Appendix F:
Noise Impact Analysis

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Noise Impact Analysis
Emerald Isle Assisted Living Facility Project
City of Santa Rosa, Sonoma County, California

Prepared for:
Oakmont Senior Living
9240 Old Redwood Highway, Suite 200
Windsor, CA 95492
707.535.3209

Contact: Steve McCullagh

Prepared by:
First Carbon Solutions
1350 Treat Boulevard, Suite 380
Walnut Creek, CA 94597
925.357.2562

Contact: Andrew Hill, Project Manager
Philip Ault, Noise & Air Quality Scientist

Date: June 8, 2017

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
ANSI	American National Standards Institute
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
FCS	FirstCarbon Solutions
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
L_{dn}	Day-Night Average Sound Level
L_{eq}	Equivalent Sound Level
OSHA	Occupational Safety and Health Administration
PPV	peak particle velocity
RMS	root mean square
SEL	Single Event Level
VdB	Vibration level at 1 microinch per second

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SECTION 1: INTRODUCTION

1.1 - Purpose of Analysis and Study Objectives

This Noise Impact Analysis has been prepared by FirstCarbon Solutions (FCS) to determine the off-site and on-site noise impacts associated with the proposed Oakmont Assisted Living Facility project. The following is provided in this report:

- A description of the study area, project site, and proposed project
- Information regarding the fundamentals of noise and vibration
- A description of the local noise guidelines and standards
- A description of the existing noise environment
- An analysis of the potential short-term, construction-related noise and vibration impacts from the proposed project
- An analysis of long-term, operations-related noise and vibration impacts from the proposed project

1.2 - Project Summary

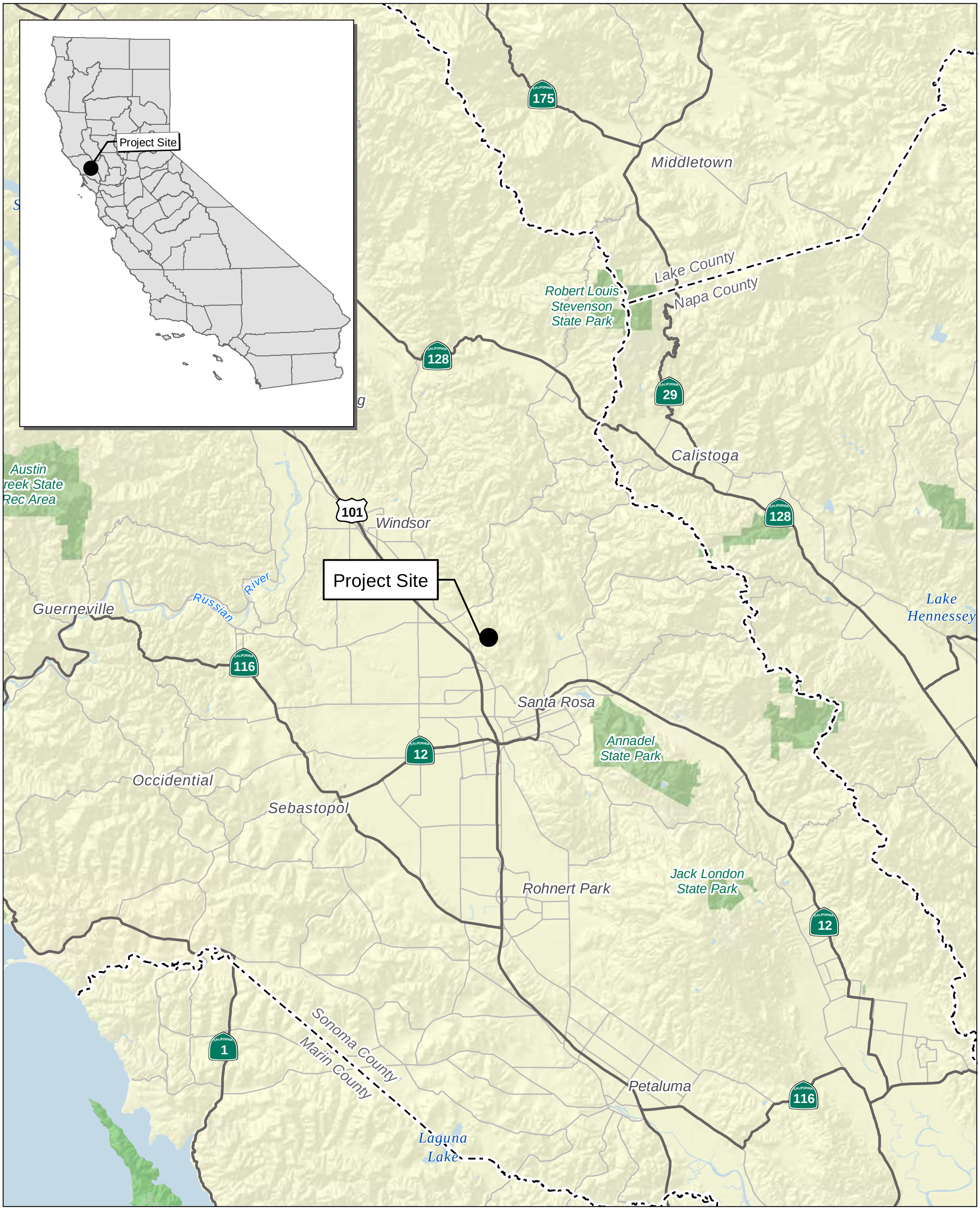
1.2.1 - Site Location

The Emerald Isle Skilled Nursing Facility Project (Project) is located at the eastern end of Gullane Drive on the grounds of the Fountaingrove Golf and Athletic Club in the northern part of the City of Santa Rosa, Sonoma County, California (see Exhibit 1). The 12.54 acre site consists of two parcels, Assessor's Parcel Numbers (APNs) 173-670-016 (10.4 acres) and 173-670-004 (2.1 acres), and is entirely surrounded by the golf course (see Exhibit 2). Noise-sensitive residential land uses are located to the east and west of the project site, beyond the golf-course boundaries. Access to the site is provided via Thomas Lake Harris Drive, with regional access available via Fountaingrove Parkway from US 101.

1.2.2 - Project Description

The project is a 55,445-square-foot structure on 12.54 acres operating as a skilled nursing facility providing up to 70 beds in 49 units for convalescent senior citizens. The project will offer a wide range of short- and long-term hands-on care services, including physical therapy or speech therapy, stroke recovery, Parkinson's care, acute medical conditions care, terminal illness care, and general rehabilitation. The project site is surrounded by the Fountaingrove Golf Course. As shown on the site plan (Exhibit 3), the proposed facility would be constructed at the center of the site, with a winding driveway leading from Gullane Drive to the main entrance of the building and wrapping around its northern and southern ends. The main entrance to the building would feature a large, open courtyard with a fountain. There would also be a smaller courtyard at the north end of the building and an interior courtyard at the south end. Three patios would be constructed on the eastern side of the building, connected by a walking path. Landscaped walking paths would also connect the main entrance with the parking areas and the northern courtyard. A total of 63 surface parking spaces and 12 enclosed garage parking spaces would be provided along the driveway around the facility. The building would be at least 15 percent more efficient than required by California's Title 24 energy code. The majority of the project site would remain undeveloped woodland and open space, with approximately 70 percent of the existing trees on the site preserved.

