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TECHNICAL MEMORANDUM

Date: January 23, 2020

To: Nicole Greenfield, Associate Environmental Planner
GPA Consulting

From: Kurt Legleiter, Principal

Subject: **Noise & Groundborne Vibration Impact Assessment for the Proposed Diamond Bar Golf Course Renovation Project, Diamond Bar, CA**

INTRODUCTION

The purpose of this report is to evaluate potential noise and groundborne vibration impacts associated with the proposed Diamond Bar Golf Course Renovation Project (Project). To assist in the understanding of this report, a summary of acoustic fundamentals has been included in Appendix A. Noise modeling and additional supportive documentation related to this analysis is included in Appendix B.

PROPOSED PROJECT SUMMARY

The San Gabriel Valley Council of Governments and the Los Angeles County Department of Parks and Recreation and Metropolitan Transportation Authority propose to renovate the Diamond Bar Golf Course ("Golf Course"). The proposed Project is located in the City of Diamond Bar. The project site location is depicted in Figure 1.

The proposed Project would reduce the Golf Course from 178 acres to 167.9 acres and require the demolition of an existing maintenance facility. The proposed Project would realign and reconfigure six holes in the western part of the course and three in the eastern part of the course. This includes reconstructing bunkers and tee and green complexes for all holes. Holes 1, 2, 3, 4, 8, and 9 would be reconstructed in their entirety with new fairways, bunkers, and tee and green complexes. The proposed Project would increase the overall existing course yardage from 6,801 yards to 6,848 yards. The total course par would remain unchanged at 72.

Night and weekend work is not anticipated. Depending on Project phasing, construction would occur over an approximately 12- to 16-month period. The proposed Project would not require the acquisition of any right-of-way or temporary construction easement. All construction activities, including staging, would occur within the boundaries of the existing Golf Course.

Figure 1. Project Site Location & Nearby Land Uses

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EXISTING NOISE ENVIRONMENT

The existing noise environment is dominated by vehicular traffic noise emanating from State Route 57/60 (SR 57/60). Based on noise-measurement surveys previously conducted in the Project area, average-hourly ambient noise levels generally range from the upper 50s along the eastern boundary of the Project site to the upper 70s (in dBA L_{eq}) along the western boundary of the Project site, near SR 57/60.[1]

Land uses in the project vicinity generally consist of a mix of residential, recreational, public, and commercial land uses. The nearest noise-sensitive land uses consist predominantly of residential land uses. The nearest residential land uses are located adjacent to and east of the project site along Golden Prados Drive. Additional residential land uses are located east of the project site, across Golden Springs Drive, and north of the project site, across S. Prospectors Road. Sycamore Canyon Park, Calvary Chapel Golden Springs, and La Petite Academy of Diamond Bar are also located east of the project site, across Golden Springs Drive. Ayres Suites Diamond Bar is located adjacent to and south of the project site, along Golden Springs Drive, and Best Western Diamond Bar Hotel & Suites is located north of the project site, along S. Prospectors Road. In addition, the Mt. Calvary Lutheran School and Lorbeer Middle School are located east of the site, near the intersection of Golden Springs Drive and S. Diamond Bar Boulevard. Nearby land uses are depicted in Figure 1.

EXISTING REGULATORY ENVIRONMENT

CITY OF DIAMOND BAR GENERAL PLAN

The *Diamond Bar General Plan 2040* was adopted on December 17, 2019. The Public Safety Element of the *City of Diamond Bar General Plan* identifies policies and noise standards for ensuring the compatibility for proposed development exposed to transportation or non-transportation noise sources. The *Diamond Bar General Plan* does not identify noise standards for construction-related activities. However, policies have been included to ensure consistency with applicable noise standards identified in the City's noise control ordinance.[2]

CITY OF DIAMOND BAR NOISE ORDINANCE

The City of Diamond Bar Noise Control Ordinance (Chapter 22.28, Section 22.28.120) establishes maximum noise exposure standards for noise-sensitive structures exposed to noise-generating construction activities, including mobile sources and stationary equipment. The City's noise standards for construction activities are summarized in Table 1.[3]

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1 California Department of Transportation (Caltrans). May 2012. *State Route 57/State Route 60 Confluence Project Noise Study Report*.

2 City of Diamond Bar. December 17, 2019. *Diamond Bar General Plan 2040, Public Safety Element.* Available at website url: http://www.diamondbargp.com/.

3 City of Diamond Bar. *Municipal Code of Ordinances. Chapter 22.28. Noise Control Ordinance*. Available at website url: https://library.municode.com/ca/diamond_bar.

Table 1. City of Diamond Bar Construction Noise Level Limits

Time Interval	Maximum Allowable Noise Level (dBA)[1]		
	Single-family Residential	Multi-family Residential	Semi-Residential/ Commercial
Mobile Equipment[2]			
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	75	80	85
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	60	64	70
Stationary Equipment[3]			
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	60	65	70
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50	55	60

1. *Maximum noise levels are applied at the receiving structure. Maximum noise levels at non-structure locations for nonscheduled, intermittent, short-term operation of mobile equipment are limited to a maximum of 85 dBA daily (all hours), including Sundays and legal holidays.*
2. *Mobile equipment maximum noise levels for nonscheduled, intermittent, short-term operation (less than ten days).*
3. *Stationary equipment maximum noise levels for repetitively scheduled and relatively long-term operation (period of ten days or more).*

Source: City of Diamond Bar. November 3, 1998. Municipal Code. Chapter 22.28, Noise Control. Section 22.28.120.

