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May 20, 2015  
Project No. 47-007

Mr. Corbett Wright  
CW Land Consultants, Inc.  
174 West Cliff Drive  
Santa Cruz, CA 95060

Subject: Traffic Noise Assessment Study for the Planned Mixed-Use Development,  
Scotts Valley Drive, Scotts Valley

Dear Mr. Wright:

This report presents the results of a noise assessment study for the planned mixed-use development along Scotts Valley Drive in Scotts Valley, as shown on the Site Development Plan, Ref. (a). The noise exposures at the site were evaluated against the standards of the City of Scotts Valley General Plan Noise Element, Ref. (b). The analysis of the on-site sound level measurements indicates that the existing noise environment is due primarily to vehicular traffic sources on Scotts Valley Drive. Project-generated noise impacts from the proposed office building could not be quantified as no specific tenants or mechanical equipment have been determined. The results of the analysis reveal that the noise exposure impacts to the project are within limit of the standards.

Section I of this report contains a summary of our findings. Subsequent sections contain the site, traffic and project descriptions, analyses, and evaluations. Attached hereto are Appendices A, B and C, which include the list of references, descriptions of the applicable standards, definitions of the terminology, descriptions of the acoustical instrumentation used for the field survey, general building shell controls, and the on-site noise measurement data and calculation tables.

## **I. Summary of Findings**

The noise assessment results presented in the findings are shown in reference to the City of Scotts Valley Noise Element, which utilizes the Day-Night Level (DNL) 24-hour noise descriptor to define community noise impacts, and specifies that exterior noise exposures at residential areas are limited to 60 dB DNL. In addition, interior noise exposures are limited to 45 dB DNL.

Row townhouses are now regulated by the California Residential Code and are considered attached single-family homes. The CRC does not contain environmental noise standards.

The noise exposures shown below are without the application of mitigation measures and represent the noise environment for existing and proposed site conditions.

### **A. Exterior Noise Exposures**

- The existing exterior noise exposure at the most impacted planned building setback from Scotts Valley Drive, 205 ft. from the centerline of the road, is 58 dB DNL. Under future traffic conditions, the noise exposure is predicted to increase to 59 dB DNL.

The exterior noise exposures at the planned building setbacks will be within the 60 dB DNL limit of the City of Scotts Valley Noise Element standard. Noise mitigation measures for exterior areas of the site will not be required.

### **B. Interior Noise Exposures**

- The interior noise exposures in the most impacted living spaces closest to Scotts Valley Drive will be 43 and 44 dB DNL under existing and future traffic conditions, respectively.

The interior noise exposures will be within the 45 dB DNL limit of the City of Scotts Valley Noise Element standards. Noise mitigation measures for the interior living spaces will not be required.

## **II. Site, Traffic and Project Descriptions**

The planned development site is a vacant parcel located on the west side of Scotts Valley Drive between Dunslee Way and El Pueblo Road in Scotts Valley. The site is at-grade with Scott Valley Drive and slopes up to the west with Dunslee Way. Surrounding land uses include multi-family residential adjacent to the north, vacant hillsides adjacent to the west, single-family residential and an office building across Scotts Valley Drive to the east and the Baymonte Christian Preschool and single-family residential across Dunslee Way to the south.

The on-site noise environment is controlled primarily by traffic sources on Scotts Valley Drive. The most recent traffic volume data from 2012 indicates the Scotts Valley Drive carries an Average Daily Traffic (ADT) of 16,382 vehicles, Ref. (c).

The planned project includes the construction of 25 townhouse units in four buildings. Ingress and egress to the site will be by way of a project driveway off of Dunslee Way. Access to the commercial building on the site will be via Scotts Valley Drive. The Site Development Plan is shown as Figure 1 on page 4.