The General Plan land use designation applicable to the site is Low Density Residential, which allows for residential density of between 2 and 8 units per gross acre. Attached single-family and multi-family units are permitted. Both parcels are zoned Planned Development (PD). Access to the site is provided via Thomas Lake Harris Drive, with regional access available via Fountaingrove Parkway from US 101.



Source: Census 2000 Data, The CaSIL, FCS GIS 2016.

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5 2.5 0 5
Miles

Exhibit 1
Regional Location Map

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OAKMONT SENIOR LIVING • EMERALD ISLE ASSISTED LIVING FACILITY PROJECT
NOISE IMPACT ANALYSIS

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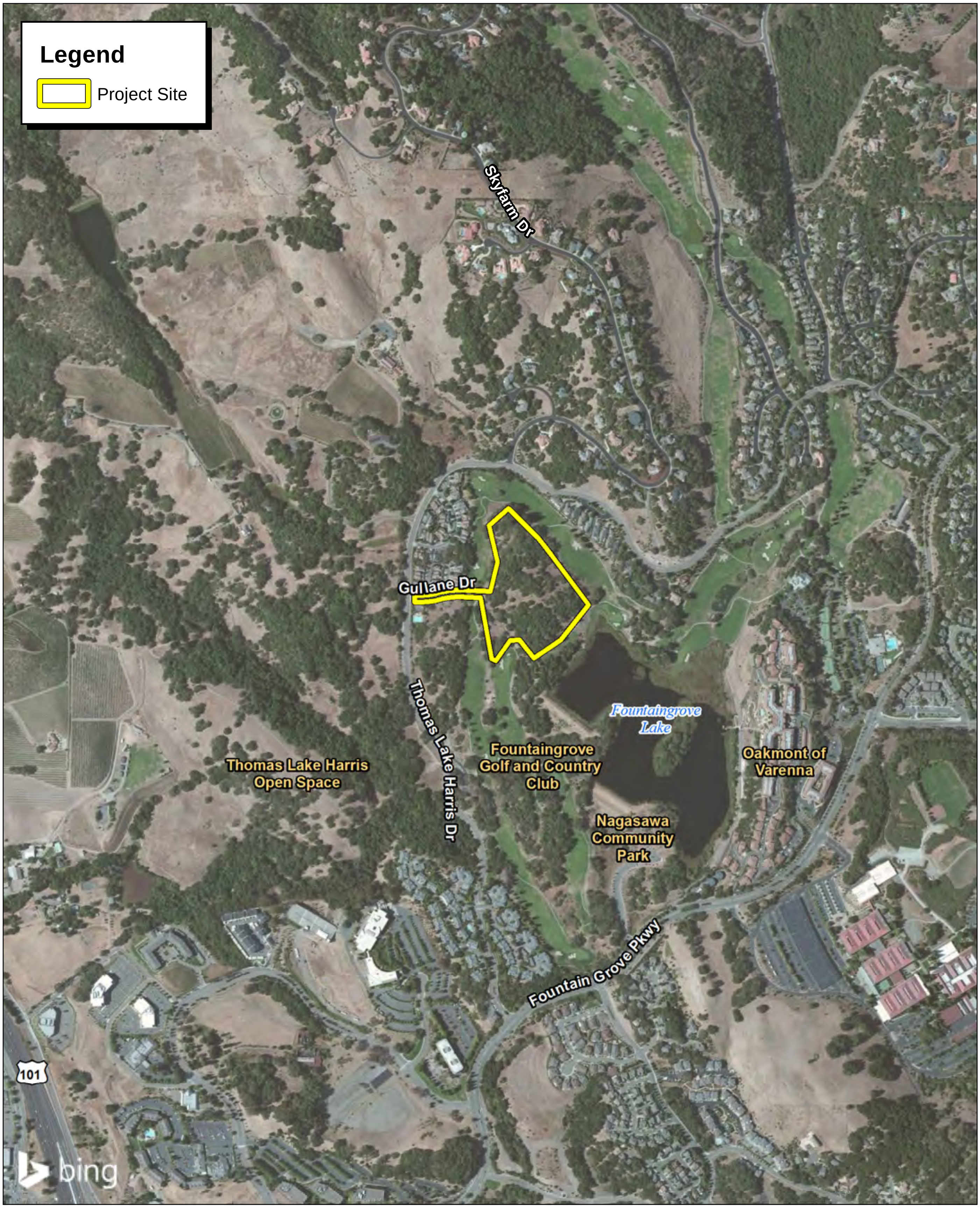

