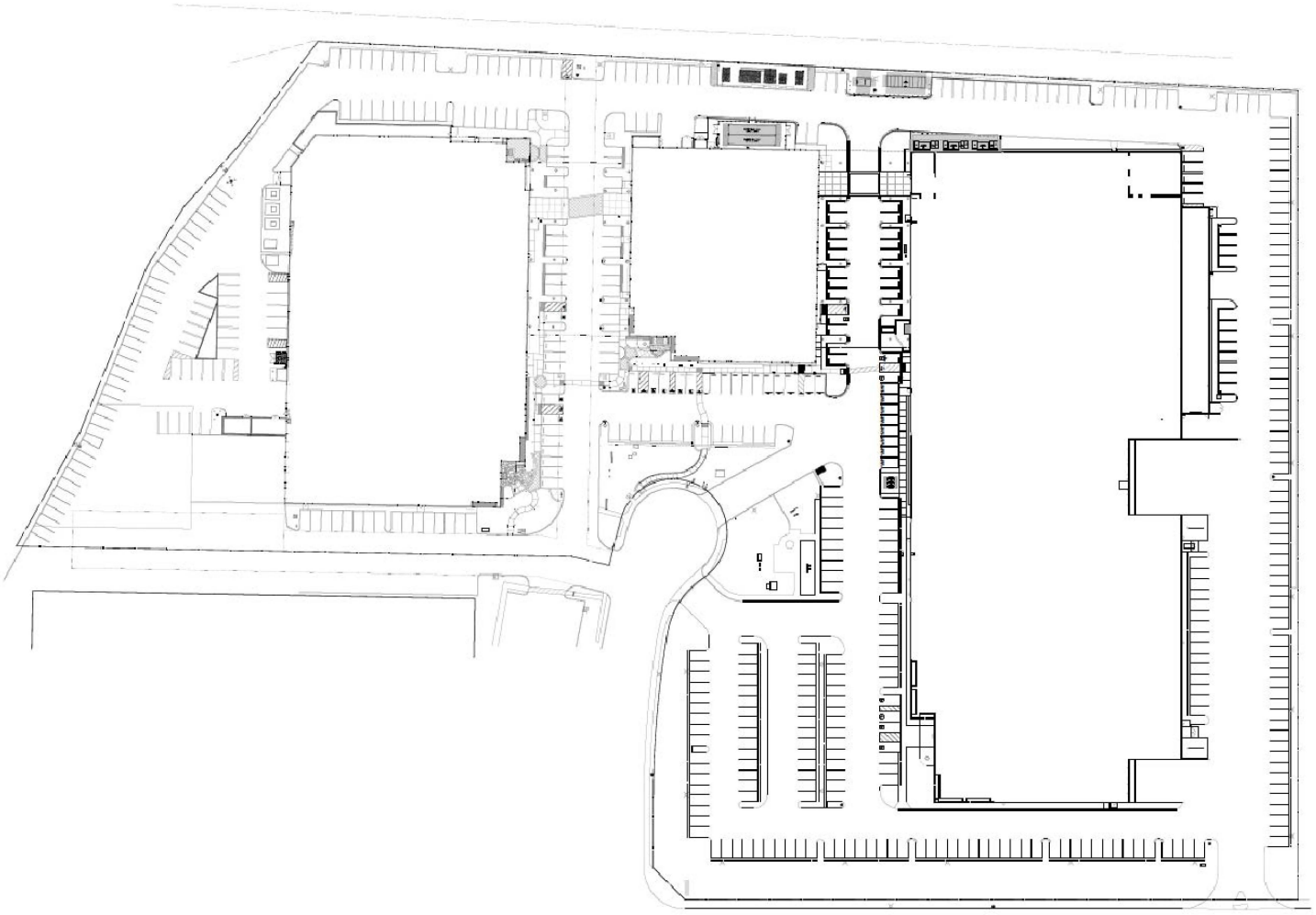
Appendix E
Noise Impact Study

APPLIED MEDICAL BUILDING L203 EXPANSION
NOISE IMPACT STUDY
City of Lake Forest, California



RK engineering group, inc.

APPLIED MEDICAL L203 BUILDING EXPANSION
NOISE IMPACT STUDY
City of Lake Forest, California

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

The purpose of this report is to evaluate the potential noise impacts from the proposed Applied Medical Building L203 Expansion (project) and provide recommendations, if necessary, to minimize any project noise impacts.

The assessment was conducted within the context of the California Environmental Quality Act (CEQA, California Public Resources Code Sections 21000, et seq.) and the standards and methodology follow the City of Lake Forest Municipal Code and General Plan requirements.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- Identification of the regulatory setting and applicable noise standards
- Analysis of the existing noise environment
- Analysis of the project's operational noise impact to adjacent sensitive receptors
- Summary of recommended mitigation measures and project design features to reduce noise level impacts.

1.2 Site Location

The proposed project is located at 20202 Windrow Drive in the City of Lake Forest. The project is located within an existing commercial business park that consists of the Applied Medical Lake Forest Campus and the Orange County Sheriff Saddleback Station.

The project site is zoned for Urban Activity Commercial/Business Park uses in the City of Lake Forest Zoning Map and is within the Baker Ranch Planned Community area. The site is designated for Business Park uses in the City of Lake Forest General Plan Land Use Plan.

The project site is bounded by California State Route (SR) 241 to the north, Rancho Parkway to the south, residential uses to the east, and Lake Forest Drive, Serrano Creek and the Etnies Skatepark to the west.

The nearest noise-sensitive land uses are considered the residential land uses located immediately adjacent to the site to the east (approximately 76 feet from the proposed Applied Medical L203 building). The project site pad elevation is situated approximately 6 feet lower than the adjacent residential homes (with the grade differential supported by an 8-foot high retaining wall). On top of the retaining wall sits a 6-foot high concrete masonry (CMU) block wall that acts as a noise barrier to shield the first floor of homes facing the project site.

The project site location map is provided in Exhibit A.

1.3 Project Description

Applied Medical currently occupies two (2) buildings within the Windrow Drive business park campus (Building L201 located at 20161 Windrow Drive, and Building L202 located at 20162 Windrow Drive) for purposes of developing and manufacturing medical devices. The project consists of expanding Applied Medical's operations into the northern portion of the 20202 Window Drive building (designated as L203 by Applied Medical). The proposed project operations within the L203 building will be similar to the existing operations within the Applied Medical campus, which consists of research and development, manufacturing, storage and general office uses.

The southerly portion of the 20202 Windrow building will remain occupied by the Orange County Sheriff Department (OCSD).

The project is also proposing to construct a 13,253 sqaure foot bridge that will connect building L202 and L203. The proposed bridge will primarily serve as a pedestrian foot bridge between the two buildings and will house a new central cogeneration (Cogen) power plant as well as other mechanical equipment.

The project includes multiple pieces of mechanical equipment associated with the Cogen system and heating, ventilation and exhaust (HVAC). Mechanical equipment will be located on the proposed bridge and on the roof of L203. This report analyzes the impacts from the proposed on-site noise sources to the nearest adjacent sensitive receptors.

The scope of this analysis also includes impacts from the parking lot and loading areas and project construction activity to the adjacent residential homes.

The site plan used for this analysis, provided by TD Architects, Inc. is illustrated in Exhibit B.

1.4 Recommended Noise Reduction Features

The following recommendations include project design features, standard rules and requirements, and best practices for helping reduce noise levels and disturbances during project operation and construction. The recommended Noise Reduction Features are typically included as part of the conditions of approval for the project.

It should be noted that the noise impact analysis, summarized in Section 6 and 7 of this report, shows that the project will have a less than significant impact according to the City of Lake Forest thresholds of significance. Hence, the following recommendations are not typically considered mitigation measures under CEQA.

Operation

1. All truck deliveries, loading and/or unloading activities should take place during daytime hours (7 a.m. to 10 p.m.) only.

2. Install signage near loading/unloading stations requiring trucks to turn off engines and stereos and limit idling to 5 minutes or less.

3. All rooftop mechanical equipment should be fully shielded from the line of sight of the adjacent residential homes (2nd story windows) and located behind a minimum twelve (12) foot high screening wall.

Construction

1. Construction activities should occur between the hours of 7:00 a.m. to 7:00 p.m. on Monday through Friday, and 8:00 a.m. to 6:00 p.m. on Saturdays. No construction shall be permitted outside of these hours or on Sundays or City of Lake Forest holidays.

2. All construction equipment should be equipped with mufflers and other suitable noise attenuation devices (i.e. engine shields).

3. Submit a haul plan, subject to approval by the City, that avoids routing trucks near residential areas and requires deliveries to observe the hours of construction described above.

4. Utilize the site's existing electrical power supply instead of generators.

5. Construction related equipment, including heavy-duty equipment, motor vehicles and portable equipment, should be turned off when not in use for more than 5 minutes.

6. Locate staging construction staging areas along the north side of the site (adjacent to the toll road) and at least 50 feet from the adjacent residential property line, where feasible.

7. The project shall maintain all sound-reducing devices and restrictions throughout the construction period.

2.0 Fundamentals of Noise and Vibration

This section of the report provides basic information about noise and vibration and presents some of the terms used in the report.

2.1 Sound, Noise, and Acoustics

The sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. The sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases, as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter (N/m2), also called micro-Pascal (μPa). One μPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels and abbreviated as dB.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two (2) sounds of equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3dB increase.

If two (2) sounds differ by approximately 10 dB the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels[1]

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, (A-weighted scale) and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighing is typically reported in terms of A-weighted decibel (dBA). Typically, the human ear can barely perceive the change in the noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway), would result in a barely perceptible change in sound level.

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant, while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels. Following are the most commonly used noise descriptors along with brief definitions.

A-Weighted Sound Level

The sound pressure level in decibels as measured on a sound level meter using the A-weighted 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 response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level

The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

[1] Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

Community Noise Equivalent Level (CNEL)

The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB)

A unit for measuring the amplitude of a 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, which is 20 micro-pascals.

dB(A)

A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ)

The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room

Any room meeting the requirements of the Uniform Building Code or other applicable regulations which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms, and similar spaces.

L(n)

The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly, L50, L90, and L99, etc.

Noise

Any unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Percent Noise Levels

See L(n).

Sound Level (Noise Level)

The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter

An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL)

The dBA level which, if it lasted for one (1) second, would produce the same A-weighted sound energy as the actual event.

2.7 Sound Propagation

As sound propagates from a source it spreads geometrically. The sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use the hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground

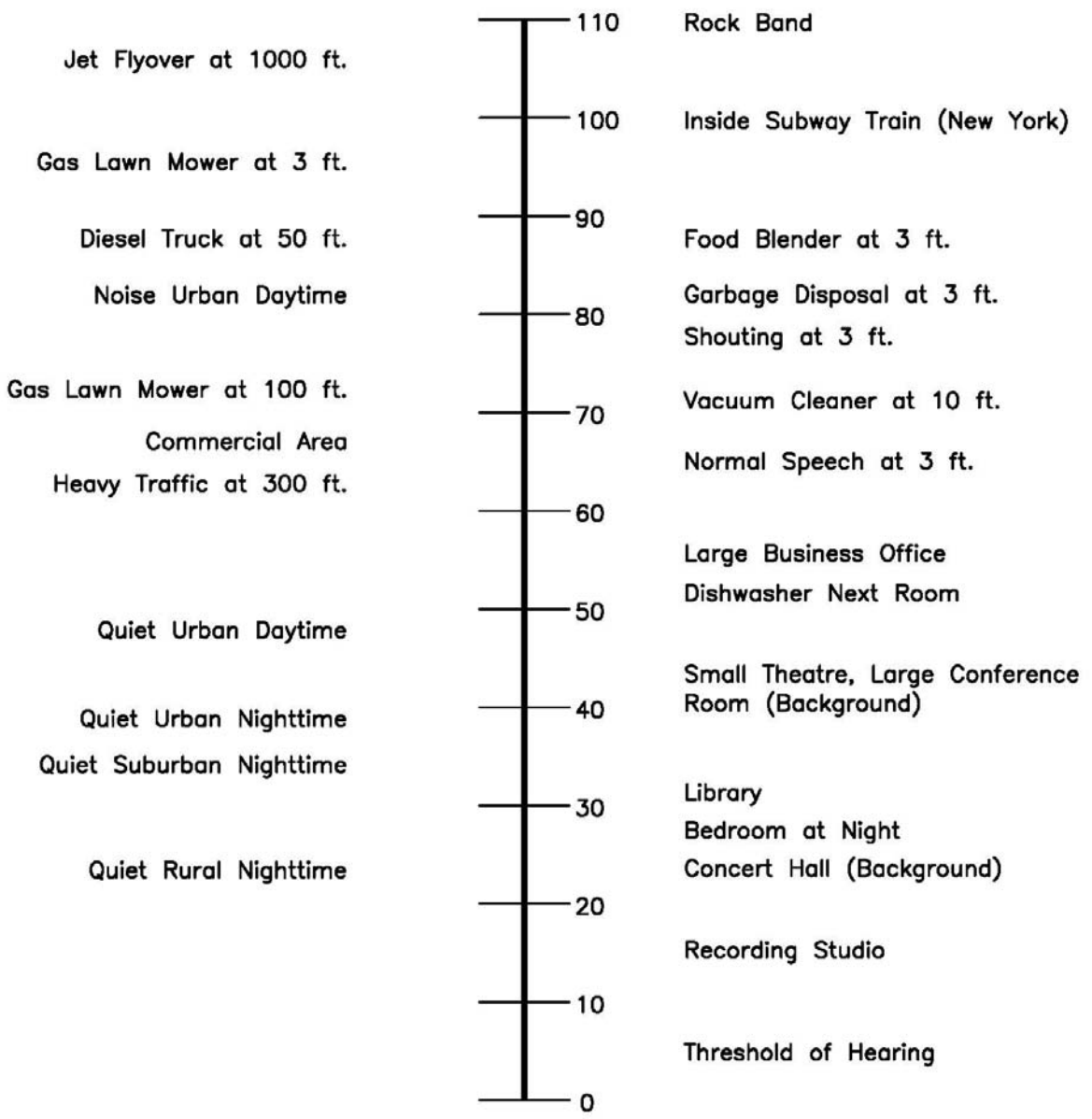
absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at an additional rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 6.0 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet and greater from a noise source. Wind, temperature, air humidity, and turbulence can further impact how far sound can travel.

Figure 1 shows typical sound levels from indoor and outdoor noise sources.

Figure 1[2]

TYPICAL SOUND LEVELS FROM
INDOOR AND OUTDOOR NOISE SOURCES



[2] Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

2.8 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV

Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS

Known as the root mean squared (RMS) can be used to denote vibration amplitude.

VdB

A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

2.9 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts.

2.10 Vibration Propagation

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wavefront, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wavefront. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wavefront. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

2.11 Construction Related Vibration Level Prediction[3]

Operational activities are separated into two different categories. The vibration can be transient or continuous in nature. Each category can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the project area site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. The thresholds from Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, in the table below provide general guidelines as to the maximum vibration limits for when vibration becomes potentially annoying.

[3] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020

Table 1
Vibration Annoyance Potential Criteria

Human Response	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.40

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts. The table below provides general vibration damage potential thresholds:

Table 2
Vibration Damage Potential Threshold Criteria

Structure and Condition	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings ruin ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

Soil conditions have an impact on how vibration propagates through the ground. The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides suggested "n" values based on soil class. The table below outlines the manual's suggested values and description.

Table 3
Suggested "n" Values Based on Soil Classes

Soil Class	Description of Soil Material	Suggested Value of "n"
I	Weak or soft soils: loose soils, dry or partially saturated peat and muck, mud, loose beach sand, and dune sand.	1.4
II	Most sands, sandy clays, silty clays, gravel, silts, weathered rock.	1.3
III	Hard soils: densely compacted sand, dry consolidated clay, consolidated glacial till, some exposed rock.	1.1
IV	Hard, component rock: bedrock, freshly exposed hard rock.	1.0

3.0 Regulatory Setting

The proposed project is located in the City of Lake Forest and noise regulations are addressed through the various federal, state, and local government agencies. The agencies responsible for regulating noise are discussed below.

