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Glass Private Helipad

El Dorado County, California

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Project # 180302

Prepared for:

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Exhibit H

S18-0006

INTRODUCTION

The project is a proposed private heliport to be located on a 5.45-acre parcel at 6650 Kelsey Canyon Road in El Dorado County, California.

The proposed heliport would consist of a storage hanger building and a single landing pad. The heliport is primarily a storage facility with operations occurring in other locations, including out of state. Typical operations would include a single takeoff with a return flight occurring days, or even weeks later. For the majority of the year, the helicopter would sit in storage. When operational, the helicopter is used to support long line/external load operations such as fire support, erosion control, and aerial seeding.

El Dorado County has required that an aircraft noise analysis be prepared for the project to assist the county with preparation of environmental documentation as required by the California Environmental Quality Act (CEQA) and the State Division of Aeronautics.

This analysis, prepared by Saxelby Acoustics, is based upon project information provided by the project applicant. Revisions to the information utilized to prepare this analysis may require a re-evaluation of the findings of this report.

Figure 1 shows an aerial photo of the project site.


Glass Helipad
El Dorado County, California
Figure 1: Project Site Plan
Legend
Parcels
Project Site
Flight Path
Local Neighborhood Road, Street
Secondary Road
Stream or River
Helipad
50 m
150 m
250 m
350 m
Projection: Geographic (Latitude/Longitude) / WGS84 / arc degrees
Rev. Date: 03/21/2018
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Kelsey Canyon Rd
Georgetown Rd
Big Sandy Ln
Texas Canyon Rd

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

The decibel scale is logarithmic, not linear. In other words, two sound levels 10-dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10-dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10-decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. The Community Equivalent Noise Level (CNEL) is similar to L_{dn}, but also includes an evening (7:00 a.m. to 7:00 p.m.) with a +5 dB penalty applied to noise occurring during this timeframe.

Table 1 lists several examples of the noise levels associated with common situations. **Appendix A** provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft.)	--100--	
Gas Lawn Mower at 1 m (3 ft.)	--90--	
Diesel Truck at 15 m (50 ft.), at 80 km/hr. (50 mph)	--80--	Food Blender at 1 m (3 ft.) Garbage Disposal at 1 m (3 ft.)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft.)	--70--	Vacuum Cleaner at 3 m (10 ft.)
Commercial Area Heavy Traffic at 90 m (300 ft.)	--60--	Normal Speech at 1 m (3 ft.)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6-dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING AMBIENT NOISE LEVELS

The existing noise environment in the project area is defined primarily by distant traffic noise and aircraft overflights.

To quantify the existing ambient noise environment on the project site, Saxelby Acoustics conducted a continuous noise measurement survey. The noise measurement locations are shown on **Figure 2**. A summary of the noise level measurement survey results is provided in **Table 2**. **Appendix B** contains the complete results of the noise monitoring.

The sound level meter was programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The sound meter was also set to trigger on loud events, such as aircraft overflights.

The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) Model 831 precision integrating sound level meter was used for the ambient noise level measurement survey. The meter was calibrated before and after use with a B&K Model 4230 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

			Average Measured Hourly Noise Levels, dBA						
				Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm – 7:00 am)		
Site	Location	Date	CNEL	L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Continuous 24-hour Noise Measurement Site									
LT-1	Project site, near proposed helipad	March 19-20, 2018	39	35	30	52	32	30	44
Source: Saxelby Acoustics – 2018									

It should be noted that the existing noise environment included 19 aircraft overflights including helicpoters, general aviation aircraft, and jets.


Glass Helipad
El Dorado County, California
Figure 2: Noise Measurement Site
Kelsey Canyon Rd
LT-1
Kelsey Canyon Rd
Texas Canyon Rd
Texas Canyon Rd
Georgetown Rd
Legend
Parcels
Project Site
Flight Path
Local Neighborhood Road, Street
Secondary Road
Stream or River
Helipad
Noise Measurement - Long Term
50 m
150 m
250 m
Projection: Geographic (Latitude/Longitude) / WGS84 / arc degrees
Rev. Date: 03/21/2018
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REGULATORY CONTEXT

The California Airport Noise Regulation (CCR Title 21, Chapter 2.5, Subchapter 6) establishes 65 dB CNEL as the acceptable level of exterior aircraft noise for persons living near airports. The El Dorado County Airport Land Use Compatibility Plan notes that residential uses are "normally compatible" with exterior noise levels of 55 dBA CNEL, or less. Airport noise levels within the 55-60 dBA CNEL range are considered "conditionally acceptable" assuming that interior noise levels stay within 45 dBA CNEL, or less.