Source: Bing Imagery, 2015

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Feet

Exhibit 2
Local Vicinity Map
Aerial Base

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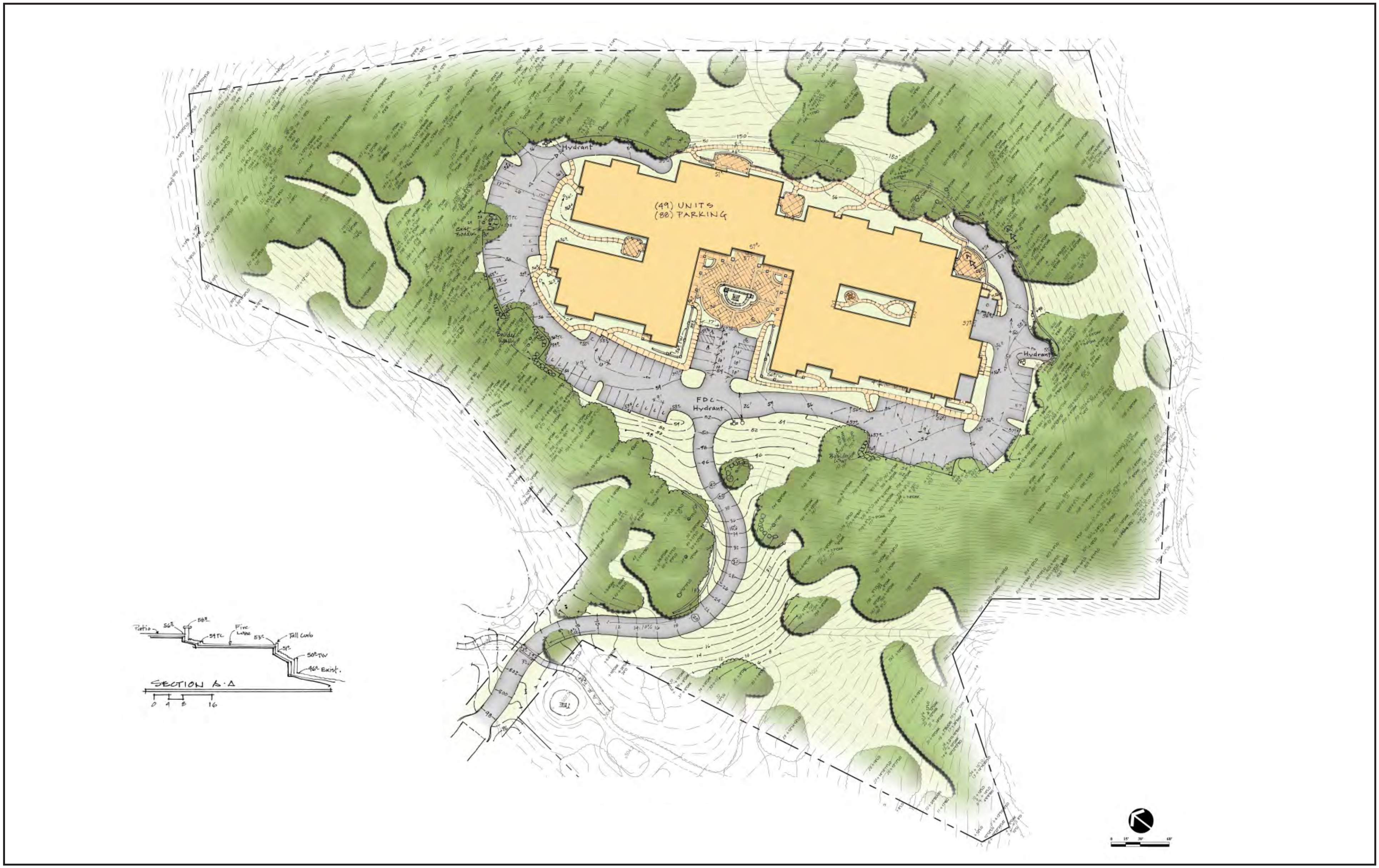

Source: Landesign Group, 2016

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Exhibit 3
Site Plan

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SECTION 2: NOISE AND VIBRATION FUNDAMENTALS

2.1 - Characteristics of Noise

Noise is generally defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

Several noise measurement scales exist which are used to describe noise in a particular location. A *decibel* (dB) is a unit of measurement that indicates the relative intensity of a sound. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3.0 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3.0 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Sound levels in dB are calculated on a logarithmic basis. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense. Each 10-dB increase in sound level is perceived as approximately a doubling of loudness. Sound intensity is normally measured through the *A-weighted sound level* (dBA). This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive.

Noise impacts can be described in three categories. The first is audible impacts, which refers to increases in noise levels noticeable to humans. An audible increase in noise levels generally refers to a change of 3.0 dB or greater, since this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise level of less than 1.0 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

As noise spreads from a source, it loses energy so that the farther away the noise receiver is from the noise source, the lower the perceived noise level would be. Geometric spreading causes the sound level to attenuate or be reduced, resulting in a 6-dB reduction in the noise level for each doubling of distance from a single point source of noise to the noise-sensitive receptor of concern. There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on A-weighted decibels (dBA). Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. CNEL is the time-varying noise over a 24-hour period, with a 5-dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10-dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within one dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise.

Common sources of noise in urban environments include mobile sources, such as traffic, and stationary sources, such as mechanical equipment or construction operations.

Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on each construction site and, therefore, would change the noise levels as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 1 shows typical noise levels of construction equipment as measured at a distance of 50 feet from the operating equipment. Construction-period noise levels are higher than background ambient noise levels, but eventually cease once construction is complete.

Table 1: Typical Construction Equipment Maximum Noise Levels, L_{max}

Type of Equipment	Impact Device? (Yes/No)	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Pickup Truck	No	55
Pumps	No	77
Air Compressors	No	80
Backhoe	No	80
Front-End Loaders	No	80
Portable Generators	No	82
Dump Truck	No	84
Tractors	No	84
Auger Drill Rig	No	85
Concrete Mixer Truck	No	85
Cranes	No	85
Dozers	No	85
Excavators	No	85
Graders	No	85
Jackhammers	Yes	85
Man Lift	No	85

Table 1 (cont.): Typical Construction Equipment Maximum Noise Levels, L_{max}

Type of Equipment	Impact Device? (Yes/No)	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Paver	No	85
Pneumatic Tools	No	85
Rollers	No	85
Scrapers	No	85
Concrete/Industrial Saws	No	90
Impact Pile Driver	Yes	95
Vibratory Pile Driver	No	95
Source: FHWA, 2006.		

2.2 - Characteristics of Groundborne Vibration

Groundborne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings.

Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. When assessing annoyance from groundborne vibration, vibration is typically expressed as root mean square (rms) velocity in units of decibels of 1 micro-inch per second. To distinguish vibration levels from noise levels, the unit is written as "VdB."

In extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Common sources of groundborne vibration include construction activities such as blasting, pile driving and operating heavy earthmoving equipment. However, construction vibration impacts on building structures are generally assessed in terms of peak particle velocity (PPV). For purposes of this analysis, project related impacts are expressed in terms of PPV. Typical vibration source levels from construction equipment are shown in Table 2.

Table 2: Vibration Levels of Construction Equipment

Construction Equipment	PPV at 25 Feet (inches/second)	RMS Velocity in Decibels (VdB) at 25 Feet
Water Trucks	0.001	57
Scraper	0.002	58
Bulldozer—small	0.003	58
Jackhammer	0.035	79

Table 2 (cont.): Vibration Levels of Construction Equipment

Construction Equipment	PPV at 25 Feet (inches/second)	RMS Velocity in Decibels (VdB) at 25 Feet
Concrete Mixer	0.046	81
Concrete Pump	0.046	81
Paver	0.046	81
Pickup Truck	0.046	81
Auger Drill Rig	0.051	82
Backhoe	0.051	82
Crane (Mobile)	0.051	82
Excavator	0.051	82
Grader	0.051	82
Loader	0.051	82
Loaded Trucks	0.076	86
Bulldozer—Large	0.089	87
Caisson drilling	0.089	87
Vibratory Roller (small)	0.101	88
Compactor	0.138	90
Clam shovel drop	0.202	94
Vibratory Roller (large)	0.210	94
Pile Driver (impact-typical)	0.644	104
Pile Driver (impact-upper range)	1.518	112
Source: Compilation of scientific and academic literature, generated by FTA and FHWA.		

Propagation of vibration through soil can be calculated using the vibration reference equation

PPV= PPV ref * (25/D)^n (in/sec)

Where:

PPV = reference measurement at 25 feet from vibration source
D = distance from equipment to property line
n = vibration attenuation rate through ground

According to Chapter 12 of the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment manual (2006), an “n” value of 1.5 is recommended to calculate vibration propagation through typical soil conditions.

