ENVIRONMENTAL NOISE ASSESSMENT

LACEY RANCH AREA MASTER PLAN
LEMOORE, CALIFORNIA

WJVA Report No. 20-046

PREPARED FOR

CRAWFORD & BOWEN PLANNING, INC.
113 NORTH CHURCH STREET, SUITE 302
VISALIA, CALIFORNIA 93291

PREPARED BY

WJV ACOUSTICS, INC.
VISALIA, CALIFORNIA

wjv acoustics

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1. INTRODUCTION

Project Description:

Within the Lacey Ranch Area Master Plan, the Project applicant is proposing to subdivide and develop approximately 156 acres of land into a planned residential community with a mix of single-family and multi-family housing units. The Project will be constructed in four phases, as outlined below. The exact numbers of each housing type may vary slightly, depending on final density. However, there will be a maximum of 825 housing units in total. Specific housing types include:

- ±164 compact lots with an average lot size of 4,500 square feet
- ±310 medium lots with an average lot size of 6,500 square feet
- ±73 estate lots with an average lot size of 9,500 square feet
- ±145 multifamily units at 20 units per acre
- ±59 multifamily units at 12 units per acre

The Project includes a total of four parks for a total of 7.9 acres and 1.64 acres of trail area. The 1.64 acres of trail area will be designated and zoned consistent with the designations and zoning of their adjacent parcels.

The site has been designed with seven points of ingress and egress. One of these points connects at W. Lacey Blvd along the northern edge of the Project; three access points connect at 18th Avenue on the western edge; two access points are along the southern edge; and one access point is along the eastern edge. The Project will be responsible for construction of internal roadways as well as for potential improvements to surrounding roadways to accommodate the Project.

Environmental Noise Assessment:

This environmental noise assessment has been prepared to determine if significant noise impacts will be produced by the project and to describe mitigation measures for noise if significant impacts are determined. The environmental noise assessment, prepared by WJV Acoustics, Inc. (WJVA), is based upon the project Site Plan provided by the applicant (Figure 1), traffic data provided by JLB Traffic, and a project site visit on January 5 and 6, 2021. Revisions to the Site Plan, project traffic information or other project-related information available to WJVA at the time the analysis was prepared may require a reevaluation of the findings and/or recommendations of the report.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). 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 utilize A-weighted sound levels, as they correlate well with public reaction to noise. Appendix B provides examples of sound levels for reference.

2. THRESHOLDS OF SIGNIFICANCE

The CEQA Guidelines apply the following questions for the assessment of significant noise impacts for a project:

a. Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

a. Noise Level Standards

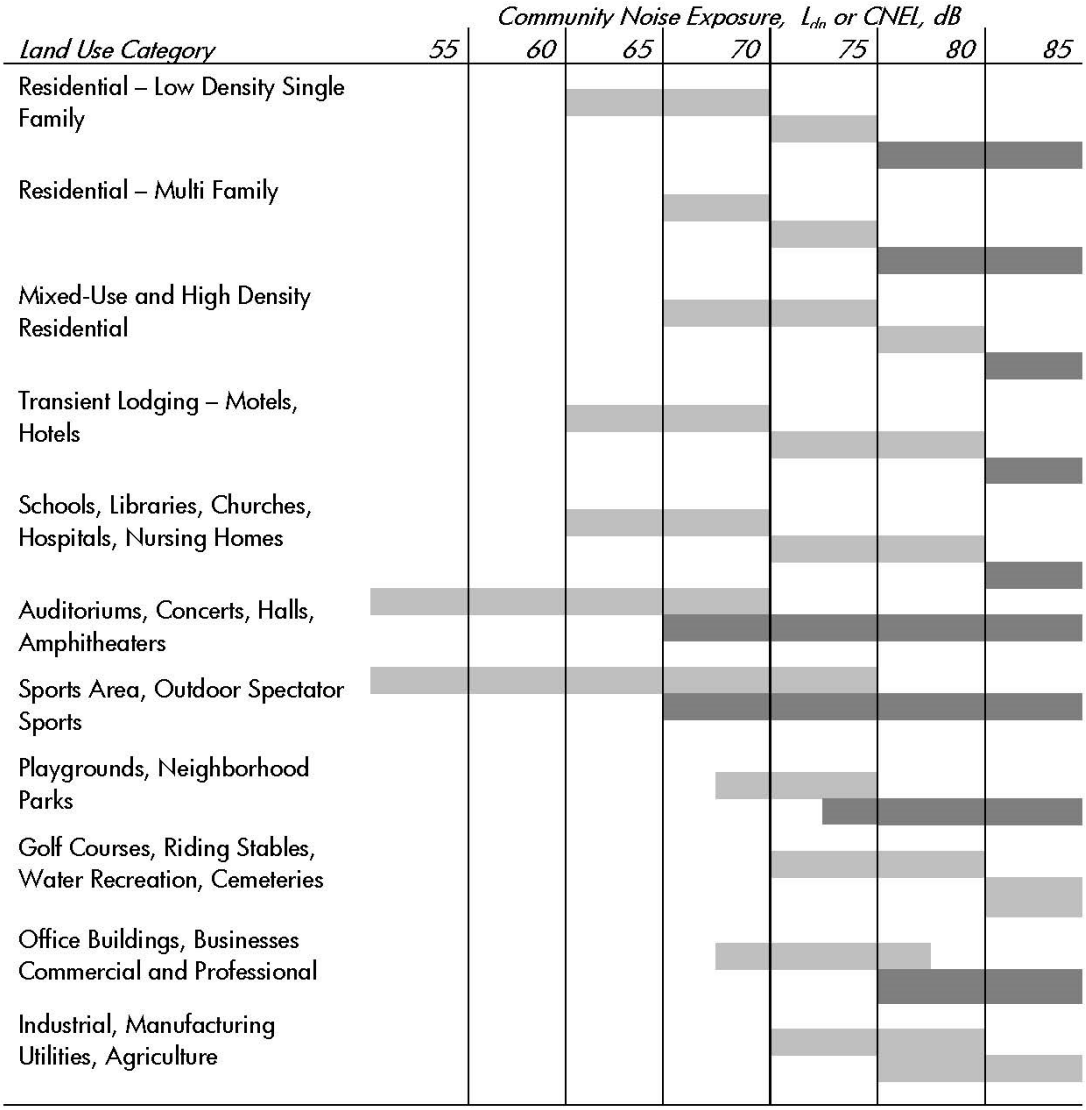
CITY OF LEMOORE

General Plan

The City of Lemoore General Plan Noise Element[1] provides exterior noise level criteria for land use compatibility for community noise environments. The General Plan sets noise compatibility standards for transportation noise sources in terms of the Day-Night Average Level (L_{dn}). The L_{dn} (also referred to as DNL) represents the time-weighted energy average noise level for a 24-hour day, with a 10 dB penalty added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The L_{dn} represents cumulative exposure to noise over an extended period of time and are therefore calculated based upon *annual average* conditions. Table I provides the General Plan Land Use Noise Compatibility Guidelines for exterior noise levels. Additionally, the General Plan states *"Consider an increase of five or more dBA to be "significant" if the resulting noise level would exceed that described as "normally acceptable" in Table 8.6."* (Table I below).

Table I: City of Lemoore Land Use Noise Compatibility Guidelines

Table 8.6 Land Use Compatibility For Community Noise Environments



Leaend:

Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
Clearly Unacceptable	New construction or development should not be undertaken.

