

NOISE IMPACT ANALYSIS

**Express Car Wash – Riverside
3729 and 3745 Van Buren Boulevard
Riverside, California 92503**

Prepared For

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1.0 EXECUTIVE SUMMARY

The proposed project, Express Car Wash – Riverside, consists of the demolition of existing on-site structures and the construction of a new car wash facility. The project site is located at 3729 and 3745 Van Buren Boulevard in the City of Riverside, California.

The purpose of this report is to assess noise impacts from proposed equipment at the facility and to determine if mitigation is necessary and feasible to reduce project-related noise impacts to meet applicable noise limits. Noise limits specified within the City of Riverside Municipal Code must be met at neighboring property lines.

Calculations show that, with the current design, noise impacts from the proposed on-site equipment are expected to meet applicable daytime noise limits of the City of Riverside at all surrounding property lines, assuming the proposed property line barriers are constructed to the minimum standards and configuration detailed herein.

2.0 INTRODUCTION

This acoustical analysis report is submitted to satisfy the noise requirements of the City of Riverside. Its purpose is to assess noise impacts from on-site project-related mechanical noise sources, and to determine if mitigation is necessary to reduce the noise impacts to be compliant with applicable noise limits.

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting, abbreviated "dBA," to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol " L_{EQ} ." Unless a different time period is specified, " L_{EQ} " is implied to mean a period of one hour. Some of the data may also be presented as octave-band-filtered and/or A-octave-band-filtered data, which are a series of sound spectra centered about each stated frequency, with half of the bandwidth above and half of the bandwidth below each stated frequency. This data is typically used for machinery noise analysis and barrier calculations.

Sound pressure is the actual noise experienced by a human or registered by a sound level instrument. When sound pressure is used to describe a noise source, the distance from the noise source must be specified in order to provide complete information. Sound power, on the other hand, is a specialized analytical metric used to provide information without the distance requirement, and may be used to calculate the sound pressure at any desired distance.

2.1 Project Description

The proposed project, Express Car Wash – Riverside, consists of the demolition of existing on-site structures and the construction of a new car wash facility with 30 individual vacuum stations, each with a double vacuum hose. According to the Business Operations Statement for the project, the proposed hours of operation for the car wash facility are 7 a.m. to 8 p.m., seven days a week.

The proposed car wash equipment is the primary focus of this analysis, as it is expected to generate the most noise on site; however, intercom equipment, vacuum hose, and central vacuum unit noise impacts were also evaluated in this analysis. For additional project details, please refer to the project plans, provided in Appendix A.

2.2 Project Location

The project site is located at 3729 and 3745 Van Buren Boulevard in the City of Riverside, California. The Assessor's Parcel Numbers (APNs) for the site are 233-022-012 and 233-022-080. The project site currently is partially developed with a single family residence, to be demolished. The project site is surrounded by Office/Commercial properties (underlying zone CR) along the north, south, and west (across Van Buren Boulevard) boundaries of the project site. The property along the eastern boundary of the project site is zoned Residential (R-1-7000).

For a graphical representation of the site, please refer to the Vicinity Map, Assessor's Parcel Map, Satellite Aerial Photograph, and Topographic Map provided as Figures 1 through 4, respectively.

2.3 Applicable Noise Standards

The noise regulations applicable to this project are contained within the City of Riverside Municipal Code Title 7, which specifies noise limits based on the land use of the properties in question.

The City of Riverside Municipal Code states that residential land uses, like those located to the east of the project site, have noise limits of 55 dBA between 7 a.m. and 10 p.m. and 45 dBA between 10 p.m. and 7 a.m. According to the Business Operations Statement for the project, the proposed hours of operation for the car wash facility are 7 a.m. to 8 p.m., seven days a week. As the proposed hours of operation are 7 a.m. to 8 p.m., the daytime noise limits were applied. Commercial noise limits are 65 dBA at all times.

Pertinent sections of the City of Riverside Municipal Code are provided as Appendix B.

3.0 ENVIRONMENTAL SETTING

3.1 Existing Noise Environment

The primary noise source in the vicinity of the project site is traffic noise from Van Buren Boulevard. No other noise source is considered significant.

An on-site inspection and a traffic noise measurement were made on the morning of Wednesday, March 11, 2020. The weather conditions were as follows: sunny skies, moderate humidity, and temperature in the mid 60s, with winds at 4 mph. A traffic noise measurement was taken approximately 220 feet to the south of the project site because there were non-traffic construction noise sources along Magnolia Avenue at the time of the measurement. As the measurement was used to calibrate the traffic noise model and thus determine the typical ambient noise environment, non-traffic noise sources are not desired during the measurement. The measurement location was moved further south so that construction noise was not a significant source of noise during the measurement, as required by City of Riverside Municipal Code Title 7 Section 25.010.C. As the measurement location is along the same segment of Van Buren Boulevard as the project site, and has a similar distance to the roadway as the western boundary of the project site, the noise measurement location would have a traffic noise level comparable to one on site. . The primary source of noise during the measurement was traffic noise. The microphone was placed at approximately five feet above the existing grade. After a 10-minute sound level measurement, paused for non-traffic noise sources such as backup alarms and aircraft, no changes in the L_{EQ} were observable and results were recorded. The measured noise level and related weather conditions are shown in Table 1, and the noise measurement location is shown in Figure 3.

Table 1. On-Site Noise Measurement Conditions and Results	
Date	Wednesday, March 11, 2020
Time	11:38 a.m. – 11:49 a.m.
Conditions	Sunny skies, wind at 4 mph, temperature in the mid 60s with moderate humidity
Measured Noise Level	73.0 dBA L _{EQ}

3.2 Future Noise Environment

The future noise environment in the vicinity of the project site will be primarily a result of the same noise sources, as well as the noise generated by the proposed mechanical equipment on site, which includes car wash tunnel equipment, pay station equipment with small speaker boxes, vacuum hoses, and the central vacuum units. The car wash dryers are expected to be the primary project-related noise source on site. As the central vacuum motor units are expected to be located indoors, they are not expected to generate high levels of noise; however, they were incorporated into the calculations for a worst-case analysis. Additionally, no rooftop HVAC equipment is proposed to be located on site.

