Appendix D

Noise Report

Giroux and Associates

NOISE IMPACT ANALYSIS

520 SOUTH EUCLID CAR WASH

CITY OF FULLERTON, CALIFORNIA

Prepared for:

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Noise Setting

BACKGROUND

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally defined as unwanted sound. Sound is characterized by various parameters that describe the physical properties of sound waves. These properties include the rate of oscillation (frequency), the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound wave. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The unit of sound pressure ratioed to the faintest sound detectable to a person with normal hearing is called a decibel (dB). Sound or noise can vary in intensity by over one million times within the range of human hearing. A logarithmic loudness scale similar to the Richter Scale for earthquake magnitude is therefore used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all sound frequencies within the entire spectrum. Noise levels at maximum human sensitivity from around 500 to 2,000 cycles per second are factored more heavily into sound descriptions in a process called "A-weighting," written as "dBA."

Alternatively, a statistical description of the sound level that is exceeded over some fraction of a given observation period can also be used to describe typical time-varying instantaneous noise. Finally, because community receptors are more sensitive to unwanted noise intrusion during more sensitive evening and nighttime hours, state law requires that an artificial dB increment be added to quiet time noise levels. The 24-hour noise descriptor with a specified evening and nocturnal penalty is called the Community Noise Equivalent Level (CNEL).

CNEL is calculated through a weighted average with 5 dB added to readings from 7 p.m. to 10 p.m. and 10 dB added to hourly levels from 10 p.m. to 7 a.m. to account for greater community noise sensitivity during those hours. In practice, CNEL and the noisiest rush hour traffic noise level are very similar.

NOISE ORDINANCE STANDARDS-CITY OF FULLERTON CODE

The City of Fullerton has adopted a Noise Ordinance which identifies exterior and interior noise standards, specific noise restrictions, exemptions, and variances for sources of noise within the City. The Noise Ordinance applies to all noise generated on one land use that impacts an adjacent use, typically stationary noise sources. Exceptions include transportation noise from vehicles operated upon any public highway, roadway, trains airplanes etc. As such, the Municipal Code provides standards against possibly intrusive noises such as car washes.

The exterior noise standards applicable to the proposed project are established in the City's Noise Ordinance, Section 15.90.30 the noise ordinance contains property line noise limits that reflect changes in noise sensitivity by time of day.

The City's noise ordinance limits are stated in terms of a 30-minute limit with allowable deviations from this standard. Thirty minutes represents fifty percent of the hour. Fifty percent of noise reading in any hour must be below this standard expressed in noise terminology as "L_{50}" for 50th percentile. The louder the noise level becomes, the shorter the time becomes that it is allowed to occur. The larger the deviation, the shorter the allowed duration up to a never-to-exceed 20 dB increase above the L_{50} standard. The applicable requirement for a "residential noise zone" (residential zoning) is a function of the time of day with a L_{50} daytime standard of 55 dB and L_{50} nighttime of 50 dB.

For the residences adjacent to the project site applicable sound level limits for the project are as shown in Table 1. However, jurisdictions typically allow for a relaxation of standards if baseline noise levels already exceed the values indicated in Table 1. The City of Fullerton Municipal Code does allow for such an adjustment in FMC 15.90.030.D which states that if the ambient level already exceeds the noise limit categories, the standard is adjusted upward to equal the ambient level.

Construction activities are exempt from noise regulations if they occur between the hours of 8:00 a.m. and 7:00 p.m. on weekdays and on Saturdays. Construction activities are not permitted on Sundays or national holidays.

Table 1
Fullerton Noise Standards from Municipal Code

The following noise standards, unless otherwise specifically indicated, shall apply to all property within the Residential Noise Zone:

Allowable Interior Noise Level	**Time Period**
Not to exceed 55 dB(A)	7:00 a.m. - 10:00 p.m.
Not to exceed 45 dB(A)	10:00 p.m. - 7:00 a.m.

Allowable Exterior Noise Level	**Time Period**
Not to exceed 55 dB(A)	7:00 a.m. - 10:00 p.m.
Not to exceed 50 dB(A)	10:00 p.m. - 7:00 a.m.

