Appendix J Noise & Vibration

Appendix J-1 Environmental Noise Assessment

Environmental Noise Assessment

Riverbend Sand and Gravel Project

Fresno County, California

BAC Job # 2011-068

Prepared For:

Riverbend Sand and Gravel, LLC

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Introduction

The acoustical consulting firm of Bollard Acoustical Consultants, Inc. has been retained by Riverbend Sand and Gravel, LLC, to assess noise and vibration emissions associated with the proposed Riverbend Sand and Gravel Project (Project).

This analysis assesses the Project's compliance with applicable Fresno County noise level standards and recommends feasible mitigation, as necessary, to ensure compliance with those standards as well as compliance with the standards set forth in the CEQA guidelines. This report assesses noise generated by on-site activities as well as offsite truck traffic.

Project Location

The project site is located north and south of Goodfellow Avenue between the Kings River and Riverbend Avenue in the County of Fresno. The proposed project site is located approximately 1.5 miles southeast of the City of Sanger, and includes approximately 619 acres of an approximately 833 acre site located immediately east and north of the Kings River. The remainder of the property, including the entire existing riparian habitat along the Kings River is excluded from the project. The project site is relatively flat and is currently in orchards and vineyards. Please see Figure 1 for the project location.

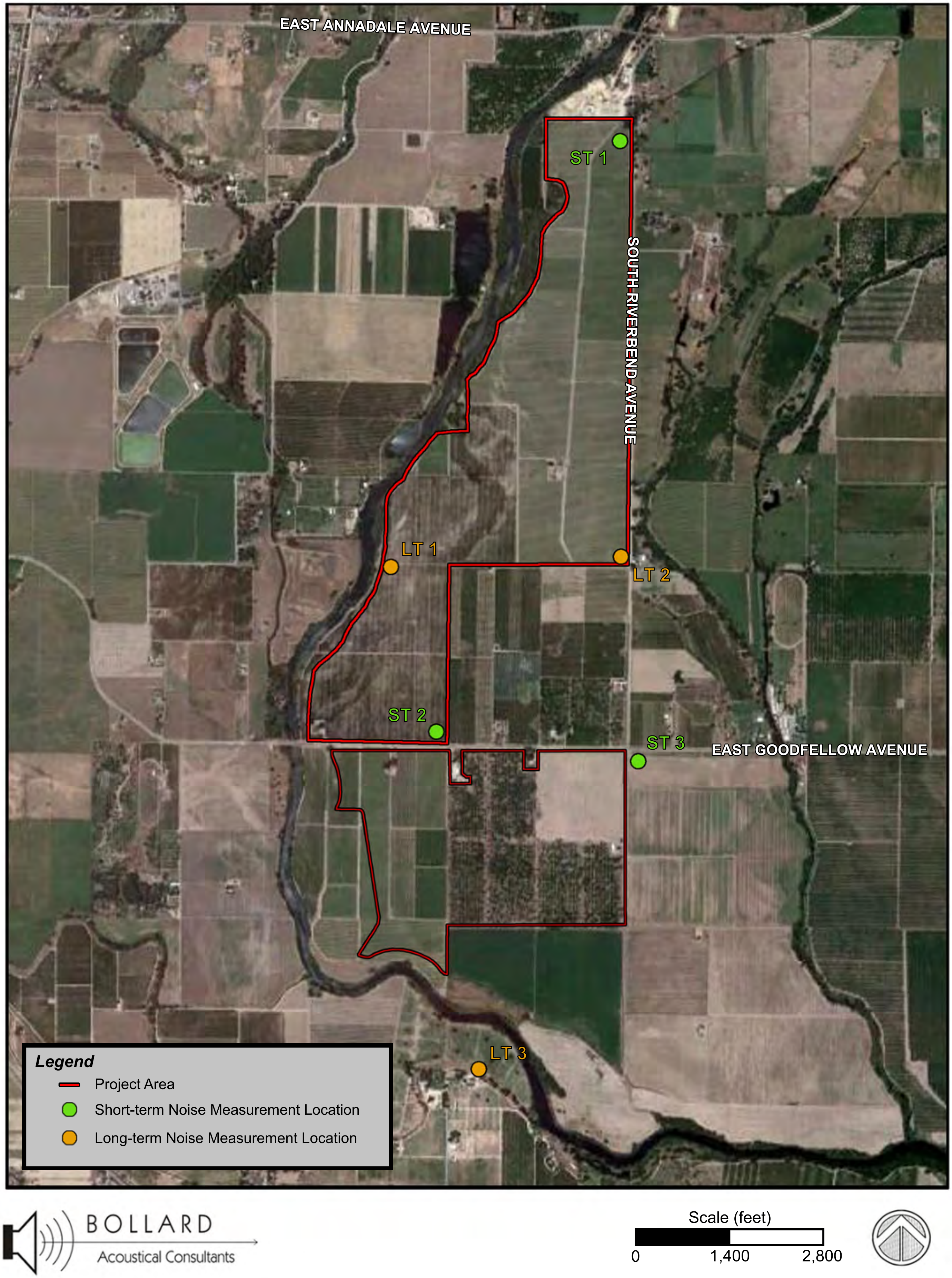
General Project Description

A Conditional Use Permit (CUP) is proposed for aggregate mining on approximately 619 acres. Operations will include mining activities, aggregate processing plant, hot mix asphalt (HMA) plant, ready-mix concrete plant (RMC) and associated mobile equipment. The facility will also include periodic use of a portable plant to recycle concrete and asphalt debris (including imported) into Crushed Miscellaneous Base (CMB). The asphalt plant will include the periodic use of a Recycled Asphalt Product (RAP) plant to facilitate use of recycled asphalt in HMA mix designs. Operations are anticipated to be on-going for at least 75 years.

The phases will be will be excavated with loaders and scrapers during removal of approximately two (2) feet of topsoil and approximately 15 - 22 feet of overburden, and by an electric-powered dragline during wet-pit operations. Mined aggregate will be initially transported to the processing plant by diesel-powered trucks for approximately one year. Subsequently, mined aggregate will be transported to the plant by electric-powered field conveyors.

Figure 1

Riverbend Sand and Gravel Project - Fresno County, California
Project Vicinity & Ambient Noise Measurement Locations



Proposed Hours of Operations

Aggregate operations are proposed to occur five days a week for approximately 250 days a year. Ready-mix concrete and asphalt plant operations are proposed to operate six days a week for approximately 275 days a year (partial days on Saturdays). Typical hours are shown on Table 1. However, mining and processing hours, including nighttime hours, will vary during different seasons of the year to comply with California's "Flex Your Hours" program by utilizing electricity during off-peak hours. Loading of material onto to trucks during nighttime hours will occur to support major public road projects that are required to be completed during night hours or on weekends to avoid traffic conflicts. In addition asphaltic oil, cement and other supplies may be delivered during nighttime hours.

Table 1
Proposed Typical Hours of Operation

Activity	Proposed Hours[1,2]
Excavation and Aggregate Processing	7:00 am - 7:00 pm, Weekdays
Loading and Aggregate Trucking[3]	6:00 am - 9:00 pm, Weekdays
Asphalt and Ready-Mixed Concrete Plants[4]	4:00 am-6:00pm, Weekdays, May-Oct
	5:30 am-6:00pm, Weekdays, Nov-Apr
	7:00 am-2:00pm, Saturdays

1- Maintenance of mobile and plant equipment extend beyond these hours.
2- During periods of public emergency and or major public road projects affecting the health and safety of the community, continuous 24 hours a day operations may be required.
3- Major public road projects may be required to be completed during night hours or on weekends to avoid traffic conflicts. Such projects may require loading operations beyond the hours and days of operation shown.
4- Asphaltic oil, cement and other supplies may be delivered during nighttime hours.

As indicated in Table 1, the proposed "typical" hours of operation are primarily daytime periods (7 am – 10 pm), with some early morning (nighttime) start-up of the asphalt and ready-mix concrete plants, as well as material load-out activities. The project also proposes flexible hours of operation during nighttime hours to take advantage of lower energy costs and to fill contracts requiring nighttime delivery of materials.

Because the Fresno County noise standards (discussed later in this report), are more restrictive during nighttime hours (10 pm – 7 am), than during daytime hours (7 am – 10 pm), and because all project operations are proposed to occur during both daytime and nighttime hours, this analysis evaluates impacts for each source separately for both daytime and nighttime periods.

Objectives of This Analysis

The objectives for this analysis are as follows:

- To provide background information pertaining to the effects of noise and vibration.
- To identify existing noise-sensitive land uses in the immediate project vicinity.
- To quantify existing ambient noise and vibration levels at those nearest noise-sensitive land uses.
- To clearly set out applicable thresholds of significance by using the California Environmental Quality Act (CEQA) Guidelines in concert with Fresno County noise standards.
- To compare existing noise and vibration levels at noise-sensitive receptors and evaluate the significance of project-related noise and vibration impacts.
- To predict project-related noise and vibration levels at the nearest noise-sensitive areas, and to compare those levels against the applicable thresholds of significance.
- To recommend mitigation, as necessary, to ensure compliance with Fresno County noise standards and the CEQA Guidelines.
- To evaluate noise and vibration mitigation options where significant project-related impacts are identified.
- To summarize the results of this analysis into a report for eventual use in the development of the project environmental documents.

Background on Noise and Vibration

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second) they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, called Hertz (Hz). Please see Appendix A for definitions of terminology used in this report.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals of pressure), as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in decibel levels correspond closely to human perception of relative loudness. Table 2 shows examples of noise levels for several common noise sources and environments.

The perceived loudness of sound is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighing the frequency response of a sound level meter by means of the standardized A-weighing network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels.

Table 2

Typical A-Weighted Sound Levels of Common Noise Sources

Loudness Ratio	dBA	Description
128	130	Threshold of pain
64	120	Jet aircraft take-off at 100 feet
32	110	Riveting machine at operators position
16	100	Shotgun at 200 feet
8	90	Bulldozer at 50 feet
4	80	Diesel locomotive at 300 feet
2	70	Commercial jet aircraft interior during flight
1	60	Normal conversation speech at 5-10 feet
1/2	50	Open office background level
1/4	40	Background level within a residence
1/8	30	Soft whisper at 2 feet
1/16	20	Interior of recording studio

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}) over a given time period (usually one hour). The L_{eq} is the foundation of the Day-Night Average Level noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The Day-Night Average Level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. L_{dn} based noise standards are commonly used to assess noise impacts associated with traffic, railroad and aircraft noise sources.

Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through a structure. As with noise, vibration consists of an amplitude and frequency. A person's response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the source.

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities (inches/second). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity. Although aggregate mining and processing vibration levels are not expected to be significant for this project due to the relatively large distances between project equipment (sources) and acoustically sensitive receivers, and the fact that no blasting will occur with this project, an assessment of mining-related vibration levels is addressed nonetheless.

Effects of Vibration on People & Structures

According to the Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, June 2004), operation of construction equipment and construction techniques generate ground vibration. Traffic traveling on roadways can also be a source of such vibration. At high enough amplitudes, ground vibration has the potential to damage structures and/or cause cosmetic damage (e.g., crack plaster). Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. Traffic, including heavy trucks traveling on a highway, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate by a few ten-thousandths to a few thousandths of an inch. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate or velocity of particle movement is the commonly accepted descriptor of the vibration "strength." This is referred to as the peak particle velocity (ppv) and is typically measured in inches per second.

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases. Given the considerable distances between project-related sources of vibration and the nearest existing residences to the project site, adverse impacts associated with project-generated vibration are unlikely.

Evaluation of Existing Ambient Noise and Vibration Environments

General Ambient Noise Environment

The existing ambient noise environment in the immediate project vicinity is consistent with that of typical rural areas and is defined primarily by natural sounds, (wind, birds, insects, etc.), local roadway traffic, and agricultural operations.

To quantify the existing ambient noise environment in the project area at representative residential receivers near the project site, (3) short-term and (3) continuous ambient noise level measurements were conducted at the 6 locations shown on Figure 1 on October 26-27, 2011.

The measurement locations were selected to be generally representative of existing ambient conditions at the nearest noise-sensitive land uses (residences) to the project site. It should be noted that it is not necessary or required to conduct ambient noise level measurements at each potentially-affected sensitive receptor in the project vicinity provided ambient measurement locations are representative of various receptor locations. For example, although no noise measurements were conducted to the north or west of the Kings River, long-term monitoring site LT-1, which was located in a quiet area near the river not affected by local traffic or other nearby noise sources, is considered to be representative similar conditions present at receptors on the opposite side of the river (R2, R8, R11). Similarly, sites ST-1, LT-2, and ST-3 are considered to be representative of receptors along South Riverbend Avenue and East Goodfellow Avenue, while monitoring site LT-3 is considered representative of receptor locations generally south of the project site (R-15).

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute.

The numerical summaries of the ambient noise level measurements are provided in Tables 3 and 4. The Table 3 data include daytime and nighttime, average and maximum noise levels for the continuous measurements, as well as the L_{dn} values computed from the hourly average noise levels. Table 4 data includes the average and maximum noise levels for the short term measurements. Appendix B shows a complete listing of the results, and Appendix C shows a graphical representation of the results.

Table 3
Summary of Continuous Noise Measurement Results
Riverbend Aggregate Mine Project B October 26-27, 2011

Site	Rep. Receiver	Description	Daytime (7 am to 10 pm) L_{eq}	L_{50}	L_{max}	Nighttime (10 pm - 7 am) L_{eq}	L_{50}	L_{max}	L_{dn}
LT 1	6, 8, 11	North of Goodfellow Ave on West of project area	43	38	60	41	39	51	48
LT 2	7 - 12	On Riverbend Ave East of project area	59	42	79	53	32	73	61
LT 3	15	South of project area across the river	47	40	72	50	36	63	56

Source: Bollard Acoustical Consultants, Inc.