Equipment noise levels for the proposed pay station speaker systems were not available to the undersigned; however, based on professional experience, they are expected to have equivalent noise levels as intercom systems manufactured by HME. The HME Intercom System is documented to have a maximum noise level of 84 dBA at one foot from the speaker post. For further details on the HME intercom system, please refer to Appendix D: Manufacturer Data Sheets.

The car wash tunnel is proposed to include fifteen 15HP Tech 21 Dryers, manufactured by MacNeil, which will be located near the exit of the tunnel. Each of the tunnel dryers is proposed to be equipped with PowerLock noise-reducing air valves in the closed position. Additionally, the noise impacts from each individual vacuum station hose were analyzed. Eilar Associates conducted measurements of comparable vacuum hose units at an existing car wash in Vista, California, to obtain accurate information to incorporate into calculations. The central vacuum unit is proposed to be located in the vacuum rooms within the buildings. Equipment noise levels for the vacuum unit were provided by Vacutech, the manufacturer, and are expected to generate a noise level of 68 dBA at a distance of three feet from the vacuum enclosure.

Noise levels of all proposed car wash dryer equipment and central vacuum unit were provided by the manufacturer, with the exception of the individual vacuum station hoses, and are shown in Table 2. Supporting manufacturer information is provided in Appendix D. As the noise levels for the car wash dryers and central vacuum unit were provided in broadband sound pressure levels at a specified distance, sound pressure levels were converted to sound power levels using the reference distance given, and a standard frequency spectrum typical of comparable equipment was applied.

Table 2. Sound Power Level of Proposed Mechanical Equipment										
Equipment	Sound Power Level at Octave Band Frequency (dB)									Sound Power Total (dBA)
	31.5	63	125	250	500	1K	2K	4K	8K	
15HP Tech 21 Dryer	--	91	95	92	92	93	91	89	96	98
Double Vacuum Station ¹	73	73	69	67	69	74	78	80	83	86
Central Vacuum Unit	67	73	71	69	68	68	65	62	55	72

¹Measured noise level of double hose vacuum station in place at an existing car wash facility, located in Vista, California.

4.0 METHODOLOGY AND EQUIPMENT

4.1 Methodology

4.1.1 Field Measurement

A “one-hour” equivalent sound level measurement (L_{EQ} , A-Weighted) was recorded near the site. During the on-site noise measurement, start and end times are recorded, and vehicle counts are made for cars, medium trucks (double-tires/two axles), and heavy trucks (three or more axles) for the corresponding road segment(s). Supplemental sound measurements of one hour or less in duration are often made to further describe the noise environment of the site.

For measurements of less than one hour in duration, the measurement time is long enough for a representative traffic volume to occur and the noise level (L_{EQ}) to stabilize. Other field data gathered include measuring or estimating distances, angles-of-view, slopes, elevations, roadway grades, and vehicle speeds. This information is subsequently verified using available maps and records.

4.1.2 Cadna Noise Modeling Software

Modeling of the outdoor noise environment is accomplished using Cadna Version 2020, which is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions. Cadna (Computer Aided Noise Abatement) assists in the calculation, presentation, assessment, and alleviation of noise exposure. It allows for the input of project information such as noise source data, barriers, structures, and topography to create a detailed model and uses the most up-to-date calculation standards to predict outdoor noise impacts. Noise standards used by Cadna that are particularly relevant to this analysis include ISO 9613 (Attenuation of sound during propagation outdoors). Cadna provides results that are in line with basic acoustical calculations for distance attenuation and barrier insertion loss.

4.2 Measurement Equipment

Some or all of the following equipment was used at the site to measure existing ambient noise levels:

- Larson Davis Model LxT Type 1 Integrating Sound Level Meter, Serial # 4084
- Larson Davis Model CAL200 Type 1 Calibrator, Serial # 16455
- Microphone with windscreen, tripod

The sound level meter was field-calibrated immediately prior to the noise measurement and checked afterwards to ensure accuracy. All sound level measurements conducted and presented in this report, in accordance with the regulations, were made with sound level meters that conform to the American National Standards Institute specifications for sound level meters (ANSI S1.4). All instruments are maintained with National Bureau of Standards traceable calibration, per the manufacturers' standards.

5.0 NOISE IMPACTS

Noise levels of the proposed on-site mechanical equipment were calculated using Cadna at surrounding properties. These receivers represent the nearest affected noise-sensitive locations, and therefore, any other potential receivers would be exposed to lower noise levels as they will receive additional attenuation due to distance and shielding from intervening structures. Equipment noise levels were calculated considering shielding provided by the proposed building on site. Additionally, calculations consider the proposed six-foot high property line wall (with the exception of the westernmost 20 feet of the wall, which is three feet high for the setback). Receivers were calculated at a height of five feet above grade. Please refer to Figure 5 for a graphical representation of evaluated receiver locations.

In addition, appropriate duty cycles were applied to the equipment operating on site. The intercom equipment was analyzed as being used for 30 minutes out of each hour, which is expected to be a conservative estimate, as they are expected to operate for very brief intervals as each individual selects their car wash preferences. As the car wash dryers and vacuum hoses may be in operation constantly, they were evaluated as being operational during the entire hour.

Results of the analysis are shown in Table 3 below. Receiver locations and equipment noise contours are shown in Figure 5. Additional information is shown in Appendix C.

Table 3. Calculated Noise Levels for Proposed Equipment – Current Design				
Receiver	Receiver Location	Noise Limit (dBA)	Calculated Equipment Noise Level (dBA)	Compliant?
R1	East Residential	55	46	Yes
R2	South Commercial	65	52	Yes
R3	South Commercial	65	57	Yes
R4	West Commercial	65	60	Yes
R5	North Commercial	65	50	Yes

As shown above, with the proposed six-foot high property line wall (with the exception of the westernmost 20 feet of the wall, which is three feet high for the setback), equipment noise levels are expected to meet applicable noise limits of the City of Riverside at all surrounding property lines as designed. No mitigation is required.

As the proposed property line wall provides significant noise shielding to the surrounding receivers, it must be solid and constructed of masonry.