SECTION 3: REGULATORY SETTING

3.1 - Federal Regulations

United States Environmental Protection Agency (EPA) In 1972, Congress enacted the Noise Control Act. This act authorized the EPA to publish descriptive data on the effects of noise and establish levels of sound "requisite to protect the public welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels) categories, as shown in Table 3. The EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of the levels.

For protection against hearing loss, 96 percent of the population would be protected if sound levels are less than or equal to an $L_{eq(24)}$ of 70 dBA. The "(24)" signifies an L_{eq} duration of 24 hours. The EPA activity and interference guidelines are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. For outdoor and indoor environments, interference with activity and annoyance should not occur if levels are below 55 dBA and 45 dBA, respectively.

Table 3: Summary of EPA Recommended Noise Levels to Protect Public Welfare

Effect	Level	Area
Hearing loss	$L_{eq}(24) \leq 70$ dB	All areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	$L_{eq}(24) \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{eq} \leq 45$ dB	Indoor residential areas
	$L_{eq}(24) \leq 45$ dB	Other indoor areas with human activities such as schools, etc.
Source: EPA, 1974.		

Federal Transit Administration

The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment document (FTA 2006). The FTA guidelines include thresholds for construction vibration impacts for various structural categories as shown in Table 4.

Table 4: Federal Transit Administration Construction Vibration Impact Criteria

Building Category	PPV (in/sec)	Approximate VdB
I. Reinforced—Concrete, Steel or Timber (no plaster)	0.5	102
II. Engineered Concrete and Masonry (no plaster)	0.3	98
III. Non Engineer Timber and Masonry Buildings	0.2	94
IV. Buildings Extremely Susceptible to Vibration Damage	0.12	90
Note: VdB=Velocity in Decibels Source: FTA, 2006.		

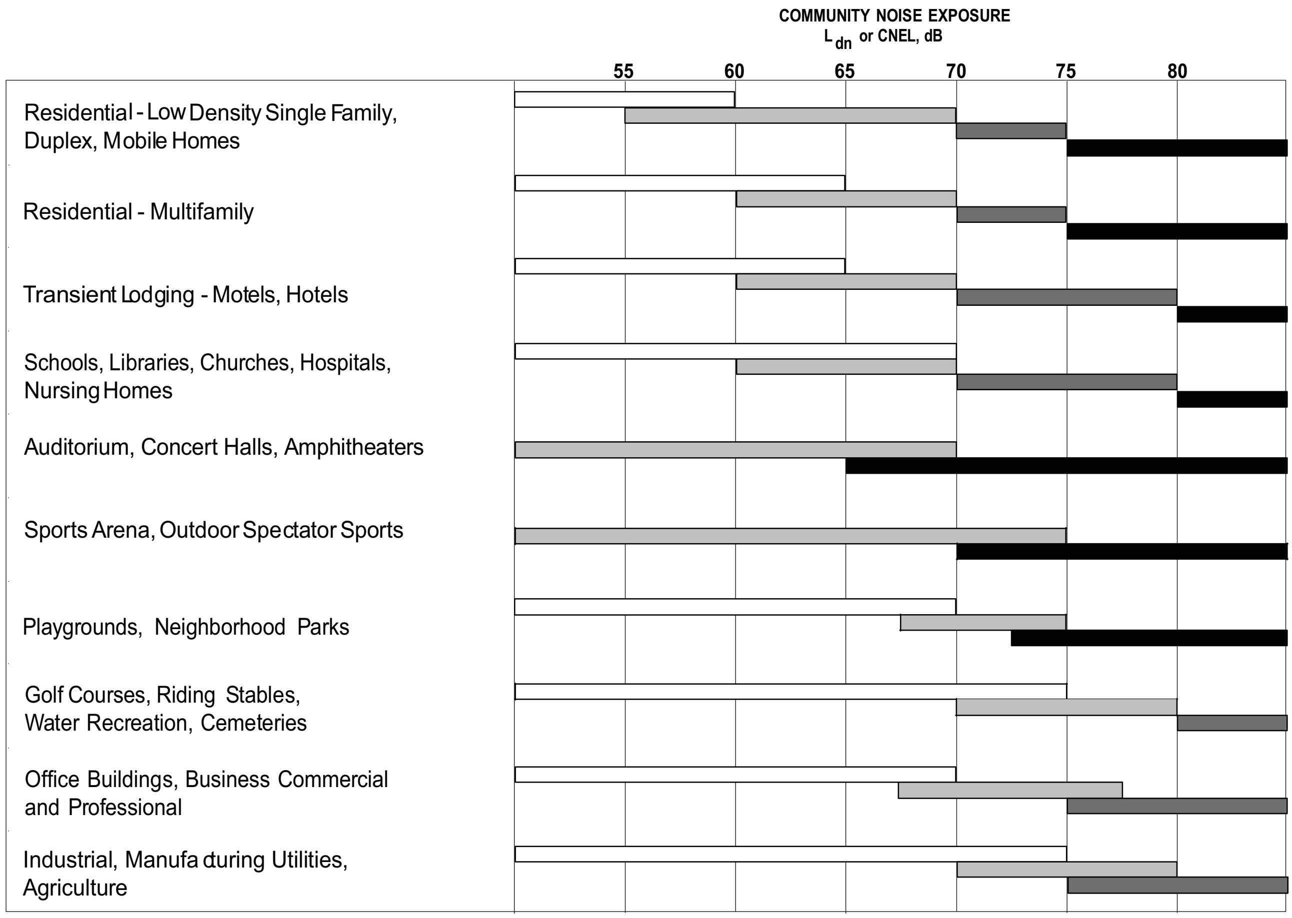
3.2 - State Regulations

The State of California has established regulations that help prevent adverse impacts to occupants of buildings located near noise sources. Referred to as the "State Noise Insulation Standard," it requires buildings to meet performance standards through design and/or building materials that would offset any noise source in the vicinity of the receptor. State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are found in the California Code of Regulations, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor-ceiling assemblies must block or absorb sound. For limiting noise from exterior noise sources, the noise insulation standards set an interior standard of 45 dBA CNEL in any habitable room with all doors and windows closed. In addition, the standards require preparation of an acoustical analysis demonstrating the manner in which dwelling units have been designed to meet this interior standard, where such units are proposed in an area with exterior noise levels greater than 60 dBA CNEL.

The State has also established land use compatibility guidelines for determining acceptable noise levels for specified land uses. The City of Santa Rosa has adopted and modified the State's land use compatibility guidelines, as discussed below.

3.3 - Local Regulations

The project site is located within the City of Santa Rosa. The City of Santa Rosa has established Noise Compatibility Standards for residential and non-residential land uses in the Noise and Safety Element of the Santa Rosa General Plan 2035 (Santa Rosa 2009) which are shown in Exhibit 4.