Table 4
Summary of Short Term Noise Measurement Results
Riverbend Aggregate Mine Project B October 27, 2011

Site	Rep. Receiver	Description	L_{eq}	L_{50}	L_{max}
ST 1	1 – 5	North of project area on Riverbend Ave	58	39	72
ST 2	13	On Goodfellow Ave near center of project area	45	38	60
ST 3	14	East of project area on Goodfellow Ave	57	49	76

Source: Bollard Acoustical Consultants, Inc.

The noise measurement results shown in Tables 3 and 4 indicate that ambient conditions varied by location during the noise survey period. Because of bridge construction on Goodfellow Avenue over the Kings River, there was no traffic on East Goodfellow Avenue, west of South Riverbend Road, during the noise survey period. As a result, noise levels at ST-2 are believed to be artificially low, as local traffic would have resulted in higher noise levels at that location.

Existing Traffic Noise Environment

To describe existing noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the area. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict traffic noise levels in terms of L_{dn}, it is necessary to adjust the input volume to account for the day/night distribution of traffic.

Traffic volumes for existing conditions were provided by VRPA Technologies, Inc. Table 5 shows the predicted existing traffic noise levels in terms of L_{dn} at a reference distance of 100 feet from the centerlines of existing project-area roadways. This is considered to be the Abaseline@ condition. A listing of the FHWA Model input data for existing conditions is provided in Appendix D.

Table 5
Summary of 2015 Traffic Noise Exposure for Local Area Roadways
Riverbend Aggregate Mine Project – Fresno County, California

Roadway	From	To	L_{dn}, dB @ 100 Feet
McCall Avenue	Jensen Avenue	SR-180	63
McCall Avenue	North Avenue	Jensen Avenue	62
McCall Avenue	Central Avenue	North Avenue	60
Central Avenue	SR-99 SB Ramp	SR-99 NB Ramp	63
Central Avenue	Chestnut Avenue	SR-99 NB Ramp	64
Central Avenue	Golden State Boulevard	Chestnut Avenue	62
Central Avenue	Willow Avenue	Golden State Boulevard	62
Central Avenue	Clovis Avenue	Willow Avenue	60
Central Avenue	Temperance Avenue	Clovis Avenue	58
Central Avenue	McCall Avenue	Temperance Avenue	57
Central Avenue	Bethel Avenue	McCall Avenue	58
Central Avenue	Academy Avenue	Bethel Avenue	60
Central Avenue	Newmark Avenue	Academy Avenue	59
Central Avenue	Riverbend Avenue	Newmark Avenue	58

Sources: Buada Associates and Bollard Acoustical Consultants, Inc.

Existing Vibration Environment

The existing ambient vibration environment in the immediate project vicinity is extremely low, as would be expected in a rural area with no appreciable sources of local vibration. Because there were no identified sources of appreciable existing vibration in the project vicinity, baseline vibration levels around the project perimeter were well below the threshold of perception.

Criteria for Acceptable Noise and Vibration Exposure

In California, cities and counties are required to adopt a noise element as part of their general plan. Cities and counties can also adopt noise control requirements within their zoning ordinances or as a separate noise ordinance. The Project site is located in Fresno County, which has both a Noise Element and a Noise Ordinance. Applicable noise-level criteria for Fresno County are discussed below.

It should be noted that many of the land uses located in the immediate project vicinity are agriculturally zoned, and agricultural uses are not considered to be noise sensitive. However, for the purposes of assessing noise impacts for this project, and to be conservative, residences located on agriculturally-designated properties are considered to be noise-sensitive. Even though a given residence is considered to be noise sensitive, the agriculturally zoned property is not, so noise impacts are evaluated in this study at the residences themselves where the noise sensitivity exists rather than at the property line of the agriculturally designated parcel which, by virtue of both its zoning and expected use, is not considered to be noise sensitive.

Fresno County General Plan Noise Element

The California State Planning Law (Government Code §65302) requires all Counties, cities, and other government entities to prepare and adopt General Plan goals and policies related to noise. Fresno County has outlined several goals and policies related to noise concerns for projects within the County. Goals and policies related to the project include:

Goal HS-G: To protect residential and other noise-sensitive uses from exposure to harmful or annoying noise levels; to identify maximum acceptable noise levels compatible with various land use designations; and to develop a policy framework necessary to achieve and maintain a healthful noise environment.

Policy HS-G.1: The County shall require that all proposed development incorporate design elements necessary to minimize adverse noise impacts on surrounding land uses.

Policy HS-G.4: So that noise mitigation may be considered in the design of new projects, the County shall require an acoustical analysis as part of the environmental review process where noise sensitive land uses are proposed in areas exposed to existing or projected noise levels that are “generally unacceptable” or higher, according to the County’s Chart HS-1, Land Use Compatibility for Community Noise Environments. Proposed projects are likely to produce noise levels exceeding the levels shown in the County's Noise Control Ordinance at existing or planned noise-sensitive uses.

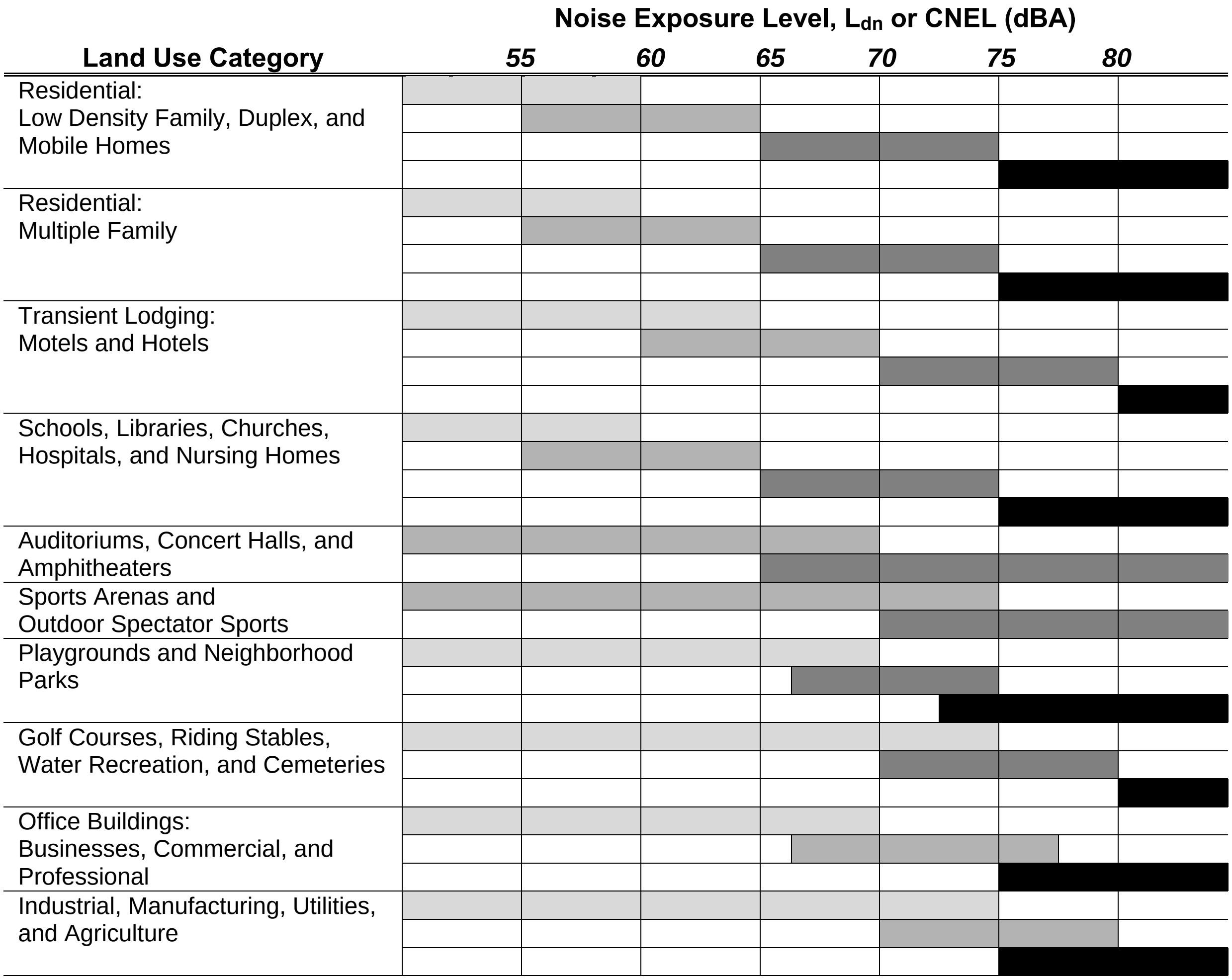
Policy HS-G.5: Where noise mitigation measures are required to achieve acceptable levels according to land use compatibility or the Noise Control Ordinance, the County shall place emphasis on such measures upon site planning and project design. These measures may include, but are not limited to, building orientation, setbacks, earthen berms, and building construction practices. The county shall consider the use of noise barriers, such as soundwalls, as a means of achieving the noise standards after other design-related noise mitigation measures have been evaluated or integrated into the project.

Policy HS-G.6: The County shall regulate construction-related noise to reduce impacts on adjacent uses in accordance with the County's Noise Control ordinance.

Policy HS-G.8: The County shall evaluate the compatibility of proposed projects with existing and future noise levels through a comparison to Chart HS-1, "Land Use Compatibility for Community Noise Environments."

Chart HS-1 provides noise compatibilities for various land use categories. The information is provided in Table 6, Land Use Compatibility for Community Noise Exposure.

Table 6
Land-Use Compatibility for Community Noise Exposure



Legend:

- **Normally Acceptable**: Specific land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise 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.
- **Generally 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.
- **Land Use Discouraged**: New construction or development should generally not be undertaken.

Source: County of Fresno 2000 General Plan

Fresno County Noise Ordinance

For residential uses affected by non-transportation (stationary or operational) noise sources (i.e., on-site aggregate extraction and processing), Section 8.40.040 (Exterior Noise Standards) of the County Code (Noise Ordinance) establishes performance standards as presented in Table 7. For this project, the evaluation period is considered to be the worst-case hours during which on-site equipment would be operating, including maximum truck traffic operations. Due to the nature of project-related noise sources, it is expected that the L_{50} criteria is the most restrictive. In the event the measured ambient noise level exceeds the applicable noise level standard in any category shown in Table 7, the applicable standard shall be adjusted per Section 8.40.040(b) of the Fresno County Noise Ordinance so as to equal the ambient noise level. Each of the noise level standards specified in Table 7 shall be reduced by 5 dB(A) for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

Table 7
Fresno County Noise Ordinance Standards

Duration Exceeded, Min.	Statistical Descriptor	Noise Level, dB Daytime (7 a.m.-10 p.m.)	Noise Level, dB Nighttime (10 p.m.-7 a.m.)
30	L_{50}	50	45
15	L_{25}	55	50
5	L_{8}	60	55
1	L_{2}	65	60
Any	L_{max}	70	65

Section 8.40.040 of Fresno County Code

Section 8.40.050 (Interior Noise Standards) of the County Code (Noise Ordinance) establishes performance standards which are essentially 15 dB lower than the County's exterior noise standards shown in Table 7 during daytime hours, and 20 dB lower than the County's nighttime noise level standards. Standard residential construction provides approximately 15 dB noise reduction with windows open and at least 25 dB with windows closed. Therefore, satisfaction with the County's daytime *exterior* noise standard would ensure satisfaction with the County's daytime *interior* noise standard. During nighttime hours, meeting the County's e*xterior* noise standard would ensure satisfaction with the County's *interior* noise standard, but only if residential windows are in the closed position.

Section 8.40.060 of the Fresno County Code states that noise sources associated with construction shall be exempt from the Table 7 standards, provided such activities do not take place before 6 a.m. or after 9 p.m. on any day except Saturday or Sunday, or before 7 a.m. or after 5 p.m. on Saturday or Sunday.

Noise Level Increase Criteria

It is generally recognized that an increase of at least 3 dB for similar noise sources is usually required before most people will perceive a change in noise levels, and an increase of 6 dB is required before the change will be clearly noticeable (*Egan, Architectural Acoustics, McGraw Hill*).

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. Table 8 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The rationale for the graduated scale is that test subject=s reactions to increases in noise levels varied depending on the starting level of the noise. Specifically, with lower ambient noise environments, such as those below 60 dB L_{dn}, a larger increase in noise levels was required to achieve a negative reaction than was necessary in more elevated noise environments. The Table 8 thresholds are consistent with those included in the Fresno County General Plan Health and Safety Element.

Table 8
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level (No Project), dB L_{dn}	Increase Required for Finding of Significance, dB
<60	+5 or more
60-65	+3 or more
>65	+1.5 or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB L_{dn}. Where pre-project ambient conditions are between 60 and 65 dB L_{dn}, a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels – specifically pre-project noise levels in excess of 65 dB L_{dn} – a 1.5 dB increase is considered by FICON as the threshold of significance.

According to the FICON study, Aif screening analysis shows that noise-sensitive areas will be at or above DNL 65 dB and will have an increase of DNL 1.5 or more, further analysis should be conducted. The FICON study also reported that “every change in the noise environment does not necessarily impact public health and welfare.”

While CEQA requires that noise impacts be assessed relative to ambient noise levels that are present without the project, it should be noted that audibility is not a test of significance according to CEQA. But CEQA specifically requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

Noise Exposure Criteria Used for Impact Assessment in this Study

As shown in Tables 2 and 3, as well as the report Appendices B & C, existing ambient noise levels in the project vicinity varied during the ambient noise survey period. In addition, the Table 4 data indicates that existing traffic noise levels near the project-area roadways similarly varies. Given the agricultural nature of the project area, and the fact that the project site is bordered by an existing aggregate operation to the north and a recently approved aggregate operation to the southeast, application of the County's Noise Ordinance Standards shown in Table 7 without upward or downward adjustment for varying ambient conditions appears to be appropriate for this project.