6.0 CONCLUSION

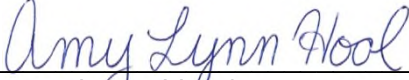
Calculations show that, with the current design, noise impacts from the proposed on-site equipment are expected to meet applicable daytime noise limits of the City of Riverside at all surrounding property lines, assuming the proposed property line barriers are constructed to the minimum standards and configuration detailed herein.

This analysis is based upon a current worst-case scenario of anticipated equipment noise levels. Substitution of equipment with higher noise emission levels may invalidate the recommendations of this study. These conclusions and recommendations are based on the best and most current project-related information available at the time this study was prepared.

7.0 CERTIFICATION

This report is based on the related project information received and measured noise levels, and represents a true and factual analysis of the acoustical impact issues associated with the Express Car Wash – Riverside project, located at 3729 and 3745 Van Buren Boulevard in the City of Riverside, California. This report was prepared by Mo Ouwenga and Amy Hool.

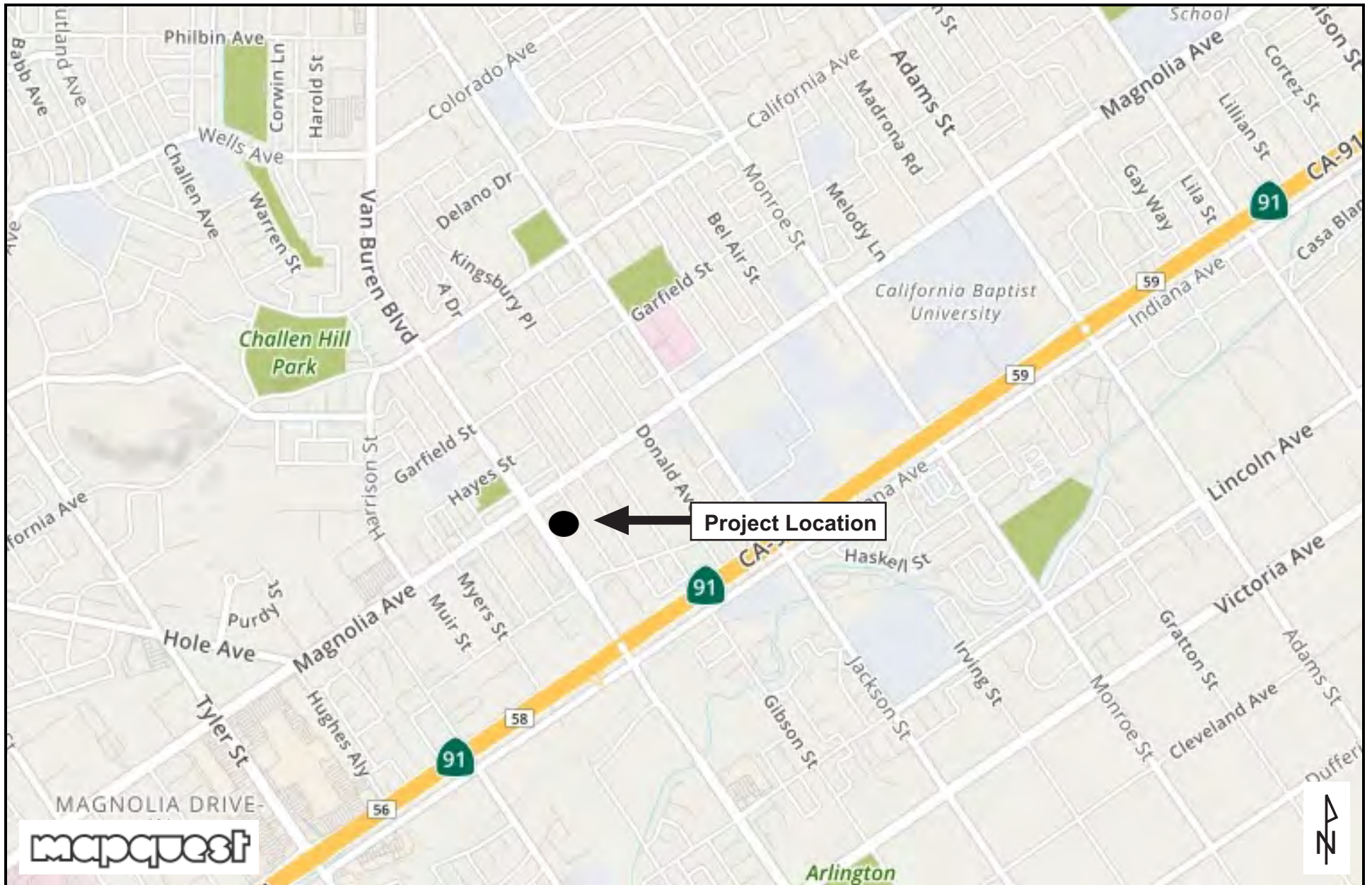

Mo Ouwenga, Acoustical Consultant


Amy Hool, President/CEO

8.0 REFERENCES

1. City of Riverside Municipal Code, Title 7 – Noise Control.
2. Meyer, Mohaddes Associates, City of Riverside General Plan 2025 Program Transportation Study, revised May 2007.
3. Federal Highway Administration, Highway Traffic Noise: Analysis and Abatement Guide, December 2011.
4. Federal Highway Administration, Traffic Noise Model Version 2.5.
5. DataKustik, Cadna (Computer Aided Noise Abatement), Version 2020.
6. Traffic Distribution Study, by Katz-Okitsu and Associates Traffic Engineers, 1986.

