Revised 2.8.2022

ACOUSTICS

ENVIRONMENTAL NOISE STUDY

VetPowered

3030 Main Street

San Diego, CA 92113

10.08.2021

Dynamic experiences. Idibri design.

CONTENTS

INTRODUCTION

The purpose of this report is to address Draft Cycle Comments (04/14/2021) Issue No. 26 & 27 requiring an acoustical analysis of any noise impacts that may occur due to project implementation. Supplemental information has been added to address Draft Cycle Comments (07/12/2021) Issue No. 50 & 51 requiring additional information on methodology, regulation, and noise impacts. Supplemental information has been added to address Draft Cycle Comments (09/2021) Issue No. 64, 65 & 66 requiring additional information on environmental setting, federal regulations, and construction noise impacts.

Executive Summary

The VetPowered facility will only be operational during business hours, therefore, the analysis and recommendations in this report are limited to this time period. Any requirements or measurements for interior to exterior impact from 7:00p.m. to 7:00a.m. are disregarded. Construction site activities should also occur during daytime hours to minimize sleep disturbance in the adjacent residential areas.

Based on the noise levels measured on-site and in an existing VetPowered facility with similar equipment to what will be used in this project, activity noise from the new VetPowered project on 3030 Main Street is not predicted to raise existing $Leq_{1\text{-}hr}$ outdoor noise levels. Additionally, interior noise levels for the project are predicted to fall within maximum allowable interior noise levels of 50dBA ($Leq_{1\text{-}hr}$) set forth by CalGreen based standard exterior construction assemblies.

REGULATIONS

City of San Diego General Plan Noise Element

TABLE NE-3: LAND USE – NOISE COMPATIBILITY GUIDELINES

"For land uses indicated as conditionally compatible, structures must be capable of attenuating exterior noise to the indoor noise level as shown on Table NE-3."

Per Table NE-3, for Offices, exterior noise exposure greater than or equal to 65dBA CNEL are considered compatible. Exterior noise exposure between 65-70dBA CNEL are considered conditionally acceptable given that interior noise levels do not exceed 50dBA CNEL.

SDMC City Noise Abatement and Control Ordinance

SECTION 59.5.0401: SOUND LEVEL LIMITS

"It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit given in the table, at any location in the City of San Diego or beyond the boundaries of the property on which the noise is produced. The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts."

Per the Table of Applicable Limits under section (a), the maximum allowable noise level at the property line to Single-Family Residential Land Use is 50dBA $Leq_{1\text{-}hr}$ during the daytime hours of 7:00am-7:00pm.

SECTION 59.5.0404: CONSTRUCTION NOISE

"It shall be unlawful for any person, including The City of San Diego, to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00a.m. to 7:00p.m."

CEQA Significance Thresholds

SECTION K.6: TEMPORARY CONSTRUCTION NOISE

"Construction noise levels measured at or beyond the property lines of any property zoned residential shall not exceed an average sound level greater than 75 decibels (dB) during the 12-hour period from 7:00a.m. to 7:00p.m."

State: Title 24 California Green Building Code

New Non-Residential Construction Mandatory Measures: The following applies for buildings exposed to a noise level of 65dBA $Leq_{1\text{-}hr}$ during any hour of operation where noise contours are not readily available.

SECTION 5.507.4.2: PERFORMANCE METHOD

"Wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($Leq_{1\text{-}hr}$) of 50 dBA in occupied areas during any hour of operation."

New Residential Construction Mandatory Measures: The following applies to all new single-family and multi-family residential construction.

SECTION 1206.5: ALLOWABLE INTERIOR NOISE LEVELS

"Interior noise levels attributable to exterior noise sources shall not exceed 45dB in any habitable room. The noise metric shall be either the day-night average sound level (Ldn) or the community noise equivalent level (CNEL), consistent with the noise element of the local general plan."

