

# Environmental Noise Assessment

## Bohemia Retail Project EIR

Placer County, California

BAC Job # 2008-078

Prepared For:

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## **ENVIRONMENTAL SETTING**

### **Project Location and Description**

The Bohemia Retail project is a single-tenant, 155,000 sq. ft. retail building on 18.62 acres of vacant land. The project is located on the east side of State Route 49 (SR 49) near the intersection of SR 49 and Luther Road, approximately 2.3 miles north of the City of Auburn, California (Placer County). The project site is adjacent to Wise Canal (west and south), single-family residential uses (east and north), and commercial/industrial uses (south). Please refer to the site plan presented below.

The main project building may be occupied by a discount club store or discount superstore tenant. Although no tenant has been selected for the project building, it is expected that prominent noise sources associated with the future use would include on-site heavy truck movements, loading docks, a trash compactor, roof-top mechanical equipment, parking lot use and maintenance, and a PA system for an outdoor shopping area (e.g., Outdoor Home/Garden Center). Noise exposure from these sources at the neighboring residential uses is discussed in the following.

The project includes a fueling station on the southwest corner of the property. This facility is well removed from neighboring residential uses (more than 700 feet), and is not expected to be a significant source of noise. Therefore, noise associated with this project facility is not discussed in the following.

### **Acoustical Terminology**

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that human hearing can detect. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, or Hertz (Hz). Human hearing is generally capable of detecting sound between 20 Hz and 20,000 Hz.

Our hearing is capable of processing these pressure variations (sound) over an extremely broad dynamic range. Therefore, the measurement of sound directly in terms of pressure would require a very large and awkward range of numbers. The logarithmic treatment of these numbers – converting measured sound pressure (Pa) into sound pressure level (decibels, dB) – was developed primarily to limit the range. The decibel scale allows for 5 orders of magnitude of sound pressure to be expressed within a range of 100 dB.

The perceived loudness of sound is dependent on 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 the A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way we perceive noise. For this reason, the A-weighted sound level has become a standard unit for environmental noise assessment. All noise levels reported below are A-weighted.

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 descriptor used to describe the ambient noise level is the average, or equivalent sound level ( $L_{eq}$ ), which corresponds to a steady-state, A-weighted sound level containing the same total energy as a

time-varying signal over a given time period (usually one hour). The  $L_{eq}$  is the foundation for the day/night average level ( $L_{dn}$ ).

The  $L_{dn}$  is based on the average noise level over a continuous 24-hour period, with a +10 dB weighting (penalty) applied to noise occurring during nighttime hours (10 p.m.-7 a.m.). The nighttime penalty is based on the assumption that people react to nighttime noise exposures as if they are 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.

Table 1 provides definitions of acoustical terminology relevant to this study.

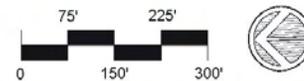
**Table 1**  
**Acoustical Terminology**

<b>Acoustics</b>	The science (or physics) of sound.
<b>Ambient Noise</b>	The distinctive acoustical characteristics of a given environment consisting of all noise sources audible at a given 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.
<b>Attenuation</b>	The reduction of noise.
<b>A-Weighting</b>	A frequency-response filter that conditions a given sound signal to approximate human response.
<b>CNEL</b>	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 (10 p.m.-7 a.m.) weighted by a factor of 10 prior to averaging.
<b>Decibel or dB</b>	A Bel 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 Bel.
<b>Frequency</b>	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
$L_{dn}$	Day/Night Average Level. Similar to CNEL but with no evening weighting. The hours of 7-10 p.m. are considered daytime.
$L_{eq}$	Equivalent or energy-averaged sound level.
$L_{max}$	The highest root-mean-square (RMS) sound level measured over a given period of time.
$L_n$	The measured sound pressure level exceeded (n) percent of the time.
<b>Loudness</b>	A subjective term for the sensation of the magnitude of sound.
<b>Noise</b>	Unwanted sound.
<b>Threshold of Hearing</b>	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB at 1,000 Hz for persons with good hearing.
<b>SEL</b>	A single-number rating indicating the total energy of a discrete noise event compressed into a 1-second time duration.

Project Site Plan and Location Map  
 Bohemia Retail Project – Placer County, California



: Noise Measurement Location  
 : Recommended Noise Barrier



## Existing Land Uses in the Project Vicinity

As described above, the project site is directly adjacent to single-family residential uses to the north and east, and commercial/industrial uses to the south. Known noise sensitive land uses in the immediate project vicinity include the existing single-family residences to the north and east off of Dyer Court and Canal Street, respectively. These uses may be affected by increased project-related traffic noise and/or project-related noise from on-site sources.

## Existing Ambient Noise Environment

The existing ambient noise environment in the immediate project vicinity is defined primarily by local traffic, distant traffic (SR 49), trains, community activities, and existing commercial/industrial operations. To quantify the existing ambient noise environment in the project vicinity, 24-hour ambient noise level measurement surveys were completed at 1680 Canal Street (Site 1) and 12250 Dyer Court (Site 2) on October 24-27, 2008. Please see the graphic above for the ambient noise level measurement locations. The ambient noise level measurement results are representative of the existing noise environments at the closest residential uses to the project.

