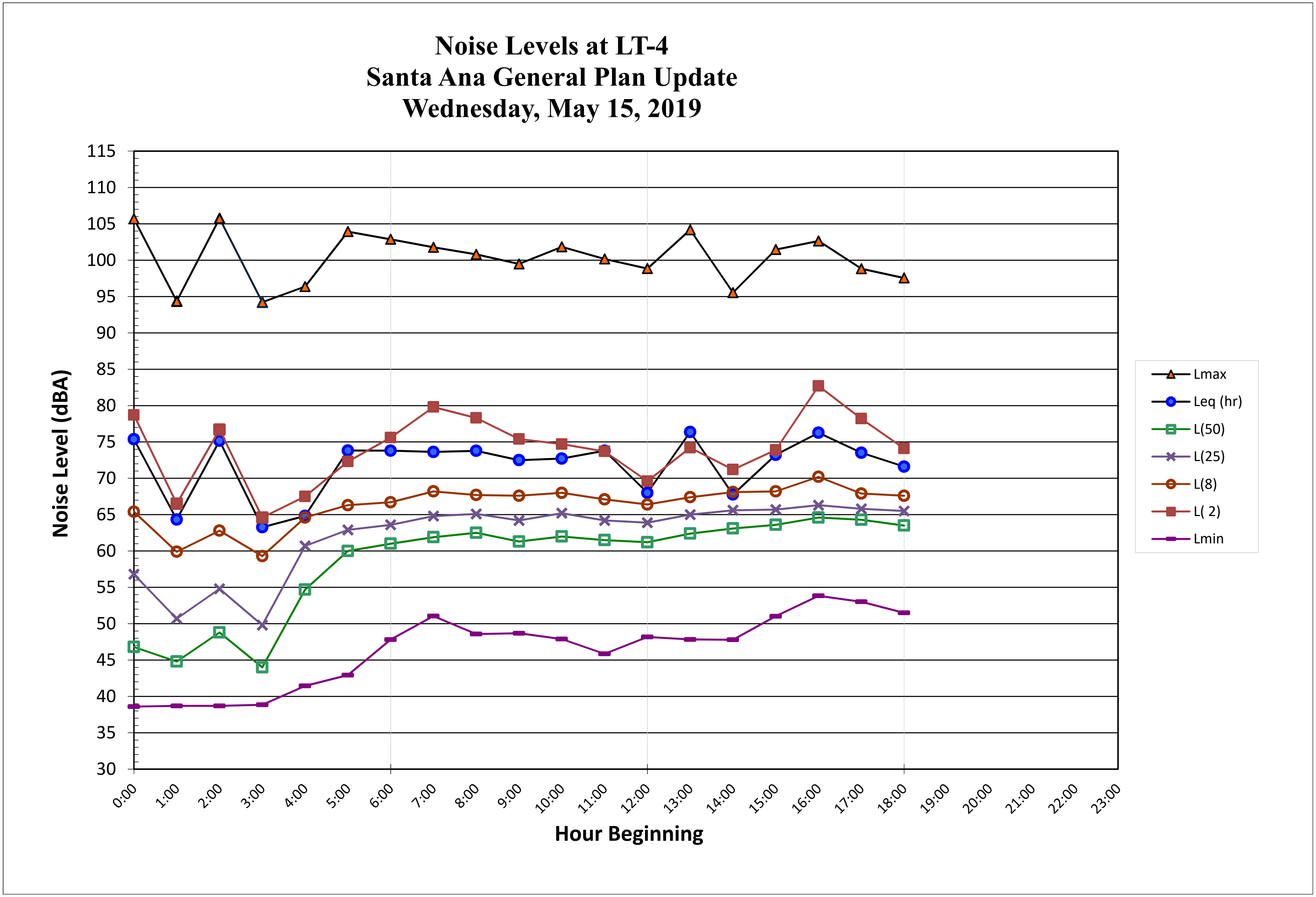
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-4
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 79 dBA



Noise Levels at LT-4
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
115
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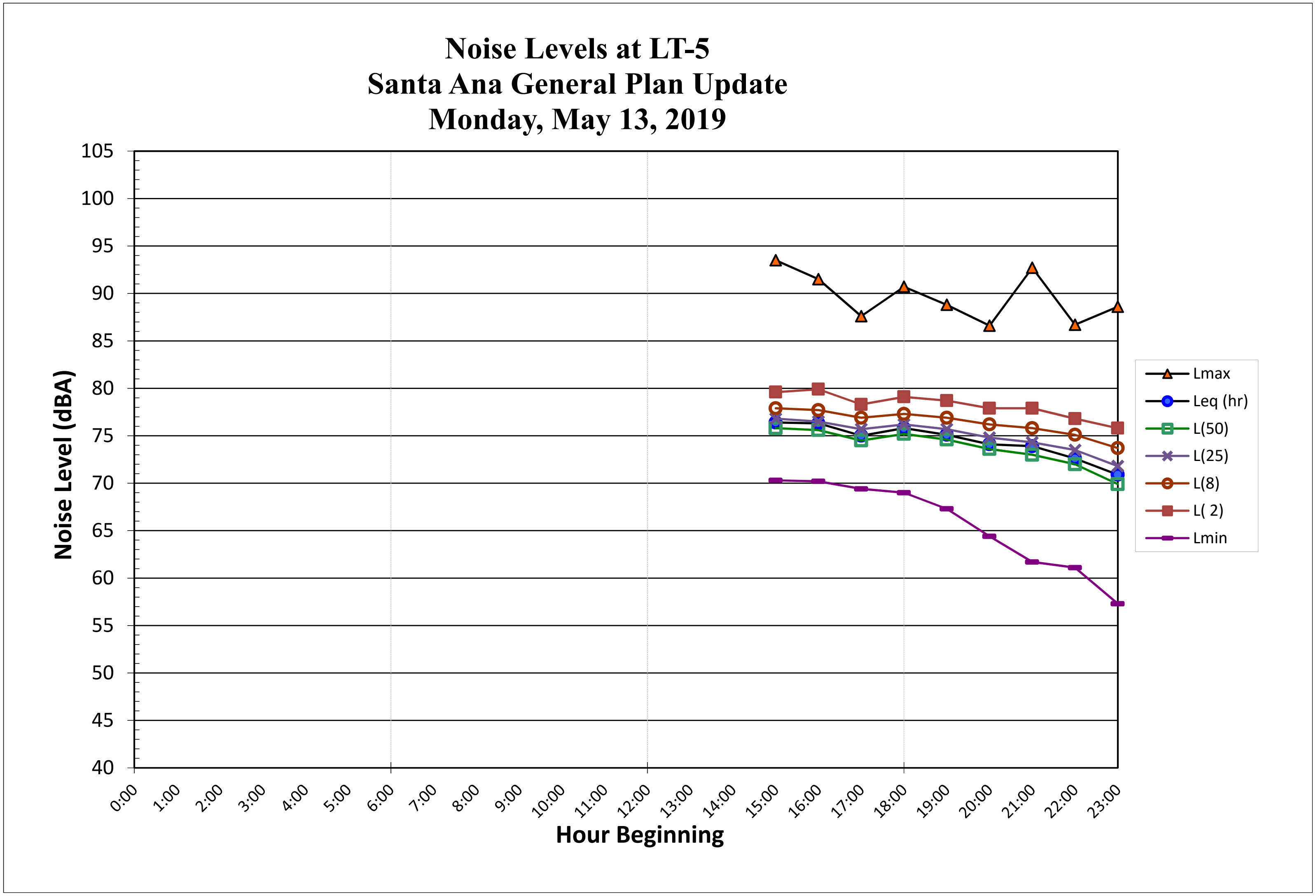
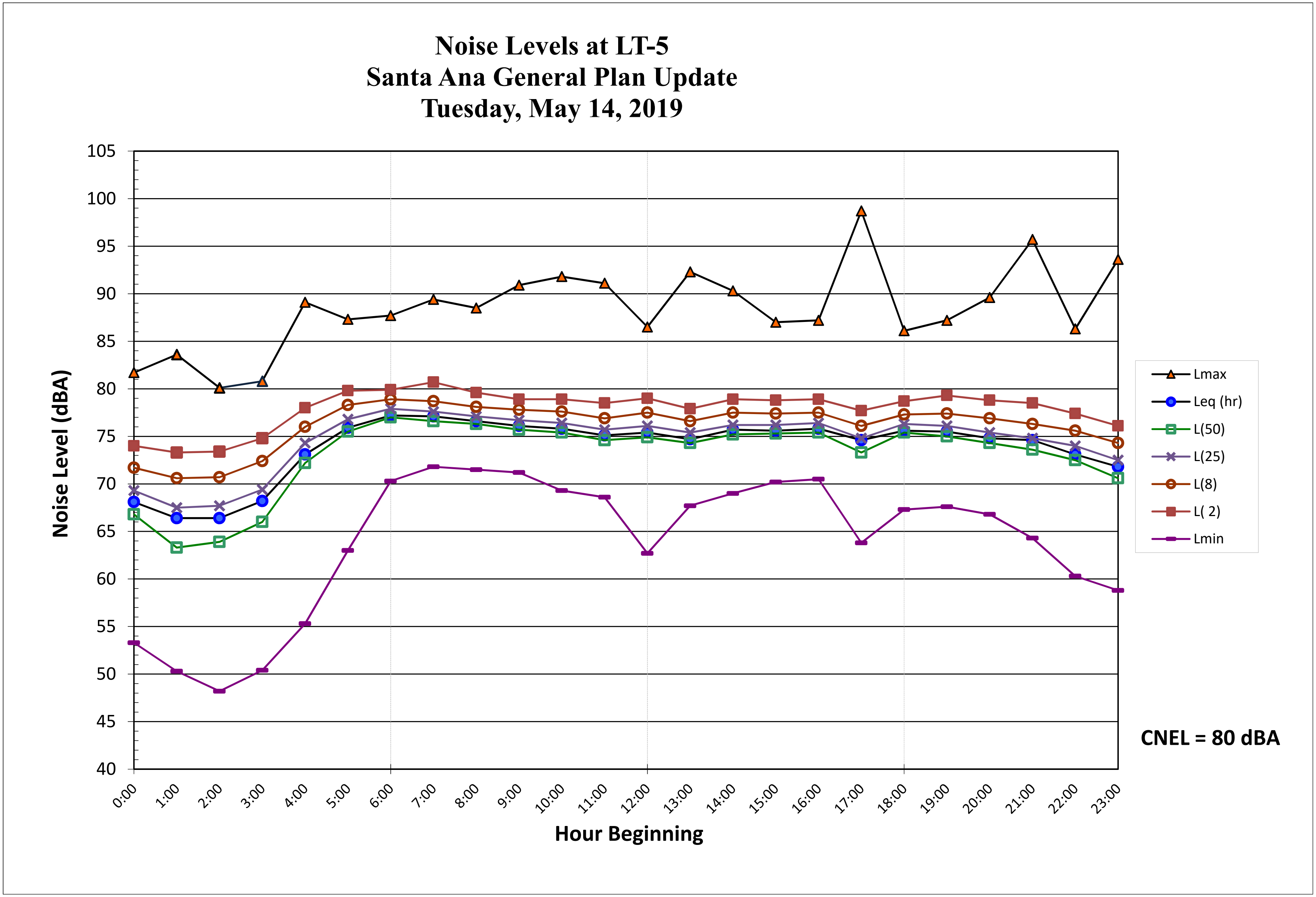
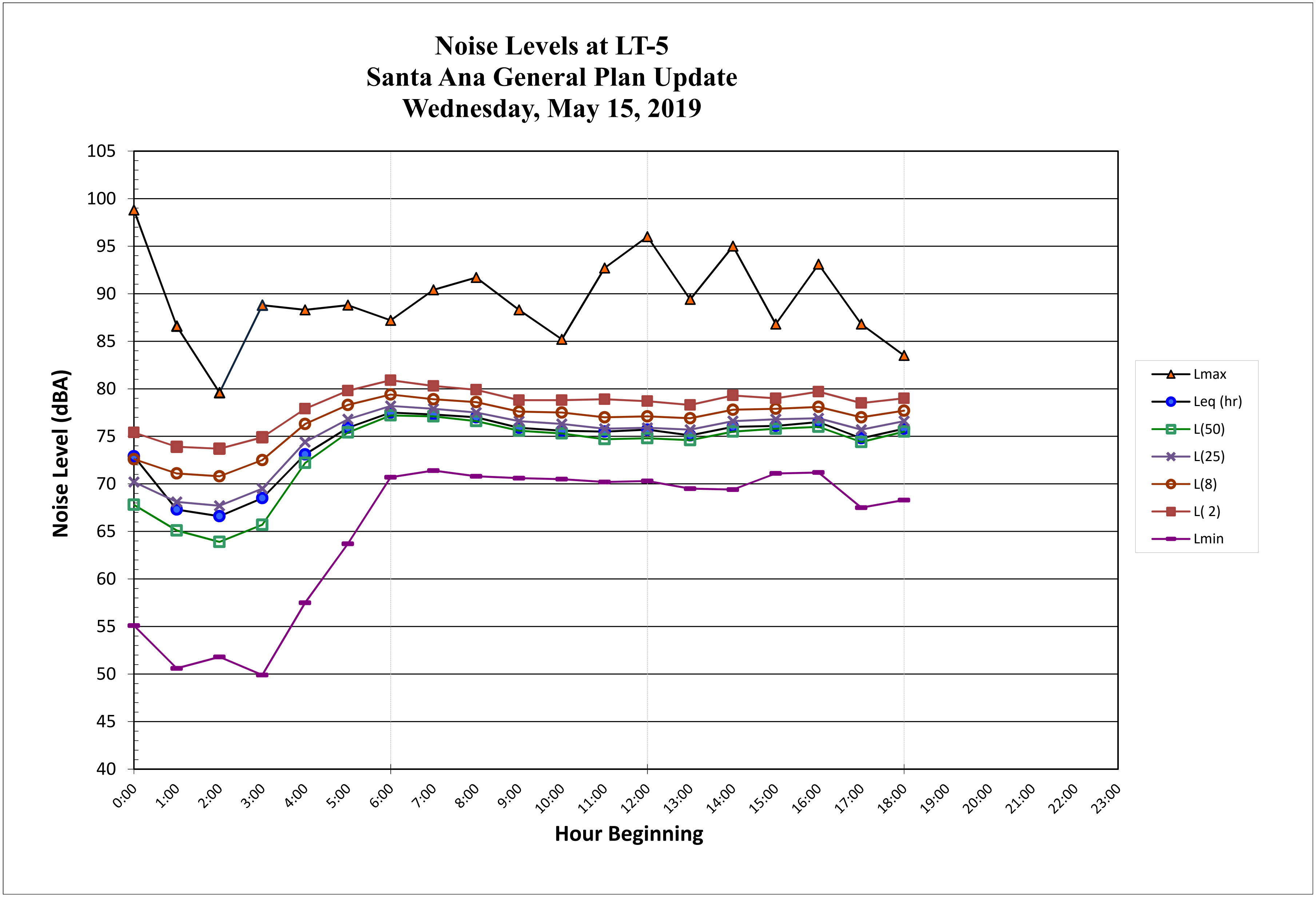
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin



Noise Levels at LT-5
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-5
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 80 dBA


Noise Levels at LT-5
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
105
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Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin

TRAFFIC NOISE INCREASE CALCULATIONS

Traffic Noise Calculator: FHWA 77-108 **Project Title: SNT-20 - Existing**

	Output						Inputs														Auto Inputs	
	dBA at 50 feet			Distance to CNEL Contour																		
ID	$L_{eq\text{-}24hr}$	L_{dn}	CNEL	70 dBA	65 dBA	60 dBA	Roadway	Segment	ADT	Posted Speed Limit	Grade	% Autos	% Med Trucks	% Heavy Trucks	% Daytime	% Evening	% Night	Number of Lanes	Site Condition	Distance to Reciever	Ground Absorption	Lane Distance
1	68.9	71.9	72.4	72	155	335	1st Street	Euclid Street to Ward Street	25233	40	0	94.9%	2.9%	2.2%	77%	12%	11%	6	Soft	50	0.5	68
2	70.9	74.5	75.0	107	230	497	Euclid Street	1st Street to McFadden Avenue	40731	40	0	94.9%	2.9%	2.2%	74%	12%	14%	6	Soft	50	0.5	68
3	70.8	73.6	74.1	94	203	437	Westminster Avenue	Harbor Boulevard to Fairview Street	30459	45	0	94.9%	2.9%	2.2%	78%	12%	10%	6	Soft	50	0.5	68
4	72.2	76.2	76.6	138	298	642	Harbor Boulevard	Westminster Avenue/17th Street to Hazard Avenue	54137	40	0	94.9%	2.9%	2.2%	71%	12%	17%	6	Soft	50	0.5	68
5	70.0	73.4	73.8	90	194	419	1st Street	Harbor Boulevard to Jackson	32736	40	0	94.9%	2.9%	2.2%	75%	12%	13%	6	Soft	50	0.5	68
6	70.4	73.4	73.9	92	197	425	Edinger Avenue	Harbor Boulevard to Fairview Street	27838	45	0	94.9%	2.9%	2.2%	76%	13%	11%	6	Soft	50	0.5	68
7	71.0	74.2	74.6	101	218	470	Warner Avenue	Harbor Boulevard to Fairview Street	31945	45	0	94.9%	2.9%	2.2%	78%	10%	12%	6	Soft	50	0.5	68
8	67.9	71.4	71.9	67	144	310	Harbor Boulevard	Segerstrom Avenue to MacArthur Boulevard	15622	45	0	94.9%	2.9%	2.2%	74%	12%	14%	6	Soft	50	0.5	68
9	72.2	74.8	75.5	116	250	538	Fairview Street	1st Street to Willits Street	42605	45	0	94.9%	2.9%	2.2%	77%	14%	9%	6	Soft	50	0.5	68
10	70.5	73.6	74.1	94	203	438	1st Street	Sullivan Street to Raitt Street	36377	40	0	94.9%	2.9%	2.2%	76%	12%	12%	6	Soft	50	0.5	68
11	72.3	76.3	76.8	142	305	658	Bristol Street	17th Street to Santa Clara Avenue	45676	45	0	94.9%	2.9%	2.2%	70%	13%	17%	4	Soft	50	0.5	44
12	70.6	73.1	73.8	89	192	414	17th Street	College Avenue to Bristol Street	37345	40	0	94.9%	2.9%	2.2%	78%	13%	9%	6	Soft	50	0.5	68
13	70.9	74.8	75.3	113	244	525	Bristol Street	17th Street to Washington Avenue	42005	40	0	94.9%	2.9%	2.2%	70%	14%	16%	5	Soft	50	0.5	56
14	71.8	75.8	76.2	130	280	603	Fairview Street	Trask Avenue to 17th Street	40432	45	0	94.9%	2.9%	2.2%	71%	12%	17%	4	Soft	50	0.5	44
15	71.1	74.7	75.2	111	239	515	Bristol Street	1st Street to Bishop Street	42663	40	0	94.9%	2.9%	2.2%	73%	13%	14%	6	Soft	50	0.5	68
16	65.9	68.7	69.1	43	94	202	Civic Center Drive	Bristol Street to Flower Street	17589	35	0	94.9%	2.9%	2.2%	81%	9%	10%	4	Soft	50	0.5	44
17	65.2	68.8	69.2	45	96	207	Flower Street	1st Street to Bishop Street	15622	35	0	94.9%	2.9%	2.2%	74%	12%	14%	2	Soft	50	0.5	20
18	68.5	72.0	72.5	73	158	340	Main Street	17th Street to 20th Street	32044	35	0	94.9%	2.9%	2.2%	74%	12%	14%	4	Soft	50	0.5	44
19	67.4	71.1	71.6	64	137	296	Main Street	Washington Street to Civic Center Drive	33489	30	0	94.9%	2.9%	2.2%	72%	13%	15%	4	Soft	50	0.5	44
20	63.1	65.7	66.1	28	59	128	Civic Center Drive	Flower Street to Ross Street	17427	25	0	94.9%	2.9%	2.2%	83%	8%	9%	4	Soft	50	0.5	44
21	64.0	66.8	67.3	33	71	153	Santa Ana Boulevard	Flower Street to Ross Street	14689	30	0	94.9%	2.9%	2.2%	80%	10%	10%	6	Soft	50	0.5	68
22	71.1	74.9	75.3	113	243	525	1st Street	Main Street to Standard Avenue	42699	40	0	94.9%	2.9%	2.2%	73%	12%	15%	6	Soft	50	0.5	68
23	68.2	71.8	72.2	70	152	326	Main Street	1st Street to Bishop Street	30125	35	0	94.9%	2.9%	2.2%	74%	12%	14%	4	Soft	50	0.5	44
24	69.4	72.8	73.3	82	178	383	Grand Avenue	Santa Clara Avenue to Fairhaven Street	30206	40	0	94.9%	2.9%	2.2%	75%	12%	13%	4	Soft	50	0.5	44
25	70.2	73.8	74.3	97	208	449	Grand Avenue	Santa Ana Boulevard to 4th Street	36678	40	0	94.9%	2.9%	2.2%	73%	13%	14%	4	Soft	50	0.5	44
26	64.7	67.3	67.8	36	77	166	Santa Clara Avenue	Grand Avenue to Tustin Avenue	10585	40	0	94.9%	2.9%	2.2%	80%	11%	9%	2	Soft	50	0.5	20
27	70.3	73.1	73.6	87	187	403	Tustin Avenue	Santa Clara Avenue to Fairhaven Street	35410	40	0	94.9%	2.9%	2.2%	80%	10%	10%	6	Soft	50	0.5	68
28	69.7	72.2	72.8	77	166	358	17th Street	Cabrillo Park Drive to Tustin Avenue	32080	40	0	94.9%	2.9%	2.2%	79%	12%	9%	4	Soft	50	0.5	44
29	68.9	71.4	71.9	67	144	309	Tustin Avenue	Fruit Street to 4th Street	25174	40	0	94.9%	2.9%	2.2%	82%	9%	9%	6	Soft	50	0.5	68
30	69.4	73.1	73.5	86	186	400	1st Street	Grand Avenue to Elk Lane	28638	40	0	94.9%	2.9%	2.2%	74%	11%	15%	6	Soft	50	0.5	68
31	68.3	71.5	71.9	67	145	312	1st Street	Cabrillo Park Drive to Tustin Avenue	22083	40	0	94.9%	2.9%	2.2%	77%	11%	12%	6	Soft	50	0.5	68
32	71.7	75.4	75.8	122	263	566	Fairview Street	Edinger Avenue to Harvard Street	37524	45	0	94.9%	2.9%	2.2%	74%	11%	15%	6	Soft	50	0.5	68
33	71.9	75.7	76.0	126	272	586	Fairview Street	Warner Avenue to Segerstrom Avenue	39878	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
34	69.0	71.6	72.1	69	149	320	MacArthur Boulevard	Harbor Boulevard to Fairview Street	26235	40	0	94.9%	2.9%	2.2%	81%	10%	9%	6	Soft	50	0.5	68
35	68.1	71.4	72.0	68	147	317	Edinger Avenue	Fairview Street to Greenvile Street	29115	35	0	94.9%	2.9%	2.2%	72%	15%	13%	4	Soft	50	0.5	44
36	66.6	70.0	70.6	55	118	255	McFadden Avenue	Fairview Street to Raitt Street	20997	35	0	94.9%	2.9%	2.2%	72%	15%	13%	4	Soft	50	0.5	44
37	69.4	71.8	72.3	71	154	331	MacArthur Boulevard	Fairview Street to Raitt Street	28809	40	0	94.9%	2.9%	2.2%	82%	10%	8%	6	Soft	50	0.5	68
38	67.5	70.3	71.2	60	130	280	Segerstrom Avenue	Fairview Street to Raitt Street	19326	40	0	94.9%	2.9%	2.2%	68%	22%	10%	4	Soft	50	0.5	44
39	70.3	73.9	74.4	98	210	453	Bristol Street	Edinger Avenue to Warner Avenue	37238	40	0	94.9%	2.9%	2.2%	73%	13%	14%	4	Soft	50	0.5	44
40	70.6	74.0	74.5	100	216	466	Bristol Street	Warner Avenue to Segerstrom Avenue	38007	40	0	94.9%	2.9%	2.2%	74%	13%	13%	6	Soft	50	0.5	68
41	71.2	74.7	75.1	110	237	510	Warner Avenue	Raitt Street to Bristol Street	34555	45	0	94.9%	2.9%	2.2%	76%	10%	14%	5	Soft	50	0.5	56
42	70.2	73.8	74.3	97	208	449	Bristol Street	MacArthur Boulevard to Sunflower Avenue	34731	40	0	94.9%	2.9%	2.2%	73%	13%	14%	6	Soft	50	0.5	68
43	66.5	69.7	70.1	51	110	237	Flower Street	Warner Avenue to Segerstrom Avenue	15378	40	0	94.9%	2.9%	2.2%	77%	11%	12%	4	Soft	50	0.5	44
44	70.2	73.6	74.2	95	204	440	Edinger Avenue	Flower Street to Main Street	36534	40	0	94.9%	2.9%	2.2%	73%	14%	13%	4	Soft	50	0.5	44
45	68.0	71.5	72.0	68	146	314	Main Street	McFadden Avenue to Edinger Avenue	28622	35	0	94.9%	2.9%	2.2%	75%	11%	14%	4	Soft	50	0.5	44
46	67.9	71.8	72.2	70	151	325	Main Street	Edinger Avenue to Warner Avenue	27972	35	0	94.9%	2.9%	2.2%	72%	12%	16%	4	Soft	50	0.5	44
47	69.5	73.3	73.6	87	188	406	Main Street	Warner Avenue to Dyer Road	30484	40	0	94.9%	2.9%	2.2%	75%	10%	15%	5	Soft	50	0.5	56
48	68.2	71.6	72.0	68	146	315	Segerstrom Avenue	Bristol Street to Flower Street	22959	40	0	94.9%	2.9%	2.2%	77%	10%	13%	4	Soft	50	0.5	44
49	70.6	73.8	74.3	97	208	448	MacArthur Boulevard	Flower Street to Main Street	37946	40	0	94.9%	2.9%	2.2%	77%	11%	12%	6	Soft	50	0.5	68
50	69.7	72.7	73.1	80	173	372	Main Street	MacArthur Boulevard to Sunflower Avenue	23692	45	0	94.9%	2.9%	2.2%	80%	9%	11%	6	Soft	50	0.5	68
51	68.4	71.0	71.1	59	127	273	Grand Avenue	Edinger Avenue to Warner Avenue	17735	45	0	94.9%	2.9%	2.2%	90%	1%	9%	6	Soft	50	0.5	68
52	72.0	75.7	76.1	127	273	589	Edinger Avenue	Richie Street to Newport Avenue	40435	45	0	94.9%	2.9%	2.2%	76%	9%	15%	6	Soft	50	0.5	68
53	69.4	72.8	73.1	80	172	372	Warner Avenue	Grand Avenue to Red Hill Avenue	22435	45	0	94.9%	2.9%	2.2%	81%	6%	13%	6	Soft	50	0.5	68
54	69.0	72.5	72.9	78	169	363	Warner Avenue	Main Street to Standard Avenue	27391	40	0	94.9%	2.9%	2.2%	76%	10%	14%	4	Soft	50	0.5	44
55	67.3	70.1	70.7	56	120	259	McFadden Avenue	Newhope Street to Harbor Boulevard	18495	40	0	94.9%	2.9%	2.2%	76%	14%	10%	4	Soft	50	0.5	44
56	66.5	70.2	70.6	55	118	254	McFadden Avenue	Standard Avenue to Grand Avenue	20188	35	0	94.9%	2.9%	2.2%	74%	11%	15%	4	Soft	50	0.5	44
57	69.8	73.7	74.1	93	201	433	Dyer Road	Red Hill Avenue to Pullman Street	31248	40	0	94.9%	2.9%	2.2%	73%	11%	16%	6	Soft	50	0.5	68
58	63.8	67.5	68.0	37	79	170	McFadden Avenue	Bristol Street to Flower Street	14951	30	0	94.9%	2.9%	2.2%	71%	14%	15%	2	Soft	50	0.5	20
59	69.8	73.5	73.8	90	195	419	Main Street	La Veta Avenue to Memory Lane	31004	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
60	70.8	74.3	74.8	104	224	482	1st Street	Bristol Street to Flower Street	39006	40	0	94.9%	2.9%	2.2%	74%	12%	14%	6	Soft	50	0.5	68
61	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!															0	#N/A
62	83.5	86.9	87.3	714	1538	3314	I-5	Chapman Ave. to Katella Ave.	248200	60	0	90.4%	6.0%	3.6%	76%	11%	13%	6	Soft	50	0.5	68
63	84.9	88.3	88.7	885	1907	4109	I-5	SR-22 to Main St.	377100	60	0	93.7%	3.1%	3.2%	76%	11%	13%	6	Soft	50	0.5	68
64	84.8	88.2	88.6	875	1884	4059	I-5	17th St./Penn Way to Grand Ave.	370300	60	0	93.7%	3.1%	3.2%	76%	11%	13%	6	Soft	50	0.5	68
65	84.3	87.7	88.2	812	1749	3768	I-5	1st St. to SR-55	339500	60	0	94.5%	2.4%	3.1%	76%	11%	13%	6	Soft	50	0.5	68

66	84.3	87.6	88.1	803	1730	3728	I-5	Newport Ave. to Red Hill Ave.	334100	60	0	94.5%	2.4%	3.1%	76%	11%	13%	6	Soft	50	0.5	68
67	83.3	86.7	87.1	692	1490	3211	I-405	Brookhurst Ave. to Euclid St.	300100	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
68	83.6	87.0	87.4	725	1562	3365	I-405	Euclid St. to Harbor Blvd.	321900	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
69	83.3	86.7	87.1	694	1494	3219	I-405	Harbor Blvd. to SR-73	301300	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
70	82.6	85.9	86.4	620	1336	2878	I-405	Bristol St. to SR-55	246400	60	0	95.7%	2.3%	2.0%	76%	11%	13%	6	Soft	50	0.5	68
71	83.3	86.6	87.1	687	1481	3191	I-405	SR-55 to MacArthur Blvd.	287700	60	0	95.7%	2.3%	2.0%	76%	11%	13%	6	Soft	50	0.5	68
72	83.4	86.8	87.3	708	1525	3286	SR-55	4th St to 17th Street	267300	60	0	93.0%	4.0%	3.0%	76%	11%	13%	6	Soft	50	0.5	68
73	84.0	87.3	87.8	765	1647	3549	SR-55	Edginer Ave. to Dyer Rd.	297300	60	0	92.8%	4.1%	3.1%	76%	11%	13%	6	Soft	50	0.5	68
74	83.2	86.6	87.0	683	1471	3169	SR-55	Dyer Rd. to MacArthur Blvd.	285700	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
75	82.3	85.6	86.1	589	1269	2734	SR-55	MacArthur Blvd. to I-405	228900	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
76	80.7	84.1	84.5	463	998	2150	SR-55	I-405 to SR-73	159700	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
77	82.3	85.6	86.1	590	1271	2738	SR-22	Euclid St. to Harbor Blvd.	223100	60	0	94.3%	4.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
78	82.5	85.8	86.3	608	1310	2822	SR-22	The City Dr. to Bristol St.	242600	60	0	95.5%	2.9%	1.6%	76%	11%	13%	6	Soft	50	0.5	68
79	80.4	83.8	84.2	443	955	2058	SR-22	I-5 to Main St.	151100	60	0	95.5%	2.9%	1.6%	76%	11%	13%	6	Soft	50	0.5	68
80	80.1	83.4	83.9	422	908	1956	SR-22	Glassell St. to Tustin Ave.	146100	60	0	96.6%	2.0%	1.4%	76%	11%	13%	6	Soft	50	0.5	68

Traffic Noise Calculator: FHWA 77-108 **Project Title: SNT-20 - 2045 GP Buildout 80%**