It shall be unlawful for any person at any location within the incorporated area of the city to create any noise that causes the noise level at any sensitive use, while the same is in operation to exceed the noise limits as specified for the Residential Noise Zone.

It shall be unlawful for any person at any location within the incorporated area of the city to create any noise which can be classified as being continuous, reoccurring, predictable, or whose operation of noise-generating capabilities can be stopped or started at a specified time, or to

allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level, when measured on the property, either incorporated or unincorporated, to exceed:

1. The noise standard for a cumulative period of more than 30 minutes in any hour;

2. The noise standard plus 5 dB(A) for a cumulative period of more than 15 minutes but less than 30 minutes in any hour;

3. The noise standard plus 10 dB(A) for a cumulative period of more than 5 minutes but less than 15 minutes in any hour;

4. The noise standard plus 15 dB(A) for a cumulative period of more than one minute but less than five minutes in any hour;

5. The noise standard plus 20 dB(A) for a cumulative period of less than one minute in an hour.

In the event the ambient noise level exceeds any of the five noise limit categories listed in Subsection C, the cumulative period applicable to the category shall be increased to reflect the ambient noise level. (Ord. 2982, 2001)

BASELINE NOISE LEVELS

Existing noise levels near the proposed project site derive mainly from vehicular sources on the adjacent arterial roads in the area. The proposed project site is currently an inactive used car lot. The surrounding area is developed with commercial uses to the west, north and south and residential uses to the east, separated from the site by an alley.

On-site noise measurements were made for 24-hours on January 27 - 28, 2010. Measurements were made at the northeast corner of the property nearest to the closest house on Roosevelt Ave, as shown in Figure 1. As shown in Table 2, the meter measured noise levels that were likely dominated by traffic on Euclid Street and Valencia Drive. The resultant measured CNEL is 68 dB which is above the recommended threshold of 60 dB CNEL for single family residential uses. Typically noise levels during nocturnal hours decrease approximately -10 dB from daytime hours, but as seen in Table 2, noise levels throughout the night remain noticeably high, without the typical dip. It is not known whether this noise had any commercial or residential activity origin. However, combined traffic and local contamination produce background noise levels at the closest residences that are in excess of the standards that the car wash on the site would be held to.

Figure 1
Noise Meter Location (January, 2010)