3.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three (3) purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was originally tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible to regulate noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible to regulate noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers.

The Federal government and the State advocate that local jurisdiction use their land use regulatory authority to arrange new development in such a way that "noise sensitive" uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

3.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix." The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

3.3 City of Lake Forest Noise Standards

The project is required to comply with the noise standards established in the City of Lake Forest General Plan 2040 Public Safety Element and the City of Lake Forest Municipal Code. For purposes of this analysis, the latest noise standards established the General Plan 2040 are applicable.

Table 1 shows the noise standards from the City of Lake Forest General Plan 2040 Public Safety Element for the surrounding residential land uses.

Table 4
City of Lake Forest Performance Standards for Stationary Noise Sources, Including Affected Projects[1,2,3,4]

Noise Level Descriptor	Daytime (7:00 AM – 10:00 PM)	Nighttime (10:00 PM – 7:00 AM)
Hourly Leq, dBA	55	50

1. Each of the noise levels specified above should be lowered by 5 dB for simple noise tones, noises consisting primarily of speech or music, or recurring impulsive noises. Such noises are generally considered to be particularly annoying and are a primary source of noise complaints.
2. No standards have been included for interior noise levels. Standard construction practices should, with the exterior noise levels identified, result in acceptable interior noise levels.
3. Stationary noise sources which are typically of concern include, but are not limited to, the following: HVAC Systems, Cooling Towers/Evaporative Condensers, Pump Stations, Lift Stations, Emergency Generators, Boilers, Steam Valves, Steam Turbines, Generators, Fans, Air Compressors, Heavy Equipment, Conveyor Systems, Transformers, Pile Drivers, Grinders, Drill Rigs, Gas or Diesel Motors, Welders, Cutting Equipment, Outdoor Speakers, and Blowers.
4. The types of uses which may typically produce the noise sources described above include but are not limited to: industrial facilities, pump stations, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

The noise standards described above are consistent with the established noise level requirements in the City of Lake Forest Municipal Code Section 11.16.040 (Exterior Noise Standards). Hence, compliance with the City of Lake Forest Performance Standards for Stationary Noise Sources would also result in compliance with the Municipal Code.

3.4 City of Lake Forest Construction Noise and Vibration Standards

The City of Lake Forest General Plan 2040 provides Action Items for the regulation of construction noise. For purposes of this analysis, the latest construction noise and vibration standards established the General Plan 2040 are applicable.

PS-6e Update the City's Noise Ordinance (Chapter 11.16) to reflect the noise standards established in this General Plan and proactively enforce the City's Noise Ordinance, including requiring the following measures for construction:

- Restrict construction activities to the hours of 7:00 a.m. to 7:00 p.m. on Monday through Friday, and 8:00 a.m. to 6:00 p.m. on Saturdays. No construction shall be permitted outside of these hours or on Sundays or City of Lake Forest holidays, without a specific exemption issued by the City.

- A Construction Noise Management Plan shall be submitted by the applicant for construction projects, when determined necessary by the City. The Construction Noise Management Plan shall include proper posting of construction schedules, appointment of a noise disturbance coordinator, and methods for assisting in noise reduction measures.

- Noise reduction measures may include, but are not limited to, the following:

    - Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds) wherever feasible.

    - Except as provided herein, impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. This muffler can lower noise levels from the exhaust

by up to about 10 dBA. External jackets on the tools themselves shall be used, if such jackets are commercially available. this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever such procedures are available and consistent with construction procedures.

- Temporary power poles shall be used instead of generators where feasible.

- Stationary noise sources shall be located as far from adjacent properties as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or use other measures as determined by the City of provide equivalent noise reduction.

- The noisiest phases of construction shall be limited to less than 10 days at a time. Exceptions may be allowed if the City determines an extension is necessary and all available noise reduction controls are implemented.

- Delivery of materials shall observe the hours of operation described above. Truck traffic should avoid residential areas to the extent possible.

- Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to the building. A vibration limit of 0.30 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Section 11.16.060 in the Lake Forest Municipal Code exempts noise sources associated with the construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a Federal holiday.

3.5 City of Lake Forest CEQA Thresholds of Significance

The City of Lake Forest CEQA Significance Thresholds Guide provides guidance for the review and preparation of environmental documents under CEQA. The following thresholds of significance are established for traffic source noise and stationary source noise.

Traffic Noise

A proposed project would normally have a significant offsite traffic noise impact if both of the following criteria are met:

- Project traffic will cause a noise level increase of 3dB or more on a roadway segment adjacent to a noise sensitive land use. Noise sensitive land uses include the following: residential (single-family, multi-family, mobile home); hotels; motels; nursing homes; hospitals; parks, playgrounds and recreation areas; and schools.

- The resulting "future with project" noise level exceeds the noise standard for sensitive land uses as identified in the City of Lake Forest General Plan (refer to Table 3-1 in Section 3.3, Interior and Exterior Noise Standards).

Stationary Noise

The project would normally have a significant noise impact if it would:

- Exceed the stationary source noise criteria for the City of Lake Forest as specified by the Exterior noise standards set forth in the Noise Control Chapter of the Lake Forest Municipal Code.

4.0 Study Method and Procedures

The following section describes the measurement procedures, measurement locations, and noise modeling procedures and assumptions used in the noise analysis.

4.1 Measurement Procedures and Criteria

Noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as the first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

RK conducted the sound level measurements in accordance with Caltrans technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA).

A Piccolo-II Type 2 integrating-averaging sound level meter was used to conduct long-term (24-hour) noise measurements at the project site and property boundaries.

The Leq, Lmin, Lmax, L2, L8, L25, and L50 statistical data were recorded over the measurement time period intervals and the information was utilized to define the noise characteristics for the project. The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed ten (10) feet above ground for long-term noise measurements
- Sound level meters were calibrated before and after each measurement
- Following the calibration of equipment, a windscreen was placed over the microphone
- Frequency weighting was set on "A" and slow response
- Temperature and sky conditions were observed and documented

Appendix B includes photos, field sheets, and measured noise data.

4.2 Stationary Noise Modeling

On-site stationary noise sources were analyzed using SoundPLAN™ noise modeling software. SoundPLAN™ is a standards-based program that incorporates more than twenty national and international noise modeling guidelines. This project consists of parking lot noise and stationary noise sources which are classified under industrial sources. The following noise prediction standards were used during the performance of this project:

- ISO 9613-2: 1996

Projected noise levels from SoundPLAN™ are based on the following key parameters:

- Developing three-dimensional noise models of the project,
- Predicting the project noise levels at the selected community locations and
- Comparing the predicted noise with the existing community ambient noise levels at the receptor locations.

The sides of the residential buildings, walls, etc. were modeled as reflective surfaces and also as diffractive bodies. Most of the ground within the project site and adjacent areas are covered with paved surfaces and are modeled as a hard site (Ground Factor=0). The Effective Flow Resistivity for paved area is SoundPLAN default. The elevation profile for the project site is derived from Google Earth and all noise receptors are placed at 5 foot above the floor level.

Sound Power Level and Sound Pressure Level

Sound power level is the acoustic energy emitted by a source which produces a sound pressure level at some distance. While the sound power level of a source is fixed, the sound pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located.

SoundPLAN requires that the source noise level be input using sound power level, which in some cases must be back calculated when using a measured sound pressure level. The sound power level is calculated using SoundPLAN software by calibrating the source noise level to equal the sound pressure level at an equal distance from the source in which the referenced measurement was taken.

The main sources of potential on-site stationary noise impacts to adjacent land uses would include noises from the mechanical equipment to be located on the new bridge and building L203 roof. The list of noise generating equipment and the location is provided in Table 3 below.

4.2.1 Mechanical Equipment Noise

Bridge Equipment Noise Levels

The new bridge will house the central plant cogeneration system, which includes micro turbines, cooling towers and other mechanical equipment. The equipment will be shielded from line of sight from the ground floor (parking lot) area. However, the bridge will have a partially open roof that will allow noise to emanate out of the enclosure.

To estimate noise level impacts from the cooling towers and micro turbine, reference noise levels are utilized. Referenced noise levels for the cooling towers and micro turbine are provided by the applicant and represent similar noise sources operating under similar conditions as would be found on the project site.

RK obtained referenced noise level data for other miscellaneous equipment (such as chillers, condenser water filters, boilers, pumps and condensing units) to be located on the proposed bridge from the existing bridge equipment located between building L201 L202, in the City of Lake Forest. Referenced noise levels were obtained on October 15, 2019.

Referenced equipment noise levels are provided in Appendix C.

Roof Equipment Noise

The project will install additional noise generating mechanical equipment on the rooftop of the L203 building. The proposed equipment would include exhaust fans and air handler units, as well as a generator braking resistor (GBR) as part of the Cogen system.

To estimate noise level impacts from the exhaust fans, air handler units and GBR, reference noise levels are utilized. Referenced noise levels for the exhaust fans and air handler units are provided by the applicant and represent similar noise sources operating under similar conditions as would be found on the project site.

Referenced equipment noise levels are provided in Appendix C.

Table 2 indicates the referenced noise levels for the on-site stationary mechanical equipment noise sources. Further information on the referenced equipment noise levels is provided in Appendix C.

Table 5
Referenced Mechanical Equipment Noise Levels

Equipment		Location	Noise Levels (dBA) L_w (Sound Power Level)
Generator Braking Resistor (GBR)[1]		Roof	97.3
Exhaust Fan[1]		Roof	88.7
Air Handling Units (AHU) [1]		Roof	85.0
Micro Turbine[1]		Bridge	101.3
Cooling Tower	Motor Side[1]	Bridge	70.0
	Opposite Motor Side[1]		70.0
	End[1]		85.3
	Roof (Top) [1]		84.4
Miscellaneous Equipment[2]		Bridge	86.0

[1] Obtained from applicant/product manufacturer specifications.
[2] Measured by RK at Bridge L202 on October 15, 2019.

4.2.2 Loading Dock/Parking Lot Noise

The project consists of four (4) loading docks that will be used to receive approximately 2-4 truck deliveries per day. Typical noise associated with loading dock activities would include engine noise from delivery trucks, lift gate operation, backup alarms, load drops, forklifts/pallet jacks, and personnel.

The noise level impacts from the loading docks and parking lot areas were estimated using a computer program that replicates the FHWA Noise Prediction Model (FHWA-RD-77-108). The FHWA model arrives at the predicted noise level through a series of adjustments to the reference energy noise level.

The model outputs the projected noise level based on the following key parameters:

- Measured referenced noise level – (e.g. how loud a source is at a specific distance)
- Vertical and horizontal distances (sensitive receptor distance from noise source)
- Noise barrier vertical and horizontal distances (noise barrier distance from sound source and receptor).
- Typical noise source spectra
- Topography

Table 3 indicates the measured referenced noise level measurements conducted by RK. The noise measurement data indicates the distance the microphone was placed from the noise source and the statistical data. Measurements were taken over a 10-minute interval.

Table 6
Reference Stationary Noise Level Measurements

Source[1]	Distance from Source (feet)	Noise Levels (dBA)					
		L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
Loading Dock Activity	6.0	79.3	97.0	91.5	81.0	74.5	71.5
Parking Lot Noise	6.0	63.8	79.5	68.5	65.5	64.5	63.0

[1] Referenced noise levels previously measured by RK over a 10-minute period.

4.3 Construction Vibration Modeling

The construction vibration assessment is based on the methodology set-forth within the Caltrans Transportation and Construction Induced Vibration Guidance Manual. The vibration impacts from heavy truck loading and jackhammer activity is analyzed. All vibratory activity is analyzed as a continuous and/or frequent event and is required to comply with the applicable guidance thresholds criteria. No impact pile driving or blasting is expected as part of this project. Vibratory impacts were calculated from the site area property line to the closest sensitive receptors and structures using the reference vibration levels, soil conditions and the reference equation *PPV= PPV ref (25/D)^n (in/sec)* (from Caltrans Manual) where:

PPV = reference measurement at 25 feet from vibration source
D = distance from equipment to property line
n= vibration attenuation rate through ground (n=1.0 was utilized for this study)

5.0 Existing Noise Environment

The existing noise environment for the project site and surrounding areas has been established based on noise measurement data collected by RK. Noise measurement data indicates that traffic noise propagating from the adjacent roadways, as well as activities from the existing commercial land use and surrounding properties are the main sources of ambient noise at the project site and surrounding area.

5.1 Long-Term (24-Hour) Noise Measurement Results

To determine the existing noise level environment, RK conducted one (1) 24-hour noise measurement at the project study area. Noise levels were measured on November 23rd and November 24th, 2020 using a Piccolo-II Type 2 integrating-averaging sound level meter. The information was utilized to establish the noise characteristics of the existing ambient environment.

The noise monitoring location were selected based on the proximity and location to adjacent sensitive receptors. Exhibit C graphically illustrates the location of the long-term measurements.

- Long-term noise monitoring location one (LT-1) was taken at approximately 215 feet from the northern property line and approximately 75 feet from the eastern property line.

Long term noise monitoring location represent the existing noise levels near the adjacent noise sensitive land uses. Long-term noise measurement results are summarized in Table 4. Appendix B includes photographs, field sheets and measured noise data.

Table 7
24 Noise Measurement Results LT-1[1]

Time	Leq (dBA)	Time	Leq (dBA)
12:00 AM	49.1	12:00 PM	55.2
1:00 AM	46.1	1:00 PM	60.9
2:00 AM	46.2	2:00 PM	66.5
3:00 AM	47.4	3:00 PM	58.1
4:00 AM	50.8	4:00 PM	56.8
5:00 AM	69.9	5:00 PM	57.4
6:00 AM	65.4	6:00 PM	56.0
7:00 AM	62.5	7:00 PM	54.4
8:00 AM	59.4	8:00 PM	54.3
9:00 AM	55.3	9:00 PM	52.5
10:00 AM	55.0	10:00 PM	51.1
11:00 AM	57.4	11:00 PM	49.6
24-Hour CNEL			**68.0**

[1] LT-1 was taken at approximately 215 feet from the northern property line and approximately 75 feet from the eastern property line. LT-1 was recorded on 11/23/2020.

6.0 Project Noise Impacts

This assessment analyzes the noise level impact from the operational noise generated by the project to the adjacent residential homes. The main sources of noise generated by the project would include on-site operational activities from the mechanical equipment located on the bridge and building L203 roof. Noise level impacts are compared to the City of Lake Forest noise standards and several recommendations are provided to help reduce noise.

6.1 Stationary Source Noise Impacts

Pursuant to the City of Lake Forest CEQA Significance Thresholds Guide, a project would normally have a significant impact from stationary noise sources if it would:

- Exceed the stationary source noise criteria for the City of Lake Forest as specified by the exterior noise standards

The City of Lake Forest exterior noise standards specified in the latest General Plan 2040, are 55 dBA Leq during daytime hours (7 a.m. to 10 p.m) and 50 dBA Leq during nighttime hours (10 p.m. to 7 a.m.).

Mechanical equipment located on the bridge and rooftop are considered sources of stationary noise. On-site stationary noise impacts are assessed at the adjacent land uses, which include residential uses to the east of the site. Noise impacts are analyzed during both daytime and nighttime conditions, as the project is expected to be operational 24 hours per day. The current design indicates that all rooftop mechanical equipment will be shielded behind a 12-foot noise barrier wall.

The noise analysis considers all project noise sources operating simultaneously during daytime hours (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) at the nearest residential sensitive receptors to the east of the project site. As shown in Table 8 and Table 9, the noise levels generated by the project are not expected to exceed the City's daytime and nighttime exterior noise standard for residential uses at the property line.