Vibration Criteria

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 9 indicates that the threshold for damage to structures ranges from 2 to 6 in/sec peak particle velocity (ppv). One-half this minimum threshold, or 1 in/sec ppv is considered a criterion that would protect against significant architectural or structural damage. The general threshold at which human annoyance could occur is noted as one tenth of that level, or 0.1 in/sec ppv.

Table 9
General Human and Structural Responses to Vibration Levels

Effects on Structures and People	Peak Vibration Threshold (in./sec. ppv)
Structural damage to commercial structures	6
Structural damage to residential structures	2
Architectural damage to structures (cracking, etc.)	1
General threshold of human annoyance	0.1
General threshold of human perception	0.01

Sources: Survey of Earth-borne Vibrations due to Highway Construction and Highway Traffic, Caltrans, 1976

Project Description

General

The project applicant is requesting a Conditional Use Permit (CUP/Use Permit) to allow for surface excavation of construction aggregate on the project site. Processing of the excavated material would be conducted within a central portion of the project site. The project is proposed for a term of up to 75 years. The locations of proposed mining boundaries and processing equipment areas are shown on Figure 2.

Proposed Processing Area Components

The processing area will contain the following project components.

- Hot mix asphalt production plant and related equipment
- Concrete ready-mix plant and related equipment
- Main aggregate processing plant (crushing, screening, washing) and related equipment
- Periodic use of portable recycled asphalt and concrete plant and related equipment.
- On-site access roads

Proposed Noise Control Measures

- The HMA plant will be equipped with an exhaust stack silencer.
- The main aggregate plant will be equipped with urethane screens on the elevated screen decks and heavy urethane or rubberized liners on the hoppers and chutes.
- All mobile equipment will be equipped with noise suppressor mufflers in compliance with all applicable local, state, and federal laws and regulations.
- Smart backup alarms will be utilized and adjusted to ambient noise levels. Strobe lights will replace audible back-up alarms during non-daylight working hours subject to California Division of Occupational Safety and Health (Cal OSHA) and United States Department of Labor Mine, Safety and Health Administration (MSHA) approval.
- Electric dragline excavation operations within 1,000 feet of an existing residence will be conducted such that the dragline boom is facing the nearest residences, thereby providing greater separation between those residences and the dragline motors/fans, and orienting the cooling fan outlet (which is the loudest dragline noise source and located on the opposite side of the dragline than the boom) away from those residences.
- A 10-foot tall vegetated earthen berm is proposed along the west side of the plant site (See Figure 2 for berm location).
- A 10-foot tall vegetated earthen berm is proposed along Riverbend Avenue (See Figure 2 for berm location).
- An 8-foot tall berm vegetated earthen is proposed along the South side of Goodfellow from Riverbend Avenue to 2000 feet West of Riverbend Avenue (See Figure 2 for berm location).

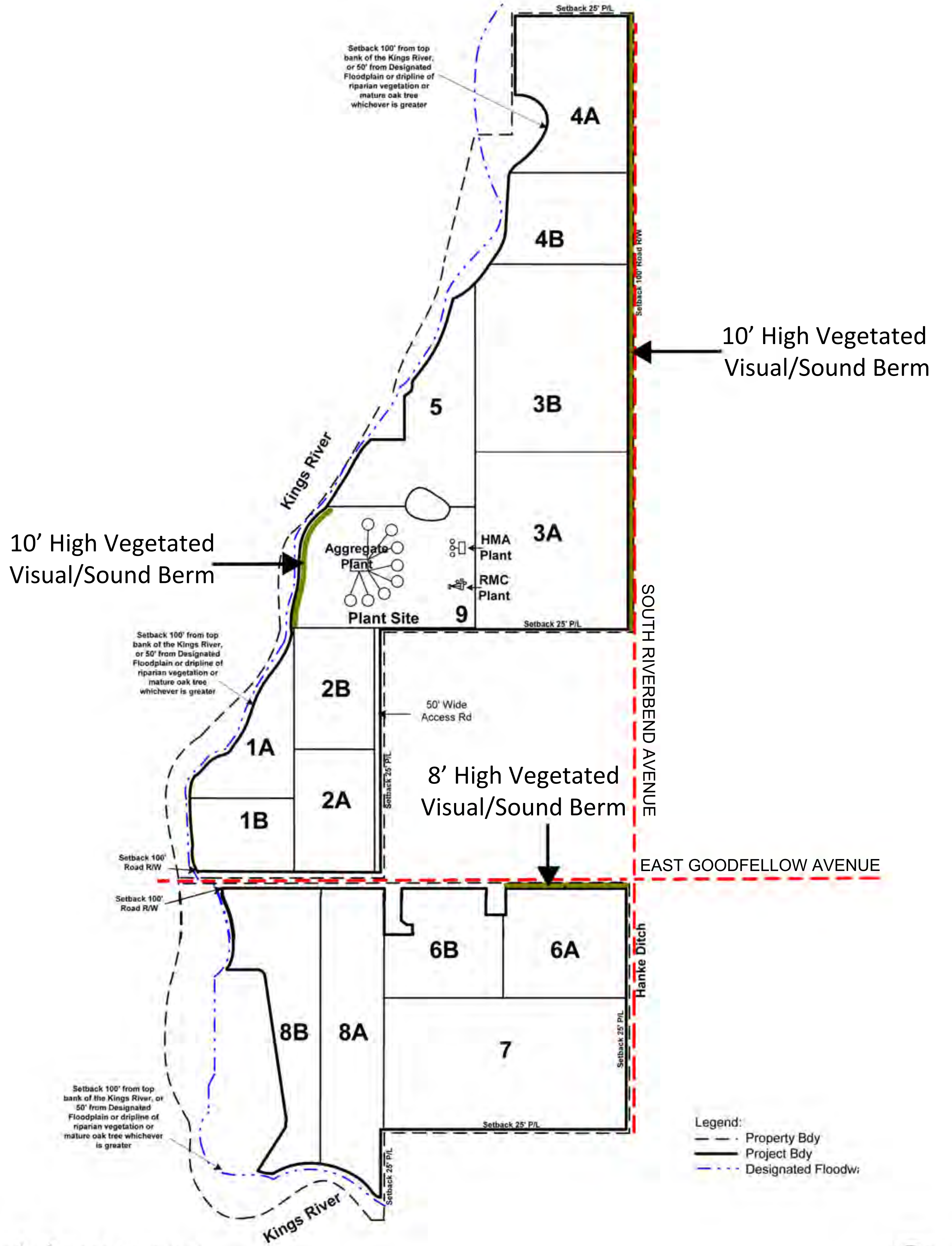
Proposed Excavation Activities

The excavation areas will be mined in sequential phases. Mining depths in each phase will vary according to, but not be limited by, quality of material, and excavation equipment limitations. Initial mining activities in each phase would involve the removal of approximately 15-20 feet of soil and overburden using dozers, tractor-scrapers, and motor graders. Water trucks would be used to control dust in mining areas and on project roadways. Groundwater levels are approximately the same level as the top of the aggregate resource. An electric dragline will be used to excavate aggregate material below the water table.

As noted above, the dragline operations will occur such that the dragline boom is oriented in the direction of the nearest residences. This measure would result in a greater separation between those residences and the dragline motors/fans (approximately 150 feet), and would orient the cooling fan outlet away from those residences.

Figure 2

Riverbend Sand and Gravel Project - Fresno County, California
Proposed Project Site Plan



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Noise Generation of the Proposed Project

Reference Noise Levels for On-Site Noise Sources

The major on-site noise sources identified for this Project include aggregate mining (heavy equipment operations in pit areas), the primary rock plant (crushing, screening, and load-out), the hot mix asphalt plant, the concrete ready-mix plant, on-site heavy truck traffic and the periodic use of the portable recycle plant. The noise emissions of these various sources were quantified through noise-level measurements taken by BAC in recent years at similar sand and gravel facilities, including the Vulcan Materials River Rock Facility located at 11599 Old Friant Road in Fresno, California, and Vulcan's Sanger-Centerville Plant to the northeast of the Riverbend site. Offsets were applied to the reference noise levels where appropriate to reflect the proposed source-specific noise-control measures included in the project design.

Table 10 shows the reference noise levels corresponding to the operation of the types of equipment that would be used at the Project site, including the aforementioned source-specific noise control measures (e.g. asphalt plant exhaust silencer, aggregate plant urethane sheets, smart backup alarms, etc.). Table 10 also shows the approximate distances to the 50 and 45 dB L_{50} noise contours for each on-site noise source, adjusted for source-specific noise control measures, but the contour distances do not account for shielding provided by proposed earthen berms, as that shielding is not uniform in all directions. The 50 and 45 dB L_{50} contours are identified in this analysis since these are the distances within which project noise generation could potentially exceed the daytime and nighttime noise standards of Fresno County.

It should be noted that BAC was unable to locate noise level data for the Bucyrus 380 electric dragline (or equivalent) which is proposed for excavation following overburden removal. Noise level measurements of the much larger Bucyrus 680 electric dragline conducted by BAC resulted in a reference median noise level (L_{50}) of approximately 78 dB at a reference distance of 100 feet from the operating dragline. Because the Model 380 electric dragline is considerably smaller than the measured 680, noise emissions of the dragline proposed for use at the Riverbend excavation areas are predicted to be lower. Although specific noise data for the 380 could not be located, BAC estimates the median noise level generated by the proposed dragline would be approximately 75 dB L50 at a reference distance of 100 feet behind the dragline, with a maximum noise level of approximately 82 dB at that same distance.

The dragline noise emissions were observed to be approximately 5 dB lower in front of the dragline versus behind the dragline. This is because the cooling fan outlets, which are one of the loudest components of dragline operation, are located on the rear of the dragline. As noted above, the proposed operation of the dragline would be such that the exhaust vents would face away from the nearest residences as the dragline pivots, thereby reducing the reference noise level from the dragline to approximately 70 dB L50. These levels should be verified once the electric dragline is in operation at the Riverbend project site.

The project site access route extends north-south between the processing plant area and East Goodfellow Avenue. While heavy trucks are on site, they would be subject to the Fresno County

Noise Ordinance Standards shown in Table 7. Once project heavy trucks leave the site and utilize public roadways, they would be subject to the criteria used to define significant traffic noise level increases at off-site residential locations. That analysis of off-site noise impacts associated with project heavy truck traffic follows in a later section of this report.

To compute noise levels associated by on-site heavy truck traffic, the noise generation of typical aggregate trucks and the number of truck passbys occurring during any given hour must be known. BAC file data for both empty and loaded aggregate trucks indicate that a mean Sound Exposure Level (SEL) of 75 dBA per truck passby can be expected a reference distance of 100 feet from the passby route, with a maximum level of approximately 73 dB at that distance.

The project would reportedly generate 144 heavy truck trips during the am peak hour. Given that number of worst-case hourly passbys and a SEL of 75 dB, the reference hourly average noise level at 100 feet computes to 61 dBA. Median (L_{50}) levels would be even lower than average noise levels, or approximately 55 dB L_{50}.

Table 10
Reference Noise Level Data and Predicted Noise Contours
Riverbend Aggregate Mine Project – Fresno County, California

	Reference Noise Level at 100 Feet[1]		Distance to Unmitigated Noise Contour, Feet[2]	
Noise Source	**L_{50}, dB**	**L_{max}, dB**	**50 dB L_{50} (Day)**	**45 dB L_{50} (Night)**
Mining (Excavation – Dragline[3])	70	80	1,400	2,200
Processing (Rock) Plant	75	90	1,400	2,200
Hot-Mix Asphalt Plant	74	80	1,300	2,000
Ready-Mix Concrete Plant	73	80	1,200	1,800
Recycle Plant (periodic [4])	73	85	1,200	1,800
On-Site Truck Movements	55	73	200	300

[1] Average noise levels represent any 1-hour period and assume continuous operation of the noise sources.
[2] The locations of the noise contours were computed from the reference levels assuming standard spherical spreading loss (-6 dB per doubling of distance) and a 1.5 dB reduction per 1,000 feet for atmospheric absorption and ground attenuation.
[3] Excavation will occur at locations 15-20 feet below existing grade level using a Bucyrus 380-W electric dragline or equivalent. These reference levels assume the dragline cooling air exhaust vents would not face the nearest residences. The noise contours for the dragline, however, are calculated based on worst case exposure of 75 dB L_{50} at the 100 foot reference distance.
[4] Estimated 250 hrs/yr annualized equivalent 0.8 hrs/day.

Noise Levels at Nearest Residences from On Site Project Noise Sources

Figure 3 illustrates the locations of the plant area noise sources and nearby receptors. That figure was used to scale the source-to-receiver distances needed to project the reference noise levels shown in Table 10 to the nearest residences. As stated previously, a sound decay rate of 6 dB per doubling of distance from source to receiver was used to model sound propagation from on-site project noise sources to the nearest receptors.

Sound is also attenuated over distance by molecular (atmospheric) absorption. The amount of sound energy absorbed by the atmosphere increases with distance, and is dependent on several factors. Those factors include the frequency content of the noise source, air temperature, and relative humidity. According to Table 6-1 of the publication Noise Control for Buildings and Manufacturing Plants (Bolt Beranek & Newman), for standard day conditions (59 degrees F & 70% RH), the molecular absorption at 1,000 hertz is 1.5 dB per thousand feet. To generally account for atmospheric absorption, as well as anomalous excess attenuation, an additional -1.5 dB per thousand feet was included in the computations of project noise exposure at the nearest residences.