Municipal Code

Section 9-5B-2 (Noise, Odor and Vibration Performance Standards) of The City of Lemoore Municipal Code[2] provides additional exterior and interior noise level standards. The Municipal Code sets noise compatibility standards in terms of the Community Noise Equivalent Level (CNEL). Both the L_{dn} and CNEL represent the time-weighted energy average noise level for a 24-hour day, with a 10 dB penalty added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL includes an additional penalty of 5 dB (technically 4.77 dB) that is added to noise levels occurring during the evening hours between 7:00 p.m. and 10:00 p.m. Both the L_{dn} and CNEL represent cumulative exposure to noise over an extended period of time and are therefore calculated based upon *annual average* conditions. The L_{dn} and CNEL are considered to be equivalent descriptors of the community noise environment for the purposes of this study. Table II provides the interior and exterior noise level standards provided in the City's Municipal Code.

TABLE II

INTERIOR AND EXTERIOR NOISE LEVEL STANDARDS, dBA
CITY OF LEMOORE MUNICIPAL CODE

Land Use	Noise Standards (dB L_{dn}/CNEL)	
	Interior Noise	Exterior Noise
Residential Uses	45	65[1]
Professional Uses In Mixed-Use Zones	45	70
Commercial	--	70
Office	50	70
Industrial	55	75
Public Facilities	50	70
Parks	--	70
Schools	50	65

[1]Outdoor Living Aeras e.g., backyards

State of California

There are no state noise standards that are applicable to the project.

Federal Noise Standards

There are no federal noise standards that are applicable to the project.

b. Construction Noise and Vibration

Section 9-5B-2 (Noise, Odor and Vibration Performance Standards) of The City of Lemoore Municipal Code[2] provides some generalized guidance in regards to allowable hours of construction as well as acceptable vibration levels:

Construction

Limitation On Hours Of Construction: To ensure that nearby residents as well as nonresidential activities are not disturbed by noise from early morning or late night activities, the following limits on construction are established:

- *Monday through Saturday, seven o'clock (7:00) A.M. to eight o'clock (8:00) P.M.*

- *Extended construction hours may only be allowed by the review authority through conditions of approval between eight o'clock (8:00) P.M. and ten o'clock (10:00) P.M.*

- *On Sundays and national holidays, construction activities may only be allowed by the review authority through conditions of approval between nine o'clock (9:00) A.M. and five o'clock (5:00) P.M.*

Vibration

Vibration Standards: Uses that generate vibrations that may be considered a nuisance or hazard on any adjacent property shall be cushioned or isolated to prevent generation of vibrations. Uses shall be operated in compliance with the following provisions:

- *Uses shall not generate ground vibration that is perceptible without instruments by the average person at any point along or beyond the property line of the parcel containing the activities;*

- *Uses, activities, and processes shall not generate vibrations that cause discomfort or annoyance to reasonable persons of normal sensitivity or which endanger the comfort, repose, health, or peace of residents whose properties abut the property lines of the subject parcel;*

- *Uses shall not generate ground vibration that interferes with the operations of equipment and facilities of adjoining parcels; and*

- *Vibrations from temporary construction/demolition and vehicles that leave the subject parcel (e.g., trucks, trains, and aircraft) are exempt from the provisions of this section. (Ord. 2013-05, 2-6-2014)*

Additional guidance in regards to vibration guidelines can be found in the California Department of Transportation (Caltrans) Transportation and Construction Vibration Guidance Manual[3]. The Manual provides guidance for determining annoyance potential criteria and damage potential threshold criteria. These criteria are provided below in Table III and Table IV, and are presented in terms of peak particle velocity (PPV) in inches per second (in/sec). The PPV levels reported in Table III and Table IV represent those measured at the potential receiver location.

TABLE III

GUIDELINE VIBRATION ANNOYANCE POTENTIAL CRITERIA

Human Response	Maximum PPV (in/sec) at Receiver	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.1
Severe	2.0	0.4

Source: Caltrans

TABLE IV

GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

Structure and Condition	Maximum PPV (in/sec) at Receiver	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile, historic buildings, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans

3. SETTING

The proposed Project is located on approximately 156-acres immediately north of the City of Lemoore in Kings County and is bounded by W. Lacey Blvd to the north and 18th Avenue to the west. The Project is on assessor parcel number 021-030-057-000. The project site currently consists of agricultural land uses.

Surrounding land uses generally include agricultural land uses to the west, north and east and residential land uses to the south. There is a small parcel of land owned by the City of Lemoore located at the southwest portion of the project site, which currently includes a solar energy operation and a water storage tank.

a. Background Noise Level Measurements

Existing noise levels in the project vicinity are dominated by traffic noise along W. Lacey Boulevard and 18th Street. Additional sources of noise in the project vicinity include occasional aircraft overflights (including aircraft associated with the Lemoore Naval Air Station), noise associated with agricultural activities and noise associated with residential activities (barking dogs, voices, landscaping activities, etc.).

Measurements of existing ambient noise levels in the project vicinity were conducted between January 5, 2021 and January 6, 2021. Long-term (24-hour) ambient noise level measurements were conducted at one (1) location (site LT-1). Ambient noise levels were measured for a period of 24 continuous hours at site LT-1. Site LT-1 was located in the southwest portion of the project site, adjacent to the City-owned enclosed parcel and in the vicinity of residential land uses to the south. The noise monitoring site was exposed to traffic noise associated with vehicles on 18th Avenue as well as activities occurring within the City-owned parcel. The location of the long-term measurement site is provided on Figure 2.

Measured hourly energy average noise levels (L_{eq}) at site LT-1 ranged from a low of 54.6 dB between 2:00 a.m. and 3:00 a.m. to a high of 59.1 dBA between 3:00 p.m. and 4:00 p.m. Hourly maximum (L_{max}) noise levels at site LT-1 ranged from 59.8 to 75.5 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 52.0 to 56.4 dBA. The L_{90} is a statistical descriptor that defines the noise level exceeded 90% of the time during each hour of the sample period. The L_{90} is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft and other local noise sources. The measured L_{dn} value at site LT-1 for the 24-hour measurement period was 61.8 dB L_{dn}. Figure 3 graphically depicts hourly variations in ambient noise levels at site LT-1 for the 24-hour measurement period and provides a photograph of measurement site LT-1.

Additionally, short-term (15-minute) ambient noise level measurements were conducted at four (4) locations (Sites ST-1 through ST-4). Two (2) individual measurements were taken at each of the four short-term sites to quantify ambient noise levels in the morning and afternoon hours. The locations of the long-term and short-term noise monitoring sites are shown as Figure 2.

Short-term noise measurements were conducted for 15-minute periods at each of the four sites. Site ST-1 was located near residential land uses south of the project site, near Glendale Avenue and Quandt Drive, and was exposed to noise associated with roadway traffic and residential activities. Site ST-2 was located along the western portion of the project site, along 18th Street, and was exposed to noise associated with roadway traffic and agricultural activities. Site ST-3 was located along the northern portion of the project site, along W. Lacey Boulevard, and was exposed to noise associated with roadway traffic and agricultural activities. Site ST-4 was located within the residential area south of the project site near the southeastern portion of the project site, along Ashland Drive, and was exposed to noise associated with roadway traffic and residential activities.

Table V summarizes short-term noise measurement results. The noise measurement data included energy average (L_{eq}) maximum (L_{max}) as well as five individual statistical parameters. Observations were made of the dominant noise sources affecting the measurements. The statistical parameters describe the percent of time a noise level was exceeded during the measurement period. For instance, the L_{90} describes the noise level exceeded 90 percent of the time during the measurement period, and is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft and other local noise sources.