The results of the on-site daytime operational noise analysis are shown graphically on Exhibits E and the on-site nighttime operational noise analysis are shown graphically on Exhibit F. Appendix D contains the stationary noise calculation worksheets.

Based on the results of this analysis, the mechanical equipment located on the bridge and rooftop would result in a less than significant stationary noise impact.

TABLE 8

Mechanical Equipment Exterior Noise Impact Analysis - Daytime (dBA)

Receptor	Location	Daytime Exterior Noise Level dBA[1]			
		Project Noise Contribution (Leq)	Existing Ambient Measurement (Leq)[1]	City of Lake Forest Noise Level Criteria (Leq)	Noise Level Exceeds Standard (?)
Receiver at PL-1	Property Line	48.9	51.1	55.0	No
Receiver at PL-2	Property Line	48.8	51.1		No
Receiver at PL-3	Property Line	48.2	51.1		No
Receiver at PL-4	Property Line	47.9	51.1		No

[1] Lowest Daytime Leq

TABLE 9

Mechanical Equipment Exterior Noise Impact Analysis - Nighttime (dBA)

Receptor	Location	Nighttime Exterior Noise Level dBA[1]			
		Project Noise Contribution (Leq)	Existing Ambient Measurement (Leq)[1]	City of Lake Forest Noise Level Criteria (Leq)	Noise Level Exceeds Standard (?)
Receiver at PL-1	Property Line	48.9	46.1	50.0	No
Receiver at PL-2	Property Line	48.8	46.1		No
Receiver at PL-3	Property Line	48.2	46.1		No
Receiver at PL-4	Property Line	47.9	46.1		No

[1] Lowest Nighttime Leq

6.2 Traffic Noise Impacts

Pursuant to the City of Lake Forest CEQA Significance Thresholds Guide, a proposed project would normally have a significant offsite traffic noise impact if both of the following criteria are met:

- Project traffic will cause a noise level increase of 3dB or more on a roadway segment adjacent to a noise sensitive land use. Noise sensitive land uses include the following: residential (single-family, multi-family, mobile home); hotels; motels; nursing homes; hospitals; parks, playgrounds and recreation areas; and schools.

- The resulting "future with project" noise level exceeds the noise standard for sensitive land uses as identified in the City of Lake Forest General Plan (Interior and Exterior Noise Standards).

The industry-wide rule of thumb is that it typically takes a doubling of traffic volume along a roadway to cause a 3 dB increase in noise. The project is forecast to generate a gross total of 421 daily trips (without consideration for the existing land use trip generation)[4]. Rancho Parkway, between Lake Forest Drive and Hermana Circle experiences average daily traffic (ADT) of 19,400 vehicles[5]. Therefore, the project contribution to Rancho Parkway would only result in about a 2% increase in ADT, and the change in traffic noise levels would not be perceptible. The impact to traffic noise is considered less than significant.

6.3 Loading Docks and Parking Lot Activity

The existing 20202 Windrow Drive building is currently served by a total of eight (8) truck loading bays along the east side of the building, located approximately 135 feet from the adjacent residential property line. Six (6) of the loading bays previously served the Safeway/Pinnacle tenant at the northerly portion of the building and two (2) of the loading bays still currently serve the OC Sheriff.

The project will remove the two (2) existing loading bays at the north end of the 20202 Windrow Drive building and maintain the four (4) loading bays near the middle of the building. The project is expected to receive approximately 2-4 truck delivery trucks per day. 4. All truck deliveries, loading and/or unloading activities are expected to take place during daytime hours (7 a.m. to 10 p.m.) only.

[4] Applied Medical Resources Building L203 Expansion Focused Traffic & Parking Analysis, City of Lake Forest. February 26, 2021.
[5] City of Lake Forest Public Works Dept. Average Daily Traffic Volumes. 2018.

Table 10 summarizes the results of the combined daytime exterior noise levels from mechanical equipment, loading dock and parking lot activities. As shown in the Table 7, the project is not expected to exceed the daytime noise levels of the City of Lake Forest General Plan, Lake Forest Municipal Code or Lake Forest CEQA Thresholds.

Table 10
Combined Exterior Noise Impact
Residential Property Line - Daytime

	Source	Noise Level (dBA)					
		L_{eq}	L_{max} (max)	L_2 (1 min)	L_8 (5 min)	L_{25} (15 min)	L_{50} (30 min)
Daytime (7 AM - 10 PM)	Loading Dock	50.5	68.2	62.7	52.2	45.7	42.7
	Parking Lot	42.4	60.1	54.6	44.1	37.6	34.6
	Mechanical Equipment Noise	48.9	48.9	48.9	48.9	48.9	48.9
	Total Combined Exterior Noise Impact	53.2	68.9	63.5	54.3	50.8	50.0
	City of Lake Forest Noise Level Criteria[1]	55.0	75.0	70.0	66.55.0	60.0	55.0
	Noise Level Exceeds Standard (?)	No	No	No	No	No	No

[1] Source: The City of Lake Forest General Plan 2040 Public Safety Element and Municipal Code Section 11.16.040.

Table 11 summarizes the results of the combined nighttime exterior noise levels from mechanical equipment and parking lot activities. The project is not expected to have any truck deliveries, loading and/or unloading activities during nighttime hours (10 p.m. to 7 a.m.) only.

As shown in the Table 11, the project is not expected to exceed the nighttime noise levels of the City of Lake Forest General Plan, Lake Forest Municipal Code or Lake Forest CEQA Thresholds.

The noise analysis takes into account the 14-foot high wall (8-foot retaining plus 6-foot CMU block) shielding the project site from the adjacent residential units.

Table 11
Combined Exterior Noise Impact
Residential Property Line - Nighttime

	Source	Noise Level (dBA)					
		L_{eq}	L_{max} (max)	L_2 (1 min)	L_8 (5 min)	L_{25} (15 min)	L_{50} (30 min)
Nighttime (10 PM - 7 AM)	Parking Lot[2]	37.4	55.1	49.6	39.1	32.6	29.6
	Mechanical Equipment Noise	48.9	48.9	48.9	48.9	48.9	48.9
	Total Combined Exterior Noise Impact	49.2	56.0	52.3	49.3	49.0	49.0
	City of Lake Forest Noise Level Criteria[1]	50.0	70.0	65.0	60.0	55.0	50.0
	Noise Level Exceeds Standard (?)	No	No	No	No	No	No

[1] Source: The City of Lake Forest General Plan 2040 Public Safety Element and Municipal Code Section 11.16.040.

[2] Daytime parking lot noise levels have been reduced by 5 dB to account for reduced on-site activities at night.

To help further reduce potential future noise disturbances from truck loading activities, several recommendations are provided in Section 6.5.

6.4 Interior Noise Impacts

The Lake Forest General Plan 2040 indicates that if noise levels comply with the exterior performance standards, then standard construction should result in acceptable interior noise levels[6]. Therefore, based on the results of the exterior noise analysis shown in Tables 5, 6, 7 and 8, the project noise impact to interior areas of the adjacent residential homes is considered less than significant.

6.5 Recommended Noise Reduction Features

The following recommendations include project design features, standard rules and requirements, and best practices for helping reduce noise levels and disturbances. The recommended Noise Reduction Features are typically included as part of the conditions of approval for the project.

[6] Lake Forest General Plan 2040. Public Safety Element. Table PS-2 (Footnote 2).

It should be noted that the following recommendations are not typically considered mitigation measures under CEQA, as the project is expected to result in a less than significant impact to noise.

Operation

1. All truck deliveries, loading and/or unloading activities should take place during daytime hours (7 a.m. to 10 p.m.) only.

2. Install signage near loading/unloading stations requiring trucks to turn off engines and stereos and limit idling to 5 minutes or less.

3. All rooftop mechanical equipment should be fully shielded from the line of sight of the adjacent residential homes (2nd story windows) and located behind a minimum twelve (12) foot high screening wall.

7.0 Construction Noise and Vibration Impacts

Temporary construction noise and vibration impacts have been assessed from the project site to the surrounding adjacent land uses. The degree of construction noise will vary depending on the type of construction activity taking place and the location of the activity relative to the surrounding properties.

Section 11.16.060 in the Lake Forest Municipal Code exempts noise sources associated with the construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a Federal holiday. In compliance with the City's Municipal Code, it is assumed construction would not occur during the noise-sensitive nighttime hours.

Although construction activity may be exempt from the noise standards in the City's Municipal Code, CEQA requires that potential noise impacts still be evaluated for significance. The City of Lake Forest CEQA Significance Thresholds Guide does not have established criteria for construction noise impacts. Therefore, for purposes of this analysis, the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (2006) criteria is referenced as an informational guide for the construction noise impact analysis[7]. The FTA provides reasonable criteria for assessing construction noise impacts based on the potential for adverse community reaction.

Construction phasing and off-road equipment usage assumptions are referenced from the *Applied Medical Building L203 Expansion Air Quality and Greenhouse Gas Impact Study.*

This report has also been updated to include the latest assumptions for construction activity along the eastern property line. Appendix E has been updated to include a description of the anticipated construction activity along the east side of L203 adjacent to the residential uses. As shown in Appendix E, the project will require the demolition and re-pouring of some existing asphalt and concrete up to 8 feet of the adjacent residential property line.

[7] Federal Transit Administration. Transit Noise and Vibration Impact Assessment Manual. Section 7. September 2018.

7.1 Typical Construction Noise Levels

Table 12 shows typical construction noise levels compiled by the Environmental Protection Agency (EPA) for common type construction equipment. Typical construction noise levels are used to estimate potential project construction noise levels at the adjacent sensitive receptors.

Table 12
Typical Construction Noise Levels[1]

Type	Noise Levels (dBA) at 50 Feet
Earth Moving	
Compactors (Rollers)	73 - 76
Front Loaders	73 - 84
Backhoes	73 - 92
Tractors	75 - 95
Scrapers, Graders	78 - 92
Pavers	85 - 87
Trucks	81 - 94
Materials Handling	
Concrete Mixers	72 - 87
Concrete Pumps	81 - 83
Cranes (Movable)	72 - 86
Cranes (Derrick)	85 - 87
Stationary	
Pumps	68 - 71
Generators	71 - 83
Compressors	75 - 86
Impact Equipment	
Pneumatic Wrenches	82 - 87
Jack Hammers, Rock Drills	80 - 99
Pile Drivers (Peak)	95-105
Other	
Vibrators	68 - 82
Saws	71 - 82

[1] Referenced Noise Levels from the Environmental Protection Agency (EPA)

7.2 Construction Noise Impact Analysis

The degree of construction noise will vary for different areas of the project site and vary depending on the construction activities. The City of Lake Forest does not have established thresholds of significance for construction noise, and therefore, for purposes of this analysis, the FTA criteria is utilized. FTA construction noise impact criteria is an industry standard and widely cited for the purpose of evaluating construction noise impacts under CEQA.

7.2.1 Construction Noise Impact Analysis – 50 Feet

The FTA General Assessment methodology recommends that construction noise impacts be evaluated with the assumption that all equipment operates at the center of the project site based on the average 1-hour Leq noise level. For this analysis, the potential noise impacts during the site preparation, grading, building construction, paving, and architectural coating phases are analyzed at 50 feet from the nearest residential property line. Most construction activities are expected to occur further than 50 feet from the residential property line. For example, the extent of the new building expansion will be approximately 76 feet from the residential property line. Hence, 50 feet provides a conservative assessment of typical construction noise levels that will occur near the adjacent residential property line.

Table 13 shows the result of the construction noise impact analysis at 50 feet. The expected construction noise levels will be below the recommended 1-hour Leq General Assessment construction noise threshold provided by the FTA for adverse community reaction at the adjacent residential uses. The Federal Highway Administration Roadway Construction Noise Model Version 1.1 construction noise calculation worksheets are provided in Appendix E.

The construction noise analysis takes into account the 14-foot high wall (8-foot retaining plus 6-foot CMU block) shielding the project site from the adjacent residential units.

Table 13
Project Construction Noise Levels at 50 Feet

Phase	Equipment	Quantity	Equipment Noise Level at 50ft (dBA Leq)	Combined Noise Level (dBA Leq)
Site Preparation	Graders	1	81.0	85.0
	Scrapers	1	79.6	
	Tractors/Loaders/Backhoes	1	80.0	
Grading	Graders	1	81.0	84.6
	Rubber Tired Dozers	1	77.7	
	Tractors/Loaders/Backhoes	1	80.0	
Building Construction	Cranes	1	72.6	83.4
	Forklifts	1	71.0	
	Generator Sets	1	77.6	
	Tractors/Loaders/Backhoes	1	80.0	
	Welders	3	70.0	
Paving	Cement and Mortar Mixer	1	74.8	82.9
	Pavers	1	74.2	
	Paving Equipment	1	73.0	
	Rollers	1	73.0	
	Tractors/Loaders/Backhoes	1	80.0	
Architectural Coating	Air Compressors	1	73.7	73.7
Worst Case Construction Phase Noise Level - Leq dBA (without property line wall shielding)				85.0
Worst Case Construction Phase Noise Level - Leq dBA (with property line wall shielding)[1]				74.4
FTA Construction General Assessment 1-Hour Leq Criteria				90.0
Noise level exceeds FTA criteria?				No

[1] Noise level calculated 5-feet behind the existing 14-foot high property line wall (8-foot retaining plus 6-foot CMU block) that serves to shield the project site from the adjacent residential units. Receiver height is 5 feet above residential pad level.

7.2.2 Construction Noise Impact Analysis – 8 Feet

The project will require some demolition of existing asphalt/concrete along the eastern portion of the site to allow for the relocation of underground utilities. Portions of the existing paving will be removed and replaced up to 8 feet from the property line. This pavement replacement will not require any grading or earthwork activity. The structural section of the pavement being removed will be the same as the new pavement being constructed. Saw-cutting for the limits of removal will be required. However, the new pavement will be concrete in lieu of asphalt so an asphalt roller will not be used but rather poured by concrete mixers. See Appendix E for an exhibit showing the proposed improvements along the eastern property line.

To help assess the potential impact from the construction activity occurring near the eastern property line, an additional noise impact analysis has been performed based on the most recent detailed information of construction activities provided by the applicant.

Table 14 shows the result of the construction noise impact analysis at 8 feet. The expected construction noise levels will be below the recommended 1-hour Leq General Assessment construction noise threshold provided by the FTA for adverse community reaction at the adjacent residential uses. The Federal Highway Administration Roadway Construction Noise Model Version 1.1 construction noise calculation worksheets are provided in Appendix E.

Table 14
Project Construction Noise Levels at 8 Feet

Phase	Equipment	Quantity	Equipment Noise Level at 8ft (dBA Leq)	Combined Noise Level at 8 ft (dBA Leq)
Asphalt/Concrete Demolition	Concrete Saw	1	98.5	102.2
	Hoe Ram	1	99.2	
	Tractors/Loaders/Backhoes	1	91.0	
Worst Case Construction Phase Noise Level - Leq (dBA) – without wall				102.2
Worst Case Construction Phase Noise Level - Leq (dBA) – with barrier shielding[1]				87.4
FTA Construction General Assessment 1-Hour Leq Criteria				90.0
Noise level exceeds FTA criteria?				No

[1] Noise level calculated 5-feet behind the existing 14-foot high property line wall (8-foot retaining plus 6-foot CMU block) that serves to shield the project site from the adjacent residential units. Receiver height is 5 feet above residential pad level.

7.3 Construction Vibration

To determine the vibratory impacts during construction, reference construction equipment vibration levels were utilized and then extrapolated to the façade of the nearest adjacent structures. The nearest sensitive receptors are the residential structures located 15 feet from the parking lot. All structures surrounding the project site are "new residential structures". No historical or fragile buildings are known to be located within the vicinity of the site.

The construction of the proposed project is not expected to require the use of substantial vibration inducing equipment or activities, such as pile drivers or blasting. The main sources of vibration impacts during construction of the project would be the operation of equipment such as loading trucks and jackhammers.