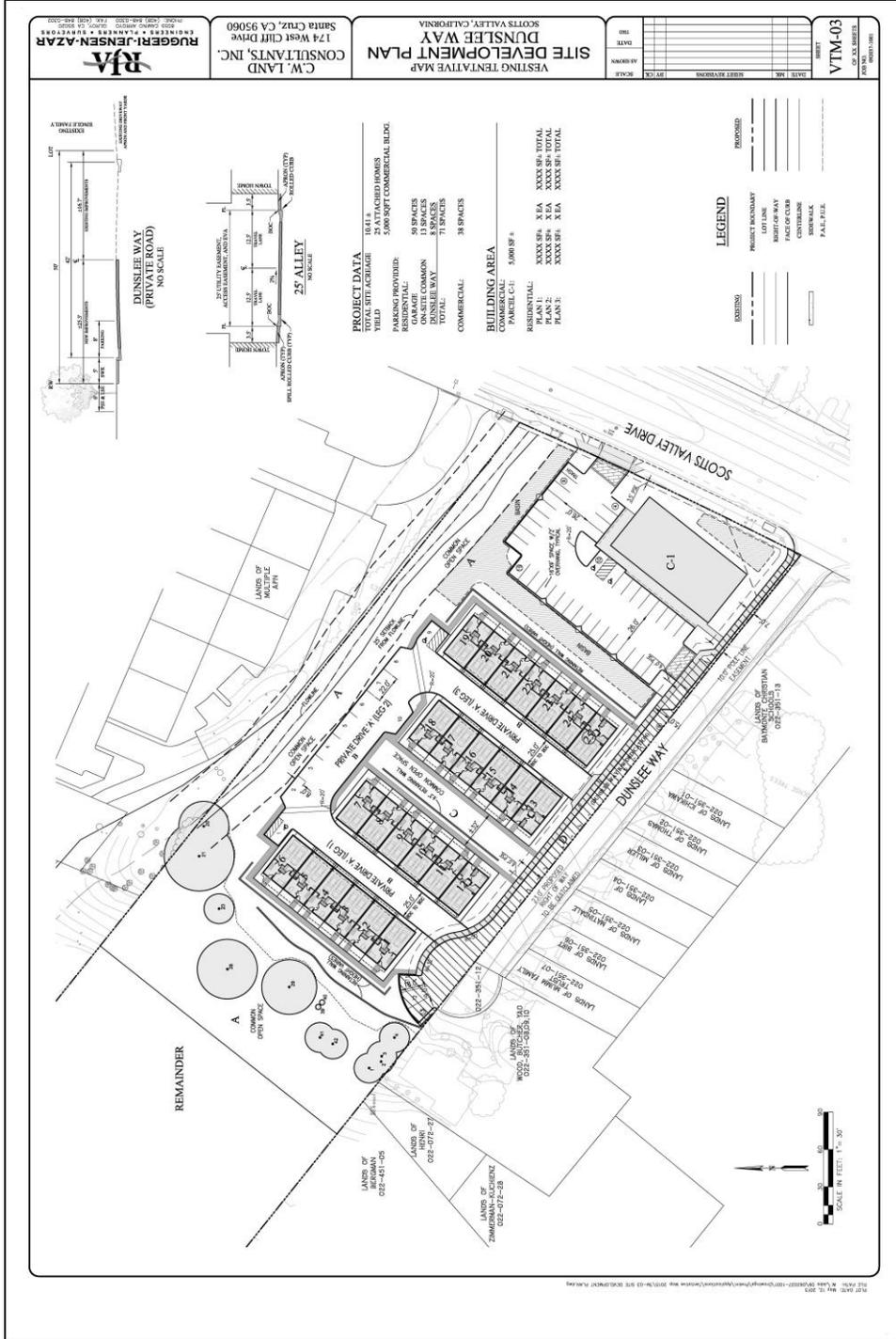


FIGURE 1 – SITE DEVELOPMENT PLAN

### **III. Analysis of the Noise Levels**

#### **A. Existing Noise Levels**

To determine the existing noise environment at the site, continuous recordings of the sound levels were made at a location 226 ft. from the centerline of Scotts Valley Drive. This location was chosen for security of the sound measuring instrument. The measurement location is shown Figure 2 on page 6. The measurements were made on March 26-27, 2015 using a Larson-Davis LDL 812 Precision Integrating Sound Level Meter. The meter yields, by direct readout, a series of descriptors of the sound levels versus time, as described in Appendix B. The measured descriptors include the  $L_1$ ,  $L_{10}$ ,  $L_{50}$ , and  $L_{90}$ , i.e., those levels that are exceeded 1%, 10%, 50%, and 90% of the time. Also measured were the maximum and minimum levels, and the continuous equivalent-energy levels ( $L_{eq}$ ), which are used to calculate the DNL. The measurements were made for a total period of 24 hours and included recordings of the noise levels during representative hours of the daytime and nighttime periods of the DNL index. The results of the measurements are shown on the data table in Appendix C.

As shown in the data tables, the  $L_{eq}$ 's at the measurement location, 226 ft. from the centerline of Scott Valley Drive, ranged from 52.6 to 57.2 dBA during the daytime and from 40.8 to 53.6 dBA at night.

#### **B. Future Noise Levels**

Future traffic volume data for Scotts Valley Drive was not available from the City of Scotts Valley. A review of previous projects in the area indicates that the traffic volumes have reduced over the past few years due to economic conditions. However, the traffic volumes from the mid-90's were approximately the same as they were for 2012. For the purposes of this study, we are estimating an annual average traffic volume growth rate of 1% per year. Over a 20 year horizon, a 1% per growth is equivalent to a 22% increase in traffic volume. A 22% increase in traffic volume yields a 1 dB increase in the traffic noise levels.