TABLE V

SUMMARY OF SHORT-TERM NOISE MEASUREMENT DATA
LACEY RANCH MASTER PLAN
JANUARY 5 &6, 2021

Site	Time	A-Weighted Decibels, dBA							Sources
		L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}	L_{90}	
ST-1	7:50 a.m.	52.8	66.4	62.0	56.0	51.4	48.4	44.8	TR, AC
ST-1	4:30 p.m.	55.2	72.1	63.8	57.0	52.4	46.2	43.1	TR, AC
ST-2	8:15 a.m.	62.0	72.5	71.1	67.9	61.9	52.5	45.2	TR, C, AC
ST-2	4:55 p.m.	63.5	76.2	70.4	66.6	62.8	54.1	45.0	TR, AC
ST-3	8:35 a.m.	62.7	73.7	72.1	68.8	61.9	53.0	45.5	TR, C
ST-3	5:15 p.m.	65.0	76.2	71.4	66.8	62.2	52.4	44.0	TR
ST-4	8:55 a.m.	44.6	51.9	48.0	46.8	45.5	44.3	41.6	TR, AC
ST-4	5:35 p.m.	47.1	62.3	50.1	47.7	44.9	42.0	38.7	TR

TR: Traffic AC: Aircraft C: Construction V: Voices D: Barking Dogs
Source: WJV Acoustics, Inc.

4. NOISE IMPACTS TO OFF-SITE SENSITIVE RECEPTORS, AND MITIGATION MEASURES

a. Project Traffic Noise Impacts on Existing Noise-Sensitive Land Uses Outside Project Site (Less Than Significant)

WJVA utilized the FHWA Traffic Noise Model[4] to quantify expected project-related increases in traffic noise exposure along roadways in the project vicinity. The FHWA Model is a standard analytical method used by state and local agencies for roadway traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within ±1.5 dB. To predict L_{dn} values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Average Daily Traffic (ADT) volumes for the analyzed receptor locations were provided by JLB Traffic Engineering. ADT traffic volumes were provided for Existing (without project), Existing Plus Project, Cumulative 2040 No Project and Cumulative 2040 Plus Project traffic scenarios.

The percentage of trucks and the day/night distribution of traffic on local roadways used for modeling was approximated based upon data previously obtained by WJVA from previous projects in the project vicinity. The Noise modeling assumptions used to calculate project traffic noise are provided as Appendix C.

Traffic noise exposure levels for specific scenarios were calculated based upon the FHWA Model and the above-described model inputs and assumptions. Project-related significant impacts would occur if an increase in traffic noise associated with the project would result in noise levels exceeding the City's applicable noise level standards at the location(s) of sensitive receptors or result in an increase of five (5) dB or more if the resulting noise level would exceed that described as "normally acceptable" in Table I (above).

The General Plan Noise Element considers a noise exposure up to 60 dB L_{dn} as "normally acceptable" for low density single family residential land uses. Traffic noise was modeled at fifteen (15) representative receptor locations in the project vicinity. The fifteen modeled receptors are located at roadway setback distances representative of the sensitive receptors along each analyzed roadway segment. The receptor locations are described below and provided graphically on Figure 4.

- R-1: Residential land use located approximately 190 feet from the centerline of Lacey Blvd.
- R-2: Residential land use located approximately 115 feet from the centerline of Lacey Blvd.
- R-3: Residential land use located approximately 125 feet from the centerline of Lacey Blvd.
- R-4: Residential land use located approximately 320 feet from the centerline of Lacey Blvd.
- R-5: Residential land use located approximately 135 feet from the centerline of 18th Ave.

- R-6: Residential land use located approximately 125 feet from the centerline of 18th Ave.
- R-7: Residential land use located approximately 90 feet from the centerline of 19th Ave.
- R-8: Residential land use located approximately 90 feet from the centerline of Liberty Dr.
- R-9: Residential land use located approximately 90 feet from the centerline of Hanford Armona Rd.
- R-10: Residential land use located approximately 70 feet from the centerline of Hanford Armona Rd.
- R-11: Residential land use located approximately 80 feet from the centerline of Liberty Dr.
- R-12: Residential land use located approximately 150 feet from the centerline of Hanford Armona Rd.
- R-13: Residential land use located approximately 120 feet from the centerline of Cinnamon Dr.
- R-14: Residential land use located approximately 75 feet from the centerline of Cinnamon Dr.
- R-13: Residential land use located approximately 90 feet from the centerline of Hanford Armona Rd.

Existing Conditions

Table VI provides Existing and Existing Plus Project traffic noise exposure levels at the fifteen analyzed receptor locations. The receptor locations are representative of existing residential land uses located along the analyzed roadway segments. Noise levels described in Table VI does not include an existing acoustical shielding (noise level reduction) that may occur as a result of any existing sound walls, intervening buildings or topography, and should be considered a worst-case assessment of traffic noise exposure levels at the receptor locations.

Reference to Table VI indicates that project-related increases in traffic noise at nearby sensitive receptor locations would generally increase by less than 1 dB for existing traffic conditions. Project-related increases in traffic noise at receptor locations located along Lacey Boulevard, east of the future alignment of Mary Drive (R-3 and R-4) would be approximately 1 dB for existing traffic conditions. Project-related increases in traffic noise at receptor locations along 18th Avenue (Lemoore Street), south of the project site (R-5 and R-6) would be approximately 2 to 3 dB for existing traffic conditions.

Project-related increases in traffic noise along the fifteen analyzed receptor locations would not result in noise levels exceeding the City's 60 dB L_{dn} exterior noise level standard or result in an increase of 5 dB at any receptor location. It should be noted, while traffic noise exposure levels at some receptor locations (R-10, R-15) do exceed the City's 60 dB L_{dn} exterior noise level standard, this exceedance is not a result of the project, and is therefore not considered to be a significant impact. Additionally, many receptors have existing sound walls which would result in noise levels lower than those described in Table VI.

TABLE VI

PROJECT-RELATED INCREASES IN TRAFFIC NOISE, dB, L_{dn}
LACEY RANCH MASTER PLAN, LEMOORE
EXISTING CONDITIONS

Modeled Receptor	Existing	Existing Plus Project	Change (Maximum)	Significant Impact?
R-1	53	53	0	No
R-2	57	58	+1	No
R-3	57	58	+1	No
R-4	51	52	+1	No
R-5	55	57	+2	No
R-6	55	58	+3	No
R-7	55	55	0	No
R-8	53	53	0	No
R-9	59	59	0	No
R-10	60	61	+1	No
R-11	52	53	+1	No
R-12	56	56	0	No
R-13	51	51	0	No
R-14	56	57	+1	No
R-15	60	60	0	No

Source: WJV Acoustics, Inc.
JLB Traffic Engineering

Cumulative 2040 Conditions

Table VII provides Cumulative 2040 and Cumulative 2040 Plus Project traffic noise exposure levels at the fifteen analyzed receptor locations. The receptor locations are representative of existing residential land uses located along the analyzed roadway segments. Noise levels described in Table VII does not include an existing acoustical shielding (noise level reduction) that may occur as a result of any existing sound walls, intervening buildings or topography, and should be considered a worst-case assessment of traffic noise exposure levels at the receptor locations.

Reference to Table VII indicates that project-related increases in traffic noise at nearby sensitive receptor locations would generally increase by less than 1 dB for Cumulative 2040 traffic conditions. Project-related increases in traffic noise at receptor locations located along Lacey Boulevard, east of the future alignment of Mary Drive (R-3 and R-4) would be approximately 1 dB for Cumulative 2040 traffic conditions. Project-related increases in traffic noise at receptor locations along 18th Avenue (Lemoore Street), south of the project site (R-5 and R-6) would be approximately 2-3 dB for Cumulative 2040 traffic conditions.

Project-related increases in traffic noise along the fifteen analyzed receptor locations would not result in noise levels exceeding the City's 60 dB L_{dn} exterior noise level standard or result in an

increase of 5 dB at any receptor location. It should be noted, while traffic noise exposure levels at some receptor locations (R-9, R-10 and R-15) do exceed the City's 60 dB L_{dn} exterior noise level standard, this exceedance is not a result of the project, and is therefore not considered to be a significant impact. Additionally, many receptors have existing sound walls (including R-9, R-10 and R-15) which would result in noise levels lower than those described in Table VII.