Larson-Davis Laboratories (LDL) Model 820 precision integrating sound level meters equipped with LDL Model 2560 ½" microphones were used to complete the ambient noise level measurement surveys. The meters were calibrated before use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all of the pertinent specifications of the American National Standards Institute (ANSI) for Type 1 (precision) sound level meters (ANSI S1.4).

Existing ambient noise exposure in the project area is summarized in Table 2. As shown, the applicable noise exposure criteria presented in the Regulatory Setting section below are within the range of ambient noise exposure levels measured in the project area. This finding justifies the use of the presented noise exposure criteria without adjustment.

**Table 2**  
**Summary of Ambient Noise Level Measurement Data**  
**October 24-27, 2008**  
**Bohemia Retail Project EIR – Placer County, California**

Noise Level Descriptor	Average Hourly Noise Level (Range), dB			
	Site 1 (1680 Canal Street)		Site 2 (12250 Dyer Court)	
	Daytime	Nighttime	Daytime	Nighttime
Hourly $L_{eq}$	55.7 (45-67)	44.1 (41-49)	50.7 (43-60)	42.8 (35-51)
Hourly $L_{max}$	73.8 (62-95)	59.2 (50-67)	69.4 (57-83)	55.4 (45-74)
$L_{dn}$	55		52	

Source: Bollard Acoustical Consultants, Inc.

## Existing Roadway Traffic Noise

To predict existing noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The Model uses the Calveno reference noise factors for automobiles, medium trucks, and heavy trucks. The Model considers vehicle volume and speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the sound propagation path. The Model was developed to predict hourly  $L_{eq}$  values for free-flowing traffic conditions.<sup>1</sup> A day/night traffic distribution of 83%/17% was factored into the calculations to determine  $L_{dn}$ . Medium/heavy truck percentages of the estimated average daily traffic volumes (ADT) were assumed to be 3%/2% and 2%/1% for SR 49 and 0.5%/0.5% for all other studied roadways. Finally, traffic speeds of 55 MPH, 45 MPH, 40 MPH, 35 MPH were assumed for Bell Road east of New Airport Road, SR 49 and principal arterials, Luther Road, and all other studied roadways, respectively. Traffic volumes for existing conditions were obtained from Omni-Means (May 2009).

Table 3 summarizes the calculated existing traffic noise levels in terms of  $L_{dn}$  at a reference distance of 100 feet from the centerlines of existing project-area roadways. The table also includes the distances to existing traffic noise contours.

**Table 3**  
**Existing Traffic Noise Levels and Contour Distances**  
**Bohemia Retail Project EIR – Placer County, California**

Roadway	Segment	$L_{dn}$ (dB) @ 100 ft.	Distance (feet)		
			70 dB $L_{dn}$	65 dB $L_{dn}$	60 dB $L_{dn}$
SR 49	North of Dry Creek Rd.	68	69	149	321
	Dry Creek Rd. to Quartz Dr.	68	69	148	319
	Quartz Dr. to Education St.	68	71	152	328
	Education St. to Bell Rd.	68	70	151	326
	Bell Rd. to Willow Creek Dr.	67	67	144	310
	Willow Creek Dr. to Atwood Rd.	67	68	146	314
	Atwood Rd. to Kemper Rd.	68	70	150	324
	Kemper Rd. to Hulbert Wy.	68	77	166	357
	Hulbert Wy. to Luther Rd.	68	76	163	351
	Luther Rd. to Edgewood Rd.	68	72	155	334
	Edgewood Rd. to Nevada St.	68	70	150	323
	South of Nevada St.	67	63	137	294
Bell Rd.	West of SR 49	66	53	115	248
	SR 49 to Quartz Dr.	66	53	115	248
	Quartz Dr. to New Airport Rd.	66	52	111	239
	East of New Airport Rd.	69	81	176	378
Luther Rd.	West of SR 49	53	7	16	34
	SR 49 to Canal St.	61	26	56	120
	Canal St. to Dairy Rd.	60	22	47	101

**Table 3**  
**Existing Traffic Noise Levels and Contour Distances**  
**Bohemia Retail Project EIR – Placer County, California**

Roadway	Segment	L <sub>dn</sub> (dB) @ 100 ft.	Distance (feet)		
			70 dB L <sub>dn</sub>	65 dB L <sub>dn</sub>	60 dB L <sub>dn</sub>
	Diary Rd. to Bowman Rd.	60	21	45	96
Canal St.	North of Project Driveway	52	6	13	29
	Project Driveway to Luther Rd.	52	6	13	29
	South of Luther Rd.	44	2	4	9
New Airport Rd.	North of Bell Rd.	56	12	27	57
	Bell Rd. to SR 49	56	12	27	58
Dry Creek Rd.	West of SR 49	56	11	25	53
	East of SR 49	56	12	27	58
Quartz Dr.	West of SR 49	55	10	20	44
	North of Bell Rd.	56	11	24	53
	South of Bell Rd.	56	11	25	53
Education St.	West of SR 49	55	9	20	44
Willow Creek Dr.	West of SR 49	52	6	13	29
	East of SR 49	55	11	23	50
Atwood Rd.	West of SR 49	59	18	38	82
	East of SR 49	57	13	27	59
Kemper Rd.	West of SR 49	55	9	20	43
Edgewood Rd.	West of SR 49	53	8	17	36
	East of SR 49	42	1	3	7
Nevada St.	West of SR 49	55	10	21	46
Marguerite Mine Rd.	East of SR 49	53	7	15	33
Diary Rd.	South of Luther Rd.	53	8	16	35

Sources: FHWA-RD-77-108, Omni-Means, and Bollard Acoustical Consultants, Inc.