Federal: HUD Noise Guidebook

The Noise Control Act of 1972 required EPA to "public information on the level of environmental noise which are requisite to protect the public health and welfare with an adequate margin of safety".

It is a goal of the U.S. Department of Housing and Urban Development (HUD) that exterior noise levels do not exceed a day-night average sound level of 55 decibels. This level is recommended by the EPA as a goal for outdoors in residential areas. It is a HUD goal that the interior auditory environment shall not exceed a day-night average sound level of 45 decibels. Emphasis shall be given to noise sensitive interior spaces such as bedrooms.

For the purposes of this regulation and to meet other program objectives, sites with a day-night average sound level of 65 and below are acceptable and are allowable. The noise environment inside a building is considered acceptable if the noise environment external to the building complies with the identified standards and the building is construction in a manner common to the area.

Noise Regulations Summary

The noise codes listed above can be separated into one of two categories regarding the direction of sound transmission: interior noise impact to the exterior at the nearest property line and existing exterior noise to the interior of the proposed project. The table below summarizes each code and corresponding criteria which is applicable to this project:

INTERIOR TO EXTERIOR NOISE		
CODE	**NOISE SOURCE**	**ALLOWABLE NOISE LEVEL AT PROPERTY LINE**
City Noise Abatement and Control Ordinance: Section 59.5.0401	Project Activity Noise	50dBA ($Leq_{1\text{-}hr}$)
City Noise Abatement and Control Ordinance: Section 59.5.0404	Construction Noise	75dBA ($Leq_{12\text{-}hr}$)
CEQA Significance Thresholds: Section K.6	Construction Noise	

EXTERIOR TO INTERIOR NOISE		
CODE	**NOISE SOURCE**	**ALLOWABLE INTERIOR NOISE LEVEL**
City of San Diego General Plan Noise Element: Table NE-3	Existing Environmental Noise	50 dBA (CNEL)
CalGreen: Section 5.507.4.2	Existing Environmental Noise	50 dBA ($Leq_{1\text{-}hr}$)

ENVIRONMENTAL SETTING

An on-site noise study was conducted to measure existing noise levels at the VetPowered site in San Diego, CA on April 23rd, 2021. The environment at the site consisted of noise from vehicular traffic including trucks, buses, motorcycles, and cars, primarily along Main Street.

Sensitive Receptors

The City of San Diego General Plan Noise Element sets the standard designed to protect noise-sensitive land uses from high noise levels and to be used as guidelines for future land uses. Noise-sensitive land uses include and are not limited to residential, hospitals, libraries, places of worship, educational facilities, etc. Nearby sensitive receptors to the VetPowered project at 3030 Main Street are the single-family residences located along Main Street, adjacent to the project site, as well as across the alley behind the project site.

Measurements & Methodology

To collect the current background noise levels of the site, a sound level meter was set out in the location seen in the figure below from 10am to 4pm.