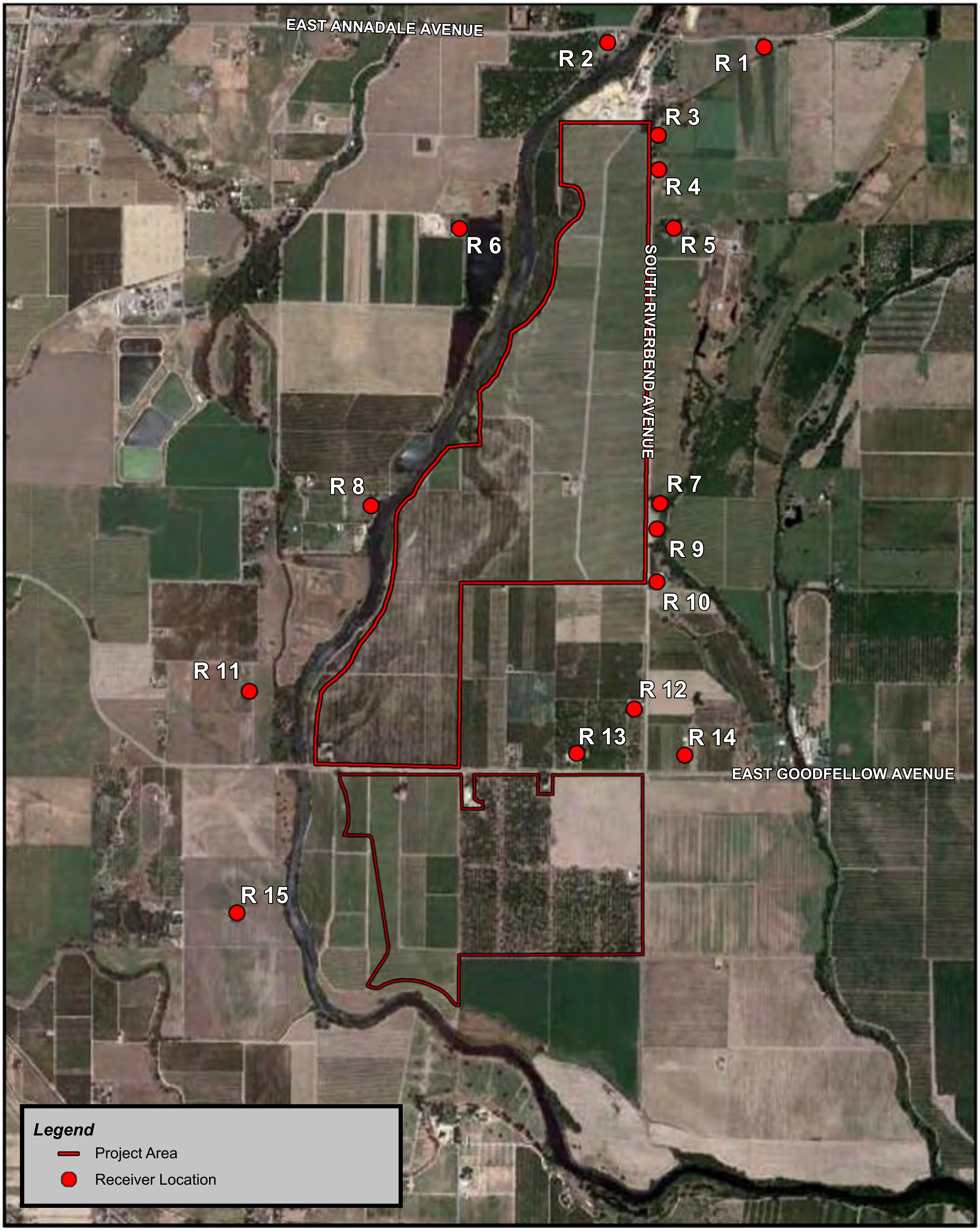
As noted previously, the project proposes earthen berms at the three locations identified on Figure 1. Where the proposed berms are located between the plant area noise sources identified on Figure 2 (aggregate, asphalt, recycle, and ready-mix plants), and the noise-sensitive receptors shown on Figure 3 (residences), a -5 dB offset was conservatively applied to the predicted noise levels at those receptors. For the proposed excavation operations which will utilize the electric dragline, a more detailed noise barrier analysis was utilized which incorporates actual elevations of the dragline, top of berm elevations, and receiver elevations. The results of those calculations indicate that the proposed berms would reduce noise generated by the electric dragline by approximately 8-9 dBA. The detailed barrier calculations for the electric dragline are provided in Appendix E.

Table 11 summarizes the predicted noise exposure from on-site noise sources at the nearest identified noise-sensitive receivers, including the additional noise-reduction resulting from the noise-control measures included in the project design (see previous section). Figures 4 and 5 illustrate the locations of the 50 and 45 dB L50 noise contours, respectively, for the individual noise sources associated with plant area operations, and include shielding provided by proposed earthen berms. The noise contours shown on Figures 4 and 5 are for individual sources, not cumulative contributions from several sources operating simultaneously.

Figure 6 illustrates the locations of the 45 and 50 dB L50 initial excavation (overburden removal) noise contours. The 50 and 45 dB L50 noise contours are illustrated in these figures because they represent the levels which would be within compliance of the County's daytime and nighttime median (L50) noise standards.

Figure 3

Riverbend Sand and Gravel Project - Fresno County, California
Receiver Locations



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Scale (feet)
0 1,400 2,800

Table 11
Summary of Estimated Distances and Noise Exposure Levels (Including source noise controls and proposed berms)
Riverbend Aggregate Mine Project – Fresno County, California

	Source to Receiver Distance, Feet						Noise Exposure – Hourly L_{50}, dB						
Receptor	Aggregate	HMA	RMC	Recycle	On-Site Traffic	Mining	Aggregate	HMA	RMC	Recycle	On-Site Traffic	Mining	Combined
1	8,300	7,700	8,000	7,600	8,350	2,225	19	20	18	19	0	35	35
2	7,300	7,000	7,400	6,900	7,550	1,225	27	27	25	26	6	41	42
3	6,450	5,900	6,300	5,900	6,450	340	24	25	23	24	4	50 – N	50 – N
4	6,050	5,500	5,800	5,500	6,050	345	25	26	24	25	5	50 – N	50 – N
5	5,400	4,800	5,100	4,800	5,400	475	27	28	26	27	7	47 – N	47 – N
6	4,400	4,400	4,700	4,100	4,480	2,080	36	35	33	35	15	36	42
7	2,940	2,000	2,100	2,300	2,900	405	36	40	38	37	16	48 – N	49 – N
8	1,250	2,100	2,200	1,900	1,250	690	46-N	39	38	40	26	43	49 – N
9	2,800	1,900	1,950	2,300	2,800	355	37	41	39	37	17	49 – N	50 – N
10	2,900	2,000	1,950	2,300	2,900	315	36	40	39	37	21	50 – N	51 – D/N
11	3,700	4,600	4,400	4,300	3,000	1,120	38	34	34	34	21	42	45
12	3,500	3,000	2,700	3,300	2,500	1,940	39	40	40	38	23	36	46 – N
13	3,500	3,350	3,000	3,500	1,700	525	39	38	39	37	28	47 – N	49 – N
14	4,500	4,100	3,800	4,300	3,200	930	35	36	36	34	20	44	46 – N
15	6,200	7,000	6,600	6,700	3,900	1,600	30	27	27	26	17	39	40

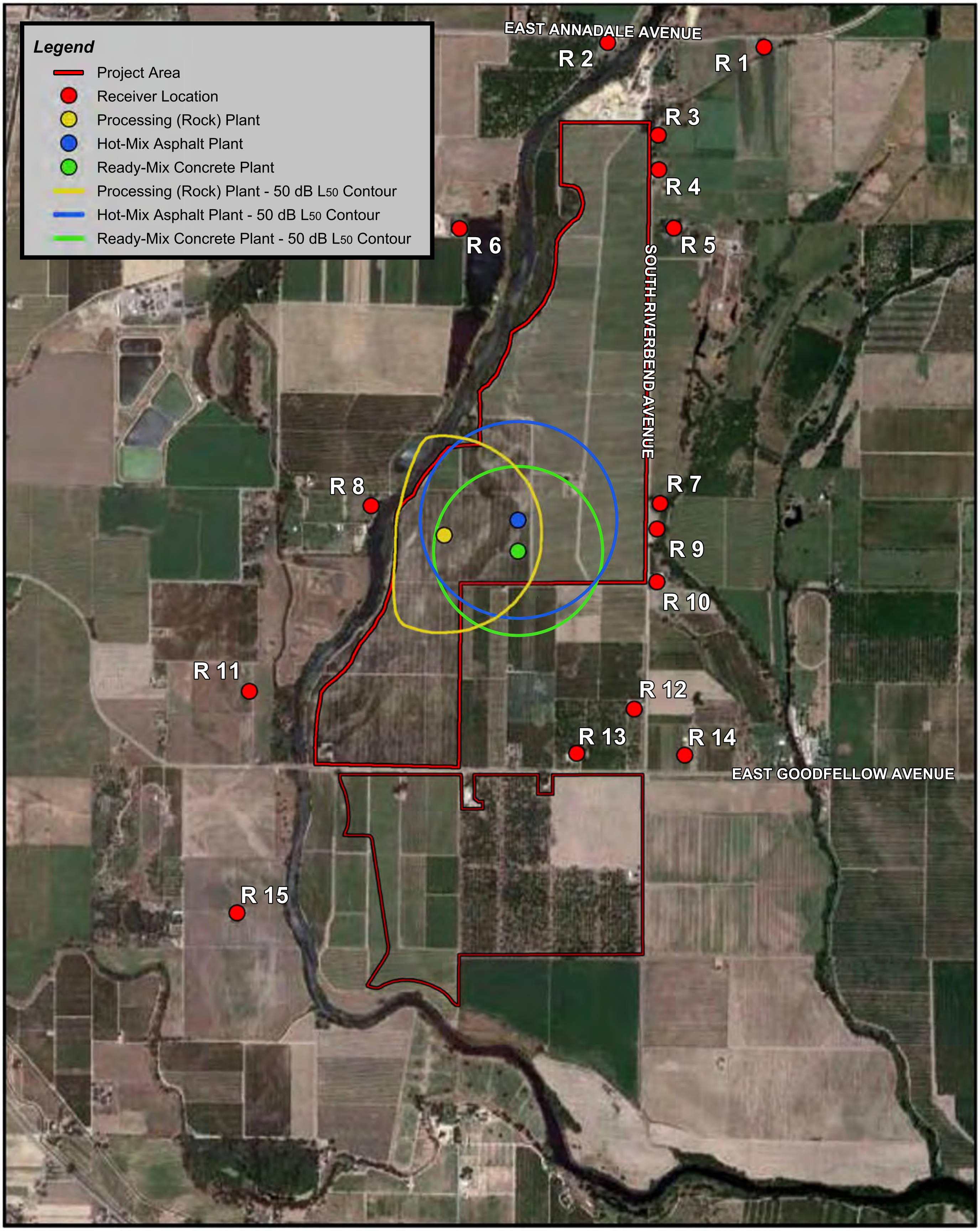
Notes:

- Median (Hourly L_{50}) noise levels represent any 1-hour period and assume continuous operation of each noise source.
- The predicted noise levels were calculated using the reference noise level data in Table 10 assuming spherical spreading loss (-6 dB per doubling of distance) and an additional 1.5 dB reduction per 1,000 feet for atmospheric and ground attenuation. In addition, where the proposed earthen berms would provide shielding of project noise at individual receiver locations, the predicted noise reduction resulting from that shielding is included in these calculations.
- The closest excavation locations were assumed to be with the dragline facing the mining border closest to the affected receiver.
- N = exceedance of 45 dB L50 nighttime noise standard.
- D = exceedance of 50 dB L50 daytime noise standard.
- Off-site traffic noise levels are not included in this table as traffic on public roadways is subject to the County's Ldn-based noise standards for Transportation noise sources whereas all on-site activities, including on-site truck traffic, are subject to the County's non-transportation noise source performance standards. Noise levels for off-site truck traffic are presented later in this report.