## REGULATORY SETTING

In order to limit population exposure to physically and/or psychologically damaging noise levels, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise. The Auburn-Bowman Community Plan (2005) provides quantitative regulations regarding noise exposure relevant to the proposed project. The following provides a general overview of the existing regulations.

### Auburn-Bowman Community Plan

Table 14 of the Auburn-Bowman Community Plan establishes exterior noise level performance standards for non-transportation or stationary noise sources. The standards are reproduced in Table 4. The standards are established over a continuous hour, and include adjustments for time of

day and noise characteristics (i.e., impulsive, tonal, speech or music). The noise exposure criteria are applied without offset for this project since the noise sources in question are generally broadband with respect to frequency content and relatively continuous – not impulsive or sporadic.

**Table 4**  
**Hourly Noise Level Performance Criteria for Stationary Noise Sources**  
**Auburn-Bowman Community Plan – Placer County, California**

Noise Level Descriptor	Acceptable Noise Level (dB)	
	Daytime (7 a.m.-10 p.m.)	Nighttime (10 p.m.-7a.m.)
$L_{eq}$	50	45
$L_{max}$	70	65

Notes:

These criteria should be applied at the property line of the affected noise sensitive receiver.

These criteria should be reduced by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring noises.

In addition to the performance standards described in Table 4 for stationary noise sources, the Auburn-Bowman Community Plan establishes noise exposure limits at noise sensitive uses for transportation noise sources (e.g., traffic). In this case, typical noise sensitive land uses (e.g., residential, office commercial, schools) are compatible with noise exposure of 60 dB  $L_{dn}$  or less (exterior) and 45 dB  $L_{dn}$  or less (interior). An exterior noise exposure level of up to 65 dB  $L_{dn}$  may be allowed provided that all appropriate noise mitigation efforts are incorporated and the interior noise exposure standard is satisfied. An exterior noise exposure limit of 70 dB  $L_{dn}$  is applied to playgrounds and neighborhood parks.

### Additional Standards of Significance

The potential increase in traffic noise exposure due to the project is a factor in determining the significance of the noise exposure. Research into the human perception of changes in sound level indicates the following.

- A 3 dB change is barely perceptible,
- A 5 dB change is clearly perceptible, and
- A 10 dB change is perceived as being twice or half as loud.

One limitation regarding the use of a single noise level increase value to evaluate the significance of noise impact is that it fails to account for pre-project noise conditions. Table 5 is based on recommendations made in August 1992 by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based on studies that relate aircraft noise exposure levels to the percentage of people highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impact, it has been asserted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the  $L_{dn}$ . Specifically, they provide good correlation to transportation-related noise sources.<sup>ii</sup>

An increase in traffic noise level becomes more significant as the ambient noise level increase. For instance, a significant increase in traffic noise level is expected to be 1.5 dB when the “No Project” traffic noise level exceeds 65 dB  $L_{dn}$ . However, a significant increase in traffic noise level is expected to be 5 dB when the No Project traffic noise level is less than 60 dB  $L_{dn}$ . In other words, as ambient noise levels increase, a smaller increase in noise resulting from the project is sufficient to cause significant annoyance (impact).

**Table 5**  
**Significance of Changes in Cumulative Noise Exposure**

Noise Level Without Project ( $L_{dn}$ )	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Generally, a project may have a significant impact on the environment if it will substantially increase the ambient noise exposure at adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed, as discussed above. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local planning criteria.

Additionally, noise impacts associated with the proposed project would be considered significant if they would expose existing noise sensitive land uses to a traffic noise level increase consistent with Table 5.

## **NOISE IMPACTS ANALYSES**

The identified, primary, noise-producing elements associated with the project are increased traffic on the local roadway network, tractor-trailer truck movements and loading dock activities, project trash compactor operation, rooftop mechanical equipment, parking lot use and maintenance, outdoor PA system, and project construction. With the exception of the outdoor shopping area PA system, the identified on-site noise sources would not be expected to exhibit “pure tone” or speech characteristics based on reference noise level measurements and aural observations of these sources.

The noise assessments completed for this project were based on the project site plan presented above. Significant changes to the site plan could affect the accuracy and validity of these analyses and the associated impacts and mitigation.