	Output						Inputs														Auto Inputs	
	dBA at 50 feet			Distance to CNEL Contour																		
ID	$L_{eq\text{-}24hr}$	L_{dn}	CNEL	70 dBA	65 dBA	60 dBA	Roadway	Segment	ADT	Posted Speed Limit	Grade	% Autos	% Med Trucks	% Heavy Trucks	% Daytime	% Evening	% Night	Number of Lanes	Site Condition	Distance to Reciever	Ground Absorption	Lane Distance
1	67.6	71.3	71.7	64	139	299	1st Street	Euclid Street to Ward Street	18700	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
2	70.2	73.9	74.3	96	207	446	Euclid Street	1st Street to McFadden Avenue	34000	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
3	68.3	72.1	72.4	73	157	337	Westminster Avenue	Harbor Boulevard to Fairview Street	17400	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
4	70.4	74.1	74.5	100	216	465	Harbor Boulevard	Westminster Avenue/17th Street to Hazard Avenue	36200	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
5	68.5	72.2	72.6	74	160	344	1st Street	Harbor Boulevard to Jackson	23100	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
6	69.6	73.3	73.7	88	190	410	Edinger Avenue	Harbor Boulevard to Fairview Street	23300	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
7	70.1	73.8	74.2	96	206	444	Warner Avenue	Harbor Boulevard to Fairview Street	26300	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
8	73.5	77.2	77.6	160	345	743	Harbor Boulevard	Segerstrom Avenue to MacArthur Boulevard	56900	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
9	71.8	75.5	75.9	124	266	574	Fairview Street	1st Street to Willits Street	38600	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
10	69.1	72.8	73.2	82	176	378	1st Street	Sullivan Street to Raitt Street	26600	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
11	72.1	75.8	76.2	130	280	602	Bristol Street	17th Street to Santa Clara Avenue	41500	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
12	69.5	73.3	73.6	87	188	405	17th Street	College Avenue to Bristol Street	29500	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
13	71.4	75.1	75.5	116	250	538	Bristol Street	17th Street to Washington Avenue	45100	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
14	72.8	76.5	76.9	143	308	665	Fairview Street	Trask Avenue to 17th Street	48100	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
15	71.7	75.5	75.8	122	264	569	Bristol Street	1st Street to Bishop Street	49000	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
16	66.1	69.8	70.2	52	111	240	Civic Center Drive	Bristol Street to Flower Street	18600	35	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
17	61.7	65.4	65.8	26	56	121	Flower Street	1st Street to Bishop Street	6900	35	0	94.9%	2.9%	2.2%	75%	10%	15%	2	Soft	50	0.5	20
18	70.0	73.7	74.1	94	202	435	Main Street	17th Street to 20th Street	43000	35	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
19	64.9	68.6	69.0	43	93	199	Main Street	Washington Street to Civic Center Drive	19000	30	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
20	60.8	64.5	64.9	23	49	106	Civic Center Drive	Flower Street to Ross Street	10200	25	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
21	64.1	67.8	68.2	38	82	176	Santa Ana Boulevard	Flower Street to Ross Street	15800	30	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
22	69.8	73.5	73.9	91	195	420	1st Street	Main Street to Standard Avenue	32900	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
23	68.3	72.0	72.4	72	155	333	Main Street	1st Street to Bishop Street	30500	35	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
24	69.8	73.5	73.9	90	195	420	Grand Avenue	Santa Clara Avenue to Fairhaven Street	31100	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
25	70.3	74.0	74.4	98	211	454	Grand Avenue	Santa Ana Boulevard to 4th Street	35000	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
26	63.9	67.6	68.0	37	79	170	Santa Clara Avenue	Grand Avenue to Tustin Avenue	8700	40	0	94.9%	2.9%	2.2%	75%	10%	15%	2	Soft	50	0.5	20
27	67.9	71.6	72.0	68	147	317	Tustin Avenue	Santa Clara Avenue to Fairhaven Street	20400	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
28	70.2	73.9	74.3	97	209	451	17th Street	Cabrillo Park Drive to Tustin Avenue	34600	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
29	69.3	73.0	73.4	85	182	392	Tustin Avenue	Fruit Street to 4th Street	28100	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
30	69.5	73.2	73.6	87	187	402	1st Street	Grand Avenue to Elk Lane	30800	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
31	66.2	70.0	70.3	53	114	245	1st Street	Cabrillo Park Drive to Tustin Avenue	14600	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
32	72.5	76.2	76.6	137	296	637	Fairview Street	Edinger Avenue to Harvard Street	45100	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
33	72.2	75.9	76.2	130	281	605	Fairview Street	Warner Avenue to Segerstrom Avenue	41800	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
34	70.0	73.7	74.1	93	201	433	MacArthur Boulevard	Harbor Boulevard to Fairview Street	32600	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
35	67.1	70.8	71.2	60	130	280	Edinger Avenue	Fairview Street to Greenvile Street	22200	35	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
36	62.4	66.1	66.5	29	63	136	McFadden Avenue	Fairview Street to Raitt Street	8200	35	0	94.9%	2.9%	2.2%	75%	10%	15%	2	Soft	50	0.5	20
37	69.5	73.2	73.5	86	186	400	MacArthur Boulevard	Fairview Street to Raitt Street	28900	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
38	69.6	73.3	73.6	88	189	406	Segerstrom Avenue	Fairview Street to Raitt Street	29600	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
39	72.2	75.9	76.3	132	283	610	Bristol Street	Edinger Avenue to Warner Avenue	54500	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
40	71.4	75.1	75.4	115	249	536	Bristol Street	Warner Avenue to Segerstrom Avenue	44800	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
41	69.4	73.1	73.5	86	185	398	Warner Avenue	Raitt Street to Bristol Street	22300	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
42	71.9	75.6	76.0	125	270	582	Bristol Street	MacArthur Boulevard to Sunflower Avenue	50800	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
43	69.8	73.5	73.9	91	197	424	Flower Street	Warner Avenue to Segerstrom Avenue	33300	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
44	68.9	72.6	72.9	79	169	365	Edinger Avenue	Flower Street to Main Street	25200	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
45	67.8	71.5	71.9	67	144	311	Main Street	McFadden Avenue to Edinger Avenue	27500	35	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
46	69.3	73.1	73.4	85	183	393	Main Street	Edinger Avenue to Warner Avenue	38200	35	0	94.9%	2.9%	2.2%	75%	10%	15%	5	Soft	50	0.5	56
47	70.7	74.4	74.8	104	225	485	Main Street	Warner Avenue to Dyer Rd	38600	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
48	69.0	72.7	73.1	80	173	372	Segerstrom Avenue	Bristol Street to Flower Street	25900	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
49	70.8	74.6	74.9	107	230	495	MacArthur Boulevard	Flower Street to Main Street	39800	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
50	70.6	74.3	74.7	102	220	474	Main Street	MacArthur Boulevard to Sunflower Avenue	29000	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
51	71.7	75.4	75.7	121	260	561	Grand Avenue	Edinger Avenue to Warner Avenue	37300	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
52	72.9	76.6	77.0	146	315	679	Edinger Avenue	Richie Street to Newport Avenue	49700	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
53	71.3	75.0	75.4	115	248	534	Warner Avenue	Grand Avenue to Red Hill Avenue	34600	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
54	68.6	72.3	72.7	76	164	352	Warner Avenue	Main Street to Standard Avenue	23900	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
55	64.0	67.7	68.1	37	80	173	McFadden Avenue	Newhope Street to Harbor Boulevard	8700	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
56	62.6	66.3	66.7	30	65	140	McFadden Avenue	Standard Avenue to Grand Avenue	8600	35	0	94.9%	2.9%	2.2%	75%	10%	15%	2	Soft	50	0.5	20
57	73.9	77.6	78.0	171	368	793	Dyer Road	Red Hill Avenue to Pullman Street	80700	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
58	62.7	66.4	66.8	31	66	142	McFadden Avenue	Bristol Street to Flower Street	11800	30	0	94.9%	2.9%	2.2%	75%	10%	15%	2	Soft	50	0.5	20
59	71.8	75.6	75.9	124	268	578	Main Street	La Veta Avenue to Memory Lane	50200	40	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
60	68.7	72.4	72.8	77	165	356	1st Street	Bristol Street to Flower Street	25700	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
61	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!															0	#N/A
62	84.3	88.0	88.4	838	1804	3888	I-5	Chapman Ave. to Katella Ave.	295846	60	0	90.4%	6.0%	3.6%	75%	10%	15%	6	Soft	50	0.5	68
63	84.4	88.2	88.5	860	1853	3992	I-5	SR-22 to Main St.	338810	60	0	93.7%	3.1%	3.2%	75%	10%	15%	6	Soft	50	0.5	68
64	85.3	89.0	89.4	975	2101	4526	I-5	17th St./Penn Way to Grand Ave.	409068	60	0	93.7%	3.1%	3.2%	75%	10%	15%	6	Soft	50	0.5	68
65	84.9	88.6	89.0	928	1999	4307	I-5	1st St. to SR-55	389327	60	0	94.5%	2.4%	3.1%	75%	10%	15%	6	Soft	50	0.5	68

66	84.8	88.5	88.9	907	1953	4208	I-5	Newport Ave. to Red Hill Ave.	375987	60	0	94.5%	2.4%	3.1%	75%	10%	15%	6	Soft	50	0.5	68
67	84.0	87.7	88.1	803	1729	3726	I-405	Brookhurst Ave. to Euclid St.	351979	60	0	96.5%	1.7%	1.8%	75%	10%	15%	6	Soft	50	0.5	68
68	84.5	88.2	88.6	862	1858	4003	I-405	Euclid St. to Harbor Blvd.	391915	60	0	96.5%	1.7%	1.8%	75%	10%	15%	6	Soft	50	0.5	68
69	84.2	87.9	88.3	831	1791	3859	I-405	Harbor Blvd. to SR-73	370931	60	0	96.5%	1.7%	1.8%	75%	10%	15%	6	Soft	50	0.5	68
70	82.5	86.2	86.6	640	1378	2968	I-405	Bristol St. to SR-55	242220	60	0	95.7%	2.3%	2.0%	75%	10%	15%	6	Soft	50	0.5	68
71	84.1	87.8	88.2	819	1766	3804	I-405	SR-55 to MacArthur Blvd.	351350	60	0	95.7%	2.3%	2.0%	75%	10%	15%	6	Soft	50	0.5	68
72	83.7	87.4	87.8	766	1650	3555	SR-55	4th St to 17th Street	282301	60	0	93.0%	4.0%	3.0%	75%	10%	15%	6	Soft	50	0.5	68
73	84.3	88.1	88.4	847	1825	3932	SR-55	Edginer Ave. to Dyer Rd.	325314	60	0	92.8%	4.1%	3.1%	75%	10%	15%	6	Soft	50	0.5	68
74	83.3	87.0	87.4	718	1547	3334	SR-55	Dyer Rd. to MacArthur Blvd.	289242	60	0	95.3%	3.0%	1.7%	75%	10%	15%	6	Soft	50	0.5	68
75	83.2	86.9	87.3	709	1527	3289	SR-55	MacArthur Blvd. to I-405	283503	60	0	95.3%	3.0%	1.7%	75%	10%	15%	6	Soft	50	0.5	68
76	80.8	84.5	84.9	489	1054	2271	SR-55	I-405 to SR-73	162679	60	0	95.3%	3.0%	1.7%	75%	10%	15%	6	Soft	50	0.5	68
77	82.3	86.0	86.4	617	1330	2866	SR-22	Euclid St. to Harbor Blvd.	224252	60	0	94.3%	4.0%	1.7%	75%	10%	15%	6	Soft	50	0.5	68
78	80.1	83.8	84.2	441	949	2045	SR-22	The City Dr. to Bristol St.	140466	60	0	95.5%	2.9%	1.6%	75%	10%	15%	6	Soft	50	0.5	68
79	81.1	84.8	85.2	515	1110	2391	SR-22	I-5 to Main St.	177513	60	0	95.5%	2.9%	1.6%	75%	10%	15%	6	Soft	50	0.5	68
80	80.2	83.9	84.3	446	961	2070	SR-22	Glassell St. to Tustin Ave.	149143	60	0	96.6%	2.0%	1.4%	75%	10%	15%	6	Soft	50	0.5	68

Roadway	Segment	Existing ADT	Future ADT	Existing Traffic Noise	Future Traffic Noise	Increase
1st Street	Euclid Street to Ward Street	25,233	18,700	72.4	71.7	-0.7
Euclid Street	1st Street to McFadden Avenue	40,731	34,000	75.0	74.3	-0.7
Westminster Avenue	Harbor Boulevard to Fairview Street	30,459	17,400	74.1	72.4	-1.7
Harbor Boulevard	Westminster Avenue/17th Street to Hazard Avenue	54,137	36,200	76.6	74.5	-2.1
1st Street	Harbor Boulevard to Jackson	32,736	23,100	73.8	72.6	-1.3
Edinger Avenue	Harbor Boulevard to Fairview Street	27,838	23,300	73.9	73.7	-0.2
Warner Avenue	Harbor Boulevard to Fairview Street	31,945	26,300	74.6	74.2	-0.4
Harbor Boulevard	Segerstrom Avenue to MacArthur Boulevard	15,622	56,900	71.9	77.6	5.7
Fairview Street	1st Street to Willits Street	42,605	38,600	75.5	75.9	0.4
1st Street	Sullivan Street to Raitt Street	36,377	26,600	74.1	73.2	-1.0
Bristol Street	17th Street to Santa Clara Avenue	45,676	41,500	76.8	76.2	-0.6
17th Street	College Avenue to Bristol Street	37,345	29,500	73.8	73.6	-0.1
Bristol Street	17th Street to Washington Avenue	42,005	45,100	75.3	75.5	0.2
Fairview Street	Trask Avenue to 17th Street	40,432	48,100	76.2	76.9	0.6
Bristol Street	1st Street to Bishop Street	42,663	49,000	75.2	75.8	0.6
Civic Center Drive	Bristol Street to Flower Street	17,589	18,600	69.1	70.2	1.1
Flower Street	1st Street to Bishop Street	15,622	6,900	69.2	65.8	-3.5
Main Street	17th Street to 20th Street	32,044	43,000	72.5	74.1	1.6
Main Street	Washington Street to Civic Center Drive	33,489	19,000	71.6	69.0	-2.6
Civic Center Drive	Flower Street to Ross Street	17,427	10,200	66.1	64.9	-1.2
Santa Ana Boulevard	Flower Street to Ross Street	14,689	15,800	67.3	68.2	0.9
1st Street	Main Street to Standard Avenue	42,699	32,900	75.3	73.9	-1.4
Main Street	1st Street to Bishop Street	30,125	30,500	72.2	72.4	0.1
Grand Avenue	Santa Clara Avenue to Fairhaven Street	30,206	31,100	73.3	73.9	0.6
Grand Avenue	Santa Ana Boulevard to 4th Street	36,678	35,000	74.3	74.4	0.1
Santa Clara Avenue	Grand Avenue to Tustin Avenue	10,585	8,700	67.8	68.0	0.1
Tustin Avenue	Santa Clara Avenue to Fairhaven Street	35,410	20,400	73.6	72.0	-1.6
17th Street	Cabrillo Park Drive to Tustin Avenue	32,080	34,600	72.8	74.3	1.5
Tustin Avenue	Fruit Street to 4th Street	25,174	28,100	71.9	73.4	1.6
1st Street	Grand Avenue to Elk Lane	28,638	30,800	73.5	73.6	0.0
1st Street	Cabrillo Park Drive to Tustin Avenue	22,083	14,600	71.9	70.3	-1.6
Fairview Street	Edinger Avenue to Harvard Street	37,524	45,100	75.8	76.6	0.8
Fairview Street	Warner Avenue to Segerstrom Avenue	39,878	41,800	76.0	76.2	0.2
MacArthur Boulevard	Harbor Boulevard to Fairview Street	26,235	32,600	72.1	74.1	2.0
Edinger Avenue	Fairview Street to Greenvile Street	29,115	22,200	72.0	71.2	-0.8
McFadden Avenue	Fairview Street to Raitt Street	20,997	8,200	70.6	66.5	-4.1
MacArthur Boulevard	Fairview Street to Raitt Street	28,809	28,900	72.3	73.5	1.2
Segerstrom Avenue	Fairview Street to Raitt Street	19,326	29,600	71.2	73.6	2.4
Bristol Street	Edinger Avenue to Warner Avenue	37,238	54,500	74.4	76.3	1.9
Bristol Street	Warner Avenue to Segerstrom Avenue	38,007	44,800	74.5	75.4	0.9
Warner Avenue	Raitt Street to Bristol Street	34,555	22,300	75.1	73.5	-1.6
Bristol Street	MacArthur Boulevard to Sunflower Avenue	34,731	50,800	74.3	76.0	1.7
Flower Street	Warner Avenue to Segerstrom Avenue	15,378	33,300	70.1	73.9	3.8
Edinger Avenue	Flower Street to Main Street	36,534	25,200	74.2	72.9	-1.2
Main Street	McFadden Avenue to Edinger Avenue	28,622	27,500	72.0	71.9	-0.1
Main Street	Edinger Avenue to Warner Avenue	27,972	38,200	72.2	73.4	1.2

Main Street	Warner Avenue to Dyer Rd	30,484	38,600	73.6	74.8	1.2
Segerstrom Avenue	Bristol Street to Flower Street	22,959	25,900	72.0	73.1	1.1
MacArthur Boulevard	Flower Street to Main Street	37,946	39,800	74.3	74.9	0.6
Main Street	MacArthur Boulevard to Sunflower Avenue	23,692	29,000	73.1	74.7	1.6
Grand Avenue	Edinger Avenue to Warner Avenue	17,735	37,300	71.1	75.7	4.7
Edinger Avenue	Richie Street to Newport Avenue	40,435	49,700	76.1	77.0	0.9
Warner Avenue	Grand Avenue to Red Hill Avenue	22,435	34,600	73.1	75.4	2.4
Warner Avenue	Main Street to Standard Avenue	27,391	23,900	72.9	72.7	-0.2
McFadden Avenue	Newhope Street to Harbor Boulevard	18,495	8,700	70.7	68.1	-2.6
McFadden Avenue	Standard Avenue to Grand Avenue	20,188	8,600	70.6	66.7	-3.9
Dyer Road	Red Hill Avenue to Pullman Street	31,248	80,700	74.1	78.0	3.9
McFadden Avenue	Bristol Street to Flower Street	14,951	11,800	68.0	66.8	-1.2
Main Street	La Veta Avenue to Memory Lane	31,004	50,200	73.8	75.9	2.1
1st Street	Bristol Street to Flower Street	39,006	25,700	74.8	72.8	-2.0

RAILROAD NOISE MODELING

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	50
Future Train Speed (mph)	50
Number of Existing Trains in one Direction	39
Number of Future Trains in one Direction	39
Existing Number of Day Trains (7 am to 10 p.m.)	31.5
Future Number of Day Trains (7 am to 10 p.m.)	31.5
Existing Number of Night Trains (10 p.m. to 7 am)	7.5
Future Number of Night Trains (10 p.m. to 7 am)	7.5
Existing Average Number of Cars	10.5
Future Average Number of Cars	10.5
Existing Average Number of Locomotives	1.5
Future Average Number of Locomotives	1.5

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive			
National Average (50% front, 50% middle)			1
All Front Mounted			2
All Middle Mounted			3
User Defined	80	% front mounted horns	4

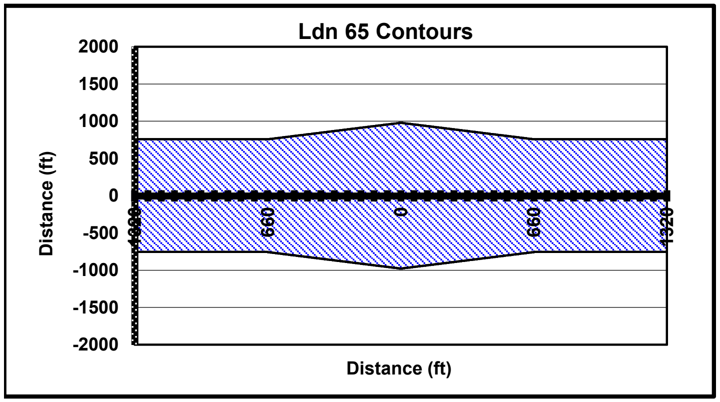
Non Train Noise Environment			
Urban			1
Suburban			2
Rural			3
User Defined Ldn =	50	dBA	4

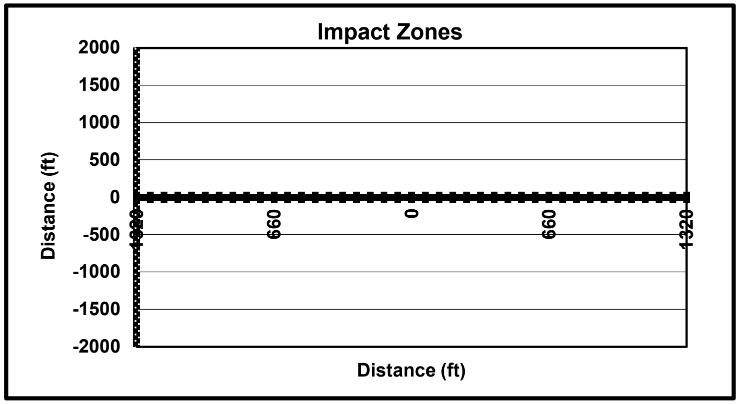
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	978
Future 65 Ldn Contour at X-ing	978
Existing 65 Ldn Contour at 1/2 zone length	756
Future 65 Ldn Contour at 1/2 zone length	756
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: SCRRA Orange Subdivision

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	58	59
Source 1	62	54	56
Source 2	59	51	53
Source 3	54	51	46
Source 4	51	49	44
Source 5	51	48	44
Source 6	49	46	41
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS												
Parameter	**Source 1**		**Source 2**		**Source 3**		**Source 4**		**Source 5**		**Source 6**	
Source Num.	Freight Locomotive	9	Freight Cars	10	Commuter Diesel Locomotive	2	Commuter Rail Cars	3	Commuter Diesel Locomotive	2	Commuter Rail Cars	3
Distance (source to receiver)	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210
Daytime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(7 AM - 10 PM)	trains/hour	0.267	trains/hour	0.267	trains/hour	2.6	trains/hour	2.6	trains/hour	1.333	trains/hour	1.333
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Nighttime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(10 PM - 7 AM)	trains/hour	0.444	trains/hour	0.444	trains/hour	0.778	trains/hour	0.778	trains/hour	0.444	trains/hour	0.444
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%
Jointed Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Embedded Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Aerial Structure?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Barrier Present?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Intervening Rows of of Buildings	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	10
Future Train Speed (mph)	10
Number of Existing Trains in one Direction	2
Number of Future Trains in one Direction	2
Existing Number of Day Trains (7 am to 10 p.m.)	1.25
Future Number of Day Trains (7 am to 10 p.m.)	1.25
Existing Number of Night Trains (10 p.m. to 7 am)	0.75
Future Number of Night Trains (10 p.m. to 7 am)	0.75
Existing Average Number of Cars	15
Future Average Number of Cars	15
Existing Average Number of Locomotives	2
Future Average Number of Locomotives	2

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive	
National Average (50% front, 50% middle)	1
All Front Mounted	2
All Middle Mounted	3
User Defined 80 % front mounted horns	4

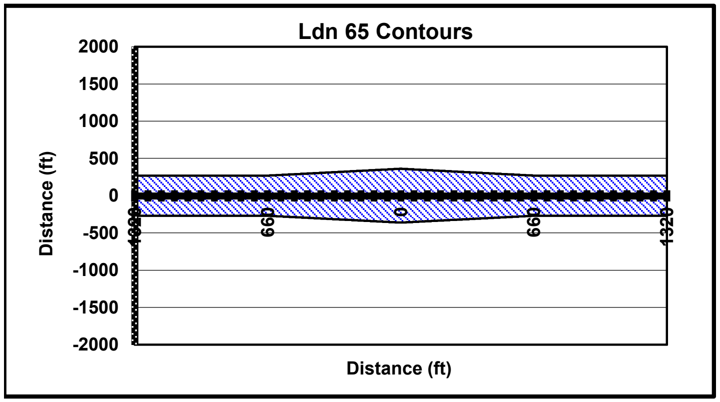
Non Train Noise Environment	
Urban	1
Suburban	2
Rural	3
User Defined Ldn = 50 dBA	4

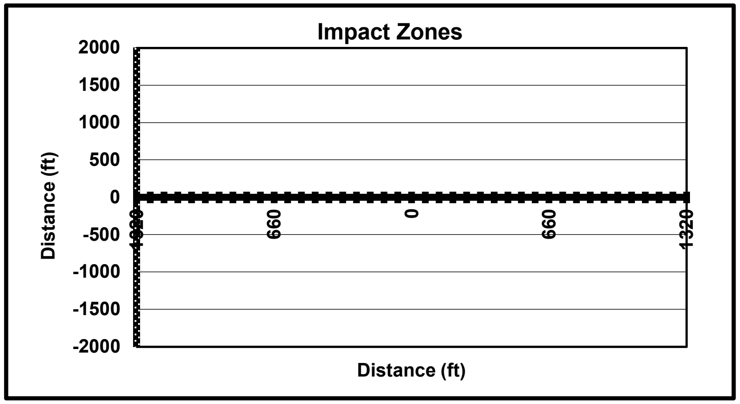
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	361
Future 65 Ldn Contour at X-ing	361
Existing 65 Ldn Contour at 1/2 zone length	269
Future 65 Ldn Contour at 1/2 zone length	269
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: UP Santa Ana Industrial Lead

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	57	59
Source 1	64	56	58
Source 2	58	49	52
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Freight Locomotive	9	Freight Cars	10		
Distance (source to receiver)	distance (ft)	30	distance (ft)	30		
Daytime Hours	speed (mph)	10	speed (mph)	10		
(7 AM - 10 PM)	trains/hour	0.133	trains/hour	0.133		
	locos/train	2	length of cars (ft) / train	900		
Nighttime Hours	speed (mph)	10	speed (mph)	10		
(10 PM - 7 AM)	trains/hour	0.222	trains/hour	0.222		
	locos/train	2	length of cars (ft) / train	900		
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		
Jointed Track?	Y/N	n	Y/N	n		
Embedded Track?	Y/N	n	Y/N	n		
Aerial Structure?	Y/N	n	Y/N	n		
Barrier Present?	Y/N	n	Y/N	n		
Intervening Rows of of Buildings	number of rows	0	number of rows	0		

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: 2045 BNSF Irvine Industrial Lead

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	57	59
Source 1	64	56	58
Source 2	57	49	51
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Freight Locomotive	9	Freight Cars	10		
Distance (source to receiver)	distance (ft)	20	distance (ft)	20		
Daytime Hours	speed (mph)	10	speed (mph)	10		
(7 AM - 10 PM)	trains/hour	0.067	trains/hour	0.067		
	locos/train	2	length of cars (ft) / train	900		
Nighttime Hours	speed (mph)	10	speed (mph)	10		
(10 PM - 7 AM)	trains/hour	0.111	trains/hour	0.111		
	locos/train	2	length of cars (ft) / train	900		
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		
Jointed Track?	Y/N	n	Y/N	n		
Embedded Track?	Y/N	n	Y/N	n		
Aerial Structure?	Y/N	n	Y/N	n		
Barrier Present?	Y/N	n	Y/N	n		
Intervening Rows of of Buildings	number of rows	0	number of rows	0		

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	10
Future Train Speed (mph)	10
Number of Existing Trains in one Direction	1
Number of Future Trains in one Direction	1
Existing Number of Day Trains (7 am to 10 p.m.)	0.625
Future Number of Day Trains (7 am to 10 p.m.)	0.625
Existing Number of Night Trains (10 p.m. to 7 am)	0.375
Future Number of Night Trains (10 p.m. to 7 am)	0.375
Existing Average Number of Cars	15
Future Average Number of Cars	15
Existing Average Number of Locomotives	2
Future Average Number of Locomotives	2

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive	
National Average (50% front, 50% middle)	1
All Front Mounted	2
All Middle Mounted	3
User Defined 80 % front mounted horns	4

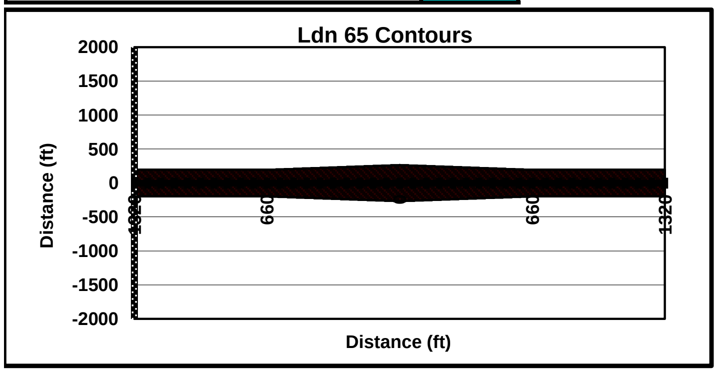
Non Train Noise Environment	
Urban	1
Suburban	2
Rural	3
User Defined Ldn = 50 dBA	4

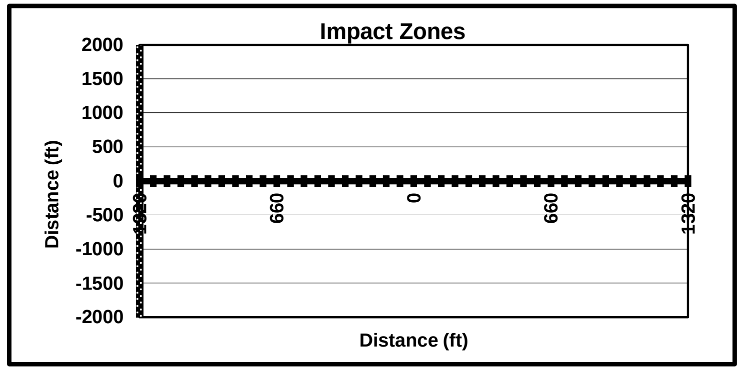
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	266
Future 65 Ldn Contour at X-ing	266
Existing 65 Ldn Contour at 1/2 zone length	195
Future 65 Ldn Contour at 1/2 zone length	195
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	50
Future Train Speed (mph)	50
Number of Existing Trains in one Direction	39
Number of Future Trains in one Direction	52.5
Existing Number of Day Trains (7 am to 10 p.m.)	31.5
Future Number of Day Trains (7 am to 10 p.m.)	40
Existing Number of Night Trains (10 p.m. to 7 am)	7.5
Future Number of Night Trains (10 p.m. to 7 am)	12
Existing Average Number of Cars	10.5
Future Average Number of Cars	8.5
Existing Average Number of Locomotives	1.5
Future Average Number of Locomotives	1.3

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive	
National Average (50% front, 50% middle)	1
All Front Mounted	2
All Middle Mounted	3
User Defined 80 % front mounted horns	4

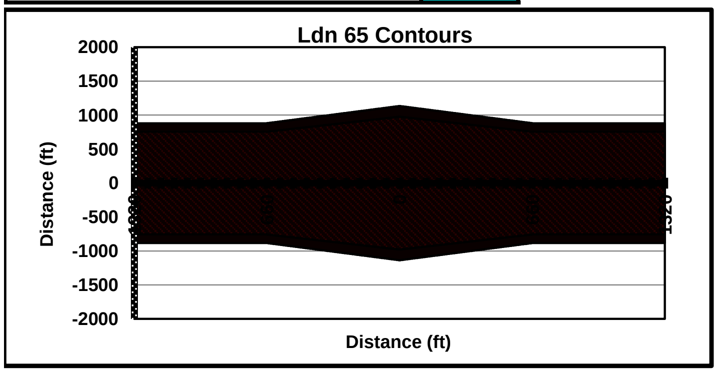
Non Train Noise Environment	
Urban	1
Suburban	2
Rural	3
User Defined Ldn = 50 dBA	4

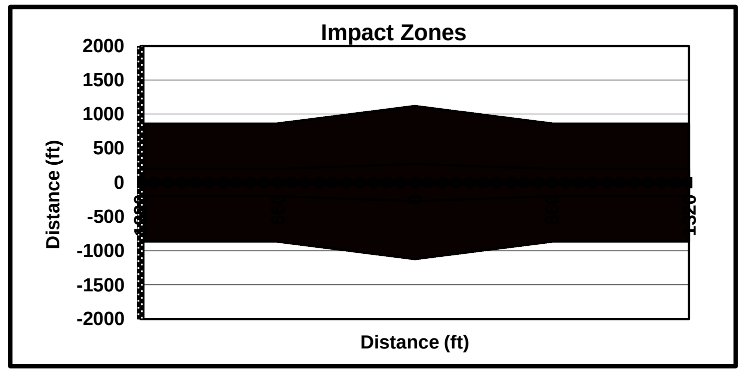
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	978
Future 65 Ldn Contour at X-ing	1136
Existing 65 Ldn Contour at 1/2 zone length	756
Future 65 Ldn Contour at 1/2 zone length	882
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	1120
Severe Impact Distance at X-ing	274
Impact Distance at 1/2 zone length	865
Severe Impact Distance at 1/2 zone length	199
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: 2045 SCRRA Orange Subdivision

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	59	59
Source 1	62	54	56
Source 2	59	51	53
Source 3	55	52	47
Source 4	53	50	45
Source 5	55	49	48
Source 6	52	47	46
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers

NOISE SOURCE PARAMETERS												
Parameter	**Source 1**		**Source 2**		**Source 3**		**Source 4**		**Source 5**		**Source 6**	
Source Num.	Freight Locomotive	9	Freight Cars	10	Commuter Diesel Locomotive	2	Commuter Rail Cars	3	Commuter Diesel Locomotive	2	Commuter Rail Cars	3
Distance (source to receiver)	distance (ft)	220	distance (ft)	220	distance (ft)	220	distance (ft)	220	distance (ft)	220	distance (ft)	220
Daytime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(7 AM - 10 PM)	trains/hour	0.267	trains/hour	0.267	trains/hour	3.533	trains/hour	3.533	trains/hour	1.6	trains/hour	1.6
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Nighttime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(10 PM - 7 AM)	trains/hour	0.444	trains/hour	0.444	trains/hour	1.111	trains/hour	1.111	trains/hour	1.333	trains/hour	1.333
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%
Jointed Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Embedded Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Aerial Structure?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Barrier Present?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Intervening Rows of of Buildings	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	10
Future Train Speed (mph)	10
Number of Existing Trains in one Direction	2
Number of Future Trains in one Direction	2
Existing Number of Day Trains (7 am to 10 p.m.)	1.25
Future Number of Day Trains (7 am to 10 p.m.)	1.25
Existing Number of Night Trains (10 p.m. to 7 am)	0.75
Future Number of Night Trains (10 p.m. to 7 am)	0.75
Existing Average Number of Cars	15
Future Average Number of Cars	15
Existing Average Number of Locomotives	2
Future Average Number of Locomotives	2

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive	
National Average (50% front, 50% middle)	1
All Front Mounted	2
All Middle Mounted	3
User Defined 80 % front mounted horns	4

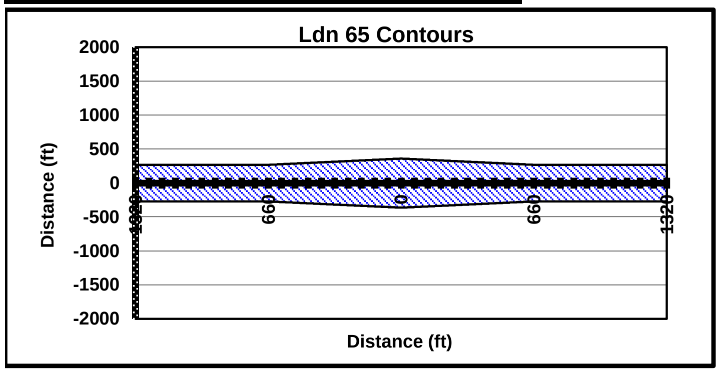
Non Train Noise Environment	
Urban	1
Suburban	2
Rural	3
User Defined Ldn = 50 dBA	4

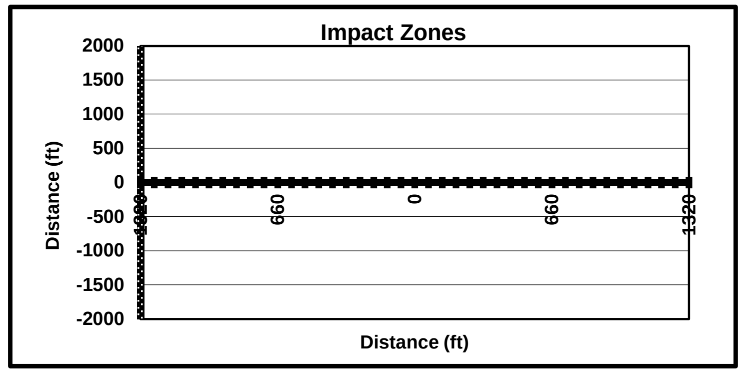
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	361
Future 65 Ldn Contour at X-ing	361
Existing 65 Ldn Contour at 1/2 zone length	269
Future 65 Ldn Contour at 1/2 zone length	269
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: 2045 UP Santa Ana Industrial Lead

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	57	59
Source 1	64	56	58
Source 2	58	49	52
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Freight Locomotive	9	Freight Cars	10		
Distance (source to receiver)	distance (ft)	30	distance (ft)	30		
Daytime Hours	speed (mph)	10	speed (mph)	10		
(7 AM - 10 PM)	trains/hour	0.133	trains/hour	0.133		
	locos/train	2	length of cars (ft) / train	900		
Nighttime Hours	speed (mph)	10	speed (mph)	10		
(10 PM - 7 AM)	trains/hour	0.222	trains/hour	0.222		
	locos/train	2	length of cars (ft) / train	900		
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		
Jointed Track?	Y/N	n	Y/N	n		
Embedded Track?	Y/N	n	Y/N	n		
Aerial Structure?	Y/N	n	Y/N	n		
Barrier Present?	Y/N	n	Y/N	n		
Intervening Rows of of Buildings	number of rows	0	number of rows	0		

Appendix J-a Existing Conditions Report for Fire and Police Services

Appendices

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September 2019

EXISTING CONDITIONS REPORT FOR FIRE AND POLICE SERVICES

GENERAL PLAN UPDATE

City of Santa Ana

Prepared for:

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PLACEWORKS

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1. Introduction

1.1 INTRODUCTION

This report contains information on the City of Santa Ana's police and fire services that support the quality of life for residents, businesses, and visitors in the City. It addresses the regulatory framework and existing conditions that inform the General Plan and provide the setting for the Environmental Impact Report (EIR).

