

Environmental Noise & Vibration Assessment

Blue Oak Car Wash

Sacramento County, California

BAC Job # 2024-079

Prepared For:

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CEQA Checklist

NOISE AND VIBRATION – Would the Project Result in:	NA – Not Applicable	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X		
b) Generation of excessive groundborne vibration or groundborne noise levels?				X	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?					X

Introduction

The proposed Blue Oak Car Wash development (project) is located south of Garfield Avenue and west of Verner Avenue in Sacramento County, California (APN: 220-0023-004). The project area and surrounding land uses are shown in Figure 1. The proposed project site plan is presented in Figure 2.

The project proposes the development of a car wash tunnel building and vehicle vacuum system. The purposes of this assessment are to quantify the existing noise and vibration environments, identify potential noise and vibration impacts resulting from the project, identify appropriate mitigation measures, and provide a quantitative and qualitative analysis of impacts associated with the project. Specifically, impacts are identified if project-related activities would cause a substantial increase in ambient noise levels at existing sensitive land uses in the project vicinity, generate excessive vibration levels at nearby sensitive uses, or result in noise levels that would exceed applicable federal, state, or local standards at existing sensitive uses.

Noise and Vibration Fundamentals

Noise

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

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals of pressure) as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in decibel levels correspond closely to human perception of relative loudness. Noise levels associated with common noise sources are provided in Figure 3.

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

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical

tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}). The L_{eq} is the foundation of the day-night average noise descriptor, DNL (or L_{dn}), and shows very good correlation with community response to noise. DNL is based on the average noise level over a 24-hour day, with a +10-decibel weighting applied to noise occurring during nighttime hours (10:00 p.m. to 7:00 a.m.). The nighttime penalty is based on the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because DNL represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Vibration

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

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration in terms of velocity in inches per second peak particle velocity (IPS, PPV) or root-mean-square (VdB, RMS). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity as well as RMS velocities.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance.

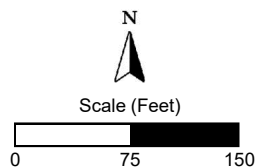
Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases.

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



Legend

- Project Boundary (Approximate)
- Short-Term Noise Survey Location
- ▲ Noise-Sensitive Receiver