### **Off-Site Traffic**

To assess noise impacts due to project-related traffic increases on the local roadway network, traffic noise levels were predicted at a representative distance (100 feet from the roadway centerlines) for the Short Term No Project, Short Term+Project, Cumulative No Project, and Cumulative+Project scenarios for both Discount Club Store and Discount Superstore project options. The traffic noise

levels were predicted using the same modeling methodology applied for the Existing scenario described in the Environmental Setting section above. Likewise, the same speed and traffic distribution assumptions were incorporated. Modeled traffic volumes were obtained from Omni-Means (May 2009). Results of the traffic noise analyses are summarized in Tables 6 and 7.

As shown in Tables 6 and 7, project-related traffic noise level increases would be no more than 1 dB at any of the studied roadway segments except on Canal Street near the project site. At residences on Canal Street, project-related traffic noise exposure increases of 1-4 dB may be expected. This noise exposure increase does not exceed the applicable +5 dB significance threshold. Project-related traffic noise level increases are not expected to exceed the applicable significance criteria anywhere in the project vicinity.

**Table 6**  
**Predicted Traffic Noise Exposure Levels at 100 Feet from Roadway Centerlines**  
**Bohemia Retail Project EIR – Placer County, California**  
**Discount Club Store Project Option**

Roadway	Segment	L <sub>dn</sub> , dB (re: No Project, dB)	
		Short Term+Project	Cumulative+Project
SR 49	North of Dry Creek Rd.	69 (0)	69 (0)
	Dry Creek Rd. to Quartz Dr.	69 (0)	68 (0)
	Quartz Dr. to Education St.	69 (0)	68 (0)
	Education St. to Bell Rd.	69 (0)	68 (0)
	Bell Rd. to Willow Creek Dr.	69 (0)	69 (+1)
	Willow Creek Dr. to Atwood Rd.	69 (0)	69 (0)
	Atwood Rd. to Kemper Rd.	69 (0)	69 (0)
	Kemper Rd. to Hulbert Wy.	70 (0)	69 (0)
	Hulbert Wy. to Luther Rd.	69 (0)	69 (0)
	Luther Rd. to Edgewood Rd.	69 (0)	69 (0)
	Edgewood Rd. to Nevada St.	69 (0)	69 (0)
	South of Nevada St.	68 (0)	68 (0)
Bell Rd.	West of SR 49	66 (0)	67 (0)
	SR 49 to Quartz Dr.	66 (0)	67 (0)
	Quartz Dr. to New Airport Rd.	66 (0)	67 (0)
	East of New Airport Rd.	69 (0)	70 (0)
Luther Rd.	West of SR 49	53 (0)	55 (0)
	SR 49 to Canal St.	61 (0)	62 (0)
	Canal St. to Dairy Rd.	61 (0)	62 (0)
	Dairy Rd. to Bowman Rd.	61 (+1)	61 (0)
Canal St.	North of Project Driveway	41(+3)	54 (+1)
	Project Driveway to Luther Rd.	54 (+2)	55 (+2)
	South of Luther Rd.	44 (0)	46 (0)

**Table 6**  
**Predicted Traffic Noise Exposure Levels at 100 Feet from Roadway Centerlines**  
**Bohemia Retail Project EIR – Placer County, California**  
**Discount Club Store Project Option**

Roadway	Segment	L <sub>dn</sub> , dB (re: No Project, dB)	
		Short Term+Project	Cumulative+Project
New Airport Rd.	North of Bell Rd.	59 (0)	59 (0)
	Bell Rd. to SR 49	58 (0)	58 (0)
Dry Creek Rd.	West of SR 49	56 (0)	58 (0)
	East of SR 49	57 (0)	58 (0)
Quartz Dr.	West of SR 49	55 (0)	56 (0)
	North of Bell Rd.	56 (0)	63 (0)
	South of Bell Rd.	56 (0)	58 (0)
Education St.	West of SR 49	55 (0)	57 (0)
Willow Creek Dr.	West of SR 49	56 (0)	57 (0)
	East of SR 49	56 (0)	56 (0)
Atwood Rd.	West of SR 49	59 (0)	60 (+1)
	East of SR 49	57 (0)	58 (0)
Kemper Rd.	West of SR 49	55 (0)	56 (0)
Edgewood Rd.	West of SR 49	54 (+1)	54 (0)
	East of SR 49	42 (0)	45 (0)
Nevada St.	West of SR 49	55 (0)	56 (0)
Marguerite Mine Rd.	East of SR 49	53 (0)	54 (0)
Diary Rd.	South of Luther Rd.	54 (0)	54 (0)

Sources: FHWA-RD-77-108, Omni-Means, and Bollard Acoustical Consultants, Inc.