Police and fire services consist of programs that support the basic needs of citizens and create a viable, sustainable, and cohesive community. Police services are provided by the City of Santa Ana, while the City partners with the Orange County Fire Authority (OCFA) to provide fire services for the City. This report was prepared in consultation with the Santa Ana Police Department and the OCFA.

In cooperation with the City Manager, City Staff, and the community, the City of Santa Ana Mayor and City Council developed a five-year Strategic Plan, from fiscal year 2014–15 to fiscal year 2018–19. Community Safety is one of the seven goals of the Strategic Plan. The plan focuses on the following six objectives for Community Safety:

1. Modernize the community policing philosophy to improve customer service, crime prevention, and traffic/pedestrian/bicycle safety;
2. Broaden communications, information sharing, and community awareness of public safety activities;
3. Promote fiscal accountability to ensure financial responsibility at all levels of the organization;
4. Ensure a sound fiscal model for jail operation through coordinated efforts with personnel from the City Manager's Office, Police Department, City Attorney's Office, Finance, and Personnel;
5. Provide high quality Police and Fire/Emergency Medical Services response times within the City of Santa Ana; and
6. Enhance Public Safety integration, communications, and community outreach (Santa Ana 2014).

California law does not mandate the preparation of an element that specifically addresses police and fire services. Under Section 65303 of the Government Code, the General Plan may include any other elements or address any other subjects which, in the judgement of the legislative body, relate to the physical development of the city. Because safety is a key principal in the General Plan vision, Santa Ana's General Plan Update will contain a Public Services Element. The General Plan Update Policy Framework includes the following Public Services goal and policies:

1. Introduction

- **Goal 2**: Preserve a safe and secure environment for all people and property.
  - **Policy 2.1**: **Public Safety Agencies.** Collaborate with the Police Department and the Fire Authority to promote the implementation of crime prevention through environmental design principles for all development projects.
  - **Policy 2.2: Code Compliance.** Require all development to comply with the provisions of the most recently adopted fire and building codes and maintain an ongoing fire inspection program to reduce fire hazards.
  - **Policy 2.3: Crime Prevention.** Coordinate, partner, and build relationships with community members and stakeholders to develop and implement crime prevention strategies through restorative practices that focus on rehabilitation, community service, and public safety.
  - **Policy 2.4: Community Partnerships.** Provide alternative methods to improve police services that support community partnerships, build public trust, and proactively address public safety issues. | Ed, Eq
  - **Policy 2.5: Safety Programs.** Promote early childhood education and prevention programs that improve public safety and maintain ongoing community education opportunities
  - **Policy 2.6 School Safety.** Collaborate with local schools to establish and implement comprehensive and coordinated services that enhance the security and safety of students, educators, and administrators on and off campus.
  - **Policy 2.7: Staffing Levels.** Maintain staffing levels for sworn peace officers, fire fighters, emergency medical responders, and civilian support staff to provide quality services and maintain an optimal response time citywide.
  - **Policy 2.8: Efficiency Standards.** Ensure that equipment, facilities, technology, and training for emergency responders are updated and maintained to meet modern standards of safety, dependability, and efficiency.
  - **Policy 2.9: Quality Employees.** Enhance public safety efforts by actively seeking a diverse and talented pool of public safety candidates who possess the values and skills consistent with those of the community (Santa Ana 2018).

2. Police Services

The information in this section is based partly on a written service questionnaire response by Deputy Chief of Police Eric Paulson dated August 8, 2019.

2.1 PLANNING FRAMEWORK

The Santa Ana Police Department's 2019-2024 Strategic Plan is a statement of intent and purpose consistent with the mandates and directives of the City of Santa Ana 5-Year Strategic Plan. The purpose of the Police Department's Strategic Plan is to frame the goals, priorities, and objectives, as well as to identify the issues, outcomes, and efforts of the Santa Ana Police Department (Santa Ana 2019a).

2.2 DEPARTMENT ORGANIZATION

The Santa Ana Police Department is organized into four bureaus, three of which are overseen by deputy chiefs and one by a jail administrator:

- Field Operations Bureau
- Investigations Bureau
- Administrative Bureau
- Jail Bureau

2.2.1 Field Operations Bureau

The Field Operations Bureau is the largest and most viable component of the Santa Ana Police Department and consists of the Patrol Division and a number of specialized units who serve the community as first responders to incidents in the City (Santa Ana 2016).

2.2.1.1 PATROL DIVISION

The Patrol Division's primary job is the protection of life and property 24 hours per day, seven days per week; in 2016, officers responded to 105,595 calls for service. The Patrol Division is made up of several programs and units:

- **East Directed Patrol:** Directed Patrol employs community-oriented policing strategies to serve the residents of Santa Ana and combat crime and quality of life issues in the Northeast and Southeast Districts.

- **Civic Center Patrol:** Civic Center Patrol effectively provides police services in the Civic Center. To further provide resources to the homeless, the Civic Center Patrol collaborated with the Orange County Health Care Agency (OCHCA) to implement their Psychological Emergency Response Team (PERT) program.

2. Police Services

The Homeless Emergency Assessment Response Team (H.E.A.R.T.) consists of a group of officers who are trained to work with the City's homeless population, providing them with assistance and recommendations for service needed.

- **Downtown Business Liaison Unit:** The Downton Liaison Unit was established in January 2016 and consists of a corporal and three police officers. The unit's responsibilities include developing and strengthening community relations with downtown businesses, residents, and visitors while maintaining a high police presence. The hours of operations cover seven days a week, between 10 a.m. and 7:30 p.m.

- **Park Ranger Program:** The Park Ranger Program responds to calls for service in city parks, provides enforcement, and focuses on issues related to activities in parks and on bike trails.

- **Community Oriented Policing:** The Community Oriented Policing Unit consists of officers that attend various neighborhood association meetings; organize seven "Early Morning" park clean-ups, focusing on homeless paraphernalia and illegal campers in the parks and bike trails; provide education and training to AYSO soccer coaches about security issues with their leagues and park security; and provide "Active Shooter" training to 25 Parks and Recreation employees.

- **West Directed Enforcement:** The West Policing Division's Directed Enforcement Team addresses a wide range of law enforcement related concerns, utilizing public, private, and community resources for problem solving. In 2016, the Westend team successfully addressed over 175 community complaints dealing with a variety of issues such as gang and narcotic activity, municipal code violations, transients, parking issues, and human trafficking.

- **Post Release Community Supervision Unit:** The Santa Ana Police Department continues to partner with the Orange County Probation Department, imbedding probation officers with a Santa Ana police officer to create the Post Release Community Supervision (PRCS) Unit. This unit works collaboratively with county and state partners to ensure individuals released from custody are abiding by the terms and conditions of probation. In 2016, the team was involved in over 310 compliance checks; the PRCS Unit oversees over 500 probationers who reside in the City.

- **Special Units:** The Santa Ana's Mounted Enforcement Unit works in the Downtown area to provide a visible and more personable interaction with the community. The Special Weapons and Tactics (SWAT) Team is a group of highly trained police officers and dispatchers prepared to handle critical incidents. The Homeland Security Division works in partnership with the Anaheim Police Department to administer the UASI (Urban Area Security Initiative) grant program, which improves regional capacity to prevent, protect against, respond to, and recover from terrorist incidents and catastrophic events.

- **Traffic:** The Santa Ana Police Department's Traffic Division is tasked with ensuring the safety of residents and visitors that utilize the network of roadways, walkways, and bikeways within the City (Santa Ana 2016).

2.2.2 Investigation Bureau

The Investigation Bureau is responsible for the timely and thorough investigation of criminal activity throughout the City, and consists of the Crimes Against Persons Division, Criminal Investigations Division, Special Investigations Division, and the Orange County Regional Narcotics Program. These units conduct investigations on crimes ranging from property thefts to street gangs, cold cases, and missing persons.

- **Crime Against Persons (CAP) Division:** CAP incorporates the Homicide, Felony Assaults, Missing Persons Detail, and Gang Units.

- **Criminal Investigations Division (CID):** CID is responsible for investigating all property crime, robbery, domestic violence, child abuse, and sex-related offenses. The division also includes the Forensic Services Section, which processes all case evidence.

- **Regional Narcotics Suppression Program (RNSP):** RNSP is a countywide major narcotics investigations initiative, administered by the Orange County Sheriff's Department, to which the Santa Ana Police Department provides a variety of personnel, including a commander that serves as the program manager.

- **Special Investigations Division (SID):** The SID is composed of two multiagency tasks forces led by the Santa Ana Police Department. In addition to the Vice and Narcotics Unit, the Santa Ana Gang Task Force combats organized crime and criminal enterprises with a nexus to the roots of gang issues within the City (Santa Ana 2016).

2.2.3 Administrative Bureau

The Administrative Bureau oversees the Evidence Section, Information Systems Division, the Training Division, the Communications Division, and the Central Distribution Center (CDC).

- **Evidence:** The Evidence Section provides for the proper handling, storage, maintenance, and disposal of law enforcement–held property and evidence.

- **Information Systems:** The Information Systems Division supports the various computerized systems used throughout the Santa Ana Police Department; which range from the Computer Aided Dispatch, to Mobile Data Computers, to police department smartphones.

- **Training:** The Training Division provides high-quality professional training to personnel in an effort to save lives and prevent injury, improve the operational effectiveness of the department, and reduce liability. The Training Division oversees the Background Unit, the Video Production Unit, the Santa Ana Police Athletic and Activity League (SAPAAL), and the Academy Tactical Position.

- **Communications:** The Communications Division has two sections: Communications Section, which handles both emergency and nonemergency calls 24/7, and the Telephone Reporting Unit, which serves as a key component for handling reports from victims reporting crimes over the phone and via the internet through E-Reporting. The Communications Section, as the first point of contact, answers approximately 34,680 emergency and nonemergency calls monthly (Santa Ana 2016)Central Distribution Center: The CDC coordinates and transports vehicles for repair and purchases and issues equipment, uniforms, and office items to employees.

2.2.4 Jail Bureau

The Jail Bureau has three divisions: Jail Administration and Support Services, Jail Operations, and Police Records. The Jail Operations Division is responsible for receiving those placed in Santa Ana Police custody who will eventually be released or booked at the county jail; the Records staff is also responsible for the processing and maintaining of all police and public records pertaining to public safety activities.

- **Jail Administration and Support Services Division:** This division includes a variety of inmate services required by local, state, and federal mandates. Jail records staff are responsible for booking all arrestees from local and contract agencies.

- **Jail Operations Division:** The Jail Operations Division is responsible for receiving those placed in Santa Ana Police custody; the correctional staff also supervises the contract agency inmate population housed within the 512-bed facility.

- **Police Records Division:** This division is responsible for the maintenance and storage of all police-related records; in 2016, over 34,400 reports were processed through the division (Santa Ana 2016).

2.3 FACILITIES AND STAFFING

2.3.1 Facilities

The Santa Ana Police Administrative Building and Jail Facility are conjoined by a large Community Room available for public meetings

The Police Headquarters is the Administrative Building, which is home to all four bureaus as well as Police Administration and all supporting units. The Administrative Building has a front counter where individuals can come in for police-related business regarding traffic issues and obtaining copies of police reports. Additionally, there are private interview rooms where the public can come in to file a police report. For optimal customer service and privacy, a reception area is open on the second floor for those who wish to meet with detectives regarding their cases. The front lobby is open Monday through Friday, between 7:20 a.m. to 5:30 p.m.

The Jail Facility's primary function is to house the inmate population; administrative personnel work in the facility to manage and oversee jail operations. The public lobby is open seven days a week from 7 a.m. to 9 p.m. (Santa Ana 2016).

As shown in Figure 1, *Santa Ana Police Department Police Facilities,* there are six police facilities in the City:

1. **Santa Ana Police Administrative Building and Jail Facility,** 60 Civic Center Plaza, Santa Ana, CA 92702
2. **Jose Vargas Community Affairs Office,** 20 Civic Center Plaza, Santa Ana, CA 92701
3. **Santa Ana Regional Transportation Public Safety Office,** 1000 E Santa Ana Boulevard #107, Santa Ana, CA 92701
4. **Westend Substation,** 3750 W McFadden Avenue #1, Santa Ana, CA 92704
5. **Santa Ana Law Enforcement and Fire Training Center,** 3000 W Edinger Avenue, Santa Ana, CA 92702
6. **Southeast Substation,** 1780 E McFadden Avenue #114B, Santa Ana, CA 92705 (Santa Ana 2016).

The police department is divided into two policing divisions, East and West, and these are further divided into four districts overseen by two district commanders. Figure 2, *Santa Ana Police Department Districts*, shows the locations of the districts.

- West Division:
  - Westend District, serving all areas north of First Street and west of Flower Street
  - Southcoast District, serving all areas south of First Street and west of Flower Street
- East Division:
  - Northeast District, serving all areas north of First Street and east pf Flower Street
  - Southeast District, serving all areas south of First Street and east of Flower Street (Santa Ana 2016)

The police department has received funding to implement a family justice center. The center will concentrate on family crime and will offer guidance and education in addition to a facility where family crime reports can be filed. The site for the facility has not yet been determined.

2.3.2 Staffing

As of August of 2019, 348 sworn positions and 250 professional staff positions serve the Santa Ana Police Department. The department does not apply a staffing ratio (e.g., officers/population), but instead evaluates performance and needs as summarized in Section 2.5, *Performance Standards and Measures.* Santa Ana, however, is relatively understaffed in comparison to several neighboring Orange County cities, with substations being more lightly staffed. The Westend Substation at 3750 West Mc Fadden Avenue, and the Santa Ana Regional Transportation Public Safety Office, at 1000 East Santa Ana Boulevard, both have planned programs to increase staffing. The police department also runs a recruitment retention plan in colleges to recruit new officers (Paulson 2019).

2.4 FUNDING

Funding for police facilities and staff comes from grants, special revenue funds, and the City's general fund. Furthermore, the City of Santa Ana and the City of Anaheim are assigned as the Urban Areas Security Initiative (UASI) Program's controlling agency for Orange County. UASI assists high-threat, high-density urban areas in efforts to build and sustain the capabilities necessary to prevent, protect against, mitigate, respond to, and recover from acts of terrorism. The UASI program is intended to provide financial assistance to address the unique multidisciplinary planning, organization, equipment, training, and exercise needs of high-threat, high-density urban areas (HSG 2019). Most of the police department facilities are close to 20 years old, and the need for capital improvement funding is rising.

2.5 PERFORMANCE STANDARDS AND MEASURES

2.5.1 Performance Standards

The Santa Ana Police Department prioritizes calls as follows:

- **Priority 1:** Emergency calls for situations that are life threatening. Services shall be dispatched immediately.

- **Priority 2:** Calls for situations that threaten the safety of citizens and may or may not include threats to property. Calls of serious crimes that are in progress or have just occurred. Services shall be dispatched immediately.

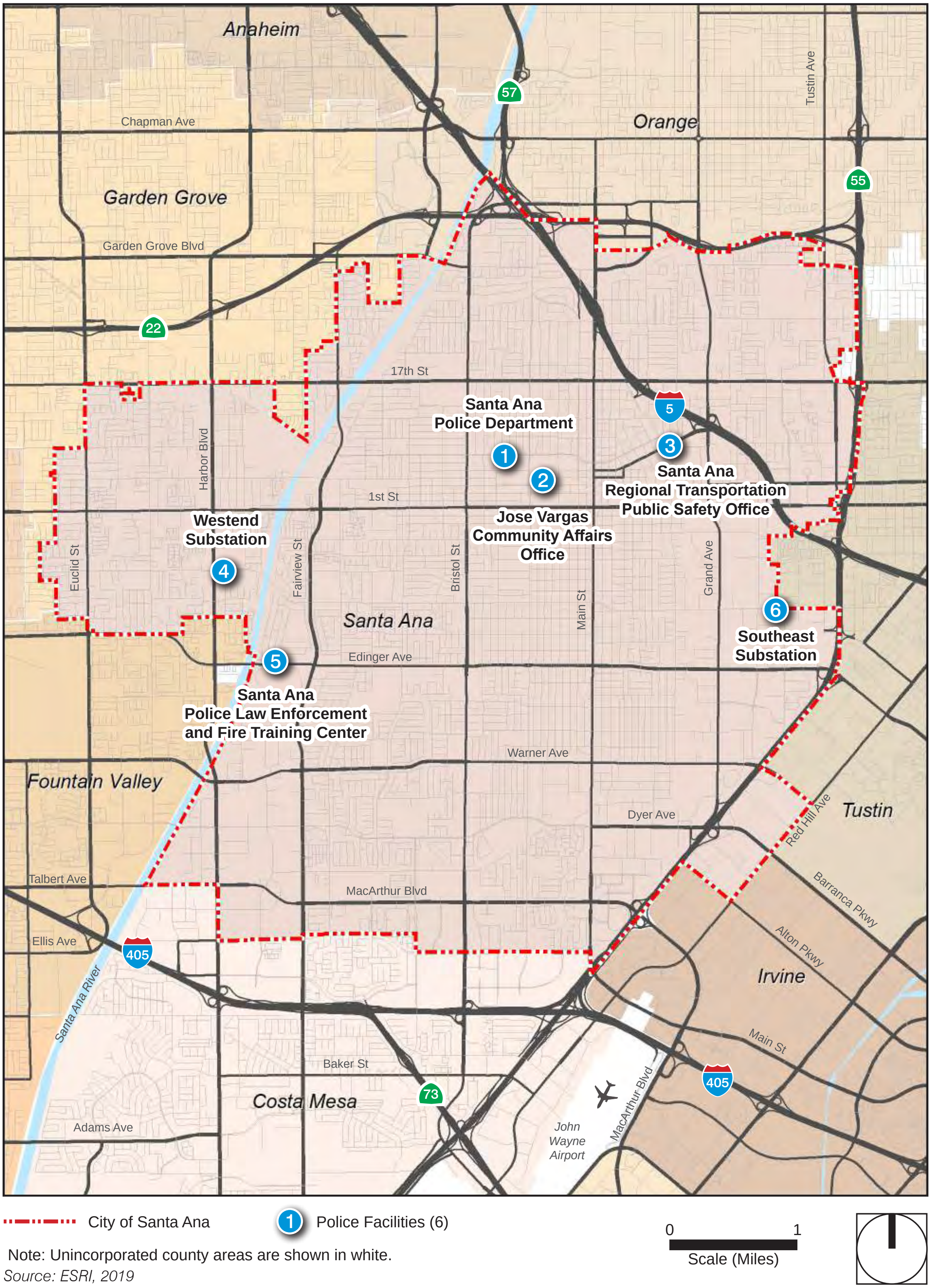
- **Priority 3:** Calls for situations that are not life threatening and nonemergency that require a timely but not immediate response. Calls should be assigned to units from the district where the call occurs. Follow-up officers may be dispatched from any district.

- **Priority 4:** Routine incidents whose nature is not life threatening and not urgent that require a police response for appropriate documentation and/or action. Calls should be assigned to the officers from the same district as the call unless circumstances exist that would cause undue delay, i.e., Spanish-speaking call with no Spanish-speaking officers assigned to the district.

- **Priority 5:** Calls that are routine, nonurgent, or administrative in nature. Calls should be assigned to the officers from the same district as the call unless circumstances exist that would cause undue delay, i.e., Spanish-speaking call with no Spanish-speaking officers assigned to the district.

In addition to call priority, common circumstances that may require an immediate response include the need for preservation of evidence, likelihood of victim/witness interviews, and sensitivity of the situation. Examples of these types of situations include:

Figure 1 - Santa Ana Police Department Police Facilities



Note: Unincorporated county areas are shown in white.

Source: ESRI, 2019

2. Police Services

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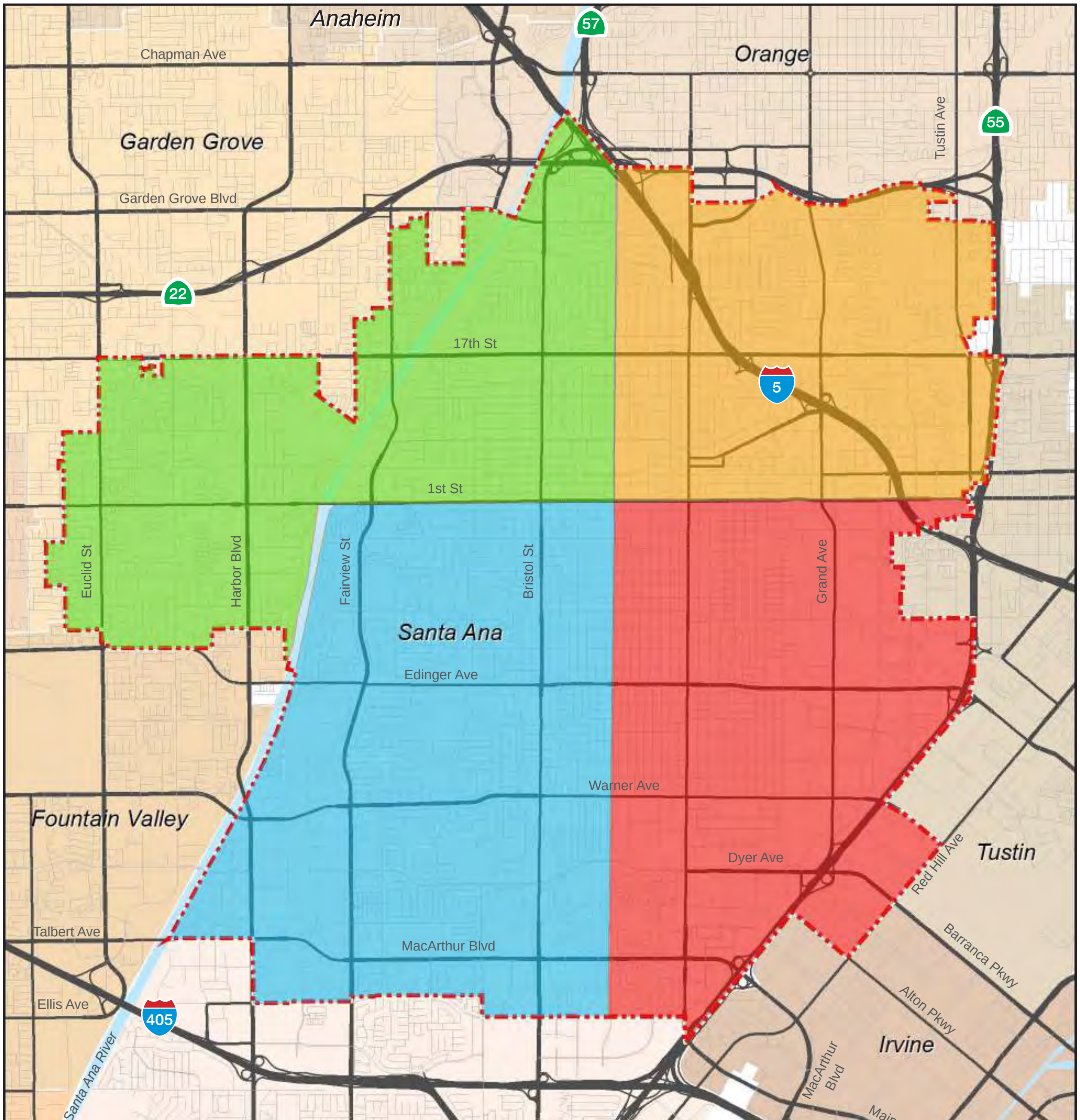
Figure 2 - Santa Ana Police Department Districts



City of Santa Ana

Southcoast & Westend Districts: Commander Ruben Ibarra

Westend District
West Division (serving all areas north of First Street and west of Flower Street)

Southcoast District
West Division (serving all areas south of First Street and west of Flower Street)

Northeast & Southeast Districts: Commander Ken Gominsky

Northeast District
East Division (serving all areas north of First Street and east of Flower Street)

Southeast District
East Division (serving all areas south of First Street and east of Flower Street)

Note: Unincorporated county areas are shown in white.

Source: ESRI, 2019

0 1
Scale (Miles)

PlaceWorks

2. Police Services

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- Child molestation reports.
- Domestic violence.
- Alarm calls where it is likely the call is valid
- Suspects in custody of citizens, or citizens in custody of suspects.
- Robberies reported within a reasonable time of occurrence.
- Any other circumstances where an expedited response is appropriate.
- Accessible firearms and/or weapons in plain view on public property.

The Santa Ana Police Department has no set performance standards. However, the City's response time for priority calls is consistent with the western states' average response time of seven minutes

2.5.2 Performance Measures

The Santa Ana Police Department monitors the following performance measures to evaluate the effectiveness of the traffic, field operations, animal services, criminal investigations, crimes against persons, special investigations, and jail operations services provided to the community. Table 1, *Santa Ana Police Department Performance Measures,* shows the performance measures for each service from the 2015–16 fiscal year to 2018–19 fiscal year.

Table 1 Santa Ana Police Department Performance Measures

Service	Performance Measures	Actual FY 15–16	Actual FY 16–17	Estimated FY 17–18	Objective FY 18–19
Traffic	# of reported collisions	4,858	5,350	TBD	TBD
	# of reported hit & run collisions	1,654	699	TBD	TBD
	# of traffic violations	13,357	14,720	TBD	TBD
	# of DUI arrests	691	699	TBD	TBD
	# of parking violations issued	103,385	106,536	TBD	TBD
	% change in number of reported collisions[1]	8.87%	10.13%		
Field Operations	# of calls for service	105,195	119,440	TBD	TBD
	# of reported incidents	34,454	41,530	TBD	TBD
	# of Priority One calls responded to	3,520	3,762	TBD	TBD
	Average Priority Response Time	7.00 minutes	7.47 minutes	TBD	TBD
	% of Priority One calls responded to in under 7 minutes	50%	46%	TBD	TBD
	# of criminal cases filed	4,822	6,148	TBD	TBD
Animal Services	# of service calls handled	5,602	3,690	4,000	5,000
	# of enforcement actions taken	210	164	250	250
	# of animal impounds	2,839	1,852	2,000	2,000
	# of educational presentations given	1	1	2	3
	# of spay/neuter events held	0	0	0	0
	# of telephone calls handled	8,143	7,379	8,000	8,000

2. Police Services

Table 1 Santa Ana Police Department Performance Measures

Service	Performance Measures	Actual FY 15–16	Actual FY 16–17	Estimated FY 17–18	Objective FY 18–19
Criminal Investigations	# of cases presented to DA by Prosecution Unit	5,431	6,700	6,600	6,500
	# of business/community meetings	6	5	5	5
	# of community awareness presentations	16	12	12	12
	# of cases refused by the DA Office	715	850	750	750
	# of Special Enforcement operations	43	45	45	40
	Average monthly arrest by Detectives	21	20	20	20
	% rate of criminal charges	87%	85%	86%	85%
	# of arrests by Detectives during Special Enforcement Operations	49	20	40	30
Crimes Against Persons	Part I Crime Committed	10,204	10,516	1% reduction	1% reduction
	Part I Crime Cases Cleared	2,603	1,421	TBD	TBD
	Part I Crime Clearance Rate	25.50%	13%	TBD	TBD
	Total Arrests	814	1,382	TBD	TBD
	Probation Home Compliance Checks	330	534	180	180
	Firearms Seized	80	111	TBD	TBD
	Community Outreach Activities	80	111	48	48
Special Investigations	# of career criminal arrests	78	33	65	75
	# of weapons seized	11	15	15	25
	# of federal weapons violations cases reviewed	12	149	175	180
	# of surveillance operations	105	60	75	80
	# of search warrants issued	41	53	50	50
	# of confidential human sources cultivated	10	10	12	15
	# of federal weapons violations cases adopted	7	21	20	25
Jail Operations	# of inmates processed	8,224	8,227	7,611	7,611
	# of inmates fast-booked to OCJ	4,281	4,424	4,181	4,181
	# of visitors processed	19,464	15,378	14,370	14,370
	# of Pay-To-Stay Program Revenue	N/A	146,370	130,000	130,000
	% of compliance with regulatory agencies	100%	100%	100%	100%
	# of DNA collected or verified	1,454	3,035	3,116	3,116
	# of Registrants processed	1,700	5,422	6,194	6,194
	# of HiSet/GED graduates	N/A	11	60	60

Source: Santa Ana 2019b
1 Percentages are approximate

Table 2 shows the current average response time for the different call priorities detailed under Section 2.5.1.

Table 2 Santa Ana Police Department Average Response Times

Priority	Time
Priority 1	7m 03s
Priority 2	10m 22s
Priority 3	30m 32s
Priority 4	35m 07s
Priority 5	52m 59s

Source: Paulson, 2019

Deputy Chief Paulson indicated that the current response time for Priority 1 meets the western states average as well as the Santa Ana community needs.