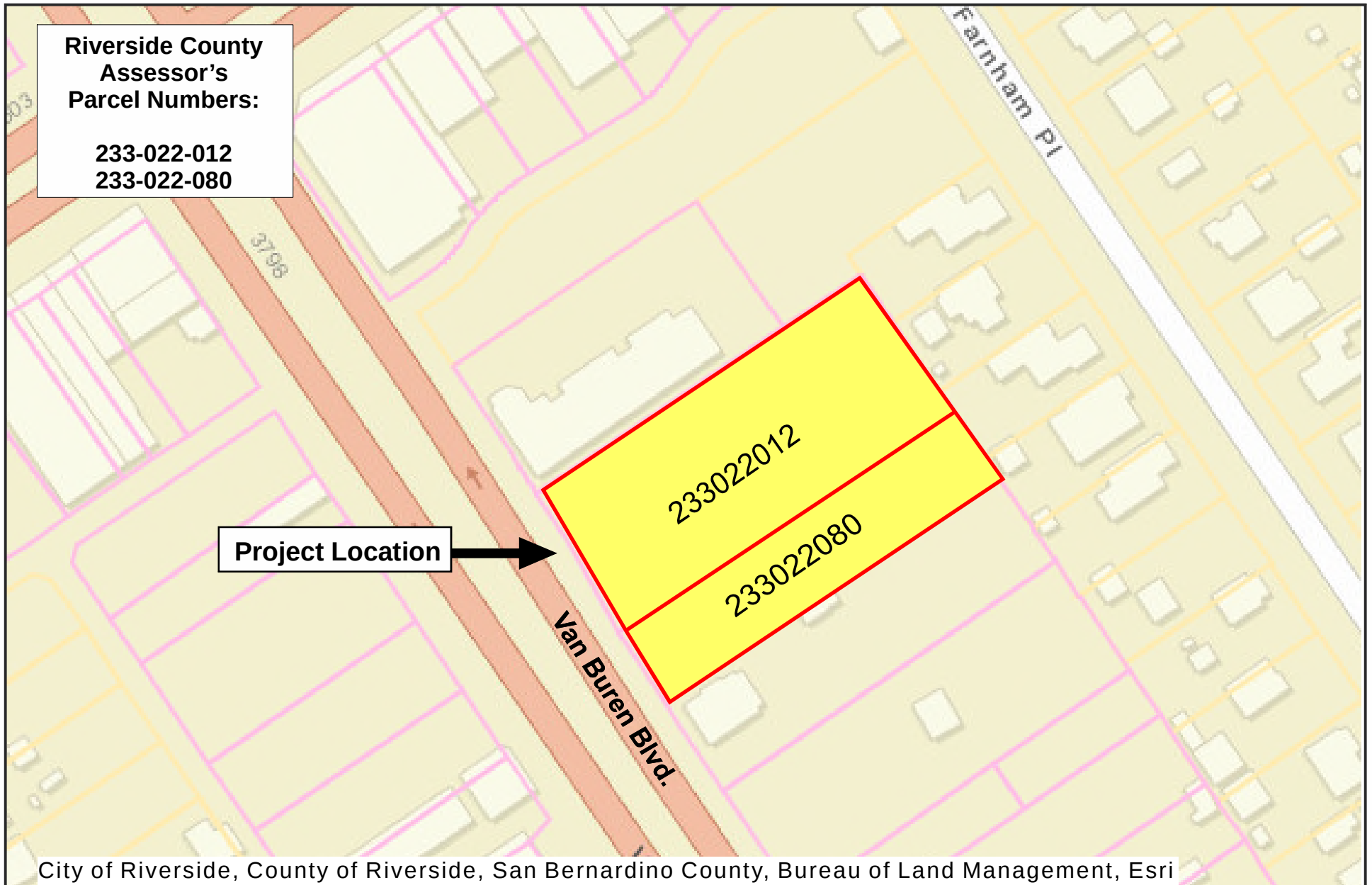
FIGURES



Eilar Associates, Inc.
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Vicinity Map
Job # S200304

Figure 1



Eilar Associates, Inc.
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Assessor's Parcel Map
Job # S200304