**Table 7**  
**Predicted Traffic Noise Exposure Levels at 100 Feet from Roadway Centerlines**  
**Bohemia Retail Project EIR – Placer County, California**  
**Discount Superstore Project Option**

Roadway	Segment	L <sub>dn</sub> , dB (re: No Project, dB)	
		Short Term+Project	Cumulative+Project
SR 49	North of Dry Creek Rd.	69 (0)	69 (0)
	Dry Creek Rd. to Quartz Dr.	69 (0)	68 (0)
	Quartz Dr. to Education St.	69 (0)	68 (0)
	Education St. to Bell Rd.	69 (0)	68 (0)
	Bell Rd. to Willow Creek Dr.	69 (0)	69 (+1)
	Willow Creek Dr. to Atwood Rd.	69 (0)	69 (0)
	Atwood Rd. to Kemper Rd.	69 (0)	69 (0)
	Kemper Rd. to Hulbert Wy.	70 (0)	69 (0)
	Hulbert Wy. to Luther Rd.	69 (0)	69 (0)
	Luther Rd. to Edgewood Rd.	69 (0)	69 (0)
	Edgewood Rd. to Nevada St.	69 (0)	69 (0)
	South of Nevada St.	68 (0)	68 (0)
Bell Rd.	West of SR 49	66 (0)	67 (0)
	SR 49 to Quartz Dr.	66 (0)	67 (0)
	Quartz Dr. to New Airport Rd.	66 (0)	67 (0)
	East of New Airport Rd.	69 (0)	70 (0)
Luther Rd.	West of SR 49	53 (0)	55 (0)
	SR 49 to Canal St.	62 (+1)	62 (0)
	Canal St. to Diary Rd.	61 (0)	62 (0)
Canal St.	Diary Rd. to Bowman Rd.	61 (+1)	61 (0)
	North of Project Driveway	42 (+4)	54 (+1)
	Project Driveway to Luther Rd.	54 (+2)	55 (+2)
New Airport Rd.	South of Luther Rd.	44 (0)	46 (0)
	North of Bell Rd.	59 (0)	59 (0)
	Bell Rd. to SR 49	58 (0)	58 (0)
Dry Creek Rd.	West of SR 49	56 (0)	58 (0)
	East of SR 49	57 (0)	58 (0)
Quartz Dr.	West of SR 49	55 (0)	56 (0)
	North of Bell Rd.	56 (0)	63 (0)
	South of Bell Rd.	56 (0)	58 (0)
Education St.	West of SR 49	55 (0)	57 (0)
Willow Creek Dr.	West of SR 49	56 (0)	57 (0)

**Table 7**  
**Predicted Traffic Noise Exposure Levels at 100 Feet from Roadway Centerlines**  
**Bohemia Retail Project EIR – Placer County, California**  
**Discount Superstore Project Option**

Roadway	Segment	L <sub>dn</sub> , dB (re: No Project, dB)	
		Short Term+Project	Cumulative+Project
Atwood Rd.	East of SR 49	56 (0)	56 (0)
	West of SR 49	59 (0)	60 (+1)
Kemper Rd.	East of SR 49	57 (0)	58 (0)
	West of SR 49	55 (0)	56 (0)
Edgewood Rd.	West of SR 49	54 (+1)	54 (0)
	East of SR 49	42 (0)	45 (0)
Nevada St.	West of SR 49	55 (0)	56 (0)
Marguerite Mine Rd.	East of SR 49	53 (0)	54 (0)
Diary Rd.	South of Luther Rd.	54 (0)	54 (0)

Sources: FHWA-RD-77-108, Omni-Means, and Bollard Acoustical Consultants, Inc.

### Tractor-Trailer Truck Movements (On-Site)

Daily operations of the Bohemia retail store would include deliveries of goods to the store via tractor-trailer trucks. A majority of these trucks would be expected to enter the project property from SR 49 onto Hulbert Drive, turn left and travel north thru the project parking lot to the northwest corner of the property, turn right and travel east along the north side of the project property, turn right and travel south along the east side of the project property, and back into the loading docks at the southeast corner of the project building. After delivery, trucks would be expected to exit the project property at Canal Street to the east or Hulbert Way to the west, along the south side of the property. Along the delivery route, trucks would be approximately 90 feet from the north residential property line (backyards) and approximately 135 feet from the residential front yards and building facades to the east.

Daily deliveries to the project would include six heavy trucks, with as many as three of these trucks having refrigeration units. The project proposes daily operations between 6 a.m. and 12 a.m. We estimate that no more than one of the truck deliveries could occur during nighttime hours of operation (6 a.m.-7 a.m. or 10 p.m.-12 a.m.), with the remaining five deliveries made during daytime hours of operation (7 a.m.-10 p.m.). Regarding daytime tractor-trailer truck deliveries, it is expected that no more than two deliveries would be made during any given hour. This is the best tractor-trailer truck delivery operations information currently available, and it is comparable to information gathered and applied at other superstore projects in northern California.

Trucks en route to/from the loading dock area are estimated to produce an average SEL and L<sub>max</sub> of approximately 83 dB and 75 dB, respectively, at a distance of 50 feet. This data was collected at a Sacramento, California area truck stop in June 2008, and included 20 tractor-trailer truck pass-by

events – including 8 refrigeration trucks. At the nearest residential properties on Dyer Court and Canal Street, unmitigated noise exposure associated with a given heavy truck movement on the project site is estimated to be approximately 79 dB SEL/71 dB  $L_{max}$  and 76 dB SEL/68 dB  $L_{max}$ , respectively, based on a spreading loss adjustment of -4.5 dB per doubling of distance. As calculated, unmitigated maximum noise exposure ( $L_{max}$ ) from on-site truck movements would exceed both daytime and nighttime criteria at the closest receivers to the north, and would exceed the applicable nighttime criterion at the closest receivers to the east.