TABLE VII

PROJECT-RELATED INCREASES IN TRAFFIC NOISE, dB, L_{dn}
LACEY RANCH MASTER PLAN, LEMOORE
CUMULATIVE 2040 CONDITIONS

Modeled Receptor	2040 No Project	2040 Plus Project	Change (Maximum)	Significant Impact?
R-1	54	54	0	No
R-2	58	59	+1	No
R-3	58	59	+1	No
R-4	52	53	+1	No
R-5	55	57	+2	No
R-6	55	58	+3	No
R-7	56	56	0	No
R-8	55	55	0	No
R-9	60	60	0	No
R-10	61	62	+1	No
R-11	54	54	0	No
R-12	56	57	+1	No
R-13	52	52	0	No
R-14	57	57	0	No
R-15	60	60	0	No

Source: WJV Acoustics, Inc.
JLB Traffic Engineering

b. Noise from Construction (Less Than Significant With Mitigation)

Construction noise would occur at various locations within the project site through the buildout period. Existing sensitive receptors could be located as close as 100 feet from construction activities. Table VIII provides typical construction-related noise levels at distances of 100 feet, 200 feet, and 300 feet.

Construction noise is not considered to be a significant impact if construction is limited to the allowed hours and construction equipment is adequately maintained and muffled. Extraordinary noise-producing activities (e.g., pile driving) are not anticipated. The City of Lemoore limits hours of construction to occur only between the hours of 7:00 a.m. to 8:00 p.m., Monday through Saturday. Construction activities outside of these hours, as well as Sundays and Holidays, may

only be allowed by the review authority through conditions of approval between. Construction noise impacts could result in annoyance or sleep disruption for nearby residents if nighttime operations were to occur or if equipment is not properly muffled or maintained.

TABLE VIII

TYPICAL CONSTRUCTION EQUIPMENT MAXIMUM NOISE LEVELS, dBA

Type of Equipment	100 Ft.	200 Ft.	300 Ft.
Concrete Saw	84	78	74
Crane	75	69	65
Excavator	75	69	65
Front End Loader	73	67	63
Jackhammer	83	77	73
Paver	71	65	61
Pneumatic Tools	79	73	69
Dozer	76	70	66
Rollers	74	68	64
Trucks	80	72	70
Pumps	74	68	64
Scrapers	81	75	71
Portable Generators	74	68	64
Backhoe	80	74	70
Grader	80	74	70

Source: FHWA
Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987

Potential Impact:
A noise impact could occur if construction activities do not incorporate appropriate mitigation measures and best management practices.

Mitigation Measures:
Noise levels associated with construction activities may be effectively mitigated by incorporating noise mitigation measures and appropriate best management practices. The following mitigation measures and best management practices should be applied during periods of project construction.

- Per the City of Lemoore Municipal Code, construction activities should not occur outside the hours of 7:00 a.m. to 8:00 p.m. Monday through Saturday and all day on Sunday.

- All construction equipment shall be properly maintained and muffled as to minimize noise generation at the source.

- Noise-producing equipment shall not be operating, running, or idling while not in immediate use by a construction contractor.

- All noise-producing construction equipment shall be located and operated, to the extent possible, at the greatest possible distance from any noise-sensitive land uses.

- Locate construction staging areas, to the extent possible, at the greatest possible distances from any noise-sensitive land uses.

- Signs shall be posted at the construction site and near adjacent sensitive receptors displaying hours of construction activities and providing the contact phone number of a designated noise disturbance coordinator.

c. Vibration Impacts (Less Than Significant)

The dominant sources of man-made vibration are sonic booms, blasting, pile driving, pavement breaking, demolition, diesel locomotives, and rail-car coupling. None of these activities are anticipated to occur with construction or operation of the proposed project. Vibration from construction activities could be detected at the closest sensitive land uses, especially during movements by heavy equipment or loaded trucks and during some paving activities (if they were to occur). Typical vibration levels at distances of 100 feet and 300 feet are summarized by Table IX. These levels would not be expected to exceed any significant threshold levels for annoyance or damage, as provided above in Table III and Table IV.

TABLE IX

TYPICAL VIBRATION LEVELS DURING CONSTRUCTION

	PPV (in/sec)	
Equipment	**@ 100´**	**@ 300´**
Bulldozer (Large)	0.011	0.006
Bulldozer (Small)	0.0004	0.00019
Loaded Truck	0.01	0.005
Jackhammer	0.005	0.002
Vibratory Roller	.03	0.013
Caisson Drilling	.01	0.006

Source: *Caltrans*

After full project build out, it is not expected that ongoing operational activities will result in any vibration impacts at nearby sensitive uses. Activities involved in trash bin collection could result in minor on-site vibrations as the bin is placed back onto the ground. Such vibrations would not be expected to be felt at the closest off-site sensitive uses. Additional mitigation is not required.

5. NOISE IMPACTS TO PROPOSED ON-SITE SENSITIVE RECEPTORS, AND MITIGATION MEASURES

The proposed residential development would result in new on-site sensitive receptors. These proposed residential land uses are subject to the noise level compatibility guidelines provided above in Table I.

a. Traffic Noise Impacts To Proposed On-Site Receptors (Less Than Significant With Mitigation)

Exterior Noise Levels

The City of Lemoore General Plan establishes an exterior noise level standard of 60 dB L_{dn} within outdoor activity areas of residential land uses, and the City's Municipal Code establishes an interior noise level standard of 45 dB L_{dn} within residential land uses. Transportation-related noise level exposures resulting from roadways within the project site would not result in an exceedance of these standards due to low traffic speeds and low traffic volumes. However, the proposed project includes sensitive receptors (residential land uses) that could be impacted by traffic noise exposure adjacent to arterial roadways (specifically 18th Avenue and Lacey Boulevard) that border the project site.

WJVA used the above-described FHWA traffic noise model and traffic noise modeling assumptions to determine the distances from the center of the roadways to the 60 dB CNEL/L_{dn} noise exposure contour. Table X provides the approximate distances from the center of the arterial roadways adjacent to the project site to the 60 dB CNEL/L_{dn} noise exposure contours. Table X provides the contour distances for 2040 Cumulative plus project traffic conditions, as they represent a worst-case assessment of traffic noise exposure at proposed sensitive receptor locations.

TABLE X

DISTANCES TO 60 dB CNEL/L_{dn} TRAFFIC NOISE CONTOURS
LACEY RANCH MASTER PLAN
2040 CUMULATIVE PLUS PROJECT CONDITIONS

Roadway Segment (Description)	Distance (feet) to 60 dB CNEL/L_{dn}
Lacey Blvd. (east of 18th Avenue)	92
Lacey Blvd. (west of 17th Avenue)	102
18th Avenue (Lacey Blvd to Street "S")	70
18th Avenue (Street "S" to Glendale Avenue)	89

Source: WJV Acoustics, Inc.
JLB Traffic Engineering

Potential Impact:
An exterior noise impact could occur if the outdoor activity areas of proposed multi- and single-family residential land uses are located within the 2040 cumulative conditions 60 dB CNEL/L_{dn} traffic noise contours, described above in Table X. Outdoor activity areas are generally considered to be backyards of single-family residential land uses and outdoor common use areas (pools, BBQ/Picnic areas, playgrounds, etc.) and individual patios and balconies of multi-family residential land uses. Based upon the site plan (Figure 1), residential land uses are proposed adjacent to these arterial roadways.

If the outdoor activity areas of the proposed residential land uses located along the roadways described above in Table X are within the 60 dB CNEL/L_{dn} contour (as described in Table X), an impact would be expected to occur. Such impacts could occur at proposed residential land uses adjacent to these roadways.

