EQUINIX SV10/SV11 DATA CENTER PROJECT
NOISE ASSESSMENT
SAN JOSÉ, CALIFORNIA

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INTRODUCTION

This report presents the results of the noise assessment completed for the Equinix SV10/SV11 Data Center project proposed at 5-7 Great Oaks Boulevard in San José, California. The project is the development of an 11.5-acre project site with two data center buildings. The two data centers buildings, each approximately 193,000 square feet in size, would be located on the eastern portion of the 76-acre former iStar property (APN 706-09-117 and -118). The site is designated as Commercial Industrial/Commercial and is undeveloped, consisting only of vegetation and trees. The proposed data center buildings would not exceed a height of 65 feet. The project includes landscaping around the data center buildings and 160 surface parking spaces throughout the site.

The new data center buildings would house computer servers and supporting equipment for private clients, as well as associated office uses, in environmentally controlled structures. Standby backup electricity for each building would be provided by nine diesel fueled engine-generators located in the equipment yards adjacent to each building. The electric generating capacity of each generator would be approximately 2.5 megawatts (MW). Diesel fuel for generators will be stored in 5,000 gallon aboveground tanks under each generator.

The Setting section of this report presents the fundamentals of environmental noise, a discussion of policies and standards applicable to the project, and the results of the noise monitoring survey. The Impacts and Mitigation Measures section of the report provides an evaluation of the potential significance of project-related noise impacts, and where necessary, mitigation to reduce impacts to a less-than-significant level.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise* descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the *sound level meter*. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (*L_{dn} or *DNL)* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

Regulatory Criteria – Noise

The State of California and the City of San José have established plans and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies are contained in the following documents: (1) the State California Environmental Quality Act (CEQA) Guidelines, Appendix G, (2) the City of San José Noise Element of the General Plan, and (3) the City of San José Municipal Code.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. CEQA asks the following applicable questions. Would the project 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) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

(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, exposure of people residing or working in the project area to excessive noise levels?

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

Of these guidelines, only items (a) and (d) are applicable to the proposed project. Guidelines (b), (c), (e), and (f) are not applicable to this assessment because this project would replace more intensive office land uses recently approved as part of the iStar-Great Oaks Mixed-Use project. Impacts related to the compatibility of the proposed land use with the on-site noise environment, project-generated traffic, temporary construction noise and vibration were assessed as part of the iStar-Great Oaks Mixed-Use project, and the proposed project would not result in new or more significant impacts than previously identified. Therefore, impacts related to Guidelines (b), (c), (e), and (f) are not discussed further.

City of San José General Plan. The Environmental Leadership Chapter in The Envision San José 2040 General Plan sets forth policies related to noise and vibration control in the City of San José. The following policies are applicable to the proposed project:

EC-1.2 Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3, and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain "Normally Acceptable"; or
- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the "Normally Acceptable" level.

EC-1.3 Mitigate noise generation of new nonresidential land uses to 55 dBA DNL at the property line when located adjacent to existing or planned noise sensitive residential and public/quasi-public land uses.

EC-1.6 Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City's Municipal Code.

City of San José Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.30.700 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit.

Chapter 20.40.600 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 60 dBA at any property line shared with land zoned for commercial or other non-residential purposes, except upon issuance and in compliance with a Conditional Use Permit.

The code is not explicit in terms of the acoustical descriptor associated with these noise level limits. A reasonable interpretation of this standard, which is based on similar codes of other Bay Area communities, would identify the ambient base noise level criteria as an average or median noise level (L_{eq}/L_{50}).

Existing Noise Environment

The project site is located just north of State Route 85 (SR 85) and southwest of Great Oaks Boulevard, the Union Pacific Railroad (UPRR), and Monterey Road. Existing Equinix data centers (SV1 and SV5) border the site to the east. Existing residential land uses are located northeast of Monterey Road approximately 320 feet from the site at its nearest point. Various land uses approved as part of the iStar-Great Oaks Mixed-Use project will be constructed immediately adjacent to the project site. Industrial/commercial uses are proposed northwest of the site opposite Raleigh Road and residential land uses are proposed west and southwest of the site. The predominant sources of noise in the site vicinity include vehicular traffic along SR 85 and Monterey Road, passenger and freight trains along the UPRR, and aircraft. Day-night average noise levels attributable to transportation related noise sources are calculated to range from approximately 65 to 75 dBA DNL throughout the site and at the nearest proposed land uses (Figure 1). The testing and operation of standby diesel generators at the two existing Equinix facilities (SV1 and SV5) also contribute to the noise environment in the site vicinity on an intermittent basis.