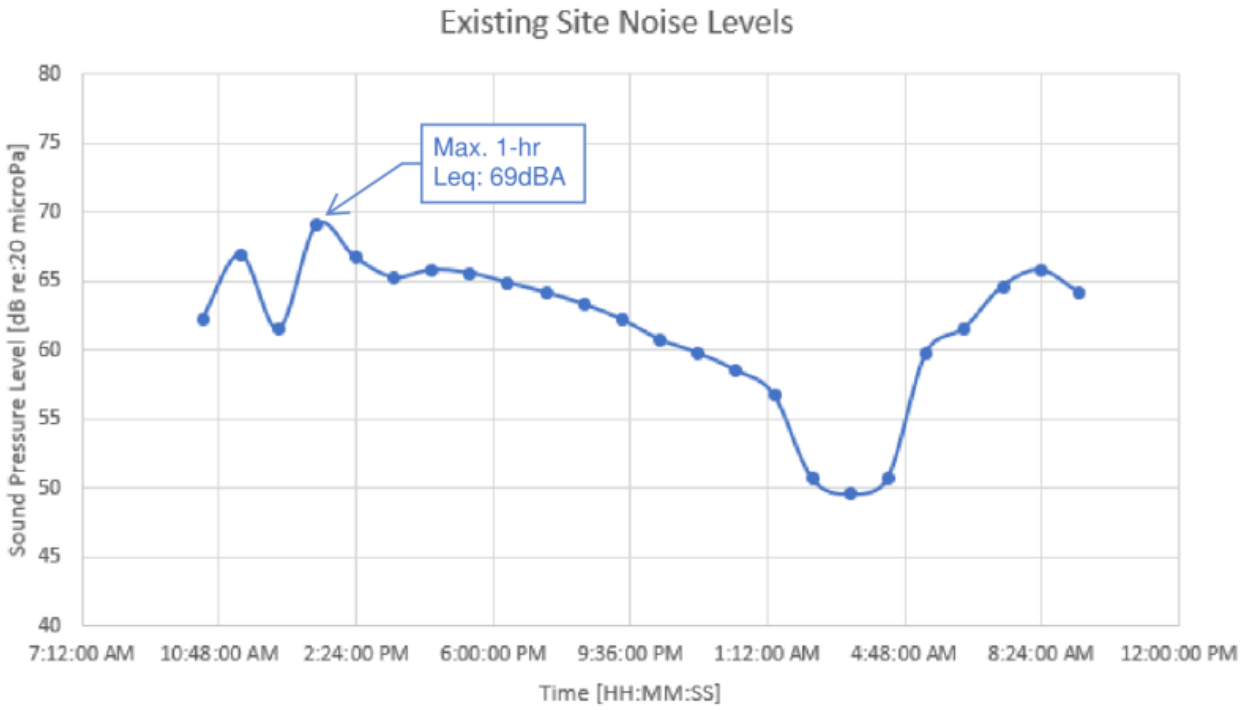
The Leq represents the equivalent continuous sound level that occurred over a defined period of time. In order to calculate the maximum 1-hr equivalent noise level, road noise outside of the on-site measurement hours (10am-4pm) was extrapolated following the Typical Hourly Distribution of Total Daily Urban Vehicle Traffic (Figure 4.15) presented in Architectural Acoustics (Second Edition) by Marshall Long.

An industry approved software, SoundDesign, was used to calculate the composite transmission loss values of the building shell construction materials and predict interior noise levels from exterior noise sources (such as vehicular traffic).

Existing Noise Conditions

The table below provides a summary of the maximum 1-hour and 12-hour equivalent noise levels calculated at Main Street located at the project site:

MEASUREMENTS		
Metric	**Leq (dBA)**	**Leq (dBA)**
Time Period	**Max. 1-hr**	**12-hr**
Main Street	69	66



SITE NOISE IMPACTS

Interior to Exterior

ACTIVITY NOISE ANALYSIS

The activity within the Workshop is understood to consist of utilizing enclosed Computer Numerical Controlled Machines (CNC), automated/robotic drill presses and lathes, etc. Louder fabrication type activity (such as Water Jetting) will not take place at this site. Noise levels were measured of similar activity at an existing facility showing 75-80dBA for the machine activity described.

There are two loading areas/roll-up doors located at the south façade of the building. It is understood that both roll-up doors will largely remain closed throughout the day, other than to receive delivery trucks. Deliveries are anticipated multiple times a day only during typical business hours (8:00am-5:00pm). During loading/unloading of delivery trucks, the roll-up doors will remain closed. The delivery trucks will be electric vehicles; therefore, low engine noise levels would be anticipated.

The table below summarizes the code allowable noise levels at the adjacent residential property lines, existing noise levels measured, and predicted noise level impact from the project as calculated using source noise levels transmitted through the building shell.