As indicated in Table 1, mobile-source activities associated with construction are limited to a maximum of 75 dBA at single-family residential structures between the hours of 7:00 a.m. and 8:00 p.m., and 60 dBA between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday. Operational noise levels associated with stationary construction equipment (e.g., generators, compressors) are limited to a maximum of 60 dBA at single-family residential structures between the hours of 7:00 a.m. and 8:00 p.m., and 45 dBA between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday. In comparison to the maximum allowable noise limits for single-family structures, allowable exterior noise limits are approximately 4-5 dB higher at multi-family structures and 10 dB higher at other noise-sensitive semi-residential and commercial structures. Mobile-equipment noise associated with site clearing, grading, and other construction activities are limited to an exterior noise level of 85 dBA at outdoor activity areas (non-structure locations). In addition to the noise standards noted in Table 1, demolition and construction-related activities that result in a noise disturbance (excluding emergency work of public service utilities) at residential or commercial property lines between the hours of 7:00 p.m. and 7:00 a.m. on weekdays or at any time on Sundays or holidays would be considered a violation of the City's noise ordinance.[3]

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IMPACT ANALYSIS

SIGNIFICANCE THRESHOLD CRITERIA

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

a. Result in a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
b. Result in the generation of excessive groundborne vibration or groundborne noise levels.
c. For a project located within the vicinity of a private airstrip or 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, expose people residing or working in the project area to excessive noise levels.

The proposed Project would not result in the relocation of major on-site noise sources nor long-term changes in vehicle trip generation or traffic distribution along area roadways. As a result, long-term noise impacts associated with the proposed Project would be considered less than significant and are not discussed further in this report.

Substantial Increases in Noise Levels

The CEQA Guidelines do not define the levels at which a "substantial increase" in noise levels would occur. For purposes of this analysis, a "substantial increase" is defined as an increase of 5 dB, or greater. This level is generally defined as the level required before any noticeable change in community response or increases in annoyance would occur.

Construction Noise

A project would normally have a significant impact on noise levels from construction if the project would result in a substantial increase in noise levels that would exceed the City of Diamond Bar's applicable noise standards (refer to Table 1). As previously noted, the City's Noise Control Ordinance exempts noise sources associated with construction provided that mobile source activities associated with construction do not exceed 75 dBA at single-family residential structures between the hours of 7:00 a.m. and 8:00 p.m., or 60 dBA between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday. Mobile-source noise associated with site clearing, grading, and other construction activities are limited to an exterior noise level of 85 dBA at outdoor activity areas. Operational noise levels associated with stationary construction equipment (e.g., generators, compressors) are limited to 60 dBA at single-family residential structures between the hours of 7:00 a.m. and 8:00 p.m. and 45 dBA between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday. Allowable exterior noise limits for other noise-sensitive land uses are slightly higher (refer to Table 1). In addition to the noise standards noted in Table 1, demolition and construction-related activities that result in a noise disturbance (excluding emergency work of public service utilities) at residential or commercial property lines between the hours of 7:00 p.m. and 7:00 a.m.

on weekdays or at any time on Sundays or holidays would be considered a violation of the City's noise ordinance.[3]

Groundborne Vibration

The City of Diamond Bar does not have specific policies pertaining to vibration levels. However, various agencies, such as the California Department of Transportation (Caltrans), have developed recommended criteria for the evaluation of ground-borne vibration levels with regard to potential human annoyance and building structural damage. The Caltrans-recommended criteria for the evaluation of ground-borne vibration events are presented in terms of peak particle velocity (ppv) in inches per second (in/sec). The Caltrans-recommended threshold at which there may be a risk with regard to architectural damage is based on a peak-particle velocity (ppv) of 0.5 inches per second (in/sec), excluding fragile or historic structures. For the protection of fragile and historic structures, Caltrans recommends a threshold of 0.2 inches per second ppv (in/sec ppv). This same threshold would represent the level at which vibrations would be potentially annoying to people in buildings.[4]

No fragile or historic structures are located in the Project vicinity that would be adversely affected by onsite construction activities. Groundborne vibration levels exceeding 0.5 in/sec ppv at nearby structures would be considered to have a potentially significant impact.

IMPACT DISCUSSION

IMPACT A: GENERATION OF A SUBSTANTIAL TEMPORARY OR PERMANENT INCREASE IN AMBIENT NOISE LEVELS IN THE VICINITY OF THE PROJECT IN EXCESS OF STANDARDS ESTABLISHED IN THE LOCAL GENERAL PLAN OR NOISE ORDINANCE, OR APPLICABLE STANDARDS OF OTHER AGENCIES?

Implementation of the proposed Project would not result in the installation of any stationary noise sources, nor would the Project introduce new vehicle traffic on area roadways. For this reason, potential noise impacts associated with the proposed Project would be limited to short-term construction activities.

Noise associated with short-term construction activities typically occurs intermittently and varies depending upon the nature or phase of construction (e.g., land clearing, grading, and excavation). Noise generated by construction equipment, including earth movers and material handling equipment, can reach high levels. Typical noise levels for construction equipment are summarized in Table 2.

As depicted in Table 2, individual equipment noise levels (in dBA L_{max}) typically range from the mid-70's to the upper 80's at 50 feet. Typical operating cycles may involve 2 minutes of full power, followed by 3 or 4

[4] California Department of Transportation (Caltrans). September 1, 2013. *Transportation and Construction Vibration Guidance Manual.* Available at website url: https://dot.ca.gov/programs/environmental-analysis/noise-vibration/guidance-manuals.

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minutes at lower settings. Depending on the activities performed and equipment usage requirements, combined average-hourly noise levels at construction sites can reach levels of up to approximately 83 dBA L_{eq} at 50 feet. Assuming a maximum construction noise level of 89 dBA and an average attenuation rate of 6 dBA per doubling of distance from the source, predicted exterior noise levels could reach maximum instantaneous levels of 85 dBA at approximately 76 feet, 80 dBA at 150 feet, and 75 dBA at 265 feet.

Table 2. Typical Construction Equipment Noise Levels

Type of Equipment	Typical Noise Level at 50 feet (dBA L_{max})
Air Compressor	81
Backhoe	80
Compactor	82
Concrete Pump	82
Concrete Vibrator	76
Dozer	85
Generator	81
Grader	85
Jack Hammer	88
Loader	85
Paver	89
Roller	74
Saw	76
Truck	88
Sources: Federal Highway Administration (FHWA). 2006. Road Construction Noise Model.	