Hourly  $L_{eq}$  noise exposure from on-site tractor-trailer truck movements was calculated using the following equation. In this case, the SEL is 79 dB and 76 dB at the closest residences to the north and east, respectively, for a single truck operation/movement; N is the number of truck operations/movements in an assumed peak hour (2 daytime and 1 nighttime); and 35.6 is 10 times the logarithm of the number of seconds in an hour (time constant).

$$L_{eq} = SEL + 10\text{Log}(N) - 35.6$$

It is estimated that unmitigated, worst-case noise exposure associated with truck movements on the project site would be 46 dB  $L_{eq}$  (day)/43 dB  $L_{eq}$  (night) at the closest residences to the north, and 43 dB  $L_{eq}$  (day)/40 dB  $L_{eq}$  (night) at the closest residences to the east. This noise source alone would not be expected to exceed the applicable hourly-average noise exposure criteria at the closest noise sensitive receivers.

## Loading Docks

The proposed project loading docks will have a capacity of two trucks, and will be below the project building grade so that retail goods are unloaded at the building pad level. Primary noise sources associated with the project loading docks would include heavy trucks stopping (air brakes), backing into the docks (back-up alarm), refrigeration units for trucks carrying perishable food items (at idle), and pulling out of the loading docks area (revving engine). Noise associated with the moving of merchandise from the trucks into the store would also contribute, but would be largely contained within the trucks and store structures.

Expected worst-case loading docks noise levels were recorded on August 16, 2008 at the Citrus Heights Super Wal-Mart facility as part of a long-term noise level survey (August 15-18, 2008). Measurements were taken at a distance of 100 feet from the center of the loading docks area. Measured noise exposure from loading docks operations was 58 dB  $L_{eq}$ /74 dB  $L_{max}$  and 55 dB  $L_{eq}$ /73 dB  $L_{max}$  for worst-case daytime and nighttime hours, respectively. It is assumed that this measurement data represents all loading docks activities, including the sources described above and truck movements to and from the docks. The Citrus Heights Super Wal-Mart loading docks facility has a four truck capacity, but it is assumed that no more than two Wal-Mart trucks used the facility during the heaviest use hours. Therefore, this measurement data is assumed to be applicable to worst-case operations associated with the project's two-truck docks.

The reference loading docks noise level data was adjusted by -5 dB to account for the increased distance between the source and closest residential receivers to the east based on standard

spherical spreading loss (-6 dB per doubling of distance). Loading docks noise exposure at the closest residences to the east (approximately 175 feet from the center of loading docks area) would be approximately 53 dB  $L_{eq}$ /69 dB  $L_{max}$  and 50 dB  $L_{eq}$ /68 dB  $L_{max}$  during worst-case daytime and nighttime hours of loading docks operations. These levels exceed the applicable noise criteria by as much as 5 dB.

The noise exposure calculations presented above do not account for the shielding provided by the proposed 8-foot high noise barrier along the east property boundary. This barrier would be expected to provide substantial shielding regarding loading docks noise exposure.

### **Trash Compactor**

The project would likely have a trash compactor near the loading docks area. The proposed compactor is expected to produce a noise level of approximately 61 dB at a distance of 15 feet away based on manufacturer reference noise level data obtained for similar projects. Assuming standard spherical spreading loss (-6 dB per doubling of distance), compactor noise would be approximately 38 dB ( $L_{eq}$  and  $L_{max}$ ) at the closest residences on Canal Street (approximately 245 feet away). The assumed trash compactor is not expected to be a significant noise contributor.

### **Rooftop Mechanical Equipment**

Observations at the existing Super Wal-Mart store in Citrus Heights, California conducted in August 2008 revealed that rooftop food cold storage and other mechanical equipment were inaudible around the perimeter of the store building. Shielding provided by the project building (i.e., parapet and building height relative to receivers) would be expected to reduce rooftop HVAC equipment noise to less than significant levels, which would contribute insignificantly to the aggregate noise exposure from the project. It is expected that the project building will be constructed in a similar fashion, with substantial parapet height to shield roof-top mechanical equipment noise.

### **Parking Lot**

Noise exposure from project parking lot use was calculated based on reference noise level measurement data collected in 2004 (internal study completed by Bollard & Brennan, Inc.). Typical noise exposure due to an automobile arrival/departure, including car doors closing and people conversing, was measured to be approximately 72 dB SEL and 63 dB  $L_{max}$  at a distance of 50 feet from the parking spot. Assuming standard spherical spreading loss (-6 dB per doubling of distance), this noise exposure would be approximately 60 dB SEL and 61 dB  $L_{max}$  at the closest residential properties to the north of the main parking lot. This noise exposure assumes a distance of 200 feet from the center of the assumed parking area to the receivers (used for SEL) and a distance of 60 feet from the closest parking spots to the receivers (used for  $L_{max}$ ). It is assumed that approximately 230 cars could enter and leave this proposed parking lot area within a worst-case hour of store activity. Parking lot noise exposure was estimated using the equation presented above for heavy truck movements.

$$L_{eq} = 60 + 10\text{Log}(230) - 35.6 \cong 48 \text{ dB}$$

In this case, 60 dB is the SEL for a single automobile parking operation, 230 is the number of parking lot operations in a worst-case hour, and 35.6 is 10 times the logarithm of the number of seconds in an hour. Using the equation and operations data described above, the proposed parking lot would be expected to produce unmitigated noise exposure of approximately 48 dB  $L_{eq}$  and 61 dB  $L_{max}$  at the closest residential properties to the north. This noise source alone would not be expected to exceed the applicable daytime noise exposure criteria. Parking lot noise exposure would be substantially reduced during nighttime store hours (6-7 a.m. and 10 p.m.-12 a.m.).