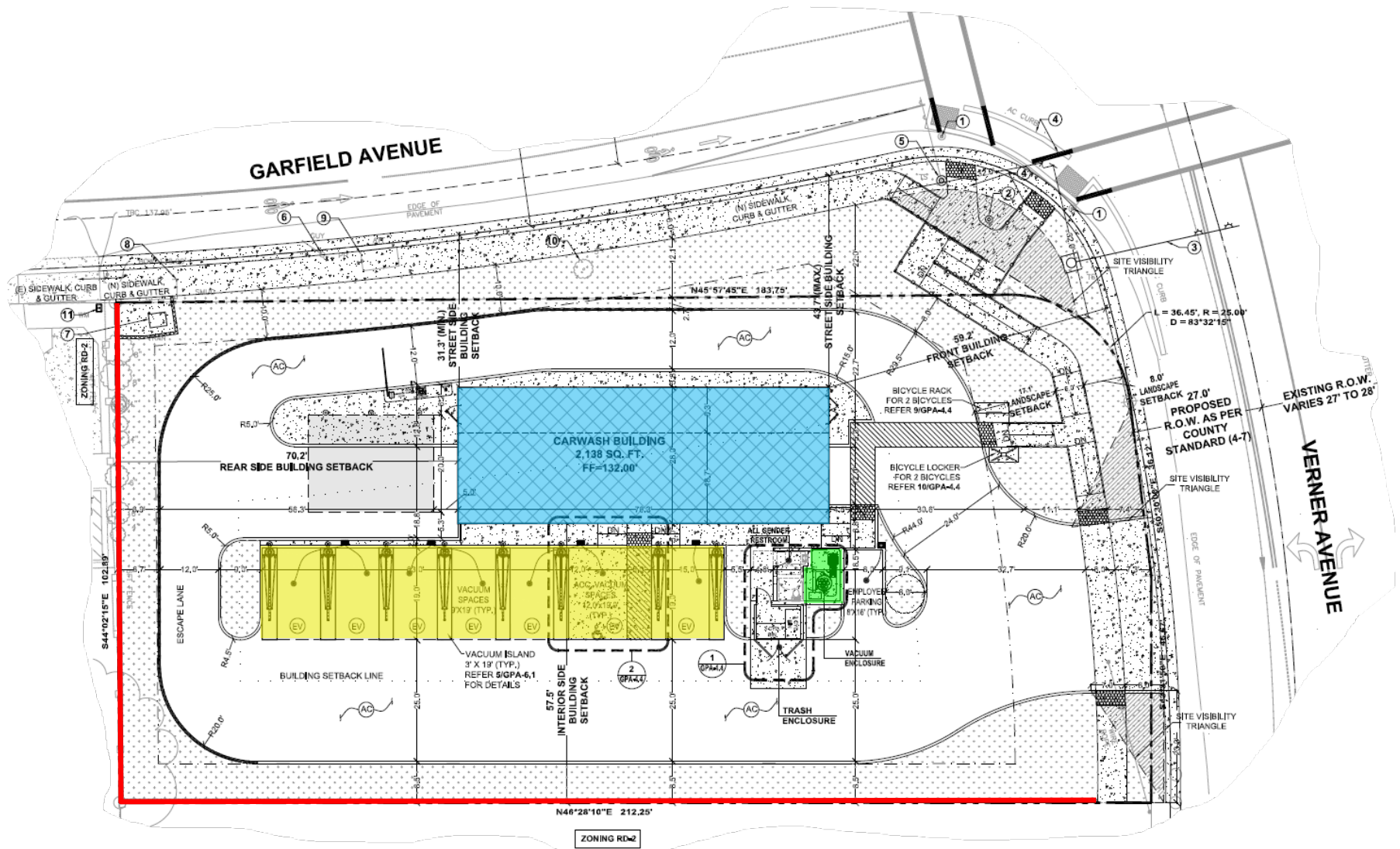


Blue Oak Car Wash
Sacramento County, California

Project Area

Figure 1

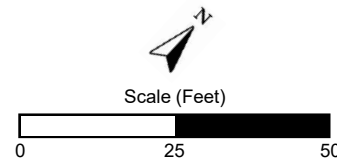




Contextual Map Plan Dated 4/1/2022

Legend

- Car Wash Tunnel
- Vehicle Vacuum Area
- Fully-Enclosed Vacuum Motor Enclosure (Lined with Sound Absorptive Material)
- Proposed 8' Masonry Wall (On Top of Retaining Wall)



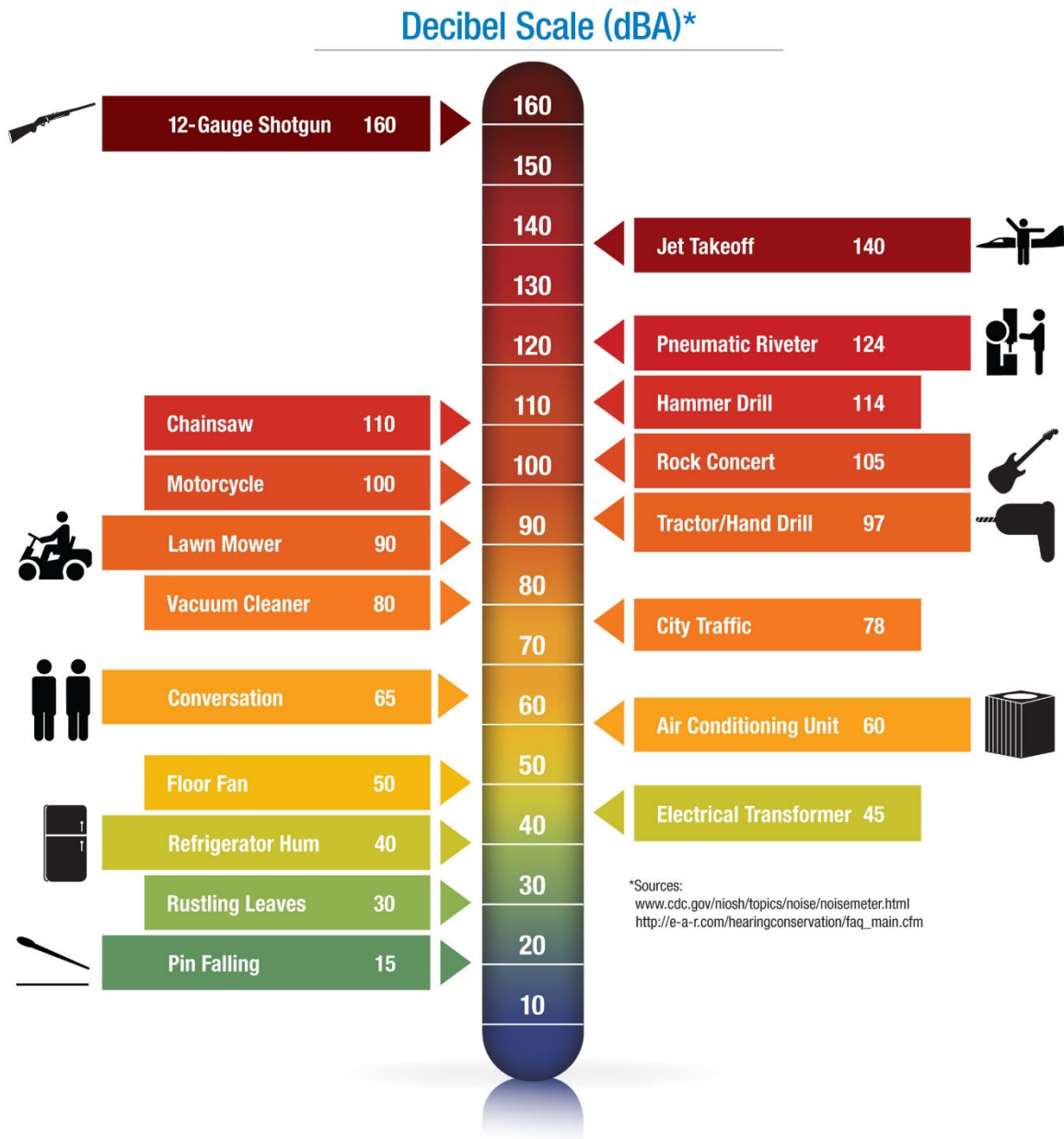
Blue Oak Car Wash
Sacramento County, California