Figure 4

Riverbend Sand and Gravel Project - Fresno County, California

Plant Noise Contour Locations - Mitigated (50 dB L50)



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Scale (feet)

0 1,400 2,800

Figure 5

Riverbend Sand and Gravel Project - Fresno County, California
Plant Noise Contour Locations - Mitigated (45 dB L_{50})

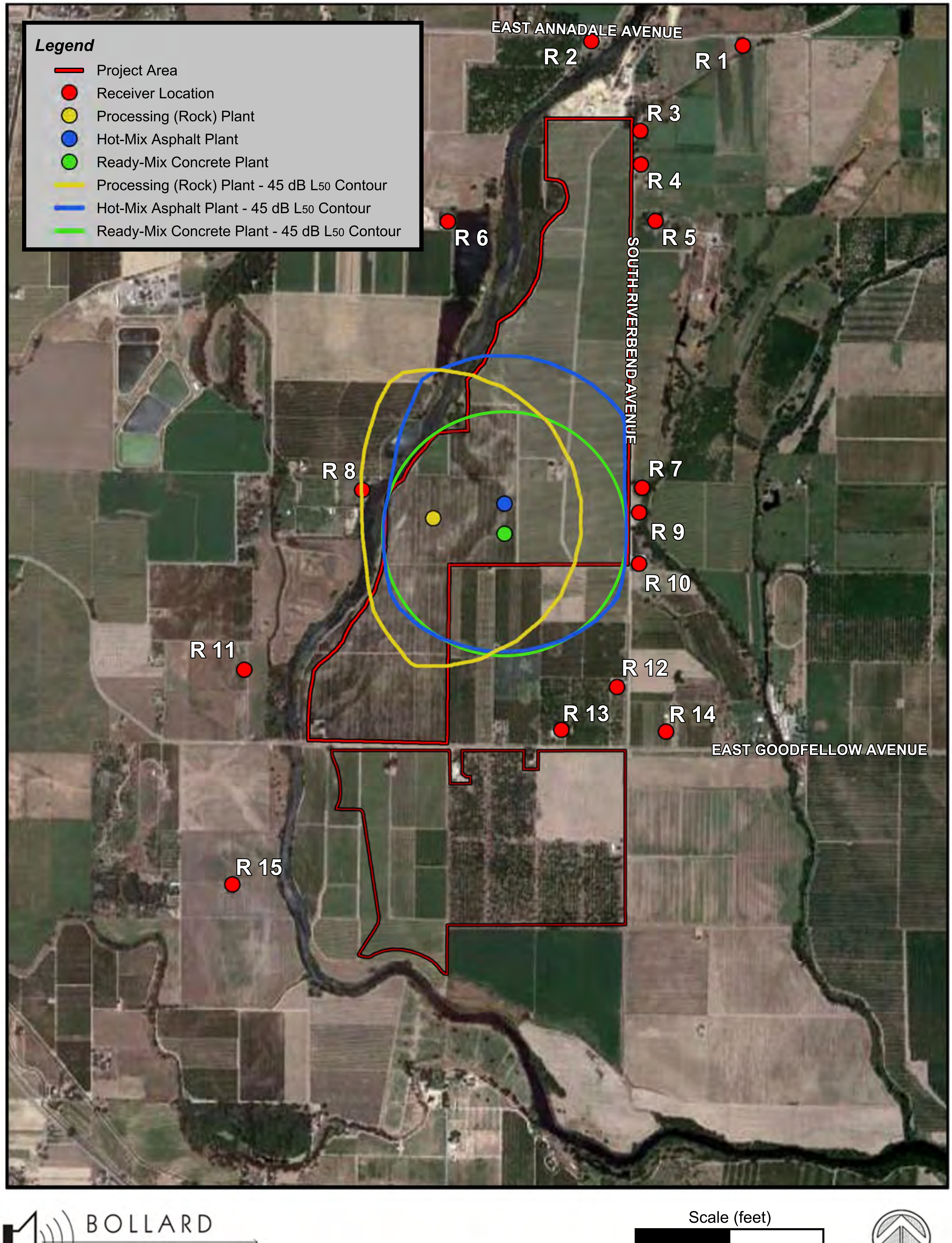

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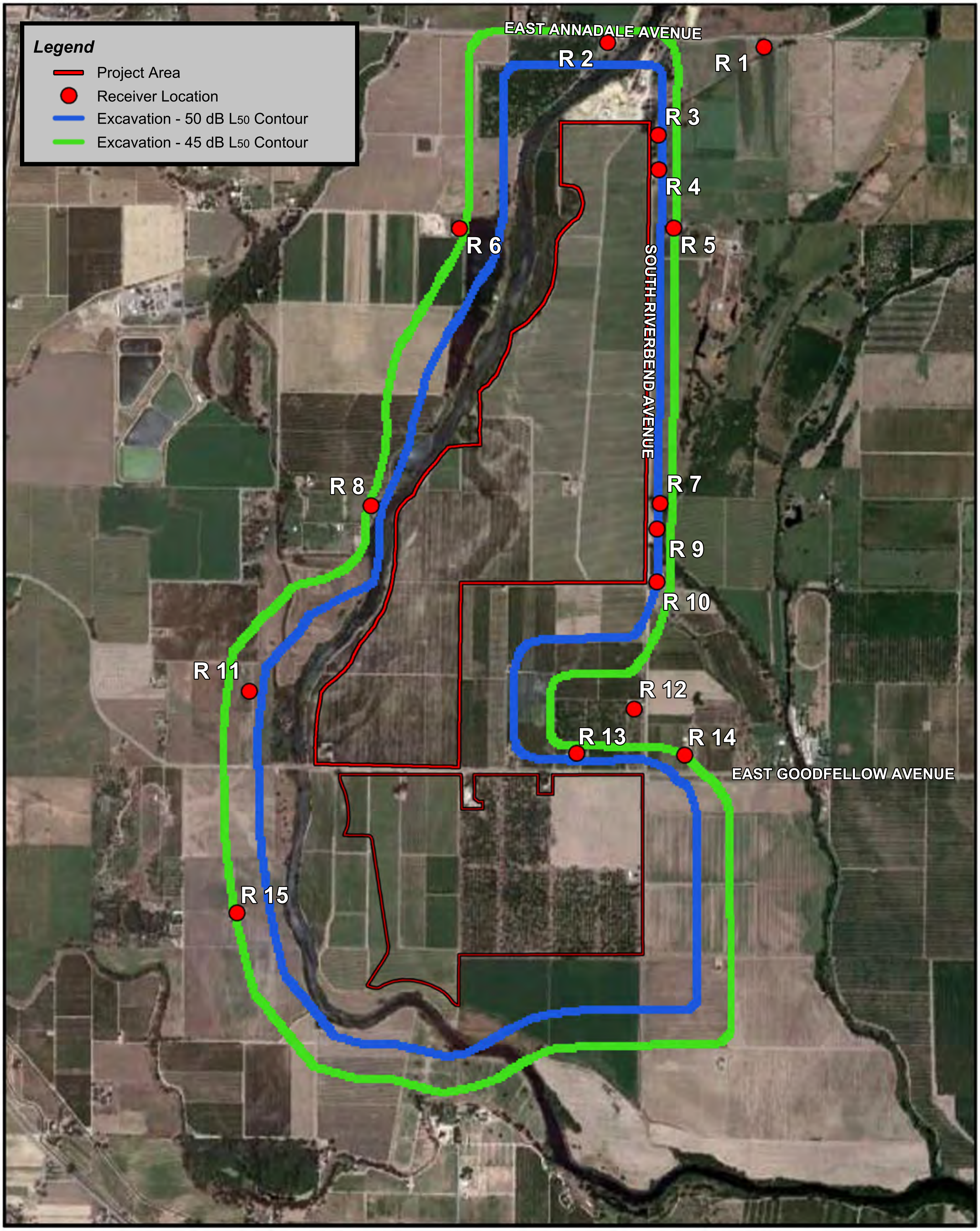
Figure 6

Riverbend Sand and Gravel Project - Fresno County, California

Excavation Noise Contour Locations - Mitigated (45 & 50 dB L_{50})



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Scale (feet)
0 1,400 2,800

Noise Impacts of the Proposed Project

On-Site Noise Sources

Table 11 provides a comparison of calculated project noise exposure from on-site sources to the applicable noise criteria at each of the closest identified noise-sensitive receivers. Those receiver locations are identified on Figure 1.

Table 11 indicates that, with the proposed noise control measures included in the project design, noise generated by the plant-area sources (aggregate processing, asphalt, concrete, and recycle plants) are predicted to satisfy the daytime and nighttime median (L50) noise standards of Fresno County at all of the nearest residences with the exception of Receptor 8, where aggregate plant noise levels could exceed the County's nighttime noise standard by 1 dB.

Table 11 also indicates that, due to a much closer proximity to existing residences, project excavation activities would likely result in exceedance of the County's nighttime noise standards of significance at 7 of the 15 residences located closest to the project site. If excavation activities were limited to daytime hours, Table 11 indicates that the County's daytime noise standards would be satisfied. Nonetheless, if nighttime excavation were to occur at the project site, noise impacts are predicted to be ***significant***.

Off-Site Traffic Noise Increases

To quantitatively assess traffic noise levels associated with the Project, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The Model is based on the Calveno reference noise factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Traffic Noise Model (TNM Version 2.5) was not used for this assessment due to inaccuracies involved with using TNM to compute traffic noise levels in terms of Day/Night Average Levels (L_{dn}).

Traffic volumes for future (2015), future (2019) and future (2035) conditions without the Project were provided by VRPA Technologies, Inc. in the form of peak hour turning movements for non-project traffic, and Average Daily Volumes for project traffic. ADT's for non project traffic were computed by multiplying the peak hour volumes by a factor of ten (10). The Project's proposed truck usage distribution on the area roadways was also provided by VRPA Technologies, taking into account the planned yearly material production. Table 12 shows the predicted future project traffic noise levels in terms of L_{dn} at a reference distance of 100 feet from the centerlines of existing project-area roadways for all project scenarios. Table 12 also shows the change in traffic noise levels due to the addition of project trucks, in parenthesis. The extent by which existing land uses located along the roadways listed below are affected by existing traffic noise depends on their proximity to the roads and their individual sensitivity to noise. A listing of the FHWA Model input data is provided in Appendix D.

It should be noted that, although the Table 12 data is provided at a reference distance of 100 feet from the roadway centerlines, it is recognized that distances from the roadway centerlines to existing residences located along project haul routes vary. However, regardless of the distance between the roadway centerline and residences, the *changes* shown in Table 12 (the values in parentheses), are not distance dependent. In other words, if a residence located 100 feet from the roadway centerline would experience a 2 dB increase in noise levels due to the project, a neighboring house located 50 or 200 feet from the roadway centerline would experience the same 2 dB increase. The *absolute* traffic noise levels would be higher for residences located closer to the roadway, and lower for residences further away, but the change would remain the same.

The Table 12 data indicate that the project-related increase in traffic noise levels could be significant along Goodfellow Avenue from McCall to Riverbend Avenue in future years. Since there are currently residences along this route, off-site traffic noise increases resulting from the project are expected to be ***significant***.

Nighttime Heavy Truck Traffic Noise

The project does not propose nighttime delivery of materials as part of its normal operations. However, local construction projects occasionally require supply of aggregate materials to the construction site during nighttime hours to ease daytime traffic congestion and increase safety to construction workers. In such cases, the Riverbend Quarry proposes to supply those projects if it is awarded the contract for materials. This does not mean, however, that the Riverbend Quarry will have Carte Blanche to load-out materials at night, as nighttime truck traffic generation would be based on the specific requirement of Caltrans or the local agency responsible for the night paving project.

The potential for sleep disturbance associated with additional nighttime truck traffic on the local roadway network during night paving projects is a regional issue, rather than project specific. That is because the local area aggregate producers do not dictate which projects would require nighttime delivery of paving materials. Such determinations are typically within the purview of Caltrans, or city and county public works departments. The individual aggregate producers bid on projects requiring nighttime delivery of materials, and those materials are shipped from the successful bidder's quarry. As a result, regardless of which quarry supplies the night paving project, additional heavy trucks on area roadways would occur.

It is important to note that there is already heavy truck traffic on area roadways during nighttime hours. Although nighttime paving projects would result in temporarily increased number of nighttime heavy trucks on area roadways (regardless of the supplier), existing residences located along the haul routes are already exposed to nighttime heavy truck passby noise. As a result, nighttime deliveries would not constitute a new noise source in the area.

Project Vibration

The project is not expected to produce any significant vibration at acoustically sensitive receivers in the project vicinity. This is due to the type of equipment which will be used at the site, the planned extraction methods (no blasting), and the relatively large distances between the project operations and potential receivers. As such, the potential impact associated with project-generated vibration is expected to be ***less than significant.***

Noise Impacts associated with Conveyance of Aggregate Materials from Phases 6A, 6B & 7 to CUP 3052 Site for Processing

An aggregate mining and processing site is permitted to operate adjacent to the project site, i.e. to the east and southeast under CUP 3052. In the future, the operators of CUP 3052 may be interested in an agreement with Riverbend to mine Phases 6A, 6B and 7 and process the excavated material at the CUP 3052 plant. If such an agreement were made, and if CUP #3052 were amended to import material from the Riverbend site, the aggregate in the Riverbend proposed Phases 6A, 6B and 7 would be excavated by an electric dragline and transported to the CUP 3052 plant (to the east and southeast) by overland conveyor for processing. The processing would occur in the same manner as if it was mined by Riverbend and conveyed to the Riverbend aggregate plant (to the north).

Project noise impacts associated with excavation of these materials would be the same as identified in Table 11 (i.e. excavation by electric dragline and material conveyed by electric conveyor). The only on-site operational difference is that excavated material would be conveyed off-site to the southeast to the CUP 3052 plant instead of north to the on-site Riverbend plant. This scenario could only occur if CUP 3052, including any environmental analysis (e.g. noise) of impacts to CUP 3052 operations, is amended to allow such material to be imported. Noise impacts associated with this scenario are expected to be ***less than significant***.

Project Construction Noise

During project construction, noise will be generated by the creation of onsite haul roads, berm construction, and plant assembly. However, the noise generation of these sources is predicted to be at or below the noise generation of the noise sources evaluated in Table 1. Provided project construction activities are limited to daytime hours, noise impacts associated with project construction are expected to be ***less than significant.***

Table 12
Summary of Traffic Noise Exposure Calculations
Riverbend Aggregate Mine Project – Fresno County, California

Roadway	From	To	L_{dn}, dB @100 Feet (Δ re: Project) 2015	2019	2035
McCall Avenue	SR-180	Jensen Avenue	64 (1)	65 (1)	67 (1)
McCall Avenue	Jensen Avenue	North Avenue	63 (1)	65 (2)	66 (1)
McCall Avenue	North Avenue	Central Avenue	61 (1)	**64 (3)**	65 (2)
Central Avenue	SR-99 NB Ramp	SR-99 SB Ramp	63 (0)	63 (0)	64 (0)
Central Avenue	SR-99 NB Ramp	Chestnut Avenue	64 (0)	64 (0)	65 (0)
Central Avenue	Chestnut Avenue	Golden State Boulevard	62 (0)	62 (0)	63 (0)
Central Avenue	Golden State Blvd	Willow Avenue	62 (0)	62 (0)	63 (0)
Central Avenue	Willow Avenue	Clovis Avenue	60 (0)	60 (0)	62 (0)
Central Avenue	Clovis Avenue	Temperance Avenue	58 (0)	59 (0)	61 (0)
Central Avenue	Temperance Avenue	McCall Avenue	57 (0)	58 (0)	60 (0)
Central Avenue	McCall Avenue	Bethel Avenue	60 (2)	**63 (4)**	**63 (3)**
Central Avenue	Bethel Avenue	Academy Avenue	61 (1)	**63 (3)**	64 (2)
Central Avenue	Academy Avenue	Newmark Avenue	61 (2)	**63 (4)**	**64 (3)**
Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	60 (2)	**63 (4)**	**64 (4)**

Notes:

1. Levels in **bold** represent potential project noise impact. Impacts are identified where the project would cause an increase in traffic noise levels of 5 dB or more where existing levels without the project are below 60 dB Ldn, an increase of 3 dB where existing noise levels are between 60 and 65 dB Ldn, and 1.5 dB where existing noise levels exceed 65 dB Ldn. This explains why a 3 dB increase is significant along some segments and less than significant along others.
2. Because this table shows traffic noise levels with the project, the existing traffic noise level without the project can be determined by subtracting the project-related increase (the dB level in parentheses), from the noise levels shown to the immediate left.
3. Sources: VRPA Technologies and Bollard Acoustical Consultants, Inc.