Calculations are based on all doors and windows being standardly in the closed position outside of short durations of deliveries. The building shell should consist of sealed standard roll-up doors with glass insets (minimum 1/4" monolithic pane (STC-31/OITC-29)) in the designed 8” CMU exterior wall construction.

METRIC	ALLOWABLE NOISE LEVEL AT PROPERTY LINE	EXISTING NOISE LEVELS MEASURED	PREDICTED FUTURE NOISE LEVEL
$Leq_{1\text{-}hr}$ (dBA)	50	69	Unchanged[1]

[1]The predicted noise level at the adjacent property line of the equipment is more than 10dB below the existing noise levels, therefore, will not increase the existing background noise levels. The predicted noise level is in compliance with City Noise Abatement and Control Ordinance Section 59.5.0401.

Exterior to Interior

Based on existing exterior noise levels, the resulting interior noise levels are calculated based on standard exterior construction assemblies consisting of 1” insulated exterior glazing (1/4” pane – 1/2” air space – 1/4" pane; STC-35/OITC-30), standard roll-up doors with glass insets (min. 1/4" pane; STC-31/OITC-29), fully sealed exterior doors, and 8” CMU exterior wall construction.

METRIC	EXTERIOR NOISE SOURCE LEVEL	INTERIOR NOISE LEVELS
$Leq_{1\text{-}hr}$ (dBA)	69	45-50

Exterior to Exterior

CONSTRUCTION NOISE

In order to achieve the allowable noise level of 75dBA $Leq_{12\text{-}hr}$ at the adjacent property line per City Noise Abatement and Control Ordinance Section 59.5.0404 and CEQA Significance Thresholds Section K.6, for example, an equivalent noise level of 85dBA would be allowable for only one hour during the 12-hour period from 7:00am to 7:00pm. The construction noise levels would otherwise need to fall in line with the current measured background levels.

The table below summarizes the noise emission levels for different construction equipment. Note that this list is not all inclusive. This information is provided by the Federal Highway Administration (2017).

Table 9.9 FTA Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50ft from Source
Air Compressor	81
Backhoe	80
Compactor	82
Dozer	85
Jack Hammer	88
Pile Driver (Sonic)	96
Dump Truck	88

The project site is located adjacent to zero lot line residential properties, therefore, there will likely be instances where the distance between construction operation to the property lines falls below 50feet.

Based on the close proximity of the site to the adjacent properties, and the anticipated noise levels from various construction equipment activities, temporary construction noise impact can exceed the allowable noise level of 75dBA $Leq_{12\text{-}hr}$ at the adjacent property line per City Noise Abatement and Control.

Construction noise mitigation strategies include, but are not limited to:

- Employing time constraints for noisy operations to reduce potential impacts during sensitive time periods.
- Maintaining and monitoring equipment to ensure they meet manufacturer specified noise levels.
- Scheduling several noisy operations to occur concurrently rather than separately.
- Requiring quieter or silenced site-based equipment options to control noise emissions.
- Providing mufflers or baffle systems on all generators, compressors, and other similar noise-generating equipment.
- Utilizing flaggers to reduce the need for back-up beepers and to decrease heavy vehicle stop and starts.
- Utilizing electrical powered equipment as an alternative to typically noisier gasoline or diesel powered equipment when those options exist.
- Providing 24-hour construction noise monitoring to log all construction site noise.

CONSTRUCTION VIBRATION

The Transit Noise and Vibration Impact Assessment Manual (Sept 2018) by presented by the Federal Transit Administration provides general vibration assessment impact criteria for different land use categories. For residential land use, the ground-borne vibration impact levels for frequency events should not exceed 72 VdB (Table 6-3 Indoor Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Vibration Assessment). The manual states that a vibration level that causes annoyance is well below the damage risk threshold for typical buildings (100VdB).

The table below summarizes the vibration levels for different construction equipment. Note that this list is not all inclusive. This information is provided by the Federal Railroad Administration (2012).