For the purpose of this analysis, the County's 55 dBA CNEL standard, which is 10 dBA *more* restrictive than the above-described state standard will be applied to the proposed project.

The CNEL is the energy average sound level for a 24-hour period determined after addition of penalties of 5 dB to aircraft noise events during the evening hours (7:00 p.m.-10:00 p.m.) and 10 dB to aircraft noise events during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL is calculated based upon annual average conditions regarding aircraft operations and runway use. That means that the noise exposure on a day is likely to be either higher or lower than the annual average for a given location.

The Federal Aviation Administration (FAA) and U.S. Department of Housing and Urban Development (HUD) both apply an exterior noise level standard of 65 dB, as defined by the Day-Night Average Level (DNL), when evaluating land use compatibility around airports. The only difference between the DNL and the CNEL noise metrics is that the CNEL includes a 5-dB penalty during the evening hours and the DNL does not. Both metrics apply a 10-dB penalty during the nighttime hours of 10:00 p.m. to 7:00 a.m., and are considered to be equivalent descriptors of the community noise environment within +/- 1.0 dB.

EVALUATION OF AIRCRAFT NOISE EXPOSURE

Aircraft noise exposure was calculated using the Federal Aviation Administration (FAA) Integrated Noise Model (INM), helipad configuration information provided by the project applicant and aircraft operations data provided by the project applicant. Aircraft noise exposure was calculated using the CNEL noise metric.

The INM calculates aircraft noise exposure by mathematically combining aircraft noise levels and heliport operations factors at a series of points within a cartesian coordinate system which defines the location of helipads and generalized aircraft flight tracks. User inputs to the INM include the following:

- Helipad configuration
- Aircraft flight track definitions
- Distribution of aircraft to flight tracks
- Aircraft traffic volume and fleet mix
- Temporal distribution of flights (day/evening/night)

The INM database includes aircraft performance parameters and noise level data that may be used to model noise from operations by most of the civilian aircraft presently in service at U.S. airports. When a user specifies a particular aircraft type from the INM database, the model automatically provides the necessary inputs concerning aircraft power settings, speed, departure profiles and noise levels. In its present form, the INM accounts for changes in the distance from a receptor to an aircraft noise source (slant range distance) due to variations in local terrain. The INM does not consider reflections from nearby buildings or acoustical shielding caused by buildings or vegetation that may surround an airport.

A worst-case operational scenario of 4 daily operations (two takeoffs and two landings) per day has been utilized for this analysis. The project applicant plans to have a single Bell UH-1 aircraft based at the heliport. This analysis assumes worst case that two operations could occur during nighttime (10:00 p.m. to 7:00 a.m.) hours, one operation during evening (7:00 p.m. to 10:00 p.m.) hours, and one operation could occur between daytime (7:00 a.m. to 7:00 p.m.) hours.

The modeled worst-case scenario described above is considered to be the loudest scenario that could occur under the proposed project. If the 4 daily operations were to occur during daytime (7 am – 7 pm) or evening (7 pm – 10 pm) hours, the project-related noise levels would be less than that shown in this report. The only restriction assumed in this analysis is that a maximum of 2 nighttime (10 pm – 7 am) operations would occur out of the 4 total daily operations.

