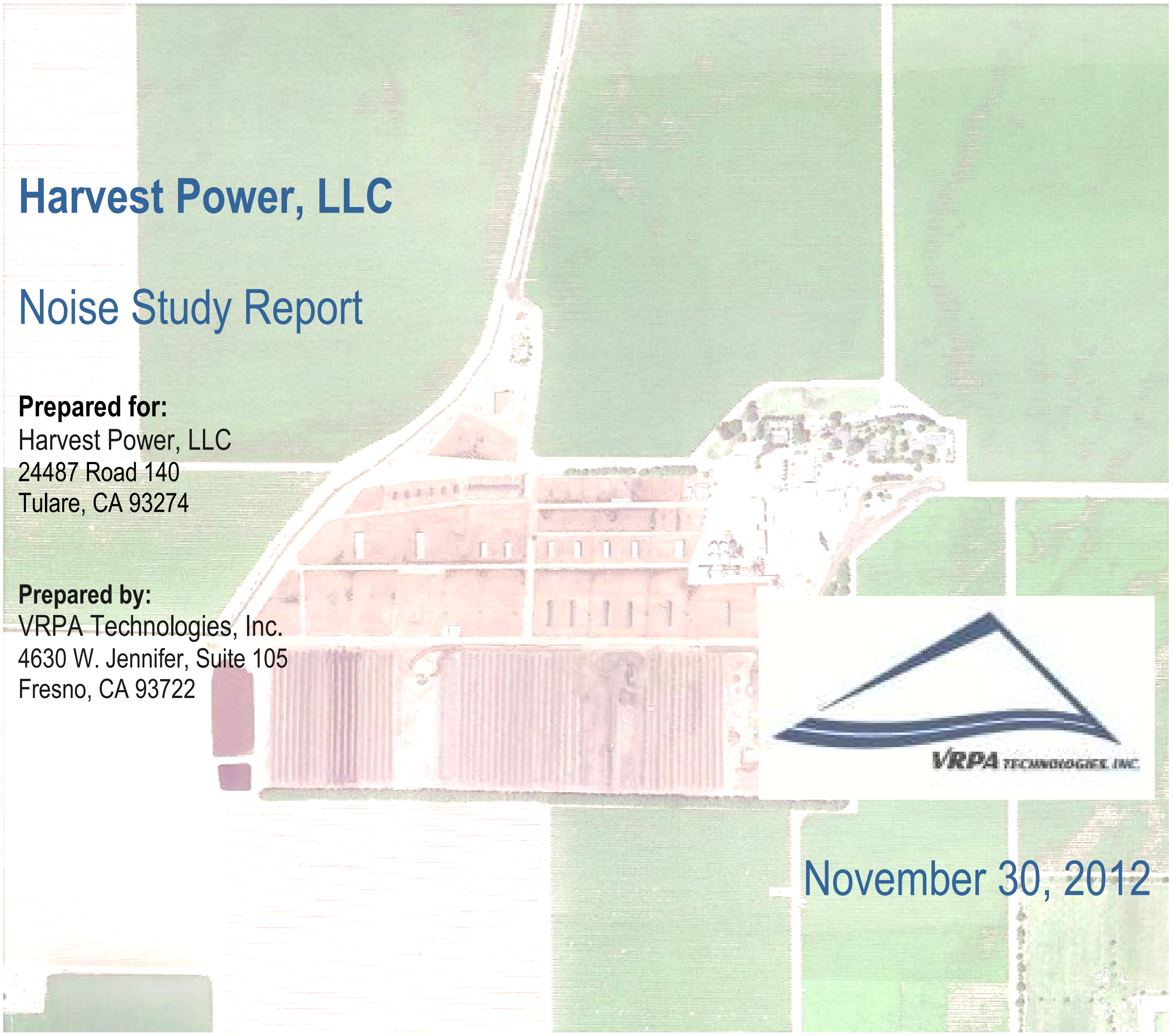

Harvest Power, LLC

Noise Study Report

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1.0 Introduction

This Noise Study Report (NSR) has been prepared for the purpose of identifying potential noise impacts that may result from the proposed equipment additions (Project) to the existing Harvest Power, LLC (formerly known as Tulare County Compost and Biomass Inc.) compost facility. The proposed Project site is located off Road 140 north of Prosperity Avenue in Tulare County and provides expert custom blending services. Some of the products provided by Harvest Power include compost, horticulture blends, mixed wood fines, co-generation fuel, and blue-berry mix.

1.1 Description of the Region/Project

Harvest Power's goal is to continue to provide the region's robust agricultural community with top quality compost, mulch products and custom blending mixes to meet customer specifications. The proposed Project lies within the central portion of the San Joaquin Valley, on the Valley floor, at an elevation of approximately 249 feet above sea level with the surrounding area mostly flat. Figures 1 and 2 show the location of the Project along with major roadways and highways.

1.2 Sound and the Human Ear

The amplitude of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude. Sound pressure amplitude is measured in units of micro-Newton per square meter (N/m2), also called micro-Pascal (μPa). One μPa is approximately one-hundred billionth (0.00000000001) of normal atmospheric pressure. The pressure of a very loud sound may be 200 million μPa, or 10 million times the pressure of the weakest audible sound (20 μPa). Because expressing sound levels in terms of μPa would be very cumbersome, sound pressure level (SPL) is used instead to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander Graham Bell. To provide a finer resolution, a bel is subdivided into 10 decibels, abbreviated dB.

1.2.1 *A-Weighted Decibels*

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear. Human hearing is limited not only in the range of audible frequencies but also in the way it perceives the SPL in that range. In general, the healthy human ear is most sensitive to sounds between 1,000 Hertz (Hz) and 5,000 Hz, and it perceives a sound within that range as being more intense than a sound of higher or lower frequency with the same magnitude.