Noise Mitigation Measures

As noted above, project-related noise impacts are identified at several existing residences in the immediate project vicinity receiver locations if main processing plant and excavation activities were to occur during nighttime hours. As a result, noise mitigation measures would be required for this identified significant noise impact.

In general, there are three primary avenues for noise mitigation: (1) treatment of the noise source; (2) treatment of the sensitive receiver; or (3) treatment of the path in between. Treatment of the noise source involves reducing the sound output of the various project components. Treatment of the receiver involves providing additional acoustical insulation of the affected residential structures (e.g., improved windows and doors, appropriate weather-stripping, other building facade upgrades, etc.). Treatment of the sound transmission path involves either increasing the length of the path through the creation of additional setbacks between the noise source and receiver, or constructing a physical barrier which intercepts line of sight between the noise source and receiver. The following section provides specific mitigation recommendations for the various aspects of the project identified as either individually, or collectively contributing to a significant noise impact at an existing residence.

Excavation Noise Mitigation

As noted in Table 11, noise exposure from nighttime excavation operations, specifically those along the borders of the mining areas nearest existing residences, are predicted to exceed the applicable County noise exposure limits at 7 residences if excavation were to occur during nighttime hours. Excavation noise exposure is predicted to range from 2 to 5 dB above the applicable 45 dB L_{50} nighttime criteria at the affected residences.

It is important to note that the excavation noise predictions shown in Table 11 already assume 8 to 10 foot berms that break the line of sight between the excavation drag-line noise source and sensitive receivers. The Table 11 data also assume that the dragline is operating from a position approximately 17-24 feet below existing ground elevation. As a result, no further topographic shielding of dragline operations beyond that already included in the Table 11 calculations can be expected as excavation progresses.

Because excavation operations could exceed the project significance criteria during nighttime hours, and because nighttime excavation is proposed to take advantage of reduced energy costs at night, significant excavation-related noise impacts were identified for project excavation.

The following specific measures are required to ensure impacts associated with project dragline excavation are less than significant:

1. The reference sound levels associated with dragline operation shall be verified through noise level measurements immediately upon commencement of dragline operations at the project site. In the event that actual noise emissions of the dragline exceed the assumptions contained within this analysis, additional noise control measures shall be implemented. Those measures would include replacing fan motors with variable drive motors and/or installation of cooling air inlet and/or exhaust silencers directly to the dragline as required to satisfy the Fresno County Noise Ordinance standards.

2. Excavation activities using the proposed dragline shall be limited to daytime hours unless it can be demonstrated through on-site noise measurements that such activities could occur during nighttime hours without exceeding the project standards of significance at nearby residences.

3. Prior to mining within 900 feet of Residences 3, 4, 5, 7, & 9 along Riverbend Avenue, the proposed 10-foot tall berm should be constructed near the western edge of the proposed 100-foot excavation setback.

4. Prior to mining within 900 feet of Residence 10 along Riverbend Avenue, an 11-foot tall berm should be constructed near the western edge of the proposed 100-foot excavation setback.

5. Prior to mining within 900 feet of Residence 13, the proposed 8-foot tall berm should be constructed near the southern edge of the proposed 100-foot excavation setback along the South side of Goodfellow from Riverbend Avenue to 2000 feet West of Riverbend Avenue.

6. Excavation activities within 1,000 feet of an existing residence shall be conducted such that the dragline cooling exhaust fans do not directly face the residence.

7. Nighttime excavation within 1,000 feet of Residence 8 shall not occur concurrently with nighttime operation of the aggregate plant unless it can be demonstrated through noise level measurements that combined nighttime excavation and aggregate plant operations would not exceed 45 dBA L_{50} at Residence 8.

Asphalt Plant Noise Mitigation

Table 11 indicates that, during nighttime operation of the proposed asphalt plant, the Fresno County 45 dB L_{50} noise standard would be satisfied at all residences in the immediate project vicinity. Specifically, noise generated by asphalt plant operations is predicted to range from 19 to 40 dB L_{50} at the nearest residences. As a result, no additional noise mitigation measures beyond those proposed as part of the project description would be required for this aspect of the project.

Main Processing Plant Noise Mitigation

Table 11 indicates that, during nighttime operation of the proposed main processing plant, the Fresno County 45 dB L_{50} noise standard would be satisfied at all residences in the immediate project vicinity with the possible exception of Receptor 8. Specifically, noise generated by processing plant operations is predicted to range from 19 to 46 dB L_{50} at the nearest residences. As a result, additional noise mitigation measures beyond those proposed as part of the project description would be required for this aspect of the project.

The following specific measures are required to ensure impacts associated with nighttime operation of the main processing plant are less than significant:

1. Prior to commencement of nighttime operation of the main aggregate processing plant, the applicant shall conduct noise level measurements of the processing plant equipment in normal operation to determine the degree of additional noise attenuation (if any), which would be required to achieve compliance with the County's 45 dB nighttime exterior noise standard.

2. If it is determined from the processing plant noise surveys that additional noise reduction would be required to achieve compliance with the County's 45 dB nighttime noise standards, then no nighttime operation of the main processing plant equipment shall be conducted until additional noise control measures have been incorporated into the project design. Such measures could include, but not be limited to, one or a combination of the following:

    a. Aggregate stockpiles could be maintained so as to provide additional shielding of main processing plant noise generation in the direction of Receptor 8.

    b. The proposed 10-foot tall earthen berm in the vicinity of Receptor 8 could be increased in height.

    c. An additional sound barrier could be constructed adjacent to the noisiest plant area equipment to provide additional shielding in the direction of Receptor 8.

3. Following implementation of the additional main processing plant noise control measures, additional daytime noise tests should be conducted to confirm that the County's 45 dB exterior noise standard has been satisfied prior to commencement of nighttime operation of the main processing plant activities.

Ready-Mix Plant Noise Mitigation

Table 11 indicates that, during operation of the proposed Ready-Mix plant, noise generated by that equipment would satisfy the project significance criteria at all residences in the immediate project vicinity during both daytime and nighttime hours. As a result, no additional noise mitigation measures beyond those proposed as part of the project description would be required for this aspect of the project.

Recycle Plant Noise Mitigation

Table 11 indicates that, during operation of the Recycle Plant, noise generated by that equipment would satisfy the project significance criteria at all residences in the immediate project vicinity during both daytime and nighttime hours. As a result, no additional noise mitigation measures beyond those proposed as part of the project description would be required for this aspect of the project.

On-Site Truck Traffic Noise Mitigation

Table 11 indicates that noise generated by on-site truck traffic would satisfy the project significance criteria at all residences in the immediate project vicinity during both daytime and nighttime hours. As a result, no additional noise mitigation measures beyond those proposed as part of the project description would be required for this aspect of the project.

Significance of Noise Impacts after Mitigation

Excavation Activities

The mitigation measures recommended above would reduce the potential noise impacts associated with excavation activities to a ***less than significant*** level.

Off-Site Traffic Noise

Mitigation Measures which could be employed to reduce off-site heavy truck traffic noise levels, such as reduction of truck speeds, construction of off-site noise barriers, etc., would be infeasible. Specifically, speed limits are set based on surveys of existing speeds and cannot be arbitrarily lowered. Construction of off-site noise barriers would also be infeasible because the applicant does not own the right-of-way upon which such barriers would be constructed. Further, openings that would be required in such barriers for driveway access would significantly reduce noise barrier effectiveness. As a result, the traffic noise impacts identified for future project off-site heavy truck traffic would remain ***significant and unavoidable***. These impacts extend beyond the receptors identified in Figure 1 to any residences located along these impacted roadway segments.

Cumulative Setting, Impacts and Mitigation Measures

The cumulative setting would include noise generated by other aggregate producers in the area and increased traffic on local roadways resulting from aggregate operations and general growth in the region. Future (cumulative) traffic noise impacts were evaluated in Table 12. Cumulative impacts associated with other aggregate producers in the area will depend on the proximity of those operations to operations proposed within the Riverbend project.

Although the Riverbend Site borders the Santa Fe Aggregates facility to the north, and the CMI Aggregates facility to the southeast, there is a considerable distance between the plant area equipment of the Riverbend site and those users. In addition, the distance from the Riverbend plant areas to the existing Vulcan Sanger Centerville and the approved Carmelita project sites ranges from 3-4 miles. As a result, it is unlikely that that the cumulative contribution of noise from the plant area sources would be appreciably different from the noise generated by each aggregate producer operating independently.

Because noise is highly localized, it is also unlikely that noise generated by non-aggregate projects in the City of Sanger (Sanger Crossing Apartments, Pitman Farms parking lot expansion, Family Dollar project, etc.), would be cumulatively considerable when added to the Riverbend Noise. Although the cumulative contribution of fixed noise sources associated with various projects and aggregate producers is not expected to be significant, the cumulative increase in traffic noise levels in the region resulting from these various sources of traffic would exceed the significance criteria. As a result, cumulative traffic noise impacts are considered to be ***significant***.

Cumulative Traffic Noise Mitigation

Mitigation Measures which could be employed to reduce off-site traffic noise levels, such as reduction of truck speeds, construction of off-site noise barriers, etc., would be infeasible. Specifically, speed limits are set based on surveys of existing speeds and cannot be arbitrarily lowered. Construction of off-site noise barriers would also be infeasible because the applicant does not own the right-of-way upon which such barriers would be constructed. Further, openings that would be required in such barriers for driveway access would significantly reduce noise barrier effectiveness. As a result, the traffic noise impacts identified for future conditions with the project would remain ***significant and unavoidable***. These impacts extend beyond the receptors identified in Figure 1 to any residences located along these impacted roadway segments.

Appendix A

Acoustical Terminology

Acoustics The science of sound.

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

Attenuation The reduction of an acoustic signal.

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

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

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

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

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

Leq Equivalent or energy-averaged sound level.

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

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

Masking The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.

Noise Unwanted sound.

Peak Noise The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the Maximum level, which is the highest RMS level.

RT$_{60}$ The time it takes reverberant sound to decay by 60 dB once the source has been removed.

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

SEL A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.

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

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

Appendix B-1

Riverbend Aggregate Mine
24hr Continuous Noise Monitoring at LT 1
October 26-27, 2011

Hour	Leq	Lmax	L50	L90
13:00	40	58	37	35
14:00	40	59	36	35
15:00	39	53	37	35
16:00	43	62	38	36
17:00	39	54	38	37
18:00	40	56	38	37
19:00	41	58	39	38
20:00	43	57	40	39
21:00	43	60	40	39
22:00	42	59	40	39
23:00	41	56	39	38
0:00	39	46	39	37
1:00	39	41	39	38
2:00	39	55	38	37
3:00	39	41	38	37
4:00	39	44	39	38
5:00	39	45	39	38
6:00	46	70	42	40
7:00	45	68	44	42
8:00	44	56	43	41
9:00	43	60	38	37
10:00	38	61	35	34
11:00	48	70	35	33
12:00	45	72	34	33

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	48.4	38.4	43.1	45.9	38.6	41.0
Lmax (Maximum)	72.0	53.3	60.3	69.6	40.9	50.7
L50 (Median)	43.6	34.5	38.3	41.8	38.4	39.4
L90 (Background)	42.3	33.2	36.8	40.3	37.3	38.1

Computed Ldn, dB	47.8
% Daytime Energy	73%
% Nighttime Energy	27%

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Appendix B-2

Riverbend Aggregate Mine
24hr Continuous Noise Monitoring at LT 2
October 26-27, 2011

Hour	Leq	Lmax	L50	L90
13:00	58	79	44	38
14:00	58	77	42	35
15:00	58	80	43	36
16:00	58	78	43	31
17:00	59	77	41	31
18:00	58	75	40	30
19:00	55	77	36	30
20:00	56	74	37	32
21:00	55	84	35	31
22:00	50	76	33	30
23:00	49	73	33	31
0:00	48	72	30	27
1:00	45	70	27	26
2:00	38	65	29	26
3:00	41	67	28	27
4:00	52	75	30	28
5:00	54	75	34	29
6:00	60	81	47	39
7:00	61	80	50	42
8:00	59	77	47	42
9:00	62	89	45	37
10:00	62	87	41	33
11:00	58	76	39	31
12:00	57	74	40	34

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	62.1	55.3	58.8	59.7	38.0	52.7
Lmax (Maximum)	88.9	74.4	78.9	80.6	65.4	72.6
L50 (Median)	49.9	35.1	41.5	46.9	26.9	32.4
L90 (Background)	42.2	29.6	34.1	38.6	25.8	29.1

Computed Ldn, dB	60.7
% Daytime Energy	87%
% Nighttime Energy	13%

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Appendix B-3

Riverbend Aggregate Mine
24hr Continuous Noise Monitoring at LT 3
October 26-27, 2011