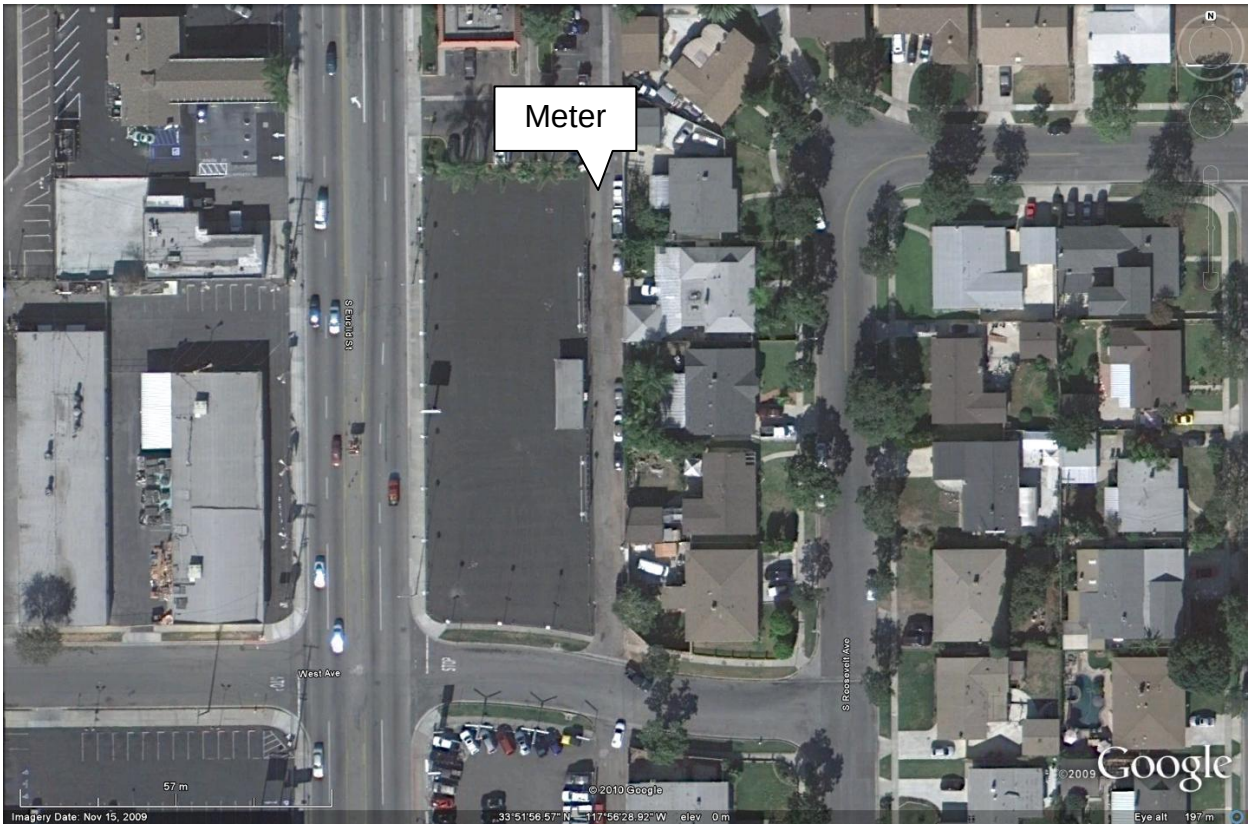


Table 2
Fullerton Car Wash-January, 2010
(Existing Hourly Leq and L_{50}, dBA)

Time Interval	Leq*	L_{50}**	Residential Standard
15:00-16:00	64	61	55
16:00-17:00	63	61	55
17:00-18:00	62	61	55
18:00-19:00	62	61	55
19:00-20:00	62	60	55
20:00-21:00	60	59	55
21:00-22:00	60	58	55
22:00-23:00	60	58	50
23:00-24:00	61	56	50
0:00-1:00	58	55	50
1:00-2:00	62	55	50
2:00-3:00	57	54	50
3:00-4:00	60	56	50
4:00-5:00	60	58	50
5:00:6:00	62	60	50
6:00-7:00	65	64	50
7:00-8:00	66	65	55
8:00-9:00	65	62	55
9:00-10:00	63	61	55
10:00-11:00	63	61	55
11:00-12:00	65	60	55
12:00-13:00	62	60	55
13:00-14:00	63	59	55
14:00-15:00	65	61	55

Shaded entries represent night time values (10:00 p.m. to 7:00 a.m.)