Noise-sensitive land uses in the Project vicinity include a mix of land uses, including single-family and multi-family residential, schools, parks, hotels, and places of worship. The nearest noise-sensitive land uses include single-family residential land uses generally located adjacent to and east of the Project site; as well as, outdoor recreational-use areas at Ayres Suites Diamond Bar, which is located adjacent to and south of the Project site. Predicted construction noise levels at these nearest land uses could reach maximum levels of approximately 89 dBA when activities occur within approximately 50 feet of the nearest site boundary. Based on these same assumptions, construction noise levels at the nearest schools and child daycare facilities would be approximately 74 dBA, or less. Predicted exterior noise levels at Sycamore Canyon Park would be approximately 82 dBA.

Predicted construction noise levels at land uses, particularly evening and nighttime activities occurring near adjacent noise-sensitive land uses and outdoor activity areas, could potentially exceed the City's

applicable exterior noise standards (refer to Table 1). During the daytime hours, construction-generated noise levels at the nearby land uses would be somewhat masked by existing traffic noise emanating from SR 57/60 and local roadways. However, construction activities occurring during the quieter nighttime hours may result in increased levels of annoyance and potential sleep disruption to occupants of nearby residential dwellings and hotels. Noise-generating construction activities occurring on Sundays and during the weekday evening hours could also result in increased levels of annoyance at nearby places of worship. In addition, if construction were to occur during periods when the golf course is open, noise-generating construction activities could result in intermittent speech interference and increased levels of annoyance to nearby patrons at on-course (e.g., driving range) and clubhouse locations. Construction-generated noise would, therefore, be considered to result in a ***potentially significant*** short-term noise impact to nearby noise-sensitive land uses.

Mitigation Measures:

The following measures shall be implemented for the control of construction-generated noise levels:

- In accordance with the provisions of the "City of Diamond Bar Municipal Code" noise-generating construction activities (excluding activities where public or worker safety would be a concern) shall be restricted to between the hours of 7:00 a.m. and 7:00 p.m., on weekdays and Saturdays. Noise-generating construction activities shall be prohibited on Sundays and federal holidays.
- Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.
- When not in use, the idling of off-road equipment and haul trucks shall be prohibited. Signs shall be posted in the designated queuing areas and or job sites to remind drivers and the idling prohibition.
- Staging and queuing areas shall be located at the furthest distance possible from nearby residential land uses.
- Truck haul routes shall be located along roadways that would minimize potential impacts to nearby sensitive land uses.
- Stationary equipment (e.g., generators, compressors) shall be located at the furthest distance possible from nearby residential land uses.
- Temporary construction barriers shall be installed when noise-generating activities occurring within 100 feet of noise-sensitive land uses and outdoor activity areas. These areas include, but are not limited to, nearby residential dwellings, Ayres Suites Diamond Bar Hotel, golf course driving range, and golf course clubhouse. Barriers may consist of loaded vinyl noise curtains, wood, hay bales, or materials of similar density and usage, and constructed to a minimum height of 6 feet above ground level. Barrier heights of 8 feet are recommended.
- The construction contractor shall post signage at the Project entrance that identifies the name and telephone number of a designated individual(s) to be contacted regarding construction-related noise complaints.

- Written notices shall be provided to land uses located within 100 feet of the Project site in advance of construction-related activities. The written notices shall be provided a minimum of one week in advance of scheduled construction activities. The written notices shall include identification of anticipated construction schedules, designated construction haul truck routes, and the name and telephone number of a designated individual(s) to be contacted regarding construction-related noise complaints.

Significance After Mitigation

With mitigation, noise levels generated by construction-related activities would be limited to the daytime hours to minimize potential impacts to nearby noise-sensitive land uses. Construction activities would also be prohibited on Sundays and weekday evening hours to minimize potential nuisance impacts to nearby places of worship. Additional measures, such as the use of mufflers would reduce construction equipment noise levels by approximately 10 dB and the use of temporary construction barriers would reduce noise levels by approximately 5 dB. Additional measures, such as on-site idling limitations, would further reduce construction-generated noise levels. With mitigation, short-term construction noise impacts would be considered ***less than significant***.

IMPACT B: GENERATION OF EXCESSIVE GROUNDBORNE VIBRATION OR GROUNDBORNE NOISE LEVELS?

Groundborne vibration spreads through the ground and diminishes in strength with distance. The effects of ground vibration can vary from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and slight damage to nearby structures at the highest levels. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely result in structural damage.

Construction activities associated with the proposed improvements would require the use of various off-road equipment, such as tractors and haul trucks. The use of major groundborne vibration-generating construction equipment, such as pile drivers, would not be required for this Project.

Groundborne vibration levels associated with representative construction equipment are summarized in Table 3. As noted, groundborne vibration generated by construction equipment would be approximately 0.09 in/sec ppv, or less, at 25 feet. Because groundborne vibration levels diminish with increased distance from the source, predicted vibration levels in excess of 25 feet would be less. Predicted groundborne vibration levels at nearby structures would not be projected to exceed 0.5 in/sec ppv. In addition, no historic or fragile structures or indoor activities/operations that would be sensitive to groundborne vibration have been identified within approximately 100 feet of the Project site. As a result, this impact would be considered ***less than significant*.**

Table 3. Representative Vibration Source Levels for Typical Construction Equipment

Equipment	Peak Particle Velocity at 25 Feet (in/sec ppv)
Large Tractors	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Tractors	0.003
Source: Caltrans 2013	

IMPACT C: FOR A PROJECT LOCATED WITHIN THE VICINITY OF A PRIVATE AIRSTRIP OR 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?

The nearest airports in relation to the Project site include the following:

- Bracket Field Airport, located approximately 5.2 miles north of the Project site.
- El Monte/San Gabriel Airport, located approximately 13.1 miles northwest of the Project site
- Fullerton Municipal Airport, located approximately 12.3 miles southwest of the Project site
- Chino Airport, located approximately 9.8 miles southeast of the Project site
- Ontario International Airport, located approximately 11.2 miles northeast of the Project site

The Project site is not located within the projected noise contours of nearby airports.[5,6,7,8,9] In addition, no private airstrips were identified within approximately two miles of the Project site. As a result, the Project site is not be subject to high levels of aircraft noise and would not result in a safety hazard for individuals or construction workers located in the Project area. ***No impact***.