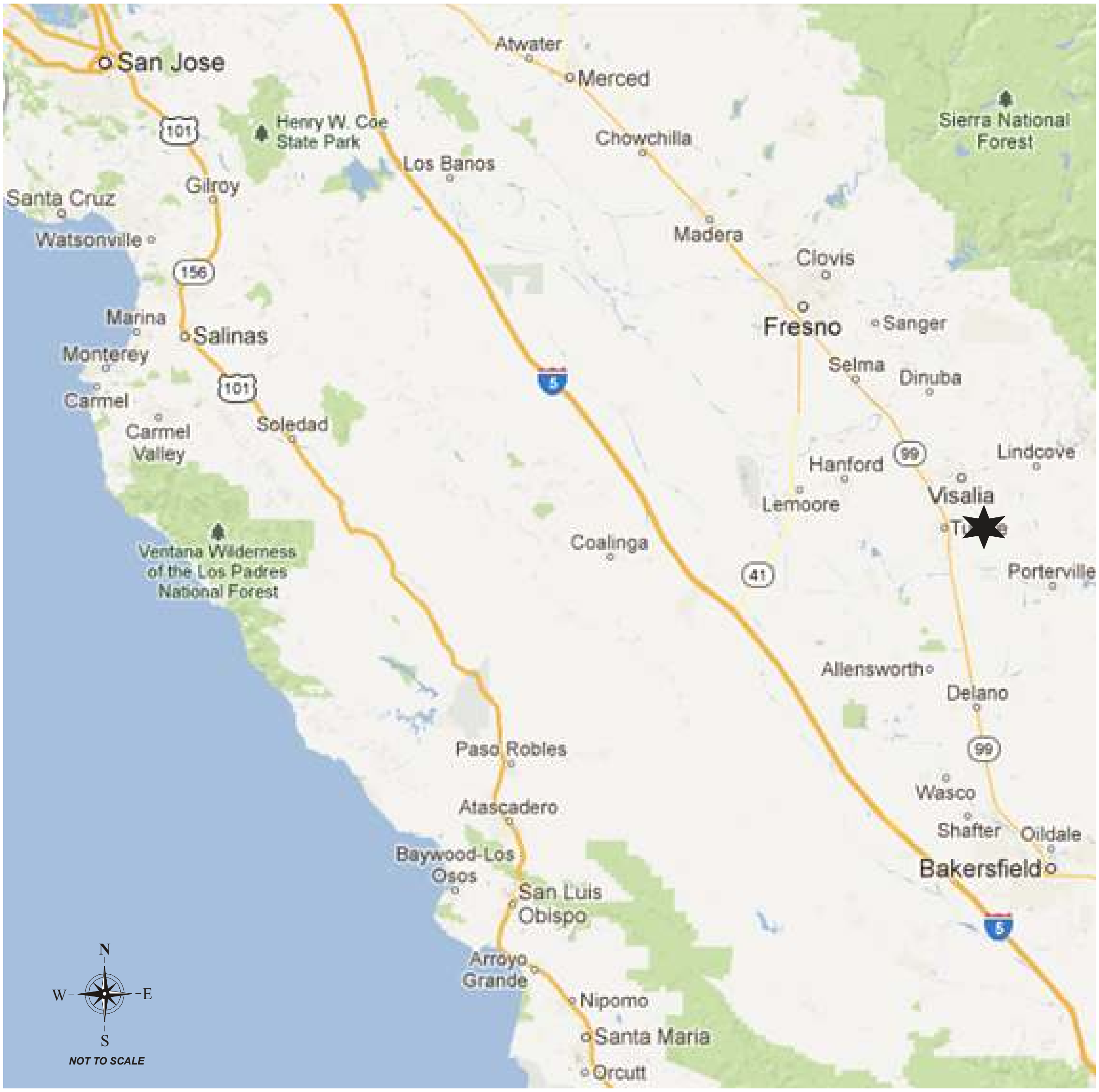

FIGURE 1

Regional Location

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★ Project Location

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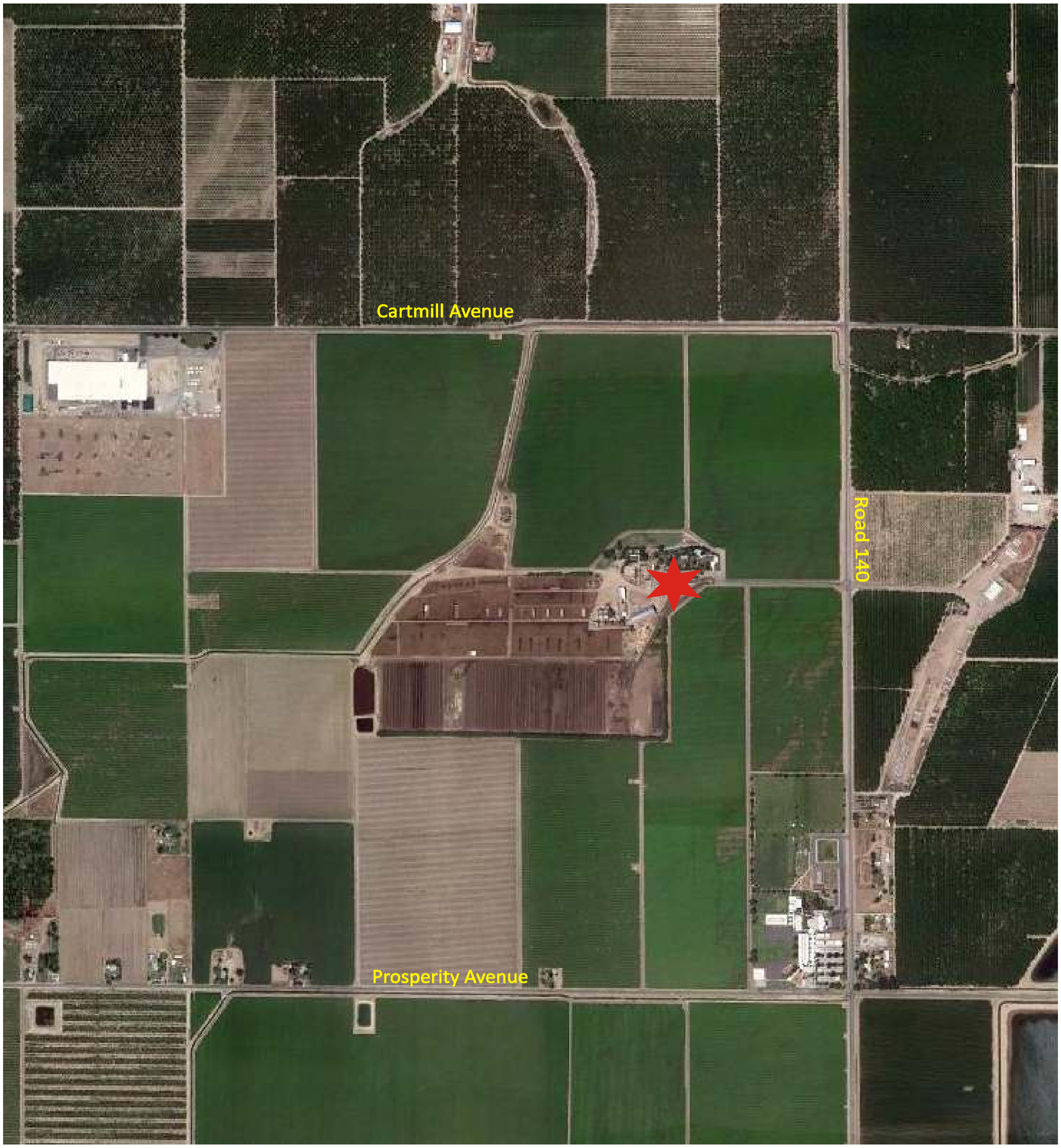

FIGURE 2

Project Location

LEGEND

Project Location

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To approximate the frequency response of the human ear, a series of SPL adjustments is usually applied to the sound measured by a sound level meter. The adjustments (referred to as a weighting network) are frequency dependent. The A-scale weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds.

Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-scale, C-scale, D-scale), but these scales are rarely, if ever, used in conjunction with highway trafficnoise. Noise levels for traffic noise reports are typically reported in terms of A-weighted dBAs. In environmental noise studies, A-weighted SPLs are commonly referred to as noise levels.

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

- ✓ Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans.
- ✓ Outside of the laboratory, a 3 dB change is considered a just-perceivable difference.
- ✓ A change in level of at least 5 dB is required before any noticeable change in community response would be expected.
- ✓ A 10 dB change is subjectively heard as approximately a doubling in loudness.