Proposed Site Plan

Figure 2



Figure 3
Noise Levels Associated with Common Noise Sources



Environmental Setting – Existing Ambient Noise and Vibration Environment

Noise-Sensitive Land Uses in the Project Vicinity

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the primary intended use of the land. Places where people live, sleep, recreate, worship, and study are generally considered to be sensitive to noise because intrusive noise can be disruptive to these activities. The nearest noise-sensitive uses to the project have been identified as nearby properties zoned Single-Family Residential (RD-2), which existing uses consist of residences, a school/day care center, and a church. The locations of the identified residentially-zoned properties and associated noise-sensitive receivers on those parcels are shown in Figure 1.

Existing Overall Ambient Noise Environment within the Project Vicinity

The existing ambient noise environment within the immediate project vicinity is defined primarily by traffic on Garfield Avenue and Verner Avenue, and by distant traffic on Interstate 80. To quantify the existing ambient noise environment within the immediate project vicinity, BAC conducted a short-term (12-hour) ambient noise level survey at five (5) locations on Thursday, May 16th, 2024. The ambient noise survey locations are identified as sites 1-5 in Figure 1. Photographs of the noise survey sites are provided in Appendix B. Noise level measurements obtained at sites 1-5 are believed to be representative of the existing ambient noise level environments at the property lines of each corresponding noise-sensitive use (receivers 1-5) during the hours measured.

Larson Davis Laboratories (LDL) Models 820 and LxT precision integrating sound level meters were used to complete the short-term noise level survey. The meters were calibrated immediately before use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all specifications of the American National Standards Institute requirements for Type 1 sound level meters (ANSI S1.4). The results of the short-term ambient noise survey are summarized in Table 1.