Homelessness-related calls increased by approximately 10,000 from 2017 to 2018, and this is a rising issue in Santa Ana. The police department has collaborated with public works and parks and recreational departments to create a quality-of-life program to address increased homelessness-related demands (Paulson 2019).

Additionally, the City currently partners with local nonprofits, neighboring cities, and the county to reduce and address homelessness. Since 1998 the County of Orange has coordinated a comprehensive regional Continuum of Care (CoC) strategy that includes the participation of all 34 cities in Orange County, county agencies, the county's homeless service providers, and other community groups (including nonprofits, local governmental agencies, faith-based organizations, the homeless and formerly homeless, interested business leaders, schools, and many other stakeholders) to identify the gaps and unmet needs of the county's homeless (Santa Ana 2019c).

2.6 SCHOOL DISTRICT POLICE SERVICES/CAMPUS SAFETY

School districts in Santa Ana have police services and school safety programs. For instance, the Santa Ana Unified School District has its own police department, whose mission is to provide for the safety and security of everyone who attends and works at school facilities throughout the district (SAUSD 2019). Furthermore, the Garden Grove Unified School District provides various student and campus safety resources, such as district and campus safety initiatives, partnerships with law enforcement (Garden Grove Police Department, Fountain Valley Police and Fire Departments, Orange County Fire Authority, Orange County Sherriff's Department, Santa Ana Police and Fire Departments, and Westminster Police Department), and mental health resources (GGUSD 2019). The Tustin Unified School District has security/campus safety officers who patrol the district and provide security for students, district property, and employees (TUSD 2019).

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3. Fire Protection

The information in this section is based partly on information provided by Octavio Medina, Administrative Captain Division 6, at a meeting between OCFA, the City, and PlaceWorks on July 29, 2019.

3.1 PLANNING FRAMEWORK

OCFA's Fiscal Year 2018–19 Adopted Budget provides a list of goals and objectives for the budget cycle. The OCFA's Executive Management Team identified three primary goals for OCFA to continuously pursue:

- **Service Delivery.** The service delivery model is built on continuous improvement. All services are sustainable through a range of economic environments and focused on the OCFA mission.
- **People.** Promote a highly skilled, accountable, and resilient workforce that is united in the OCFA's common mission.
- **Technology.** Implement and utilize emerging technologies that support the needs of the organization by maximizing operational efficiency and improving quality of service.

In order to pursue progress for these three goals, priorities have been established for the fiscal year 2018–19 budget cycle. Some of these priorities include:

- **Organizational Structure.** Implementing organizational structure changes, as approved by the Board. The goal is to better align the work efforts with the OCFA mission and evolving emergency response parameters and priorities; an Emergency Medical Service department has been established to that end. The organization will be divided into two large bureaus headed by two deputy chief positions.
- **Initiate Projects to Enhance Technologies.** OCFA remains focused on cyber-security, safety to personnel and systems, and leveraging emerging technologies to enhance services. Technology projects during the fiscal year will have a heavy focus on security, as well as upgrades and replacements of existing technology systems.
- **Mission Driven Culture Training.** During the 2018–19 fiscal year, OCFA will be conducting workforce and leadership training designed for the fire service culture and environment unique to the field. Provided by the International Association of Fire Chiefs, the training program curriculum is designed to build adaptiveness, cohesiveness, and resiliency within fire service organizations. The program has been approved by the Department of Homeland Security and the Federal Emergency Management Agency, through the California Office of Emergency Services.

- **Transition to Lexipol Policy Management and Training System.** During the 2018–19 fiscal year, OCFA will move to a web-based delivery platform and mobile app to house the OCFA policy manual and updates. This change will also provide the opportunity to conduct daily training bulletins through 2-minute daily training exercises, designed to help personnel learn and apply agency policy content. Further, this system provides for continuous review of new laws, case law, and best practices in the field, resulting in policy guidance and updates specific to California law and regulations (OCFA 2018).

3.2 DEPARTMENT ORGANIZATION

The Orange County Fire Authority is a regional fire service agency that serves 23 cities in Orange County and all unincorporated areas. The OCFA protects over 1,680,000 residents. It is organized into seven departments, including the Community Risk Reduction Department and the Operations Department. The City of Santa Ana receives regional fire and emergency services from all OCFA stations and resources; however, 10 primary stations within the city's jurisdiction (listed in Table 3) routinely serve the City of Santa Ana.

3.2.1 Community Risk Reduction Department

The Community Risk Reduction (CRR) Department, formerly known as Fire Prevention, adopts and enforces codes and ordinances relative to fire and life safety issues, reviews plans and conducts inspections of construction projects, coordinates annual life safety inspections of all existing commercial buildings, provides long-range analysis of impacts on resources associated with future land use and development, and investigates all fires (OCFA 2019a).

CRR resources dedicated to Santa Ana include an assistant fire marshal, two senior fire prevention specialist, to fire prevention specialist, and an office assistant. One fire prevention analyst is assigned to the Building Department public counter each weekday afternoon. In addition to prevention service, OCFA provides a full-service Fire Investigations section, with five investigators and one police officer.

3.2.2 Operations Department

The Operations Department has seven divisions and nine battalions that include 71 fire stations. Operations provide regional emergency response to all fires, medical aids, rescues, hazardous materials incidents, wildland fire, aircraft fire and rescue services to John Wayne Airport, and other miscellaneous emergencies (OCFA 2019a).

Strategic Services Section The Strategic Services Section provides strategic and advanced planning functions for OCFA, which includes CEQA review, initiating Secured Fire Protection Agreements with developers for infill projects, deployment and resource modeling, analytics and statistical data review, new station placement and agreements, Strategic Plan, Standards of Cover, Accreditation, and ISO and LAFCO coordination. Monitoring land use annexations and associated new road development preplanning are also priorities of the section (OCFA 2019b).

The Secured Fire Protection Agreement is an agreement between the OCFA and a property developer addressing the provision of fire safety and emergency medical services for the benefit of future residents who will reside in the developed area (OCFA 2018).

3.2.3 Automatic/Mutual Aid

All fire departments in Orange County participate in an automatic aid agreement to ensure that the closest resources are dispatched to an emergency, regardless of jurisdictional boundaries (OCFA 2018). Automatic aid includes engines, trucks, paramedics, and battalion chiefs.

3.3 FACILITIES AND STAFFING

The OCFA Operations Division 6 serves the City of Santa Ana. Table 3, *OCFA Division 6 Fire Stations: Locations, Staffing, and Apparatus,* details the staffing and apparatus for each OCFA fire station in Santa Ana. Figure 3, *OCFA Division 6 Fire Station Locations,* illustrates the location of these stations within the City.

Table 3 OCFA Division 6 Fire Stations: Locations, Staffing, and Apparatus

Station	Location	Staffing (total of 3 shifts)	Apparatus
70	2301 Old Grande Street North	3 Fire Captains 3 Fire Apparatus Engineers/Paramedics 3 Firefighters/Paramedics 3 Firefighters	1 Paramedic Engine
71	1029 West 17th Street	6 Fire Captains/Paramedics 6 Fire Apparatus Engineers 6 Firefighters/Paramedics 6 Firefighters	1 Paramedic Engine 1 Paramedic truck
72	1668 East 4th Street	3 Fire Captains/Paramedics 3 Fire Apparatus Engineers 3 Firefighters/Paramedics 3 Firefighters	1 Paramedic Engine
73	419 South Franklin Street	3 Fire Captains/Paramedics 3 Fire Apparatus Engineers 3 Firefighters/Paramedics 3 Firefighters	1 Paramedic Engine
74	1427 South Broadway	3 Fire Captains/Paramedics 3 Fire Apparatus Engineers 3 Firefighters/Paramedics 3 Firefighters	1 Paramedic Engine
75	120 West walnut	6 Fire Captains/Paramedics 6 Fire Apparatus Engineers 6 Firefighters/Paramedics 6 Firefighters	1 Paramedic Engine 1 Paramedic Truck
76	950 West MacArthur	3 Fire Captains 3 Fire Apparatus Engineers 6 Firefighters/Paramedics	1 Paramedic truck
77	2317 South Greenville	3 Fire Captains	1 Paramedic Engine

Table 3 OCFA Division 6 Fire Stations: Locations, Staffing, and Apparatus

Station	Location	Staffing (total of 3 shifts)	Apparatus
		3 Fire Apparatus Engineers 6 Firefighters/Paramedics	
78	501 North Newhope	3 Fire Captains 3 Fire Apparatus Engineers 6 Firefighters/Paramedics	1 Paramedic Engine
79	1320 East Warner	3 Fire Captains 3 Fire Apparatus Engineers 6 Firefighters/Paramedics	1 Paramedic Engine
Total		144	14

Source: Medina 2019

In addition to the staff in Table 3, a division chief is assigned exclusively to Santa Ana to serve as the City's local fire chief, and three battalion chiefs (one for each of the three 24-hour shift schedules) provide daily management of station personnel and activities. Furthermore, an administrative captain, administrative assistant, nurse educator, and a fire community relations and education specialist (bilingual) are assigned to serve the City of Santa Ana and the neighboring OCFA communities (Medina 2019).

3.4 FUNDING

The City of Santa Ana signed a 10-year cash contract with OCFA that is valid until 2030. The City has until 2028 to decide whether they want to extend the OCFA contract. Staff, equipment, and facilities are all under the same contract. If there is a major change to the service area within the City (i.e., an annexation), the contract can be amended. The OCFA contract is funded from the City's general fund.

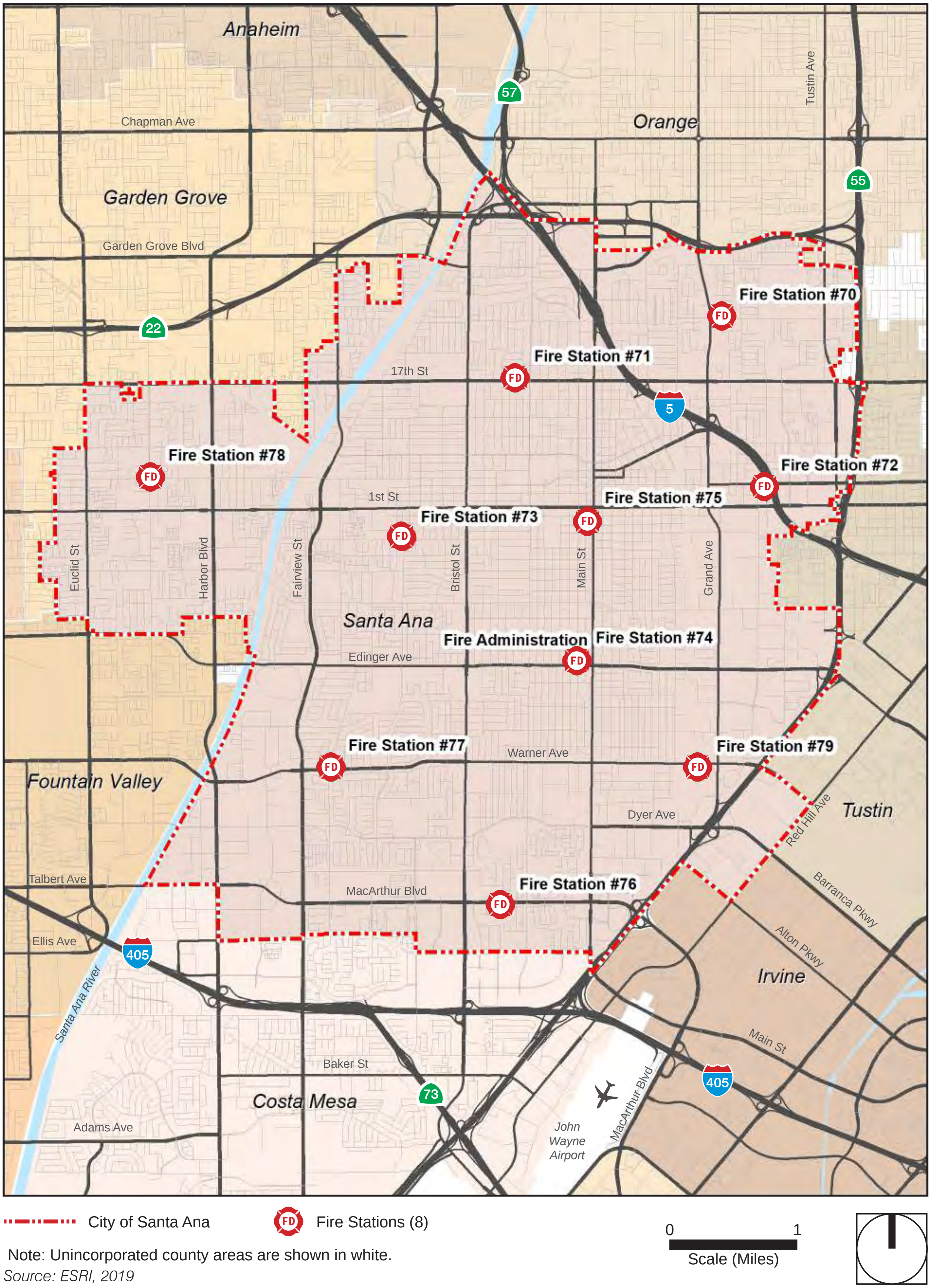
The majority of CRR services are funded through cost recovery fees. Since CRR services are primarily directed to businesses, developers, architects, and contractors, the fees are charged to the business community and not to individual homeowners and residents.

3.5 PERFORMANCE STANDARDS AND MEASURES

3.5.1 Performance Standards

The OCFA's response time goal to emergency calls in urban areas is that the first response unit shall arrive at a priority emergency within 7 minutes 20 seconds, 60 percent of the time. Further, OCFA provides standards of cover for its fire, EMS, and rescue sections for high, moderate, and low concentrations, which are as follows:

Figure 3 - OCFA Division 6 Fire Station Locations



Note: Unincorporated county areas are shown in white.

Source: ESRI, 2019

3. Fire Protection

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Fire

- **High concentration.** 6 engines, 2 trucks, 1 medic, 2 battalion chiefs (BC), 29 personnel should arrive within 15 minutes, 80 percent of the time.
- **Moderate concentration.** 3 engines, 1 truck, 1 BC, 1 medic, 15 personnel should arrive within 12 minutes, 80 percent of the time.
- **Low concentration.** 2 engines, 6 personnel should arrive within 10 minutes, 80 percent of the time.

EMS

- **High concentration.** 2 engines, 2 medic, 8 personnel (4 paramedics) should arrive within 12 minutes, 80 percent of the time.
- **Moderate concentration.** 1 medic engine/truck or medic car with 1 unit, 4 personnel (2 paramedic) should arrive within 10 minutes, 80 percent of the time.
- **Low concentration.** 1 unit, 2 personnel (2 EMT) should arrive within 7 minutes and 20 seconds, 80 percent of the time.

Rescue

- **High concentration.** 3 engines, 1 truck, 1 USAR truck, 1 medic, 15 personnel (3 USAR, 2 paramedic) should arrive within 20 minutes, 80 percent of the time.
- **Moderate concentration.** 1 engine, 1 truck, 1 medic, 8 personnel (2 paramedic) should arrive within 12 minutes, 80 percent of the time.
- **Low concentration.** 1 engine or truck, 3 personnel should arrive within 7 minutes and 20 seconds, 80 percent of the time (OCFA 2006).

3.5.2 Performance Measures

Table 4, *Fire Services for Santa Ana,* details fire incident statistics from 2014 through 2017.

Table 4 Fire Services for Santa Ana

Service Information	2013	2014	2015	2016	2017	2018	Change
Fire Incidents	350	362	391	393	517	566	62%
EMS Incidents	14,502	16,018	17,912	21,952	11,280	21,952	51%
Other Incidents[1]	4,299	3,885	4,028	4,702	2,086	4,702	9%
Total	19,251	20,265	22,232	27,220	13,596	27,220	41%

Source: Medina, 2019.
1 Other includes cancelled, false alarms, miscellaneous, or service calls.

3. Fire Protection

As shown in Table 4, fire incidents in the City have increased by approximately 41 percent from 2013 to 2018. Calls related to the homeless population have been rising steadily. However, even with rising fire incidents, OCFA meets the performance standard for emergency calls in the City of Santa Ana (Medina 2019).

4. References

Garden Grove Unified School District (GGUSD). 2019. Student and Safety Campus Resources. https://www.ggusd.us/pages/school-safety.

Homeland Security Grants (HSG). 2019. Urban Areas Security Initiative (UASI) Program. https://www.homelandsecuritygrants.info/GrantDetails.aspx?gid=17162.

Medina, Octavio (Administrative Captain Division 6). 2019, August 8. Meeting between OCFA, the City of Santa Ana, and PlaceWorks.

Orange County Fire Authority (OCFA). 2006. Standards of Cover. https://www.ocfa.org/Uploads/Orange%20County%20Fire%20Authority%20SOC_FINAL.pdf.

_____. 2018. FY 2018/19 Adopted Budget. https://www.ocfa.org/Uploads/Transparency/OCFA%202018-2019%20Adopted%20Budget.pdf.

_____. 2019a. Departments. https://www.ocfa.org/aboutus/departments/Departments.aspx.

_____. 2019b. Operations. https://www.ocfa.org/aboutus/departments/Operations.aspx.

Paulson, Eric (Deputy Chief). 2019, August 8. Questionnaire Response. Santa Ana Police Department.

Santa Ana, City of. 2014, March 18. 2014-15 to 2018-19 Santa Ana Strategic Plan. https://www.ci.santa-ana.ca.us/sites/default/files/Documents/StrategicPlanCombined-FullDoc.pdf.

_____. 2016. Santa Ana Police Department 2016 Annual Report. https://www.santa-ana.org/sites/default/files/Documents/2016AnnualReport-final.pdf.

_____. 2018. City of Santa Ana General Plan Update: General Plan Policy Framework. https://www.santa-ana.org/sites/default/files/pb/general-plan/documents/GeneralPlanPolicyFrameworkMaster.DRAFT.cmo2.pdf

_____. 2019a. Santa Ana Police Department Strategic Plan 2019-2024. https://www.ci.santa-ana.ca.us/sites/default/files/PD%20Attachments/FINAL%20FINAL%20SP%202019%2007-02-2019(2).pdf.

_____. 2019b. City of Santa Fiscal Year 2018-2019 Adopted City Budget. https://www.ci.santa-ana.ca.us/sites/default/files/finance/budget/2018-2019/FY18-19-adopted-budget.pdf.

_____. 2019c. Continuum of Care (CoC) Program. https://www.santa-ana.org/departments/community-development-agency/addressing-homelessness/regional-approach.

4. References

Santa Ana Unified School District (SAUSD). 2019. Police Services: Mission and Values. https://www.sausd.us/Page/67.

Tustin Unified School District (TUSD). 2019. Security/Campus Safety. https://www.tustin.k12.ca.us/departments/business-services/maintenance-operations-facilities/securitycampus-safety.

Appendix J-b Service Provider Questionnaire Responses

Appendices

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1. Please **confirm or update** the following information we obtained from the District's website:

   SAUSD schools serving the City of Santa Ana include:
   (Please enter enrollments and capacities in the table.)

SAUSD Schools Serving Residents from the City of Santa Ana

School	*Grades*	*Location*	*Academic Year 2019-2020 Enrollment*	*Capacity*
John Adams Elementary School	K-5th	2130 South Raitt Street	411	650
Advanced Learning Academy (ALA)	3rd-6th	335 East Walnut Street	108	300
Advanced Learning Academy Early College	7th-8th	1325 E. Fourth Street	253	525
Gerald P. Carr Intermediate School	6th-8th	2120 West Edinger Avenue	1424	2135
George Washington Carver Elementary School	K-3rd	1401 West Santa Ana Boulevard	694	1475
Century High School	9th-12th	1401 South Grand Avenue	1565	3744
Cesar E. Chavez High School	9th-12th	2128 Cypress Avenue	85	576
Wallace R. Davis Elementary School	K-5th	1405 French Street	513	925
Diamond Elementary School	K-5th	1450 South Center Street	470	750
Thomas A. Edison Elementary School	K-5th	2063 Orange Avenue	463	1000
Manuel Esqueda Elementary School	K-5th	2240 South Main Street	1039	1200
Benjamin Franklin Elementary School	K-5th	210 West Cubbon Street	377	325
John C. Fremont Elementary School	K-5th	1930 West Tenth Street	480	775
James A. Garfield Elementary School	K-5th	850 Brown Street	664	875
Godinez Fundamental High School	9th-12th	3002 Centennial Road	2341	3744
Greenville Fundamental School	K-5th	3600 South Riatt Street	1002	1100
Lorin Griset Academy	9th-12th	1915 West McFadden Avenue	309	648
Carl Harvey Elementary School	K-5th	1635 South Center Street	399	650
Martin R. Heninger Elementary School	K-5th	417 West Walnut Street	1114	1275
Heroes Elementary School	K-5th	1111 West Civic Center Drive	526	725
Herbert Hoover Elementary School	K-5th	408 East Santa Clara Avenue	335	575
Andrew Jackson Elementary	K-5th	1143 South Nakoma Drive	672	1300
Thomas Jefferson Elementary School	K-5th	1522 West Adam Street	661	975
John F. Kennedy	K-5th	1300 East McFadden	581	925

Elementary School		Avenue		
Dr. Martin Luther King Jr. Elementary School	K-5th	1001 Graham Lane	609	925
Julia C. Lathrop Technology Magnet Intermediate School	6th-8th	1111 South Broadway	876	1820
Abraham Lincoln Elementary School	K-5th	425 South Sullivan Street	691	1400
James Russell Lowell Elementary School	K-5th	700 South Flower Street	630	1050
Douglas MacArthur Fundamental Intermediate School	6th-8th	600 West Alton Avenue	1190	1540
James Madison Elementary School	K-5th	1124 Hobart Street	990	1325
Glenn L. Martin Elementary School	K-5th	939 West Wilshire Avenue	620	1050
McFadden Intermediate School	6th-8th	2701 South Raitt Street	1141	2065
Gonzalo and Felicitas Mendez Fundamental Intermediate School	6th-8th	2000 North Bristol Street	1428	1890
Middle College High School	9th-12th	1530 West 17th Street	348	540
James Monroe Elementary School	K-5th	417 East Central Avenue	272	550
Monte Vista Elementary School	K-5th	2116 West Monte Vista Avenue	458	850
John Muir Fundamental Elementary School	K-5th	1951 Mabury Street	787	1175
Pio Pico Elementary School	K-5th	931 West Highland Street	513	800
REACH Academy	-	804 North Fairview Road	41	540
Romero-Cruz Academy	K-8th	2701 West Fifth Street	1009	1525
Roosevelt Elementary School	K-5th	501 Halladay Street	558	1150
Saddleback High School	9th-12th	2802 South Flower Street	1491	3204
Santa Ana High School	9th-12th	520 West Walnut Street	3237	4212
Santiago Elementary School	K-5th	2212 North Baker Street	1103	1250
Segerstrom High School	9th-12th	2301 West High School	2472	3024
Jose A. Sepulveda Elementary School	K-5th	1801 South Poplar Street	342	625
Sierra Preparatory Academy	6th-8th	2021 North Grand Avenue	673	1680
Taft Elementary School	K-5th	500 Keller Avenue	560	1325
Jim Thorpe Fundamental Elementary School	K-5th	2450 West Alton Avenue	886	1050
Valley High School	9th-12th	1801 South Greenville Street	2222	4032
Raymond A. Villa Fundamental Intermediate School	6th-8th	1441 East Chestnut Avenue	1375	1575
Adeline C. Walker Elementary School	K-5th	811 East Bishop Street	399	575

2. Does the District plan to build any new schools that would potentially serve the project area? If so, please provide grade levels, location, and capacity for each planned school.

Grades	***Location/Address***	***Capacity***	***Anticipated Opening Year***

3. Are there any existing shortages in the amount of classroom, athletic, recreational or other facilities available to serve the current number of students? If shortages exist, what is the basis for determining those shortages?

None at this time.

4. Please **confirm or update** the following developer impact fees for residential and commercial development (obtained from the SAUSD Facilities Master Plan 2020).

   a. The school impact fees are Level 1 fees.

   b. Residential development fees are $4.08 per square foot.

   c. Commercial development fees are $0.66 per square foot.

5. Please **confirm or update** the following student generation rates for elementary, intermediate, and high schools obtained from the District's 2020 Residential Development School Fee Justification Study.

    a. Elementary school (Grades K-5): 0.4028 per single-family housing unit/0.1937 per multi-family housing unit

    b. Intermediate school (Grades 6-8): 0.2203 per single-family housing unit/ 0.1111 per multi-family housing unit

    c. High school (Grades 9-12): 0.2868 per single-family housing unit/0.1427 per multi-family housing unit

6. How would the proposed project, which includes land use designation changes that would accommodate a buildout of 6,819,422 additional nonresidential square feet, 36,167 additional dwelling units, and 14,362 jobs affect the existing SAUSD school services and facilities?

Traffic and safety concerns for students that are in areas or close proximity to the school

7. Please provide any additional comments you may have regarding the proposed project.

n/a

Response Prepared By:

Name	**Title**
Agency	**Date**

PLACEWORKS

RECEIVED
MAR 0 5 2020
FACILITIES

G.G.U.S.D.
MAR 02 2020
BUSINESS SERVICES

→ J. Hills for response to questionnaire

TRANSMITTAL

DATE	February 26, 2020
TO	Garden Grove Unified School District
ADDRESS	10331 Stanford Avenue,
	Garden Grove, CA 92840
CONTACT	Rick Nakano, Assistant Superintendent of Business Services
FROM	Jasmine A. Osman, Project Planner
SUBJECT	Service Provider Questionnaire
PROJECT NUMBER	SNT-20.0

These items are transmitted via: ☒ US Mail ☐ Express Mail ☐ Courier ☐ Hand Delivery ☐ E-mail

GENERAL REMARKS

PlaceWorks has been retained by the City of Santa Ana to prepare an Environmental Impact Report for the proposed City of Santa Ana General Plan Update. This letter is to request your assistance in updating information regarding existing school services in the City and assessing the potential impacts that would be created by the proposed project.

Please see the attached Notice of Preparation which provides details on the proposed project. Additionally, a brief questionnaire has been included.

Please provide your responses to the enclosed questionnaire. Note that your responses will become a part of the administrative record for this project and will be included as an appendix to the EIR. Please respond to PlaceWorks no later than March 6th, 2020. If you need additional time to respond or would like an MSWord version of the questionnaire, please let us know. You may mail the responses to the questionnaire to the address in the footer, or you may email the responses to josman@placeworks.com

Please feel free to call at 714.966.9220 if you have any questions or require further information.

Jasmine A. Osman

Jasmine A. Osman

California Environmental Quality Act

NOTICE OF PREPARATION AND SCOPING MEETING

Date:	February 26, 2020
To:	Responsible Agencies and Interested Parties
Subject:	Notice of Preparation and Scoping Meeting for the Santa Ana General Plan Program Environmental Impact Report

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To: Reviewing Agencies and Other Interested Parties

Project Title: Santa Ana General Plan

Project Applicant: City of Santa Ana

Notice of Preparation Review Period: 2/26/20 through 3/27/2020 (30 days)

Scoping Meeting: Thursday, March 5, 2020, Santa Ana Police Community Room

NOTICE IS HEREBY GIVEN that the City of Santa Ana (City) will prepare a program environmental impact report (EIR) for the Santa Ana General Plan. The City is the lead agency for the project. The purpose of this notice is (1) to serve as a Notice of Preparation of an EIR pursuant to the California Environmental Quality Act (CEQA) Guidelines Section 15082, (2) to advise and solicit comments and suggestions regarding the scope and content of the EIR to be prepared for the proposed project, and (3) to notice the public scoping meeting.

The City determined that the proposed project would require preparation of a full-scope EIR; thus, an Initial Study was not prepared in conjunction with this Notice of Preparation.

1. Introduction

The City's General Plan was last comprehensively updated in 1982. Various updates to the City's Land Use Element, Circulation Element, Urban Design Element and Economic Development were completed in 1998. In March 2014 the City Council adopted the Santa Ana Strategic Plan. The Strategic Plan was the result of an extensive community outreach process and established specific goals, objectives and strategies to guide the City's major efforts. One of the key strategies identified is to complete a comprehensive update of the City's Existing General Plan. The updated General Plan will provide long-term policy direction to guide the physical development, quality of life, economic health, and sustainability of the Santa Ana community through 2045. The updated General Plan will address the eight topics required by state law as well as five optional topics. The topic of housing will also be addressed as a separate effort in late 2021 in accordance with state law.

2. Environmental Setting

Project Location

The City of Santa Ana encompasses roughly 27 square miles of land in central Orange County. The cities of Orange and Costa Mesa border Santa Ana to the north and south, respectively. Santa Ana's western border connects with the cities of Garden Grove, Westminster, and Fountain Valley, while Santa Ana's eastern border touches the cities of Irvine and Tustin. Regional connectivity to the City of Santa Ana is provided by interstates 15 and 405 and by State Routes 22 and 55. The City of Santa Ana is the second largest city in Orange County in terms of both population (approximately 340,000 residents as of 2019) and workers (approximately 160,000 jobs as of 2019).

3. Project Description

The City of Santa Ana is in the process of preparing a comprehensive update to its existing General Plan. Santa Ana's "Golden City Beyond: A Shared Vision" General Plan is expected to be completed in 2020 and will guide the City's development and conservation for the next 25 years through 2045. The update will provide long-term policy direction and communicate the vision, values, and goals for the City's physical development, fiscal and environmental sustainability, and overall quality of life. The new Santa Ana General Plan will serve to identify areas of opportunity and provide options to enhance development potential in key areas of the city while bringing the City into compliance with recent state laws and reflect updates to current conditions and input from the general public, city staff, and other stakeholders.

Santa Ana's General Plan is based on a vision statement and core values established as part of an extensive multi-year community outreach effort, a Technical Advisory Committee, and a General Plan Advisory Group.

Vision Statement

"Santa Ana is a city that promotes the physical, social, and economic health and wellness of our people and our community. We celebrate our past, embrace the power of diversity, and work together to create economic and educational opportunities for the next generation, leading to a more sustainable and prosperous future."

Core Values

» **Health.** The people of Santa Ana value a physical environment that encourages healthy lifestyles, a planning process that ensures that health impacts are considered, and a community that actively pursues policies and practices that improve the health of our residents.

» **Equity**. Our residents value taking all necessary steps to ensure equitable outcomes, expanding access to the tools and resources that residents need, and to balance competing interests in an open and democratic manner.

» **Sustainability.** Santa Ana values land use decisions that benefit future generations, plans for the impacts of climate change, and incorporates sustainable design practices at all level of the planning process.

» **Culture.** Our community values efforts that celebrate our differences as a source of strength, preserve and build upon existing cultural resources, and nurture a citywide culture of empowered residents.

» **Education.** We are a city that values the creation of lifelong learners, the importance of opening up educational opportunities to all residents and investing in educational programs that advance our residents' economic wellbeing.

General Plan Topics

State law requires that a general plan address eight specific topics, which each topic commonly presented as an element of the general plan. State law gives jurisdictions the discretion to incorporate optional topics and to address any of these topics in a single element or across multiple elements of the general plan. Santa Ana's General Plan will address the following eight mandatory and five optional topics:

Mandatory Topics

- Land Use
- Circulation
- Housing*
- Environmental Justice**
- Open Space
- Conservation
- Safety
- Noise

Optional Topics

- Health and Wellness
- Historic Preservation
- Urban Design
- Economic Prosperity
- Community Services

** The updated General Plan will incorporate the current 2014–2021 Housing Element and no substantive changes are anticipated as part of the comprehensive general plan update. The topic of housing will be addressed as a separate effort in late 2021 in accordance with state law.*

*** The topic of environmental justice will be incorporated throughout the General Plan, with goals and policies incorporated into multiple elements.*

Project Buildout

In coordination with the General Plan Advisory Group, the City identified five areas suited for new growth and development: South Main Street, Grand Avenue/17th Street, West Santa Ana Boulevard, 55 Freeway/Dyer Road, and South Bristol Street. These five areas are located along major travel corridors, the future OC Streetcar line, and/or linked to the Downtown. In general, many areas currently designated for General Commercial and Professional Office are expanding opportunities for residential development through a proposed change to the Urban Neighborhood or District Center General Plan land use designations. Industrial Flex would be introduced where Industrial land use designations currently exist within each of the five focus areas in order to allow for cleaner industrial and commercial uses with live-work opportunities.

There are seven other planning areas that represent specific plans and other special zoning areas that were previously adopted: Adaptive Reuse Overlay (2014), Bristol Street Corridor Specific Plan (1991/2018), Harbor Mixed Use Corridor Specific Plan (2014), MainPlace Specific Plan (2019), Metro East Overlay Zone (2007/2018), Midtown Specific Plan (1996), and Transit Zoning Code Specific Development (2010). The potential for new development in these areas is based on the forecasted buildout at the time of the respective zoning document's adoption, minus the amount of new development built between their adoption date and 2019. The most recent adoption/amendment date for each zoning document is noted in parentheses.