Hour	Leq	Lmax	L50	L90
13:00	51	76	44	41
14:00	45	72	39	35
15:00	47	70	37	32
16:00	43	59	39	34
17:00	43	64	39	33
18:00	41	60	35	31
19:00	38	55	33	31
20:00	44	57	40	37
21:00	44	65	38	36
22:00	43	64	37	33
23:00	41	62	35	32
0:00	33	45	31	27
1:00	32	51	29	26
2:00	50	75	28	26
3:00	58	80	44	29
4:00	41	65	33	28
5:00	39	55	38	36
6:00	51	70	47	41
7:00	51	71	46	43
8:00	78	109	47	44
9:00	67	96	45	40
10:00	62	96	41	36
11:00	46	65	39	33
12:00	46	67	36	31

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	78.1	37.9	66.8	58.2	31.6	50.2
Lmax (Maximum)	108.7	54.7	72.0	79.9	45.3	63.2
L50 (Median)	46.8	33.3	39.9	46.5	28.2	35.8
L90 (Background)	43.7	30.8	35.8	41.1	26.3	31.0

Computed Ldn, dB	65.3
% Daytime Energy	99%
% Nighttime Energy	1%

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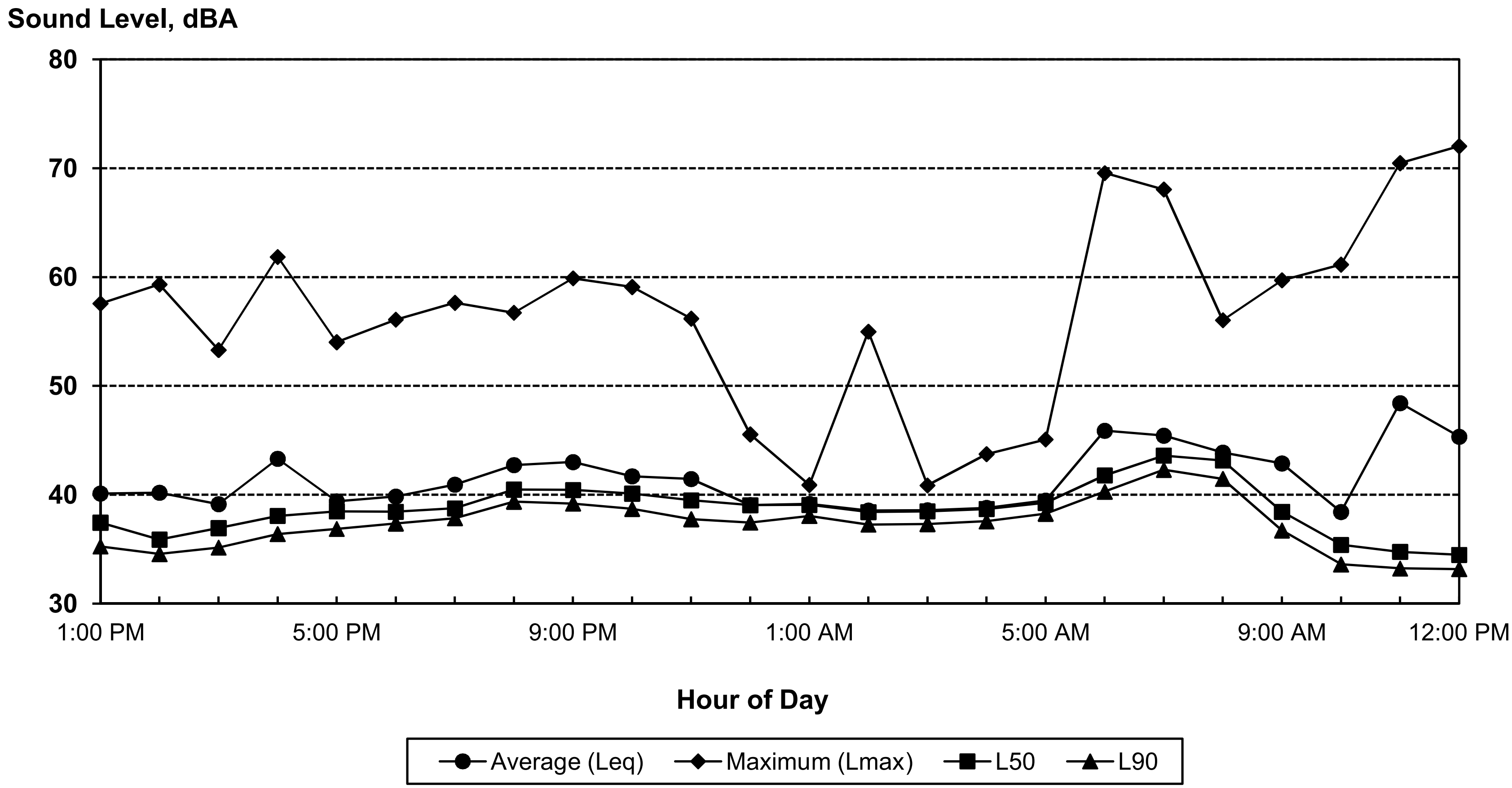
Appendix C-1
Riverbend Aggregate Mine
24hr Continuous Noise Monitoring at LT 1
October 26-27, 2011



Ldn: 48 dB

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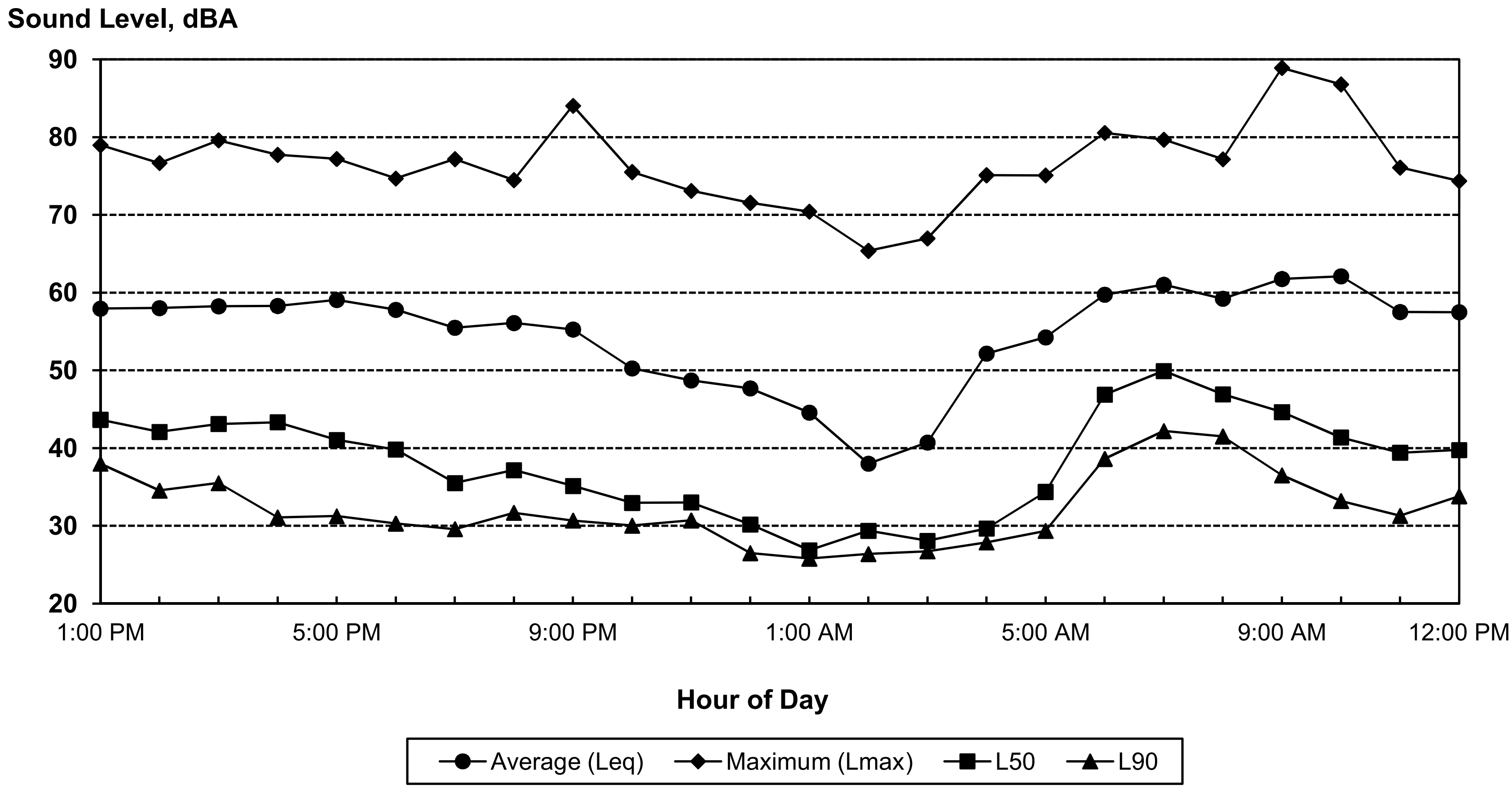
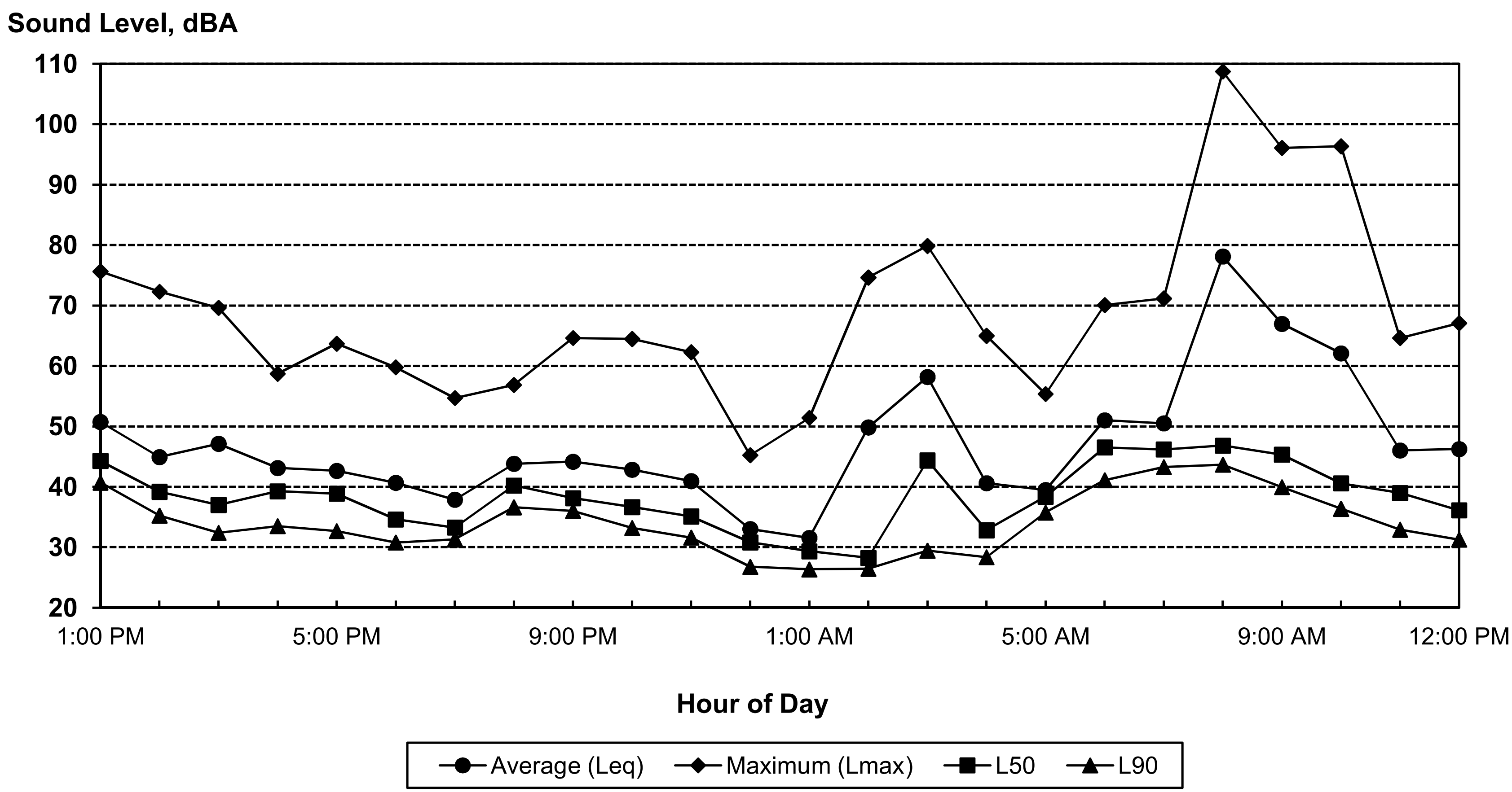
Appendix C-2
Riverbend Aggregate Mine
24hr Continuous Noise Monitoring at LT 2
October 26-27, 2011



Ldn: 61 dB

Appendix C-3
Riverbend Aggregate Mine
24hr Continuous Noise Monitoring at LT 3
October 26-27, 2011



Ldn: 65 dB

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Appendix D-1

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2015 Traffic No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description From	Segment Description To	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	McCall Avenue	SR-180	Jensen Avenue	8,720	85		15	2.5	5	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	7,320	85		15	2.5	5	40	100	
3	McCall Avenue	North Avenue	Central Avenue	4,470	85		15	2.5	5	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	8,500	85		15	2.5	5	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	10,720	85		15	2.5	5	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	6,910	85		15	2.5	5	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	6,210	85		15	2.5	5	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	3,870	85		15	2.5	5	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	2,840	85		15	2.5	5	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	2,220	85		15	2.5	5	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	2,700	85		15	2.5	5	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	3,840	85		15	2.5	5	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	2,980	85		15	2.5	5	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	2,630	85		15	2.5	5	40	100	