The construction vibration assessment is based on the methodology set-forth within the Caltrans Transportation and Construction Induced Vibration Guidance Manual and compared to the City of Lake Forest standards. Table 15 shows the project's construction-related vibration analysis at the nearest habitable residential dwelling to the site.

Table 15
Construction Vibration Impact Analysis

Construction Activity	Distance to Nearest Structure (ft)	Calculated Vibration Level - PPV (in/sec)	City Threshold PPV (in/sec)	Exceed Threshold (?)
Loaded Trucks	15	0.076	0.3	No
Jackhammer	15	0.035		No

Construction vibration calculation worksheets are provided in Appendix E.

7.4 Recommended Construction Noise Reduction Features

The following recommendations include project design features, standard rules and requirements, and best practices for helping reduce noise levels and disturbances during project construction. The recommended Noise Reduction Features are typically included as part of the conditions of approval for the project and are not considered mitigation under CEQA.

Construction

1. Construction activities should occur between the hours of 7:00 a.m. to 7:00 p.m. on Monday through Friday, and 8:00 a.m. to 6:00 p.m. on Saturdays. No construction shall be permitted outside of these hours or on Sundays or City of Lake Forest holidays.

2. All construction equipment should be equipped with mufflers and other suitable noise attenuation devices (i.e., engine shields).

3. Submit a haul plan, subject to approval by the City, that avoids routing trucks near residential areas and requires deliveries to observe the hours of construction described above.

4. Utilize the site's existing electrical power supply instead of generators.

5. Construction related equipment, including heavy-duty equipment, motor vehicles and portable equipment, should be turned off when not in use for more than 5 minutes.

6. Locate staging construction staging areas at least 50 feet away from the adjacent residential property line, where feasible.

7. The project shall maintain all sound-reducing devices and restrictions throughout the construction period.

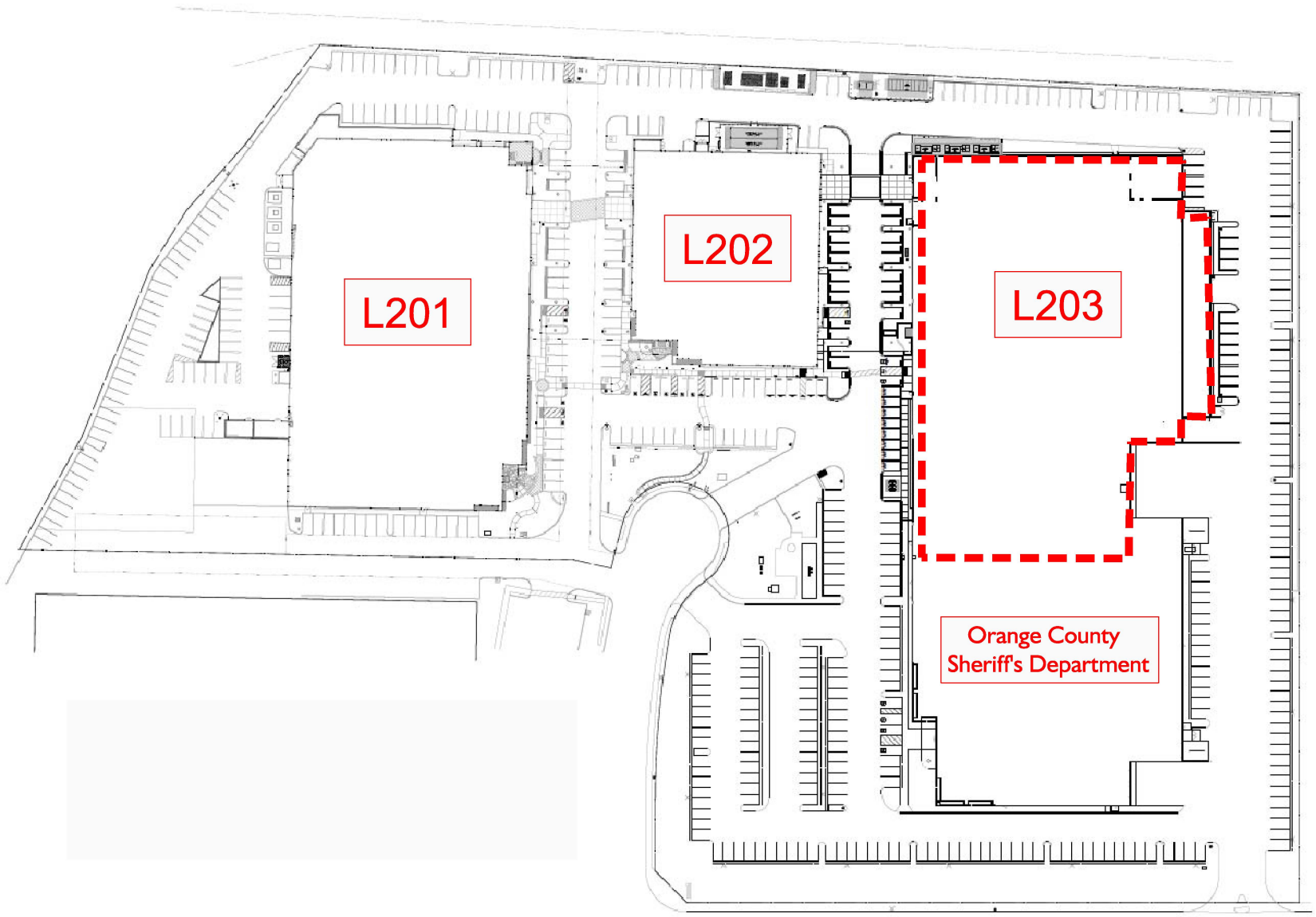
Exhibits

Exhibit A
Location Map

N

Exhibit B

Site Plan



N

Exhibit C

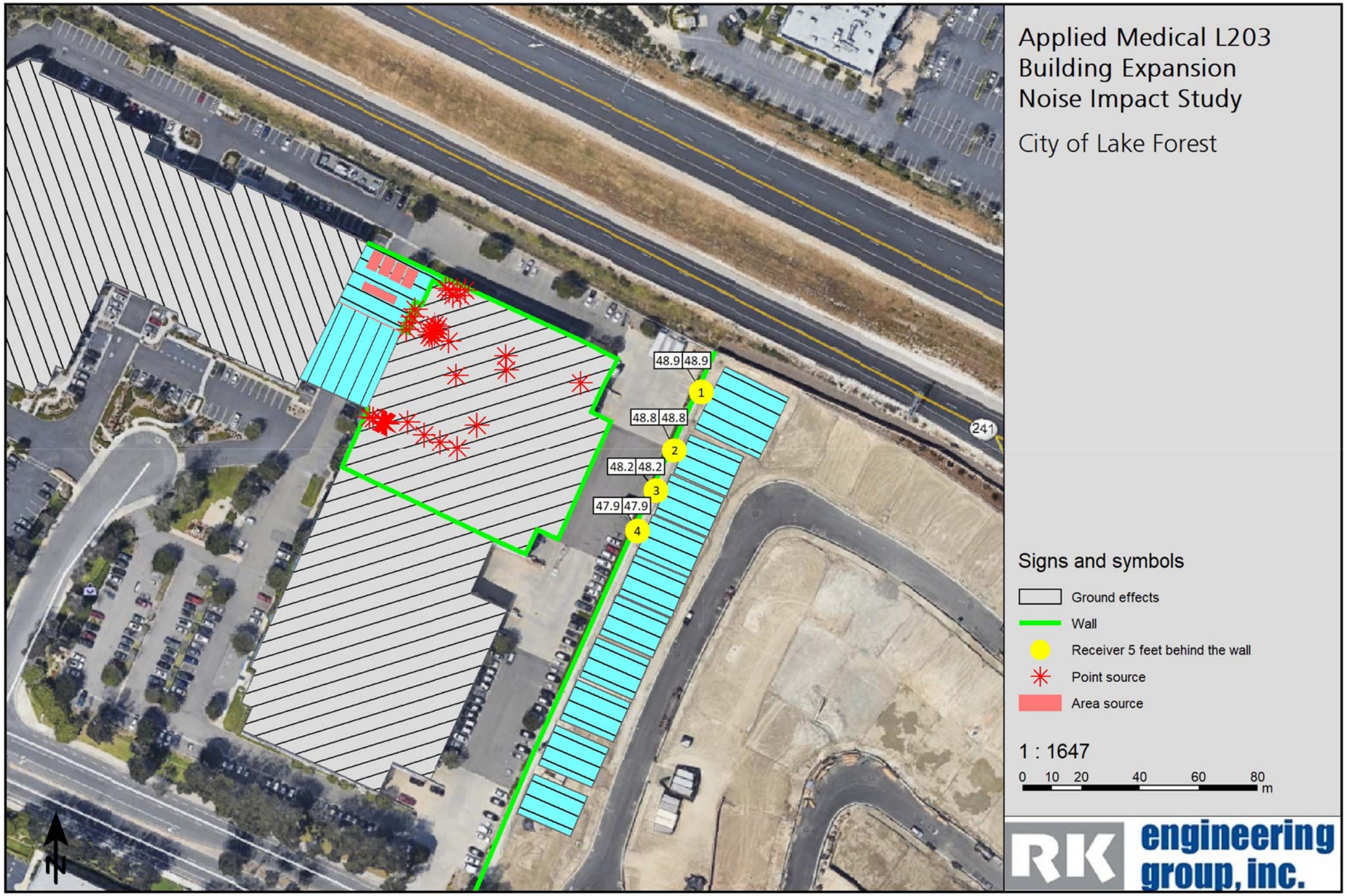
Noise Monitoring Locations

Legend:

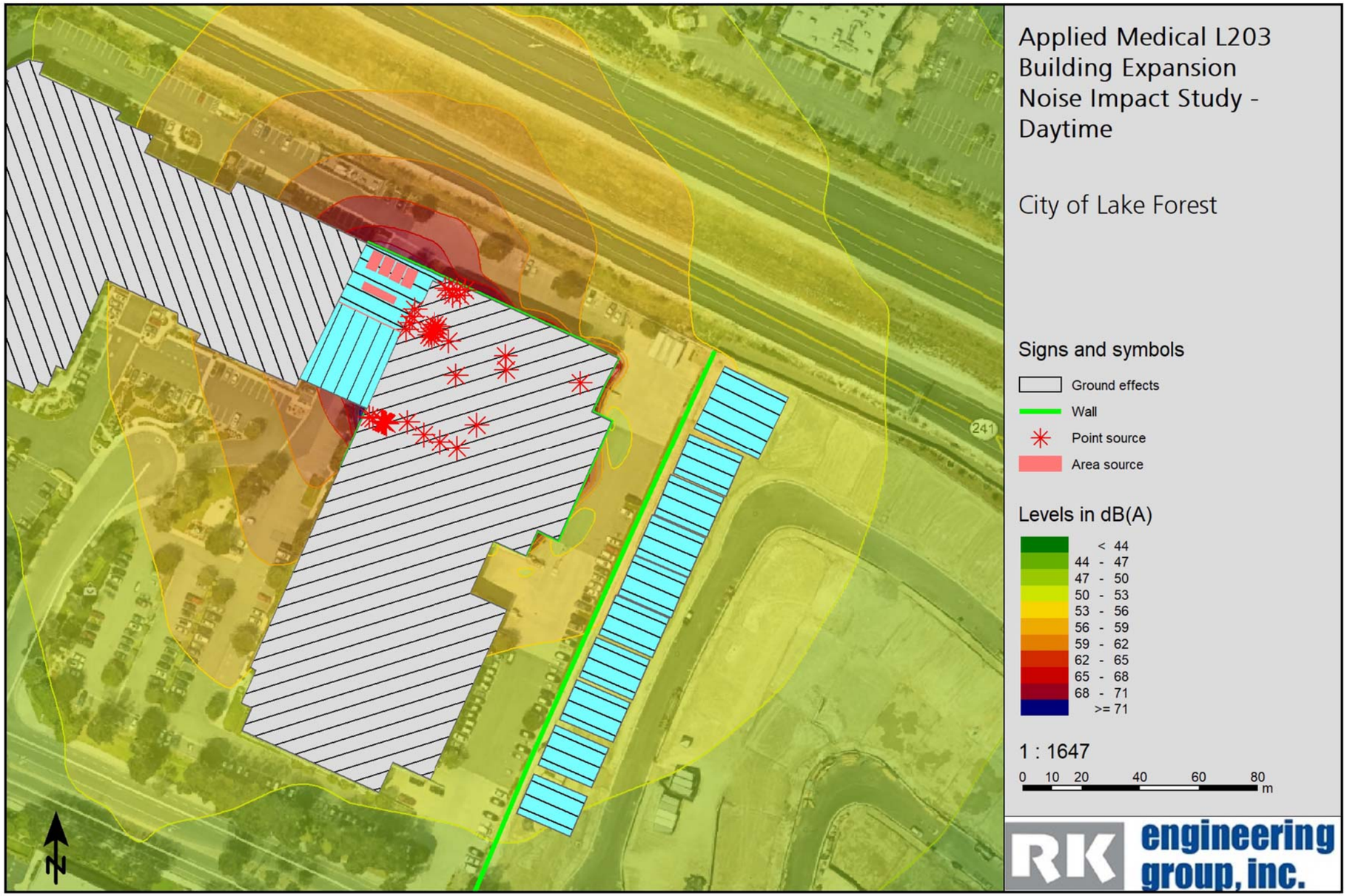
LT-1 = Long-Term (24-Hour) Measurement

N

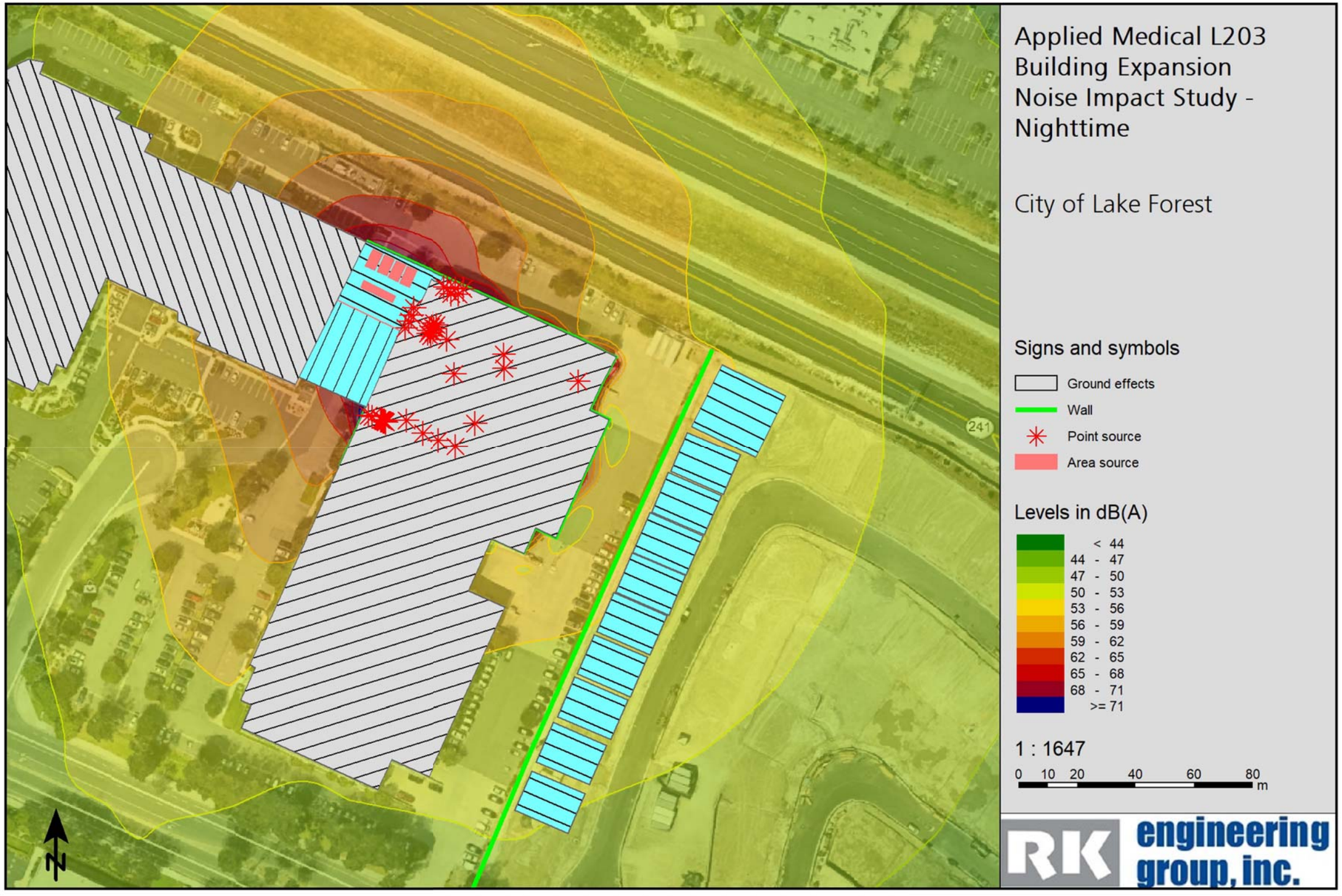
SoundPLAN Project Noise Level Results



Project Noise Level Contours - Daytime



Project Noise Level Contours - Nighttime



Appendices

Appendix A

City of Lake Forest Noise Standards

GOAL PS-6 NOISE

A comfortable community environment that is free from excessive noise pollution.