Growth outside of the focus areas and special planning areas is expected to be incremental and limited. Some growth was projected for the professional office surrounding the Orange County Global Medical Center and along Broadway north of the Midtown Specific Plan. Some growth was also projected for the commercial and retail area south of the West Santa Ana Boulevard focus area. Finally, some additional residential development is expected to occur on a small portion (five percent) of single-family and multi-family lots through the construction of second units.

Table 1 provides a statistical summary of the buildout potential associated with the General Plan compared to existing conditions. Figure 1 displays the draft General Plan Land Use Map while Figure 2 illustrates the boundaries of the five focus areas and special planning areas.

4. Probable Environmental Effects

The City has determined that a Program EIR will be prepared for the proposed General Plan. Section 15168 of the CEQA Guidelines states that a Program EIR may be prepared on a series of actions that can be characterized as one large project and are related either: 1) geographically; 2) as logical parts in the chain of contemplated actions; 3) in connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or 4) as individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects that can be mitigated in similar ways.

The Program EIR will be prepared in accordance with the requirements of CEQA Statute and Guidelines, as amended. Pursuant to Section 15146 of the CEQA Guidelines, the degree of specificity in the Program EIR will correspond to the degree of specificity involved in the proposed General Plan. The EIR will focus on the primary effects that can be expected to follow from adoption of the proposed project and will not be as detailed as an EIR on the specific development or construction projects that may follow. Based on the City's preliminary analysis of the project, the following environmental impact categories and their associated impact thresholds will be examined in the Program EIR:

- Aesthetics
- Agricultural/Forest Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards/Hazardous Materials
- Hydrology/Water Quality
- Land Use/Planning
- Mineral Resources
- Noise
- Population/Housing
- Public Services
- Recreation
- Transportation
- Tribal Cultural Resources
- Utilities/Service Systems
- Wildfire

The Draft EIR will address the short- and long-term effects of the General Plan on the environment. Mitigation measures will be proposed for impacts that are determined to be significant. A mitigation monitoring program will also be developed as required by Section 15150 of the CEQA Guidelines.

5. Public Review Period

This NOP will be available for a 30-day public review period from **February 26, 2020,** to **March 27, 2020,** on the City's website at https://www.santa-ana.org/general-plan. Hard copies will also be available at:

City of Santa Ana, Planning Division
20 Civic Center Plaza, M-20
Santa Ana, CA 92701

City of Santa Ana Public Library
26 Civic Center Plaza
Santa Ana, CA 92701

The City is seeking input from both agencies and members of the public on the scope and content of the environmental information and analysis in the EIR. Due to the time limits mandated by state law, written comments must be sent via mail, e-mail, or fax no later than 5:00 PM on **Thursday March 27, 2020**. Please send your comments at the earliest possible date to:

Verny Carvajal, Principal Planner
City of Santa Ana Planning and Building Agency
PO BOX 1988 (M-20)
Santa Ana, CA 92702
Email: VCarvajal@santa-ana.org

6. Public Scoping Meeting

Pursuant to the California Public Resources Code Section 21083.9, the City will conduct a public scoping meeting. This meeting will provide a public forum for information dissemination and dialogue regarding the components of the proposed project and the environmental review process. Please note the main purpose of the public scoping meeting is to provide a project description and solicit comments to refine and/or expand the scope of the EIR. **Although staff will summarize the issues raised at these meetings, anyone wishing to make formal comments on the scope of the EIR must do so in writing.** The public scoping meeting will be held on:

Date:	Thursday, March 5, 2020
Time:	from 6:00 to 7:30 PM
Location:	Santa Ana Police Community Room, 60 Civic Center Plaza, Santa Ana, CA 92701

Table 1 Existing Conditions, Potential Growth, and Buildout Conditions in Santa Ana, 2020 to 2045

PLANNING AREA	EXISTING [1]			GROWTH [2]			BUILDOUT		
	Housing Units	Bldg. Sq. Ft.[3]	Jobs	Housing Units	Bldg. Sq. Ft.[3]	Jobs	Housing Units	Bldg. Sq. Ft.[3]	Jobs
FOCUS AREAS	6,380	12,849,259	29,931	17,481	3,233,332	9,542	23,861	16,082,591	39,473
55 Freeway/Dyer Road	1,221	5,094,557	10,401	8,731	1,434,665	3,849	9,952	6,529,222	14,250
Grand Avenue/17th Street	561	1,400,741	3,568	1,667	-689,325	-1,929	2,228	711,416	1,639
South Bristol Street	220	1,577,511	3,337	5,233	3,508,975	11,319	5,453	5,086,486	14,656
South Main Street	1,720	1,685,978	3,455	588	-739,316	-1,304	2,308	946,662	2,151
West Santa Ana Boulevard	2,658	3,090,472	9,170	1,262	-281,667	-2,393	3,920	2,808,805	6,777
SPECIFIC PLAN / SPECIAL ZONING	4,685	13,924,891	38,548	15,839	3,033,554	1,154	20,524	16,958,445	39,702
Adaptive Reuse Overlay Zone [4]	260	976,935	3,043	1,000	0	-476	1,260	976,935	2,567
Bristol Street Corridor Specific Plan	136	140,348	294	-1	2,791	-12	135	143,139	282
Harbor Corridor Specific Plan	1,324	1,767,937	3,286	3,298	200,045	-1,708	4,622	1,967,982	1,578
Main Place Specific Plan	0	1,108,080	2,216	1,900	1,318,843	3,164	1,900	2,426,923	5,380
Metro East Overlay Zone	844	2,516,056	7,524	4,707	2,169,891	4,734	5,551	4,685,947	12,258
Midtown Specific Plan	607	1,885,065	4,824	0	-66,812	-209	607	1,818,253	4,615
Transit Zoning Code	1,514	5,530,470	17,361	4,935	-591,204	-4,339	6,449	4,939,266	13,022
ALL OTHER AREAS OF THE CITY [5]	67,727	39,772,550	92,004	2,847	552,536	3,666	70,574	40,325,086	95,670
CITYWIDE TOTAL	78,792	66,546,700	160,483	36,167	6,819,422	14,362	114,959	73,366,122	174,845

Source: City of Santa Ana, 2020.

1. Existing represents conditions as of December 2019 as derived from the City of Santa Ana Planning Information Network and projects already under construction per the January 2020 monthly development project report.
2. The potential growth for new development in specific plan/special zoning area is based on the forecasted buildout at the time of the respective zoning document's adoption, minus the amount of new development built between its adoption date and 2019.
3. Only includes nonresidential building square footage.
4. The figures shown on the row for the Adaptive Reuse Overlay represents parcels that are exclusively in the Adaptive Reuse Overlay boundary. Figures for parcels that are within the boundaries of both the Adaptive Reuse Overlay Zone and a specific plan, other special zoning, or focus area boundary are accounted for in the respective specific plan, other special zoning, or focus area.
5. The City has included an assumption for growth on a small portion (five percent) of residential parcels through the construction of second units, which is distributed throughout the City and is not concentrated in a subset of neighborhoods. Additional growth includes known projects in the pipeline and an increase of 10 percent in building square footage and employment for the professional office surrounding the Orange County Global Medical Center and along Broadway north of the Midtown Specific Plan, as well as the commercial and retail area south of the West Santa Ana Boulevard focus area.

Figure 1 - Proposed General Plan Land Use

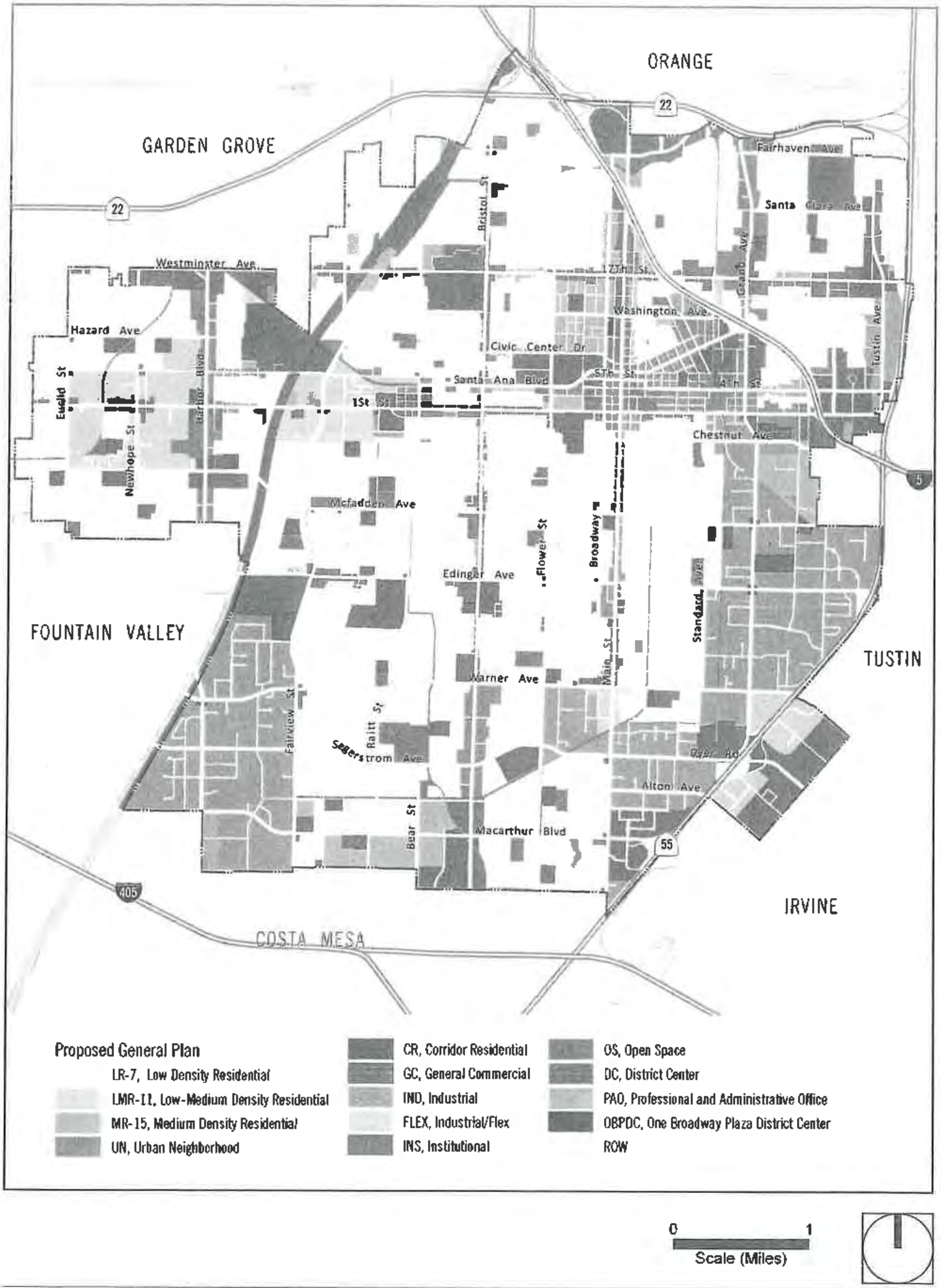
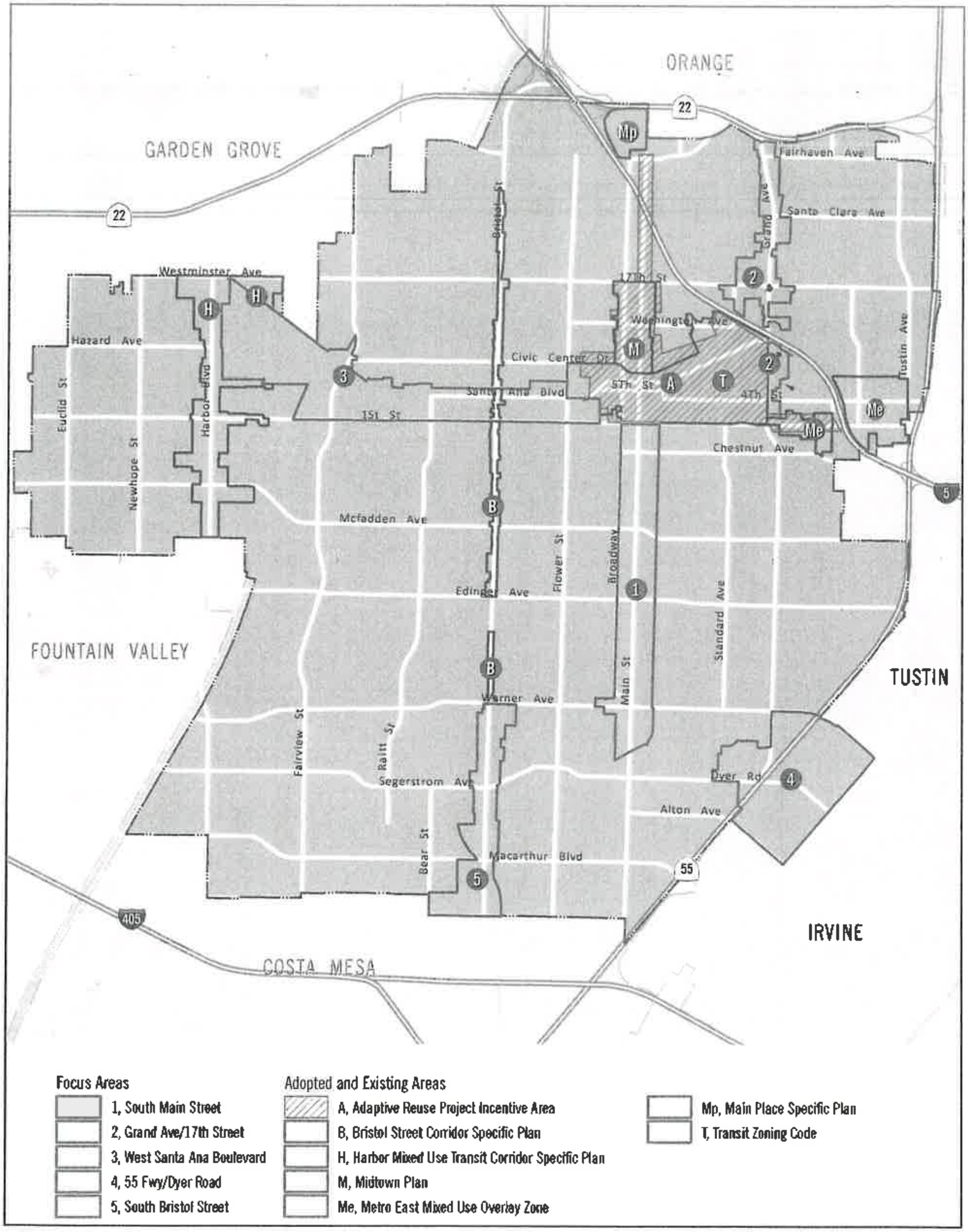


Figure 2 - Proposed General Plan Focus Areas and Other Special Planning Areas



0 1
Scale (Miles)

PlaceWorks

1. Please **confirm or update** the following information we obtained from the District's website:

Data only Available for 2019-2020

GGUSD schools serving the City of Santa Ana include:
(Please enter enrollments and capacities in the table.)

GGUSD Schools Serving Residents from the City of Santa Ana

School	Grades	Location	Academic Year 2020-2021 Enrollment	Perm/ Inc. Portable Capacity
R. F. Hazard Elementary School	K-6th	4218 West Hazard Avenue	432	350/700
Rosita Elementary School	K-6th	4726 West Hazard Avenue	503	450/725
Heritage Elementary School	K-6th	426 South Andres Place	506	550/850
Edward Russell Elementary School	K-6th	600 South Jackson	492	500/875
Newhope Elementary	K-6th	4419 West Regent Drive	394	450/600
Stephen R. Fitz Intermediate	7th-8th	4600 West McFadden Avenue	640	783/719

Calculated at 25 per class k-6, 27 per class 7-12

2. Does the District plan to build any new schools that would potentially serve the project area? If so, please provide grade levels, location, and capacity for each planned school.

Grades	Location/Address	Capacity	Anticipated Opening Year

NA

3. Are there any existing shortages in the amount of classroom, athletic, recreational or other facilities available to serve the current number of students? If shortages exist, what is the basis for determining those shortages?

TABLE 1
FACILITIES CAPACITY AND STUDENT ENROLLMENT

SCHOOL LEVEL	EXISTING PERMANENT FACILITIES CAPACITY	STUDENT ENROLLMENT (OCTOBER 2019)	AVAILABLE/ (DEFICIT) CAPACITY
Elementary School (TK-6)	22,100	20,748	1,352
Intermediate School (7-8)	6,399	6,735	(336)
High School (9-12)	12,069	13,742	(1,673)
TOTAL	**40,568**	**41,225**	**(657)**

4. Please **confirm or update** the following developer impact fees for residential and commercial development (obtained from the GGUSD's Website).

   a. Residential development fees are $3.79 per square foot.
   Proposed increase to $4.09 on 5/16/20

   b. Commercial/Industrial/Senior Housing development fees are $0.61 per square foot.
   Proposed increase to $0.66 on 5/16/20

   c. Assessable space for self-storage development fees are $0.06 per square foot.
   Confirmed

5. What are the student generation rates for elementary, intermediate, and high schools within the District?

   a. Are there generation rates specific to housing type (i.e., single-family, multifamily, etc.)?

TABLE 3
STUDENT GENERATION RATES

SCHOOL LEVEL	STUDENT GENERATION RATES PER RESIDENTIAL UNIT		
	SFD	SFA	MF
Elementary School (TK-6)	0.2989	0.0876	0.2296
Intermediate School (7-8)	0.0969	0.0272	0.0734
High School (9-12)	0.2029	0.0562	0.1421
TOTAL	**0.5987**	**0.1710**	**0.4451**

6. How would the proposed project, which includes land use designation changes that would accommodate a buildout of 6,819,422 additional nonresidential square feet, 36,167 additional dwelling units, and 14,362 jobs affect the existing GGUSD school services and facilities?

In the 2 areas where GGUSD students are drawn from: Focus area 3, West Santa Ana Boulevard and Specific plan area H, Harbor Mixed use Transit corridor residential units and Commercial square footage will produce an estimated 848 net increase in students.

7. Please provide any additional comments you may have regarding the proposed project.

Response Prepared By:

Jerry Hills — Facilities Director

Name — **Title**

Garden Grove Unified School District — 3/10/20

Agency — **Date**

School site	grades	location	2019-2020 enrollment	capacity permanent building	Capacity relocatabl	total capacity
Clinton	k-6	13641 Clinton St., Garden Grove	595	600	475	**1075**
Post	k-6	14641 Ward St. ,Westminster	462	500	150	**650**
Paine	k-6	15792 Ward st., Garden Grove	442	500	75	**575**
Monroe	k-6	16225 Newhope St., Fountain Valley	416	500		**500**
Riverdale	k-6	13222 Lewis St., Garden Grove	558	350	375	**725**
Anthony	k-6	15320 Pickford st., Westminster	359	500	50	**550**
Morningside	k-6	10521 Morningside Dr., Garden Grove	432	500	100	**600**
Peters	k-6	13162 Newhope st., Garden Grove	1118	775	675	**1450**
Doig	7-8	12752 Trask Ave., Garden Grove	765	621	297	**918**
Irvie	7-8	10552 Hazard Ave., Garden Grove	674	783	108	**891**
Santiago	9-12	12342 Trask Ave., Garden Grove	1967	1782	621	**2403**
Los Amigos	9-12	16566 Newhope St., Fountain Valley	1741	1539	540	**2079**
LaQuinta	9-12	10372 McFadden Ave., Westminster	2145	2214	243	**2457**
Bolsa Grande	9-12	9401 Westminster Ave., Garden Grove	1916	1674	216	**1890**

1. Please provide the following:

   - A list of all the schools in TUSD that service Santa Ana residents,
   - The existing enrollments of each of these schools, and
   - The existing capacities of each of these schools.

   Please see Appendix A from the attached a table Fee Justification Report adopted by the Board of Education on April 13, 2020. Schools that service students from the general plan area are highlighted in yellow.

2. Does the District plan to build any new schools that would potentially serve the project area? If so, please provide grade levels, location, and capacity for each planned school.

Grades	***Location/Address***	***Capacity***	***Anticipated Opening Year***

3. Are there any existing shortages in the amount of classroom, athletic, recreational or other facilities available to serve the current number of students? If shortages exist, what is the basis for determining those shortages?

   As a whole, schools in the District are at or above capacity per the Table attached in item 1. The District strives to provide adequate facilities at all of its schools. The collection of developer fees helps the District to fund projects that may help to fill any shortages.

4. Please **confirm or update** the following developer impact fees for residential and commercial development (obtained from the TUSD website).

    a. Residential development fees are $3.79 per square foot.

    b. Commercial development fees are $0.61 per square foot.

The Board of Education took action of April 13, 2020 to increase residential development fees to $4.08 per square foot and commercial/industrial development fees to $0.66 per square foot. These increased fees will take effect on June 12, 2020.

5. Please **confirm or update** the following student generation rates for elementary, intermediate, and high schools obtained from the District's 2018 Residential, Commercial/Industrial Development School Fee Justification Study.

    a. Elementary school (Grades K-5): 0.1434 per multi-family housing unit

    b. Intermediate school (Grades 6-8): 0.0736 per multi-family housing unit

    c. High school (Grades 9-12): 0.0902 per multi-family housing unit

There are no student generation rates for single-family homes because "the vast majority of future unmitigated residential dwelling units expected to be constructed consist of multi-family dwelling units."[1]

Table 4 on page 8 of the attached District's Fee Justification Report adopted by the Board of Education on April 13, 2020, shows current student generation rates, including rates for single family detached units.

6. How would the proposed project, which includes land use designation changes that would accommodate a buildout of 6,819,422 additional nonresidential square feet, 36,167 additional dwelling units, and 14,362 jobs affect the existing TUSD school services and facilities?

As stated above, school facilities in TUSD are at or near capacity. The addition of k-12 students would create a major impact on our facilities unless mitigation is provided to help the District respond to the facilities needs created by those new students.

[1] Fee Justification Report for Residential and Commercial/Industrial Development https://www.tustin.k12.ca.us/uploaded/District_Office/Business_Services/Fiscal_Services/School_Facilities_Fees/Fee_Justification_Report_March_2018.pdf (page 13)

7. Please provide any additional comments you may have regarding the proposed project.

The District expects that all future development created by this project will pay the maximum development fee in place at the time building permits are obtained.

The District has attached the Fee Justification Report adopted by the Board of Education on April 13, 2020 as a reference to this request.

Response Prepared By:

Name	Title
Tom Rizzuti	Director, Facilities & Planning

Agency	Date
Tustin Unified School District	April 17, 2020

Tustin Unified School District
Capacity Calculation - State Loading Standards

Fiscal Year 2019/20

	School	Total CR (1)	Current Classroom Counts (1): TK-6 (25)		7-12 (27)		Severe (9)		Non Severe (13)		Capacity: 2019/20 100%	Enrollment: 2019/20 Enrollment	State Loading: 100% Capacity vs Enrollment +/-
ELEM	Arroyo	24	24	600		0	0	0	0	0	600	637	-37
ELEM	Benson	17	14	350		0	0	0	3	39	389	391	-2
ELEM	Beswick	12	11	275		0	0	0	1	13	288	511	-223
ELEM	Estock	21	21	525		0	0	0	0	0	525	516	9
ELEM	Guin Foss	15	15	375		0	0	0	0	0	375	427	-52
ELEM	Heideman	29	29	725		0	0	0	0	0	725	606	119
ELEM	Heritage	21	21	525		0	0	0	0	0	525	485	40
ELEM	Hicks Canyon	36	36	900		0	0	0	0	0	900	934	-34
ELEM	Ladera	14	14	350		0	0	0	0	0	350	318	32
ELEM	Loma Vista	25	22	550		0	0	0	3	39	589	469	120
ELEM	Myford	28	25	625		0	0	0	3	39	664	594	70
ELEM	Nelson	26	24	600		0	0	0	2	26	626	531	95
ELEM	Orchard Hills - k-8 (see below)	18	18	450		0	0	0	0	0	450	431	19
ELEM	Peters Canyon	22	19	475		0	0	0	3	39	514	510	4
ELEM	Red Hill	23	21	525		0	0	0	2	26	551	553	-2
ELEM	Thorman	30	30	750		0	0	0	0	0	750	787	-37
ELEM	Tustin Connect Academy	1	1	25		0	0	0	0	0	25	17	8
ELEM	Tustin Memorial Academy	22	22	550		0	0	0	0	0	550	602	-52
ELEM	Tustin Ranch	21	21	525		0	0	0	0	0	525	570	-45
		405	388		0		0		17		9,921	9,889	32

	School	Total CR	TK-6 (25)		7-12 (27)		Severe (9)		Non Severe (13)		2019/20 100%	2019/20 Enrollment	100% Capacity vs Enrollment +/-
MID	Columbus Tustin	38	0	0	28	756	0		5	65	821	808	13
MID	Currie	31	0	0	24	648	0		2	0	648	591	57
MID	Hewes	38	0	0	33	891	0		1	13	904	984	-80
MID	Orchard Hills	28	0	0	25	675	0		2	26	701	993	-292
MID	Pioneer	46	0	0	41	1107	0		1	13	1,120	1,189	-69
MID	Tustin Connect Academy	1	0	0	1	27	0		0	0	27	31	-4
MID	Utt	36	0	0	29	783	0		3	39	822	937	-115
	Totals	218	0		181		0		14		5,043	5,533	-490

	School	Total CR	TK-6 (25)		7-12 (27)		Severe (9)		Non Severe (13)		2019/20 100%	2019/20 Enrollment	100% Capacity vs Enrollment +/-
HIGH	Beckman	107		0	91	2457	0	0	6	78	2,535	2,947	-412
HIGH	Foothill	95		0	81	2187	0	0	6	78	2,265	2,424	-159
HIGH	Hillview/Sycamore at Lambert	25		0	13	351	0	0	0	0	351	230	121
HIGH	Tusin Connect Center	3		0	3	273	0	0	0	0	273	98	175
HIGH	Tustin	97		0	82	2214	0	0	8	104	2,318	2,282	36
		327	0		270		0		20		7,742	7,981	-239

SUMMARY	Total CR	TK-6	7-12	Severe	Non Severe	2019/20 Capacity 100%	2019/20 Enrollment	100% Capacity vs Enrollment +/-
	950	388	451	0	51	22,706	23,403	-697

(1) Classroom Counts exclude classroom facilities that do not meet state requirements (i.e., less < 960 square feet) or which are used for other educational purposes (ROP, etc).

SDFA | SPECIAL DISTRICT FINANCING & ADMINISTRATION

437 W. Grand Avenue, Escondido CA 92025
Tel: 760.233.2630 | Fax: 760.233.2631

Tustin Unified School District

FEE JUSTIFICATION REPORT

For Residential & Commercial/Industrial Development

March 2020

PREPARED FOR:
Tustin Unified School District
300 South C Street
Tustin, CA 92780
Tel: 714 • 730 • 7301
Contact: Anthony Soria

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EXECUTIVE SUMMARY

This Fee Justification Report ("Report") for Residential and Commercial/Industrial Development has been prepared by Special District Financing & Administration ("SDFA") for the purpose of identifying the impact of projected future development on the school facilities of the Tustin Unified School District ("TUSD" or "District"), the ability of the District's current facilities to accommodate the impact, and the extent to which projected demand exceeds the District's current facilities capacity as well as quantify the costs associated with meeting the increased demand.

Specifically, this Report is intended to provide the Board of Education of the District with the required information to make the necessary findings set forth in Government Code Section 66001 et seq. and in accordance with Government Code Section 65995 et. seq, to support the District's collection of its fair share of the statutory fees allowed by the State of California, which for unified districts (K-12) is currently \$4.08 per square foot of new residential development and \$0.66 per square foot of new commercial/industrial development. The TUSD is a unified school district providing school facilities to elementary and secondary students living within the cities of Irvine, Santa Ana and Tustin as well as small portions of unincorporated areas within the County of Orange.

The findings contained in this Report include the following:

- *In accordance with state classroom loading standards, the District currently has school capacity to house approximately 22,706 students.*

- *As of October 2, 2019, current enrollment, including Special Day Class students, is approximately 23,403 students resulting in an aggregate capacity deficit of 697 seats.*

- *At least 3,127 new dwelling units could be constructed during the next twenty years within the boundaries of the school district and for which they have not mitigated the impact of their development through participation in a community facilities district, a negotiated fee payment or some other mitigation measure ("Mitigated Developments").*

- *Future development of single-family housing is largely expected to occur within the District's remaining mitigated developments (i.e., Orchard Hills and Tustin Legacy) and almost all future unmitigated development will consist of multi-family housing and the District's student generation rates indicate that almost one and one-half elementary, one middle, and one high school student is generated from every ten multi-family ("MF") dwelling units constructed.*

- *Approximately eighty-two percent (82%) of an elementary school and forty-two percent (42%) of a Grade 6-12 school facility will need to be constructed in order to* *provide adequate facilities to house students to be generated from currently unmitigated developments which lie within the boundaries of the District. The estimated cost of these school facilities, excluding interim housing requirements and central administrative support, is almost $78 million dollars.*

- *Taking into account the cost of interim housing and administrative support, the total cost of school facilities results in a cost of approximately $78,661 per elementary student, $90,919 per school student in grades 6-12. Thus, estimated school facilities cost per dwelling unit is approximately $26,065.*

- *Based on development plans for projects within the Cities of Irvine, Santa Ana and Tustin, the District estimates that the average size of future residential dwelling units to be constructed within the TUSD will be approximately 1,414 square feet. Based upon the average square footage, the District would need to collect approximately $18.43 per square foot of new residential development to mitigate the school facilities impacts. This amount is well in excess of the amount that may be currently collected by the District (i.e., the District's maximum fee amount is $4.08 per square foot) and permitted by state statute. Thus, the District is justified in collecting the statutory fees for residential development as permitted by state law.*

- *Utilizing estimates regarding employee generation and associated residential household generation gleaned from recent Census data, it was determined that the District would need to collect between $0.38 and $60.35 per square foot of commercial/industrial development to mitigate the gross school facilities impacts resulting from almost all new non-residential development. This amount is well in excess of the amount currently collected by the District (i.e., the District's maximum fee amount is $0.66 per square foot) and permitted by state statute. Thus, the District is justified in collecting $0.38 per square foot for new self-storage development and the District is justified in collecting the matimum statutory fee of $0.66 per square foot for all commercial/industrial development as permitted by state law.*

- *Absent additional state or local funding, the District will not be able to provide adequate school facilities for new residential, commercial or industrial developments that are constructed within the boundaries of the District and for which no additional mitigation is received.*

Section
One

INTRODUCTION

This Section of the Report sets forth the legislative requirements as well as the methodology and data sources utilized in the analysis of the District's school facilities impact. Also included in this Section is a brief description of the TUSD, its current student enrollment and its current capacity.

The Tustin Unified School District

The TUSD is a political subdivision of the State of California and encompasses more than twenty-four (24) square miles in central Orange County and includes almost all of the territory within the boundaries of the City of Tustin as well as portions of the cities of Irvine and Santa Ana as well as an unincorporated area known as Tustin Foothills located primarily in the northern portion of the District. Its western boundary includes portions of Santa Ana with the portion of the western boundary line that lies north of Interstate 5 running along Marbury and Wright Streets and the portion that lies south of the Interstate largely coterminous with Lyon Avenue. Its southern boundary line runs along Warner Avenue on both the west and east areas of the District with the central portion of the district's southern boundary (between Armstrong and Jamboree) extending south to McGaw Avenue. The eastern boundary of the District is coterminous with Jamboree Road south of Interstate 5 and then is represented by Culver Drive north of Interstate 5 with the boundary line extending north of Portola Parkway into the area known as Orchard Hills (Planning Area No. 1 of the City of Irvine). The eastern portion of the District's northern boundary lies adjacent to Peters Canyon Regional Park and then follows along a number of residential streets in the Tustin Foothills on the west side of the District.

The TUSD is a geographically small, unified (K-12) school district that primarily serves an urban population with an enrollment of almost 24,000 students housed in twenty-nine different schools, including seventeen elementary, one K-8 school, five middle (grades 6-8), three comprehensive high schools as well as one alternative education school and one continuation school. The District serves a diverse ethnic population that includes more than 100,000 people in the cities of Irvine, Tustin and Santa Ana as well as the unincorporated area known as the Tustin Foothills.

Synopsis of District Growth & Student Capacity

During the past thirty years, the District has experienced significant student growth as well as accompanying demographic changes both in terms of ethnicity and economic diversity. With the development of Tustin Ranch, Lower Peter's Canyon, MCAS/Legacy and Orchard Hills master-planned communities as well as other projects, the last decade has seen continuous enrollment growth. During the ten-year period from 2009 to 2018, District enrollment went up by almost 1,800 students, an increase of more than eight percent (8%).

Student enrollment for 2019/20 by school type is as follows:

Table I

FY 2019/20 Student Enrollment

School Type	Current Enrollment (1)
Elementary School (Grades K-6)	9,889
Middle School (Grades 7-8)	5,533
High School (Grades 9-12)	7,981
Total 2019/20 Enrollment	23,403

(1) Reflects enrollment in District's iniital enrollment data file from October 2 2019 and may not correspond to CSIS enrollment figures.