A noise monitoring survey specific to the operation of the standby diesel generators at the Equinix SV5 data center was conducted on August 6, 2015. Noise levels produced by the SV5 generators were documented as part of this analysis because of the similar characteristics in equipment and acoustical shielding common to the SV5, SV10, and SV11 facilities. The noise monitoring survey included attended noise measurements of the generators to quantify source levels at various distances from the equipment. Noise levels were measured on all four sides of a running generator during normal testing loads. At 5 feet, noise levels from the generator were 89 dBA. At a distance of 25 feet outside of the perforated ribbed metal screen wall, and approximately 35 feet from the generator, the operational noise level was 68 dBA. The noise level was measured to be 65 dBA at a distance of 145 feet.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Appendix G of the CEQA Guidelines states that a project would normally be considered to result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans or if ambient noise levels at sensitive receptors would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.
- A significant impact would be identified if the project would substantially increase noise levels at sensitive receptors in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.

Impact 1: **Operational Noise.** Existing and proposed residential land uses could be exposed to exterior noise levels greater than 55 dBA L_{eq} during the testing of individual standby diesel generators. Industrial/commercial uses could be exposed to exterior noise levels greater than 60 dBA L_{eq}. The testing of standby diesel generators would exceed the noise limits presented in the City of San José Municipal Code. **This is a significant impact.**

The project would introduce new sources of noise nearer to residential and industrial/commercial land uses approved as part of the iStar-Great Oaks Mixed Use Project. The predominant noise source at these data centers would be the testing and operation of standby diesel generators, which were not previously evaluated. Other significant sources of mechanical equipment noise, such as cooling towers, are not proposed as part of this project, and the remaining pieces of mechanical equipment are proposed in mechanical yards located on the opposite sides of the data center buildings and away from the nearest proposed receptors. A site plan showing the proposed locations of the generators is shown on Figure 2.

Nine, 2500kW generators (CAT 3516C) are proposed outside of the SV10 and SV11 data centers, respectively, and adjacent to the future industrial/commercial building to the northwest, and future residential land uses to the south and southwest. Each generator would be tested monthly (11 of 12 months) for a period of 5 minutes at no load and for a period of 60 minutes at full load. An annual four-hour test would be completed during the final month. The total testing time per engine is 16 hours per year. The generators would run continuously during power outages.

Noise levels resulting from the testing of individual generators at Equinix SV10 and SV11 would at times exceed ambient noise levels resulting from transportation noise sources in the project vicinity. The nine generators proposed for the SV11 data center would be located in a mechanical yard northwest of the building and shielded by a 22 foot perforated ribbed metal screen wall. The nine generators for the SV10 data center would be located in a similar mechanical yard southwest of the building.

Future industrial/commercial land uses located approximately 125 feet northwest of SV11 would be exposed to future noise levels of approximately 66 dBA L_{eq} at a height of five feet above the ground assuming the attenuation provided by the proposed 22 foot screen wall during hourly testing operations. Future single-family and multi-family residential land uses proposed west and southwest of the data centers would be exposed noise levels of approximately 68 dBA L_{eq} during hourly testing. The testing of the northernmost generator at SV11 would produce noise levels of about 60 dBA L_{eq} at the nearest existing single-family residences located approximately 350 feet northeast of the site, opposite of Monterey Road.