1.2.2 *Sound Pressure Levels and Decibels*

Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels. The sound pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold. In addition, because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. A dBA scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for comparison is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most authorities for purposes of environmental noise regulation. Typical indoor and outdoor noise levels are presented in Figure 3.

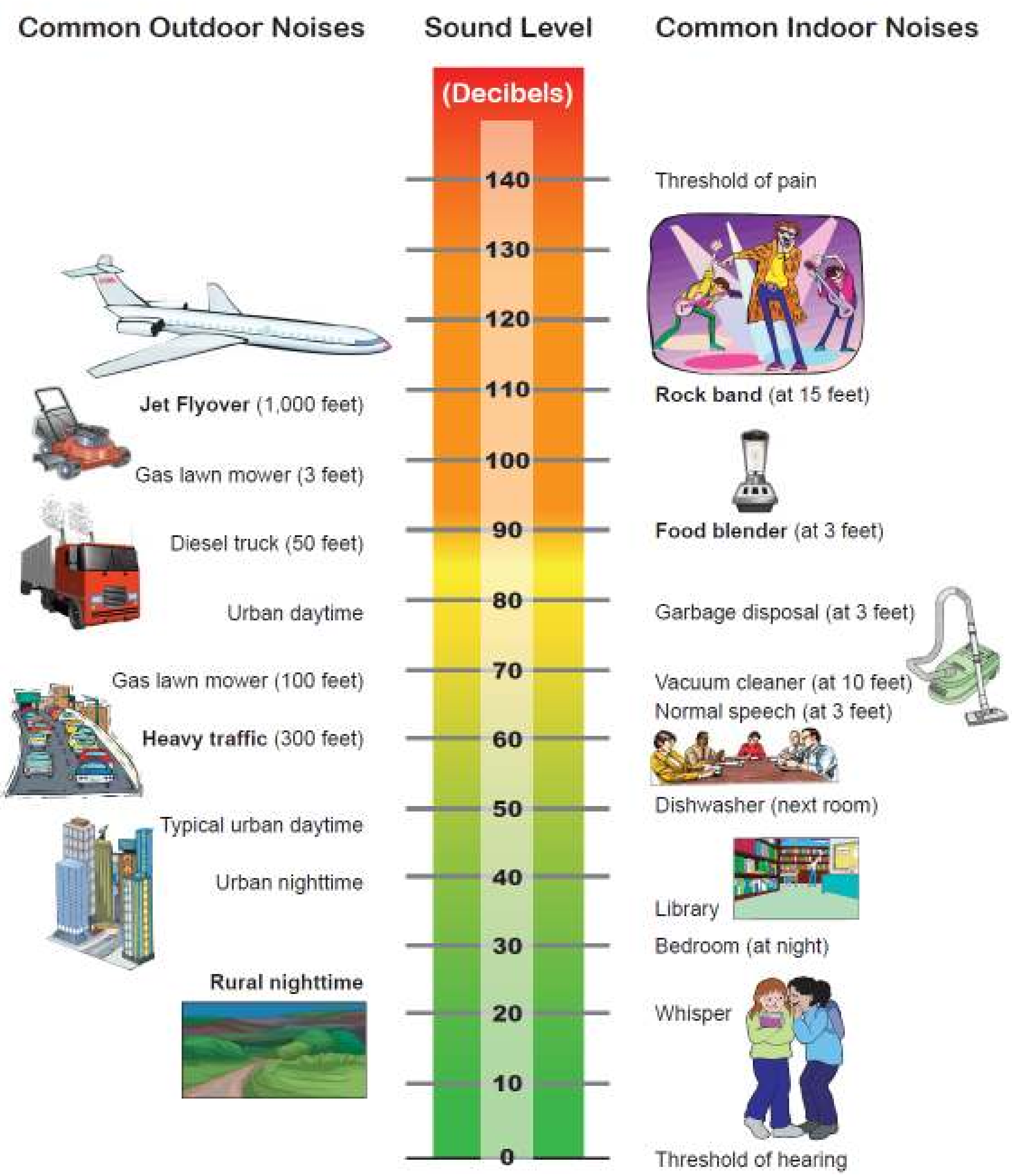

FIGURE 3

Common Environmental Sound Levels

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1.2.3 *Sound, Noise, and Acoustics*

Sound is a disturbance created by a moving or vibrating source in a gaseous or liquid medium or the elastic stage of a solid and is capable of being detected by the hearing organs. Sound may be thought of as the mechanical energy of a vibrating object transmitted by pressure waves through a medium to a hearing organ, such as a human ear. For traffic sound, the medium of concern is air. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. Sound is actually a process that consists of three components: the sound source, the sound path, and the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there is no sound. Likewise, without a medium to transmit sound pressure waves, there is also no sound. Finally, sound must be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receptors rather than just one of each. Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound.

1.2.4 *Frequency and Hertz*

A continuous sound can be 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, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz). A frequency of 250 cycles per second is referred to as 250 Hz. High frequencies are sometimes more conveniently expressed in units of kilo-Hertz (kHz), or thousands of Hertz. The extreme range of frequencies that can be heard by the healthiest human ear spans from 16–20 Hz on the low end to about 20,000 Hz (or 20 kHz) on the high end.

1.2.5 *Addition of Decibels*

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces an SPL of 70 dBA as it passes an observer, two cars passing simultaneously would not produce 140 dBA; they would, in fact, combine to produce 73 dBA. When two sounds of equal SPL are combined, they will produce a combined SPL 3 dBA greater than the original individual SPL. In other words, sound energy must be doubled to produce a 3 dBA increase. If two sound levels differ by 10 dBA or more, the combined SPL is equal to the higher SPL; in other words, the lower sound level does not increase the higher sound level.

1.3 Characteristics of Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks, and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates (is reduced) at a rate between 3.0 and 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. Hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance. Noise generated by stationary sources typically attenuates at a rate between 6.0 and about 7.5 dBA per doubling of distance. Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the “line of sight” between the source and the receiver. Buildings, concrete walls, and berms can all act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

1.3.1 *Noise Descriptors*

Noise in the daily environment fluctuates over time. Some of the fluctuations are minor; some are substantial. Some noise levels occur in regular patterns; others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely; others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is a list of the noise descriptors most commonly used in traffic noise analysis:

- ✓ **Equivalent Sound Level (L_{eq}) -** L_{eq} represents an average of the sound energy occurring over a specified period. L_{eq} is, in effect, the steady-state sound level that, in a stated period, would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The one-hour A-weighted equivalent sound level, L_{eq}(h), is the energy average of the A-weighted sound levels occurring during a one-hour period.
- ✓ **Percentile-Exceeded Sound Level (L_x) -** L_x represents the sound level exceeded for a given percentage of a specified period. For example, L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time.
- ✓ **Maximum Sound Level (L_{max}) -** L_{max} is the highest instantaneous sound level measured during a specified period.