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5 Los Angeles County Airport Land Use Commission. December 19, 1991. (Revised December 1, 2004.) *Los Angeles County Airport Land Use Plan.* Available at website url: http://planning.lacounty.gov/assets/upl/data/pd_alup.pdf.

6 County of Los Angeles. June 1995. *El Monte Airport Master Plan Report*. Available at website url: https://dpw.lacounty.gov/avi/airports/documents/SGV_MP.pdf.

7 City of Fullerton. May 2004. *Fullerton Municipal Airport Master Plan*. Available at website url: https://www.cityoffullerton.com/gov/departments/dev_serv/planning/airport_master_plan.asp.

8 San Bernardino County. November 1991. *Chino Airport Comprehensive Land Use Plan*. Available at website url: http://www.sbcounty.gov/Uploads/lus/Airports/Chino.pdf.

9 Ontario International Airport Inter-Agency Collaborative. July 2018. *Ontario International Airport Land Use Compatibility Plan*. Available at website url: http://www.ont-iac.com/airport-land-use-compatibility-plan/ont-alucp-chapter-2/.

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Appendix A
Acoustic Fundamentals

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ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is mechanical energy transmitted in the form of a wave because of a disturbance or vibration. Sound levels are described in terms of both amplitude and frequency.

Amplitude

Amplitude is defined as the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65-dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3-dB change in amplitude as the minimum audible difference perceptible to the average person.

Frequency

The frequency of a sound is defined as the number of fluctuations of the pressure wave per second. The unit of frequency is the Hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. For instance, the human ear is more sensitive to sound in the higher portion of this range than in the lower and sound waves below 16 Hz or above 20,000 Hz cannot be heard at all. To approximate the sensitivity of the human ear to changes in frequency, environmental sound is usually measured in what is referred to as “A-weighted decibels” (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA (U.S. EPA 1971). Common community noise sources and associated noise levels, in dBA, are depicted in Figure A-1.

Addition of Decibels

Because decibels are logarithmic units, sound levels cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces a sound level of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together would produce an increase of 5 dB.

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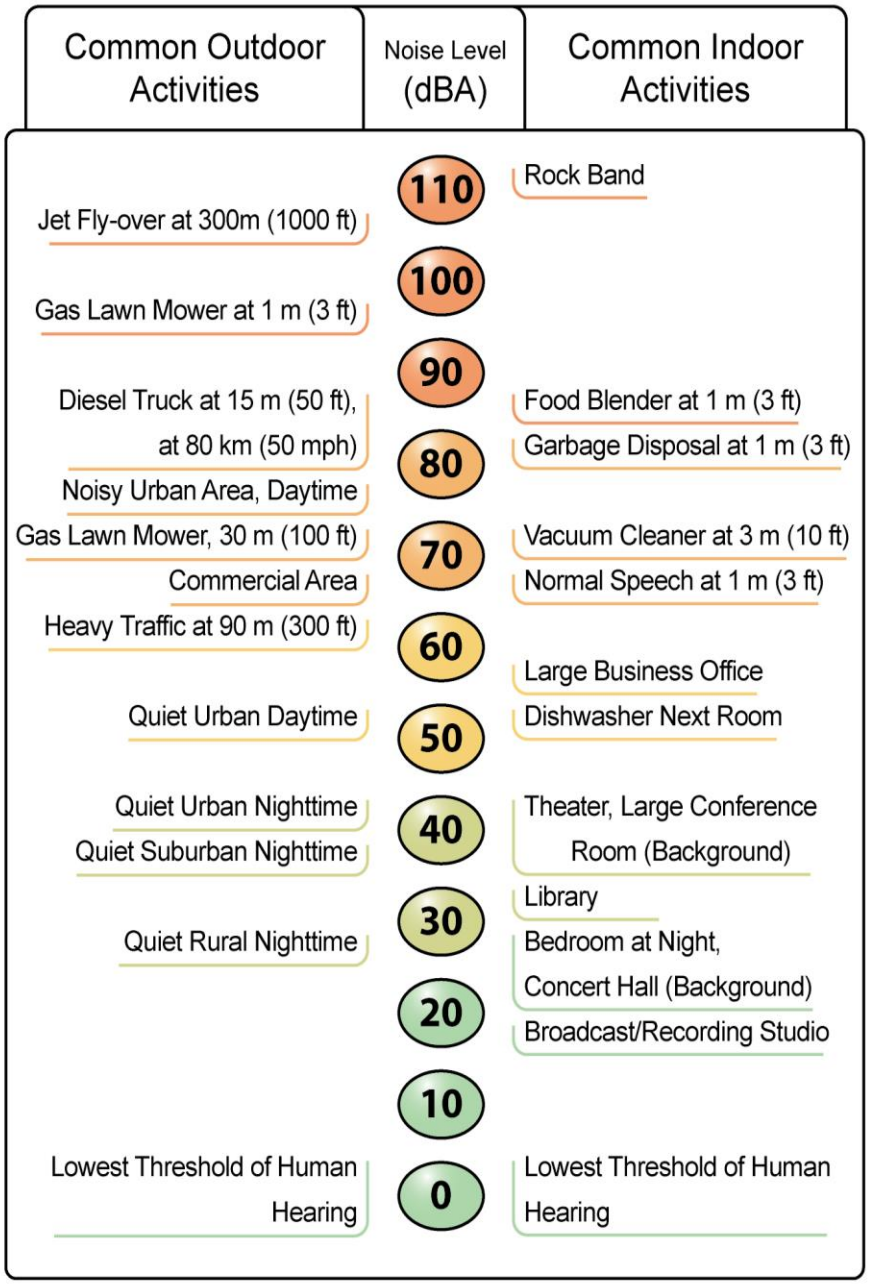
Figure A-1
Common Community Noise Sources & Noise Levels



Source: Caltrans. 2018. EIR/EA Annotated Outline.