LEGEND:

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: City of Santa Rosa General Plan

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Exhibit 4
Land Use Compatibility Standards

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For the proposed Skilled Nursing Facility Project, the closest comparable land use designation of the City's land use compatibility guidelines is nursing home land use. The following are the General Plan noise policies applicable to the land use designation of nursing homes:

- Noise environments of up to 70 dBA L_{dn} are considered "normally acceptable" based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.
- Noise environments of 60 dBA to 70 dBA L_{dn} are "conditionally unacceptable" where new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
- Noise environments of 70 dBA to 80 dBA L_{dn} are "normally unacceptable" where new construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
- Noise environments of 80 dBA L_{dn} and higher are "clearly unacceptable" where new construction or development should generally not be undertaken.

Applicable goals and policies of the General Plan are summarized as follows:

- Encourage residential developers to provide buffers other than sound walls, where practical. Allow sound walls only when projected noise levels at a site exceed land use compatibility standards [see Exhibit 4].
- Prevent new stationary and transportation noise sources from creating a nuisance in existing developed areas. Use a comprehensive program of noise prevention through planning and mitigation, and consider noise impacts as a crucial factor in project approval. The Land Use Compatibility Standards specify normally acceptable levels for community noise in various land use areas.
- Require new projects in the following categories to submit an acoustical study, prepared by a qualified acoustical consultant:
  - All new projects proposed for areas with existing noise above 60 dBA L_{dn}. Mitigation shall be sufficient to reduce noise levels below 45 dBA L_{dn} in habitable rooms and 60 dBA L_{dn} in private and shared recreational facilities. Additions to existing housing units are exempt.
  - All new projects that could generate noise whose impacts on other existing uses would be greater than those normally acceptable (as specified in the Land Use Compatibility Standards).
- Pursue measures to reduce noise impacts primarily through site planning. Engineering solutions for noise mitigation, such as sound walls, are the least desirable alternative.
- Do not permit existing uses to generate new noises exceeding normally acceptable levels unless:
  - Those noises are mitigated to acceptable levels; or

  - The activities are specifically exempted by the City Council on the basis of community health, safety, and welfare.

- Adopt mitigations, including reduced speed limits, improved paving texture, and traffic controls, to reduce noise to normally acceptable levels in areas where noise standards may be exceeded (e.g., where homes front regional/ Arterial streets and in areas of mixed use development.)

- Encourage developers to incorporate acoustical site planning into their projects. Recommended measures include:
  - Incorporating buffers and/or landscaped earth berms;
  - Orienting windows and outdoor living areas away from unacceptable noise exposure;
  - Using reduced-noise pavement (rubberized-asphalt);
  - Incorporating traffic calming measures, alternative intersection designs, and lower speed limits; and
  - Incorporating state-of-the-art structural sound attenuation and setbacks.
  - Discourage new projects that have potential to create ambient noise levels more than 5 dBA L_{dn} above existing background, within 250 feet of sensitive receptors.

The City of Santa Rosa also addresses noise in the ordinances of the City Code. Santa Rosa City Code ordinance 17-16.120 Machinery and Equipment, states that “it is unlawful for any person to operate any machinery, equipment, pump, fan, air-conditioning apparatus or similar mechanical device in any manner so as to create any noise, which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels. (Prior code § 27.20).”

Standard city conditions of project approval limit the hours of construction to 7:00 a.m. to 7:00 p.m. Monday through Friday, and 8:00 a.m. to 6:00 p.m. on Saturdays. No construction is permitted on Sundays and holidays.

SECTION 4: EXISTING NOISE CONDITIONS

The following section describes the existing ambient noise environment of the project vicinity.

4.1 - Existing Noise Sources

The project site is located in the City of Santa Rosa, California. Most of the land uses surrounding the Project site are residential land uses. Single-family homes are located beyond the golf course to the northwest and northeast of the Project boundaries. The Fountaingrove Lodge is located southwest of the project site.

4.2 - Existing Ambient and Traffic Noise Levels

The existing noise levels on the project site were documented through a long-term ambient noise measurement taken on the project site.

One long-term noise measurement was taken on Thursday, August 18, 2016 beginning at 4:00 p.m. and ending on Friday, August 19, 2016 at 3:00 p.m. The noise measurements data sheet is provided in Appendix A of this document. The noise measurements were taken near the western boundary of the project site near the proposed site entrance along Gullane Drive. The noise monitoring location was selected in order to document existing long-term ambient noise levels on the project site and to determine compatibility of the proposed nursing home land use development with the City's land use compatibility standards.

The average hourly ambient noise levels were measured to be 47.8 dBA L_{eq}, with a maximum reading of 76.7 dBA L_{max} and minimum reading of 31.6 dBA L_{min}. The 24-hour weighted day-night average noise level for the project site is 49.5 dBA L_{dn}.

The long-term noise measurement captured noise from all noise sources in the project vicinity, including parking lot activities at the nearby hotel land use and traffic on local roadways.

4.3 - Existing Stationary Source Noise Levels

Existing stationary noise sources in the project vicinity include truck deliveries, loading/unloading activities, and typical parking lot activities associated with the nearby hotel land use. Typical medium truck (step-van type with roll-doors) loading and unloading activities in the project vicinity result in maximum noise levels from 70 dBA to 80 dBA L_{max} at 50 feet. Representative parking activities, such as people conversing or doors slamming, generate approximately 60 dBA to 70 dBA L_{max} at 50 feet. These activities are potential point sources of noise that contribute to the existing ambient noise environment in the project vicinity.

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SECTION 5: THRESHOLDS OF SIGNIFICANCE AND IMPACT ANALYSIS

5.1 - Thresholds of Significance

This report analyzes potential project impacts according to the following criteria of significance. The proposed project would result in a significant impact if the project would result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

c) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project; or

d) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

5.2 - Exceedance of Noise Standards Impacts

5.2.1 - Construction Noise Impacts

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the project site. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance, the effect on longer-term (hourly or daily) ambient noise levels would be small. Therefore, short-term construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction related noise ranges to be categorized by work phase. Table 1 lists typical construction equipment noise levels, based on a distance of 50 feet between the equipment and a noise receptor. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings. Impact equipment such as pile drivers are not expected to be used during construction of this project.

The highest noise levels would be generated during ground clearing, excavation, and foundation construction, as these phases require the use of the heaviest, and loudest, pieces of construction equipment. Large pieces of earth-moving equipment, such as graders, excavators, and bulldozers, generate maximum noise levels of 80 dBA to 85 dBA L_{max} at a distance of 50 feet. These noise levels drop off at a rate of about 6 dBA per doubling of distance between the noise source and receptor. As construction moves away from noise-sensitive receptors, noise levels generated by heavy construction will be lower. A characteristic of noise is that each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, the worst-case combined noise level during this phase of construction would be 90 dBA L_{max} at a distance of 50 feet from an active construction area.