Mitigation Measures:
Noise levels from transportation noise sources may be effectively mitigated by incorporating noise mitigation measures into the project design that consider the geographical relationship between the noise sources of concern and potential receptors, the noise-producing characteristics of the sources and the path of transmission between noise sources and sensitive receptors.

Based upon the existing site, plan WJVA conducted a preliminary analysis of sound wall mitigation along Lacey Boulevard and 18th Avenue. A sound wall insertion loss program based on the FHWA Model was used to calculate the insertion loss (noise reduction) provided by a sound wall constructed along the project property line along the roadways. The model calculates the insertion loss of a wall of given height based on the effective height of the noise source, height of the receiver, distance from the receiver to the wall, and distance from the noise source to the wall. The standard assumptions used in the sound wall calculations are effective source heights of 8, 2 and 0 feet above the roadway for heavy trucks, medium trucks and automobiles, respectively. The standard height of a residential receiver is five feet above the ground elevation.

The preliminary sound wall analysis indicated that a sound wall constructed to a minimum height of 6 feet above project site grade would generally provide approximately 5 dB of noise level reduction within the proposed residential lots. This preliminary analysis indicates that with a 6-foot sound wall, outdoor activity areas located at a minimum setback distance of approximately fifty (50) feet from the centerline of both 18th Avenue and Lacey Boulevard would comply with the 60 dB CNEL/L_{dn} exterior noise level standard. This analysis should be considered preliminary in nature.

Interior Noise Levels
The City of Lemoore Municipal Code establishes an interior noise level standard of 45 dB CNEL/L_{dn} within indoor habitable spaces. The intent of the interior noise level standard is to provide an acceptable noise environment for indoor communication and sleep.

A specific analysis of interior noise levels was not performed. However, it may be assumed that residential construction methods complying with current building code requirements will reduce exterior noise levels by approximately 25 dB if windows and doors are closed. As the exterior noise exposure levels at any proposed residential land uses would not be expected to exceed 70 dB CNEL/L_{dn}, this will be sufficient for compliance with the City's 45 dB L_{dn} interior standard at all proposed lot (70-25=45). Requiring that it be possible for windows and doors to remain closed for sound insulation means that air conditioning or mechanical ventilation will be required.

b. Noise Impacts from Nearby Airports or Airstrips (No Impact)

The Project site is not located within two miles of a public airport or private airstrip.

6. IMPACT SUMMARY

This impact summary addresses only the noise impacts determined to be "potentially significant" and summarizes the mitigation measures that would be required to reduce noise levels to a "less than significant" level or states that the impact may be significant an unavoidable. Potential impacts and correlating mitigation measures are described in detail above, and summarized below.

- A noise impact could occur if construction activities do not incorporate appropriate mitigation measures and best management practices. Noise levels associated with construction activities may be effectively mitigated by incorporating noise mitigation measures and appropriate best management practices. The following mitigation measures and best management practices should be applied during periods of project construction.

    - Per the City of Lemoore Municipal Code, construction activities should not occur outside the hours of 7:00 a.m. to 8:00 p.m. Monday through Saturday and all day on Sunday.

    - All construction equipment shall be properly maintained and muffled as to minimize noise generation at the source.

    - Noise-producing equipment shall not be operating, running, or idling while not in immediate use by a construction contractor.

    - All noise-producing construction equipment shall be located and operated, to the extent possible, at the greatest possible distance from any noise-sensitive land uses.

    - Locate construction staging areas, to the extent possible, at the greatest possible distances from any noise-sensitive land uses.

    - Signs shall be posted at the construction site and near adjacent sensitive receptors displaying hours of construction activities and providing a contact phone number of a designated noise disturbance coordinator.

This impact is considered less than significant with mitigation.

- An exterior noise impact could occur if the outdoor activity areas of proposed multi- and single-family residential land uses are located within the 2040 cumulative conditions 60 dB CNEL/L_{dn} traffic noise contours, described above in Table X. Outdoor activity areas are generally considered to be backyards of single-family residential land uses and outdoor common use areas (pools, BBQ/Picnic areas, playgrounds, etc.) and individual patios and balconies of multi-family residential land uses. Based upon the site plan (Figure 1), residential land uses are proposed adjacent to these arterial roadways.

- Noise levels from transportation noise sources may be effectively mitigated by incorporating noise mitigation measures into the project design that consider the geographical relationship between the noise sources of concern and potential receptors, the noise-producing characteristics of the sources and the path of transmission between noise sources and sensitive receptors. Options for noise mitigation include the use of building setbacks, project design and the construction of berms and sound walls.

This impact is considered less than significant with mitigation.

7. SOURCES CONSULTED

1. City of Lemoore General Plan, May 2008.

2. City of Lemoore Municipal Code, March 16, 2021.

3. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual,* September 2013.