CNEL	68.0

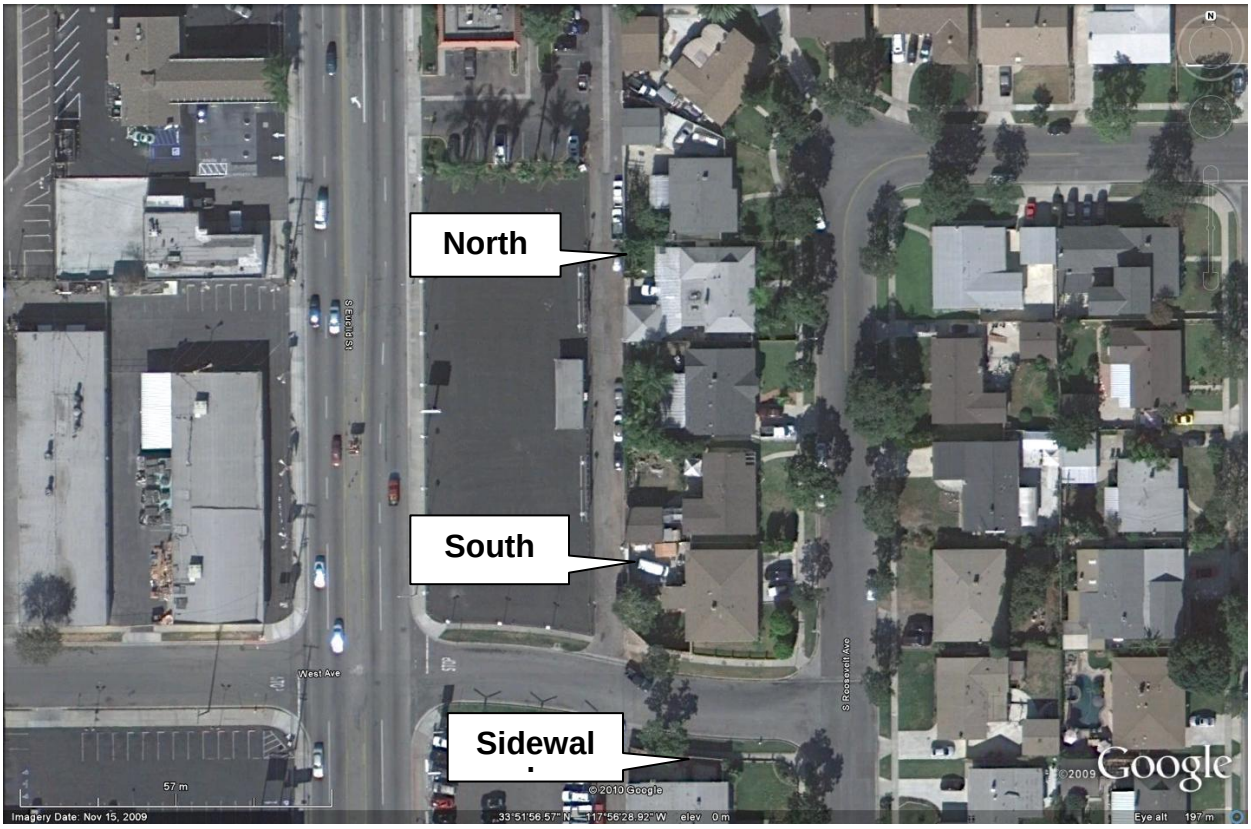
*Leq= the single value noise level that has the same acoustical energy as the average of all variable event ("equivalent level")
**L_{50}= 50th percentile, one-half of readings were louder than this, one-half were quieter

When background noise levels (due to traffic or other sources) exceed the noise ordinance standard, the applicable standard is adjusted upward to equal background levels (FMC 15.90.030.D). The daytime L_{50} ordinance standard is 55 dB unless it never gets that quiet. Table 2 shows that the quietest single hour during proposed car wash operating hours (7 a.m. to 8 p.m.) was 59 dB (L_{50}) from 1-2 p.m. at the northeast corner of the project site. The applicable compliance standard for the proposed project is therefore 59 dB (L_{50}) at the nearest residences because the quietest hour is defined as the ambient level.

An additional set of noise measurements were made on September 29-30, 2010, to better document existing level along the length of the alley. Two locations were instrumented for 24-hours and a short-term reading was conducted in front of the nearest home on West Street. The monitoring locations are shown in Figure 2. Table 3 summarizes these results.

The most recent readings were almost identical to those made in January, 2010. Based upon the quietest hour in the January readings, it was concluded that the applicable noise standard for the proposed car wash should be 59 dB (L_{50}). Table 2 shows that the quietest hour during proposed hours of operation (7 a.m. – 8 p.m.) measured in September was 59 dB (L_{50}) near the tunnel entrance and 60 dB (L_{50}) near the tunnel exit and the site access driveway. The closest home on

Figure 2
Noise Meter Location (September, 2010)



West Street similarly has a baseline level of 59 dB (L_{50}) during the quieter part of the day. The use of 59 dB (L_{50}) as the appropriate noise standard for the proposed project is thus doubly confirmed.