PS-6 Policies

PS-6.1 **Land Use Planning**. Require development and infrastructure projects to be consistent with the maximum allowable noise exposure standards identified in Table PS-1 to ensure acceptable noise levels for existing and future development.

PS-6.2 **Sensitive Facilities**. Ensure appropriate mitigation is incorporated into the design of noise-sensitive facilities to minimize noise impacts.

PS-6.3 **Site Design**. Require site planning and project design techniques to minimize noise impacts adjacent to sensitive uses.

PS-6.4 **Noise Control**. Ensure that noise levels do not exceed the limits established in Table PS-2 by incorporating sound-reduction design in new construction or revitalization projects impacted by non-transportation-related noise sources.

PS-6.5 **Roadway Noise**. Encourage nonmotorized transportation alternatives for local trips and the implementation of noise sensitivity measures in the public realm, including traffic-calming road design, lateral separation, natural buffers, and setbacks to decrease excessive motor vehicle noise.

PS-6.6 **Highway Noise**. Continue to coordinate with the California Department of Transportation (Caltrans) and the Transportation Corridor Agency (TCA) to achieve maximum noise abatement in the design of new highway projects or improvements along I-5.

PS-6.7 **Vehicles and Trucks**. Monitor and enforce existing speed limits and motor vehicle codes requiring adequate mufflers on all types of vehicles traveling through the city.

PS-6.8 **Commercial Noise**. Require the use of noise attenuation measures, including screening and buffering techniques, for all new commercial development expected to produce excessive noise; in existing cases where the City's noise standards are exceeded, work with Code Enforcement to require compliance.

PS-6.9 **Interjurisdictional Coordination**. Coordinate with neighboring cities to minimize noise conflicts between land uses along the City's boundaries.

PS-6.10 **Airplane Noise**. Maintain communication with John Wayne Airport and other relevant air transportation agencies to ensure that all future plans have limited impacts to the community of Lake Forest.

PS-6 Actions

PS-6a Update Chapter 11.16 of the Lake Forest Municipal Code to ensure that the noise standards are consistent with this General Plan, including Tables PS-1 and PS-2, and to require new residential, mixed-use with a residential component, and other noise-sensitive development to be designed to minimize noise exposure to noise sensitive uses through incorporation of site planning and architectural techniques. The update shall also include noise standards for residential uses within a mixed-use development, which may differ from other adopted residential noise standards.

PS-6b Review new development projects for compliance with the noise requirements established in this General Plan, including the standards established in Tables PS-1 and PS-2. Where necessary, require new development to mitigate excessive noise through best practices, including building location and orientation, building design features, placement of noise-generating equipment away from sensitive receptors, shielding of noise-generating equipment, placement of noise-tolerant features between noise sources and sensitive receptors, and use of noise-minimizing materials such as rubberized asphalt.

PS-6c Require acoustical studies for all new discretionary projects, including those related to development and transportation, which have the potential to generate noise impacts which exceed the standards identified in this General Plan. The studies shall include representative noise measurements, estimates of existing and projected noise levels, and mitigation measures necessary to ensure compliance with this element.

PS-6d In making a determination of impact under the California Environmental Quality Act (CEQA), a substantial increase will occur if ambient noise levels have a substantial increase. Generally, a 3 dB increase in noise levels is barely perceptible, and a 5 dB increase in noise levels is clearly perceptible. Therefore, increases in noise levels shall be considered to be substantial when the following occurs:

- When existing noise levels are less than 60 dB, a 5 dB increase in noise will be considered substantial;
- When existing noise levels are between 60 dB and 65 dB, a 3 dB increase in noise will be considered substantial;
- When existing noise levels exceed 65 dB, a 1.5 dB increase in noise will be considered substantial.

PS-6e Update the City's Noise Ordinance (Chapter 11.16) to reflect the noise standards established in this General Plan and proactively enforce the City's Noise Ordinance, including requiring the following measures for construction:

- Restrict construction activities to the hours of 7:00 a.m. to 7:00 p.m. on Monday through Friday, and 8:00 a.m. to 6:00 p.m. on Saturdays. No construction shall be permitted outside of these hours or on Sundays or federal holidays, without a specific exemption issued by the City.
- A Construction Noise Management Plan shall be submitted by the applicant for construction projects, when determined necessary by the City. The Construction Noise Management Plan shall include proper posting of construction schedules, appointment of a noise disturbance coordinator, and methods for assisting in noise reduction measures.
- Noise reduction measures may include, but are not limited to, the following:

- Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds) wherever feasible.

- Except as provided herein, impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. This muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used, if such jackets are commercially available. this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever such procedures are available and consistent with construction procedures.

- Temporary power poles shall be used instead of generators where feasible.

- Stationary noise sources shall be located as far from adjacent properties as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or use other measures as determined by the City of provide equivalent noise reduction.

- The noisiest phases of construction shall be limited to less than 10 days at a time. Exceptions may be allowed if the City determines an extension is necessary and all available noise reduction controls are implemented.

- Delivery of materials shall observe the hours of operation described above. Truck traffic should avoid residential areas to the extent possible.

- Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to the building. A vibration limit of 0.30 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

PS-6f The City shall require new residential projects located adjacent to major freeways, hard rail lines, or light rail lines to follow the FTA vibration screening distance criteria to ensure that residential uses are not exposed to vibrations exceeding 72 VdB for frequent events (more than 70 events per day), 75 VdB for occasional events (30-70 events per day), or 80 VdB for infrequent events (less than 30 events per day).

Table PS-1: Land Use Compatibility for Community Noise Environment

Land Use [1]	Outdoor Activity Areas [2, 3]	Interior Spaces	
		Ldn/ CNEL, dB	Leq, dB [4]
Residential	60	45	-
Motels/Hotels	65	45	-
Mixed-Use	65	45	
Hospitals, Nursing Homes	60	45	-
Theaters, Auditoriums	-	-	35
Churches	60	-	40
Office Buildings	65	-	45
Schools, Libraries, Museums	70	-	45
Playgrounds, Neighborhood Parks	70	-	-
Industrial	75	-	45
Golf Courses, Water Recreation	70	-	-

1. Where a proposed use is not specifically listed, the use shall comply with the standards for the most similar use as determined by the City.

2. Outdoor activity areas for residential development are considered to be the backyard patios or decks of single-family units and the common areas where people generally congregate for multi-family developments. Where common outdoor activity areas for multi-family developments comply with the outdoor noise level standard, the standard will not be applied at patios or decks of individual units provided noise-reducing measures are incorporated (e.g., orientation of patio/deck, screening of patio with masonry or other noise-attenuating material). Outdoor activity areas for non-residential developments are the common areas where people generally congregate, including pedestrian plazas, seating areas, and outside lunch facilities; not all residential developments include outdoor activity areas.

3. In areas where it is not possible to reduce exterior noise levels to achieve the outdoor activity area standard w using a practical application of the best noise-reduction technology, an increase of up to 5 Ldn over the standard will be allowed provided that available exterior noise reduction measures have been implemented and interior noise levels are in compliance with this table

4. Determined for a typical worst-case hour during periods of use.

Table PS-2: Performance Standards for Stationary Noise Sources, Including Affected Projects [1,2,3,4]

Noise Level Descriptor	Daytime	Nighttime
	7 am to 10 pm	10 pm to 7 am
Hourly Leq, dBA	55	50

1. Each of the noise levels specified above should be lowered by 5 dB for simple noise tones, noises consisting primarily of speech or music, or recurring impulsive noises. Such noises are generally considered to be particularly annoying and are a primary source of noise complaints.

2. No standards have been included for interior noise levels. Standard construction practices should, with the exterior noise levels identified, result in acceptable interior noise levels.

3. Stationary noise sources which are typically of concern include, but are not limited to, the following:

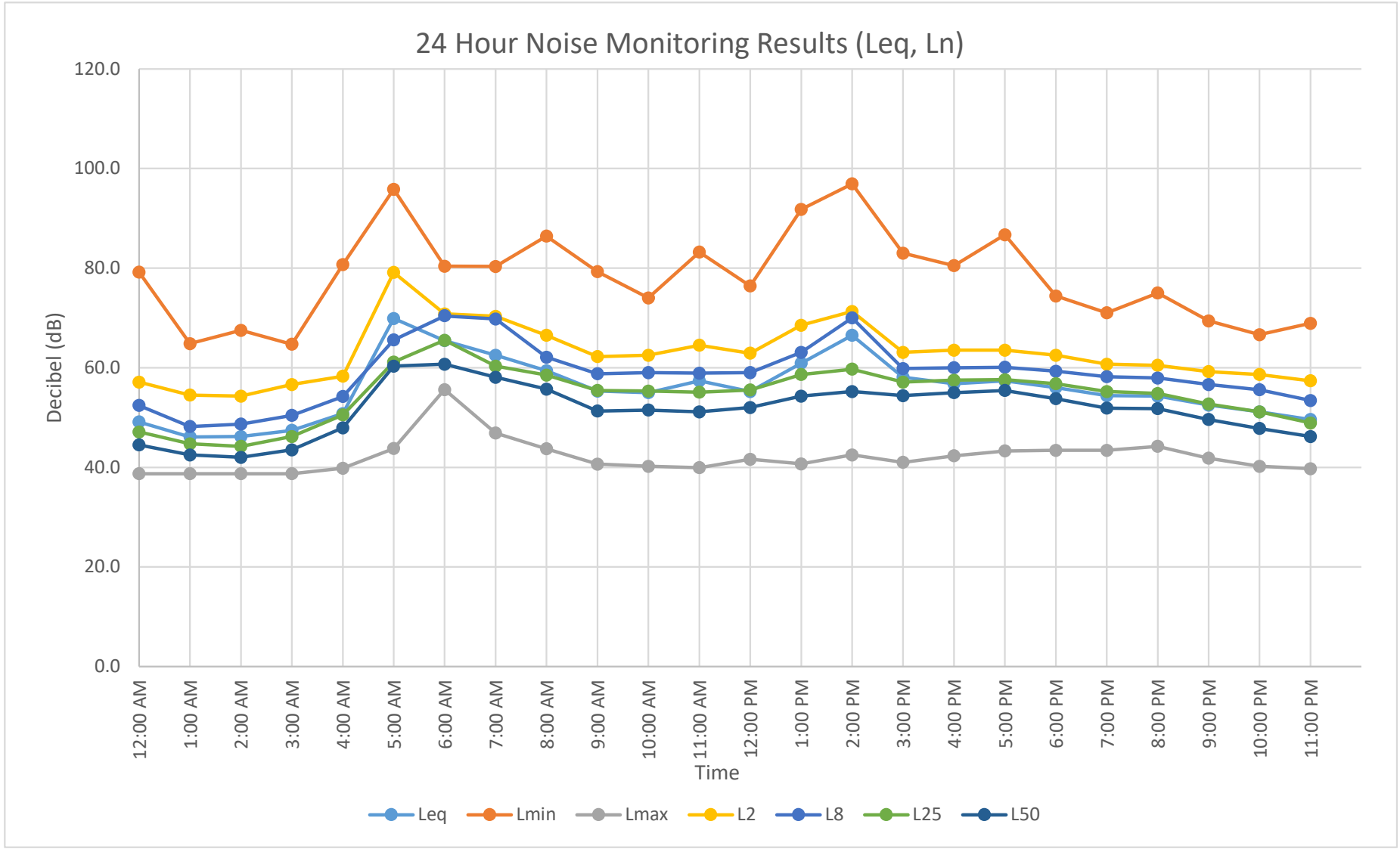
HVAC Systems	Cooling Towers/Evaporative Condensers
Pump Stations	Lift Stations
Emergency Generators	Boilers
Steam Valves	Steam Turbines
Generators	Fans
Air Compressors	Heavy Equipment
Conveyor Systems	Transformers
Pile Drivers	Grinders
Drill Rigs	Gas or Diesel Motors
Welders	Cutting Equipment
Outdoor Speakers	Blowers

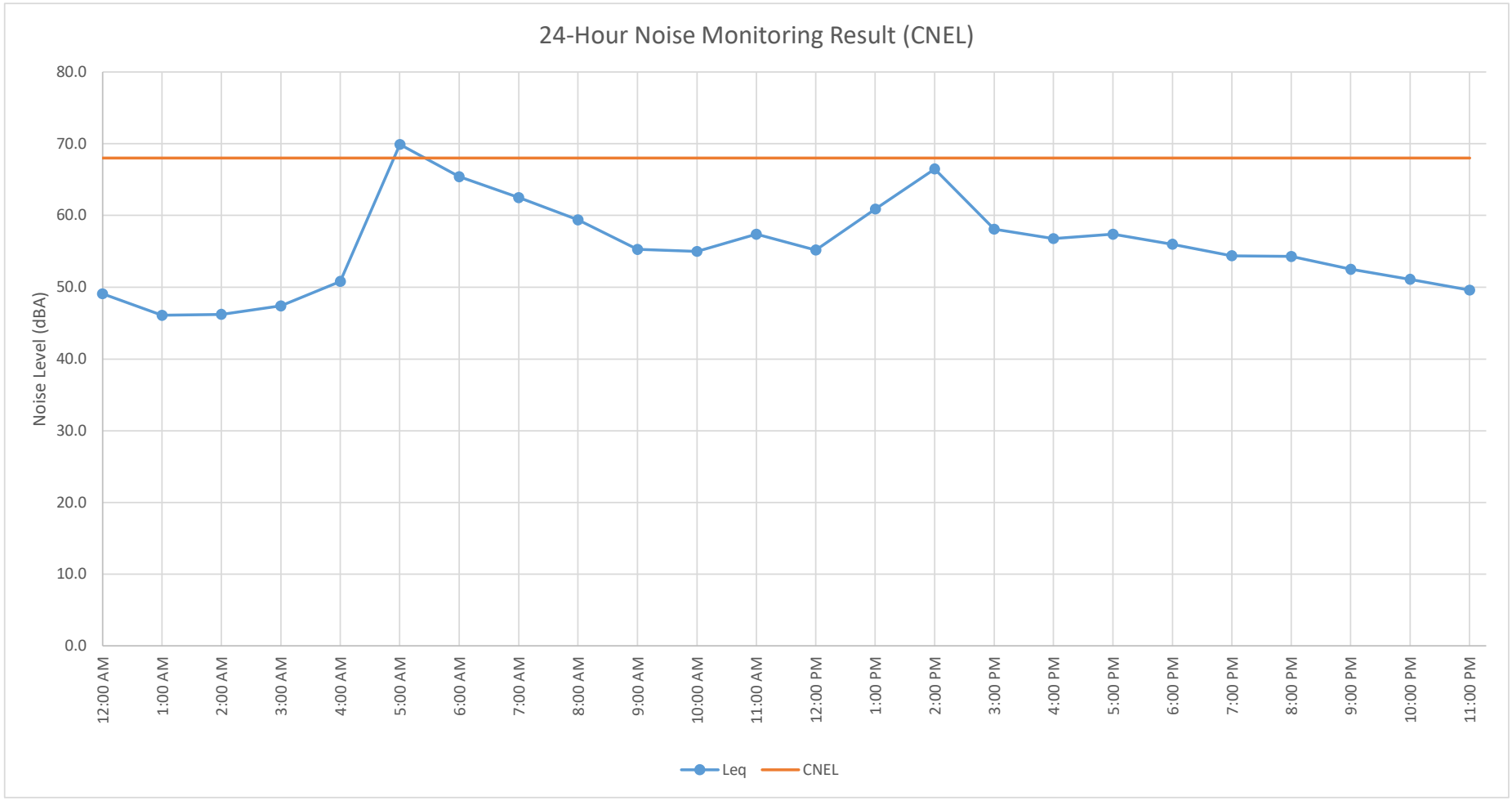
4. The types of uses which may typically produce the noise sources described above include but are not limited to: industrial facilities, pump stations, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