1.3.2 *Sound Propagation*

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise reduces with distance depends on the following factors:

- ✓ **Geometric Spreading -** 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 (or drops off) at a rate of six dBA for each doubling of distance. Highway noise is not a single, stationary point source of sound. The movement of the vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a line source) rather than a point. This line source results in cylindrical spreading rather than the spherical spreading that results from a point source. The change in sound level from a line source is three dBA per doubling of distance.
- ✓ **Ground Absorption -** Most often, the noise path between the highway and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 60 m (200 ft), prediction results based on this scheme are sufficiently accurate. For acoustically hard sites (i.e., those sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receiver), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, between the source and the receiver), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally

assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

- ✓ **Atmospheric Effects -** Research by Caltrans and others has shown that atmospheric conditions can have a significant effect on noise levels within 60 m (200 ft) of a highway. Wind has been shown to be the most important meteorological factor within approximately 150 m (500 ft) of the source, whereas vertical air temperature gradients are more important for greater distances. Other factors such as air temperature, humidity, and turbulence also have significant effects. Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur as a result of temperature inversion conditions (i.e., increasing temperature with elevation).
- ✓ **Shielding by Natural and Human-Made Features -** A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dBA of noise reduction.

1.4 Methodology

When preparing an NSR, guidelines set by affected agencies must be followed. Acoustical terminology used for this NSR is documented in Appendix A. In analyzing noise levels, the Federal Highways Administration (FHWA) Highway Traffic Noise Prediction methodology was applied. Safety concerns must also be analyzed to determine the need for appropriate mitigation resulting from increased noise due to increased traffic and other evaluations such as the need for noise barriers and other noise abatement improvements. Unless otherwise stated, all sound levels reported are in A-weighted decibels (dBA). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards use A-weighting, as it provides a high degree of correlation with human annoyance and health effects.

1.4.1 *California Environmental Quality Act*

CEQA requires a strictly no-build versus build analysis to assess whether a proposed Project will have a noise impact. If a proposed Project is determined to have a significant noise impact under the California Environmental Quality Act (CEQA), then CEQA dictates that mitigation measures must be incorporated into the Project unless such measures are not feasible.

1.4.2 *Tulare County*

The Safety section of the Tulare County General Plan Background Report and the Tulare County General Plan 2030 Update serve as the primary policy statement by the County for implementing policies to maintain and improve the noise environment in Tulare County. The General Plan presents Goals and Objectives relative to planning for the noise environment within the County. Future noise/land use incompatibilities can be avoided or reduced with implementation of the Tulare County noise criteria and standards. Tulare County realizes that it may not always be possible to avoid constructing noise sensitive developments in existing noisy areas and therefore provides noise reduction strategies to be implemented in situations with potential noise/land use conflicts.

Table 1 shows Tulare County's Maximum Acceptable Ambient Noise Exposure for Various Land Uses. During preparation of this NSR, conformance of the proposed project with the County's Maximum Acceptable Ambient Noise Exposure for Various Land Uses is used to evaluate potential noise impacts and provides criteria for environmental impact findings and conditions for project approval.

TABLE 1

Maximum Acceptable Ambient Noise Exposure for Various Land Uses

Land Use	Suggested Maximum Ldn
Residential - low density	60
Residential - high density	65
Transient lodging	65
Schools, libraries, churches, hospitals	65
Playgrounds, parks	65
Commercial	70
Industrial	75
Notes: Ldn = Day-Night Average Sound Level	

1.4.3 *Study Methods and Procedures*

✓ **Site Selection**

Developed and undeveloped land uses in the project vicinity were identified through land use maps, aerial photography, and site inspection. Within each land use category, sensitive receptors were then identified. Land uses in the project vicinity include industrial and agricultural uses. The generalized land use data and location of particular sensitive receptors were the basis for the selection of the noise monitoring and analysis sites. A total of two (2) receptor locations were evaluated in the field to represent industrial and agricultural land uses in the project vicinity. These receptor locations are shown in Figure 4.

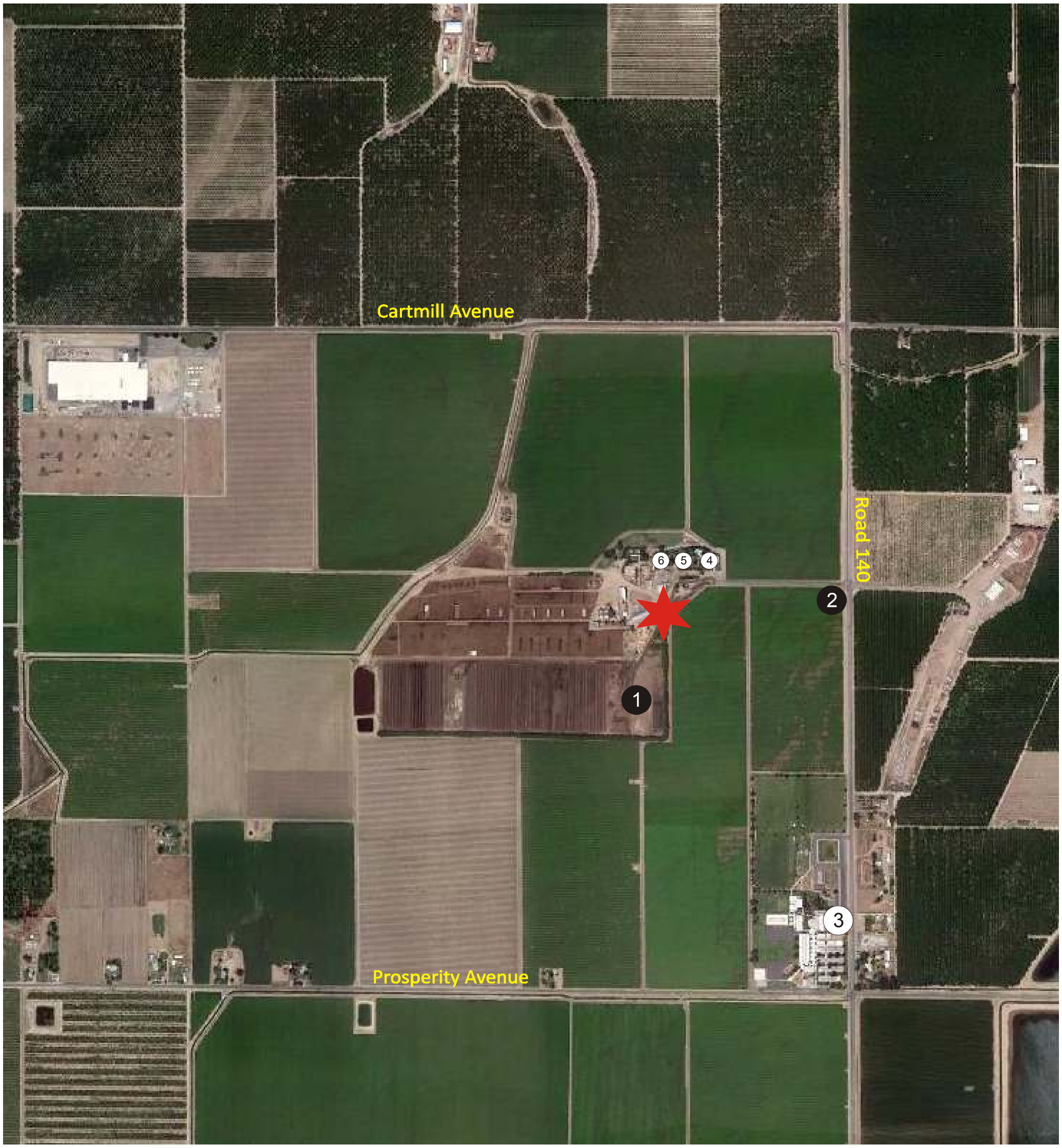

FIGURE 4

Noise Receptor Locations

LEGEND

Project Location

Field Receptor Locations # Modeled Receptor Locations

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- ✓ **Noise Level Measurement Program**

  Existing noise levels in the project vicinity were sampled during the afternoon peak hour. This peak hour was selected because the Harvest Power facility closes at 4:30pm. All measurements were made using an Extech Type 2 sound level meter datalogger.