4. Federal Highway Administration, *Traffic Noise Model, Version 2.5,* April 14, 2004

FIGURE 1: PROJECT LAND USE PLAN

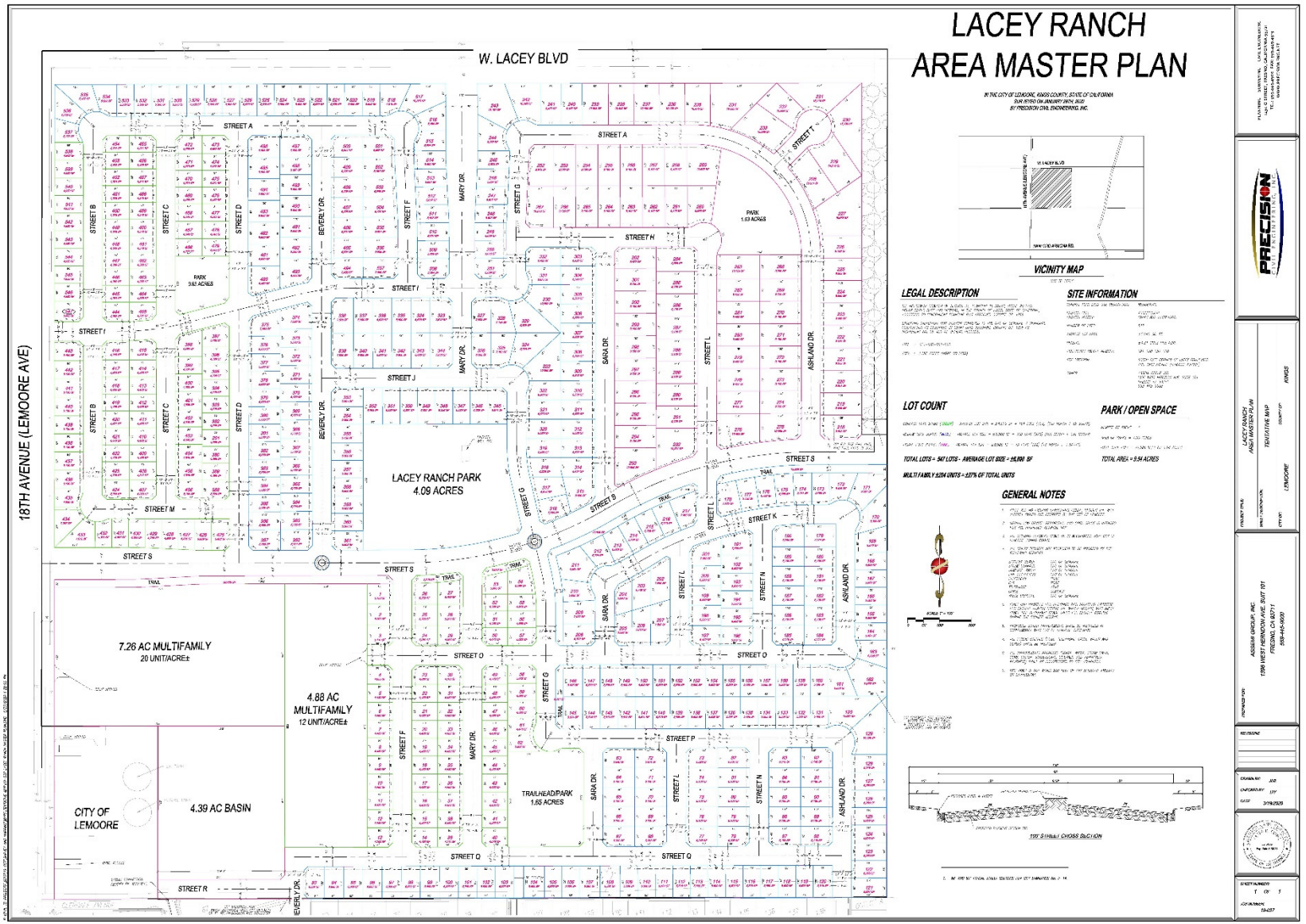


FIGURE 2: PROJECT VICINITY AND AMBIENT NOISE MONITORING SITES

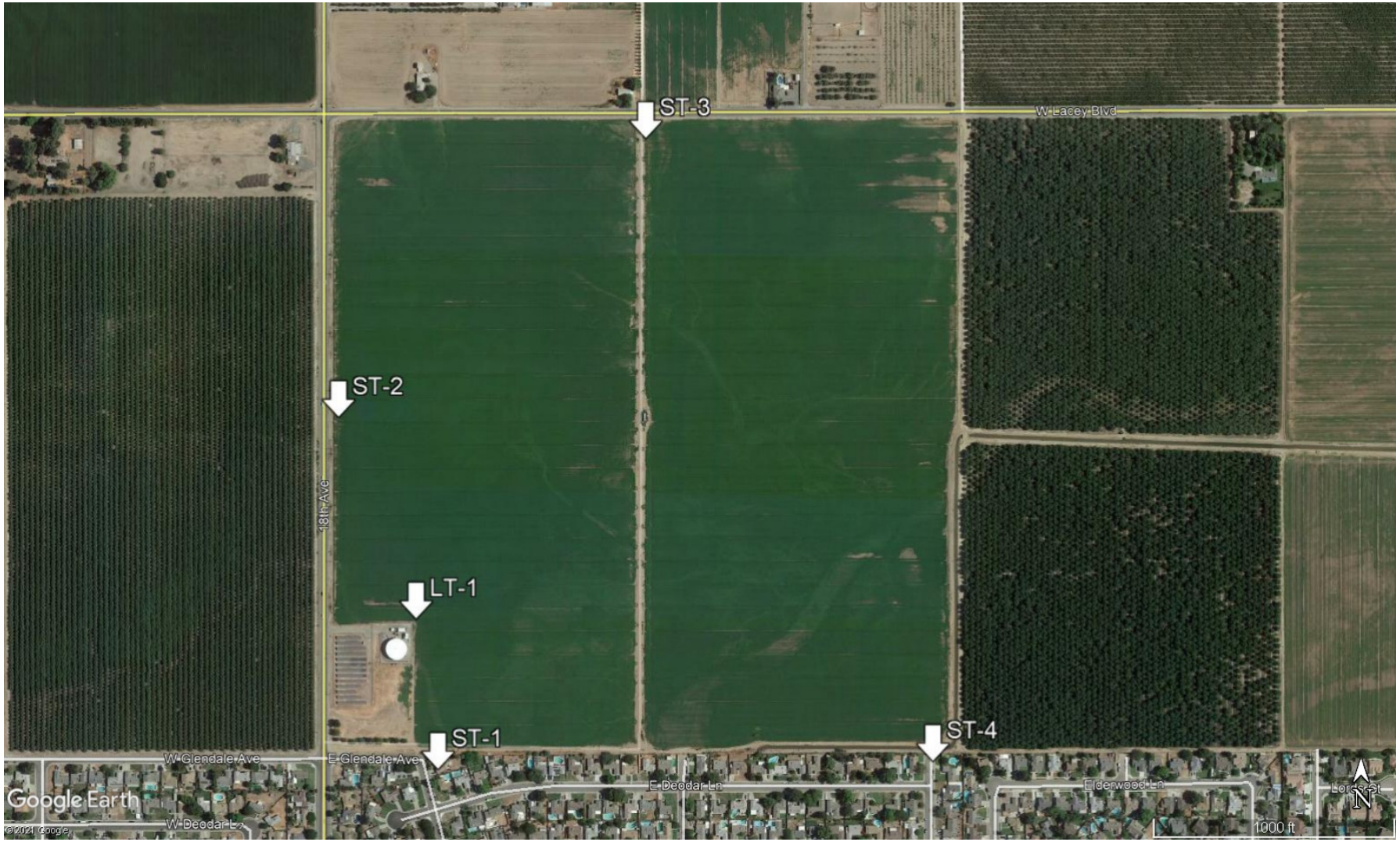


FIGURE 3: HOURLY NOISE LEVELS AT SITE LT-1

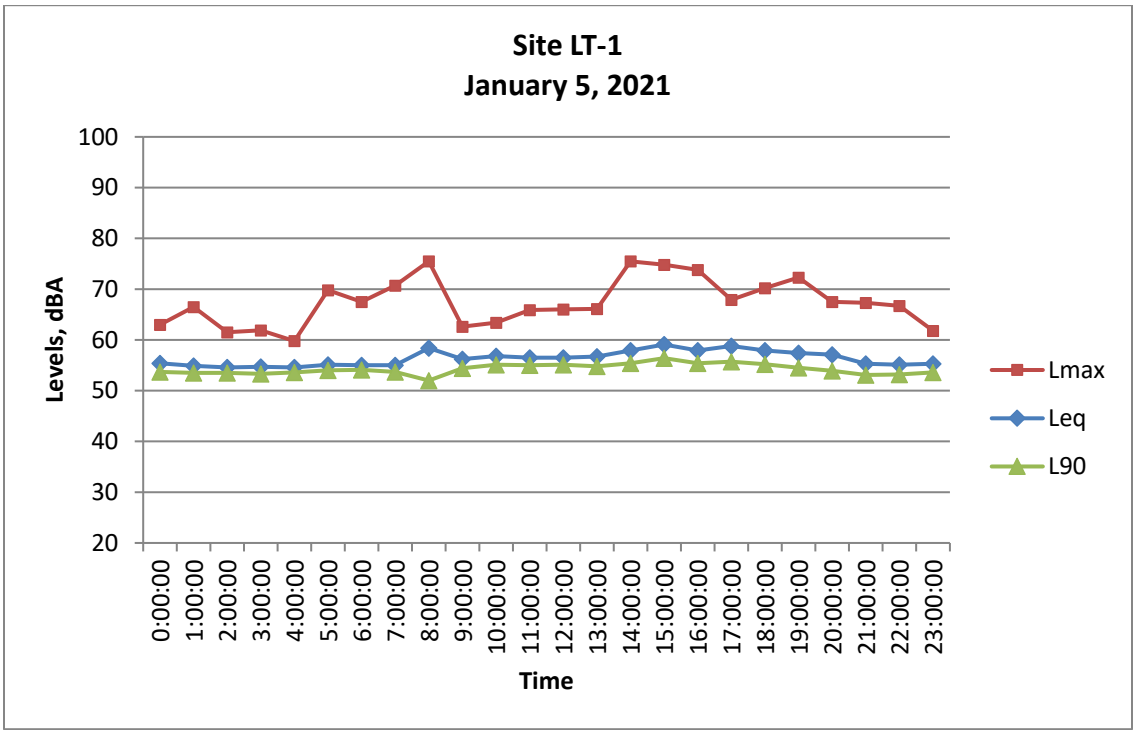
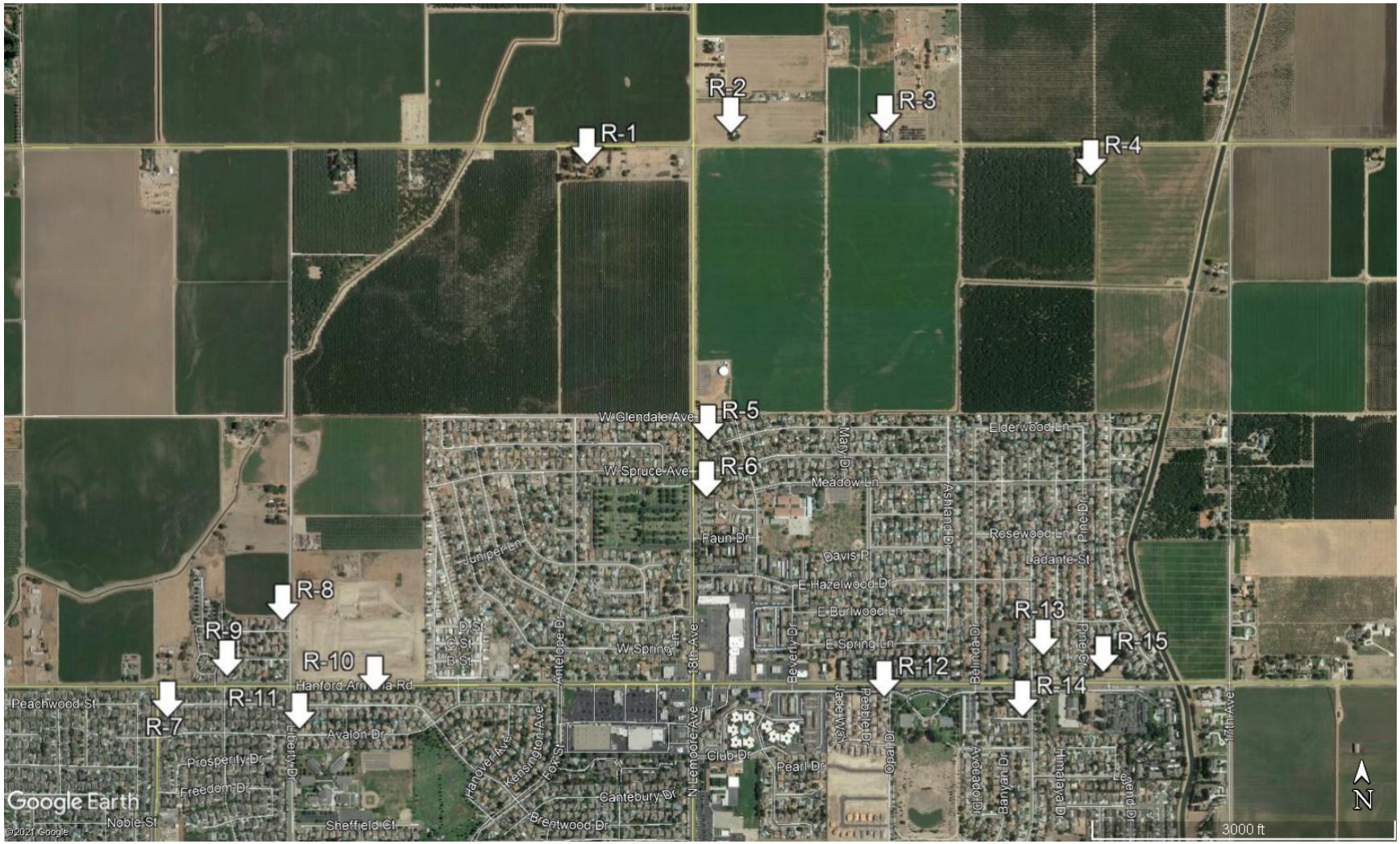


FIGURE 4: MODELED TRAFFIC NOISE RECEPTOR LOCATIONS



APPENDIX A-1

ACOUSTICAL TERMINOLOGY

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 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

DECIBEL, dB: 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 micronewtons per square meter).