Appendix D-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2015 Truck Traffic Only
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description From	Segment Description To	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	McCall Avenue	SR-180	Jensen Avenue	136	85		15	0.05	99.9	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	139	85		15	0.05	99.9	40	100	
3	McCall Avenue	North Avenue	Central Avenue	139	85		15	0.05	99.9	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	8	85		15	0.05	99.9	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	8	85		15	0.05	99.9	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	8	85		15	0.05	99.9	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	8	85		15	0.05	99.9	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	8	85		15	0.05	99.9	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	8	85		15	0.05	99.9	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	8	85		15	0.05	99.9	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	143	85		15	0.05	99.9	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	143	85		15	0.05	99.9	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	154	85		15	0.05	99.9	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	154	85		15	0.05	99.9	40	100	

Appendix D-3

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2017 Traffic No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description From	Segment Description To	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	McCall Avenue	SR-180	Jensen Avenue	9,390	85		15	2.5	5	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	7,850	85		15	2.5	5	40	100	
3	McCall Avenue	North Avenue	Central Avenue	4,830	85		15	2.5	5	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	8,650	85		15	2.5	5	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	10,860	85		15	2.5	5	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	7,030	85		15	2.5	5	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	6,350	85		15	2.5	5	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	4,020	85		15	2.5	5	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	3,130	85		15	2.5	5	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	2,370	85		15	2.5	5	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	2,870	85		15	2.5	5	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	4,090	85		15	2.5	5	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	3,150	85		15	2.5	5	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	2,790	85		15	2.5	5	40	100	

Appendix D-4

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2017 Truck Traffic Only
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description From	To	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	McCall Avenue	SR-180	Jensen Avenue	259	85		15	0.05	99.9	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	265	85		15	0.05	99.9	40	100	
3	McCall Avenue	North Avenue	Central Avenue	265	85		15	0.05	99.9	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	15	85		15	0.05	99.9	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	15	85		15	0.05	99.9	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	15	85		15	0.05	99.9	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	15	85		15	0.05	99.9	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	15	85		15	0.05	99.9	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	15	85		15	0.05	99.9	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	15	85		15	0.05	99.9	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	271	85		15	0.05	99.9	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	271	85		15	0.05	99.9	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	293	85		15	0.05	99.9	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	293	85		15	0.05	99.9	40	100	

Appendix D-5

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2019 Traffic No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description From	To	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	McCall Avenue	SR-180	Jensen Avenue	10,080	85		15	2.5	5	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	8,390	85		15	2.5	5	40	100	
3	McCall Avenue	North Avenue	Central Avenue	5,180	85		15	2.5	5	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	8,770	85		15	2.5	5	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	10,900	85		15	2.5	5	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	7,150	85		15	2.5	5	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	6,480	85		15	2.5	5	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	4,240	85		15	2.5	5	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	3,410	85		15	2.5	5	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	2,540	85		15	2.5	5	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	3,040	85		15	2.5	5	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	4,360	85		15	2.5	5	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	3,320	85		15	2.5	5	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	2,990	85		15	2.5	5	40	100	

Appendix D-6

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2019 Truck Traffic Only
Ldn/CNEL: Ldn
Hard/Soft: Soft

		Segment Description						% Med.	% Hvy.			Offset
Segment	Roadway Name	From	To	ADT	Day %	Eve %	Night %	Trucks	Trucks	Speed	Distance	(dB)
1	McCall Avenue	SR-180	Jensen Avenue	432	85		15	0.05	99.9	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	442	85		15	0.05	99.9	40	100	
3	McCall Avenue	North Avenue	Central Avenue	442	85		15	0.05	99.9	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	26	85		15	0.05	99.9	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	26	85		15	0.05	99.9	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	26	85		15	0.05	99.9	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	26	85		15	0.05	99.9	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	26	85		15	0.05	99.9	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	26	85		15	0.05	99.9	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	26	85		15	0.05	99.9	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	452	85		15	0.05	99.9	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	452	85		15	0.05	99.9	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	488	85		15	0.05	99.9	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	488	85		15	0.05	99.9	40	100	

Appendix D-7

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2011-068 Riverbend Aggregate Mine
Description: 2035 Traffic No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description From	To	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	McCall Avenue	SR-180	Jensen Avenue	15,560	85		15	2.5	5	40	100	
2	McCall Avenue	Jensen Avenue	North Avenue	12,210	85		15	2.5	5	40	100	
3	McCall Avenue	North Avenue	Central Avenue	8,060	85		15	2.5	5	40	100	
4	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	SR-99 SB Off-Ramp	10,050	85		15	2.5	5	40	100	
5	Central Avenue - Goodfellow Avenue	SR-99 NB On-Ramp	Chestnut Avenue	12,190	85		15	2.5	5	40	100	
6	Central Avenue - Goodfellow Avenue	Chestnut Avenue	Golden State Boulevard	8,050	85		15	2.5	5	40	100	
7	Central Avenue - Goodfellow Avenue	Golden State Boulevard	Willow Avenue	7,520	85		15	2.5	5	40	100	
8	Central Avenue - Goodfellow Avenue	Willow Avenue	Clovis Avenue	5,960	85		15	2.5	5	40	100	
9	Central Avenue - Goodfellow Avenue	Clovis Avenue	Temperance Avenue	5,700	85		15	2.5	5	40	100	
10	Central Avenue - Goodfellow Avenue	Temperance Avenue	McCall Avenue	3,760	85		15	2.5	5	40	100	
11	Central Avenue - Goodfellow Avenue	McCall Avenue	Bethel Avenue	4,440	85		15	2.5	5	40	100	
12	Central Avenue - Goodfellow Avenue	Bethel Avenue	Academy Avenue	6,550	85		15	2.5	5	40	100	
13	Central Avenue - Goodfellow Avenue	Academy Avenue	Newmark Avenue	4,730	85		15	2.5	5	40	100	
14	Central Avenue - Goodfellow Avenue	Newmark Avenue	Riverbend Avenue	4,390	85		15	2.5	5	40	100	

Appendix E-1

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 3

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 59
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 3
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 140

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-9.3	49.7	Yes
11	11	-9.7	49.3	Yes
12	12	-10.2	48.8	Yes
13	13	-10.7	48.3	Yes
14	14	-11.1	47.9	Yes
15	15	-11.6	47.4	Yes
16	16	-12.0	47.0	Yes
17	17	-12.3	46.7	Yes
18	18	-12.7	46.3	Yes
19	19	-12.9	46.1	Yes
20	20	-13.3	45.7	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-2

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 4

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 59
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 4
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 145

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-9.3	49.7	Yes
11	11	-9.7	49.3	Yes
12	12	-10.1	48.9	Yes
13	13	-10.6	48.4	Yes
14	14	-11.1	47.9	Yes
15	15	-11.6	47.4	Yes
16	16	-12.0	47.0	Yes
17	17	-12.3	46.7	Yes
18	18	-12.7	46.3	Yes
19	19	-12.9	46.1	Yes
20	20	-13.3	45.7	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-3

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 5

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 56
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 5
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 275

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-8.9	47.1	Yes
11	11	-9.5	46.5	Yes
12	12	-9.8	46.2	Yes
13	13	-10.2	45.8	Yes
14	14	-10.7	45.3	Yes
15	15	-11.1	44.9	Yes
16	16	-11.4	44.6	Yes
17	17	-11.8	44.2	Yes
18	18	-12.1	43.9	Yes
19	19	-12.3	43.7	Yes
20	20	-12.7	43.3	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-4

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 7

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 57
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 7
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 205

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-9.1	47.9	Yes
11	11	-9.5	47.5	Yes
12	12	-9.9	47.1	Yes
13	13	-10.4	46.6	Yes
14	14	-10.9	46.1	Yes
15	15	-11.2	45.8	Yes
16	16	-11.7	45.3	Yes
17	17	-12.0	45.0	Yes
18	18	-12.3	44.7	Yes
19	19	-12.5	44.5	Yes
20	20	-12.9	44.1	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-5

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 8

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 52
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 8
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 490

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-8.9	43.1	Yes
11	11	-9.4	42.6	Yes
12	12	-9.7	42.3	Yes
13	13	-10.0	42.0	Yes
14	14	-10.4	41.6	Yes
15	15	-10.8	41.2	Yes
16	16	-11.1	40.9	Yes
17	17	-11.5	40.5	Yes
18	18	-11.8	40.2	Yes
19	19	-12.1	39.9	Yes
20	20	-12.3	39.7	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-6

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 9

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 58
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 9
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 155

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-9.3	48.7	Yes
11	11	-9.7	48.3	Yes
12	12	-10.1	47.9	Yes
13	13	-10.6	47.4	Yes
14	14	-11.1	46.9	Yes
15	15	-11.5	46.5	Yes
16	16	-11.9	46.1	Yes
17	17	-12.3	45.7	Yes
18	18	-12.5	45.5	Yes
19	19	-12.9	45.1	Yes
20	20	-13.1	44.9	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-7

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 10

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 59
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 10
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 115

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 10

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
10	10	-9.4	49.6	Yes
11	11	-9.8	49.2	Yes
12	12	-10.3	48.7	Yes
13	13	-10.9	48.1	Yes
14	14	-11.3	47.7	Yes
15	15	-11.8	47.2	Yes
16	16	-12.2	46.8	Yes
17	17	-12.5	46.5	Yes
18	18	-12.9	46.1	Yes
19	19	-13.3	45.7	Yes
20	20	-13.7	45.3	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix E-8

Barrier Insertion Loss Calculation
Riverbend Aggregates Berms vs. Electric Dragline

Project Information:

Job Number: 2011-068
Project Name: Riverbend Aggregate Mine
Location(s): Receiver 13

Noise Level Data:

Source Description: Excavation
Source Noise Level, dBA: 55
Source Frequency (Hz): 500
Source Height (ft): 0

Site Geometry:

Receiver Description: Receiver 13
Source to Barrier Distance (C_1): 200
Barrier to Receiver Distance (C_2): 325

Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
8	8	-8.2	46.8	Yes
9	9	-8.7	46.3	Yes
10	10	-8.9	46.1	Yes
11	11	-9.4	45.6	Yes
12	12	-9.8	45.2	Yes
13	13	-10.2	44.8	Yes
14	14	-10.6	44.4	Yes
15	15	-11.0	44.0	Yes
16	16	-11.3	43.7	Yes
17	17	-11.7	43.3	Yes
18	18	-12.0	43.0	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s). An additional 2 dB noise level reduciton was applied to the berm to account for the increased noise reduction of an earthen berm versus a solid noise wall.

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Appendix J-2 Letter Addendum to Environmental Noise Assessment

May 9, 2014

John C. Buada
Buada Associates, Inc.
4872 N Arcade Ave
Fresno, CA 93704
Email: jcbuada@buada.com

Subject: Addendum to Bollard Acoustical Consultants, Inc. (BAC) noise study prepared for the Riverbend Sand and Gravel Project in Fresno County, California to clarify the effects of distance on project-related traffic noise level increases.

Dear Mr. Buada

In the noise analysis BAC prepared for the Riverbend Project, the following information was provided regarding how project-related traffic noise level increases are not distance-dependent:

> *"It should be noted that, although the Table 12 data is provided at a reference distance of 100 feet from the roadway centerlines, it is recognized that distances from the roadway centerlines to existing residences located along Project haul routes vary. However, regardless of the distance between the roadway centerline and residences, the changes shown in Table 12 (i.e. the values in parentheses) are not distance dependent. In other words, if a residence located 100 feet from the roadway centerline would experience a 2 dB increase in noise levels due to the Project, a neighboring house located 50 or 200 feet from the roadway centerline would experience the same 2 dB increase. The absolute traffic noise levels would be higher for residences located closer to the roadway, and lower for residences further away, but the change would remain the same.*

Because it is our understanding that this information may be confusing or unclear to the reader, the following additional information and example are provided for clarification:

> *In Table 12 of the BAC report, traffic noise levels are predicted at a reference distance of 100 feet from the roadway centerlines for the major routes which would be utilized by project truck traffic. In the first row of data in Table 12 (McCall Avenue from SR-180 to Jensen Avenue), the data for the year 2015 indicates that the traffic noise level at the 100 foot reference distance, including project truck traffic, would be 64 dB Ldn. The indicated project-related traffic noise increase at that location is 1 dB, which means the 2015 traffic noise level along that roadway segment without the project (the no-project condition) would be 63 dB Ldn.*

The data mean that, if a residence were located 100 feet from the centerline of McCall Avenue between SR-180 and Jensen Avenue, that residence would be exposed to a traffic noise level of 63 dB Ldn without the project, and 64 dB Ldn with the project. In this example, the project-related traffic noise level increase for this hypothetical residence is 1 dB.

Traffic noise decreases at a rate of approximately 5 dB per doubling of distance from the roadway centerline. Using the example above, if a residence were located 200 feet from the centerline of McCall Avenue along this roadway segment, the predicted traffic noise level without the project would be 58 dB Ldn (63-5=58). The traffic noise level at this theoretical residence located 200 feet from the roadway centerline with the project would be 59 dB Ldn (64-5=59). The project-related traffic noise level increase at this residence would also be 1 dB Ldn (59-58=1).

This example illustrates that the project-related traffic noise level increase at both residences is 1 dB Ldn despite the fact that these hypothetical residences are located different distances from the roadway centerline. Because sound decreases with distance, it is expected that residences located closer to a roadway would be exposed to higher traffic noise levels than residences located further from the same roadway (5 dB higher in the case of the theoretical residences in this example). But this example illustrates that, despite the fact that the residences have different overall traffic noise exposure due to their being located different distances from the roadway centerline, the increase in noise levels experienced by both residences would be the same (1 dB). This 1 dB increase due to the project holds regardless of the distance between the residence and roadway centerline.

I hope that this additional information is useful in providing clarification regarding the evaluation of traffic noise level increases for the Riverbend Project. Please contact BAC at (916) 663-0500 or paulb@bacnoise.com with any questions or requests for additional information.

Sincerely,

Bollard Acoustical Consultants, Inc.

Paul Bollard

Paul Bollard
President