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Table 3
Fullerton Car Wash
Residential Lot Line Noise Monitoring (09/29-09/30, 2010)
(Existing Hourly Leq and L_{50}, dBA)

	North End		South End	
Time Interval	**Leq**	**L_{50}**	**Leq**	**L_{50}**
7:00-8:00	66*	63	64	64
8:00-9:00	62	60	64	63
9:00-10:00	62	61	63	63
10:00-11:00	63	60	63	60
11:00-12:00	64	59	64	60
12:00-13:00	61	60	61	60
13:00-14:00	61	60	63	60
14:00-15:00	61	60	62	60
15:00-16:00	61	60	61	61
16:00-17:00	61	60	62	60
17:00-18:00	62	60	62	61
18:00-19:00	63	61	63	62
19:00-20:00	67*	61	62	62
20:00-21:00	64	60	62	61

*Possible local contamination

Short Term Reading
Sidewalk on West Street 14:15-14:30
Leq = 60 dB L_{50} = 59 dB

Site Operational Noise

Car Wash Noise

Car wash noise was analyzed by monitoring noise levels at an existing car wash equipped with the same type of car wash equipment as proposed for the project site. Measurements were made at an existing Express Car Wash in Anaheim (590 S. Magnolia Ave.) on June 30, 2010, at 2 p.m. when that car wash is usually busiest. Figure 3 shows the site plan where noise measurements were taken at the comparably equipped car wash. The Anaheim measurements were made directly down axis of the car wash tunnel. The Fullerton site has the nearest homes off-axis. An

off-axis measurement showed levels that were at least 5 dB lower at the same distance. The off-axis correction may be greater, but passing vehicles at the off-axis location created some data contamination.

The field test site was equipped with the same Aerodry dryer proposed for the project site. Measurements were made at 45 feet from the car wash tunnel entry and 30 feet from the exit. These data were then extrapolated to the 93-foot separation between the centerline of the proposed tunnel and the closest homes. Under normal geometrical spreading losses, the noise level at 93 feet is -6 to -10 dB lower than the measurement at 45 and 30 feet respectively.

Two sets of readings were taken along with an intervening background reading during a lull in the cycle of washes. Both wash cycles had the maximum number of vehicles in the tunnel simultaneously for the entire measurement period (one in the dryer, one in rinse, one in soap wash). Although there is a normal variation in hourly vehicle throughput, an uninterrupted vehicle flow for any single hour was assumed as a worst case. Readings made at the Anaheim facility that measured the levels recorded on at least one-half of the time if the facility operates non-stop. Readings were also made to document the levels that would occur in a cumulative 15-minute period (25th percentile, or L_{25}) and a cumulative 5 minute period (8th percentile, or L_{08}) as well as the 1-second maximum (Lmax). The results (dB) were as follows at 45 feet from the entrance:

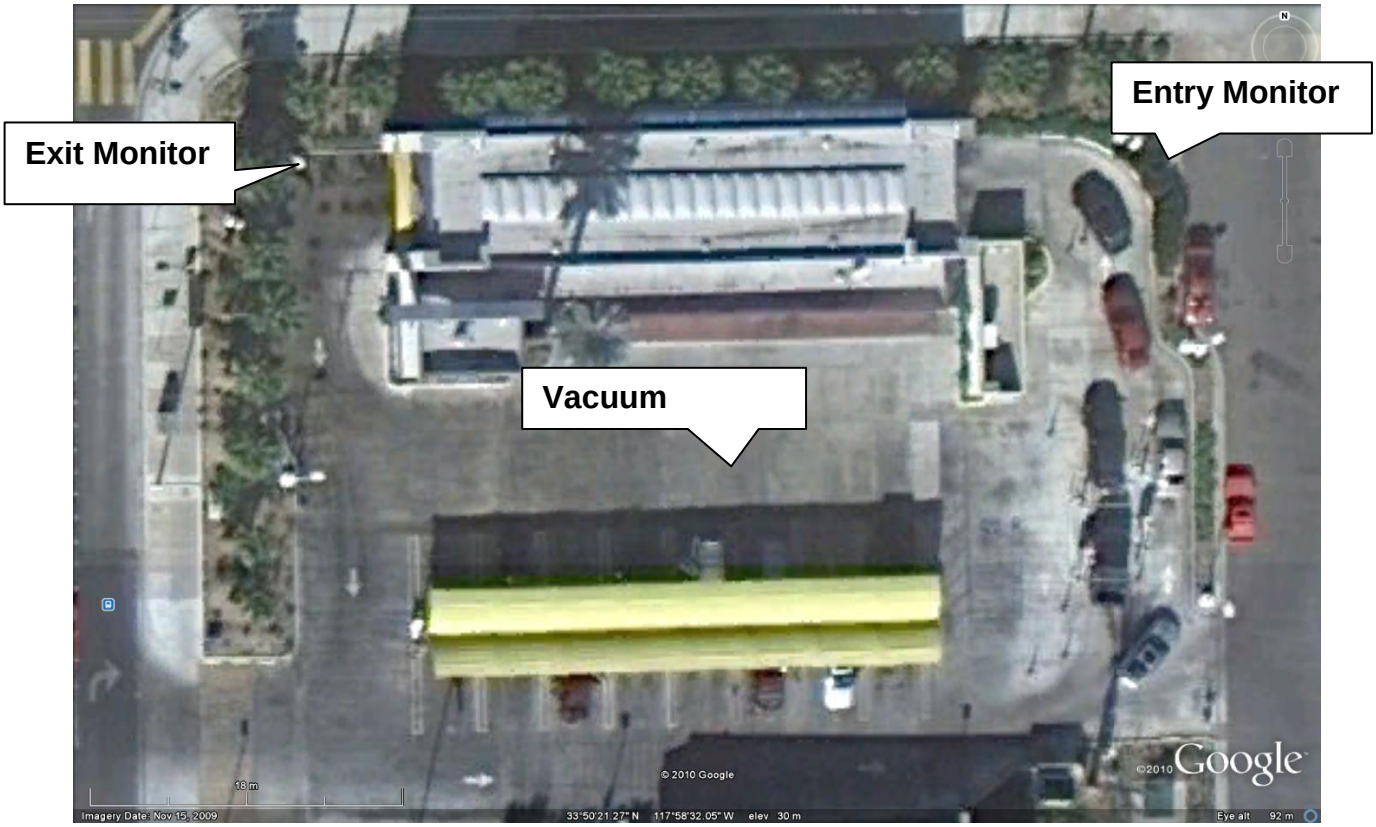
Activity	**Lmax**	**5-min (L_{08})**	**15-min (L_{25})**	**30-min (L_{50})**
Wash Cycle 1	72	71	69	69
Background	70	68	66	65
Wash Cycle 2	73	72	69	68
Average (w/o background)	73	69	66	65
Ordinance Standard	75	65	60	59*

*based upon an adjustment for elevated background traffic noise

For non-stop hourly operations, the ordinance standard would be exceeded by several of these readings, but the closest neighbors are more than 45 feet away and do not have a direct line-of-sight down the car wash tunnel entrance.

When the readings are adjusted for increased distance spreading loss and for a measured off-tunnel axis partial shielding of -5 dB, the resulting noise levels at the rear of the closest homes on Roosevelt to the tunnel entrance are as follows (dB):

Figure 3
Existing Car Wash Noise Measurement Location



Parameter	Lmax	5-min (L_{08})	15-min (L_{25})	30-min (L_{50})
Measured @ 45'	73	69	66	65
Distance Loss @ 90-95'	-6	-6	-6	-6
Off-Axis Adjustment	-5	-5	-5	-5
Residual Level	62	58	55	54
Fullerton Standard	75	65	60	59

Noise exposures to car wash operations at the closest homes to the proposed tunnel entrance will be well within ordinance standards and generally well below existing traffic noise even with continuous non-stop car wash operations.

The blowers/dryers near the tunnel exit are louder, but they are recessed away from the actual exit and the vanes are directed inward along the tunnel conveyor. At 30 feet from the exit, directly looking down the tunnel, the following noise levels were observed (dB):

Parameter	Lmax	5-min (L_{08})	15-min (L_{25})	30-min (L_{50})
Cars in dryer	83	80	79	78
No cars in system	80	75	70	68
Car wash only	83	78	78	78
Fullerton Standard	75	65	60	59

At 30 feet from the exit, looking straight down the tunnel axis, all noise ordinance standards would be exceeded. The closest homes, however, are farther away and only have a sideways view of the exit.