DNL/L_{dn}: Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten 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.

NOTE: The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.

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.). For example, L_{10} equals the level exceeded 10 percent of the time.

ACOUSTICAL TERMINOLOGY

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.

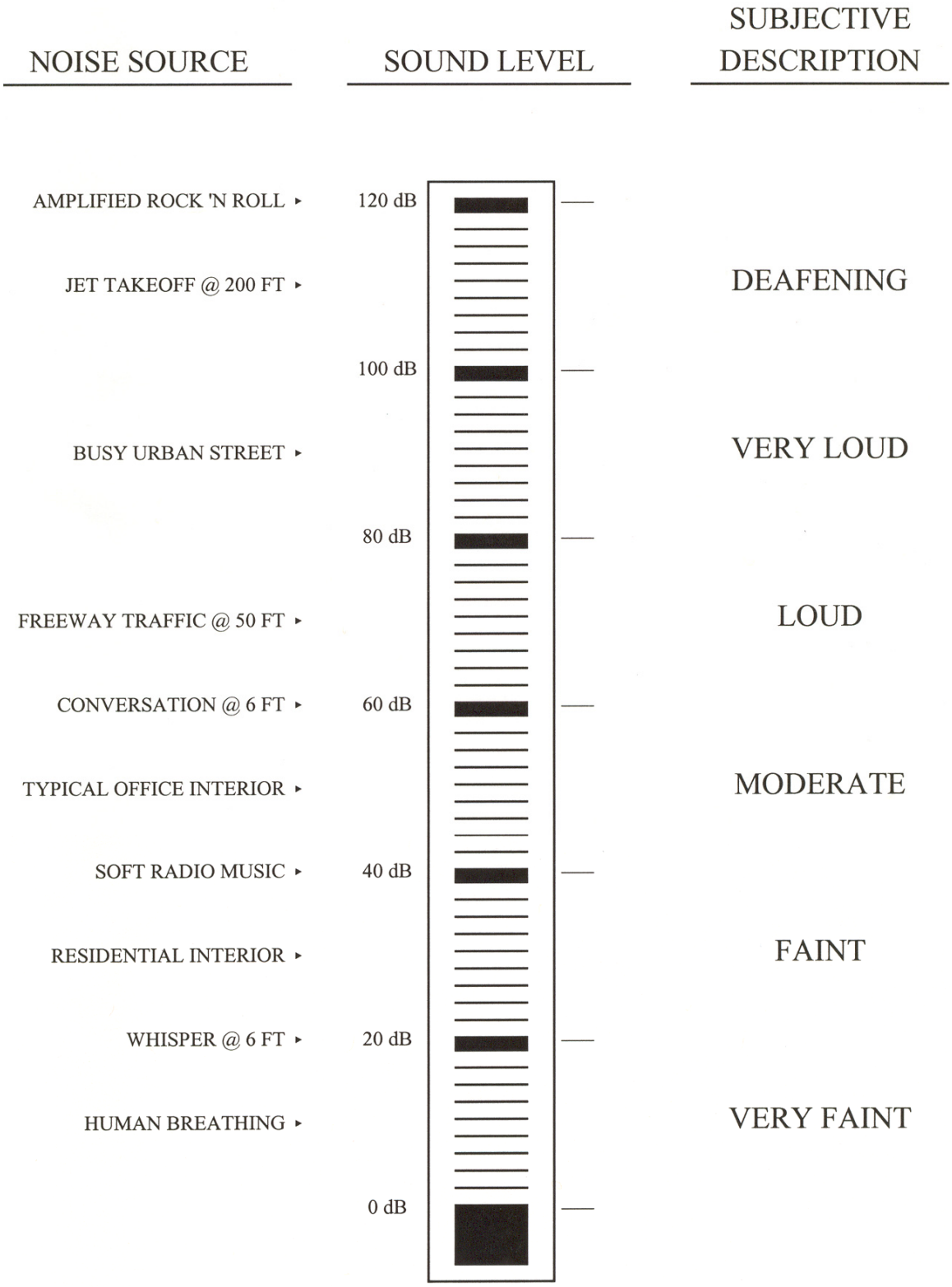
NOISE LEVEL REDUCTION (NLR): The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of "noise level reduction" combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

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 a 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 a reference duration of one second.