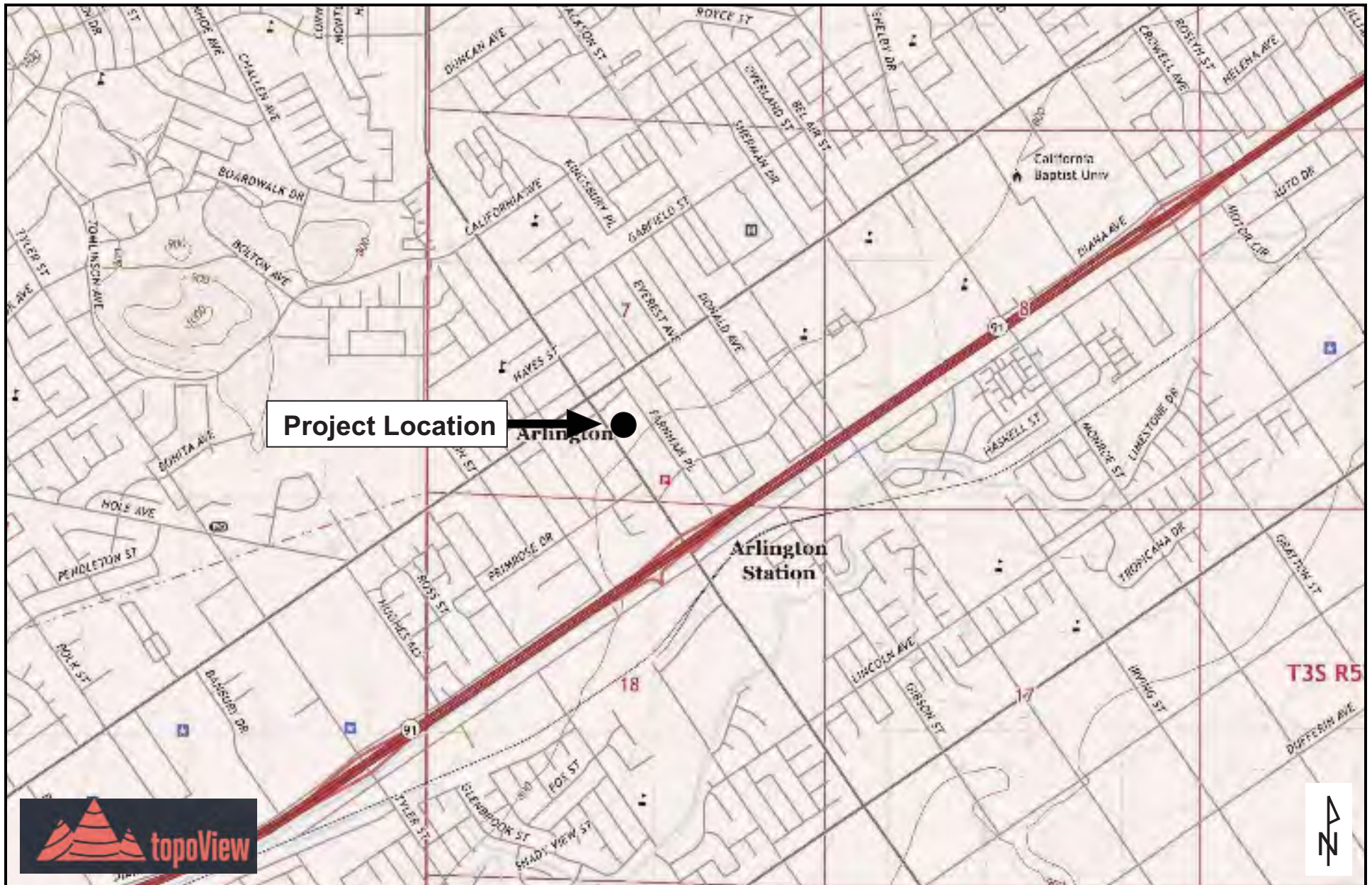
Figure 2



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Satellite Aerial Photograph Showing Noise Measurement Location
Job # S200304