Table 1
Summary of Short-Term Ambient Noise Survey Results – May 16th, 2024

Time Period	Average Measured Hourly Noise Levels (dB)														
	Site 1 ¹			Site 2 ¹			Site 3 ¹			Site 4 ¹			Site 5 ¹		
	L _{eq}	L ₅₀	L _{max}	L _{eq}	L ₅₀	L _{max}	L _{eq}	L ₅₀	L _{max}	L _{eq}	L ₅₀	L _{max}	L _{eq}	L ₅₀	L _{max}
7:00 am. to 8:00 am	68	66	89	62	61	80	56	51	72	54	52	71	58	54	77
8:00 am. to 9:00 am	66	65	83	62	61	73	51	51	60	57	51	81	59	54	79
9:00 am. to 10:00 am	66	63	82	60	59	72	51	51	67	54	50	78	60	53	84
10:00 am. to 11:00 am	65	62	83	60	58	73	50	49	63	54	49	78	58	52	78
11:00 am. to 12:00 pm	65	62	90	61	58	89	49	48	67	53	49	78	58	52	84
12:00 pm. to 1:00 pm	64	62	82	59	58	82	49	47	66	52	49	69	57	52	77
1:00 pm. to 2:00 pm	64	61	86	60	57	84	48	47	65	53	49	75	58	52	83
2:00 pm. to 3:00 pm	65	63	83	60	58	75	48	47	63	53	49	69	59	52	88
3:00 pm. to 4:00 pm	66	63	85	62	59	84	48	47	59	55	49	83	60	52	83
4:00 pm. to 5:00 pm	66	63	81	60	58	75	48	47	65	52	49	72	56	52	77
5:00 pm. to 6:00 pm	70	63	88	63	59	83	48	46	61	58	50	86	66	52	94
6:00 pm. to 7:00 pm	68	64	95	62	60	87	52	47	78	52	49	68	57	52	77
<i>Monitoring Average</i>	66	63	85	61	59	80	50	48	65	54	50	75	59	53	82
¹ Noise measurements obtained at each monitoring site are believed to be representative of ambient noise conditions at each corresponding receiver (e.g., Site 1 = Receiver 1). Measurement sites and receiver locations are shown in Figure 1.															

Source: BAC 2024

Existing Ambient Vibration Environment within the Project Vicinity

During a site visit on May 16th, 2024, BAC staff noted that vibration levels were below the threshold of perception within the project area and the immediate project vicinity. Therefore, the existing vibration environment in the project area and immediate project vicinity is considered to be negligible.

Regulatory Setting: Criteria for Acceptable Noise and Vibration Exposure

Federal

There are no federal noise or vibration criteria which would be directly applicable to this project. However, Sacramento County does not currently have a policy for assessing noise impacts associated with increases in ambient noise levels from project-generated noise sources. As a result, the following federal noise criteria was applied to the project.

Federal Interagency Commission on Noise (FICON)

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. The criteria shown in Table 2 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The FICON standards have been used extensively in recent years in the preparation of the noise sections of Environmental Impact Reports that have been certified in many California cities and counties.

The use of the FICON standards is considered conservative relative to thresholds used by other agencies in the State of California. For example, the California Department of Transportation (Caltrans) requires a project-related traffic noise level increase of 12 dB for a finding of significance, and the California Energy Commission (CEC) considers project-related noise level increases between 5 to 10 dB significant, depending on local factors. Therefore, the use of the FICON standards, which set the threshold for finding of significant noise impacts as low as 1.5 dB, provides a very conservative approach to impact assessment for this project.

Table 2
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level Without Project (DNL)	Change in Ambient Noise Level Due to Project
<60 dB	+5.0 dB or more
60 to 65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, as shown in Table 2, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB DNL. Where pre-project ambient conditions are between 60 and 65 dB DNL, a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels, specifically pre-project noise levels in excess of 65 dB DNL, a 1.5 dB increase is considered by FICON as the threshold of significance.

State of California

California Environmental Quality Act (CEQA)

Appendix G of the CEQA Guidelines asks whether the project would result in any of the following to determine whether a significant noise or vibration impact would occur:

- A. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies; or
- B. Generation of excessive groundborne vibration or groundborne noise levels; or
- C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, the project expose people residing or working in the project area to excessive noise levels.

It should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered significant according to CEQA. Because every physical process creates noise, the use of audibility alone as significance criteria would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

California Department of Transportation (Caltrans)

Sacramento County does not currently have adopted standards for groundborne vibration that would be applicable to this specific project. As a result, the vibration impact criteria developed by the California Department of Transportation (Caltrans) was applied to the project. The Caltrans guidance criteria for building structure and vibration annoyance are presented in Tables 3 and 4, respectively.

Table 3
Caltrans Guidance for Building Structure Vibration Criteria

Structure and Condition	Limiting PPV (in/sec)
Historic and some old buildings	0.5
Residential structures	0.5
New residential structures	1.0
Industrial buildings	2.0
Bridges	2.0
PPV = Peak Particle Velocity	

Source: 2020 Caltrans Transportation and Construction Vibration Guidance Manual, Table 14

Table 4
Caltrans Guidance for Vibration Annoyance Potential Criteria

Human Response	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Severe/very disturbing	2.0	0.4 to 3.6
Strongly perceptible	0.9	0.1
Distinctly perceptible	0.24	0.035
Barely/slightly perceptible	0.035	0.012
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent sources include pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers and vibratory compaction equipment.		
PPV = Peak Particle Velocity		

Source: 2020 Caltrans Transportation and Construction Vibration Guidance Manual, Tables 4 & 6

Local

Sacramento County General Plan

The Noise Element of the Sacramento County General Plan contains the County's noise-related policies. The specific policies which are generally applicable to this project are reproduced below:

Non-Transportation Noise Sources

- NO-6** Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not exceed the interior and exterior noise level standards of Table 5 (General Plan Table 2) at existing noise-sensitive areas in the project vicinity.