**FIGURE 2 – NOISE MEASUREMENT LOCATION**

**IV. Evaluation of the Noise Exposures**

**A. Exterior Noise Exposures**

To evaluate the on-site noise exposures against the 60 dB DNL standard of the City of Scotts Valley Noise Element, the DNL for the survey location was calculated as decibel averages of the measured  $L_{eq}$ 's as they apply to the daily subperiods of the DNL index. A nighttime weighting factor was applied to account for the increased human sensitivity to noise during nighttime hours. The DNL was calculated using the standard formula shown in Appendix B and the results are shown in Appendix C.

The results of the calculations reveal that the existing noise exposure at the measurement location 226 ft. from the centerline of Scotts Valley Drive is 57 dB DNL. At the planned building setback of 205 ft. from the centerline, the noise exposure increases to 58 dB DNL. Under future conditions, the noise exposure is estimated to increase to 59 dB DNL.

The exterior noise exposures at the site are within the 60 dB DNL limit of the City of Scotts Valley Noise Element standards. Noise mitigation measures for the exterior areas will not be required.

**B. Interior Noise Exposures**

To determine the interior noise exposures, a 15 dB reduction was applied to the exterior noise exposures to represent the attenuation provided by a typical building shell under a closed window condition. This condition assumes that residential living units will have standard dual-pane thermal insulating windows that are kept open up to 50% of the time for natural ventilation.

The interior noise exposures in the most impacted living spaces closest to Scotts Valley Drive will be up to 43 and 44 dB DNL under existing and future traffic conditions, respectively. The interior noise exposures in the most impacted living spaces closest to Scotts Valley Drive will be within the 45 dB DNL standard of the City of Scotts Valley Noise Element. Noise mitigation measures for the interior living spaces will not be required.

The above report presents a noise assessment study for the planned "Dunslee Way" development along Scotts Valley Drive in Scotts Valley. The study findings for present conditions are based on field measurements and other data and are correct to the best of our knowledge. Future noise exposures were based on estimates made by Edward L. Pack Associates, Inc. from information provided by the City of Scotts Valley. However, significant deviations in the future traffic volumes, changes in motor vehicle technology, speed limits, noise regulations, or other future changes beyond our control may produce long-range noise results different from our estimates.

If you have any questions or would like an elaboration on this report, please call me.

Sincerely,

EDWARD L. PACK ASSOC., INC.

A handwritten signature in blue ink, reading "Jeffrey K. Pack", is written over a horizontal line.

Jeffrey K. Pack  
President

Attachments: Appendices A, B, and C

## APPENDIX A

### References:

- (a) Site Development Plan, Dunslee Way, by Ruggeri, Jensen, Azar, Inc., undated
- (b) Noise Element of the General Plan, City of Scotts Valley, 1993
- (c) Information on Existing and Future Traffic Volumes Provided by Ms. Kimarie Jones, City of Scotts Valley Transportation Department, by Telephone to Edward L. Pack Associates, Inc., September 22, 2014
- (d) Highway Research Board, "Highway Noise – A Design Guide for Highway Engineers", Report 117, 1971

## **APPENDIX B**

### **Noise Standards, Terminology, Instrumentation and General Building Shell Controls**

#### **1. Noise Standards**

##### **A. City of Scotts Valley Noise Element Standards**

The Noise Element of the Scotts Valley General Plan specifies the use of the Day-Night Level (DNL) 24-hour noise descriptor to describe the noise environment for residential land use.

The noise standards specify a limit of 60 dB DNL for exterior areas at residential locations. For interior living spaces of residences, a limit of 45 dB DNL is specified.

## 2. Terminology

### A. Statistical Noise Levels

Due to the fluctuating character of urban traffic noise, statistical procedures are needed to provide an adequate description of the environment. A series of statistical descriptors have been developed which represent the noise levels exceeded a given percentage of the time. These descriptors are obtained by direct readout of the Sound Level Meters. Some of the statistical levels used to describe community noise are defined as follows:

- $L_1$  - A noise level exceeded for 1% of the time.
- $L_{10}$  - A noise level exceeded for 10% of the time, considered to be an "intrusive" level.
- $L_{50}$  - The noise level exceeded 50% of the time representing the "mean" sound level.
- $L_{90}$  - The noise level exceeded 90 % of the time, designated as a "background" noise level.
- $L_{eq}$  - The continuous equivalent-energy level is that level of a steady-state noise having the same sound energy as a given time-varying noise. The  $L_{eq}$  represents the decibel level of the time-averaged value of sound energy or sound pressure squared and is used to calculate the DNL and CNEL.