The closest sensitive-noise receptor to the east of the project site are residential land uses. The closest building façades of these residential homes would be located approximately 355 feet from the construction footprint where the heaviest construction equipment would be operating. At this distance, these residential land uses may be exposed to noise levels ranging up to approximately 73 dBA L_{max} when construction activities occur at the portion of the project site nearest these homes.

The closest sensitive-noise receptor to the west of the project site is also residential land uses. The closest building façades of these residential homes would be located approximately 365 feet from the construction footprint. At this distance, these residential land uses may be exposed to noise levels ranging up to approximately 73 dBA L_{max} when operation of heavy construction equipment occurs at the portion of the project site nearest these homes.

Another noise sensitive receptor in the project vicinity includes the hotel land use to the southwest of the project site. The closest building façades of this lodge would be located approximately 550 feet from the construction footprint where the heaviest construction equipment would operate. At this distance, the lodge's nearest building façades may be exposed to noise levels ranging up to 69 dBA L_{max} when construction activities occur at the portion of the project site nearest this lodge.

Although there would be single-event noise exposure potential causing intermittent noise nuisance from project construction activity, the effect on longer-term (hourly or daily) ambient noise levels would be small. Standard City conditions of project approval limit the hours of construction to 7:00 a.m. to 7:00 p.m. Monday through Friday, and 8:00 a.m. to 6:00 p.m. on Saturdays; and no construction is permitted on Sundays and holidays. Therefore, restricting construction activities to these allowable time periods, as well as implementing the best management noise reduction techniques and practices outlined in Mitigation Measure (MM) NOI-1, would ensure that potential short-term construction noise impacts on sensitive receptors in the project vicinity would be reduced to less than significant.

Level of Significance Before Mitigation

Potentially significant unless mitigation is incorporated.

Mitigation Measures

MM NOI-1 Implementation of the following multi-part mitigation measure is required to reduce potential construction period noise impacts:

- The construction contractor shall ensure that all equipment driven by internal combustion engines shall be equipped with mufflers, which are in good condition and appropriate for the equipment.
- The construction contractor shall ensure that unnecessary idling of internal combustion engines (i.e., idling in excess of 5 minutes) is prohibited.
- The construction contractor shall utilize "quiet" models of air compressors and other stationary noise sources where technology exists.
- At all times during project grading and construction, the construction contractor shall ensure that stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from adjacent residences.
- The construction contractor shall ensure that the construction staging areas shall be located to create the greatest feasible distance between the staging area and noise-sensitive receptors nearest the project site.
- All on-site demolition and construction activities, including deliveries and engine warm-up, shall be restricted to the hours between 7:00 a.m. and 7:00 p.m., Monday through Friday, and between 8:00 a.m. and 6:00 p.m. on Saturday. No such activities shall be permitted on Sundays or holidays.

Level of Significance After Mitigation

Less than significant impact.

5.2.2 - Stationary Source Operational Noise Impacts

A significant impact would occur for the proposed nursing homes type land use development if the Project would result in noise levels that would create ambient noise levels more than 5 dBA L_{dn} above existing background noise levels in the project vicinity. According to the City of Santa Rosa City Code, it is also unlawful for any person to operate any machinery, equipment, pump, fan, air-conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels.

The proposed project would include new stationary noise sources, such as typical parking lot activities. Typical parking lot activities such as people conversing, doors slamming, or vehicles idling generate noise levels of approximately 60 dBA to 70 dBA L_{max} at 50 feet. These activities are expected to occur sporadically throughout the day, as visitors and staff arrive and leave the parking lot areas. The proposed project's tentative site plan shows 63 potential surface parking spaces and 12 enclosed garage parking spaces. Existing background ambient noise levels are documented by the long-term ambient noise measurement to average 47.8 dBA L_{eq} and maximum noise levels of up to 76.7 dBA L_{max} at the western project limits near the residential homes adjacent to Gullane Drive. Although there would be occasional high, single-event noise exposure ranging up to 52 dBA L_{max} as measured at the nearest receptor from parking lot activities, such activities would not result in an increase above existing ambient noise levels. Parking lot activities would occur intermittently and for only a short duration of time. These single-event maximum noise level activities would only occur for a cumulative of a minute or two within any hour, and would therefore not result in a perceptible increase in the hourly average noise levels in the project vicinity. Therefore, project-related parking lot activities would not result in an increase in ambient noise levels by more than 5 dBA L_{dn} above existing background as measured at nearby sensitive receptors; and the impact would be less than significant.

Implementation of the project would also include occasional delivery truck loading/unloading activities. Typical medium truck (step-van type with roll-doors) loading and unloading activities result in maximum noise levels from 70 dBA to 80 dBA L_{max} at 50 feet. These activities are expected to occur at most a couple of times throughout a typical day as supplies are delivered or packages are picked up at the proposed facility. The closest noise-sensitive receptor building façades are the single family residences located approximately 645 feet northeast from the potential delivery areas. Because of distance attenuation, maximum noise levels from these activities would range from 48 dBA to 58 dBA L_{max} at this nearest residential property. These resulting noise levels from new stationary source activities are below the existing measured maximum noise level of 76.7 dBA L_{max} recorded in the project vicinity. These single-event maximum noise levels are not expected to occur for more than a cumulative 1 minute within any hour and when averaged over a 24-hour period would not result in an exceedance of the existing average ambient noise levels in the project vicinity. Therefore, project-related delivery activities would not result in an increase in ambient noise levels by more than 5 dBA L_{dn} above existing background noise levels experienced in the project vicinity, and would result in a less than significant impact on nearby sensitive receptors.

At the time of preparation of this analysis, details were not available pertaining to proposed rooftop mechanical ventilation systems for the project. Therefore, a reference noise level for typical rooftop mechanical ventilation systems was used. Noise levels from typical rooftop mechanical ventilation equipment are anticipated to range up to approximately 60 dBA L_{eq} at a distance of 25 feet. Rooftop mechanical ventilation systems could be located as close as 420 feet northeast from the nearest off-site sensitive receptor. In addition, the roof parapet would block the line of sight from all rooftop equipment to off-site receptors, providing a minimum of 6 dBA in shielding reduction. Therefore, noise generated by rooftop mechanical ventilation equipment would attenuate to less than approximately 29 dBA L_{eq} at the nearest off-site residential receptor. According to City Code 17-16.120, it is unlawful for any person to operate any machinery, equipment, pump, fan, air-conditioning apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels. The long-term ambient noise levels in the project vicinity is documented through the long-term ambient noise measurement to be 47.8 dBA L_{eq}. Therefore, rooftop mechanical ventilation equipment operational noise levels, as measured at the nearest off-site sensitive receptor, would not exceed existing ambient noise levels more than 5 dBA L_{dn}.

Therefore, all project-related stationary operational noise sources would result in a less than significant impact.