At the closest property line at 93 feet from the exit centerline, geometrical spreading losses would provide an additional 10 dB of attenuation. The side view measured noise was -8 dB quieter than the tunnel axis noise. These adjustment factors were applied to the above measurements to calculate the noise level at the nearest Fullerton residence to the tunnel exit. The ordinance level could be marginally exceeded seen as follows (dB) if one assumes non-stop hourly car wash operations:

Condition	Lmax	5-min (L_{08})	15-min (L_{25})	30-min (L_{50})
Measured @ 30"	83	78	78	78
Distance Loss to 90-95'	-10	-10	-10	-10
Off-Axis Adjustment	-8	-8	-8	-8
Residual Level	65	60	60	60
Fullerton Standard	75	65	60	59

The very small degree of potential excess that might occur during non-stop tunnel operations could be mitigated by placing the blower nozzles another 2-3 feet down the tunnel, or by adding a 10-foot long wing wall along the east side of the tunnel exit the same height as the tunnel door. Either measure would reduce noise by 5 dB, and would allow the noise standards to be met with a reasonable margin of safety.

These calculations are for the rear yard property line at the alley of the closest homes on S. Roosevelt Avenue north of West Avenue. Each of these residences is shielded from a direct line-of-sight by existing rear yard walls. The sound level on their rear patios will be at least 5 dB less than shown above by the protection created by these walls.

One residence at 601 S. Roosevelt Avenue south of West Avenue has a side yard exposure to the car wash exit that reduces the off-axis reduction that would be experienced at the homes with a 90-degree orientation. However, this property line is more than 150 feet from the exit. The partial field of view correction of approximately +4 dB is off-set by increased distance spreading losses of -4 dB. The noise level at the side yard of the first home west of Roosevelt and south of West Avenue will be almost identical to the rear lot line noise level at the first home west of Roosevelt and north of West Avenue.

Vacuum Noise

The vacuums will operate from a central blower enclosed within the car wash building with nozzles at each self-service free vacuum station. The blower noise was completely inaudible near the vacuum stations when the doors to the storage/machine room are closed. Vacuum activity noise derives from suction "whoosh" on carpets and seats. Measured vacuum noise during a driver's full car vacuum at 18 feet from the driver's seat with a direct view into open car doors was as follows (including traffic noise from Magnolia):

Condition	**Lmax**	**5-min (L_{08})**	**15-min (L_{25})**	**30-min (L_{50})**
Vacuum a 4-door sedan (18 feet)	71	70	68	66
Fullerton Standard (FME 15.90.030.C)	75	65	60	59
Adjusted to 52-feet at nearest home	62	61	59	57

Vacuum noise by itself using a centralized motor in the enclosed equipment room shown on Sheet AS-1.0 dated 10/21/2009 will not cause the noise ordinance to be exceeded. However, the vacuums will operate concurrently with the car wash. The combined noise levels assuming the use of recommended mitigation near the tunnel exit, is as follows:

Location/Source	**Lmax**	**5-min (L_{08})**	**15-min (L_{25})**	**30-min (L_{50})**
Near Tunnel Entrance				
Car Wash	62	58	55	54
Vacuums	62	61	59	57
Total	65	64	60	59
Near Tunnel Exit				
Car Wash*	60	55	55	55
Vacuums	62	61	59	57
Total	64	62	60	59
Fullerton Standard	75	65	60	59

*with an additional 2.5 feet of blower nozzle recess into the tunnel and/or construction of a 10-foot long wing wall along the eastern edge of the tunnel exit.

Conclusion

Even under worst-case continuous operational conditions, the most stringent noise standards will be met with incorporation of minor noise mitigation at the tunnel exit. Noise impacts will be maintained at less-than-significant levels under the following conditions:

1. Hours of operation are 7 a.m. to 8 p.m.

2. Car wash equipment is identical to the equipment tested at 590 S. Magnolia in Anaheim.

3. The blower nozzles are moved 2.5 feet farther into the tunnel than in Anaheim, or a 10-foot long wing wall is constructed along the eastern drive aisle exit at a height to match the tunnel exit-opening.

No additional mitigation would be required to maintain worst-case noise impacts at less-than-significant.