**B. Day-Night Level (DNL)**

Noise levels utilized in the standards are described in terms of the Day-Night Level (DNL). The DNL rating is determined by the cumulative noise exposures occurring over a 24-hour day in terms of A-Weighted sound energy. The 24-hour day is divided into two subperiods for the DNL index, i.e., the daytime period from 7:00 a.m. to 10:00 p.m., and the nighttime period from 10:00 p.m. to 7:00 a.m. A 10 dBA weighting factor is applied (added) to the noise levels occurring during the nighttime period to account for the greater sensitivity of people to noise during these hours. The DNL is calculated from the measured  $L_{eq}$  in accordance with the following mathematical formula:

$$DNL = 10\log_{10}[(L_d) \& (L_n+10)]/24$$

where:

- $L_d = L_{eq}$  for the daytime (7:00 a.m. to 10:00 p.m.)
- $L_n = L_{eq}$  for the nighttime (10:00 p.m. to 7:00 a.m.)
- 24 indicates the 24 hour period
- & denotes decibel addition

**C. A-Weighted Sound Level**

The decibel measure of the sound level utilizing the "A" weighted network of a sound level meter is referred to as "dBA". The "A" weighting is the accepted standard weighting system used when noise is measured and recorded for the purpose of determining total noise levels and conducting statistical analyses of the environment so that the output correlates well with the response of the human ear.

### **3. Instrumentation**

The on-site field measurement data were acquired by the use of one or more of the sound analyzer listed below. The instrumentation provides a direct readout of the L exceedance statistical levels including the equivalent-energy level ( $L_{eq}$ ). Input to the meters was provided by microphones extended to a height of 5 ft. above the ground. The “A” weighting network and the “Fast” response setting of the meters were used in conformance with the applicable standards. The Larson-Davis meters were factory modified to conform to the Type 1 performance standards of ANSI S1.4. All instrumentation was acoustically calibrated before and after field tests to assure accuracy.

Bruel & Kjaer 2231 Precision Integrating Sound Level Meter

Larson Davis LDL 812 Precision Integrating Sound Level Meter

Larson Davis 2900 Real Time Analyzer

### **4. Building Shell Controls**

The following additional precautionary measures are required to assure the greatest potential for exterior-to-interior noise attenuation by the recommended mitigation measures. These measures apply at those units where closed windows are required.

- Unshielded entry doors having a direct or side orientation toward the primary noise source must be 1-5/8" or 1-3/4" thick, insulated metal or solid-core wood construction with effective weather seals around the full perimeter. Mail slots should not be used in these doors or in the wall of a living space, as a significant noise leakage can occur through them.
- If any penetrations in the building shell are required for vents, piping, conduit, etc., sound leakage around these penetrations can be controlled by sealing all cracks and clearance spaces with a non-hardening caulking compound.
- Ventilation openings shall not compromise the acoustical integrity of the building shell.

**APPENDIX C**

**On-Site Noise Measurement Data and Calculation Tables**

## DNL CALCULATIONS

CLIENT: CW LAND  
 FILE: 47-007  
 PROJECT: DUNSLEE WAY TOWNHOUSES  
 DATE: 3/26-27/2015  
 SOURCE: SCOTTS VALLEY DR.

LOCATION 1	Scotts Valley Dr.		
Dist. To Source	226 ft.		
TIME	Leq	10 <sup>Leq/10</sup>	
7:00 AM	55.7	371535.2	
8:00 AM	57.2	524807.5	
9:00 AM	55.8	380189.4	
10:00 AM	54.5	281838.3	
11:00 AM	53.8	239883.3	
12:00 PM	53.3	213796.2	
1:00 PM	55.6	363078.1	
2:00 PM	54.7	295120.9	
3:00 PM	55.2	331131.1	
4:00 PM	54.7	295120.9	
5:00 PM	54.2	263026.8	
6:00 PM	56.3	426579.5	
7:00 PM	56.0	398107.2	
8:00 PM	53.5	223872.1	
9:00 PM	52.6	181970.1	SUM= 4790056.6
10:00 PM	49.3	85113.8	Ld= 66.8
11:00 PM	46.6	45708.8	
12:00 AM	44.6	28840.3	
1:00 AM	43.5	22387.2	
2:00 AM	40.8	12022.6	
3:00 AM	43.6	22908.7	
4:00 AM	46.6	45708.8	
5:00 AM	51.5	141253.8	
6:00 AM	53.6	229086.8	SUM= 633030.8
			Ld= 58.0
	Daytime Level=	66.8	
	Nighttime Level=	68.0	
	<b>DNL=</b>	<b>57</b>	
	24-Hour Leq=	53.5	