Current enrollment figures show that the total student population is just over 23,400 students. For purposes of calculating current capacity under the School Facilities Program the District relies on capacity computations as summarized on its School Capacity Study worksheet, attached as Appendix "A". This worksheet indicates that the District's current school facilities are sufficient to house 9,921 elementary, 5,034 middle, and 7,742 high school students or a total of 22,706 pupils. A comparison of current student enrollment to current capacity demonstrates that the District currently has insufficient facilities to adequately house its current enrollment at both middle and high school levels with approximately one classroom of excess capacity at the elementary school level. While there may be some short-term surplus capacity at various sites, with the pending build-out of the Orchard Hills Development (which has already mitigated its obligation via the funding and construction of the Orchard Hills K-8 facility located in CFD No. 14-1), any current surplus seats in the District will likely be absorbed as students from CFD 14-1 are generated.

Based upon the most recent population and housing estimates and trends as indicated by recent census data and corroborated by recent development within the District, it is anticipated that the growth experienced by the District during the past decade is likely to continue in the near future with the redevelopment of the Marine Corps Air Base (MCAS). Specifically, current growth estimates of the cities of Santa Ana, and Irvine indicate that housing development in the northwest portion of Irvine and the eastern portion of Santa Ana, and more particularly within the jurisdictional boundaries of the TUSD, will continue. Thus, as the District's current facilities are inadequate to house *all* of the additional students beyond its current enrollment and the future dwelling units to be constructed within Mitigated Developments, additional facilities must be added to provide some incremental capacity for students that will be generated from new non-mitigated development.

During the past twenty-eight years the District and the development community have entered into various mitigation agreements in order to ensure the timely construction of school facilities to house students from new development (Mitigated Development). The primary financing mechanism authorized in the mitigation agreements is the formation of a community facilities district (CFD). The District can then issue bonds to construct school facilities with repayment of the bonds being accomplished through the levy of a special tax on properties within the CFDs. These developments that are subject to the special tax are considered Mitigated Developments as they have provided significant funding and support to the TUSD facilities program since 1989. Nevertheless, increased student generation within existing developments as well as new residential construction for which a mitigation agreement does not exist continues to cause the District to operate with inadequate school facilities.

Legislative History

School districts have historically relied upon state funds and local bond measures to provide funding for the acquisition and construction of new school facilities. Prior to the passage of Proposition 13 in 1978, a school district's share of local property taxes was typically sufficient to build necessary schools to accommodate new development. The rapid increase in real estate prices within California during the 1970's and 1980's ensured that revenues would expand as the "ad valorem" tax base grew. However, limitations on the growth of this funding source were significantly constrained by the passage of Proposition 13, which limited annual increases in assessed values, except in the case of ownership transfers, to two percent (2%). This action, combined with a compounding need for new construction monies, caused significant hardships in many school districts during the early 1980's.

In 1986 the state legislature attempted to address this funding shortfall through the enactment of Assembly Bill 2926 ("School Fee Legislation"), which provided for the imposition of development fees on new residential and commercial/industrial construction. The School Fee Legislation provides that development fees are to be collected prior to the issuance of a building permit. Furthermore, no city or county is authorized to issue a building permit for new residential or commercial/industrial projects unless it first certifies with the appropriate school districts that the developer of the project has complied with the development fee requirement.

Shortly thereafter, AB 1600 ("Mitigation Fee Act") was enacted by the state legislature and took effect on January 1, 1989. Government Code Section 66001 and following sets forth the requirements for establishing, imposing and increasing development fees initially authorized under AB 2926. Specifically, the Mitigation Fee Act requires that a reasonable relationship or "nexus" exist between the type and the amount of a development fee imposed and the cost of the benefit to be derived from the fee. Specifically, Section 66001 of the Government Code with respect to the imposition of development fees provides, in pertinent part, that any action establishing, increasing, or imposing a fee on new development shall do all the following:

- *Identify the purpose of the fee.*
- *Identify the use to which the fee is to be put.*

- *Determine how there is a reasonable relationship between the fee's use and the type of development project on which the fee is imposed.*
- *Determine how there is a reasonable relationship between the need for the public facility and the type of development project on which the fee is imposed.*

The development fees are currently authorized under Education Code Section 17620 and are $4.08 per square foot of new residential construction and $0.66 per square foot of new commercial/industrial development (for K-12 school districts). These development fees may next be increased by the SAB in 2022 and every two years thereafter.

In June of 2006, Assembly Bill 2751 was passed which added the criteria that a fee is prohibited from including the cost attributable to existing deficiencies in public facilities. In the case of a school district, this would mean that existing capacity deficits could not be added to the facilities funding required from future development. In this Report, this is demonstrated in the calculations by not including any deficit which would be shown in Table II, if any, to the School Facilities Required for New Development (Unmitigated) (Table X) or to the cost of such school facilities (Tables XII, XIII and XIV).

Methodology

In order to determine the impact of new construction on TUSD facilities the relationship between the new construction and its impact on the demand for school facilities must be identified. For residential development this determination includes the following:

- *Projecting the number of future residential dwelling units to be constructed within TUSD boundaries.*
- *Calculating a student generation rate (i.e., students expected to be generated from each new home) for the future dwelling types expected to be constructed in the future.*
- *Determining the number of students to be generated from new development.*
- *Identifying the "per student cost" for new elementary, middle and high school facilities.*
- *Multiplying the per student costs for elementary, middle and high school facilities by the applicable student generation rate.*

The methodology for determining the impact of new commercial/industrial development is similar. However, instead of determining the number of students to be generated per new dwelling unit, the focus is on the number of students generated per employee.

This Report utilizes in part, employee generation factors derived from the Traffic Generator's Guide prepared by the San Diego Association of Governments (SANDAG), last updated in April of 2002, as well as certain census data compiled by the U.S. Census Bureau.

Data Sources

The primary information used to establish a nexus between new development and school facilities impacts includes residential housing projections, employment impacts from new commercial/industrial development, historical student generation rates and facilities cost estimates. Primary information sources regarding future housing projections includes preliminary data for the Legacy Project gleaned from the Specific Plan for the Marine Corps Air Station (MCAS) as well as planning and current project documents obtained from the cities of Irvine, Santa Ana and Tustin. Data for determining commercial/industrial impacts was derived from the Traffic Generators Guide prepared by SANDAG as well as 2006-2010 Census Data for the cities of Irvine, Tustin and Santa Ana. Student generation rates for this Report were calculated by SDFA. Equal Employment Opportunity Commission (EEOC) worksite data derived from the American Community Survey (2006-10) conducted by the US Census Bureau was utilized to determine school facilities impacts associated with new non-residential development. Facilities cost estimates were prepared using cost information obtained from the District's Facilities Department.

Section

Two

RESIDENTIAL DEVELOPMENT

This Section of the Report identifies the school facilities impact from new residential construction.

Existing Facilities Capacity and Current Enrollment

Prior to examining the school facilities impacts from new development, the District's current capacity and enrollment were reviewed to identify existing facilities that may be available to house future students. As shown in Appendix "A" (School Capacity Worksheet), the District has determined that its existing school building capacity is approximately 22,706 elementary, middle and high school seats. As shown in Table I, CSIS enrollment figures for 2019/20 include 23,403 students. The resulting capacity deficit is shown in Table II.

Table II
Existing School Facilities Capacity

School Type	2019/20 Capacity (1)	2019/20 Enrollment (2)	Existing Seat Surplus/(Deficit)
Elementary (K-6)	9,921	9,889	32
Middle (7-8)	5,043	5,533	(490)
High (9-12)	7,742	7,981	(239)
Aggregate	22,706	23,403	(697)

(1) Includes Permanent Facilities & Interim Facilities.
(2) For purposes of determining available overall facilities capacity in accordance with state classroom loading standards, both capacity and enrollment figures identified in Appendix "A" and Table II reflect grades K-6 at the elementary school level and grades 7-8 at the middle school level. However, consistent with current District educational program policies, the District's sixth graders are predominantly attending the District's middle schools. Thus, for determining the facilities impact from future development and future school design goals, the District will assume that sixth grade students generated from future unmitigated development will continue to be housed at middle school facilities.

Future Residential Unit Projections

In the summer of 2005, the District entered into a mitigation agreement with the Irvine Company for the future development project known as Orchard Hills (Planning Area No. 1), which is primarily located northwest of the intersection of Culver Drive and Portola Parkway in the City of Irvine. And in the fall of 2015, TUSD completed its negotiations with the City Tustin related to the redevelopment of the remaining portion of the Tustin Marine Corps Air Station (MCAS). Both of these projects are expected to generate a significant number of students that must be housed in school facilities provided by the District but as a result of successful negotiations, their anticipated facilities impacts will be met through the formation of two CFDs and the issuance of bonds to construct facilities to serve their communities.

As a result, the anticipated student impacts from these communities at grades kindergarten through twelfth (K-12) are excluded from this analysis, so that only the net impact from unmitigated developments that will be subject to statutory fees will be considered.

Thus, for purposes of this analysis, the District's projection of future housing that is not yet mitigated consists primarily of (i) underdeveloped property located north of McGaw Avenue between Armstrong and Jamboree Road which is referred to as the IBC (Irvine Business Center), (ii) the Metro-East Overlay Zone located in the City of Santa Ana and (iii) future "in-fill" developments within the City of Tustin. The District has not incorporated in its estimate a significant number of future dwelling units expected from currently unidentified in-fill development. This estimate is summarized in Table III and is also included in Appendix "D".

Table III
Projected Future Residential Units located within Unmitigated Developments [(1)]

Jurisdiction	Single-Family Detached (SFD) Dwelling Units	Single-Family Attached (SFA) Dwelling Units	Multi-Family Apartment Dwelling Units	Total Future Dwelling Units
City of Irvine (IBC)	0	357	0	357
City of Santa Ana	24	0	2,205	2,229
City of Tustin	0	115	426	541
Unincorporated	0	0	0	0
Total for TUSD	24	472	2,631	3,127

(1) Future Planned Residential Projects without Mitigation as identified in planning documents or as estimated by planning agencies responsible for approving projects located within the jurisdictional boundaries of TUSD.

As previously indicated, a significant number of future dwelling units will be constructed within master-planned communities which are considered Mitigated Developments because they have already mitigated their school impacts through the formation of a community facilities district. These units are considered part of Mitigated Developments and therefore, both their impact on school facilities and their mitigation payments are excluded from the fee calculation in this Report.

Student Generation Rates

To establish a nexus between anticipated future residential development and a corresponding need for additional school facilities, the number of future students anticipated to be generated from the new residential development must be determined. This calculation often results in a student generation rate or factor, which represents the number of students, or portion thereof, expected to attend District schools from each new house. While additional single-family and multi-family housing will be constructed in both Orchard Hills and in Tustin Legacy (MCAS), these two areas represent mitigated developments and are excluded from this report.

For purposes of estimating the school facilities impact expected from future development, the District utilized its student generation rates tabulated for single-family detached (SFD), single-family attached (SFA) and multi-family units (apartments) located within its CFDs (CFD Nos. 88-1, 97-1, 06-1, 07-1 and 14-1) as well as the City of Tustin's CFD 14-1 – (Greenwood @ Legacy). Student generation rates for the District's CFDs were computed in February of 2020 and a summary of these generation rates is contained in Appendix "C". The student generation rates for multi-family apartment units, single-family attached (SFAs) and single-family detached (SFDs) dwellings located within the District's CFDs are summarized in Table IV.

Table IV
Student Generation Rates for Residential Units Located in CFDs [1]

School Level	Multi-Family Units (Apartments)	Single-Family Attached (SFAs)	Single-Family Detached (SFDs)
Elementary (K-5) [2]	0.1402	0.1584	0.1968
Middle (6-8) [2]	0.0647	0.0945	0.1319
High (9-12)	0.0878	0.1154	0.1968
Aggregate	0.2927	0.3683	0.5255

(1) *Rounded to the nearest ten-thousandth.*
(2) *For determining the facilities impact from future development and future school design goals, the District assume that sixth-grade students generated from future unmitigated development will continue to be housed at middle school facilities.*

Students Generated by New Unmitigated Development

The number of students estimated to be generated from future Unmitigated Development is determined by multiplying the projected number of future unmitigated dwelling units (Table III) by the corresponding generation rates (Tables IV). This computation is reflected in Table V:

Table V
Student Generation from Future Residential Dwelling Units

	Future MF (Apt) Units: *2,631*		Future SFA Dwellings: *472*		Future SFD Dwellings: *24*	
School Level	MF Student Generation Rate	MF Future Students [1]	SFA Student Generation Rate	SFA Future Students [1]	SFD Student Generation Rate	SFD Future Students [1]
Elementary (K-5)	0.1402	369	0.1584	75	0.1968	5
Middle (6-8)	0.0647	170	0.0945	45	0.1319	3
High (9-12)	0.0878	231	0.1154	54	0.1968	5
Aggregate (K-12)	0.2927	770	0.3683	174	0.5255	13

(1) Students shown are rounded to the nearest integer.

School Facilities Required to Serve New Development

In order to determine the number of schools, or portions thereof, necessary to serve students generated from new development, the aggregate future students shown in Table V is divided by the school capacity (i.e., design population). Table VI shows the number of new elementary, middle and high schools required to serve new development:

Table VI
School Facilities Required for New Development (Unmitigated)

School Facility	Current Available Capacity (1)	Design Capacity	Future Unhoused Students	Required Facilities (2)
Elementary School (K-5)	0	550	449	0.8164
Middle/High School (6-12)	0	1,200	508	0.4233

(1) While Table II indicates a current capacity surplus of 32 seats at the Elementary school level, these seats are reserved for future mitigated students expected to be generated from new residential development in Orchard Hills (CFD No. 14-1).
(2) Rounded to the nearest ten-thousandth.

Estimated School Facilities Costs

To calculate the cost for new school facilities, SDFA relied on actual historical costs and current estimates of costs associated with the construction of recent school facilities. These numbers reflect the District's estimate of land acquisition and construction costs, and also include anticipated costs for furniture, equipment and technology. Based on the District's most recent transfer of property to the City of Tustin, the District has utilized a land cost of $1.5 million per acre as the *average* acquisition price associated with providing future elementary school facilities for future unmitigated development. For future middle and high school facilities the District has assumed that such facilities may be partially or entirely housed at a facility to be constructed on the 40-acre site located within the MCAS/Legacy project area. Pursuant to the Reuse Plan for the MCAS, this site has already been acquired from the City.

The estimated costs for elementary, middle and high school facilities are contained in Appendix "E". The resulting facilities costs per school site, including acquisition and site development are shown in Table VII.

Table VII
Estimated Facilities Costs per School Site

School Facility	Site Acquisition/ Development	Construction (1)	Total Cost
Elementary (K-5)	$16,000,000	$25,000,000	$41,000,000
Middle & High (6-12)	$4,000,000	$100,000,000	$104,000,000

(1) Includes plans, tests and inspections, furniture and equipment, technology and other items.

The aggregate facilities cost impact from new, Unmitigated Development is determined by multiplying the per site costs shown in Table VII by the required number of sites reflected in Table VI. This resulting impact is shown in Table VIII.

Table VIII
Estimated Facilities Costs (Excluding Interim Housing & Admin. Facilities)

School Type	Required Schools (1)	Site Acquisition/ Development	Construction (2)	Total Cost
Elementary (K-5)	0.8164	$13,062,400	$20,410,000	$33,472,400
Middle & High (9-12)	0.4233	$1,693,333	$42,333,333	$44,026,666
Aggregate		$14,755,733	$62,743,333	$77,499,066

(1) Rounded to four decimals.
(2) Includes plans, tests and inspections, furniture and equipment, technology and other items.

Interim Housing and Administrative Support

In addition to the need for incremental permanent K-12 school facilities, new development imposes additional facilities impacts on school districts. Because development fees are collected at the time a building permit is issued, funds to provide facilities accumulate over a period of time and revenues, particularly when other local or state funds are not available, are not sufficient to build a school when development so warrants. The solution to this problem is most often addressed through “interim housing” in which the District purchases or leases relocatable classrooms that are used to temporarily alleviate overcrowding at existing school sites. Utilizing recent cost data associated with the setup and leasing of portables at its current sites, the TUSD has determined that it costs the District approximately $3,212 per elementary, and $3,352 per middle or high school student to provide interim housing until new facilities are available.

Additional central administrative facilities and support is also required as new students place incremental demands on school administration. The District has determined that $900 for each new student is necessary to provide for corresponding central administrative facilities. The estimated total cost of interim housing and central administrative facilities is shown in Table IX.

Table IX
Costs for Interim Housing & Administrative Support Facilities

School Level	Future Students	Per Pupil Costs		Total Cost
		Interim Housing (1)	Administrative Support (1)	
Elementary (K-5)	449	$3,212	$900	$1,846,288
Middle/High (6-8)	508	$3,352	$900	$2,160,016
Aggregate	957			$4,006,304

(1) Per Pupil costs estimates for interim Housing and administrative support are included in Appendix E-2..

Thus, the estimated total cost of school facilities (Table VIII) and ancillary facilities (Table IX) necessary to accommodate students generated from new residential development is shown in Table X:

Table X
Total Estimated Facilities Costs

School Level	School Facilities	Interim Housing (1)	Administrative Support (1)	Total Cost
Elementary (K-5)	$33,472,400	$1,442,188	$404,100	$35,318,688
Middle & High (6-12)	$44,026,666	$1,702,816	$457,200	$46,186,682
Aggregate	$77,499,066	$3,145,004	$861,300	$81,505,370

(1) Amounts shown are equal to the number of future students shown in Table IX multiplied by the respective estimated facilities costs included in Appendix E-1 and E-2.

Total Estimated Cost per Student

The estimated facilities cost for each elementary, middle and high school student is derived by dividing the school facilities costs by the respective number of students expected to be generated from new residential development. The per pupil costs for interim housing and administrative support (Table IX) are added to the per pupil school facilities cost to determine the total per student facilities costs for elementary, middle and high school facilities. The total estimated per pupil facilities cost is shown below:

Table XI
Total Facilities Costs per Pupil

	Base		Per Pupil Costs (1)			
School Level	School Facilities Cost	Future Students	School Facilities	Interim Housing	Administrative Support	Total Cost
Elementary (K-5)	$33,472,400	449	$74,549	$3,212	$900	$78,661
Middle & High (6-12)	$44,026,666	508	$86,667	$3,352	$900	$90,919
Weighted Average (2)	$77,499,066	957	$80,981	$3,287	$900	$85,167

(1) Rounded to the nearest dollar.
(2) Reflects a weighted average based upon anticipated number of K-5 and 6-12 pupils expected to be generated.

School Facilities Impact per Dwelling Unit

The total estimated facilities cost for each new residential unit is determined by multiplying the facilities costs per student (Table XI) by the applicable student generation rate (Table IV) and is shown in the following table:

Table XII
Total Facilities Costs per Residential Unit

Housing Type	Per Pupil Cost	Composite -Wtd Avg. Student Generation Rate (1)	Composite -Wtd Avg. Facilities Cost Per Dwelling Unit (2)
Elementary (K-5)	$78,661	0.1436	$11,295
Middle &High (6-12)	$90,919	0.1625	$14,770
Weighted Average	$85,168	0.3060	$26,065

(1) Rounded to the nearest ten-thousandth.
(2) Facilities costs per dwelling unit as shown differs slightly from the product of the Per Pupil Cost and the SGRs shown above because the Per Pupil Cost is, in part, derived from the number of students generated to the nearest whole integer.

The District estimates that the weighted average assessable space of future multi-family dwelling units constructed within the expected unmitigated development will be approximately 1,414 square feet. This figure incorporates the weighted average size of future dwelling units as identified in Appendix “D”. Dividing the total facilities cost per dwelling unit of $26,065 by the average size of a dwelling unit yields a school facility cost of $18.43 per square foot.

As previously indicated, the current statutory development fee authorized by Government Code Section 65995 (b)(1) for new residential construction is $4.08 per square foot. Based on the District’s student generation rates, actual costs to provide school facilities and the average square footage for new dwelling units, the District, as outlined above, would need to levy an additional $14.35 per square foot to actually provide the school facilities necessitated by new residential development. This Report demonstrates that the school facilities impact amount per square foot equals $18.43 for future unmitigated residential development within the boundaries of the District, Thus, there is full justification for collecting the District’s share of the maximum statutory developer fee allowed of $4.08 per square foot (K-12) of new residential development.

Since the District’s school facilities impact per square foot is greater than the maximum statutory fee allowed under Government Code Section 65995 (b)(1), the District actually suffers <u>unmitigated</u> impacts from new residential development, which not only supports the collection of the statutory development fee for residential developments, but also those fees for new commercial/industrial development as provided for in Section Three of this Report. In this instance, TUSD is justified in levying and collecting the maximum fee per square foot from new residential developments in the amount indicated in the following Table:

Table XIII
Fee Allocation by School Type -- Residential Development

Authorized Fee Pursuant to Government Code Section 65995	Amount (*)
Statutory School Fee (Level I Fee)	$4.08 per square foot

* Fees collected by TUSD effective June 12, 2020 if adopted by the Board on April 13, 2020.

Table XIV identifies the facilities costs per dwelling unit and on a square foot basis -- the facilities cost per square foot, the amount of the proposed fee to be collected by TUSD and the net fee deficit for new development. As can be seen, the amount required is over five times the amount that can be collected ($4.08) by the TUSD if adopted by the Board:

Table XIV
Comparison of Facilities Cost to Currently Authorized Fee (*)

Facilities Cost Per D/U	Average SqFt Per Dwelling Unit	Facilities Cost Per Sqft	Current Fee Per Sqft	Fee Deficit Per Sqft
$26,065	1,414	$18.43	$4.08	($14.35)

* Fees collected by TUSD effective June 12, 2020 if adopted by the Board on April 13, 2020.

Section
Three

COMMERCIAL/INDUSTRIAL DEVELOPMENT

This Section of the Report identifies the school facilities impact from new commercial and industrial development.

School Facilities Impacts from Commercial/Industrial Development

Just as the District is required to establish the impact of new residential development on student enrollment and a corresponding need for additional school facilities, a similar nexus must be established between new commercial/industrial development and the corresponding need for additional school facilities. The four-step methodology used to quantify the impact of commercial/industrial development on student enrollment is discussed in this section of the report and is summarized as follows:

1. *Determine the number of employees required per square foot for specific types of commercial and industrial development (i.e., new jobs created within the school district).*
2. *Determine the number of new employees that would both live and work within the school district.*
3. *Determine the number of occupied housing units that would be associated with new employees.*
4. *Determine the number of new students generated from these employees utilizing the estimated student generation rates.*

Estimated Number of Employees per Square Foot

Because the utilization of commercial and industrial buildings varies significantly, in order to estimate the number of employees and hence, the number of school age children generated by employees, it is important that the relationship between the size of any commercial/industrial development and its associated employee base, be established for various development or land use types. To do this, the TUSD relied on survey results published in SANDAGs report entitled Traffic Generators Guide. This Traffic Generators Guide reflects data gleaned from a site-specific employment inventory of diverse developments throughout San Diego County. Multiple sites for 17 different development types are included in the survey data and the square footage and number of employees has been averaged for each development type yielding the average number of employees per thousand square feet as shown in the following table:

Table XV
Region-wide Employment Per 1,000 Square Feet by Development Type [1]

Development Type	Square Feet of Dev. Type	Total Employees	Employees per 1,000 Sqft. [2]
Self-Storage	34,191	2	0.058
Specialized Recreation	19,850	9	0.453
Hotel /Motel	165,200	184	1.114
Discount Retail Club	128,679	215	1.671
Commercial Strip Center	27,677	50	1.807
Regional Shopping Center	1,496,927	2,777	1.855
Car Dealers	28,433	57	2.005
Industrial Parks (No Commercial)	351,266	733	2.087
Community Shopping Center	151,525	363	2.396
Industrial Plants (Mult. Shift)	456,000	1,120	2.456
Neighborhood Shopping Center	69,509	178	2.561
Corporate Office (Single User)	127,331	342	2.686
Banks	9,203	26	2.825
Scientific Research & Development	221,184	673	3.043
Industrial/Business Parks	260,379	972	3.733
Commercial Offices (>100,000 sqft)	135,433	625	4.615
Commercial Offices (<100,000 sqft)	27,100	130	4.797
Medical Offices	15,306	96	6.272
Restaurants	5,267	48	9.113

(1) Source: SANDAG Publication, Traffic Generators Guide
(2) Employees per 1,000 Sqft = (Total Employees divided by Square Feet of Development Type x .0001)

Estimated Number of Employees Living & Working within the School District

In order to determine the minimum number of students that will be generated as a result of new commercial/industrial development, an estimate of the number of employees (i.e., parents of the children expected to attend schools within the District) that will both work and live within the District must be determined. To make this determination, SDFA relied on Census data and Worksite information provided by the Equal Employment Opportunity Commission (EEOC). Specifically, SDFA obtained employment and population estimates for the cities of Irvine, Santa Ana and Tustin. Tabulations of the Worksite and population estimates are contained in Appendix ‘F’.

Based on its American Community Survey (2006-2010), the US Census Bureau estimated that there was a total of 408,950 employees working within the cities of Irvine, Santa Ana and Tustin (the “Worksite Census Area”). The census data also contains “place of residence” information for these employees. The following table identifies the residential employee generation rate (REGR) for the three cities, which is determined by dividing the total number of employees within the Worksite Census Area by the total number of employees that *both live and work* within the boundaries of Worksite Census Area.

Table XVI
Estimated Resident Employees within the Worksite Census Area (1)

Jurisdiction	Total Employees	Place of Residence			Pct of Employees Residing in Irvine, Santa Ana or Tustin
		Irvine	Santa Ana	Tustin	
Irvine	216,375	42,265	19,910	7,495	32.20%
Santa Ana	154,675	6,390	41,630	5,460	34.58%
Tustin	37,900	2,815	4,490	6,325	35.96%
Total	408,950	51,470	66,030	19,280	33.45%

(1) Source: US Census Bureau American Community Survey (2006-2010)

Because the census data does not identify a place of residence which corresponds solely to the jurisdictional boundaries of the TUSD, it was assumed that the REGR for the Worksite Census Area would produce a close approximation of the actual REGR for the TUSD. This assumption is reasonable because the commercial and industrial development characteristics of areas outside of the TUSD but within the jurisdictional boundaries of the Worksite Census Area are similar to those of commercial and industrial developments within the boundaries of the TUSD.

It should be noted that by considering only those employees that both live and work within the TUSD (as expressed by the REGR), the District is being conservative in its estimate of the impact of commercial/industrial development on student enrollment because the methodology identified herein does not take into account any students who may attend schools within the District as a result of Education Code Section 48204 (i.e., interdistrict transfers). Section 48204 of the Education Code permits employees working within the school district who do not reside within the boundaries of the school district to request that their children be permitted to attend a school within the boundaries of the District in which they work. The census data suggests that approximately sixty-seven percent (67%) of Worksite Census Area workers commute from outside of the Worksite Census Area to their jobs.

Nevertheless, by multiplying the number of employees per thousand square feet as shown in Table XV by the REGR computed for the Worksite Census Area, one can derive a REGR for the various commercial/industrial development types. The following table indicates that for every 1,000 square feet of new commercial or industrial development, expected residential employee generation ranges from a low of 0.019 employees for *Self-Stor5age* to a high of 3.048 employees for *Restaurants*.

Table XVII
Resident Employee Generation Factors by Development Type

Development Type	Employees per 1,000 Sqft.	Residential Employment Generation Rate	Resident Employee Per 1,000 Sqft.
Self-Storage	0.058	.3345	0.019
Specialized Recreation	0.453	.3345	0.152
Lodging	1.114	.3345	0.373
Discount Retail Club	1.671	.3345	0.559
Commercial Strip Center*	1.807	.3345	0.604
Regional Shopping Center	1.855	.3345	0.620
Car Dealers*	2.005	.3345	0.671
Industrial Parks (No Commercial)	2.087	.3345	0.698
Community Shopping Center	2.396	.3345	0.801
Industrial Plants (Mult. Shift)*	2.456	.3345	0.821
Neighborhood Shopping Center	2.561	.3345	0.857
Corporate Office (Single User)	2.686	.3345	0.898
Banks	2.825	.3345	0.945
Scientific Research & Development	3.043	.3345	1.018
Industrial/Business Parks	3.733	.3345	1.249
Commercial Offices (>100,000 sqft)	4.615	.3345	1.544
Commercial Offices (<100,000 sqft)	4.797	.3345	1.604
Medical Offices	6.272	.3345	2.098
Restaurants*	9.113	.3345	3.048

Estimated Household Rate per Resident Worker

In order to quantify the impact of these residential workers on the District, two additional relationships must be established. The first of these is the number of households per resident worker. Utilizing estimates of occupied housing within the Worksite Census Area as prepared by the California Department of Finance, SDFA identified the household rate (i.e., the number of occupied housing units per residential worker) to be 0.7596:

Table XVIII
Household Rate for Worksite Census Area

Worksite Census Area Component	Resident Workers (Irvine, Santa Ana or Tustin)	Occupied Housing Units	Household Rate *
City of Irvine	51,470	81,165	63.41%
City of Santa Ana	66,030	73,242	90.15%
City of Tustin	19,280	25,662	75.13%
Aggregate Worksite Census Area	**136,780**	**180,069**	**75.96%**

Source: 2006-2010 Census Data and 2013 Housing Unit Estimates from the California Department of Finance
** Household Rate = Occupied Housing Units / Resident Workers*

By applying the household generation rate for the Worksite Census Area of .7596 to the Resident Employee Generation Factors shown in Table XVII, housing units required per employee for each commercial/industrial land use category can then be determined. Expected household generation per 1,000 square feet of commercial/industrial development appears in the following table:

Table XIX
Household Generation for Commercial/Industrial Land Uses

Development Type	Residential Employees per 1,000 Sqft.	Household Generation Rate	District Households Per 1,000 Sqft
Self-Storage	0.019	.7596	0.015
Specialized Recreation	0.152	.7596	0.115
Lodging	0.373	.7596	0.283
Discount Retail Club	0.559	.7596	0.425
Commercial Strip Center*	0.604	.7596	0.459
Regional Shopping Center	0.620	.7596	0.471
Car Dealers*	0.671	.7596	0.509
Industrial Parks (No Commercial)	0.698	.7596	0.530
Community Shopping Center	0.801	.7596	0.609
Industrial Plants (Mult. Shift)*	0.821	.7596	0.624
Neighborhood Shopping Center	0.857	.7596	0.651
Corporate Office (Single User)	0.898	.7596	0.682
Banks	0.945	.7596	0.718
Scientific Research & Development	1.018	.7596	0.773
Industrial/Business Parks	1.249	.7596	0.948
Commercial Offices (>100,000 sqft)	1.544	.7596	1.172
Commercial Offices (<100,000 sqft)	1.604	.7596	1.219
Medical Offices	2.098	.7596	1.593
Restaurants*	3.048	.7596	2.315

School Facilities Cost from Commercial/Industrial Development

Since the school facilities cost per new dwelling unit was already identified in Table XII, by applying the total cost per dwelling unit to the district household generation shown in Table XIX, the gross school facilities impact of commercial/industrial development can be determined. The resulting facilities cost per square foot is shown in Table XX and ranges from $.038 to $60.35 per square foot of development.

Table XX
Gross School Facilities Impact for Commercial/Industrial Land Uses

Development Type	District Households Per Sqft of Non-Res. Dev.	School Facilities Cost Per Dwelling Unit	Gross Facilities Cost Per Sqft of Commercial/industrial Development
Self-Storage	0.0000147	$26,0650.00	$0.38
Specialized Recreation	0.0001151	$26,065.00	$3.00
Lodging	0.0002830	$26,065.00	$7.38
Discount Retail Club	0.0004245	$26,065.00	$11.07
Commercial Strip Center*	0.0004591	$26,065.00	$11.97
Regional Shopping Center	0.0004713	$26,065.00	$12.28
Car Dealers*	0.0005094	$26,065.00	$13.28
Industrial Parks (No Commercial)	0.0005032	$26,065.00	$13.82
Community Shopping Center	0.0006087	$26,065.00	$15.87
Industrial Plants (Mult. Shift)*	0.0006240	$26,065.00	$16.26
Neighborhood Shopping Center	0.0006506	$26,065.00	$16.96
Corporate Office (Single User)	0.0006824	$26,065.00	$17.79
Banks	0.0007177	$26,065.00	$18.71
Scientific Research & Development	0.0007731	$26,065.00	$20.15
Industrial/Business Parks	0.0009484	$26,065.00	$24.72
Commercial Offices (>100,000 sqft)	0.0011725	$26,065.00	$30.56
Commercial Offices (<100,000 sqft)	0.0012187	$26,065.00	$31.77
Medical Offices	0.0015935	$26,065.00	$41.53
Restaurants*	0.0023152	$26,065.00	$60.35

Commercial/Industrial Development Impact

As noted, the school facilities impact shown above represents the total cost to provide school facilities required to serve new students resulting from the construction of new commercial/industrial development. This amount reflects the gross impact of such development and does not consider the impact fees already collected from new residential construction. Nor does it consider that as new commercial/industrial development occurs, some portion of the new employees will be housed in existing housing (from which no additional residential impact fee may be collected). Assuming that each resident employee also resides in a dwelling unit for which the statutory fee amount has also been paid, one could then derive the net facilities impact associated with each development type. If the statutory fee of $4.08 per square foot is imposed on the average home size of 1,414 per square foot (see Table XIV), then a total of $5,769 would be collected for each dwelling unit leaving a facilities deficit of $20,296 per dwelling unit. By applying the Per Square Foot Household Factors (PSFHF) shown in Table XX, one can then identify the net facilities impact.