  The following measurement procedure was utilized as applicable:

  - ✓ Calibrate sound level meter.
  - ✓ Set up sound level meter at a height of 1.5 m (5 ft).
  - ✓ Commence noise monitoring.
  - ✓ Collect site-specific data such as date, time, direction of traffic, and distance from sound level meter to the right-of-way.
  - ✓ Count passing vehicles for a period of 15 minutes. Vehicles were split into three categories: Heavy Trucks, Medium Trucks, and Automobiles. Traffic counts are shown in Table 2. Traffic counts were only recorded at Field Receptor 2 since Field Receptor 1 was taken on the Project site.
  - ✓ Stop measurement after 15 minutes.
  - ✓ Proceed to next monitoring site and repeat.

2.0 Existing Conditions

2.1 Existing Noise Conditions

Existing traffic noise levels are established based on previously collected traffic data (Table 2) and using Traffic Noise Model (TNM) Version 2.5. TNM 2.5 is an FHWA Traffic Noise Prediction Program. Once existing levels are established, future levels, based on expected traffic growth, are calculated and compared to both the existing noise level and the maximum acceptable noise levels for various land uses as described in Tulare County's General Plan. Referencing Table 1, Tulare County's noise criteria shows that mitigation must be considered when the exterior noise exposure level of 60 Ldn for low-density residential uses is exceeded, the exterior noise exposure level of 65 Ldn for school uses is exceeded, and when the exterior noise exposure level of 75 Ldn for industrial uses is exceeded. Levels reported in this section are in terms of A-weighted levels.

Existing traffic noise levels were evaluated using TNM 2.5. Traffic volumes collected from the General Plan 2030 Update traffic report and average vehicle speeds along Road 140 were entered into the model to estimate noise levels at various receptors that would be affected by the proposed Project.

To assess the traffic noise impacts from the project on the adjacent receptors, the first step is to determine the baseline or the existing noise condition. The second is to then compare the baseline to future level results, based on expected traffic growth, and Tulare County's Maximum Acceptable Ambient Noise Exposure for Various Land Uses.

TABLE 2

Field Data/Traffic Counts

Receptor Location	Directional movement	15 minute count		
		Auto's	Medium Trucks	Large Trucks
2	NB	28	6	10
	SB	32	4	7

To assess existing noise conditions, VRPA Technologies' staff compiled current traffic counts and existing geometric conditions. Staff conducted noise level measurements at the project site and tabulated the results. The weather during the time of the noise measurements consisted of sunshine and wind speeds of less than 5 mph. The purpose of the measurements was to evaluate the accuracy of the model in describing traffic noise exposure within the project site.

The locations for each field receptor location are described below in Table 3 and are geographically depicted in Figure 4. Receptors 3, 4, 5, and 6 were added to the analysis and represent an existing school site and residential homes. These locations were not measured in the field but were evaluated for potential impacts from the proposed improvements at the Project site. It is anticipated that the Project site will experience an increase of approximately 35 daily trips, which will consist of heavy trucks, rendering dump trucks and liquid tanker trucks. For purposes of this analysis, it was assumed that 18 additional trips would enter and exit the site during the afternoon peak hour. This represents approximately half of the overall trips anticipated to be added to the daily traffic operations.

In addition to the increase in Project traffic, the Harvest Power site is proposing to add two (2) loaders, one (1) natural gas compressor, one (1) windrow turner, and possibly one (1) electric crane. During the site evaluation, it was determined that with the current equipment, the site experiences noise levels of approximately 56.8 Leq(h) dB at the entrance to the facility staging area. The following is a list of equipment that currently exists on the Project site:

- ✓ Five (5) loaders (4 Volvo / 1 Cat)
- ✓ 4600 Morbark Grinder
- ✓ 830 Power Screen
- ✓ Komptech L-3 Screen
- ✓ Komptech Hurricane Screen
- ✓ Two (2) Water Tractors
- ✓ Two (2) Roll Off Trucks

The equipment that is currently being used is not operated continuously during operation hours, but used as necessary for Project operations. The Tulare County General Plan Update has identified a sound level of 88 dBA for front-end loaders at a distance of 50 feet. The natural gas compressor will produce a decibel reading of approximately 70 dBA at a distance of 50 feet. The windrow turner will produce a decibel reading of approximately 70 dBA at a distance of 100 feet. Typically, cranes can generate sound levels of approximately 85 dBA at a distance of 50 feet. The Project is anticipated to add an electric crane, which is much quieter than a typical crane. However, for purposes of analyzing the Project's potential impacts, noise from a typical crane will be utilized.

In order to calibrate the TNM 2.5 model, the existing counts (expanded to one hour), site geometry and any other pertinent existing conditions were added to the model. The noise level measurements taken at the project site were then compared to the noise levels computed by the model. The difference between the measured and modeled noise levels, referred to as the "K constant", is then added to the future calculated noise levels to obtain the predicted noise levels.

TABLE 3
Existing Noise Levels

Receptor I.D. No.	Location	Type of Development	Existing Noise Level Leq(h) dBA
1	Approximate location of new equipment	Project Site	56.8
2	Agricultural Area. Approximately 30 feet from Road 140 Centerline	Agriculture	64.8

Noise measurements were conducted in terms of the equivalent energy sound level (L_{eq}). Measured L_{eq} were compared to L_{eq} values calculated (predicted) by TNM 2.5. Traffic volumes, truck mix and vehicle speeds were used as inputs to the model. The results of the TNM 2.5 model, as shown in Appendix B, were combined with the estimated sound levels expected to be produced by the addition on the new equipment to be located on site using the following methodology found in Caltrans' Technical Noise Supplement (Appendix C).

When Two Decibel Values Differ By:	Add This Amount to the Higher Value:	Example:
0 or 1 dB	3 dB	70+69 = 73
2 or 3 dB	2 dB	74+71 = 76
4 to 9 dB	1 dB	66+60 = 67
10 dB or more	0 dB	65+55 = 65

Source: Caltrans Technical Noise Supplement

FIGURE 5
Decibel Addition

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Using the decibel addition methodology described above, it was determined that at 50 feet from the entrance to the staging area, with installation of the new equipment, the noise level experienced would be approximately 92 dB's if all the equipment was placed at the entrance to the staging area and operational all at the same time. Though the new pieces of equipment will be strategically placed in various locations of the staging area, assuming the equipment would be placed at the entrance of the staging provides a worst-case scenario.