Appendix B

Noise Measurement, Field Data and Photos

PROJECT:	APPLIED MEDICAL L203 BUILDING EXPANSION					JOB #:	1445-2019-02
NOISE METER	Piccolo II SLM, 24-Hour Measurement					DATE:	23-Nov-20
LOCATION:	20202 WINDOW DRIVE, LAKE FOREST					BY:	D. Shivaiah
Time	Leq	Lmin	Lmax	L2	L8	L25	L50
12:00 AM	49.1	79.2	38.7	57.1	52.4	47.1	44.5
1:00 AM	46.1	64.8	38.7	54.5	48.2	44.7	42.5
2:00 AM	46.2	67.5	38.7	54.3	48.7	44.2	42.0
3:00 AM	47.4	64.7	38.7	56.6	50.4	46.2	43.5
4:00 AM	50.8	80.7	39.8	58.3	54.2	50.5	47.9
5:00 AM	69.9	95.8	43.8	79.1	65.6	61.1	60.3
6:00 AM	65.4	80.4	55.6	70.8	70.4	65.5	60.7
7:00 AM	62.5	80.3	46.9	70.3	69.8	60.3	58.1
8:00 AM	59.4	86.4	43.7	66.5	62.1	58.5	55.7
9:00 AM	55.3	79.3	40.6	62.2	58.8	55.4	51.3
10:00 AM	55.0	74.0	40.2	62.5	59.0	55.3	51.5
11:00 AM	57.4	83.2	39.9	64.5	58.9	55.1	51.1
12:00 PM	55.2	76.4	41.6	62.9	59.0	55.5	52.0
1:00 PM	60.9	91.8	40.7	68.5	63.1	58.6	54.3
2:00 PM	66.5	96.9	42.5	71.3	70.0	59.7	55.2
3:00 PM	58.1	83.0	41.0	63.1	59.8	57.1	54.4
4:00 PM	56.8	80.5	42.3	63.5	60.0	57.5	55.0
5:00 PM	57.4	86.7	43.3	63.5	60.1	57.6	55.4
6:00 PM	56.0	74.4	43.4	62.5	59.3	56.8	53.8
7:00 PM	54.4	71.0	43.4	60.7	58.2	55.2	51.9
8:00 PM	54.3	75.0	44.2	60.5	57.9	54.8	51.8
9:00 PM	52.5	69.4	41.8	59.2	56.6	52.7	49.6
10:00 PM	51.1	66.6	40.2	58.6	55.6	51.1	47.8
11:00 PM	49.6	68.9	39.7	57.4	53.4	48.9	46.2
Daytime	59.0	66.6	46.9	65.4	63.0	56.9	53.8
Nighttime	62.3	64.7	55.6	70.8	62.9	58.1	54.8


24 Hour Noise Monitoring Results (Leq, Ln)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Decibel (dB)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time
Leq
Lmin
Lmax
L2
L8
L25
L50


24-Hour Noise Monitoring Result (CNEL)
Noise Level (dBA)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Leq
CNEL

Field Sheet - ST1 Location Photos

Project: Applied Medical L203 Building Expansion	**Engineer:** D. Shivaiah	**Date:**	11/23/2020
		JN:	2312-18-02
Measurement Address: 20202 Window Drive (L203)	**City:** Lake Forest	**Site No.:**	1

RK engineering group, inc.

Appendix C

Reference Noise Level Sheets

Daniel Sanchez

From: Ivan Thomas <ivan.thomas@p2sinc.com> on behalf of Ivan Thomas
Sent: Thursday, August 13, 2020 5:59 PM
To: Jamie Pham (jamie@tdarc.com); Tony Dabaghy (tony@tdarc.com); Daniel Sanchez (daniel@tdarc.com)
Subject: 9832 AMR L202-L203 Bridge and L203 Expansion Equipment Sound Data
Attachments: AMR L203 Energy Labs Sound Power Data Summary - 8-13-20.pdf

Jamie/Tony,

Remaining sound data:

1. Air Handling Unit (AHU-1-7) – manufacturer provide more detailed information, see attached.

2. Exhaust Fans:
   - Press Room – Exhaust fan manufactured by Greenheck Vektor
   - Large Upblast Exhaust Fan

	62.5 Hz (dB)	125 Hz (dB)	250 Hz (dB)	500 Hz (dB)	1000 Hz (dB)	2000 Hz (dB)	4000 Hz (dB)	8000 Hz (dB)	LwA (dB)	dBA At 5 ft	dBA At 10 ft
Individual Fan - Inlet	100	102	103	99	97	93	89	80	102	90	N/A
Individual Fan - Outlet	95	99	102	102	98	94	91	84	104	92	86
All Fans (TOTAL) - Outlet	95	99	102	102	98	94	91	84	103	92	86

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	86	85	95	85	79	75	72	67	89	77	28

3. Condensing Unit

System Data:

Refrigerant Type	R410A
Refrigerant Control	EEV
Refrigerant Charge (lbs.)	3.53
ODU Sound Pressure	
(Cooling / Heating) (±3 dB[A])³	53 / 53
IDU Sound Pressure	
Cooling (H/M/L/Sleep) (±3 dB[A])³	45 / 40 / 35 / 29
Heating (H/M/L) (±3 dB[A])³	45 / 40 / 35
ODU Net / Shipping Weight (lbs.)	116.8 / 126.5
IDU Net / Shipping Weight (lbs.)	25.6 / 32.2
Heat Exchanger Coating	GoldFin™

Thanks, Ivan

4. Gas to Steam Humidifiers
   - Data on submittals from 6723 do not indicate any NC or acoustics for the unit.

Thank you,

Thomas Anderson | Mechanical Design Engineer
O 562.497.2999 | **D** 562.452.7847 | www.p2sinc.com

From: Ivan Thomas
Sent: Thursday, August 13, 2020 11:28 AM
To: Jamie Pham (jamie@tdarc.com) <jamie@tdarc.com>; Tony Dabaghy (tony@tdarc.com) <tony@tdarc.com>
Subject: 9832 AMR L202-L203 Bridge AHU Sound Data

Tony/Jamie,

Following is the air handling unit sound data:

OPEN	SOUND POWER LEVELS (db)								
	BAND	1	2	3	4	5	6	7	8
	FREQ	63	125	250	500	1000	2000	4000	8000
SA DISCH		74	76	83	81	78	79	76	71
RA		73	72	83	78	70	73	73	65
RADIATED		64	64	56	50	50	50	50	50

Thanks, Ivan

Ivan Thomas, PE, LEED AP | Principal / Engineering Group Leader
O 562.497.2999 | **C** 562.254.5138 | www.p2sinc.com

From: Ivan Thomas <ivan.thomas@p2sinc.com>
Sent: Wednesday, August 12, 2020 9:28 AM
To: Jamie Pham (jamie@tdarc.com) <jamie@tdarc.com>; Tony Dabaghy (tony@tdarc.com) <tony@tdarc.com>
Cc: Kellen Zeller <kellen.zeller@p2sinc.com>
Subject: 9832 AMR L202-L203 Bridge and L203 Expansion Equipment Sound Data
Importance: High

Tony/Jamie,

For AMR L202-L203 Bridge Cogen Central Plant, the following is the acoustical information for the mechanical equipment.

1. **Chillers**

Octave Band Center Frequency (Hz)

	63	125	250	500	1000	2000	4000	8000
Full Load 100%	76.0	77.0	76.0	74.0	74.0	72.0	74.0	66.0
Part Load 50%	77.0	76.0	75.0	72.0	69.0	68.0	69.0	69.0
Part Load 25%	77.0	76.0	76.0	72.0	70.0	68.0	67.0	69.0

2. **Cooling Towers**

a.

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		Sound
	5.0 ft	50.0 ft	5.0 ft	50.0 ft	5.0 ft	50.0 ft	5.0 ft	50.0 ft	5.0 ft	50.0 ft	Power
Band	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	Level (db)
63 HZ	70	64	67	64	70	64	67	64	68	59	95
125 HZ	67	59	61	56	67	59	61	56	65	59	90
250 HZ	63	53	57	51	63	53	57	51	64	58	86
500 HZ	62	53	54	47	62	53	54	47	65	53	83
1 KHZ	63	53	50	43	63	53	50	43	62	51	83
2 KHZ	60	50	46	41	60	50	46	41	59	48	80
4 KHZ	60	49	45	39	60	49	45	39	57	43	78
8 KHZ	60	50	43	38	60	50	43	38	50	40	78
Calc dBA	68	58	56	50	68	58	56	50	67	56	88

3. **Microturbine**
   a. AMR stated that they would speak with Flex Energy and provide the latest microturbine sound data with the low sound package.
   b. The information noted below is “preliminary”, we do not have the latest sound data for the Flex Energy microturbines.

SOUND LEVELS	
Turbine Package	69 dB(A) @ 10 m
GBRs	65 dB(A) @ 10 m

4. **Roof Supply Fan**

a.

	Octave Bands (hz)								LwA	dBA	Sones
	62.5	125	250	500	1000	2000	4000	8000			
Inlet	80	68	67	71	71	68	67	61	76	64	12.8

5. **Miscellaneous Equipment:**
   a. Sound data for the following mechanical equipment is not readily available. The acoustical consultant can go to L201-L202 Bridge Central Plant and determine sound data.
      - Air handling unit
      - Pumps
      - Condenser Water Filter
      - Boiler

Thanks, Ivan

Ivan Thomas, PE, LEED AP | Principal / Engineering Group Leader
O 562.497.2999 | **C** 562.254.5138 | www.p2sinc.com

From: Ivan Thomas
Sent: Tuesday, August 11, 2020 10:32 AM
To: Tony Dabaghy (tony@tdarc.com) <tony@tdarc.com>; Jamie Pham (jamie@tdarc.com) <jamie@tdarc.com>
Cc: Rolando Domingo <rolando.domingo@p2sinc.com>; Kellen Zeller - P2S (kellen.zeller@p2sinc.com) <kellen.zeller@p2sinc.com>
Subject: 9832 AMR L202-L203 Bridge Sound Data Plumbing

Tony,

Per our discussion this morning, the sound level for each air compressors on L202-L203 Bridge is 75 dBa.

We are working on the mechanical equipment on L202-L203 Bridge and L203. I will email it to you as soon as we receive it.

Ingersoll Rand

Rotary Screw Air Compressor
RS200ne (268 Hp)

Image for reference only

Technical Information:

Available Flow (Capacity):
- 664-1551 cfm @100 psig
- 664-1464 cfm @115 psig
- 660-1306 cfm @145 psig

Weight: 18,378 lbs

Compressed air outlet size: 4.0" NPT

Condensate drain outlet size: 0.38"

Dimensions - Facing control panel (L x W x H): 170" x 85" x 99"

Sound Level per ANSI S5.1 Standard
- Aircooled 75 dBA
- Watercooled 75 dBA

Additional Engineering Data available upon request

Thanks, Ivan

Ivan Thomas, PE, LEED AP | Principal / Engineering Group Leader
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P2S ENG

From: Ivan Thomas
Sent: Friday, October 18, 2019 11:16 AM
To: Jamie Pham <jamie@tdarc.com>
Cc: Tony Dabaghy <tony@tdarc.com>; Daisy Barriga <daisy@tdarc.com>; Rogier Goedecke <rg@rkengineer.com>; Bryan Estrada <be@rkengineer.com>; Darshan Shivaiah <dt@rkengineer.com>; Talle, Mike <mtalle@appliedmedical.com>; Daniel Sanchez <daniel@tdarc.com>
Subject: L203 Expansion & Bridge - RK Engineers Coordination

Jamie,

Photo #1 is compressed air dryer and #5 is compressed air receiver. The actual noise producer is the air compressor itself and should be studied. The air dryer does produce noise.

Photo #2 is AMR's vacuum system and I do not know anything about it.

Photo #3 and 4 is boiler system, yes, include.

Photo #6 are chillers, yes, include.

Thanks, Ivan

Ivan Thomas, PE, LEED AP | Principal / Engineering Group Leader
O 562.497.2999 | **C** 562.254.5138 | www.p2sinc.com

Field Sheet

Project: Applied Medical L203 Building Expansion
Engineer: D. Shivaiah
Date: 10/9/2018
JN: 2312-18-02

Measurement Address: Applied Medical Campus at L202 Bridge
City: Lake Forest
Site No.: 1

Sound Level Meter:
LD-712
Serial # A0520

Calibrator:
LD-250 250
Serial # 1322

Calibration Record:

	Input, dB/	Reading, dB/	Offset, dB/	Time
1				
2	94.0	93.2	0.8	10:52 AM
3				
4				
5				

Notes:
Temp: --
Windspeed: --
Direction: --
Skies: --
Camera:
Photo Nos.

Meter Settings:
☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☒ INTERVALS ___10____ - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☒ L_N PERCENTILE VALUES

Notes:

Measurement Type:
Long-term
Short-term X

		Start Time	Stop Time	Leq	Lmin	Lmax	L2	L8	L25	L50
Locations	1	10:52 AM	11:02 AM	86.0	84.7	89.8	87.2	86.8	86.4	86
		Measurement was taken at L202 bridge. Noise meter was located at the opening of the bridge (under the roof). Ambient noise levels includes noise from the operation of all equipements on the bridge.								
	2									
	3									
	4									
	5									

RK engineering group, inc.

Field Sheet - ST1 Location Photos

Project: Applied Medical L203 Building Expansion	**Engineer:** D. Shivaiah	**Date:**	10/9/2018
		JN:	2312-18-02
Measurement Address: Applied Medical Campus at L202 Bridge	**City:** Lake Forest	**Site No.:**	1

RK engineering group, inc.