The following table shows the *net facilities* impact remaining if the currently authorized maximum statutory fee (Level I Fee) was collected from all new residential development:

By multiplying the "fee deficit per D/U" of $20,296 by the PSFHF applicable to each of the non-residential development types, we can then see the net facilities cost remaining after collection of the statutory residential fee:

Table XXI
Net Facilities Deficit After Collection of Residential Impact Fee

Development Type	District Households Per Square Foot of Non-Residential Development	Unfunded Impact Per Square Foot After Collection of Statutory Fee
Self-Storage	0.0000147	$0.10
Specialized Recreation	0.0000115	$2.43
Lodging	0.0000283	$5.98
Discount Retail Club	0.0004245	$8.98
Commercial Strip Center*	0.0004591	$9.71
Regional Shopping Center	0.0004713	$9.96
Car Dealers*	0.0005094	$10.77
Industrial Parks (No Commercial)	0.0005032	$11.21
Community Shopping Center	0.0006087	$12.87
Industrial Plants (Mult. Shift) *	0.0006240	$13.19
Neighborhood Shopping Center	0.0006506	$13.76
Corporate Office (Single User)	0.0006824	$14.43
Banks	0.0007177	$15.18
Scientific Research & Development	0.0007731	$16.35
Industrial/Business Parks	0.0009484	$20.05
Commercial Offices (>100,000 sqft)	0.0011725	$24.79
Commercial Offices (<100,000 sqft)	0.0012187	$25.77
Medical Offices	0.0015935	$33.69
Restaurants*	0.0002315	$48.95

Thus, assuming that all employees working in new non-residential developments within the District also reside in new housing within the District and the District was collecting the current statutory fee (Level I) of $4.08 per square foot from each home, a fee deficit *after collecting the maximum statutory fee for residential development* would still range between $0.10 (Self-Storage) and $48.95 (Restaurants) per square foot of new non-residential development.

Thus, based on TUSD's authorized share of the proposed non-residential fee (i.e., $0.66 per square foot of non-residential development), assuming that every employee within the TUSD also resided within the TUSD and was housed in a dwelling unit for which the statutory fee (Level I Fee) for residential and the statutory non-residential fee was collected, with the exception of Self-Storage, a net facilities funding deficit would still remain for all of the development types listed in Table XXI .

And as previously mentioned, this analysis does not consider inter-district transfers pursuant to Education Code Section 48204. Section 48204 of the Education Code permits employees working within the school district who do not reside within the boundaries of the school district to request that their children be permitted to attend a school within the boundaries of the District in which they work. For any of these pupils, the District will have collected no corresponding residential development impact fees.

Pursuant to Government Code Section 65995(b)(2), a unified school district is authorized to collect $0.66 per square foot of new commercial/industrial development. Since not all employees reside within the District and live in homes that have or will pay statutory school fees, for Self-Storage development, the District is justified in collecting the gross school facility impact of $0.38 per square foot as indicated in Table XX. For all other commercial/industrial development types shown in Table XXI, TUSD is justified in levying the maximum fee of $0.66 per square foot as shown in the following table.

Table XXII
Authorized Development Fee -- Commercial/Industrial Development

Fee Component	Total Statutory Fee Collected per Government Code §65995
Authorized Statutory Fee (Level 1) Per Square Foot of New Commercial/Industrial Development	$0.66 per square foot

Impacts from Senior Housing

As it relates to the imposition of developer fees upon senior citizen housing projects, Section 65995.1(a) of the Government Code reads as follows:

> *Notwithstanding any other provision of law, as to any development project for the construction of senior citizen housing, as described in Section 51.3 of the Civil Code, a residential care facility for the elderly as described in subdivision (k) of Section 1569.2 of the Health and Safety Code[1], or a multilevel facility for the elderly as described in paragraph (9) of subdivision (d) of Section 15432, any fee charge, dedication or other requirement that is levied under Section 53080[2] may be applied only to new construction and is subject to the limits and conditions under subdivision (b) of Section 65995 in the case of commercial or industrial development.*
>
> *[1] Although described in subdivision (k), the definition is found under subdivision (o) and (p).*
> *[2] Government Code Section 53080 was revised to Education Code Section 17620.*

The District acknowledges that students will not reside in senior citizen housing units. However, the development of such housing generally generates jobs for facilities maintenance and administration, and in the case of assisted care living situations, health professionals. These jobs may be filled by persons living either within the boundaries of the District or outside the boundaries of the District. In either case, the employees may enroll their students in the District. As, a result some students may be generated as a result of the development of new senior citizen housing.

The District conducted a survey of senior citizen housing projects within the District- both assisted-care and independent-living facilities and as a result of applying the methodology used to quantify the impacts of commercial and industrial development as set forth in this report, determined that the expected facilities cost per square foot of senior housing was $2.40. Thus, the District acknowledges Section 65995.1 and will levy its share of developer fees on any senior citizen housing projects at the current commercial/industrial rate of $0.66 per square foot.

Redevelopment

Redevelopment means the voluntary demolition of existing residential dwelling units or commercial or industrial construction and the subsequent construction of new residential dwelling units or commercial/industrial construction ("Redevelopment").

The District acknowledges that Redevelopment projects, more specifically, the demolishing of existing development replaced with new construction, may occur within the next five-year period. In such a situation, the District shall levy school fees authorized pursuant to Education Code Section 17620 and Government Code Sections 65995 et seq. ("School Fees") if there is a nexus established between the impact of the new construction in terms of a net increase in students generated and the fee to be imposed. In other words, the School Fees must bear a nexus to the burden caused by the Redevelopment project.

The purpose of this section is to set forth a general policy for the levy of Statutory School Fees on future Redevelopment projects within the District. The District may levy the applicable Statutory School Fees if an unmitigated impact exists once an analysis has been done on the impact on school facilities from such construction and consideration has been given as to the applicability of a "credit" for previously existing impacts, if any.

The analysis will identify if the Redevelopment project results in any additional impact to the District by comparing the potential students to be generated from the new construction to the potential students generated from the existing construction to be demolished. Statutory School Fees will be assessed only to the extent of the net school facilities impact from the new construction as noted above, but in no event will the School Fees assessed be greater than the applicable Statutory School Fees.

The District will perform an analysis utilizing the above-mentioned criteria to determine the applicability of Statutory School Fees to each Redevelopment project presented to the District.

Section
Four

CONCLUSIONS & STATEMENT OF FINDINGS

Based upon the data gathered by SDFA regarding future development within the boundaries of the TUSD, student generation, school facilities costs and the methodology employed to determine the school facilities impact from new residential and commercial development, TUSD makes the following findings pursuant to Section 66001 of the California Government Code:

- *The purpose of the fee is to pay for the construction and/or acquisition of new school facilities and equipment necessary to serve students expected to be generated from new residential and commercial/industrial development.*

- *The fees will be collected and may be used to repay debt service on bonds issued for the purpose of providing new school facilities or to pay directly for the acquisition and/or construction of such facilities and equipment. The fees may also be used to pay for the leasing or acquisition of portable classrooms to meet the temporary needs of students generated from new development.*

- *There is a reasonable relationship between the expected use of the fee (i.e., new school facilities and equipment) and the development on which the fee is imposed (i.e., new residential, commercial and industrial development) because additional students will be generated by new residential and commercial/industrial development.*

- *There is a reasonable relationship between the number of new residential units constructed and the number of elementary school students expected to be generated from the construction of such units. There is also a reasonable relationship between the construction of new commercial and industrial development and the number of students expected to be generated from the construction of such commercial/industrial development, as the parents of students will be employed by new businesses occupying the new commercial or industrial development and a portion of the students' parents will also choose to live within the boundaries of the District.*

- *There is a reasonable relationship between the amount of the fee identified in this Report and the cost of the school facilities to be constructed and deemed required to serve new residential, commercial and industrial developments.*

- *There is a reasonable relationship between the amount of the fee identified in this Report and the cost of the school facilities to be constructed and deemed required to serve new development projects that are intended to house senior citizens.*

Section
Five

APPENDICES

Appendix A: School Capacity Worksheet

Appendix B: Department of Finance – Population & Household Projections

Appendix C: Student Generation Rate Computations

Appendix D: Future Development Projects

Appendix E: School Facilities Cost Estimates

Appendix F: 2006-10 Census Data – Employment & Housing

Appendix A: School Capacity Worksheet

Tustin Unified School District
Capacity Calculation - State Loading Standards

Fiscal Year 2019/20

	School	Total CR (1)	Current Classroom Counts (1) TK-6 (25)		7-12 (27)		Severe (9)		Non Severe (13)		Capacity 2019/20 100%	Enrollment 2019/20 Enrollment	State Loading 100% Capacity vs Enrollment +/-
ELEM	Arroyo	24	24	600		0	0	0	0	0	600	637	-37
ELEM	Benson	17	14	350		0	0	0	3	39	389	391	-2
ELEM	Beswick	12	11	275		0	0	0	1	13	288	511	-223
ELEM	Estock	21	21	525		0	0	0	0	0	525	516	9
ELEM	Guin Foss	15	15	375		0	0	0	0	0	375	427	-52
ELEM	Heideman	29	29	725		0	0	0	0	0	725	606	119
ELEM	Heritage	21	21	525		0	0	0	0	0	525	485	40
ELEM	Hicks Canyon	36	36	900		0	0	0	0	0	900	934	-34
ELEM	Ladera	14	14	350		0	0	0	0	0	350	318	32
ELEM	Loma Vista	25	22	550		0	0	0	3	39	589	469	120
ELEM	Myford	28	25	625		0	0	0	3	39	664	594	70
ELEM	Nelson	26	24	600		0	0	0	2	26	626	531	95
ELEM	Orchard Hills - k-8 (see below)	18	18	450		0	0	0	0	0	450	431	19
ELEM	Peters Canyon	22	19	475		0	0	0	3	39	514	510	4
ELEM	Red Hill	23	21	525		0	0	0	2	26	551	553	-2
ELEM	Thorman	30	30	750		0	0	0	0	0	750	787	-37
ELEM	Tustin Connect Academy	1	1	25		0	0	0	0	0	25	17	8
ELEM	Tustin Memorial Academy	22	22	550		0	0	0	0	0	550	602	-52
ELEM	Tustin Ranch	21	21	525		0	0	0	0	0	525	570	-45
		405	388		0		0		17		9,921	9,889	32

	School	Total CR	TK-6 (25)		7-12 (27)		Severe (9)	Non Severe (13)		2019/20 100%	2019/20 Enrollment	100% Capacity vs Enrollment +/-
MID	Columbus Tustin	38	0	0	28	756	0	5	65	821	808	13
MID	Currie	31	0	0	24	648	0	2	0	648	591	57
MID	Hewes	38	0	0	33	891	0	1	13	904	984	-80
MID	Orchard Hills	28	0	0	25	675	0	2	26	701	993	-292
MID	Pioneer	46	0	0	41	1107	0	1	13	1,120	1,189	-69
MID	Tustin Connect Academy	1	0	0	1	27	0	0	0	27	31	-4
MID	Utt	36	0	0	29	783	0	3	39	822	937	-115
	Totals	218	0		181		0	14		5,043	5,533	-490

	School	Total CR	TK-6 (25)		7-12 (27)		Severe (9)		Non Severe (13)		2019/20 100%	2019/20 Enrollment	100% Capacity vs Enrollment +/-
HIGH	Beckman	107		0	91	2457	0	0	6	78	2,535	2,947	-412
HIGH	Foothill	95		0	81	2187	0	0	6	78	2,265	2,424	-159
HIGH	Hillview/Sycamore at Lambert	25		0	13	351	0	0	0	0	351	230	121
HIGH	Tusin Connect Center	3		0	3	273	0	0	0	0	273	98	175
HIGH	Tustin	97		0	82	2214	0	0	8	104	2,318	2,282	36
		327	0		270		0		20		7,742	7,981	-239

SUMMARY	Total CR	TK-6	7-12	Severe	Non Severe	2019/20 Capacity 100%	2019/20 Enrollment	100% Capacity vs Enrollment +/-
	950	388	451	0	51	22,706	23,403	-697

(1) Classroom Counts exclude classroom facilities that do not meet state requirements (i.e., less < 960 square feet) or which are used for other educational purposes (ROP, etc).

Appendix A-1

Appendix B: DOF – Population & Household Projections

Table 2: E-5 City/County Population and Housing Estimates, 1/1/2013

County / City	POPULATION			HOUSING UNITS							Vacancy Rate	Persons per Household
	Total	Household	Group Quarters	Total	Single Detached	Single Attached	Two to Four	Five Plus	Mobile Homes	Occupied		
Orange County												
Aliso Viejo	49,477	49,008	469	19,251	7,002	5,176	666	6,407	0	18,574	3.5%	2.64
Anaheim	346,161	342,604	3,557	105,846	44,903	8,902	11,390	35,966	4,685	99,811	5.7%	3.43
Brea	41,394	41,325	69	15,365	8,550	1,412	497	3,899	1,007	14,826	3.5%	2.79
Buena Park	81,953	81,139	814	24,714	14,396	1,812	1,740	6,413	353	23,774	3.8%	3.41
Costa Mesa	111,358	108,607	2,751	42,162	16,641	4,301	5,714	14,576	930	39,986	5.2%	2.72
Cypress	48,547	48,045	502	16,094	9,819	2,594	576	2,684	421	15,680	2.6%	3.06
Dana Point	33,863	33,622	241	15,960	8,724	1,995	2,633	2,372	236	14,201	11.0%	2.37
Fountain Valley	56,180	55,743	437	19,196	12,632	1,897	682	3,594	391	18,679	2.7%	2.98
Fullerton	138,251	134,246	4,005	47,976	24,279	4,856	4,040	13,922	879	45,492	5.2%	2.95
Garden Grove	173,075	171,134	1,941	47,702	27,284	3,976	4,188	10,626	1,628	45,986	3.6%	3.72
Huntington Beach	193,616	192,726	890	78,732	38,741	9,219	9,649	18,036	3,087	74,884	4.9%	2.57
Irvine	231,117	214,949	16,168	86,376	32,604	16,722	4,734	31,151	1,165	81,165	6.0%	2.65
Laguna Beach	23,105	23,016	89	12,958	8,533	686	1,523	1,927	289	10,851	16.3%	2.12
Laguna Hills	30,703	30,334	369	10,993	6,399	1,917	571	1,754	352	10,421	5.2%	2.91
Laguna Niguel	64,065	63,817	248	25,392	14,458	5,107	1,406	4,373	48	24,309	4.3%	2.63
Laguna Woods	16,500	16,333	167	13,079	918	3,721	2,237	6,203	0	11,360	13.1%	1.44
La Habra	61,202	60,862	340	19,963	10,560	1,509	1,553	5,449	892	19,015	4.7%	3.20
Lake Forest	78,501	77,986	515	27,142	14,683	4,125	1,513	5,549	1,272	26,276	3.2%	2.97
La Palma	15,818	15,798	20	5,234	3,764	469	127	861	13	5,090	2.8%	3.10
Los Alamitos	11,626	11,383	243	4,362	2,074	371	766	1,050	101	4,219	3.3%	2.70
Mission Viejo	94,824	93,882	942	34,307	24,771	4,122	936	4,427	51	33,284	3.0%	2.82
Newport Beach	86,436	86,034	402	44,221	20,146	7,010	5,114	10,777	1,174	38,775	12.3%	2.22
Orange	138,792	132,303	6,489	45,215	26,052	4,865	4,884	8,192	1,222	43,467	3.9%	3.04
Placentia	51,776	51,439	337	17,049	10,078	1,911	1,398	3,077	585	16,537	3.0%	3.11
Rancho Santa Margarita	48,550	48,548	2	17,268	9,355	3,538	622	3,743	10	16,673	3.4%	2.91
San Clemente	64,542	64,269	273	26,018	14,844	2,602	4,092	3,879	601	23,954	7.9%	2.68
San Juan Capistrano	35,321	35,234	87	12,022	6,402	2,362	795	1,079	1,384	11,472	4.6%	3.07
Santa Ana	329,915	324,685	5,230	76,968	35,481	5,657	7,499	24,283	4,048	73,242	4.8%	4.43
Seal Beach	24,487	24,263	224	14,546	4,734	1,518	1,120	7,020	154	13,004	10.6%	1.87
Stanton	38,764	38,414	350	11,296	3,059	1,799	1,321	3,679	1,438	10,837	4.1%	3.55
Tustin	77,983	77,463	520	26,958	9,454	3,564	4,048	8,983	909	25,662	4.8%	3.02
Villa Park	5,900	5,855	45	2,018	1,987	23	8	0	0	1,978	2.0%	2.96
Westminster	91,169	90,499	670	27,715	14,907	2,056	2,478	5,129	3,145	26,226	5.4%	3.45
Yorba Linda	66,437	66,247	190	22,751	17,852	2,245	760	1,466	428	22,007	3.3%	3.01
Balance Of County	120,396	119,628	768	39,346	30,476	3,794	865	3,578	633	37,835	3.8%	3.16
Incorporated	2,961,408	2,911,812	49,596	1,016,849	506,086	124,039	91,280	262,546	32,898	961,717	5.4%	3.03
County Total	3,081,804	3,031,440	50,364	1,056,195	536,562	127,833	92,145	266,124	33,531	999,552	5.4%	3.03

J-b-54

California Department of Finance
Demographic Research Unit

Appendix C: Student Generation Rate Computations

Tustin Unified School District

Student Generation Rate Computations - Dwelling Units Permitted from Project Inception through December 31, 2018
(Reflects Dwelling Units Constructed within CFD Nos. 88-1, 97-1, 06-1, 07-1 and 14-1)

CFD	Project Number	Project Name	Tract No.	Permitted Dwelling Units	Permitted D/Us with Sq Ft	Permitted Square Footage	Average Square Footage	Student Totals Grades K- 5	Grades 6 - 8	Grades 9 -12	Grades K - 12	Student Generation Rates Grades K- 5	Grades 6 - 8	Grades 9 -12	Grades K - 12
Apartment Units:															
07-1	99	Orchard Hills Apartments	16529	500	500	796,384	1,593	72	57	46	175	0.1440	0.1140	0.0920	0.3500
88-1	1	Rancho Maderas	13030	266	0			45	17	24	86	0.1692	0.0639	0.0902	0.3233
88-1	2	Rancho Tierra	13038	252	0			54	33	30	117	0.2143	0.1310	0.1190	0.4643
88-1	12	Rancho Mariposa	13735	238	0			23	9	13	45	0.0966	0.0378	0.0546	0.1891
88-1	14	Sierra Vista	13786	306	0			31	12	17	60	0.1013	0.0392	0.0556	0.1961
88-1	15	Shadow Canyon	13788	170	0			11	4	13	28	0.0647	0.0235	0.0765	0.1647
88-1	29	Rancho Monterey	14447	436	0			46	27	27	100	0.1055	0.0619	0.0619	0.2294
88-1	37	Rancho Santa Fe	15350	316	0			72	42	41	155	0.2278	0.1329	0.1297	0.4905
97-1	54	Estancia	15652-A	388	388	515,480	1,329	144	46	60	250	0.3711	0.1186	0.1546	0.6443
97-1	55	Solano	15652-B	356	356	424,941	1,194	79	24	23	126	0.2219	0.0674	0.0646	0.3539
97-1	56	Montecito Vista (Affordable)	15661	162	162	212,248	1,310	25	28	37	90	0.1543	0.1728	0.2284	0.5556
97-1	68	Somerset	15871	378	756	565,012	747	42	15	26	83	0.1111	0.0397	0.0688	0.2196
97-1	76	Las Palmas	15922-A	380	380	577,966	1,521	44	20	43	107	0.1158	0.0526	0.1132	0.2816
97-1	77	Anacapa	15922-B	736	736	888,429	1,207	85	40	57	182	0.1155	0.0543	0.0774	0.2473
97-1	94	Serrano	16319	756	756	910,093	1,204	68	24	86	178	0.0899	0.0317	0.1138	0.2354
MCAS	Aff	Amalfi (St Anton) - 3100 Park	17404	225	225	285,487	1,269	44	13	18	75	0.1956	0.0578	0.0800	0.3333
MCAS	Mkt	Anton @ Legacy - 16000 Legacy	17404	533	533	781,044	1,465	12	3	1	16	0.0225	0.0056	0.0019	0.0300
Total Apartment Dwelling Units:				6,398	4,792	5,957,084	1,243	897	414	562	1,873	0.1402	0.0647	0.0878	0.2927
Single-Family Attached (SFAs):															
06-1	102	Cambridge	16857	156	156	203,695	1,306	19	8	6	33	0.1218	0.0513	0.0385	0.2115
06-1	103	Camden	16857	222	222	354,108	1,595	39	12	12	63	0.1757	0.0541	0.0541	0.2838
06-1	105	Meriwether	16857	114	114	187,085	1,641	19	1	2	22	0.1667	0.0088	0.0175	0.1930
06-1	107	Mirabella	16857	60	60	114,594	1,910	7	4	4	15	0.1167	0.0667	0.0667	0.2500
14-1	115	Terraza	16719	149	149	307,459	2,063	36	13	10	59	0.2416	0.0872	0.0671	0.3960
88-1	6	Arcadia	13096	237	0	0		32	25	24	81	0.1350	0.1055	0.1013	0.3418
88-1	7	Sevilla	13106	110	0	0		19	9	15	43	0.1727	0.0818	0.1364	0.3909
88-1	8	Estancia	13161	145	0	0		10	10	13	33	0.0690	0.0690	0.0897	0.2276
88-1	10	Miramonte	13733	138	0	0		21	26	35	82	0.1522	0.1884	0.2536	0.5942
88-1	13	Mandevilla	13746	316	0	0		23	5	11	39	0.0728	0.0158	0.0348	0.1234
88-1	16	Corte Villa	13796	108	0	0		10	8	12	30	0.0926	0.0741	0.1111	0.2778
88-1	17	Rancho Vera Cruz	13824	317	0	0		18	3	4	25	0.0568	0.0095	0.0126	0.0789
88-1	18	Venturanza	13835	268	55	174,418	3,171	45	35	30	110	0.1679	0.1306	0.1119	0.4104
88-1	22	Ventana	14110	129	0	0		12	16	12	40	0.0930	0.1240	0.0930	0.3101
88-1	27-A	Presidio	14381	32	0	0		9	6	4	19	0.2813	0.1875	0.1250	0.5938
88-1	27-B	Presidio	14567	33	0	0		5	1	10	16	0.1515	0.0303	0.3030	0.4848
88-1	27-C	Presidio	14748	102	0	0		27	15	9	51	0.2647	0.1471	0.0882	0.5000
88-1	30	Cantada	14499	208	0	0		29	10	12	51	0.1394	0.0481	0.0577	0.2452
88-1	34	The Orchards	14883	223	0	0		26	16	26	68	0.1166	0.0717	0.1166	0.3049
97-1	58	Sheridan Place	15712	147	147	289,002	1,966	36	25	28	89	0.2449	0.1701	0.1905	0.6054
97-1	60	Brisbane	15740	130	130	275,530	2,119	21	16	18	55	0.1615	0.1231	0.1385	0.4231
97-1	61	Evergreen	15741	108	108	283,848	2,628	20	23	25	68	0.1852	0.2130	0.2315	0.6296
97-1	72	Summer Place	15875	69	69	172,335	2,498	12	11	11	34	0.1739	0.1594	0.1594	0.4928
97-1	74	Mandeville	15877	132	132	260,556	1,974	37	17	21	75	0.2803	0.1288	0.1591	0.5682
97-1	75	Andover	15878	138	138	257,007	1,862	35	21	31	87	0.2536	0.1522	0.2246	0.6304
97-1	81	Auburn	15975	152	152	328,268	2,160	45	17	22	84	0.2961	0.1118	0.1447	0.5526
97-1	82	San Simeon	15976	116	98	200,757	2,049	24	26	28	78	0.2069	0.2241	0.2414	0.6724
97-1	88	Vintner's Reserve	16080	64	64	162,078	2,532	9	10	21	40	0.1406	0.1563	0.3281	0.6250
97-1	92	San Juan Batista	16084	108	108	225,141	2,085	16	15	28	59	0.1481	0.1389	0.2593	0.5463
97-1	93	Monticello	16085	112	104	211,816	2,037	13	8	17	38	0.1161	0.0714	0.1518	0.3393
97-1	96	Tamarisk	16644	113	113	157,002	1,389	32	9	13	54	0.2832	0.0796	0.1150	0.4779
Total Single-Family Attached (SFAs):				4,456	2,119	4,164,699	1,965	706	421	514	1,641	0.1584	0.0945	0.1154	0.3683
Single-Family Detached (SFDs):															
06-1	101	Astoria	16857	102	102	298,214	2,924	26	5	1	32	0.2549	0.0490	0.0098	0.3137
06-1	104	Gables	16857	84	84	257,187	3,062	17	3	2	22	0.2024	0.0357	0.0238	0.2619
06-1	106	Verandas	16857	97	97	211,020	2,175	27	10	5	42	0.2784	0.1031	0.0515	0.4330
14-1	108	La Vita	16702	72	72	260,108	3,613	10	7	4	21	0.1389	0.0972	0.0556	0.2917
14-1	109	Saviero/Pasadena	16703	90	64	251,039	3,922	13	9	8	30	0.1444	0.1000	0.0889	0.3333
14-1	110	Vicenza	16704	91	91	364,354	4,004	24	17	14	55	0.2637	0.1868	0.1538	0.6044
14-1	111	Messina	16705	43	37	137,496	3,716	7	4	1	12	0.1628	0.0930	0.0233	0.2791
14-1	112	Tevi II	16707	35	29	154,708	5,335	8	5	5	18	0.2286	0.1429	0.1429	0.5143
14-1	113	Amelia	16708	70	65	300,357	4,621	12	8	7	27	0.1714	0.1143	0.1000	0.3857
14-1	114	Lucia (Amelia Ext)	16709	17	4	17,626	4,407	0	0	1	1	0.0000	0.0000	0.0588	0.0588
14-1	116	Strada	16722-Ptn	59	59	151,063	2,560	14	7	8	29	0.2373	0.1186	0.1356	0.4915
14-1	117	Messina II	16741	59	59	218,122	3,697	20	7	9	36	0.3390	0.1186	0.1525	0.6102
14-1	118	Trevi	17091	37	35	199,412	5,697	9	6	5	20	0.2432	0.1622	0.1351	0.5405
14-1	119	Capella	17619	72	72	221,669	3,079	32	12	8	52	0.4444	0.1667	0.1111	0.7222
14-1	120	Trevi III	17628	10	6	31,498	5,250	0	1	1	2	0.0000	0.1000	0.1000	0.2000
14-1	121	Bella Vista	17746	95	26	132,130	5,082	7	6	3	16	0.0737	0.0632	0.0316	0.1684
14-1	122	Alta Vista	17746	97	31	181,488	5,854	5	3	6	14	0.0515	0.0309	0.0619	0.1443
14-1	123	Varenna	17768	99	43	111,490	2,593	5	3	1	9	0.0505	0.0303	0.0101	0.0909
14-1	124	Pavoda	17767	69	12	37,997	3,166	4	3	3	10	0.0580	0.0435	0.0435	0.1449
88-1	3	Almeria	13053	118	0	0		18	14	24	56	0.1525	0.1186	0.2034	0.4746
88-1	4	Maricopa	13080	100	0	0		15	12	29	56	0.1500	0.1200	0.2900	0.5600
88-1	5	Monterey	13094	103	0	0		24	12	20	56	0.2330	0.1165	0.1942	0.5437
88-1	9	Malaga	13701	70	0	0		15	15	14	44	0.2143	0.2143	0.2000	0.6286
88-1	11	Pala Vista	13734	118	0	0		17	10	14	41	0.1441	0.0847	0.1186	0.3475
88-1	19	Montecito	13902	115	0	0		22	2	7	31	0.1913	0.0174	0.0609	0.2696
88-1	20	Sorrento	13908	97	0	0		9	6	10	25	0.0928	0.0619	0.1031	0.2577
88-1	21	Alicante	13990	91	0	0		16	15	17	48	0.1758	0.1648	0.1868	0.5275
88-1	23-A	San Miguel	14168	69	0	0		10	6	16	32	0.1449	0.0870	0.2319	0.4638
88-1	23-B	San Miguel	14669	69	0	0		20	10	18	48	0.2899	0.1449	0.2609	0.6957
88-1	24	San Marco	14188	57	0	0		8	8	14	30	0.1404	0.1404	0.2456	0.5263
88-1	25	Barcelona	14295	77	0	0		14	8	16	38	0.1818	0.1039	0.2078	0.4935
88-1	26-A	Serrano	14366	48	0	0		10	5	14	29	0.2083	0.1042	0.2917	0.6042
88-1	26-B	Serrano	14576	43	0	0		13	10	6	29	0.3023	0.2326	0.1395	0.6744
88-1	28	El Dorado	14410	171	0	0		53	38	58	149	0.3099	0.2222	0.3392	0.8713
88-1	31	Travilla	14782	94	0	0		16	8	5	29	0.1702	0.0851	0.0532	0.3085
88-1	32-A	Valencia	14784	98	0	0		10	10	11	31	0.1020	0.1020	0.1122	0.3163
88-1	32-B	Valencia	14837	52	0	0		9	9	9	27	0.1731	0.1731	0.1731	0.5192
88-1	33-A	Vidorra	14797	31	31	63,411	2,046	6	8	6	20	0.1935	0.2581	0.1935	0.6452
88-1	33-B	Vidorra	15428	30	2	3,572	1,786	10	4	14	28	0.3333	0.1333	0.4667	0.9333
88-1	33-C	Vidorra	15429	27	27	46,707	1,730	8	6	7	21	0.2963	0.2222	0.2593	0.7778
88-1	33-D	Vidorra	15430	34	34	60,846	1,790	9	7	8	24	0.2647	0.2059	0.2353	0.7059

Tustin Unified School District

Student Generation Rate Computations - Dwelling Units Permitted from Project Inception through December 31, 2018
(Reflects Dwelling Units Constructed within CFD Nos. 88-1, 97-1, 06-1, 07-1 and 14-1)