Bollard Acoustical Consultants, Inc. conducted field measurements of a sweeper truck during normal operation at an existing commercial/retail facility in Sacramento, California on January 31, 2007. Typical sweeper truck pass-by noise levels were measured to be approximately 84 dB SEL and 75 dB  $L_{max}$  at a reference distance of 50 feet. Pavement cleaning/sweeping at the northwest parking lot area and along the truck route to the north and east of the project building would be within approximately 75 feet, 90 feet, and 135 feet of residential properties, respectively. Assuming a spreading loss adjustment or -4.5 dB per doubling of distance, unmitigated noise exposure from pavement cleaning/sweeping at the closest residential uses to the north and east would be approximately 80-81 dB SEL/71-72 dB  $L_{max}$  and 77 dB SEL/68 dB  $L_{max}$ , respectively. Noise exposure in terms of the average hourly noise level was calculated using the equation presented above used for assessment of heavy truck pass-bys and parking lot use. Assuming no more than two sweeper truck pass-bys in a given hour at a given location, noise exposure was calculated to be approximately 47-48 dB  $L_{eq}$  and 44 dB  $L_{eq}$  at the closest residences to the north and east, respectively. Daily pavement cleaning on the project site would be a significant source of noise.

### **Outdoor Home/Garden Center Public Address (PA) System**

A PA system within the proposed outdoor Home/Garden Center would provide store information to shoppers at levels no higher than an estimated 75 dB  $L_{max}$  (worst-case) throughout the shopping area. It is estimated that a minimum 10 dB of noise level reduction would be experienced by customers in the west project parking lot (assuming 50 feet from the project building) due to building shielding and PA speaker directivity, resulting in noise levels no higher than 65 dB ( $L_{max}$ ) in this area. Estimated Home/Garden Center PA system noise exposure at the closest residences to the north would not be expected to exceed 49 dB  $L_{max}$ . This unmitigated noise exposure assumes standard spherical spreading loss (-6 dB per doubling of distance) and a distance of 320 feet from the Outdoor Home/Garden Center to the closest residential properties. This noise exposure is well below the applicable noise criteria (65 dB  $L_{max}$ ). Therefore, noise associated with the Outdoor Home/Garden Center would not contribute significantly to the aggregate noise production of the project.

### **Aggregate Project-Related Noise Exposure (On-Site Sources)**

Table 8 summarizes aggregate project-related noise exposure associated with the assessed on-site noise sources which would apply to daily use of the project facility. Please refer to the individual noise assessments above for more detailed information regarding particular noise sources.

**Table 8**  
**Summary of Project-Related Noise Exposure – On-Site Noise Sources**  
**Bohemia Retail Project EIR – Placer County, California**

Project Noise Source	Noise Level, dB	
	Hourly $L_{eq}^*$	$L_{max}^*$
<b>Residential Receivers on Canal Street (East)</b>		
Tractor-Trailer Truck Movements	43 (40)	68 (68)
Loading Docks	53 (50)	69 (68)
Trash Compactor	38	38
Roof-Top Mechanical (HVAC)	NA	NA
Sweeper	44 (44)	68 (68)
Total	54 (51)	69 (68)
<b>Residential Receivers on Dyer Court (North)</b>		
Tractor-Trailer Truck Movements	46 (43)	71
Roof-Top Mechanical (HVAC)	NA	NA
Sweeper	47 (47)	71 (71)
Total	50 (49)	71 (71)
<b>Residential Receivers on Dyer Court (Northwest)</b>		
Parking Lot	48	61
Roof-Top Mechanical (HVAC)	NA	NA
Sweeper	48 (48)	72 (72)
PA System	NA	49
Total	51 (48)	72 (72)

\*Calculated daytime (nighttime) noise levels.

As shown in Table 8, the applicable daytime noise exposure criteria (50 dB  $L_{eq}$ /70 dB  $L_{max}$ ) may be exceeded by as much as 4 dB at residences to the east of the project property. This noise exposure is dominated by loading docks operations. The applicable nighttime noise exposure criteria (45 dB  $L_{eq}$ /65 dB  $L_{max}$ ) would likely be exceeded by as much as 7 dB at the closest residential uses to the north and east.

### Project Construction

During construction of the project, noise from building equipment would be expected to add to the noise environment in the immediate project vicinity. Activities involved in construction would likely generate maximum noise levels, as indicated in Table 9, ranging from 77-85 dB at a distance of 50 feet. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours (7 a.m.-6 p.m.). Still, existing residences in the project vicinity would likely be affected by this noise.