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Sound Propagation & Attenuation

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level decreases (attenuates) at a rate of approximately 6 decibels for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 decibels for each doubling of distance from a line source, depending on ground surface characteristics. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation for soft surfaces results in an overall attenuation rate of 4.5 decibels per doubling of distance from the source.

Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in minimum 5 dB of noise reduction. Taller barriers provide increased noise reduction.

Noise reductions afforded by building construction can vary depending on construction materials and techniques. Standard construction practices typically provide approximately 15 dBA exterior-to-interior noise reductions for building facades, with windows open, and approximately 20-30 dBA, with windows closed. With compliance with current Title 24 energy efficiency standards, which require increased building insulation and inclusion of an interior air ventilation system to allow windows on noise-impacted façades to remain closed, exterior-to-interior noise reductions typically average approximately 25 dBA. The absorptive characteristics of interior rooms, such as carpeted floors, draperies and furniture, can result in further reductions in interior noise.

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NOISE DESCRIPTORS

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound-pressure level in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies, which is referred to as the "A-weighted" sound level (expressed in units of dBA). The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with environmental noise.

The intensity of environmental noise fluctuates over time, and several descriptors of time-averaged noise levels are typically used. For the evaluation of environmental noise, the most commonly used descriptors are L_{eq}, L_{dn}, CNEL and SEL. The energy-equivalent noise level, L_{eq}, is a measure of the average energy content (intensity) of noise over any given period. Many communities use 24-hour descriptors of noise levels to regulate noise. The day-night average noise level, L_{dn}, is the 24-hour average of the noise intensity, with a 10-dBA "penalty" added for nighttime noise (10 p.m. to 7 a.m.) to account for the greater sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} but adds an additional 5-dBA penalty for evening noise (7 p.m. to 10 p.m.) Another descriptor that is commonly discussed is the single-event noise exposure level, also referred to as the sound-exposure level, expressed as SEL. The SEL describes a receiver's cumulative noise exposure from a single noise event, which is defined as an acoustical event of short duration (0.5 second), such as a backup beeper, the sound of an airplane traveling overhead, or a train whistle. Common noise level descriptors are summarized in Table A-1.

HUMAN RESPONSE TO NOISE

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When community noise interferes with human activities or contributes to stress, public annoyance with the

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noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.

Table A-1
Common Acoustical Descriptors

Descriptor	Definition
Energy Equivalent Noise Level (L_{eq})	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (L_{min})	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (L_{max})	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or L_{dn})	The DNL was first recommended by the U.S. EPA in 1974 as a "simple, uniform and appropriate way" of measuring long term environmental noise. DNL takes into account both the frequency of occurrence and duration of all noise events during a 24-hour period with a 10 dBA "penalty" for noise events that occur between the more noise-sensitive hours of 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the L_{dn} described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated L_{dn}.
Sound Exposure Level (SEL)	The level of sound accumulated over a given time interval or event. Technically, the sound exposure level is the level of the time-integrated mean square A-weighted sound for a stated time interval or event, with a reference time of one second.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans;
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference;
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial;
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

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Appendix B

Construction Noise Modeling & Supportive Documentation

NOISE PREDICTION CALCULATION

Distance from Source Center (feet)	(dB)	
50	89	Reference Noise Level
	(dB)	Receiver Description
76	85.4	Distance to 85 dB Contour
150	79.5	Distance to 80 dB Contour
265	74.5	Distance to 75 dB Contour
50	89	Adjacent Residences & Ayres Suites Outdoor Activity Area
270	74	Nearest School/Daycare Center
110	82	Sycamore Park

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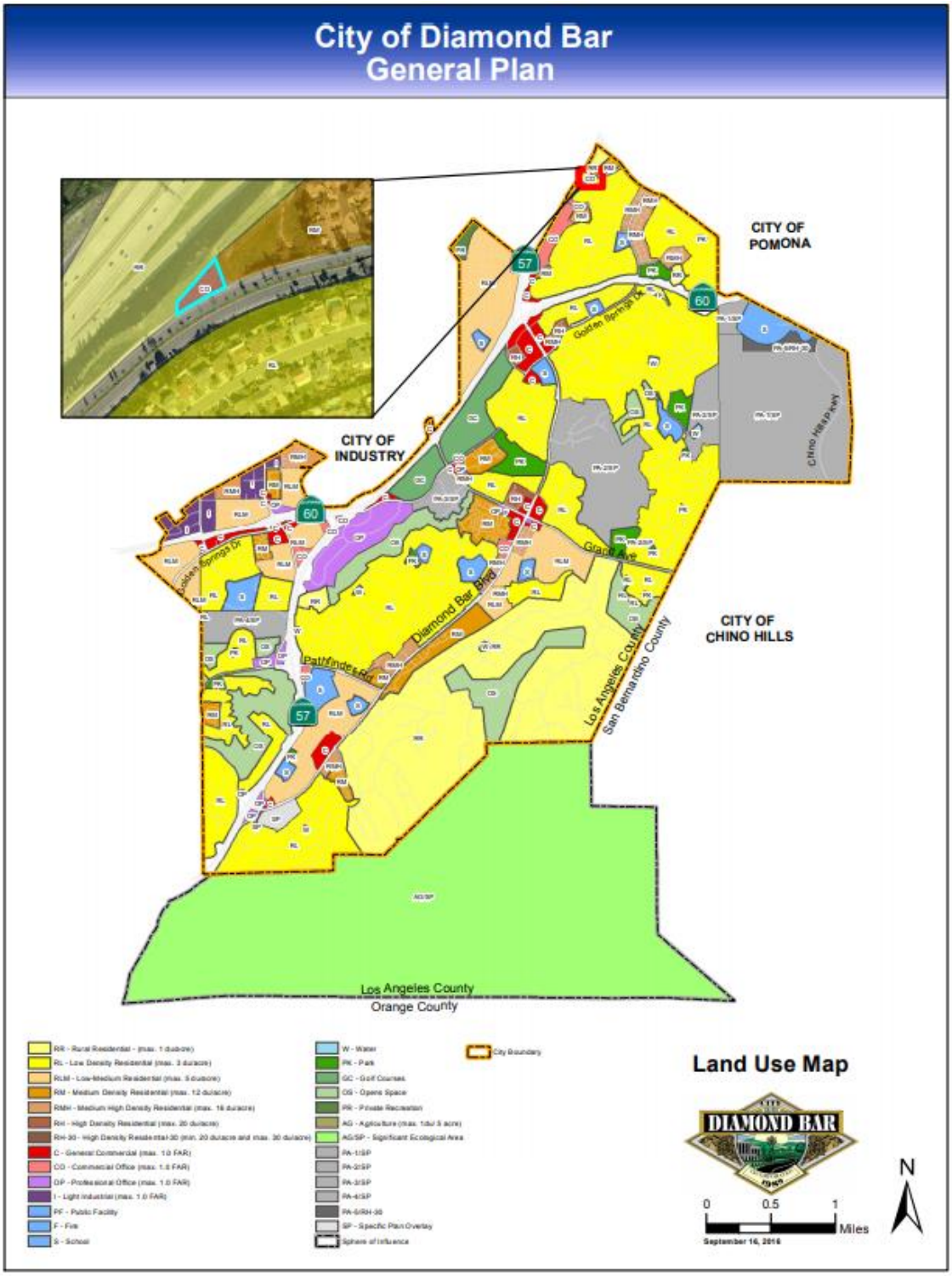