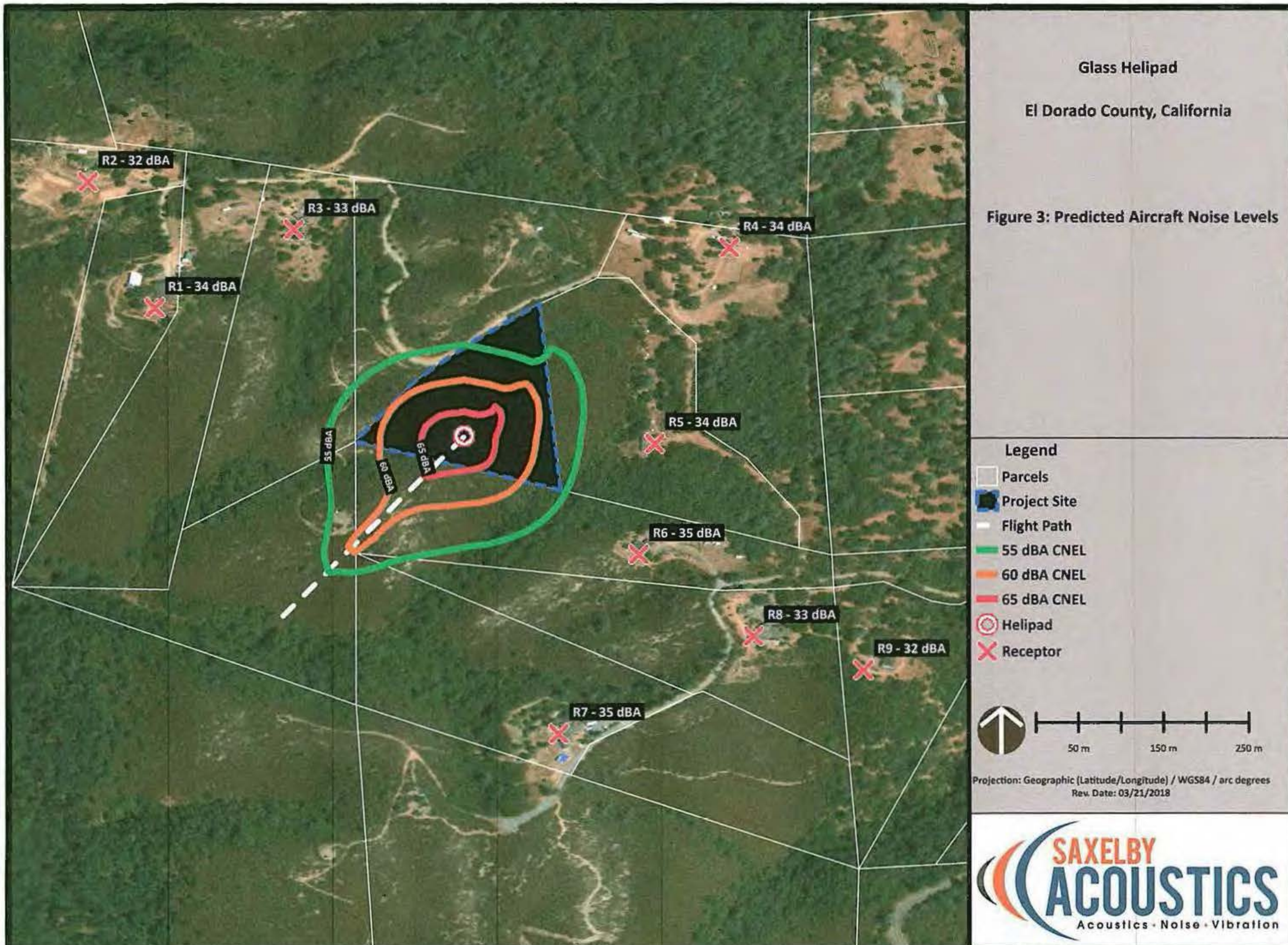
The INM was used to calculate aircraft noise exposure at the closest noise-sensitive receptors around the project site. Those receptors are shown as R1 through R9 on **Figure 3**. **Table 3** summarizes calculated CNEL's at the closest sensitive receptors based upon the worst case of 4 operations per day.

Table 3 shows the predicted noise levels at each of the modeled receptors. **Figure 3** shows the 55 dBA and 65 dBA CNEL noise contours for the project.

TABLE 3: PREDICTED HELIPORT NOISE LEVELS

Receptor	Predicted Noise Level, dBA CNEL
R1	34 dBA
R2	32 dBA
R3	33 dBA
R4	34 dBA
R5	34 dBA
R6	35 dBA
R7	35 dBA
R8	33 dBA
R9	32 dBA
Source: Saxelby Acoustics, INM v 7.0	

The **Table 3** data indicate that the predicted CNEL values calculated by the INM comply with the State of California noise compatibility standard of 65 dB CNEL and the El Dorado County "normally compatible" standard of 55 dB CNEL. This conclusion is based upon the worst-case assumption of 4 daily operations. The annual average CNEL would be expected to be less than that shown in **Table 3**.