Appendix D

Stationary Noise Calculation Worksheets

Receiver list

No.	Receiver name	Building side	Floor	Limit		Level w/o NP		Level w NP		Difference		Conflict	
				Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
				dB(A)		dB(A)		dB(A)		dB		dB	
1	Receiver at the P/L-1	-	GF	-	-	55.2	55.2	48.9	48.9	-6.3	-6.3	-	-
2	Receiver at the P/L-2	-	GF	-	-	54.9	54.9	48.8	48.8	-6.1	-6.1	-	-
3	Receiver at the P/L-3	-	GF	-	-	54.2	54.2	48.2	48.2	-6.0	-6.0	-	-
4	Receiver at the P/L-4	-	GF	-	-	54.5	54.5	47.9	47.9	-6.6	-6.6	-	-

Noise emissions of industry sources

Source name	Reference	Level		Frequency spectrum [dB(A)]								Corrections		
				63	125	250	500	1	2	4	8	Cwall	CI	CT
			dB(A)	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz	dB	dB	dB
GBR-1	Lw/unit	Day	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
		Night	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
GBR-2	Lw/unit	Day	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
		Night	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
AHU-2	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
AHU-1	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
AHU-6	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
AHU-5	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
AHU-4	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
Future AHU-1	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
Future AHU-2	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
AHU-3	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
AHU-7	Lw/unit	Day	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
		Night	85.0	47.8	59.9	74.4	77.8	78.0	80.2	77.0	69.9	3.0	-	-
GBR-3	Lw/unit	Day	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
		Night	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
GBR-4	Lw/unit	Day	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
		Night	97.3	80.4	85.4	89.5	90.6	91.2	89.5	87.1	83.1	3.0	-	-
Exhaust Fan-1	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-2	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-3	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-4	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-5	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-6	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-7	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-8	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-9	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-10	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-11	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-12	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-13	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-14	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-15	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-16	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-17	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-18	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-19	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-24	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-

Noise emissions of industry sources

Source name	Reference	Level		Frequency spectrum [dB(A)]								Corrections		
				63	125	250	500	1	2	4	8	Cwall	CI	CT
			dB(A)	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz	dB	dB	dB
Exhaust Fan-24		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-20	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-21	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-22	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
Exhaust Fan-23	Lw/unit	Day	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
		Night	88.7	59.8	68.9	86.4	81.8	79.0	76.2	73.0	65.9	3.0	-	-
All Equipments Under the Roof	Lw/unit	Day	86.0	69.1	74.1	78.2	79.3	79.9	78.2	75.8	71.8	3.0	-	-
		Night	86.0	69.1	74.1	78.2	79.3	79.9	78.2	75.8	71.8	3.0	-	-
Micro Turbine	Lw/unit	Day	101.3	84.4	89.4	93.5	94.6	95.2	93.5	91.1	87.1	-	-	-
		Night	101.3	84.4	89.4	93.5	94.6	95.2	93.5	91.1	87.1	-	-	-
CT-1 - Motor Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 2- Motor Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 3- Motor Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 4 - Motor Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 1 - Opp Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 2 - Opp Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 3 - Opp Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 4 - Opp Side	Lw/unit	Day	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
		Night	70.0	54.4	58.5	62.0	64.4	63.6	60.8	59.6	55.5	3.0	-	-
CT- 1 - Roof	Lw/unit	Day	84.4	59.0	66.1	72.6	79.0	79.2	77.4	75.2	66.1	-	-	-
		Night	84.4	59.0	66.1	72.6	79.0	79.2	77.4	75.2	66.1	-	-	-
CT- 2 - Roof	Lw/unit	Day	84.4	59.0	66.1	72.6	79.0	79.2	77.4	75.2	66.1	-	-	-
		Night	84.4	59.0	66.1	72.6	79.0	79.2	77.4	75.2	66.1	-	-	-
CT- 3 - Roof	Lw/unit	Day	84.3	58.9	66.0	72.5	78.9	79.1	77.3	75.1	66.0	-	-	-
		Night	84.3	58.9	66.0	72.5	78.9	79.1	77.3	75.1	66.0	-	-	-
CT- 4 - Roof	Lw/unit	Day	84.3	58.9	66.0	72.5	78.9	79.1	77.3	75.1	66.0	-	-	-
		Night	84.3	58.9	66.0	72.5	78.9	79.1	77.3	75.1	66.0	-	-	-
CT- 4 - End	Lw/unit	Day	85.3	61.0	68.1	71.6	76.0	80.2	78.4	78.2	76.1	3.0	-	-
		Night	85.3	61.0	68.1	71.6	76.0	80.2	78.4	78.2	76.1	3.0	-	-
CT- 1 - End	Lw/unit	Day	85.3	61.0	68.1	71.6	76.0	80.2	78.4	78.2	76.1	3.0	-	-
		Night	85.3	61.0	68.1	71.6	76.0	80.2	78.4	78.2	76.1	3.0	-	-

Contribution levels of the receivers

Source name	Traffic lane	Level w/o NP Day	Level w/o NP Night	Level w NP Day	Level w NP Night
		dB(A)		dB(A)	
Receiver at the P/L-1 GF		55.2	55.2	48.9	48.9
AHU-1	-	35.3	35.3	28.1	28.1
AHU-2	-	31.9	31.9	26.0	26.0
AHU-3	-	32.4	32.4	25.2	25.2
AHU-4	-	33.2	33.2	26.3	26.3
AHU-5	-	34.4	34.4	27.5	27.5
AHU-6	-	35.6	35.6	28.2	28.2
AHU-7	-	30.8	30.8	26.4	26.4
All Equipments Under the Roof	-	26.5	26.5	22.3	22.3
CT-1 - Motor Side	-	5.8	5.8	5.1	5.1
CT- 1 - End	-	19.8	19.8	18.9	18.9
CT- 1 - Opp Side	-	14.4	14.4	7.2	7.2
CT- 1 - Roof	-	22.2	22.2	17.4	17.4
CT- 2 - Opp Side	-	14.4	14.4	7.2	7.2
CT- 2 - Roof	-	22.3	22.3	15.4	15.4
CT- 2- Motor Side	-	5.8	5.8	3.6	3.6
CT- 3- Motor Side	-	5.8	5.8	3.5	3.5
CT- 3 - Opp Side	-	14.6	14.6	7.9	7.9
CT- 3 - Roof	-	22.2	22.2	15.3	15.3
CT- 4 - End	-	22.6	22.6	17.8	17.8
CT- 4 - Motor Side	-	6.5	6.5	3.7	3.7
CT- 4 - Opp Side	-	14.3	14.3	7.9	7.9
CT- 4 - Roof	-	22.3	22.3	15.3	15.3
Exhaust Fan-1	-	37.5	37.5	32.6	32.6
Exhaust Fan-2	-	37.6	37.6	32.7	32.7
Exhaust Fan-3	-	37.3	37.3	32.8	32.8
Exhaust Fan-4	-	39.3	39.3	33.3	33.3
Exhaust Fan-5	-	37.9	37.9	33.0	33.0
Exhaust Fan-6	-	41.3	41.3	34.1	34.1
Exhaust Fan-7	-	36.9	36.9	32.5	32.5
Exhaust Fan-8	-	36.9	36.9	32.5	32.5
Exhaust Fan-9	-	36.3	36.3	32.5	32.5
Exhaust Fan-10	-	36.3	36.3	32.5	32.5
Exhaust Fan-11	-	37.0	37.0	32.6	32.6
Exhaust Fan-12	-	37.0	37.0	32.6	32.6
Exhaust Fan-13	-	37.1	37.1	32.6	32.6
Exhaust Fan-14	-	36.5	36.5	32.6	32.6
Exhaust Fan-15	-	35.7	35.7	33.0	33.0
Exhaust Fan-16	-	35.8	35.8	33.0	33.0
Exhaust Fan-17	-	38.3	38.3	33.5	33.5
Exhaust Fan-18	-	38.3	38.3	33.5	33.5
Exhaust Fan-19	-	38.3	38.3	33.5	33.5
Exhaust Fan-20	-	38.3	38.3	33.5	33.5
Exhaust Fan-21	-	38.4	38.4	33.5	33.5
Exhaust Fan-22	-	38.4	38.4	31.8	31.8
Exhaust Fan-23	-	48.5	48.5	38.7	38.7
Exhaust Fan-24	-	38.4	38.4	31.9	31.9
Future AHU-1	-	32.9	32.9	25.9	25.9
Future AHU-2	-	32.7	32.7	25.5	25.5
GBR-1	-	42.7	42.7	36.7	36.7
GBR-2	-	42.7	42.7	36.8	36.8
GBR-3	-	44.1	44.1	36.7	36.7
GBR-4	-	44.1	44.1	36.6	36.6
Micro Turbine	-	40.4	40.4	34.0	34.0
Receiver at the P/L-2 GF		54.9	54.9	48.8	48.8
AHU-1	-	35.4	35.4	28.7	28.7
AHU-2	-	32.9	32.9	26.6	26.6
AHU-3	-	31.4	31.4	25.0	25.0
AHU-4	-	34.6	34.6	26.9	26.9
AHU-5	-	34.9	34.9	27.3	27.3
AHU-6	-	35.8	35.8	28.5	28.5
AHU-7	-	33.3	33.3	26.1	26.1
All Equipments Under the Roof	-	25.9	25.9	22.4	22.4

Contribution levels of the receivers

Source name	Traffic lane	Level w/o NP		Level w NP	
		Day	Night	Day	Night
		dB(A)		dB(A)	
CT-1 - Motor Side	-	9.9	9.9	6.6	6.6
CT- 1 - End	-	19.4	19.4	19.2	19.2
CT- 1 - Opp Side	-	5.8	5.8	6.5	6.5
CT- 1 - Roof	-	21.5	21.5	17.4	17.4
CT- 2 - Opp Side	-	5.9	5.9	5.0	5.0
CT- 2 - Roof	-	21.6	21.6	15.6	15.6
CT- 2- Motor Side	-	10.0	10.0	6.7	6.7
CT- 3- Motor Side	-	9.6	9.6	6.4	6.4
CT- 3 - Opp Side	-	5.8	5.8	5.2	5.2
CT- 3 - Roof	-	21.5	21.5	15.8	15.8
CT- 4 - End	-	20.7	20.7	19.2	19.2
CT- 4 - Motor Side	-	9.1	9.1	6.5	6.5
CT- 4 - Opp Side	-	6.0	6.0	3.9	3.9
CT- 4 - Roof	-	21.5	21.5	16.0	16.0
Exhaust Fan-1	-	36.6	36.6	32.7	32.7
Exhaust Fan-2	-	36.7	36.7	32.8	32.8
Exhaust Fan-3	-	36.9	36.9	33.0	33.0
Exhaust Fan-4	-	37.0	37.0	33.3	33.3
Exhaust Fan-5	-	37.1	37.1	33.0	33.0
Exhaust Fan-6	-	37.6	37.6	34.6	34.6
Exhaust Fan-7	-	36.4	36.4	32.7	32.7
Exhaust Fan-8	-	37.0	37.0	32.7	32.7
Exhaust Fan-9	-	37.4	37.4	32.7	32.7
Exhaust Fan-10	-	37.4	37.4	32.7	32.7
Exhaust Fan-11	-	36.2	36.2	32.8	32.8
Exhaust Fan-12	-	37.5	37.5	32.8	32.8
Exhaust Fan-13	-	37.5	37.5	32.8	32.8
Exhaust Fan-14	-	37.5	37.5	32.8	32.8
Exhaust Fan-15	-	34.8	34.8	32.3	32.3
Exhaust Fan-16	-	34.9	34.9	32.3	32.3
Exhaust Fan-17	-	35.2	35.2	31.4	31.4
Exhaust Fan-18	-	35.2	35.2	31.4	31.4
Exhaust Fan-19	-	36.4	36.4	31.4	31.4
Exhaust Fan-20	-	37.4	37.4	31.5	31.5
Exhaust Fan-21	-	37.4	37.4	31.5	31.5
Exhaust Fan-22	-	37.4	37.4	31.5	31.5
Exhaust Fan-23	-	48.0	48.0	38.7	38.7
Exhaust Fan-24	-	37.4	37.4	31.5	31.5
Future AHU-1	-	32.4	32.4	26.2	26.2
Future AHU-2	-	31.9	31.9	25.6	25.6
GBR-1	-	44.2	44.2	37.2	37.2
GBR-2	-	44.2	44.2	37.1	37.1
GBR-3	-	44.2	44.2	37.1	37.1
GBR-4	-	43.3	43.3	36.6	36.6
Micro Turbine	-	41.0	41.0	34.3	34.3
Receiver at the P/L-3	GF	54.2	54.2	48.2	48.2
AHU-1	-	33.1	33.1	28.1	28.1
AHU-2	-	31.6	31.6	25.9	25.9
AHU-3	-	31.6	31.6	25.5	25.5
AHU-4	-	36.1	36.1	27.2	27.2
AHU-5	-	36.4	36.4	28.0	28.0
AHU-6	-	33.6	33.6	27.9	27.9
AHU-7	-	34.3	34.3	26.3	26.3
All Equipments Under the Roof	-	19.2	19.2	19.9	19.9
CT-1 - Motor Side	-	9.0	9.0	6.0	6.0
CT- 1 - End	-	19.3	19.3	19.7	19.7
CT- 1 - Opp Side	-	5.5	5.5	6.5	6.5
CT- 1 - Roof	-	21.4	21.4	17.3	17.3
CT- 2 - Opp Side	-	5.6	5.6	5.7	5.7
CT- 2 - Roof	-	22.0	22.0	15.5	15.5
CT- 2- Motor Side	-	8.8	8.8	6.1	6.1
CT- 3- Motor Side	-	8.6	8.6	6.1	6.1
CT- 3 - Opp Side	-	5.8	5.8	5.9	5.9
CT- 3 - Roof	-	22.2	22.2	15.6	15.6

Contribution levels of the receivers

Source name	Traffic lane	Level w/o NP		Level w NP	
		Day	Night	Day	Night
		dB(A)		dB(A)	
CT- 4 - End	-	20.8	20.8	19.4	19.4
CT- 4 - Motor Side	-	10.8	10.8	6.4	6.4
CT- 4 - Opp Side	-	6.0	6.0	5.9	5.9
CT- 4 - Roof	-	22.5	22.5	15.9	15.9
Exhaust Fan-1	-	36.5	36.5	32.0	32.0
Exhaust Fan-2	-	36.6	36.6	32.1	32.1
Exhaust Fan-3	-	36.8	36.8	32.2	32.2
Exhaust Fan-4	-	36.8	36.8	33.4	33.4
Exhaust Fan-5	-	37.0	37.0	32.2	32.2
Exhaust Fan-6	-	37.0	37.0	33.5	33.5
Exhaust Fan-7	-	36.7	36.7	31.7	31.7
Exhaust Fan-8	-	36.7	36.7	31.7	31.7
Exhaust Fan-9	-	36.1	36.1	31.7	31.7
Exhaust Fan-10	-	36.7	36.7	31.7	31.7
Exhaust Fan-11	-	36.8	36.8	31.8	31.8
Exhaust Fan-12	-	36.8	36.8	31.8	31.8
Exhaust Fan-13	-	36.2	36.2	31.7	31.7
Exhaust Fan-14	-	36.8	36.8	31.7	31.7
Exhaust Fan-15	-	35.0	35.0	32.6	32.6
Exhaust Fan-16	-	35.1	35.1	32.6	32.6
Exhaust Fan-17	-	35.4	35.4	31.6	31.6
Exhaust Fan-18	-	35.4	35.4	31.7	31.7
Exhaust Fan-19	-	35.5	35.5	31.7	31.7
Exhaust Fan-20	-	35.5	35.5	31.7	31.7
Exhaust Fan-21	-	35.5	35.5	31.7	31.7
Exhaust Fan-22	-	35.6	35.6	31.8	31.8
Exhaust Fan-23	-	45.3	45.3	36.8	36.8
Exhaust Fan-24	-	35.6	35.6	31.8	31.8
Future AHU-1	-	35.3	35.3	26.6	26.6
Future AHU-2	-	32.1	32.1	26.0	26.0
GBR-1	-	44.6	44.6	36.5	36.5
GBR-2	-	43.6	43.6	36.4	36.4
GBR-3	-	44.0	44.0	36.4	36.4
GBR-4	-	44.0	44.0	36.3	36.3
Micro Turbine	-	39.5	39.5	33.8	33.8
Receiver at the P/L-4	GF	54.5	54.5	47.9	47.9
AHU-1	-	32.9	32.9	27.0	27.0
AHU-2	-	32.8	32.8	25.1	25.1
AHU-3	-	34.2	34.2	25.7	25.7
AHU-4	-	36.1	36.1	27.7	27.7
AHU-5	-	33.7	33.7	27.8	27.8
AHU-6	-	33.6	33.6	27.5	27.5
AHU-7	-	33.6	33.6	25.8	25.8
All Equipments Under the Roof	-	20.1	20.1	19.8	19.8
CT-1 - Motor Side	-	8.6	8.6	5.7	5.7
CT- 1 - End	-	20.0	20.0	19.3	19.3
CT- 1 - Opp Side	-	5.7	5.7	6.0	6.0
CT- 1 - Roof	-	22.7	22.7	17.0	17.0
CT- 2 - Opp Side	-	5.7	5.7	5.2	5.2
CT- 2 - Roof	-	22.6	22.6	14.9	14.9
CT- 2- Motor Side	-	8.0	8.0	5.3	5.3
CT- 3- Motor Side	-	9.2	9.2	5.4	5.4
CT- 3 - Opp Side	-	5.6	5.6	5.3	5.3
CT- 3 - Roof	-	22.4	22.4	14.9	14.9
CT- 4 - End	-	20.4	20.4	18.2	18.2
CT- 4 - Motor Side	-	8.2	8.2	5.8	5.8
CT- 4 - Opp Side	-	5.7	5.7	5.3	5.3
CT- 4 - Roof	-	22.4	22.4	14.9	14.9
Exhaust Fan-1	-	35.7	35.7	31.7	31.7
Exhaust Fan-2	-	35.3	35.3	31.7	31.7
Exhaust Fan-3	-	35.5	35.5	31.9	31.9
Exhaust Fan-4	-	35.5	35.5	33.1	33.1
Exhaust Fan-5	-	35.7	35.7	31.8	31.8
Exhaust Fan-6	-	35.7	35.7	33.2	33.2