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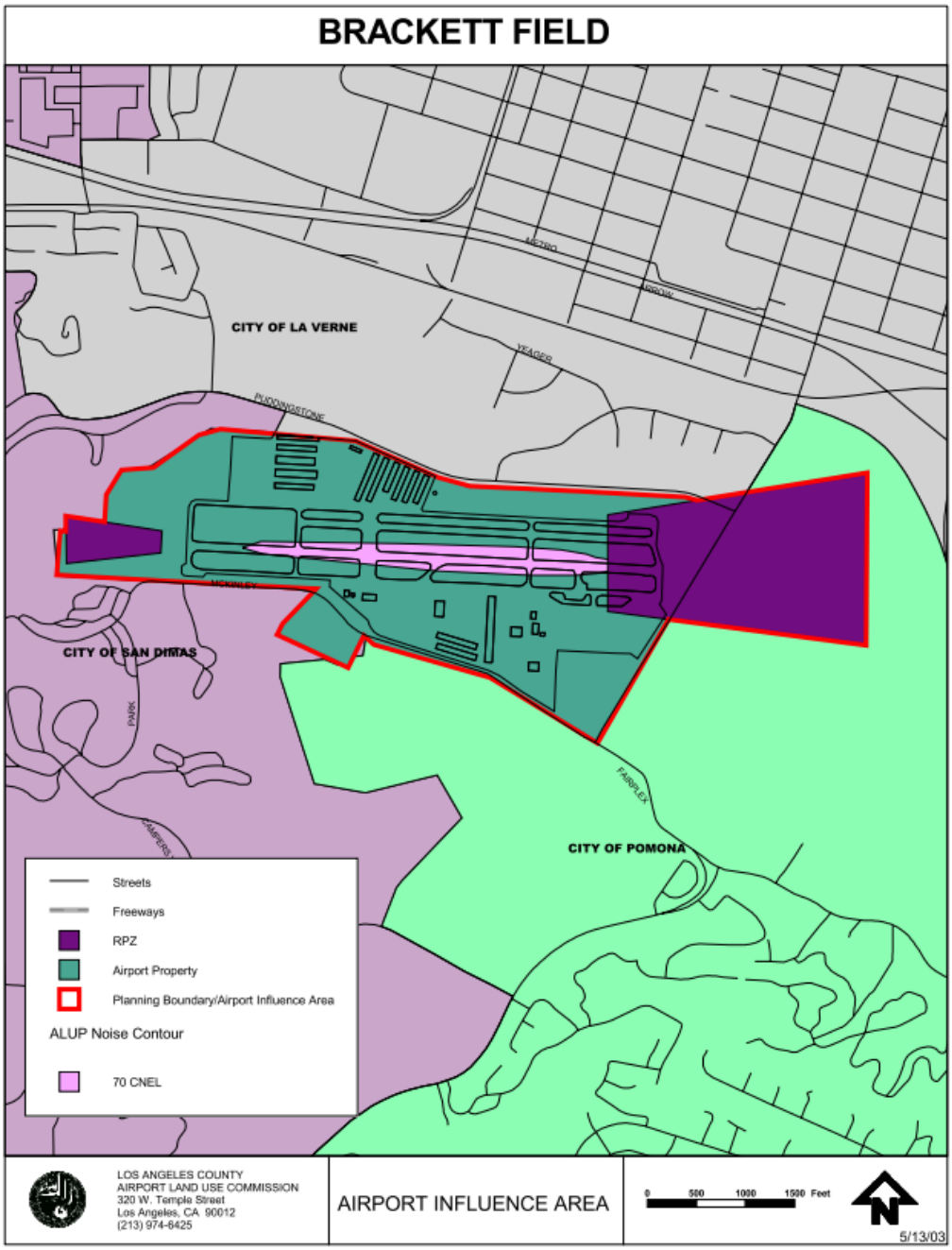
PREDICTED AIRPORT NOISE CONTOURS: Bracket Field Airport. Located approximately 5.2 miles north of the project site. Source: Los Angeles County Airport Land Use Commission. December 19, 1991. (Revised December 1, 2004.) *Los Angeles County Airport Land Use Plan.* Available at website url: http://planning.lacounty.gov/assets/upl/data/pd_alup.pdf.



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PREDICTED AIRPORT NOISE CONTOURS: El Monte/San Gabriel Airport. Located approximately 13.1 miles northwest of the project site. Source: County of Los Angeles. June 1995. *El Monte Airport Master Plan Report*. Available at website url: https://dpw.lacounty.gov/avi/airports/documents/SGV_MP.pdf.