5.2.3 - Mobile Source Operational Noise Impacts

A significant impact would occur for the proposed nursing homes type land use development if the project would be exposed to transportation noise levels in excess of the City's "normally acceptable" land use compatibility standard of 70 dBA L_{dn} or if it would be exposed to noise levels that would exceed the interior noise standards of 45 dBA L_{dn}. The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate existing and future traffic noise conditions in the vicinity of the project site. Traffic data used in the model was obtained from the traffic report for the project prepared by W-Trans (Appendix B). The resultant noise levels were weighed and summed over a 24-hour period in order to determine the L_{dn} values. The traffic noise modeling input and output files are included in Appendix C of this document. Table 5 shows a summary of the traffic noise levels for existing background traffic noise levels without and with the project as measured at 50 feet from the centerline of the outermost travel lane.

Table 5: Existing Traffic Noise Model Results Summary

Roadway Segment	Existing No Project ADT	Existing No Project (dBA) L_{dn}	Existing Plus Project ADT	Existing Plus Project (dBA) L_{dn}	Increase over Existing No Project (dBA)
Thomas Lake Harris Drive—Fountaingrove Parkway to Gullane Drive	960	50.01	1,100	50.7	0.6
Thomas Lake Harris Drive—Gullane Drive to Kilarney Circle	910	49.9	930	50.0	0.1

Note:
ADT is calculated by the FHWA model based on PM peak hour traffic volumes from the traffic study prepared for the project. FHWA model ADT assumptions are lower than ADT derived from the ITE methodology used in the traffic report; however, even if all 250 average daily trips forecast using ITE methodology traveled along any of the modeled roadway segments, they would still not result in even a 1 dBA increase in traffic noise levels that would exist without the project.
L_{dn} (dBA) is stated as measured at 50 feet from the centerline of the outermost travel lane.
Source: FirstCarbon Solutions, 2016.

Table 6 shows a summary of the traffic noise levels for baseline background traffic noise levels without and with the project as measured at 50 feet from the centerline of the outermost travel lane.

Table 6: Baseline Traffic Noise Model Results Summary

Roadway Segment	Baseline No Project ADT	Baseline No Project (dBA) L_{dn}	Baseline Plus Project ADT	Baseline Plus Project (dBA) L_{dn}	Increase over Baseline No Project (dBA)
Thomas Lake Harris Drive—Fountaingrove Parkway to Gullane Drive	2,000	53.3	2,200	53.7	0.4

Table 6 (cont.): Baseline Traffic Noise Model Results Summary

Roadway Segment	Baseline No Project ADT	Baseline No Project (dBA) L_{dn}	Baseline Plus Project ADT	Baseline Plus Project (dBA) L_{dn}	Increase over Baseline No Project (dBA)
Thomas Lake Harris Drive—Gullane Drive to Kilarney Circle	2,000	53.3	2,000	53.3	0.0
Source: FirstCarbon Solutions, 2016.					

Table 7 shows a summary of the traffic noise levels for future background traffic noise levels without and with the project as measured at 50 feet from the centerline of the outermost travel lane.

Table 7: Future Traffic Noise Model Results Summary

Roadway Segment	Future No Project ADT	Future No Project (dBA) L_{dn}	Future Plus Project ADT	Future Plus Project (dBA) L_{dn}	Increase over Future No Project (dBA)
Thomas Lake Harris Drive—Fountaingrove Parkway to Gullane Drive	3,600	55.9	3,800	56.1	0.2
Thomas Lake Harris Drive—Gullane Drive to Kilarney Circle	3,600	55.9	3,600	55.9	0.0
Source: FirstCarbon Solutions, 2016.					

Based on the modeled traffic noise results, the highest noise levels would occur under future plus project traffic conditions. The modeling results in Table 7 show that traffic noise levels along the modeled roadway segment of Thomas Lake Harris Drive adjacent to the project site, north of Fountainway Parkway to Gullane Drive, would range up to 56.1dBA L_{dn} under future plus Project traffic conditions as measured at 50 feet from the centerline of the outermost travel lane. The nearest façade of the proposed nursing home facility would be located approximately 845 feet from the centerline of the outermost travel lane of this roadway segment. At this distance, traffic noise levels along this roadway segment would attenuate by approximately -23.6 dBA to approximately 32.5 dBA L_{dn}. These traffic noise levels are well below the City's normally acceptable land use compatibility threshold of 70 dBA L_{dn} for new nursing home land use development. Therefore, traffic noise impacts on proposed exterior areas of the project site would be less than significant.

Traffic noise levels would also not exceed the City's established interior noise level standards. As stated above, traffic noise levels with implementation of the project could range up to approximately 32.5 dBA L_{dn} at the nearest façade of the proposed facility. Therefore, traffic noise impacts on interior living spaces for the proposed nursing home land uses would be well below the City's interior noise performance standard of 45 dBA L_{dn}.

Therefore, traffic noise impacts to the proposed project would not exceed the City's land use compatibility or the applicable interior noise standards for the proposed nursing home land uses.

Traffic noise impacts to the proposed project would be considered less than significant and no mitigation would be required.

5.3 - Substantial Permanent Increase Impacts

As noted in the characteristics of noise discussion, audible increases in noise levels generally refer to a change of 3 dBA or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. A change of 5 dBA is considered to be the minimum change considered readily perceptible to the human ear in outdoor environments. According to the City of Santa Rosa City Code, it is also unlawful for any person to operate any machinery, equipment, pump, fan, air-conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels. Therefore, for purposes of this analysis, an increase of 5 dBA or greater would be considered a substantial permanent increase in ambient noise levels.

This highest traffic noise level increase with implementation of the project would occur along Thomas Lake Harris Drive south of Gullane Drive under existing plus project conditions. The project would result in an increase of 0.6 dBA. This increase is below the level that is considered to be a perceptible change (a 3 dBA increase), and is well below a 5 dBA increase that would be considered a substantial permanent increase in noise levels compared with noise levels that would exist without the project. Therefore, project-related traffic noise impacts on off-site receptors would be less than significant.

As is shown in the impact discussion of Section 5.2.2, new stationary noise sources resulting from implementation of the project would not result in noise levels above existing background noise levels as measured at off-site sensitive receptors. Therefore, project-related stationary sources would not result in a substantial permanent increase compared with noise levels existing without the project, and noise impacts on off-site receptors would be less than significant.

5.4 - Substantial Temporary Increase Impacts

Implementation of the project would result in short-term increases in ambient noise levels due to construction activities. Construction noise impacts were analyzed in the impact discussion Section 5.2—Exceedance of Noise Standards Impacts, above. Project-related construction activities could result in high intermittent noise levels of up to approximately 73 dBA L_{max} at the closest noise-sensitive land uses. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance, the effect on hourly or daily ambient noise levels would be small. Compliance with the standard city project conditions of approval restricting the permissible hours of noise producing construction activities and implementation of MM NOI-1 requiring standard construction noise reduction measures (including required use of approved mufflers on equipment) would reduce short-term construction impacts on sensitive receptors in the project vicinity to a less than significant level.