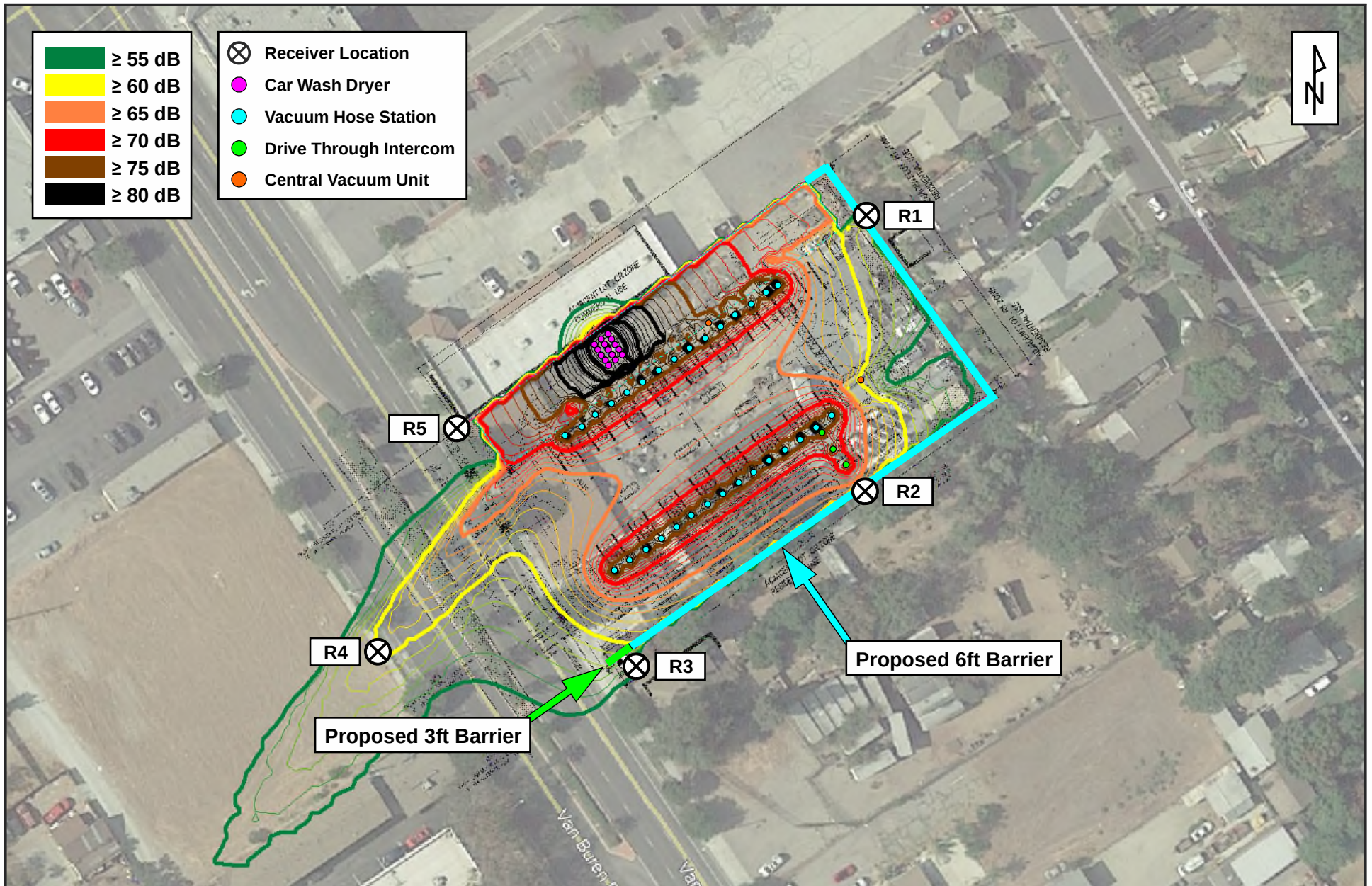
Figure 3



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 760-738-5570

Topographic Map
Job # S200304

Figure 4



Eilar Associates, Inc.
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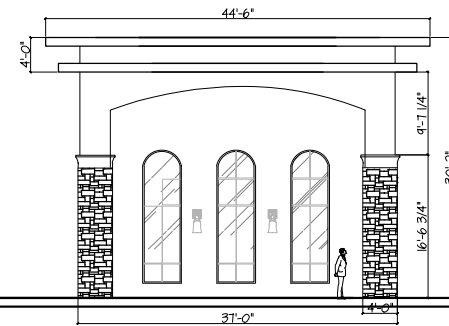
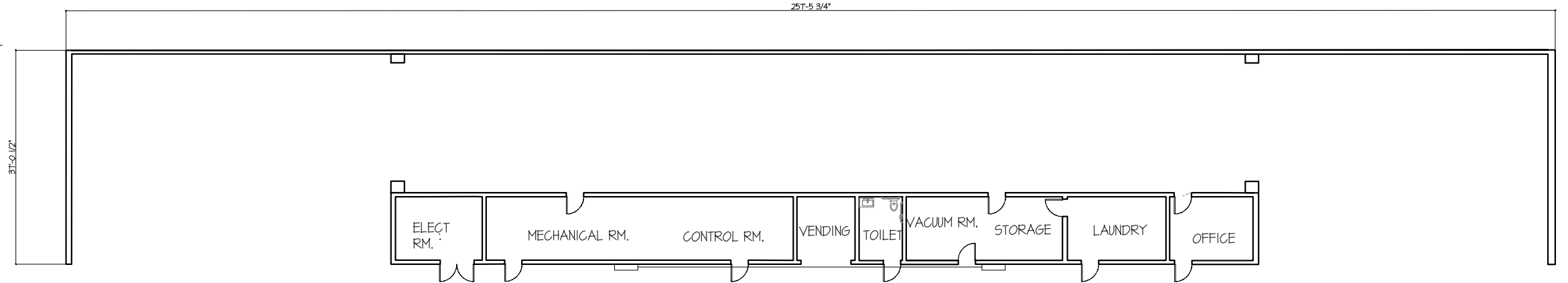
**Satellite Aerial Photograph Showing Site Plan, Equipment
 Noise Contours, and Source and Receiver Locations
 Job # S200304**

Figure 5

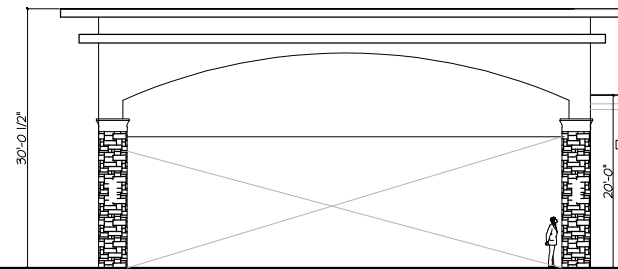
APPENDIX A

Project Plans

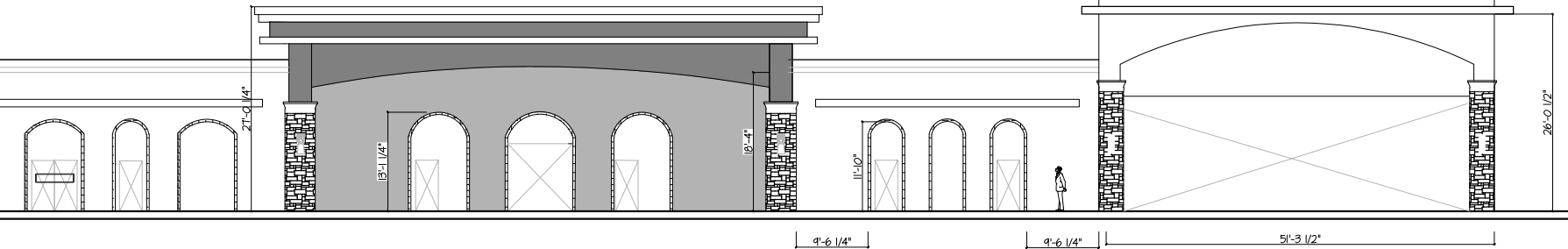
EXPRESS CAR WASH BUILDING DEVELOPMENT
 J4.4 ELEVATION OPTION I
 RIVERSIDE EXPRESS CAR WASH
 3729, 3745 VAN BUREN BLVD
 RIVERSIDE, CA 92503
 APN# : 233-022-080 ,
 233-022-083



ELEVATION 1



ELEVATION 2



OPTION 1

APPENDIX B

Applicable Noise Regulations

7.25.010 - Exterior sound level limits.

- A. Unless a variance has been granted as provided in this title, it shall be unlawful for any person to cause or allow the creation of any noise which exceeds the following:
1. The exterior noise standard of the applicable land use category, up to five decibels, for a cumulative period of more than 30 minutes in any hour; or
 2. The exterior noise standard of the applicable land use category, plus five decibels, for a cumulative period of more than 15 minutes in any hour; or
 3. The exterior noise standard of the applicable land use category, plus ten decibels, for a cumulative period of more than five minutes in any hour; or
 4. The exterior noise standard of the applicable land use category, plus 15 decibels, for the cumulative period of more than one minute in any hour; or
 5. The exterior noise standard for the applicable land use category, plus 20 decibels or the maximum measured ambient noise level, for any period of time.
- B. If the measured ambient noise level exceeds that permissible within any of the first four noise limit categories, the allowable noise exposure standard shall be increased in five decibel increments in each category as appropriate to encompass the ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.
- C. If possible, the ambient noise level shall be measured at the same location along the property line with the alleged offending noise source inoperative. If for any reason the alleged offending noise source cannot be shut down, then the ambient noise must be estimated by performing a measurement in the same general area of the source but at a sufficient distance that the offending noise is inaudible. If the measurement location is on the boundary between two different districts, the noise shall be the arithmetic mean of the two districts.
- D. Where the intruding noise source is an air-conditioning unit or refrigeration system which was installed prior to the effective date of this title, the exterior noise level when measured at the property line shall not exceed 60 dBA for units installed before 1-1-80 and 55 dBA for units installed after 1-1-80.

Table 7.25.010A

Exterior Noise Standards		
Land Use Category	Time Period	Noise Level

Residential	Night (10:00 p.m. to 7:00 a.m.) Day (7:00 a.m. to 10:00 p.m.)	45 dBA 55 dBA
Office/commercial	Any time	65 dBA
Industrial	Any time	70 dBA
Community support	Any time	60 dBA
Public recreation facility	Any time	65 dBA
Nonurban	Any time	70 dBA

Table 7.25.010.B

Land Use Category/Zoning Matrix	
Land Use Category	Underlying Zone
Residential	RE, RA-5, RR, RC, R-1-1/2 acre, R-1-13000, R-1-10500, R-1-8500, R-1-7000, R-3-2500, R-3-4000, R-3-3000, R-3-2000, R-3-1500, R-4
Office/commercial	O, CRC, CR-NC, CR, CG
Industrial	BMP, I, AIR
Community support	Any permitted zone
Nonurban	Any permitted zone

(Ord. 7489 § 20, 21(Exh. A), 2019; Ord. 6967 § 5, 2007; Ord. 6273 § 1 (part), 1996)