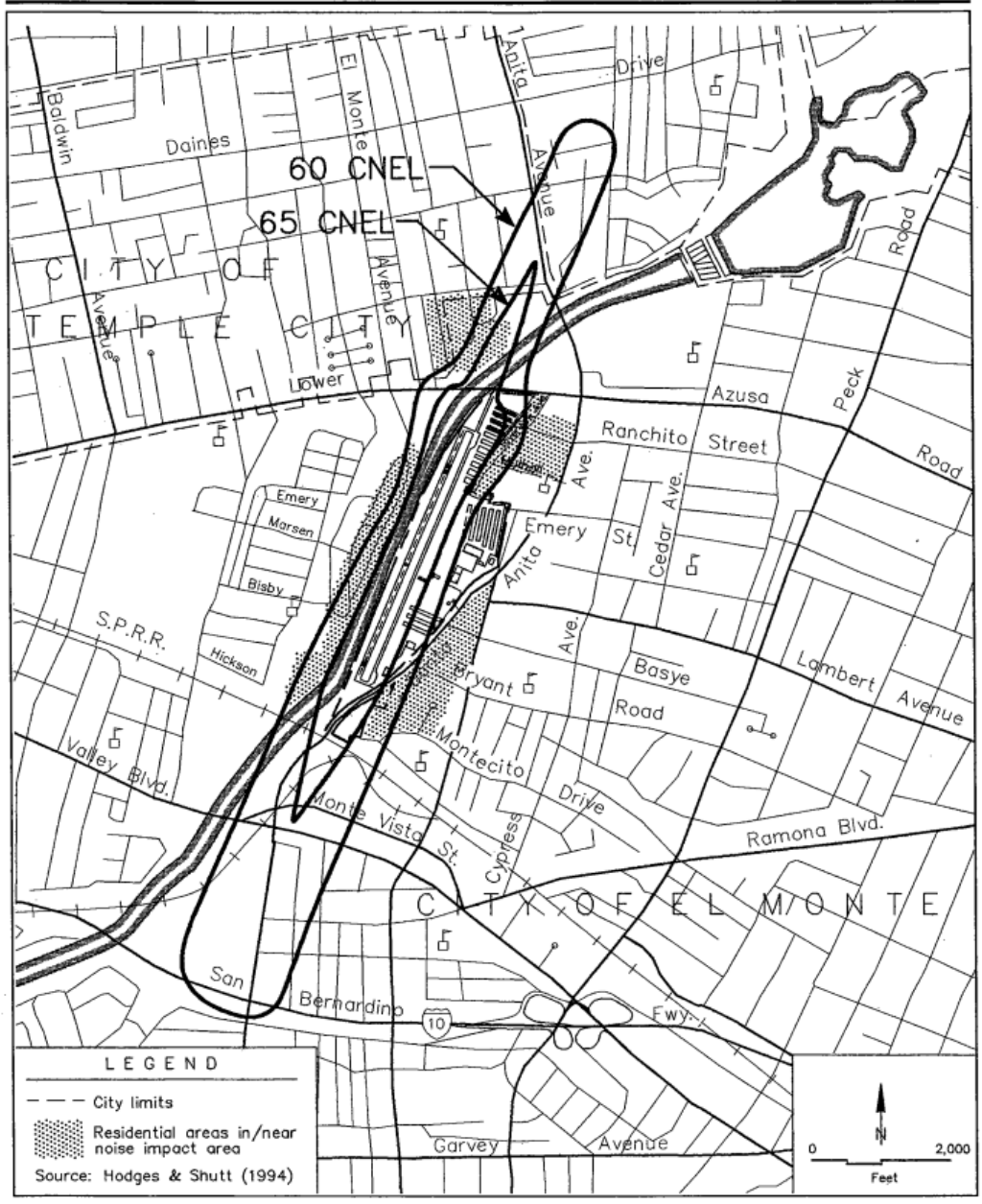

Figure 7B

Nosie Contours - Year 2013

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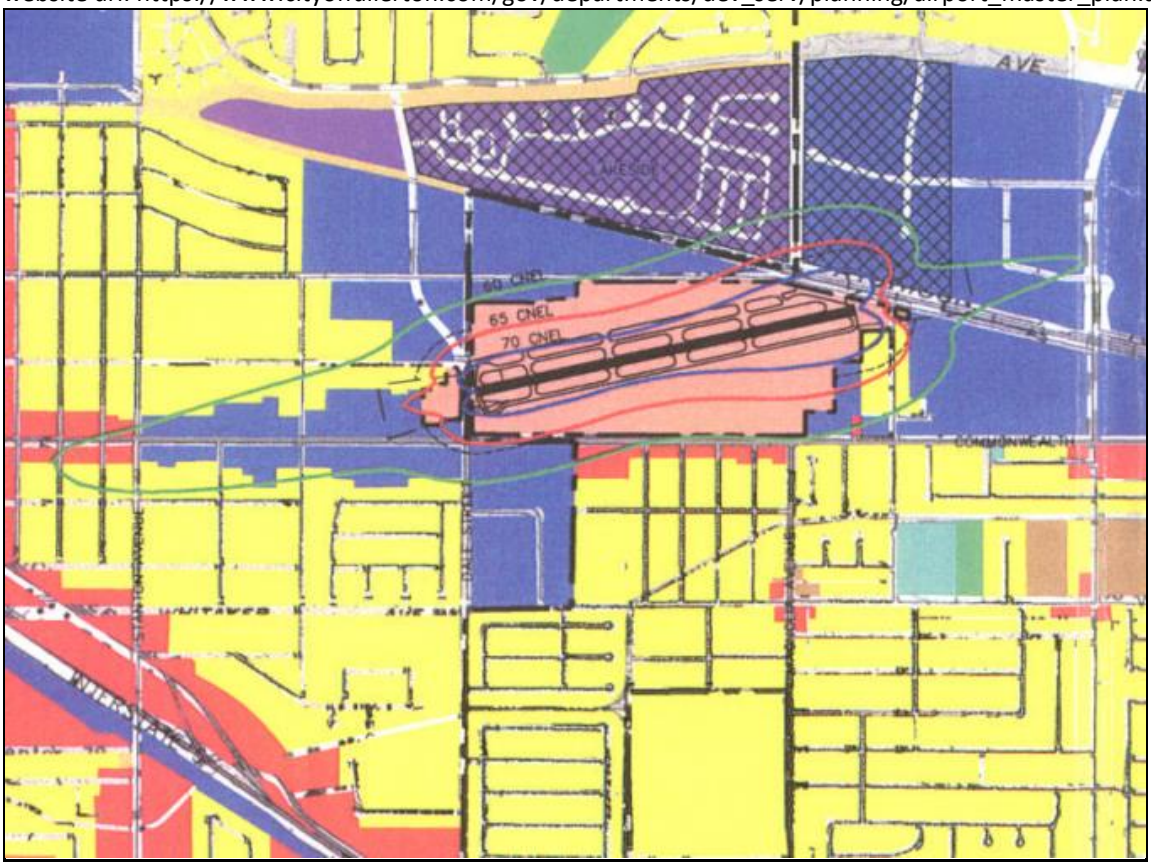
PREDICTED AIRPORT NOISE CONTOURS: Fullerton Municipal Airport. Located approximately 12.3 miles southwest of the project site. Source: City of Fullerton. May 2004. *Fullerton Municipal Airport Master Plan*. Available at website url: https://www.cityoffullerton.com/gov/departments/dev_serv/planning/airport_master_plan.asp.