Glass Helipad
El Dorado County, California
Figure 3: Predicted Aircraft Noise Levels
Legend
Parcels
Project Site
Flight Path
55 dBA CNEL
60 dBA CNEL
65 dBA CNEL
Helipad
Receptor
50 m
150 m
250 m
Projection: Geographic (Latitude/Longitude) / WGS84 / arc degrees
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R1 - 34 dBA
R2 - 32 dBA
R3 - 33 dBA
R4 - 34 dBA
R5 - 34 dBA
R6 - 35 dBA
R7 - 35 dBA
R8 - 33 dBA
R9 - 32 dBA
55 dBA
60 dBA
65 dBA

Conclusions

The proposed Alger private helipad will generate annual average noise levels in the range of 32-35 dBA CNEL, or less, at the closest existing homes around the project site. Such levels do not exceed the noise compatibility standards of the State of California or El Dorado County. Additionally, these noise levels are approximately 4-7 dBA less than the existing noise environment of 39 dBA CNEL. Therefore, no noise control measures are required for the project.

Appendix A: Acoustical Terminology

Acoustics — The science of sound.

Ambient Noise — The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

ASTC — Apparent Sound Transmission Class. Similar to STC but includes sound from flanking paths and correct for room reverberation. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.

Attenuation — The reduction of an acoustic signal.

A-Weighting — A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB — Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.

CNEL — Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by +5 dBA and nighttime hours weighted by +10 dBA.

DNL — See definition of Ldn.

IIC — Impact Insulation Class. An integer-number rating of how well a building floor attenuates impact sounds, such as footsteps. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.

Frequency — The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).

Ldn — Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

Leq — Equivalent or energy-averaged sound level.

Lmax — The highest root-mean-square (RMS) sound level measured over a given period of time.

L(n) — The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one-hour period.

Loudness — A subjective term for the sensation of the magnitude of sound.

NIC — Noise Isolation Class. A rating of the noise reduction between two spaces. Similar to STC but includes sound from flanking paths and no correction for room reverberation.

NNIC — Normalized Noise Isolation Class. Similar to NIC but includes a correction for room reverberation.

Noise — Unwanted sound.

NRC — Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.

RT60 — The time it takes reverberant sound to decay by 60 dB once the source has been removed.

Sabin — The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.

SEL — Sound Exposure Level. SEL is a rating, in decibels, of a discrete event, such as an aircraft flyover or train pass by, that compresses the total sound energy into a one-second event.

STC — Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations. The STC rating is typically used to rate the sound transmission of a specific building element when tested in laboratory conditions where flanking paths around the assembly don't exist. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.

Threshold of Hearing — The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.

Threshold of Pain — Approximately 120 dB above the threshold of hearing.

Impulsive — Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.

Simple Tone — Any sound which can be judged as audible as a single pitch or set of single pitches.

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Appendix B1 : Continuous Noise Monitoring Results

Date	Time	Measured Level, dBA			
		L_{eq}	L_{max}	L_{50}	L_{90}
Monday, March 19, 2018	9:00	35	51	31	29
Monday, March 19, 2018	10:00	34	52	31	30
Monday, March 19, 2018	11:00	41	63	31	29
Monday, March 19, 2018	12:00	32	49	30	28
Monday, March 19, 2018	13:00	38	62	31	29
Monday, March 19, 2018	14:00	36	57	31	29
Monday, March 19, 2018	15:00	32	52	30	28
Monday, March 19, 2018	16:00	34	51	29	27
Monday, March 19, 2018	17:00	30	41	28	25
Monday, March 19, 2018	18:00	27	43	25	24
Monday, March 19, 2018	19:00	32	51	24	22
Monday, March 19, 2018	20:00	35	56	31	28
Monday, March 19, 2018	21:00	35	52	34	32
Monday, March 19, 2018	22:00	34	50	33	31
Monday, March 19, 2018	23:00	32	43	32	28
Tuesday, March 20, 2018	0:00	29	40	29	26
Tuesday, March 20, 2018	1:00	27	37	27	26
Tuesday, March 20, 2018	2:00	31	52	28	26
Tuesday, March 20, 2018	3:00	28	40	27	25
Tuesday, March 20, 2018	4:00	32	42	31	27
Tuesday, March 20, 2018	5:00	32	43	31	29
Tuesday, March 20, 2018	6:00	35	50	33	30
Tuesday, March 20, 2018	7:00	34	45	33	31
Tuesday, March 20, 2018	8:00	34	53	32	30

Statistics	Leq	Lmax	L50	L90
Day Average	35	52	30	28
Night Average	32	44	30	27
Day Low	27	41	24	22
Day High	41	63	34	32
Night Low	27	37	27	25
Night High	35	52	33	31
Ldn	39	Day %		78
CNEL	39	Night %		22

Site: LT-1

Project: Glass Heliport

Location: Project site, near proposed helipad

Coordinates: 38.784331° -120.825326°

Meter: LDL 831-2

Calibrator: B&K 4230