There are three (3) homes located approximately 700 feet to the north of the entrance of the facility staging area as depicted in Figure 6. FHWA has identified that when buildings or trees/shrubs break the line of sight from the sound source to the receiver a decibel reduction of 3 – 5 dBs is plausible. Figure 6 also shows the approximate line of sight from the staging area entrance to the residential homes. There are several buildings between the staging area entrance and the homes in addition to the vast amount of trees/shrubs that surround the homes. A decibel reduction of 3 dB's was applied to noise levels at the residential locations as a result of the building structures and trees/shrubs that exist between the staging area entrance and the residential homes. Based on the distance from the source area, it is anticipated that the noise levels experienced at the residential homes from the new equipment will reach approximately 53 dBs.

As shown in Table 4, with the increase in Project traffic and installation of the new equipment, the noise levels experienced at the studied receptors will not exceed Tulare County's Maximum Acceptable Ambient Noise Exposure for Various Land Uses. When it comes to noise levels, the rule of thumb is that Ldn is within +/- 2 dBA of the peak hour L_{eq} under normal traffic conditions based upon Caltrans' Traffic Analysis Noise Protocol.

An increase of 13.6 dBs is anticipated at Receptor 1 as expected. It was assumed that the proposed new equipment would be operational for the entire hour that was analyzed. Though the new pieces of equipment will be strategically placed in various locations of the staging area, assuming the equipment would be placed at the entrance of the staging and continually operational provides a worst-case scenario. Noise levels experienced at Receptor 1 are and will continue to be the result of Harvest Power site operations.

3.0 Future Year Conditions

Impacts in the Project area resulting from 20 years of growth and development (through year 2035) are described in this section. In this scenario, traffic volume forecasts for the year 2035 were applied in the model to analyze future year conditions. Results are identified in Table 5.

3.1 Exterior Noise Analysis

When the Project is added to the background or existing noise levels, an increase in noise level is expected to occur. Under Future Year conditions, none of the sensitive receptor locations in both the with and without Project scenarios exhibit predicted noise impacts that exceed Tulare County's Maximum Acceptable Ambient Noise Exposure for Various Land Uses as a result of the new equipment and increase in traffic associated with the proposed Project. Based on the analysis results above, the new equipment to be installed at the Project site and increase in Project traffic will not have a significant impact on nearby sensitive receptors.

As depicted in the analysis, the impacts from both the new equipment (2 loaders, 1 natural gas compressor, and 1 electric crane) and the additional Project traffic will not have a significant cumulative effect on sensitive receptors. Table 5 shows the expected noise levels to be experienced at nearby sensitive receptors as a result of the increase in Project traffic and installation of the new equipment. The analysis shows that the cumulative effect from all new noise sources from the proposed Project will not cause any sensitive receptors to exceed the Tulare County's Maximum Acceptable Ambient Noise Exposure for Various Land Uses. The three residential homes will continue to experience noise levels below Tulare County's 60 dB L_{dn} threshold and the school site located at the northeast corner of Prosperity Avenue and Road 140 will continue to experience noise levels below Tulare County's 65 dB L_{dn} threshold.

TABLE 4

Noise Impacts for Existing Conditions

Receptor I.D. No.	Existing Noise Level Leq(h) dBA	Existing Noise Level Modeled Leq(h) dBA	K - Factor (Measured - Modeled = K)	Existing Plus Project Noise Level Leq(h) dBA	Noise Increase (+) or Decrease (-)	Impact
1	56.8	42.1	14.7	70.4	13.6	None
2	64.8	72.0	-7.2	66.0	1.2	None
3	--*	66.4	-7.2	60.5	1.3	None
4	--**	40.4	14.7	58.1	3.0	None
5	--**	37.9	14.7	57.4	4.8	None
6	--**	37.2	14.7	57.1	5.2	None

* Was not measured in the field. Applied K-Factor from Receptor 2.

** Was not measured in the field. Applied K-Factor from Receptor 1.

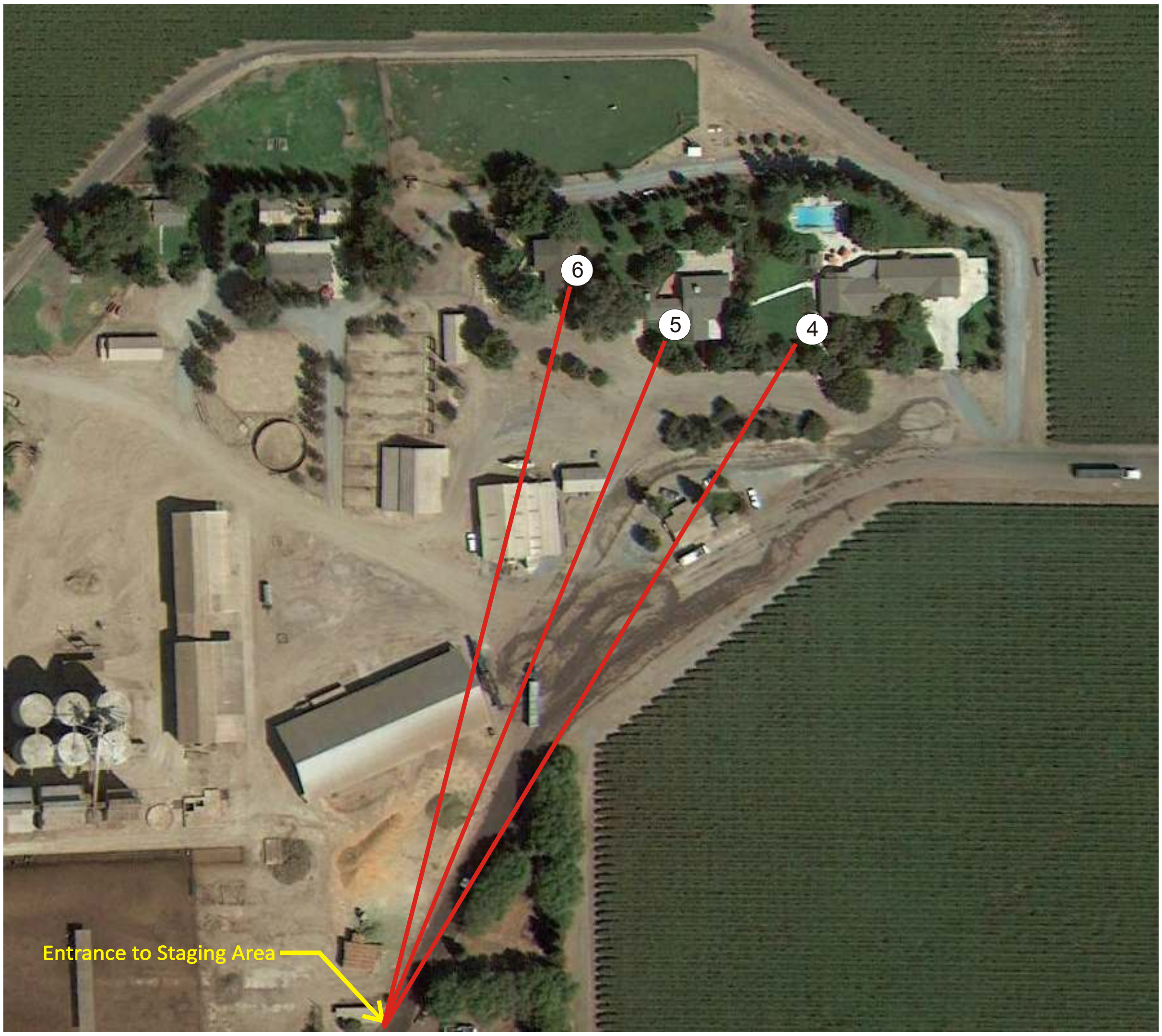

FIGURE 6

Line of Sight for Residential Homes

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Line of Sight

Modeled Receptor Locations

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TABLE 5

Noise Impacts for Future Conditions

Receptor I.D. No.	Year 2035 No Project Noise Level Leq(h) dBA	Year 2035 Plus Project Noise Level Leq(h) dBA	Noise Increase (+) or Decrease (-)	Impact
1	57.2	70.4	13.2	None
2	67.1	67.5	0.4	None
3	61.5	61.9	0.4	None
4	56.9	58.6	1.7	None
5	55.0	57.8	2.8	None
6	54.5	57.0	2.5	None