The General Plan states that non-residential land uses should mitigate noise generation to meet the 55 dBA DNL guideline at the property line of existing or planned residential land uses. The DNL is the average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured between 10:00 pm and 7:00 am. In noise environments where ambient daily average noise levels exceed 55 dBA DNL, the noise level limit is normally adjusted to equal ambient conditions. The DNL resulting from one hour of testing of one standby diesel generator during the daytime (7:00 am to 10:00 pm) would be 52 dBA at the nearest industrial/commercial land uses. The annual four-hour test would produce a DNL noise level of 58 dBA. On a DNL basis, the testing of one standby diesel generator during the daytime would not substantially increase ambient day-night average noise levels attributable to transportation related noise sources in the project vicinity on a temporary or periodic basis. At the nearest residential land uses, one hour of testing of one standby diesel generator during the daytime would produce a noise level of 54 dBA DNL. The annual four-hour test would produce a DNL noise level of 60 dBA. Similar to the conclusions reached above, the testing of one standby diesel generator during the daytime would not result in a substantial temporary or periodic increase in day-night average noise levels because ambient DNL noise levels range from 65 to 75 dBA DNL at the nearest residences. The testing of multiple generators at the same time or on the same day would yield higher noise levels. For example, if three generators at the SV10 or SV 11 data center were tested simultaneously, the noise levels reported above would be approximately 5 dBA higher. If all nine generators at the SV10 or SV 11 data center were tested simultaneously, the noise levels reported above would be approximately 10 dBA higher.

While the City's General Plan property line noise guideline of 55 dBA DNL is intended to avoid noise compatibility issues between non-residential and residential land uses, the use of this metric is not necessarily the most appropriate method for assessing intermittent noise sources such as infrequent testing activities. A more appropriate comparison for such intermittent noise sources would be made using the Equivalent Noise Level (L_{eq}). The L_{eq} measures the average noise level over a given period of time such as the noisiest hour (e.g., when generators are being tested). As noted previously, the testing of a standby diesel generator would produce a noise level of 66 dBA L_{eq} at future industrial/commercial land uses assuming the attenuation provided by the proposed 22 foot screen. This noise level would exceed the Municipal Code standard of 60 dBA L_{eq} (for industrial/commercial land uses) by 6 dBA L_{eq}. The nearest single-family and multi-family residential land uses proposed west and southwest of the data centers would be exposed to testing noise levels of approximately 68 dBA L_{eq}, exceeding the municipal code standard of 55 dBA L_{eq} (for residential land uses) by 13 dBA L_{eq}. The testing of the northernmost generator at SV11 would produce noise levels of about 60 dBA L_{eq} at the nearest existing single-family residences opposite of Monterey Road. Such noise levels would exceed the municipal code standard of 55 dBA L_{eq} by 5 dBA L_{eq}. In summary, predicted noise levels resulting from the testing of individual generators would exceed the Municipal Code noise standards by 5 to 13 dBA L_{eq}, resulting in a significant impact.

Mitigation Measure 1:

The following mitigation measures shall be included in the project to reduce the impact to a less-than-significant level:

- Relocate the standby generators on the opposite side of the data center buildings away from adjacent industrial/commercial and residential land uses approved as part of the iStar-Great Oaks Mixed Use Project. Conduct a design level acoustical analysis to ensure that standby diesel generator noise complies with the City of San José Municipal Code noise level limits at adjacent receptors.

- Alternately, construct full acoustical enclosures (e.g., generator rooms within the data center buildings) to reduce noise levels attributable to the testing and operation of standby generators. Additional noise attenuation could also be incorporated into the project's design by locating the generator intake louvers away from nearby land uses, adding additional sound attenuators within air intake plenums and within the air shafts, installing hospital/critical grade mufflers on the exhausts of the diesel generators, increasing the percentage of absorptive material within the generator rooms and air shafts, and installing acoustical louvers on the generator air intakes. Conduct a design level acoustical analysis to ensure that standby diesel generator noise complies with the City of San José Municipal Code noise level limits.

- Alternately, obtain and comply with the provisions of a Conditional Use Permit, which allows noise levels due to infrequent testing of standby diesel generators to exceed the Municipal Code noise thresholds. Conduct all testing between the hours of 10:00 AM and 4:00 PM to avoid noise-sensitive morning and evening hours. Notify adjacent land uses of the testing schedule.