APPENDIX C

Cadna Analysis Data and Results

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Phone: (760) 738-5570
Date: 02 Dec 2020

Calculation Configuration

Configuration	
Parameter	Value
General	
Country	(user defined)
Max. Error (dB)	0.00
Max. Search Radius #(Unit,LEN)	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section #(Unit,LEN)	1000.00
Min. Length of Section #(Unit,LEN)	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rcvr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature #(Unit,TEMP)	10
rel. Humidity (%)	70
Ground Absorption G	0.45
Wind Speed for Dir. #(Unit,SPEED)	3.0
Roads (TNM)	
Railways (Schall 03 (1990))	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Receivers

Name	M.	ID	Level Lr		Limit. Value		Land Use			Height	Coordinates		
			Day	Night	Day	Night	Type	Auto	Noise Type		X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)				(ft)	(ft)	(ft)	(ft)
R1	+		46.4	46.2	55.0	0.0				4.99 r	625.76	517.47	4.99
R2	+		52.3	48.9	70.0	0.0				4.99 r	625.12	346.70	4.99
R3	+		57.0	57.0	70.0	0.0				4.99 r	475.68	238.96	4.99
R4	+		60.4	60.4	70.0	0.0				4.99 r	320.58	246.09	4.99
R5	+		49.9	49.8	70.0	0.0				4.99 r	370.86	385.49	4.99

Point Sources

Name	M.	ID	Result. PWL			Lw / Li		Correction			Sound Reduction	Attenuation	Operating Time			K0	Freq.	Direct.	Height	Coordinates					
			Day (dBA)	Evening (dBA)	Night (dBA)	Type	Value	norm. dB(A)	Day dB(A)	Evening dB(A)			Night dB(A)	R	Area (ft²)					Day (min)	Special (min)	Night (min)	(dB)	(Hz)	X (ft)
Drive Through Intercom 1	+		84.5	84.5	84.5	Lw	DT		0.0	0.0	0.0				30.00	0.00	0.00	0.0	500	(none)	4.00	r	598.42	382.65	4.00
Drive Through Intercom 2	+		84.5	84.5	84.5	Lw	DT		0.0	0.0	0.0				30.00	0.00	0.00	0.0	500	(none)	4.00	r	605.87	372.15	4.00
Drive Through Intercom 3	+		84.5	84.5	84.5	Lw	DT		0.0	0.0	0.0				30.00	0.00	0.00	0.0	500	(none)	4.00	r	613.55	361.77	4.00
Dryer 1	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	456.38	437.62	8.00
Dryer 2	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	458.04	434.57	8.00
Dryer 3	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	460.21	431.93	8.00
Dryer 4	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	461.91	429.02	8.00
Dryer 5	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	464.16	426.03	8.00
Dryer 6	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	460.61	440.43	8.00
Dryer 7	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	462.27	437.83	8.00
Dryer 8	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	464.22	434.94	8.00
Dryer 9	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	466.01	432.07	8.00
Dryer 10	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	468.28	429.20	8.00
Dryer 11	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	464.58	443.69	8.00
Dryer 12	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	466.35	440.86	8.00
Dryer 13	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	468.43	438.12	8.00
Dryer 14	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	470.54	435.02	8.00
Dryer 15	+		98.0	98.0	98.0	Lw	S1		0.0	0.0	0.0							0.0		(none)	8.00	r	472.56	432.27	8.00
V1	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	604.35	392.56	4.00
V2	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	594.70	385.53	4.00
V3	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	584.96	378.50	4.00
V4	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	575.31	371.47	4.00
V5	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	565.65	365.01	4.00
V6	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	555.72	357.79	4.00
V7	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	546.54	351.23	4.00
V8	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	536.61	344.39	4.00
V9	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	527.14	337.37	4.00
V10	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	517.21	330.62	4.00
V11	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	507.77	323.52	4.00
V12	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	498.03	316.59	4.00
V13	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	488.56	309.75	4.00
V14	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	478.72	303.19	4.00
V15	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	468.98	296.54	4.00
V16	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	571.13	474.39	4.00
V17	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	563.96	469.75	4.00
V18	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	554.31	462.40	4.00
V19	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	544.23	455.70	4.00
V20	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	534.96	448.53	4.00
V21	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	525.26	441.50	4.00
V22	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	515.44	435.03	4.00
V23	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	505.79	427.86	4.00
V24	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	496.09	421.16	4.00
V25	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	486.39	414.32	4.00
V26	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	476.65	407.34	4.00
V27	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	466.92	400.49	4.00
V28	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	457.49	393.50	4.00
V29	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	448.16	386.52	4.00
V30	+		86.2	86.2	86.2	Lw	V		0.0	0.0	0.0							0.0		(none)	4.00	r	438.19	380.07	4.00

Vertical Area Sources

Name	M.	ID	Result. PWL			Result. PWL"			Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night			
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(ft²)		(min)	(min)	(min)	(dB)	(Hz)	
Central Vacuum Unit Room			75.2	75.2	75.2	72.3	72.3	72.3	Lw"	VC		0.0	0.0	0.0							3.0		(none)
Central Vacuum Unit Room			75.2	75.2	75.2	72.3	72.3	72.3	Lw"	VC		0.0	0.0	0.0							3.0		(none)

Geometry - Vertical Area Sources

Name	Height			Coordinates			
	Begin		End	x	y	z	Ground
	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)
Central Vacuum Unit Room	7.00	r		529.44	451.30	7.00	0.00
				526.99	449.56	7.00	0.00
Central Vacuum Unit Room	7.00	r		624.00	415.54	7.00	0.00
				621.55	413.80	7.00	0.00

Barriers

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height		
			left	right		horz.	vert.	Begin	End	
					(ft)	(ft)	(ft)	(ft)	(ft)	
Proposed PL Wall	+									
CW1						36.50	0.00	20.00	r	
CW3								20.00	r	
CW2								20.00	r	
Noise Barrier	-							20.00	r	