				Permitted	Permitted	Permitted	Average	Student Totals				Student Generation Rates			
CFD	Project Number	Project Name	Tract No.	Dwelling Units	D/Us with Sq Ft	Square Footage	Square Footage	Grades K- 5	Grades 6 - 8	Grades 9 -12	Grades K - 12	Grades K- 5	Grades 6 - 8	Grades 9 -12	Grades K - 12
88-1	35	La Montana	15292	65	0	0		9	11	19	39	0.1385	0.1692	0.2923	0.6000
88-1	36-A	Estrella	15316	28	28	48,482	1,732	8	4	8	20	0.2857	0.1429	0.2857	0.7143
88-1	36-B	Estrella	15373	3	0	0		2	0	0	2	0.6667	0.0000	0.0000	0.6667
88-1	36-C	Estrella	15374	30	0	0		5	9	13	27	0.1667	0.3000	0.4333	0.9000
88-1	36-D	Estrella	15375	10	10	16,472	1,647	3	2	0	5	0.3000	0.2000	0.0000	0.5000
88-1	38-A	Columbia/Westmont	15380	25	25	79,178	3,167	1	4	9	14	0.0400	0.1600	0.3600	0.5600
88-1	38-B	Columbia/Westmont	15502	9	9	27,962	3,107	1	0	0	1	0.1111	0.0000	0.0000	0.1111
88-1	38-C	Columbia/Westmont	15503	22	22	57,827	2,629	8	3	7	18	0.3636	0.1364	0.3182	0.8182
88-1	38-D	Columbia/Westmont	15504	17	17	51,174	3,010	3	5	6	14	0.1765	0.2941	0.3529	0.8235
88-1	38-E	Columbia/Westmont	15505	36	36	96,551	2,682	6	4	18	28	0.1667	0.1111	0.5000	0.7778
88-1	38-F	Columbia/Westmont	15506	23	23	60,327	2,623	10	5	5	20	0.4348	0.2174	0.2174	0.8696
88-1	38-G	Columbia/Westmont	15507	30	30	89,562	2,985	6	6	9	21	0.2000	0.2000	0.3000	0.7000
88-1	39	Madrid	15420	75	75	251,538	3,354	9	9	16	34	0.1200	0.1200	0.2133	0.4533
88-1	40-A	Arborwalk	15427	16	16	23,740	1,484	3	1	5	9	0.1875	0.0625	0.3125	0.5625
88-1	40-B	Arborwalk	15474	16	0	0		3	0	0	3	0.1875	0.0000	0.0000	0.1875
88-1	41	Arborwalk	15475	21	21	31,390	1,495	4	3	4	11	0.1905	0.1429	0.1905	0.5238
88-1	42-A	Tustin Estates	15563	46	38	184,812	4,863	8	4	12	24	0.1739	0.0870	0.2609	0.5217
88-1	42-B	Tustin Estates	15993	22	0	0		8	2	1	11	0.3636	0.0909	0.0455	0.5000
88-1	42-C	Tustin Estates	16184	51	27	149,172	5,525	7	3	8	18	0.1373	0.0588	0.1569	0.3529
88-1	43	Sedona	15568	130	90	200,896	2,232	35	27	34	96	0.2692	0.2077	0.2615	0.7385
88-1	44	Treviso	15601	44	33	135,084	4,093	5	6	14	25	0.1136	0.1364	0.3182	0.5682
88-1	45	Emerson	15681	114	107	397,577	3,716	11	14	33	58	0.0965	0.1228	0.2895	0.5088
88-1	97	Lennar - Tea Leaf	16782	25	0	0		9	7	9	25	0.3600	0.2800	0.3600	1.0000
97-1	46	Traditions	15432	127	114	394,867	3,464	27	13	22	62	0.2126	0.1024	0.1732	0.4882
97-1	47	Heritage	15433	46	46	118,642	2,579	15	5	15	35	0.3261	0.1087	0.3261	0.7609
97-1	48-A	Liberty	15434	74	74	165,473	2,236	16	13	19	48	0.2162	0.1757	0.2568	0.6486
97-1	48-B	Liberty	15512	72	72	188,552	2,619	20	8	19	47	0.2778	0.1111	0.2639	0.6528
97-1	49	Legacy	15435	37	23	93,605	4,070	2	1	12	15	0.0541	0.0270	0.3243	0.4054
97-1	50	Heritage	15511	65	37	94,604	2,557	15	10	17	42	0.2308	0.1538	0.2615	0.6462
97-1	51	Amberwood	15555	92	76	212,051	2,790	20	19	41	80	0.2174	0.2065	0.4457	0.8696
97-1	52	Glen Willows	15641	194	104	243,307	2,339	47	33	60	140	0.2423	0.1701	0.3093	0.7216
97-1	53	Briarwood	15642	78	20	65,164	3,258	15	7	14	36	0.1923	0.0897	0.1795	0.4615
97-1	57	Sheridan Square	15711	104	84	261,873	3,118	22	22	38	82	0.2115	0.2115	0.3654	0.7885
97-1	59	Terra Bella	15739	128	128	248,576	1,942	12	9	8	29	0.0938	0.0703	0.0625	0.2266
97-1	62-A	Sonoma	15742	42	35	90,490	2,585	4	8	11	23	0.0952	0.1905	0.2619	0.5476
97-1	62-B	Sonoma	15814	38	38	121,623	3,201	6	4	8	18	0.1579	0.1053	0.2105	0.4737
97-1	63	Mendocino	15743	88	88	258,916	2,942	15	17	27	59	0.1705	0.1932	0.3068	0.6705
97-1	64	Saratoga	15744	86	77	246,240	3,198	18	13	19	50	0.2093	0.1512	0.2209	0.5814
97-1	65-A	Brentwood	15745	71	71	251,321	3,540	14	16	20	50	0.1972	0.2254	0.2817	0.7042
97-1	65-B	Brentwood	15978	62	51	180,671	3,543	8	5	22	35	0.1290	0.0806	0.3548	0.5645
97-1	66-A	Huntington	15746	10	10	41,960	4,196	0	4	6	10	0.0000	0.4000	0.6000	1.0000
97-1	66-B	Huntington	15801	8	8	34,138	4,267	0	5	1	6	0.0000	0.6250	0.1250	0.7500
97-1	66-C	Huntington	15802	11	11	47,097	4,282	0	2	1	3	0.0000	0.1818	0.0909	0.2727
97-1	66-D	Huntington	15803	11	11	47,391	4,308	0	2	1	3	0.0000	0.1818	0.0909	0.2727
97-1	66-E	Huntington	15804	12	12	50,472	4,206	4	0	2	6	0.3333	0.0000	0.1667	0.5000
97-1	67	Cambria	15747	53	53	261,195	4,928	15	10	23	48	0.2830	0.1887	0.4340	0.9057
97-1	69	Concorde	15872	113	101	344,366	3,410	26	21	55	102	0.2301	0.1858	0.4867	0.9027
97-1	70	Barrington	15873	126	126	351,298	2,788	36	16	40	92	0.2857	0.1270	0.3175	0.7302
97-1	71	Kelsey Lane	15874	134	125	327,593	2,621	38	26	60	124	0.2836	0.1940	0.4478	0.9254
97-1	73	Wisteria	15876	164	164	329,142	2,007	37	27	34	98	0.2256	0.1646	0.2073	0.5976
97-1	78	Santa Venetia	15972	96	76	202,486	2,664	14	19	22	55	0.1458	0.1979	0.2292	0.5729
97-1	79	Mendocino North	15973	93	71	210,315	2,962	13	9	24	46	0.1398	0.0968	0.2581	0.4946
97-1	80	Miramar	15974	66	62	209,678	3,382	13	16	14	43	0.1970	0.2424	0.2121	0.6515
97-1	83	Monterey	15977	127	127	293,026	2,307	41	23	24	88	0.3228	0.1811	0.1890	0.6929
97-1	84-B	Huntington Collection	15980	13	13	58,475	4,498	1	1	4	6	0.0769	0.0769	0.3077	0.4615
97-1	84-C	Huntington Collection	16064	17	17	71,595	4,211	0	4	4	8	0.0000	0.2353	0.2353	0.4706
97-1	84-D	Huntington Collection	16065	15	15	67,172	4,478	0	1	3	4	0.0000	0.0667	0.2000	0.2667
97-1	84-E	Huntington Collection	16159	14	14	62,508	4,465	1	2	4	7	0.0714	0.1429	0.2857	0.5000
97-1	84-F	Huntington Collection	16160	10	10	45,353	4,535	0	1	3	4	0.0000	0.1000	0.3000	0.4000
97-1	84-G	Huntington Collection	16161	12	12	53,341	4,445	0	2	6	8	0.0000	0.1667	0.5000	0.6667
97-1	84-H	Huntington Collection	16162	15	14	62,828	4,488	3	2	1	6	0.2000	0.1333	0.0667	0.4000
97-1	84-I	Huntington Collection	16185	8	0	0		1	0	2	3	0.1250	0.0000	0.2500	0.3750
97-1	84-J	Huntington Collection	15979	8	8	30,994	3,874	0	0	0	0	0.0000	0.0000	0.0000	0.0000
97-1	85-A	Bel Air	16076	68	41	147,938	3,608	10	11	27	48	0.1471	0.1618	0.3971	0.7059
97-1	85-B	Bel Air	16077	53	29	108,567	3,744	6	12	22	40	0.1132	0.2264	0.4151	0.7547
97-1	86-A	Manchester	16078	42	25	95,757	3,830	5	11	12	28	0.1190	0.2619	0.2857	0.6667
97-1	86-B	Manchester	16086	26	26	99,025	3,809	9	1	6	16	0.3462	0.0385	0.2308	0.6154
97-1	86-C	Manchester	16087	27	27	104,163	3,858	10	6	14	30	0.3704	0.2222	0.5185	1.1111
97-1	87	Rutherford	16079	99	96	254,426	2,650	10	8	10	28	0.1010	0.0808	0.1010	0.2828
97-1	89	Triana	16081	92	91	314,469	3,456	8	5	10	23	0.0870	0.0543	0.1087	0.2500
97-1	90-A	Alder Creek	16082	51	50	126,873	2,537	18	11	16	45	0.3529	0.2157	0.3137	0.8824
97-1	90-B	Alder Creek	16088	80	56	144,687	2,584	24	15	26	65	0.3000	0.1875	0.3250	0.8125
97-1	91-A	Tiburon	16083	12	12	26,159	2,180	4	2	1	7	0.3333	0.1667	0.0833	0.5833
97-1	91-B	Tiburon	16172	10	10	21,456	2,146	4	2	4	10	0.4000	0.2000	0.4000	1.0000
97-1	91-D	Tiburon	16173	11	11	24,683	2,244	2	6	3	11	0.1818	0.5455	0.2727	1.0000
97-1	91-E	Tiburon	16174	13	13	27,544	2,119	1	3	3	7	0.0769	0.2308	0.2308	0.5385
97-1	91-F	Tiburon	16175	12	12	26,174	2,181	3	0	2	5	0.2500	0.0000	0.1667	0.4167
97-1	91-G	Tiburon	16176	12	12	26,361	2,197	0	2	8	10	0.0000	0.1667	0.6667	0.8333
97-1	92	San Juan Batista	16084	108	108	225,141	2,085	16	15	28	59	0.1481	0.1389	0.2593	0.5463
97-1	93	Monticello	16085	112	104	211,816	2,037	13	8	17	38	0.1161	0.0714	0.1518	0.3393
97-1	95	Mericort	16644	79	79	164,688	2,085	17	11	16	44	0.2152	0.1392	0.2025	0.5570
97-1	98	Montellena	16811	68	68	167,021	2,456	24	20	18	62	0.3529	0.2941	0.2647	0.9118
City	130	Sheldon	17507	103	103	216,519	2,102	11	3	4	18	0.1068	0.0291	0.0388	0.1748
City	131	Huntley	17507	77	77	219,481	2,850	19	3	2	24	0.2468	0.0390	0.0260	0.3117
City	132	Crawford	17507	96	96	332,073	3,459	31	2	1	34	0.3229	0.0208	0.0104	0.3542
City	133	Stafford	17507	99	99	376,432	3,802	27	2	0	29	0.2727	0.0202	0.0000	0.2929
Total Single-Family Detached (SFDs):				7,758	5,132	15,513,109	3,023	1,527	1,023	1,527	1,527	0.1968	0.1319	0.1968	0.5255
All Dwelling Types:				18,612	12,043	25,634,892	2,129	3,130	1,858	2,603	5,041	0.1682	0.0998	0.1399	0.4079
Weighted Average - Multi-Family				10,854	6,911	10,121,783	1,465	1,603	835	1,076	3,514	0.1477	0.0769	0.0991	0.3238

Appendix D: Future Development Projects

Tustin Unified School District
Pending and Future Development Areas - Unmitigated

General TUSD Location	Data Source	Project Status	Proposed Dwelling Type	Residential Land Use	Total Project D/Us	Permittted Prior to 01/01/2019	Net Future Unmitigated D/Us	Estimated Assessable Space Per Dwelling Unit [(1)]
City of Tustin - Future Projects: [(2)(3)]								
S.E. Corner of Sixth & "B" Street	Vintage Website	Under Construction	SFA	Identified	140	(25)	115	1,742 [(4)]
Unmitigated High Density [(5)]	Tustin Housing Element		Multi-family	Unidentified	426		426	1,500 [(6)]
Subtotal - City of Tustin [(3)]					**566**	**(25)**	**541**	**1,551**
Irvine Business Center (IBC): [(3)]								
Paseo Del Mar KB Homes (#42)	IBC Project List - Aug. 2018	Under Construction	Multi-family	Apartments/Condos	357	0	357	1,551 [(7)]
Subtotal - IBC [(3)]					**357**	**0**	**357**	**1,551**
Santa Ana Metro-East Overlay Zone & Other TUSD Areas: [(3)]								
Madison - 200 N. Cabrillo Park Drive (#3)	Planning Dept's Website	Entitled	Multi-family	6-Story Mixed Use	260		260	1,346 [(8)]
Central Point Mixed-Use 1801 East 4th St	Planning Dept's Website	Under review	Multi-family	5-Story Mixed Use	650		650	1,346 [(8)]
AMG Family Units 2114 First St. (#25) [(8)]	Planning Dept's Website	Under Construction	Multi-family	6-Story Mixed use	694	0	694	1,346 [(8)]
Avery @ The Grove (Sexlinger Farmhouse)	Planning Dept's Website	Entitled	SFD	2,340-2,777 Sqft	24		24	2,500
Wermer's Site 1660 E First St. (#26)	Planning Dept's Website	Entitled	Multi-family	6-Story Mixed use	601		601	1,346 [(8)]
Subtotal - Santa Ana [(3)]					**2,229**		**2,229**	**1,359**
				Total Future TUSD Residential Dwelling Units:	**3,152**		**3,127**	**1,414** [(9)]

(1) The plans and permit information for selected multifamily projects located within the Cities of Irvine, Santa Ana and Tustin were reviewed by SDFA in order to estimate the assessable space likely to be realized from similar projects to be constructed in the future.

(2) Excludes Future Development identified in the Housing Element as being located in Tustin/MCAS as that development has been mitigated with the formation of CFD No. 15-2.

(3) Includes only those projects that are located within the boundaries of TUSD and have not yet been constructed or were not issued a building permit as of January, 1, 2019.

(4) Average Square Footage of Project Ranges from 1,386 - 2,187 Square feet as identified on the Website for Vintage at Old Town Tustin by Taylor-Morrison.

(5) Of the 566 Multi-family units identified in the Housing Element of the 2013 General Plan, estimate assumes that 140 of those units are represented by the Vintage at Old Town project.

(6) Average Square Footage assumes a 50/ 50 mix of apartments and "for sale units with assessable space of 1,250 per apartment unit and average square footage of 1,750 for future "For-Sale condominium and townhome units. For that portion of the unidentified multi-family housing expected to be developed as apartments.

(7) For the Paseo Del Mar project located within the IBC, the average square footage was derived from the building permits issued in lated 2019 for 38 dwellling units.

(8) For the five and six-story residential and mixed-use projects expected in be developed within the the City of Santa Ana, the District estimates that the average assessable space per dwelling unit will be similar to the average assessable space computed for that portion of AMG Family Units for which permits were recently issued .

(9) Reflects the estimated weighted average of the 3,127 future unmitigated dwelling units expected to be constructed within District.

Appendix E: School Facilities Cost Estimates

TUSTIN UNIFIED SCHOOL DISTRICT
SUMMARY OF ESTIMATED COSTS

		Prototype Grade K-5 Elementary School	Prototype Grades 6-12 Academy School School
SITE ACQUISITION & DEVELOPMENT:			
Required Usable Acreage		10.0	40.0
Estimated Site Acquisition Costs (Per Acre)		$1,500,000	$0
Total Site Acquisition Costs (1)		$15,000,000	$0
Site Development Costs (Incl off-site, service site & utility services)	$100,000	$1,000,000	$4,000,000
Total Site Acquisition & Site Development Costs		$16,000,000	$4,000,000
SCHOOL CONSTRUCTION:			
Baseline Construction Cost Estimate (2)		$25,000,000	$100,000,000
TOTAL ESTIMATED COST:		$41,000,000	$104,000,000
DESIGN CAPACITY OF SCHOOL FACILITY		550	1,200
COST PER STUDENT		$74,545	$86,667

(1) Land price reflects District current estimated "average" land acquisition costs for future unidentified school sites; assumes that 6-12 will be located on the MCAS with no land cost.

(2) Reflects District's current estimate of construction costs to construct school facilities to serve the design capacities as shown.

Tustin Unified School District
Interim and Administrative Facilities Cost Estimates

Per Student Cost of Interim Facilities:

Per Student Cost for K-5 Interim Housing:

Estimated four-year period for unhoused students.
Monthly charges assumed for 1.5 years as an average requirement.

Monthly charges:	$850
Number of Periods:	18
Cost Per Classroom Unit	$15,300
Plus Incidentals (Set-up)	$65,000
Total Cost of Classroom	$80,300
Students to be Housed	25
Cost Per Student	**$3,212**

Per Student Cost for 6-8 Interim Housing:

Estimated four-year period for unhoused students.
Monthly charges assumed for 2.5 years as an average requirement.

Monthly charges:	$850
Number of Periods:	30
Cost Per Classroom Unit	$25,500
Plus Incidentals (Set-up)	$65,000
Total Cost of Classroom	$90,500
Students to be Housed	27
Cost Per Student	**$3,352**

Per Student Cost for High School Interim Housing:

Estimated six-year period for unhoused students.
Monthly charges assumed for 2.5 years as an average requirement.

Monthly charges:	$850
Number of Periods:	30
Cost Per Classroom Unit	$25,500
Plus Incidentals (Set-up)	$65,000
Total Cost of Classroom	$90,500
Students to be Housed	27
Cost Per Student	**$3,352**

Per Student Cost of Central Administrative Facilities:

Est Sqft. of Admin Facilities Required Per Student	4
Estimated Cost Per Sqft. of Construction	$225
Current Administrative Facilities Cost per Student	**$900**

Appendix F: 2006-2010 Census Data Employment and Housing Estimates

EEO-ALL01W

EEO 1w. Detailed Census Occupation by Sex and Race/Ethnicity for Worksite Geography

Universe: Civilians employed at work 16 years and over
EEO Tabulation 2006-2010 (5-year ACS data)

Note: This is a modified view of the original table.

The EEO Tabulation is sponsored by four Federal agencies consisting of the Equal Employment Opportunity Commission (EEOC), the Employment Litigation Section of the Civil Rights Division at the Department of Justice (DOJ), the Office of Federal Contract Compliance Programs (OFCCP) at the Department of Labor, and the Office of Personnel Management (OPM).

Geography: Irvine city, California
Estimate: Estimate

Occupation Code	Residence to Work Place Flows	Subject	Total, race and ethnicity
Total, all occupations	Worksite Total	Total, both sexes	
Total, all occupations	Worksite Total	Number	216,375
Total, all occupations	Irvine city, California to Irvine city, California	Total, both sexes	
Total, all occupations	Irvine city, California to Irvine city, California	Number	42,265
Total, all occupations	Santa Ana city, California to Irvine city, California	Total, both sexes	
Total, all occupations	Santa Ana city, California to Irvine city, California	Number	19,910
Total, all occupations	Tustin city, California to Irvine city, California	Total, both sexes	
Total, all occupations	Tustin city, California to Irvine city, California	Number	7,495

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

Source: U.S. Census Bureau, 2006-2010 American Community Survey

Explanation of Symbols:
An '**' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
An '***' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended

distribution. A statistical test is not appropriate.
An '*****' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
An '(X)' means that the estimate is not applicable or not available.

The U.S. Census Bureau collects race data in accordance with guidelines provided by the U.S. Office of Management and Budget (OMB). Except for the total, all race and ethnicity categories are mutually exclusive. "Black" refers to Black or African American; "AIAN" refers to American Indian and Alaska Native; and "NHPI" refers to Native Hawaiian and Other Pacific Islander. The reference to "Hawaii only" indicates that these columns are only tabulated for areas in the state of Hawaii. "Balance of Not Hispanic or Latino" includes the balance of non-Hispanic individuals who reported multiple races or reported Some Other Race alone. For more information on race and Hispanic origin, see the Subject Definitions at http://www.census.gov/acs/www/data_documentation/documentation_main/.

Race and Hispanic origin are separate concepts on the American Community Survey. "White alone Hispanic or Latino" includes respondents who reported Hispanic or Latino origin and reported race as "White" and no other race. "All other Hispanic or Latino" includes respondents who reported Hispanic or Latino origin and reported a race other than "White," either alone or in combination. To get a total for "Hispanic or Latino," add the two columns for "White alone Hispanic or Latino" and "All other Hispanic or Latino."

Occupation codes are 4-digit codes and are based on Standard Occupational Classification 2010.

EEO-ALL01W

EEO 1w. Detailed Census Occupation by Sex and Race/Ethnicity for Worksite Geography

Universe: Civilians employed at work 16 years and over
EEO Tabulation 2006-2010 (5-year ACS data)

Note: This is a modified view of the original table.

The EEO Tabulation is sponsored by four Federal agencies consisting of the Equal Employment Opportunity Commission (EEOC), the Employment Litigation Section of the Civil Rights Division at the Department of Justice (DOJ), the Office of Federal Contract Compliance Programs (OFCCP) at the Department of Labor, and the Office of Personnel Management (OPM).

Geography: Santa Ana city, California
Estimate: Estimate

Occupation Code	Residence to Work Place Flows	Subject	Total, race and ethnicity
Total, all occupations	Worksite Total	Total, both sexes	
Total, all occupations	Worksite Total	Number	154,675
Total, all occupations	Irvine city, California to Santa Ana city, California	Total, both sexes	
Total, all occupations	Irvine city, California to Santa Ana city, California	Number	6,390
Total, all occupations	Santa Ana city, California to Santa Ana city, California	Total, both sexes	
Total, all occupations	Santa Ana city, California to Santa Ana city, California	Number	41,630
Total, all occupations	Tustin city, California to Santa Ana city, California	Total, both sexes	
Total, all occupations	Tustin city, California to Santa Ana city, California	Number	5,460

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

Source: U.S. Census Bureau, 2006-2010 American Community Survey

Explanation of Symbols:
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distribution. A statistical test is not appropriate.
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Race and Hispanic origin are separate concepts on the American Community Survey. "White alone Hispanic or Latino" includes respondents who reported Hispanic or Latino origin and reported race as "White" and no other race. "All other Hispanic or Latino" includes respondents who reported Hispanic or Latino origin and reported a race other than "White," either alone or in combination. To get a total for "Hispanic or Latino," add the two columns for "White alone Hispanic or Latino" and "All other Hispanic or Latino."

Occupation codes are 4-digit codes and are based on Standard Occupational Classification 2010.

EEO-ALL01W

EEO 1w. Detailed Census Occupation by Sex and Race/Ethnicity for Worksite Geography

Universe: Civilians employed at work 16 years and over
EEO Tabulation 2006-2010 (5-year ACS data)

Note: This is a modified view of the original table.

The EEO Tabulation is sponsored by four Federal agencies consisting of the Equal Employment Opportunity Commission (EEOC), the Employment Litigation Section of the Civil Rights Division at the Department of Justice (DOJ), the Office of Federal Contract Compliance Programs (OFCCP) at the Department of Labor, and the Office of Personnel Management (OPM).

Geography: Tustin city, California
Estimate: Estimate

Occupation Code	Residence to Work Place Flows	Subject	Total, race and ethnicity
Total, all occupations	Worksite Total	Total, both sexes	
Total, all occupations	Worksite Total	Number	37,900
Total, all occupations	Irvine city, California to Tustin city, California	Total, both sexes	
Total, all occupations	Irvine city, California to Tustin city, California	Number	2,815
Total, all occupations	Santa Ana city, California to Tustin city, California	Total, both sexes	
Total, all occupations	Santa Ana city, California to Tustin city, California	Number	4,490
Total, all occupations	Tustin city, California to Tustin city, California	Total, both sexes	
Total, all occupations	Tustin city, California to Tustin city, California	Number	6,325

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

Source: U.S. Census Bureau, 2006-2010 American Community Survey

Explanation of Symbols:
An '**' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
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distribution. A statistical test is not appropriate.
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Occupation codes are 4-digit codes and are based on Standard Occupational Classification 2010.

1. Please confirm or correct:
   The Newhope Library at 122 North Newhope Street would serve the project area.

   Confirmed.

2. What is the square footage of the existing Newhope Library? What resources and special services are provided at this location?

   Santa Ana has two facilities, a Main library and the Newhope Library Learning Center. The Main Library is 39,790 square feet in size and the Newhope Library is 10,600 square feet. The libraries offer access to books, periodicals, e-content, online databases, computers and internet, a Learning Center, a TeenSpace, a Higher Education Center, and programming for all ages.

   a. Are the existing library space and number of books considered adequate for the existing population within the libraries' service area?

      No. A library service master plan or facility standards assessment would be required to best determine the needs of our service area. For the purpose of this questionnaire, the data will be gathered in comparison to Anaheim Public Library, who are simliar in terms of population to the City of Santa Ana.

   b. If not, what are the estimated deficits of:

      i. Building area in square feet? Deficit of 99,409 square feet total for the entire City population.

      ii. Volumes or collection size? Deficit of 234,483 in collection size This is total for the entire City.

      iii. Other resources (computers, etc.)? Yes, additional computers, staffing and programs.

3. What demand factors or standards are used to determine the amount of library space and number of volumes, or collection size, needed to serve a given population?

   A master plan or facility standards assessment would best determine the needs to serve the population. The library has neither, so we look at the circulation data as well as foot traffic at our existing libraries to help determine the needs. We also look at the service level of nearby cities with similar population sizes. For example, the Anaheim Public Library has 0.416 total library square footage per capita, while Santa Ana is at 0.1633.

4. The proposed project would introduce up to 36,167 residential units. What demands would you estimate the project would create:

   a. For library facilities in square feet? Additional 15,190 square feet

   b. For collection items? Additional 81,353 items

   c. For additional library staff? Additional 16.25 full time staff (FTE)

   d. Other? Additional computers and programming

5. Are there any plans for future library expansion or new libraries that would potentially serve the proposed project? If so, how would these facilities be funded?

   There is currently no plan for future library facilities. The City is in the process of procuring a mobile library unit or bookmobile to better serve the population.

6. What measures, if any, would you recommend to reduce project impacts to library facilities and/or collections?

   The recommendation would be to increase the number of library facillities and the number of resources.

7. Please add any other comments you may wish to make regarding this project.

Response Prepared By:

Lupita Arroyo	Principal Librarian
Name	**Title**
City of Santa Ana - Library Services	4/1/2020
Agency	**Date**

1. The existing General Plan states that the City has approximately 400 acres of public parks and recreation facilities distributed generally uniformly throughout the City. Please **confirm or update** the information in the following table reproduced from the City's website.

City Parks	Park Acreage	Joint Use Sites	Recreation Facilities
Adams Park	5.68	Godinez High School	Cabrillo Tennis Center
Angels Community Park	1.72	Madison Elementary School	Corbin Center
Birch Park	2.66	Monte Vista Elementary School	El Salvador Community Center+
Bomo Koral Park	10.40	Roosevelt Elementary School	Jerome Recreation Center+
Cabrillo Park	7.60	Spurgeon Intermediate School	Logan Recreation Center
Centennial Park	69.50	Willard Intermediate School	Memorial Recreation Center+
Cesar Chavez Camoesino Park	6.30	Garfield Elementary	Neal Machander Tennis Center
Chepa's Park	0.41	Monroe Elementary School	Salgado Recreation Center+
Delhi Park	10.40		Santa Anita Recreation Center+
Eldridge Park	1.2		Santa Ana Senior Center
Edna Park	2.82		Southwest Senior Center
El Salvador Park	8.4		Wildlife and Watershed Interpretive Center
Fairview Triangle Park	0.30		Godinez Gym and Performinq Arts Center
Fisher Cabin Park	2.34		Santiago Lawn Bowling Center
French Park	0.17		Fisher Cabin
Friendship Park	0.09		Santiago Cabin
Garfield Exercise	0.10		Santa Ana Zoo at Prentice Park
Grise! Park	6.79		Santa Ana Stadium
Heritage Park	6.51		Central Public Library
Jerome Park	17.92		Newhope Library
Lillie King Park	9.60		Garfield Center
Mabury Park	5.46		RooseveiUWalker Community Center
Madison Park	6.06		
Maple and Occidental Park	0.43		
McFadden Triangle Park	0.80		
Memorial Park	17		
Memory Lane Park	0.47		
Morrison Park	5.07		

Pacific Electric Park	1.39		
Plaza Calle Cuatro Park	0.20		
Portola Park	9.07		
Prentice Park	18.75		
RaitUMyrtle Park*	1.09		
Riverview Park	8.76		
Rosita Park	8.68		
Saddleback View Park	0.92		
Sandpointe Park	6.63		
Santa Anita Park	4.86		
Santiago Park	34.43		
Sara May Downie Herb Garden	0.13		
Segerstrom Triangle Park	1.22		
Sasscer Park	0.92		
Standard/McFadden Park*	.75		
17th Stree!Triangle Park	0.66		
6th and Lacy Park*	0.42		
Thornton Park	32.83		
Windsor Park	10.48		
TOTAL	348.39	-	-

*Future Parks
+ Centers with oars

2. The City's website also identified future parks as noted in the table above.

   a. Have any of these parks been built? Which ones?

   Yes, 6th and Lacy (Mariposa Park) was built and opened on December 14, 2019.

   b. If not, are there stiU plans to build these parks?

   Yes, Grant funding was recently approved to develop Standard/McFadden and Raitt/Myrtle Park sites.

3. What is the City's funding source for park and recreational facilities maintenance and improvements?

   City General Funds are used to maintain the park sites. Improvement funding mainly comes from Federal/State Grants , Community Development Block Grant or Park Residential Development Fees (A & D Fees).

4. Are the existing parks and recreational facilities in the City adequate to serve the demands of the residents?

   No, the City has not met the Municipal Code 2 acres per/ 1000 requirement.

5. Are the existing parks and recreation facilities able to accommodate buildout of the proposed project, which includes land use designation changes that would accommodate a buildout of 6,776,298 additional nonresidential square feet, 36,167 additional dwelling units, and would create 14,276 jobs? If not, what additional facilities would be needed and how will they be funded?

   No, additional park acres, recreational support facilities and community centers are needed to meet the increasing population demand. Park/Recreational Improvements would be funded by grants, CDBG funds, and Park residential development fees.

6. What mitigation measures, if any, would you recommend for the proposed project?

   Additional Park Open Space.

7. Please add any other comments you may wish to make regarding the proposed project.

Response Prepared By:

RON ONO	PRCSA ADMINISTRATIVE SERVICES MANAGER
Name	Title
PARK, RECREATION AND COMMUNITY SERVICES AGENCY	3/9/20
Agency	Date

1. What generation rates are used to estimate solid waste service requirements for various land uses (residential, commercial, industrial) in pounds/day or tons/year?

See attached solid waste generation by land use type. This information was obtained from the California Department of Resources Recovery and Recycling (CalRecycle) website.

2. Is Orange County currently meeting AB 939 goals?

AB 939, also known as the California Integrated Waste Management Act of 1989, requires all counties in California to prepare a Siting Element as part of each county's Countywide Integrated Waste Management Plan. As part of the Siting Element, each county is required to demonstrate that it has 15 years of available countywide solid waste landfill capacity, either in its jurisdiction, or has contracted with another entity (i.e., another county or waste hauler that owns a landfill that has available landfill capacity) to ensure 15 years of available countywide solid waste landfill capacity.

The County of Orange has 15 years of available countywide solid waste landfill capacity with available landfill capacity at the Olinda Alpha, Frank R. Bowerman and Prima Deshecha Landfills. All three landfills are owned by the County of Orange and are operated by the OC Waste & Recycling department.

3. Please provide any additional comments you may have regarding the proposed project.

The Orange County solid waste landfill system can serve the proposed project on both a project-specific and cumulative basis and will provide the project with long-term solid waste landfill capacity.

Response Prepared By:

John J. Arnau, CEQA Manager	
Name	**Title**
OC Waste & Recycling	March 3, 2020
Agency	**Date**

1. Please **confirm** that the disposal sites used for the City's solid waste are the Frank R. Bowerman Landfill in Irvine and Olinda Alpha Landfill in Brea.

Confirmed.

a. What additional sites, if any, are planned for solid waste disposal in the future?

None.

2. Please **confirm or update** the information in Table 1, using data from CalRecycle, regarding the three landfill's location, current remaining capacity, maximum capacity, estimated close date, and maximum daily load.

Table 1 Landfill Capacity

Landfill	Location	Current Remaining Capacity (cubic yards)	Maximum Capacity (cubic yards)	Estimated Close Date	Maximum Daily Load (tons/day)
Frank R. Bowerman	11002 Bee Canyon Road Irvine, CA 92602	~~205,000,000~~ 170,400,000*	266,000,000	2053	11,500
Olinda Alpha	1942 North Valencia Avenue Brea, CA 92823	~~34,200,000~~ 24,500,000	148,800,000	2021**	8,000

*Remaining capacity for Frank R. Bowerman and Olinda Alpha Landfills as of June 30, 2019.
**OC Waste & Recycling is currently working with the City of Brea to revise the closure date of the Olinda Alpha Landfill.

3. Are the existing landfill facilities able to accommodate buildout of the proposed project, which includes land use designation changes that would accommodate a buildout of 6,776,298 additional nonresidential square feet, 36,167 additional dwelling units, and would create 14,276 jobs? If not, what additional facilities would be needed?

Yes, the Orange County solid waste landfill system would have the ability to provide the proposed project with long-term solid waste landfill capacity, both on a project specific and cumulative basis. The County of Orange maintains 15-years of countywide solid waste landfill capacity, as required by AB 939.

4. Please provide any additional comments you may have regarding the proposed project.

N/A.

Response Prepared By:

John J. Arnau, CEQA Manager	
Name	**Title**
OC Waste & Recycling	March 3, 2020
Agency	**Date**

Estimated Solid Waste Generation Rates by Land Use Type

Land Use Type	Estimated Solid Waste Generation Rate
Residential	12.23 lbs./household/day
Offices	0.084 lb./sq. ft./day
Commercial/Retail	3.12 lbs./100 sq. ft./day
Restaurants	.005 lb./s.f./day
Industrial/Warehouse	1.42 lb./100 sq. ft./day
Schools	1 lb./student/day
Hotel/Motel	4 lbs./room/day
Public/Institutional	.007 lb./sq. ft./day

Source: CalRecycle, 2020