Figure 1 **iStar-Great Oaks Mixed Use Project Future Noise Contour Map Showing Project Site and Adjacent Land Uses**

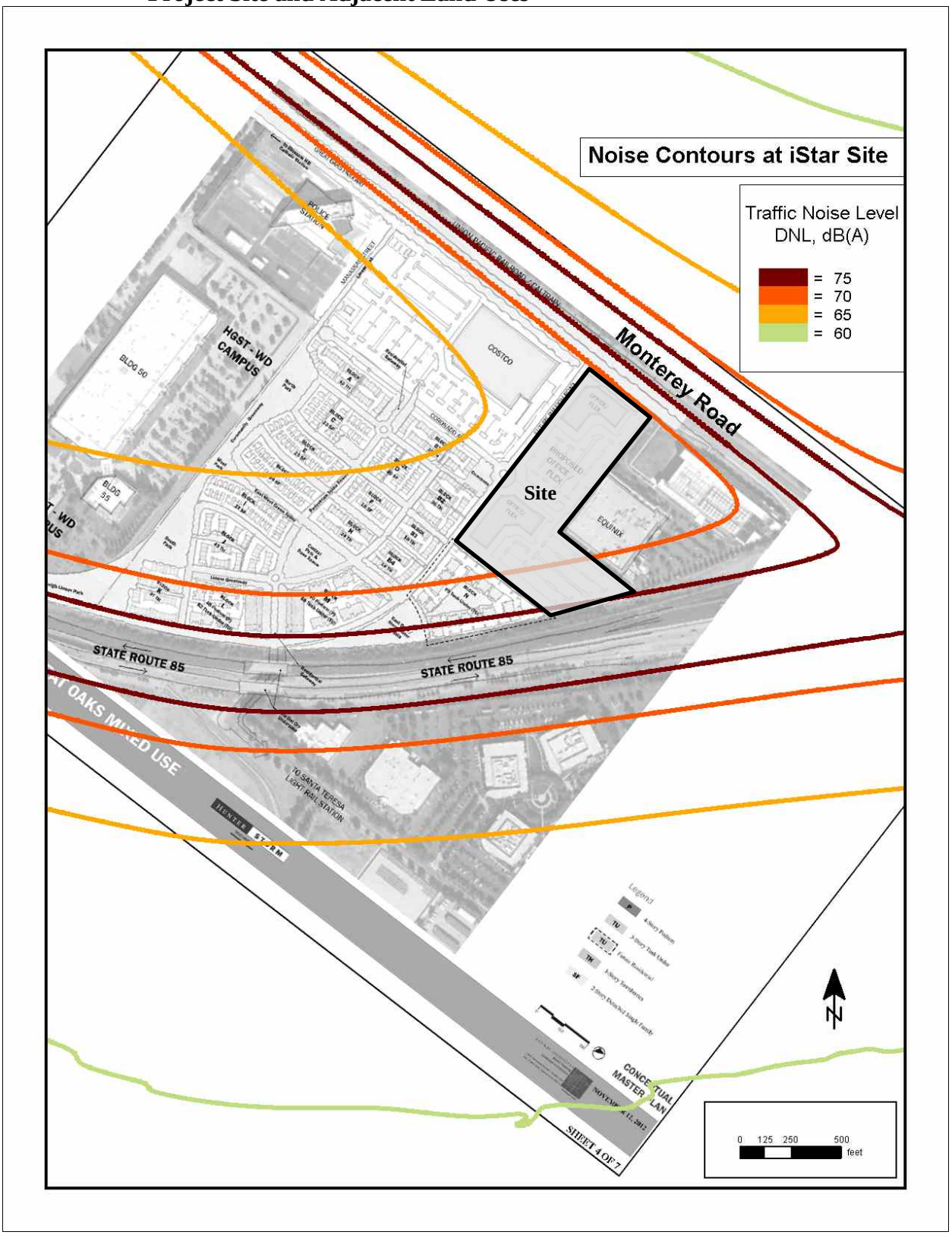

Figure 2: Site Plan and Location of Proposed Generators