SOUND LEVEL: The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC): The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

APPENDIX B
EXAMPLES OF SOUND LEVELS



APPENDIX C

TRAFFIC NOISE MODELING CALCULATIONS

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
June 15, 2021

Project #:	20-046
Description:	Existing
Ldn/Cnel:	Ldn
Site Type:	Soft

Contour Levels (dB) 60 65 70 75

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Lacey Blvd R-1	w/o 18th Ave	3440	90		10	2	1	45	190	
2	Lacey Blvd R-2	e/o 18th Ave	4360	90		10	2	1	45	115	
3	Lacey Blvd R-3	e/o Mary Dr	4370	90		10	2	1	45	125	
4	Lacey Blvd R-4	w/o 17th St	4370	90		10	2	1	45	320	
5	18th Ave R-5	s/o Glendale Ave	5410	90		10	2	1	35	135	
6	18th Ave R-6	s/o Spruce Ave	5720	90		10	2	1	35	125	
7	19th Ave R-7	s/o Hanford Armona Rd	3000	90		10	2	1	35	90	
8	Liberty Dr R-8	n/o Hanford Armona Rd	2160	90		10	2	1	35	90	
9	Hanford Armona Rd R-9	w/o Liberty Dr	7890	90		10	2	1	35	90	
10	Hanford Armona Rd R-10	e/o Liberty Dr	7410	90		10	2	1	35	70	
11	Liberty Dr R-11	s/o Hanford Armona Rd	1480	90		10	2	1	35	80	
12	Hanford Armona Rd R-12	w/o Cinnamon Dr	8390	90		10	2	1	35	150	
13	Cinnamon Dr R-13	n/o Hanford Armona Rd	2130	90		10	2	1	35	120	
14	Cinnamon Dr R-14	s/o Hanford Armona Rd	3340	90		10	2	1	35	75	
15	Hanford Armona Rd R-15	e/o Cinnaom Dr	9400	90		10	2	1	35	90	

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
June 15, 2021

Project #:	20-046
Description:	Existing + project
Ldn/Cnel:	Ldn
Site Type:	Soft

Contour Levels (dB) 60 65 70 75

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Lacey Blvd R-1	w/o 18th Ave	3660	90		10	2	1	45	190	
2	Lacey Blvd R-2	e/o 18th Ave	4890	90		10	2	1	45	115	
3	Lacey Blvd R-3	e/o Mary Dr	5960	90		10	2	1	45	125	
4	Lacey Blvd R-4	w/o 17th St	5960	90		10	2	1	45	320	
5	18th Ave R-5	s/o Glendale Ave	10060	90		10	2	1	35	135	
6	18th Ave R-6	s/o Spruce Ave	10100	90		10	2	1	35	125	
7	19th Ave R-7	s/o Hanford Armona Rd	3070	90		10	2	1	35	90	
8	Liberty Dr R-8	n/o Hanford Armona Rd	2210	90		10	2	1	35	90	
9	Hanford Armona Rd R-9	w/o Liberty Dr	8590	90		10	2	1	35	90	
10	Hanford Armona Rd R-10	e/o Liberty Dr	8200	90		10	2	1	35	70	
11	Liberty Dr R-11	s/o Hanford Armona Rd	1540	90		10	2	1	35	80	
12	Hanford Armona Rd R-12	w/o Cinnamon Dr	8890	90		10	2	1	35	150	
13	Cinnamon Dr R-13	n/o Hanford Armona Rd	2190	90		10	2	1	35	120	
14	Cinnamon Dr R-14	s/o Hanford Armona Rd	3580	90		10	2	1	35	75	
15	Hanford Armona Rd R-15	e/o Cinnaom Dr	9700	90		10	2	1	35	90	

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
June 15, 2021

Project #:	20-046
Description:	2040
Ldn/Cnel:	Ldn
Site Type:	Soft

Contour Levels (dB) 60 65 70 75

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Lacey Blvd R-1	w/o 18th Ave	3870	90		10	2	1	45	190	
2	Lacey Blvd R-2	e/o 18th Ave	5160	90		10	2	1	45	115	
3	Lacey Blvd R-3	e/o Mary Dr	5170	90		10	2	1	45	125	
4	Lacey Blvd R-4	w/o 17th St	5170	90		10	2	1	45	320	
5	18th Ave R-5	s/o Glendale Ave	5690	90		10	2	1	35	135	
6	18th Ave R-6	s/o Spruce Ave	5790	90		10	2	1	35	125	
7	19th Ave R-7	s/o Hanford Armona Rd	4090	90		10	2	1	35	90	
8	Liberty Dr R-8	n/o Hanford Armona Rd	3430	90		10	2	1	35	90	
9	Hanford Armona Rd R-9	w/o Liberty Dr	10030	90		10	2	1	35	90	
10	Hanford Armona Rd R-10	e/o Liberty Dr	9150	90		10	2	1	35	70	
11	Liberty Dr R-11	s/o Hanford Armona Rd	1950	90		10	2	1	35	80	
12	Hanford Armona Rd R-12	w/o Cinnamon Dr	9350	90		10	2	1	35	150	
13	Cinnamon Dr R-13	n/o Hanford Armona Rd	2220	90		10	2	1	35	120	
14	Cinnamon Dr R-14	s/o Hanford Armona Rd	3800	90		10	2	1	35	75	
15	Hanford Armona Rd R-15	e/o Cinnaom Dr	11070	90		10	2	1	35	90	

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
June 15, 2021

Project #:	20-046
Description:	2040 + project
Ldn/Cnel:	Ldn
Site Type:	Soft

Contour Levels (dB)	60	65	70	75					

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Lacey Blvd R-1	w/o 18th Ave	4090	90		10	2	1	45	190	
2	Lacey Blvd R-2	e/o 18th Ave	5790	90		10	2	1	45	115	
3	Lacey Blvd R-3	e/o Mary Dr	6760	90		10	2	1	45	125	
4	Lacey Blvd R-4	w/o 17th St	6760	90		10	2	1	45	320	
5	18th Ave R-5	s/o Glendale Ave	10340	90		10	2	1	35	135	
6	18th Ave R-6	s/o Spruce Ave	10370	90		10	2	1	35	125	
7	19th Ave R-7	s/o Hanford Armona Rd	4160	90		10	2	1	35	90	
8	Liberty Dr R-8	n/o Hanford Armona Rd	3480	90		10	2	1	35	90	
9	Hanford Armona Rd R-9	w/o Liberty Dr	10730	90		10	2	1	35	90	
10	Hanford Armona Rd R-10	e/o Liberty Dr	9940	90		10	2	1	35	70	
11	Liberty Dr R-11	s/o Hanford Armona Rd	2010	90		10	2	1	35	80	
12	Hanford Armona Rd R-12	w/o Cinnamon Dr	10350	90		10	2	1	35	150	
13	Cinnamon Dr R-13	n/o Hanford Armona Rd	2280	90		10	2	1	35	120	
14	Cinnamon Dr R-14	s/o Hanford Armona Rd	3940	90		10	2	1	35	75	
15	Hanford Armona Rd R-15	e/o Cinnaom Dr	11370	90		10	2	1	35	90	
16	18th Avenue	s/o Lacey Blvd.	7010	90		10	2	1	35	90	
17	18th Ave	n/o Glendale Ave	10090	90		10	2	1	35	90	