Table 10-5 Vibration Source Levels for Construction Equipment (from measured data[62,63,64,65])

Equipment		PPV at 25 ft (in/s)	Approximate L_v† at 25 ft
Pile driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile driver (vibratory)	Upper range	0.734	105
	Typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	In soil	0.008	66
	In rock	0.017	75
Vibratory roller		0.210	94
Hoe ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

† RMS velocity in decibels (VdB) re 1 μin/s.

Construction activities should occur during daytime hours to minimize sleep disturbance in the adjacent residential areas. Smaller dozers and equipment should be used to reduce vibration level impact, as well as mitigation strategies listed above.

CONCLUSION

The noise levels (interior and exterior) at the VetPowered project are predicted to meet the maximum allowable exterior noise levels at the adjacent property line outlined by City Noise Abatement and Control Ordinance Section 59.5.0401 and maximum allowable interior noise levels outlined by CalGreen Section 5.507.4.

Compliance with City Noise Abatement and Control Ordinance Section 59.5.0404 and CEQA Significance Thresholds: Section K.6 with regard to construction noise levels are contingent upon construction activities and corresponding noise levels. Mitigation strategies to control the noise construction activities will be required if noise levels are exceeded.

APPENDIX

Acoustics Terminology

Equivalent Continuous Sound Level (Leq) – The sound level in decibels, having the same total sound energy as the fluctuating level measured. LAeq is the A-weighted Leq sound level.

A-weighting – The 'common' name for A frequency-weighted sound level measurements, over the full audio range and compatible with our loudness response at lower sound levels.

Maximum Continuous Sound Level (Lmax) – The maximum sound level during a measurement period of a noise event. Should not be confused with the peak noise level.

Minimum Continuous Sound Level (Lmin) – The minimum sound level during a measurement period or a noise event.

Sound Transmission Class (STC) – A single number rating used to compare the sound insulation performance of partitions tested over a standard frequency range. In the case of STC ratings, sound isolation performance is based largely on the mid-to-high frequency sound associated with speech; therefore, low frequency sound isolation performance that may be undesirable due to mechanical, transportation, music, or other airborne noise impact with considerable low frequency or bass noise components may not be reflected in the STC rating.

Outdoor-Indoor Transmission Class (OITC) – A standard used for indicated the rate of transmission of sound between outdoor and indoor spaces. OITC measures between frequencies of 80 Hz and 4000 Hz, making it a better measure for low sound frequencies such as road noise.

Community Noise Equivalent Level (CNEL) – The 24-hr average noise level of all hourly LA_{eq} measurements with a 10 dB penalty added to the night-time levels between 22:00 and 07:00 hours and a 5 dB penalty added to the evening levels between 19:00 and 22:00 hours. Also known as Day-Evening-Night Noise Level (Lden).

Day-Night Noise Level (Ldn) – The 24-hr average noise level of all hourly LA_{eq} measurements with a 10 dB penalty added to the night-time levels between 22:00 and 07:00 hours.

Decibel (dBA) – A logarithmic unit used to relate the intensity of sound to an intensity level corresponding to the human hearing sensation.

References

City of San Diego. *General Plan Noise Element Table NE-3,* 2015

City of San Diego Municipal Code. *City Noise Abatement and Control Ordinance Section 59.5.0401*, 2019

City of San Diego Municipal Code. *City Noise Abatement and Control Ordinance Section 59.5.0404*, 2019

City of San Diego. *California Environmental Quality Significance Thresholds Section K.6,* 2016

State of California. *Title 24 California Green Building Code Section 5.504.4.2 & 1206.5*, 2019

United State Department of Housing and Urban Development. *Noise Control Guidebook*, 2009

Federal Transit Administration. *The Transit Noise and Vibration Impact Assessment Manual*, 2018

Federal Highway Administration. *FTA Construction Equipment Noise Emission Levels*, 2017

Federal Railroad Administration. *Vibration Source Levels for Construction Equipment*, 2012