Geometry - Barriers

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height		Coordinates			
			left	right		horz.	vert.	Begin	End	x	y	z	Ground
					(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Proposed PL Wall	+									467.37	237.27	3.00	0.00
										484.24	249.31	3.00	0.00
										484.54	249.53	6.00	0.00
										702.92	404.90	6.00	0.00
										600.44	547.64	6.00	0.00
										588.61	538.55	6.00	0.00
CW1						36.50	0.00	20.00	r	381.42	391.23	20.00	0.00
										588.81	538.66	20.00	0.00
CW3								20.00	r	588.81	538.66	20.00	0.00
										610.15	509.13	20.00	0.00
CW2								20.00	r	381.42	391.23	20.00	0.00
										402.03	361.52	20.00	0.00
Noise Barrier	-							20.00	r	442.47	404.70	20.00	0.00
										427.40	393.57	20.00	0.00

Buildings

Name	M.	ID	RB	Residents	Absorption	Height
						Begin
						(ft)
CW Building				0		20.00 r
CW Building 2				0		8.00 r

Geometry - Buildings

Name	M.	ID	RB	Residents	Absorption	Height	Coordinates			
						Begin	x	y	z	Ground
						(ft)	(ft)	(ft)	(ft)	(ft)
CW Building				0		20.00 r	448.08	393.19	20.00	0.00
							569.01	479.66	20.00	0.00
							561.75	489.54	20.00	0.00
							440.80	403.43	20.00	0.00
CW Building 2				0		8.00 r	643.99	429.65	8.00	0.00
							651.15	419.48	8.00	0.00
							617.80	396.00	8.00	0.00
							610.52	406.12	8.00	0.00

Sound Level Spectra

Name	ID	Type	Oktave Spectrum (dB)												Source
			Weight.	31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
15HP Tech 21 - PowerLocks Closed	S1	Lw (c)			90.8	94.8	91.8	92.2	93.3	91.4	88.9	85.7	98.0	100.8	Manufacturer
15HP Tech 21 - PowerLocks Open	S2	Lw (c)			95.8	99.8	96.8	97.2	98.3	96.4	93.9	90.7	103.0	105.8	Manufacturer
15HP Tech 21 - No PowerLock	S3	Lw (c)			99.8	103.8	100.8	101.2	102.3	100.4	97.9	94.7	107.0	109.8	Manufacturer
Drive Through Intercom	DT	Lw (c)	A					84.5					84.5	87.7	Manufacturer
Double Vacuum Station	V	Lw (c)		72.7	73.4	69.1	67.3	69.1	74.2	78.0	80.3	83.4	86.2	86.8	Measurement
Central Vacuum Unit	VC	Lw (c)		66.8	72.9	70.7	68.8	67.6	67.8	65.3	61.7	55.1	72.3	77.8	Manufacturer

APPENDIX D

Manufacturer Data Sheets

Memo

Re: Drive-Thru Sound Pressure Levels From the Menu Board or Speaker Post

The sound pressure levels from the menu board or speaker post are as follows:

1. Sound pressure level (SPL) contours (A weighted) were measured on a typical HME SPP2 speaker post. The test condition was for pink noise set to 84 dBA at 1 foot in front of the speaker. All measurements were conducted outside with the speaker post placed 8 feet from a non-absorbing building wall and at an oblique angle to the wall. These measurements should not be construed to guarantee performance with any particular speaker post in any particular environment. They are typical results obtained under the conditions described above.
2. The SPL levels are presented for different distances from the speaker post:

Distance from the Speaker (Feet)	SPL (dBA)
1 foot	84 dBA
2 feet	78 dBA
4 feet	72 dBA
8 feet	66 dBA
16 feet	60 dBA
32 feet	54 dBA

3. The above levels are based on factory recommended operating levels, which are preset for HME components and represent the optimum level for drive-thru operations in the majority of the installations.

Also, HME incorporates automatic volume control (AVC) into many of our Systems. AVC will adjust the outbound volume based on the outdoor, ambient noise level. When ambient noise levels naturally decrease at night, AVC will reduce the outbound volume on the system. See below for example:

Distance from Outside Speaker	Decibel Level of standard system with 45 dB of outside noise <u>without</u> AVC	Decibel level of standard system with 45 dB of outside noise <u>with</u> AVC active
1 foot	84 dBA	60 dBA
2 feet	78 dBA	54 dBA
4 feet	72 dBA	48 dBA
8 feet	66 dBA	42 dBA
16 feet	60 dBA	36 dBA

If there are any further questions regarding this issue please contact HME customer service at 1-800-848-4468.

Thank you for your interest in HME's products.

OCT / 07

POWERLOCK SOUND PRESSURE LEVELS

Individual Fan Study

10HP Tech 21 Dryer

10HP at 1 meter without PowerLock	=	92DB
10HP at 1 meter with PowerLock open	=	88DB
10HP at 1 meter with PowerLock closed	=	85DB

15HP Tech 21 Dryer

15HP at 1 meter without PowerLock	=	96DB
15HP at 1 meter with PowerLock open	=	92DB
15HP at 1 meter with PowerLock closed	=	87DB

On average, a site will appreciate a 30-50% sound reduction, depending on its dryer package, valve cycling, and wash area.

Bob MacNeil
R&D





SOUND LEVEL METER READINGS

MODEL: FT-DD-T560HP2 (60HP T5 TURBINE VACUUM PRODUCER with EXHAUST SILENCER)

READING A: 68 dB(A), 3 FEET FROM TURBINE @ 45° ANGLE
AND NO BACKGROUND NOISE OR OUTSIDE INTERFERENCE.

READING B: 61 dB(A), 10 FEET FROM TURBINE @ 45° ANGLE
AND NO BACKGROUND NOISE OR OUTSIDE INTERFERENCE.

READING C: 53 dB(A), 20 FEET FROM TURBINE @ 45° ANGLE
AND NO BACKGROUND NOISE OR OUTSIDE INTERFERENCE.

NOTE: THESE READINGS WERE TAKEN OUTSIDE OF 8'x10'x8' CINDER BLOCK ENCLOSURE WITH CONCRETE SLAB AND WOOD JOIST ROOF.

SOUND LEVEL METER USED:

SIMPSON MODEL #40003 – MSHA APPROVED.
MEETS OSHA & WALSH-HEALY REQUIREMENTS FOR NOISE CONTROL.
CONFORMS TO ANSI S1.4-1983, IEC 651 SPECS FOR METER TYPE.

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