Contribution levels of the receivers

Source name	Traffic lane	Level w/o NP		Level w NP	
		Day	Night	Day	Night
		dB(A)		dB(A)	
Exhaust Fan-7	-	38.0	38.0	31.6	31.6
Exhaust Fan-8	-	38.0	38.0	31.5	31.5
Exhaust Fan-9	-	38.0	38.0	31.5	31.5
Exhaust Fan-10	-	37.3	37.3	31.5	31.5
Exhaust Fan-11	-	38.1	38.1	31.6	31.6
Exhaust Fan-12	-	38.1	38.1	31.5	31.5
Exhaust Fan-13	-	37.7	37.7	31.5	31.5
Exhaust Fan-14	-	37.7	37.7	31.5	31.5
Exhaust Fan-15	-	35.0	35.0	32.6	32.6
Exhaust Fan-16	-	35.1	35.1	32.6	32.6
Exhaust Fan-17	-	35.4	35.4	31.7	31.7
Exhaust Fan-18	-	35.5	35.5	31.7	31.7
Exhaust Fan-19	-	35.5	35.5	31.7	31.7
Exhaust Fan-20	-	35.5	35.5	31.7	31.7
Exhaust Fan-21	-	35.6	35.6	31.7	31.7
Exhaust Fan-22	-	35.6	35.6	31.8	31.8
Exhaust Fan-23	-	44.5	44.5	34.5	34.5
Exhaust Fan-24	-	35.6	35.6	31.8	31.8
Future AHU-1	-	35.2	35.2	27.4	27.4
Future AHU-2	-	34.4	34.4	26.6	26.6
GBR-1	-	44.6	44.6	36.1	36.1
GBR-2	-	44.6	44.6	36.0	36.0
GBR-3	-	44.6	44.6	36.0	36.0
GBR-4	-	44.7	44.7	36.0	36.0
Micro Turbine	-	39.7	39.7	33.4	33.4

Appendix E

Construction Noise & Vibration
Calculation Worksheets

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/8/2021
Case Description: Applied Medical L203 Building Expansion

				---- Receptor #1 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
Site Preparation	Residential	55	50	50			

			Equipment			
	Impact		Spec Lmax	Actual Lmax	Receptor Distance	Estimated Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Grader	No	40	85		50	0
Scraper	No	40		83.6	50	0
Tractor	No	40	84		50	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Grader		85	81
Scraper		83.6	79.6
Tractor		84	80
	Total	85	85

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/8/2021
Case Description: Applied Medical L203 Building Expansion

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Grading	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0

Results

	Calculated (dBA)	
Equipment	*Lmax	Leq
Grader	85	81
Dozer	81.7	77.7
Tractor	84	80
Total	85	84.6

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/8/2021
Case Description: Applied Medical L203 Building Expansion

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Building Construction	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50	0
Pickup Truck	No	40		75	50	0
Generator	No	50		80.6	50	0
Tractor	No	40	84		50	0
Welder / Torch	No	40		74	50	0
Welder / Torch	No	40		74	50	0
Welder / Torch	No	40		74	50	0

Results

		Calculated (dBA)	
Equipment		*Lmax	Leq
Crane		80.6	72.6
Pickup Truck		75	71
Generator		80.6	77.6
Tractor		84	80
Welder / Torch		74	70
Welder / Torch		74	70
Welder / Torch		74	70
	Total	84	83.4

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/8/2021
Case Description: Applied Medical L203 Building Expansion

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Paving	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	50	0
Paver	No	50		77.2	50	0
Roller	No	20		80	50	0
Roller	No	20		80	50	0
Tractor	No	40	84		50	0

Results

		Calculated (dBA)	
Equipment		*Lmax	Leq
Concrete Mixer Truck		78.8	74.8
Paver		77.2	74.2
Roller		80	73
Roller		80	73
Tractor		84	80
	Total	84	82.9

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/8/2021
Case Description: Applied Medical L203 Building Expansion

				---- Receptor #1 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Architectural Coating	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50	0

Results

		Calculated (dBA)	
Equipment		*Lmax	Leq
Compressor (air)		77.7	73.7
	Total	77.7	73.7

*Calculated Lmax is the Loudest value.

NOISE BARRIER CALCULATIONS - BASED UPON FHWA - RD-77-108

PROJECT:	Applied Medical Building L203 Expansion	JOB #:	2312-2018-2
SOURCE:	Construction Noise	DATE:	30-Aug-21
LOCATION:	Residential Homes to the East	BY:	D. Shivaiah

NOISE INPUT DATA

OBS DIST=	55.0			
DT WALL=	50.0			
DT W/OB=	5.0			
HTH WALL=	7.9	********		
BARRIER =	0.0	(0=WALL,1=BERM)		
OBS HTH=	5.0			
NOISE HTH=	8.0		BARRIER+	
OBS EL =	792.5		TOPO SHIELDING =	-10.20
NOISE EL =	786.5		NOISE HTH EL=	794.5
DROP-OFF=	10.0	(20 = 6 dBA PER DOUBLING OF DISTANCE)		
COFF				

NOISE OUTPUT DATA (dBA)

	DIST (FT)	Leq	Lmax	L2	L8	L25	L50
REF LEVEL	50	85.0					
PROJ LEVEL	55	84.6					
SHIELDING	55	-10.2					
ADJ LEVEL	55	***74.4***					

NOISE LEVEL REDUCTION DUE TO DISTANCE = -0.41392685

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/24/2021
Case Description: Applied Medical L203 Expansion

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
A/C Demolition	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	8	0
Concrete Saw	No	20		89.6	8	0
Front End Loader	No	40		79.1	8	0

Results

	Calculated (dBA)	
Equipment	*Lmax	Leq
Mounted Impact Hammer (hoe ram)	106.2	99.2
Concrete Saw	105.5	98.5
Front End Loader	95	91
Total	106.2	102.2

*Calculated Lmax is the Loudest value.

NOISE BARRIER CALCULATIONS - BASED UPON FHWA - RD-77-108

PROJECT:	Applied Medical Building L203 Expansion	JOB #:	2312-2018-2
SOURCE:	A/C Demo at 8 feet	DATE:	30-Aug-21
LOCATION:	Residential Homes to the East	BY:	D. Shivaiah

NOISE INPUT DATA

OBS DIST=	13.0			
DT WALL=	8.0			
DT W/OB=	5.0			
HTH WALL=	7.9	********		
BARRIER =	0.0	(0=WALL,1=BERM)		
OBS HTH=	5.0			
NOISE HTH=	8.0		BARRIER+	
OBS EL =	792.5		TOPO SHIELDING =	-12.70
NOISE EL =	786.5		NOISE HTH EL=	794.5
DROP-OFF=	10.0	(20 = 6 dBA PER DOUBLING OF DISTANCE)		
COFF				

NOISE OUTPUT DATA (dBA)

	DIST (FT)	Leq	Lmax	L2	L8	L25	L50
REF LEVEL	8	102.2					
PROJ LEVEL	13	100.1	-2.1	-2.1	-2.1	-2.1	-2.1
SHIELDING	13	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7
ADJ LEVEL	13	***87.4***	***-14.8***	***-14.8***	***-14.8***	***-14.8***	***-14.8***

NOISE LEVEL REDUCTION DUE TO DISTANCE = -2.10853365

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	APPLIED MEDICAL L203	JOB #:	2312-2018-02
ACTIVITY:	LOADED TRUCKS	DATE:	26-Feb-21
LOCATION:	RESIDENTIAL HOMES TO EAST	ENGINEER:	B. ESTRADA

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^{n} \text{ (in/sec)}$$

PPV =	**0.133 in/sec**

Equipment Type =	4	Loaded Trucks
PPV_{ref} =	0.076	Reference PPV at 25 ft.
D =	15.00	Distance from Equipment to receiver in ft.
n =	1.10	Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	APPLIED MEDICAL L203	JOB #:	2312-2018-02
ACTIVITY:	JACKHAMMER	DATE:	26-Feb-21
LOCATION:	RESIDENTIAL HOMES TO EAST	ENGINEER:	B. ESTRADA

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^{n} \text{ (in/sec)}$$

PPV =	**0.061 in/sec**

Equipment Type =	5	Jackhammer
PPV_{ref} =	0.035	Reference PPV at 25 ft.
D =	15.00	Distance from Equipment to receiver in ft.
n =	1.10	Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003

Description of Construction at the east side of L203 adjacent to residential

BUILDING & SITE

The current distance between the existing building and the property line is approximately 100'. The proposed building expansion is roughly 24' therefore expanding to within 76' of the P.L.

The site proposes to remove the existing truck dock and be filled in and expand the building over it. The area of the dock expansion remains 100' from the property line.

Three landscape planters and 17 new parking stalls are being proposed immediately adjacent to the building expansion. The existing stall along the property line will remain. The ±8' wide planter and curbing; including the retaining & screen wall along the property line will not be disturbed.

Portions of the existing paving will be removed and replaced to within 35' to 8' from the Property Line. This pavement replacement will not require any grading or earthwork movement. The structural section of the pavement being removed will be the same as the new pavement being constructed. Saw-cutting for the limits of removal will be required. However, the new pavement will be concrete in lieu of asphalt so an asphalt roller will not be used but rather poured by concrete ready-mix trucks.

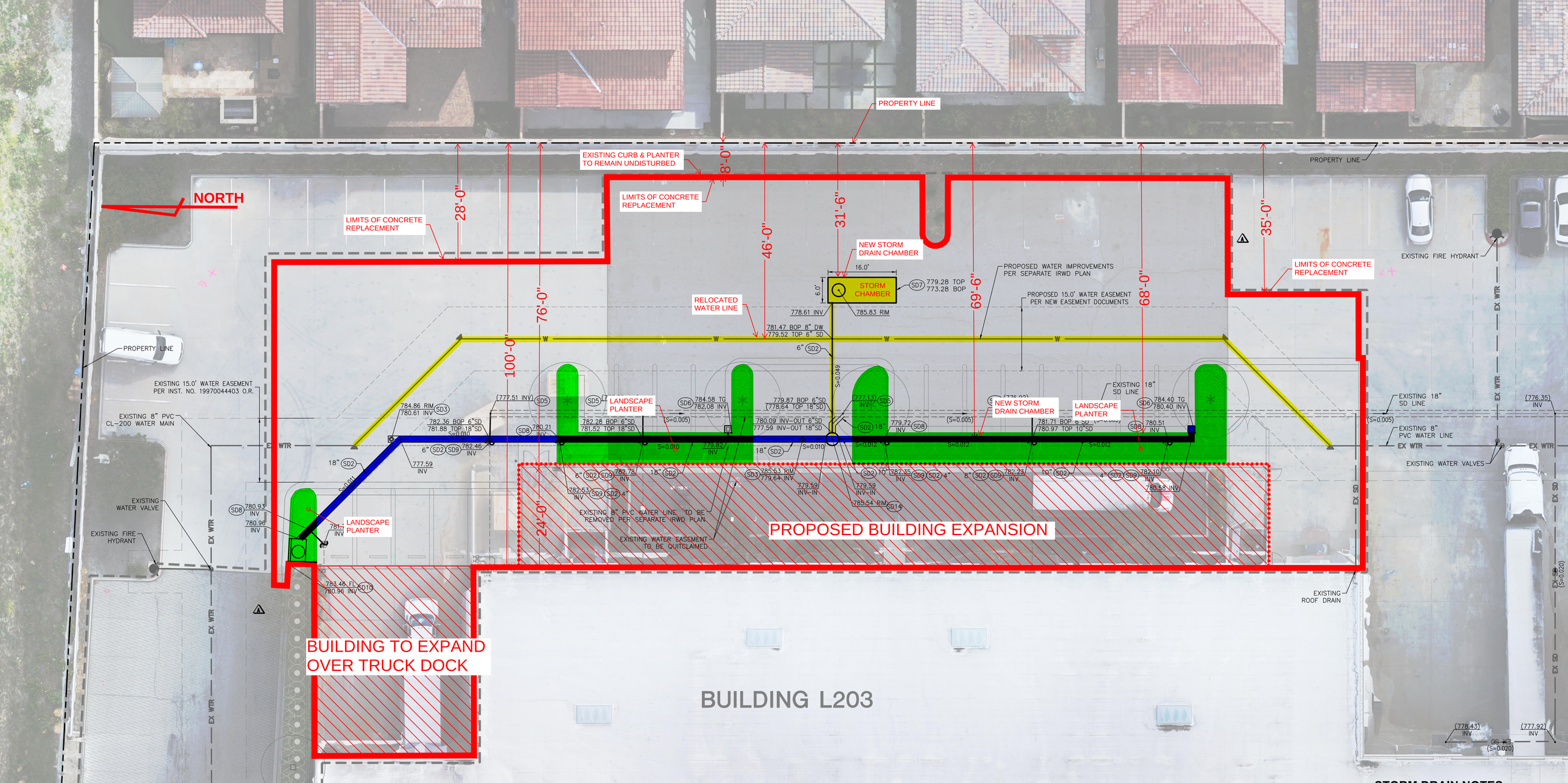
The grading operations will only be required for the new building pad and filling the truck dock. The equipment used for this operation will be single blade motor grader.

UTILITIES

Due to the building expansion; the existing water that loops around the building will need to be relocated 25' easterly of its current location as dictated by the Irvine Ranch Water District. This puts the new location of this 8" diameter water line to about 46' from the Property Line.

To abide by the latest water quality criteria; the site requires storm water mitigation upgrades. This entails a new storm drain line ranging in size from 6" to 18" in diameter. The storm drain line will run somewhat parallel and east of the building expansion within the landscape planter at approximately 69.5' away from the PL. This storm drain system will also require an underground cylindrical Storm Drain chamber for infiltration. The cylindrical chamber will measure 16' in length and will have a diameter of 6'. The top of the chamber will be buried 6' below grade and the east edge will be located 31.5' from the PL.

These proposed utilities will require a backhoe for excavating the trench and a tamping rammer for compacting it after the utilities have been installed.



STORM DRAIN NOTES