Level of Significance Before Mitigation

Potentially significant unless mitigation is incorporated.

Mitigation Measures

Implementation of Mitigation Measure NOI-1 would reduce this impact to less than significant.

Level of Significance After Mitigation

Less than significant impact.

5.5 - Excessive Groundborne Vibration Impacts

Project-related construction and operational groundborne vibration impacts are analyzed separately below.

5.5.1 - Short-term Construction Vibration Impacts

Groundborne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings.

In extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Common sources of groundborne vibration include construction activities such as blasting, pile driving, and operating heavy earthmoving equipment.

Of the variety of equipment that would be used during construction, large vibratory rollers would produce the greatest groundborne vibration levels. Impact equipment such as pile drivers is not expected to be used during construction of this project. Large vibratory rollers produce groundborne vibration levels ranging up to 0.210 inch per second (in/sec) peak particle velocity (PPV) at 25 feet from the operating equipment. The nearest off-site receptor to the proposed construction footprint is the residential land use northeast of the project on Lakepointe Circle. This receptor is located approximately 355 feet from the nearest construction area where heavy construction equipment would potentially operate. At this distance, groundborne vibration levels could range up to 0.004 PPV from operation of a large vibratory roller. This is well below the industry standard vibration damage criteria of 0.2 PPV for residential non-engineered timber and masonry buildings. Therefore, construction-related groundborne vibration impacts would be considered less than significant.

5.5.2 - Operational Vibration Impacts

Implementation of the project would not include any permanent sources that would expose persons in the project vicinity to groundborne vibration levels that could be perceptible without instruments at any existing sensitive land use in the project vicinity. In addition, there are no existing significant permanent sources of groundborne vibration in the project vicinity to which the proposed project would be exposed. Therefore, project operational groundborne vibration-level impacts would be considered less than significant.

5.6 - Airport Noise Impacts

5.6.1 - Public Airport Noise Impacts

The nearest airport to the project site is Sonoma County Airport, located approximately 4.7 miles northwest of the project site. Because of the distance from and orientation of the airport runways, the project site is located well outside of the 55 dBA CNEL airport noise contours. While aircraft noise is occasionally audible on the project site from aircraft flyovers, aircraft noise associated with nearby airport activity would not expose people residing or working in the project area to excessive noise levels. Therefore, impacts associated with public airport noise would be less than significant.

5.6.2 - Private Airstrips Noise Impacts

The project site is not located within the vicinity of a private airstrip. Therefore, no impacts associated with private airstrip noise would occur.

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SECTION 6: REFERENCES

City of Santa Rosa. 2009. City of Santa Rosa General Plan. Noise Element. Website: http://ci.santa-rosa.ca.us/departments/cityadmin/adv_planning_policy/general_plan/Pages/General%20Plan%202020%20-%20Current%20Plan.aspx. Accessed August 3, 2016.

City of Santa Rosa. 2016. City of Santa Rosa City Code. 17—Environmental Protection Website: http://ci.santa-rosa.ca.us/departments/cityadmin/cityclerk/Pages/CityCode.aspx. Accessed August 3, 2016.

Federal Highway Administration (FHWA). 2006. Highway Construction Noise Handbook. August.

Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment. May.

United States Environmental Protection Agency. 1978. Protective Noise Levels, EPA 550/9-79-100. November.

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Appendix A:
Noise Measurement and Traffic Noise Modeling Data

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Summary

Filename	LxT_Data.136
Serial Number	4228
Model	SoundTrack LxT®
Firmware Version	2.206
User	Dana
Location	Oakmont Emerald Isle
Job Description	
Note	
Measurement Description	
Start	18/08/2016 16:12:18
Stop	19/08/2016 14:19:13
Duration	22:06:54.9
Run Time	22:06:54.9
Pause	0:00:00.0
Pre Calibration	18/08/2016 15:52:09
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT2B		
Microphone Correction	Off		
Integration Method	Exponential		
Overload	145.8 dB		
	A	**C**	**Z**
Under Range Peak	**101.9**	98.9	103.9 dB
Under Range Limit	**38.0**	36.0	44.0 dB
Noise Floor	25.3	25.8	33.2 dB

Results

LASeq	47.8 dB	
LASE	96.8 dB	
EAS	535.688 µPa²h	
EAS8	193.780 µPa²h	
EAS40	968.902 µPa²h	
LApeak (max)	18/08/2016 16:13:07	103.9 dB
LASmax	19/08/2016 12:03:01	76.7 dB
LASmin	19/08/2016 05:57:28	31.6 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**
	49.5	49.9	38.7	50.0	50.6	45.7	38.7

LCSeq	56.2 dB
LASeq	47.8 dB
LCSeq - LASeq	8.4 dB
LAIeq	51.6 dB
LAeq	47.8 dB
LAIeq - LAeq	3.8 dB
# Overloads	0
Overload Duration	0.0 s

Dose Settings

Dose Name	OSHA-1	OSHA-2
Exch. Rate	5	5 dB
Threshold	90	80 dB
Criterion Level	90	90 dB
Criterion Duration	8	8 h

Results

Dose	-99.9	-99.9 %
Projected Dose	-99.9	-99.9 %
TWA (Projected)	-99.9	-99.9 dB
TWA (t)	-99.9	-99.9 dB
Lep (t)	52.2	52.2 dB

Statistics

LAS5.00	48.4 dB
LAS10.00	46.3 dB
LAS33.30	40.0 dB
LAS50.00	38.3 dB
LAS66.60	36.8 dB
LAS90.00	35.0 dB

TABLE Existing-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 960   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 50.14

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Existing-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 910   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 49.91

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 140   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 41.78

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 20   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 33.33

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Existing + Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Existing + Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1100   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 50.74

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Existing + Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Existing + Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 930   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 50.01

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Baseline-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Baseline

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2000   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 53.33

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Baseline-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Baseline

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2000 SPEED (MPH): 25 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 53.33

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Baseline + Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Baseline + Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2200 SPEED (MPH): 25 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 53.75

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Baseline + Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Baseline + Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2000   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 53.33

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	0.0

TABLE Future-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Future

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3600 SPEED (MPH): 25 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 55.88

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	64.0

TABLE Future-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Future

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3600   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 55.88

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	64.0

TABLE Future + Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Fountaingrove Pkwy to Gullane Drive
NOTES: Oakmont Emerald Isle - Future + Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3800   SPEED (MPH): 25   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.12

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	66.4

TABLE Future + Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 06/05/2017
ROADWAY SEGMENT: Thomas Lake Harris Drive - Gullane Drive to Kilarney Circle
NOTES: Oakmont Emerald Isle - Future + Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3600 SPEED (MPH): 25 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 55.88

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	0.0	64.0

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