Noise would also be generated during the project construction by increased truck traffic on local area roadways. A significant project-generated noise source would be truck traffic associated with the transport of heavy materials and equipment to and from the construction site.

**Table 9**  
**Construction Equipment Noise Levels at 50 Feet**

Type of Equipment	L <sub>max</sub> , dB	Hourly L <sub>eq</sub> , dB/% Use
Backhoe	78	74/40%
Concrete Mixer Truck	79	75/40%
Dump Truck	77	73/40%
Front End Loader	79	75/40%
Pneumatic Tools	85	82/50%
Air Compressor	78	74/40%

Source: Roadway Construction Noise Model V 1.0, U.S. Department of Transportation

## NOISE MITIGATION ANALYSES

As shown in Table 8, noise exposure from proposed on-site sources may exceed the applicable noise exposure criteria by as much as 6 dB and 7 dB at the closest residential receivers to the east and north, respectively. The primary project noise sources impacting these residences would be loading docks activities on the east side and tractor-trailer truck and parking lot sweeper operations to the north. It is expected that project-related noise exposure may be effectively mitigated with the construction of property line noise barriers.

The project applicant has proposed the construction of an 8-foot high noise barrier along the east property boundary. This barrier would be expected to provide no less than 6 dB of noise attenuation for the offending noise sources (i.e., loading docks, truck movements, sweepers) at the closest residences to the east. Mitigated noise exposure would be expected to satisfy the applicable noise exposure criteria.

As shown, unmitigated, maximum noise exposure (L<sub>max</sub>) from individual tractor-trailer truck and parking lot sweeper passbys on the north side of the project property may exceed the applicable criterion by as much as 7 dB at the residential property line. Within the neighboring residential backyards, this noise exposure would be approximately 5-6 dB in excess of the applicable 65 dB L<sub>max</sub> nighttime criterion. Construction of a 6-foot high noise barrier relative to the existing residential properties would be expected to provide the 6 dB of attenuation needed to satisfy the applicable noise exposure criterion within these noise-sensitive backyards.

Please see the recommended noise barrier location and heights on the project site plan presented above.

## **SPECIFIC IMPACTS AND MITIGATION STATEMENTS**

### **Impact 1: Project-Related Noise (Off-Site Traffic)**

The project would generate increased traffic on local area roadways. Project-related traffic noise level increases are not expected to exceed the applicable significance criteria at any of the studied roadway segments (see Tables 6 and 7). This impact is considered *less than significant*.

#### **Mitigation 1**

None required.

### **Impact 2: Project-Related Noise (On-Site Sources)**

Noise exposure from identified on-site noise sources would be expected to exceed the applicable daytime and nighttime noise exposure limits by as much as 4 dB and 7 dB, respectively. For adjacent residential receivers to the north, parking lot maintenance (sweeper truck) and heavy truck movements would likely create the noise impacts. For adjacent residential receivers to the east, loading docks noise exposure would be the primary source of noise impact. Noise exposure from identified on-site project noise sources would be *significant*.

#### **Mitigation 2**

Construct property line noise barriers of 6-8 feet high above the projected property line elevations (east) and residential receiver pad elevations (north). Please see the graphic presented above for the barrier location and heights. It is assumed that this barrier would be of continuous masonry construction. With this noise-mitigating construction, the resulting noise impact would be *less than significant*.

### **Impact 3: Construction Noise**

Activities associated with the project construction would result in elevated noise levels, with maximum noise levels ranging from 78-85 dB at 50 feet as shown in Table 9. Although these levels would be audible at the nearest existing residences, they would be temporary in nature and would likely occur during normal daytime working hours.

The Auburn-Bowman Community Plan and the Placer County Noise Element of the General Plan do not offer noise exposure criteria regarding project construction noise. Therefore, it is assumed that construction noise associated with the project would be *less than significant* at neighboring residential uses since it would be exempt from any local noise exposure criteria. That stated, project construction noise exposure at the closest residential properties may be lessened by implementing the following measures.

### **Mitigation 3**

All construction activities should adhere to the standard construction practices established by Placer County and the City of Auburn. Project construction should be limited to the hours of 7:00 a.m.-6:00 p.m. on weekdays and 8:00 a.m.-5:00 p.m. on weekend and federally recognized holidays. All internal combustion engines should be fitted with factory specified mufflers, and heavy equipment staging areas should be positioned away from neighboring residential areas.

This concludes our Environmental Noise Assessment for the Bohemia Retail Project EIR in Placer County, California. Please contact me at (916) 663-0500 or [jasonm@bacnoise.com](mailto:jasonm@bacnoise.com) if you have any questions or require additional information.

## REFERENCES CITED

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<sup>i</sup> Barry, T.M., J.A. Reagan 1978. *FHWA Highway Traffic Noise Prediction Model*. FHWA-RD-77-108. Federal Highway Administration Office of Research, Office of Environmental Policy, Washington, D.C.

<sup>ii</sup> Federal Interagency Committee on Noise (FICON) 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*. Report of Noise Methodology and Metrics (Technical) Subgroup #1, Federal Interagency Committee on Noise.