APPENDIX A
Acoustical Terminology

ACOUSTICAL TERMINOLOGY

The following terminology has been used for purposes of this NSR:

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.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7 p.m. to 10 p.m. and ten decibels to sound levels in the night before 7 a.m. and after 10 p.m.
Decibel, dBA:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micro-newtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition often decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
L_{eq}(h):	The hourly value of L_{eq}.
L_{max}:	The maximum noise level recorded during a noise event
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). L_{10} equals the level exceeded 10 percent of the time.
L_n(h):	The hourly value of L_n.
Noise Exposure Contours:	Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.
SEL or SENEL:	Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to the duration of one

second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and the reference duration of one second

Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighing filter network. The A-weighing 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 and gives good correlation with subjective reactions to noise.

Note: *CNEL and DNL represent daily levels of noise exposure averaged on an annual basis,* while L_n *represents the average noise exposure for a shorter time period, typically one hour.*

APPENDIX B
TNM 2.5 Sound Level Worksheets

Tulare County		30 November 2012
VRPA Technologies, Inc.		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	Harvest Power LLC	
RUN:	Existing Conditions	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver2 - Agricultural Site	1	1	0.0	72.0	75	72.0	10	----	72.0	0.0	8	-8.0
Receiver3 - School Site	2	1	0.0	66.4	65	66.4	10	Snd Lvl	66.4	0.0	8	-8.0
Receiver1 - On Project Site	4	1	0.0	42.1	75	42.1	10	----	42.1	0.0	8	-8.0
Receiver4 - Residential Home 1	6	1	0.0	40.4	60	40.4	10	----	40.4	0.0	8	-8.0
Receiver5 - Residential Home 2	7	1	0.0	37.9	60	37.9	10	----	37.9	0.0	8	-8.0
Receiver6 - Residential Home 3	8	1	0.0	37.2	60	37.2	10	----	37.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Tulare County					**30 November 2012**						
VRPA Technologies, Inc.					**TNM 2.5**						
INPUT: ROADWAYS							**Average pavement type shall be used unless**				
PROJECT/CONTRACT:	**Harvest Power LLC**						**a State highway agency substantiates the use**				
RUN:	**Existing Conditions**						**of a different type with the approval of FHWA**				
Roadway		**Points**									
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**	
				X	**Y**	**Z**	**Control**	**Speed**	**Percent**	**Pvmt**	**On**
							Device	**Constraint**	**Vehicles**	**Type**	**Struct?**
									Affected		
	ft			ft	ft	ft		mph	%		
Road 140 NB	12.0	point1	1	6.0	0.0	0.00				Average	
		point2	2	6.0	5,280.0	0.00					
Road 140 SB	12.0	point3	3	-6.0	5,280.0	0.00				Average	
		point4	4	-6.0	0.0	0.00					
WB Acces Driveway	12.0	point5	5	-12.0	3,262.0	0.00				Average	
		point6	6	-1,180.0	3,262.0	0.00				Average	
		point7	7	-1,506.0	3,036.0	0.00					
EB Access Driveway	12.0	point8	8	-1,506.0	3,024.0	0.00				Average	
		point9	9	-1,180.0	3,250.0	0.00				Average	
		point10	10	-12.0	3,250.0	0.00					

Tulare County						30 November 2012					
VRPA Technologies, Inc.						TNM 2.5					
INPUT: RECEIVERS											
PROJECT/CONTRACT:	Harvest Power LLC										
RUN:	Existing Conditions										
Receiver											
Name	No.	#DUs	Coordinates (ground)			Height	Input Sound Levels and Criteria				Active
			X	Y	Z	above	Existing	Impact Criteria		NR	in
						Ground	LAeq1h	LAeq1h	Sub'l	Goal	Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Receiver2 - Agricultural Site	1	1	-30.0	3,100.0	0.00	4.92	0.00	75	10.0	8.0	Y
Receiver3 - School Site	2	1	-70.0	1,500.0	0.00	4.92	0.00	65	10.0	8.0	Y
Receiver1 - On Project Site	4	1	-1,600.0	2,500.0	0.00	4.92	0.00	75	10.0	8.0	Y
Receiver4 - Residential Home 1	6	1	-1,180.0	3,462.0	0.00	4.92	0.00	60	10.0	8.0	Y
Receiver5 - Residential Home 2	7	1	-1,330.0	3,462.0	0.00	4.92	0.00	60	10.0	8.0	Y
Receiver6 - Residential Home 3	8	1	-1,470.0	3,462.0	0.00	4.92	0.00	60	10.0	8.0	Y

Tulare County				30 November 2012	
VRPA Technologies, Inc.				TNM 2.5	
INPUT: TREE ZONES					
PROJECT/CONTRACT:	**Harvest Power LLC**				
RUN:	**Existing Conditions**				
Tree Zone		**Points**			
Name	**Average**	**No.**	**Coordinates (ground)**		
	Height		**X**	**Y**	**Z**
	ft		ft	ft	ft
Tree Zone1	0.00	1	-1,180.0	3,312.0	15.00
		2	-1,180.0	3,337.0	15.00
		3	-1,340.0	3,337.0	15.00
		4	-1,340.0	3,312.0	15.00
Tree Zone2	0.00	5	-1,110.0	3,387.0	15.00
		6	-1,560.0	3,387.0	15.00
		7	-1,560.0	3,412.0	15.00
		8	-1,110.0	3,412.0	15.00
Tree Zone3	0.00	9	-1,120.0	3,415.0	20.00
		10	-1,120.0	3,440.0	20.00
		11	-1,235.0	3,440.0	20.00
		12	-1,235.0	3,415.0	20.00
Tree Zone4	0.00	13	-35.0	3,283.1	5.00
		14	-1,075.3	3,283.1	5.00
		15	-1,075.3	3,474.1	5.00
		16	-1,126.1	3,515.1	5.00
		17	-1,193.7	3,527.2	5.00
		18	-1,193.7	3,889.7	5.00
		19	-35.0	3,889.7	5.00