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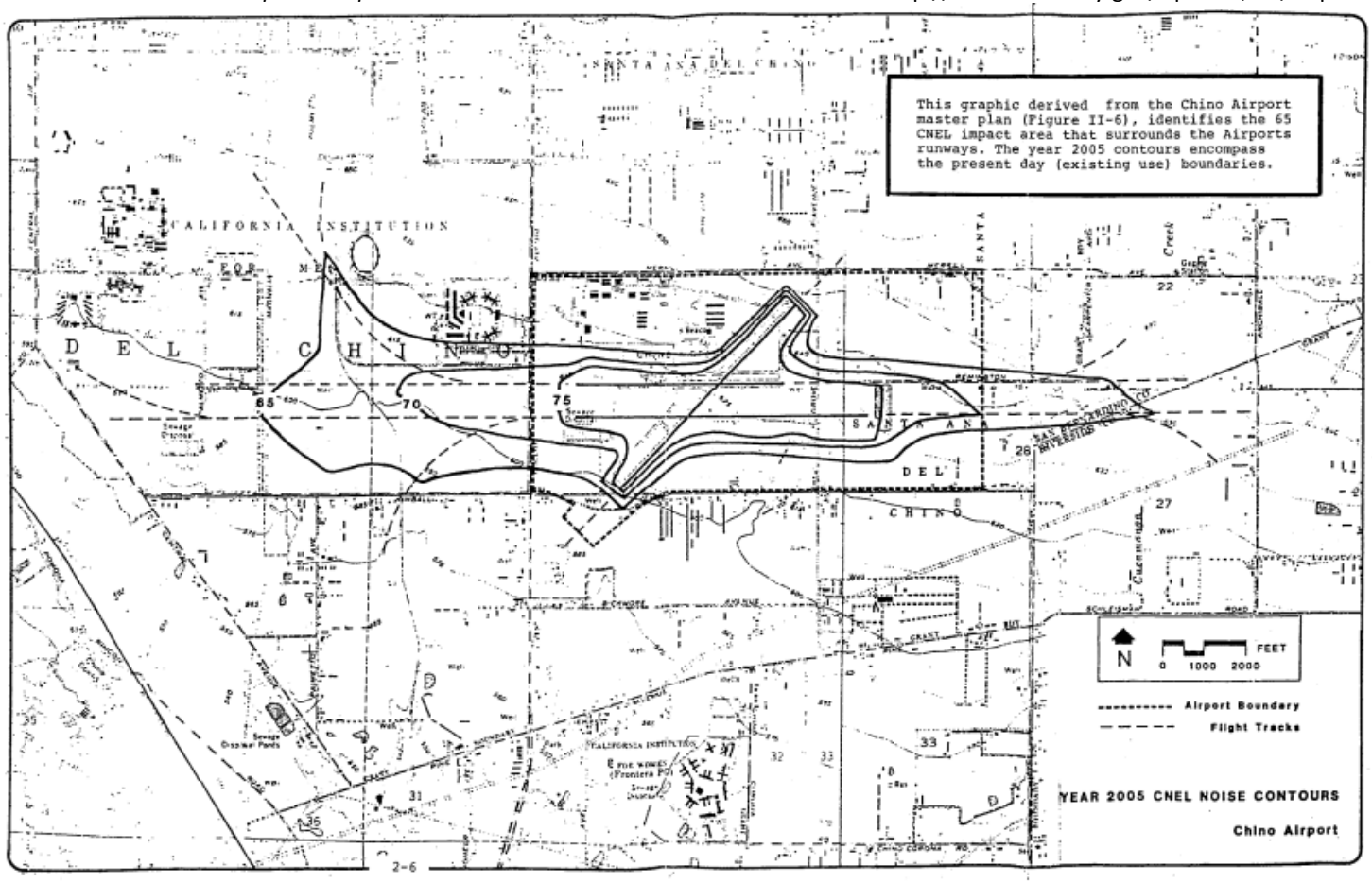
PREDICTED AIRPORT NOISE CONTOURS: Chino Airport. Located approximately 9.8 miles southeast of the project site. Source: San Bernardino County. November 1991. *Chino Airport Comprehensive Land Use Plan*. Available at website url: http://www.sbcounty.gov/Uploads/lus/Airports/Chino.pdf.



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PREDICTED AIRPORT NOISE CONTOURS: Ontario International Airport. Located approximately 11.2 miles northeast of the project site. Source: Ontario International Airport Inter-Agency Collaborative. July 2018. *Ontario International Airport Land Use Compatibility Plan*. Available at website url: http://www.ont-iac.com/airport-land-use-compatibility-plan/ont-alucp-chapter-2/.