RESULTS: SOUND LEVELS Harvest Power LLC

Tulare County 30 November 2012
VRPA Technologies, Inc. TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: Harvest Power LLC
RUN: Existing Plus Project Conditions
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver2 - Agricultural Site	1	1	0.0	66.0	75	66.0	10	----	66.0	0.0	8	-8.0
Receiver3 - School Site	2	1	0.0	60.5	65	60.5	10	----	60.5	0.0	8	-8.0
Receiver1 - On Project Site	4	1	0.0	58.6	75	58.6	10	----	58.6	0.0	8	-8.0
Receiver4 - Residential Home 1	6	1	0.0	57.1	60	57.1	10	----	57.1	0.0	8	-8.0
Receiver5 - Residential Home 2	7	1	0.0	55.4	60	55.4	10	----	55.4	0.0	8	-8.0
Receiver6 - Residential Home 3	8	1	0.0	54.1	60	54.1	10	----	54.1	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Tulare County				
VRPA Technologies, Inc.		30 November 2012		
		TNM 2.5		
		Calculated with TNM 2.5		
RESULTS: SOUND LEVELS				
PROJECT/CONTRACT:	Harvest Power LLC			
RUN:	Year 2035 No Project Conditions			
BARRIER DESIGN:	INPUT HEIGHTS		Average pavement type shall be used unless	
			a State highway agency substantiates the use	
ATMOSPHERICS:	68 deg F, 50% RH		of a different type with approval of FHWA.	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver2 - Agricultural Site	1	1	0.0	67.1	75	67.1	10	----	67.1	0.0	8	-8.0
Receiver3 - School Site	2	1	0.0	61.5	65	61.5	10	----	61.5	0.0	8	-8.0
Receiver1 - On Project Site	4	1	0.0	57.2	75	57.2	10	----	57.2	0.0	8	-8.0
Receiver4 - Residential Home 1	6	1	0.0	56.9	60	56.9	10	----	56.9	0.0	8	-8.0
Receiver5 - Residential Home 2	7	1	0.0	55.0	60	55.0	10	----	55.0	0.0	8	-8.0
Receiver6 - Residential Home 3	8	1	0.0	54.5	60	54.5	10	----	54.5	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Tulare County							30 November 2012					
VRPA Technologies, Inc.							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		Harvest Power LLC										
RUN:		Year 2035 Plus Project Conditions										
BARRIER DESIGN:		INPUT HEIGHTS						Average pavement type shall be used unless				
								a State highway agency substantiates the use				
ATMOSPHERICS:		68 deg F, 50% RH						of a different type with approval of FHWA.				
Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver2 - Agricultural Site	1	1	0.0	67.5	75	67.5	10	----	67.5	0.0	8	-8.0
Receiver3 - School Site	2	1	0.0	61.9	65	61.9	10	----	61.9	0.0	8	-8.0
Receiver1 - On Project Site	4	1	0.0	58.1	75	58.1	10	----	58.1	0.0	8	-8.0
Receiver4 - Residential Home 1	6	1	0.0	57.6	60	57.6	10	----	57.6	0.0	8	-8.0
Receiver5 - Residential Home 2	7	1	0.0	55.8	60	55.8	10	----	55.8	0.0	8	-8.0
Receiver6 - Residential Home 3	8	1	0.0	55.0	60	55.0	10	----	55.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

APPENDIX C

Caltrans Technical Noise Supplement
(Decibel Addition Methodology)

The above excercises can be further expanded to include other useful applications in highway noise. For instance, if one were to ask what the respective SPL increases would be along a highway if existing traffic were doubled, tripled and quadrupled (assuming that traffic mix, distribution, and speeds would not change), we could make a reasonable prediction using equation N-2135.1. In this case N would be the existing traffic (N=1), N=2 would be doubling, N=3 tripling, and N=4 quadrupling the existing traffic. Since the $10\log_{10}(N)$ term in eq. N-2135.1 represents the increase in SPL, we can solve N for N=2, N=3, and N=4. The results would respectively be: +3 dB, +4.8 dB, and +6 dB.

The question might also come up what the SPL decrease would be if the traffic would be reduced by a factor of two, three, or four. In this case N = 1/2, N= 1/3, and N = 1/4, respectively. Applying the $10\log_{10}(N)$ term for these values of N would result in -3 dB, -4.8 dB, and -6 dB, respectively.

The same problem may come up in a different form. For instance, if the traffic flow on a given facility is presently 5000 vehicles per hour (vph) and the present SPL is 65 dB at a given location next to the facility, what would the expected SPL be if future traffic increased to 8000 vph? Solution: $65 + 10\log_{10}(8000/5000) = 65 + 2 = 67$ dB.

The N value may thus represent an integer, a fraction, or a ratio. However, N must always be greater than 0! Taking the logarithm of 0 or a negative value is not possible.

Adding and Subtracting Unequal Noise Levels. If noise sources are not equal, or if equal noise sources are at different distances, the $10\log_{10}(N)$ term cannot be used. Instead, the SPL's have to be added or subtracted individually, using the SPL and relative energy relationship in section N-2134 (eq. N-2134.1). If the number of SPL's to be added is N, and $SPL_{(1)}$, $SPL_{(2)}$, ...$SPL_{(n)}$ represent the 1st, 2nd, and nth SPL, respectively, the addition is accomplished by:

$$\mathbf{SPL_{(Total)} = 10\log_{10}[10^{SPL_{(1)}/10}+10^{SPL_{(2)}/10} + \ldots\ldots\ldots 10^{SPL_{(n)}/10}]} \quad \textbf{(eq. N-2135.3).}$$

The above equation is the general equation for adding SPL's. The same equation may be used for subtraction also (simply change the "+" to "-" for the term to be subtracted. However, the result between the brackets must always be greater than 0!

For example, find the sum of the following sound levels: 82, 75, 88, 68, 79. Using eq.2135.3, the total SPL is:

$$SPL = 10\ Log_{10}\ (10^{68/10} + 10^{75/10} + 10^{79/10} + 10^{82/10} + 10^{88/10}) = 89.6\ dB$$

Adding SPL's Using a Simple Table - When combining sound levels, the following table may be used as an approximation.

Table N-2135.1 Decibel Addition

When Two Decibel Values Differ By:	Add This Amount to the Higher Value:	Example:
0 or 1 dB	3 dB	70+69 = 73
2 or 3 dB	2 dB	74+71 = 76
4 to 9 dB	1 dB	66+60 = 67
10 dB or more	0 dB	65+55 = 65

This table yields results within ± 1 dB of the mathematically exact value and can easily be memorized. The table can also be used to add more than two SPL's. First, sort the list of values, from lowest to highest. Then, starting with the lowest values, combine the first two, add the result to the third value and continue until only the answer remains.

Example: find the sum of the sound levels used in the above example, using Table N-2135.1. First, rank the values from low to high:

68 dB
75 dB
79 dB
82 dB
<u>88 dB</u>
?? dB Total

Using table 2135.1 add the first two noise levels. Then add the result to the next noise level ...., etc.

a. 68 + 75 = 76,
b. 76 + 79 = 81,
c. 81 + 82 = 85,
d. 85 + 88 = **90 dB** (For comparison, using eq.2135.3, the total SPL was 89.6 dB).

Two decibel addition rules are important. First, when adding a noise level with another approximately equal noise level, the total noise level rises 3 dB. For example doubling the traffic on a highway would result in an increase of 3 dB. Conversely, reducing traffic by one half, the noise level reduces by 3 dB. Second, when two noise levels are 10 dB or more apart, the lower value does not contribute significantly (< 0.5 dB) to the total noise level.