Table 5
Non-Transportation Noise Standards – Median (L₅₀) / Maximum (L_{max})¹

Receiving Land Use	Outdoor Areas ²		Interior Areas ³	Notes
	Daytime	Nighttime	Day & Night	
Residential	55 / 75	50 / 70	35 / 55	
Transient lodging	55 / 75	--	35 / 55	4
Hospitals, nursing homes	55 / 75	--	35 / 55	5, 6
Theaters & auditoriums	--	--	30 / 50	6
Churches, schools, libraries	55 / 75	--	35 / 60	6
Office buildings	60 / 75	--	45 / 65	6
Commercial buildings	--	--	45 / 65	6
Playgrounds, parks	65 / 75	--	--	6
Industry	60 / 80	--	50 / 70	6

¹ The Table 2 standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of Table 2, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.

² Sensitive areas are defined in the acoustic terminology section.

³ Interior noise level standards are applied within the noise-sensitive areas of the various land uses, with windows and doors in the closed positions.

⁴ Outdoor activity areas of transient lodging facilities area not commonly used during nighttime hours.

⁵ Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

⁶ The outdoor activity areas of these uses (if any) are not typically utilized during nighttime hours.

⁷ Where median (L₅₀) noise level data is not available for a particular noise source, average (Leq) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Source: Sacramento County General Plan, Noise Element, Table 2

- NO-7** The “last use there” shall be responsible for noise mitigation. However, if a noise-generating use is proposed adjacent to lands zoned for uses which may have sensitivity to noise, then the noise generating use shall be responsible for mitigating its noise generation to a state of compliance with the Table 5 (General Plan Table 2) standards at the property line of the generating use in anticipation of the future neighboring development.

Construction Noise Sources

- NO-8** Noise associated with construction activities shall adhere to the County Code requirements. Specifically, Section 6.68.090(e) addresses construction noise within the County.

Sacramento County Code

The provisions of the Sacramento County Code which would be most applicable to this project are reproduced below. It should be noted that Section 6.68 of the Sacramento County Code (Noise Control) establishes standards for acceptable noise exposure at residential uses. However, the County's Noise Ordinance standards are consistent with the County's General Plan standards. Therefore, compliance with the General Plan's noise level criteria shown in Table 5 of this report would ensure satisfaction of both the General Plan and Noise Ordinance standards.

6.68.90 Exemptions.

- e) Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on each Sunday after the hour of 8:00 p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.

Adjustments to County Exterior Noise Level Standards Based on Measured Ambient Conditions

As mentioned previously, the closest noise-sensitive parcels to the project have been identified as nearby properties zoned Single-Family Residential (RD-2), which existing uses consist of residences, a school/day care center, and a church. The locations of the nearby residentially-zoned properties and associated noise-sensitive receptors on those parcels, identified as receivers 1-5, are shown in Figure 1.

It is our understanding that the proposed hours of operation for the project are 7:00 a.m. to 7:00 p.m. (i.e., daytime hours only). Pursuant to footnote 1 of Table 5 of this report, the County General Plan exterior noise level standards shall be increased in 5 dB increments to encompass the ambient in cases where ambient noise levels already exceed Table 5 standards. Comparison of the results from the BAC ambient noise level survey (Table 1) and County General Plan exterior noise level criteria (Table 5) indicate that a portion of the County's daytime noise standards are being exceeded at BAC measurement sites 1, 2 and 5, which are believed to be representative of the ambient noise level environments at nearby noise-sensitive receivers 1, 2 and 5.

Based on the results from the BAC ambient noise survey, the proposed hours of operations identified above, and pursuant to General Plan adjustment and assessment criteria footnoted in Table 5, the following exterior noise level standards shown in Table 6 have been applied to project on-site operations noise sources and assessed at the property lines of the receivers 1-5.

Table 6
County General Plan Daytime Exterior Noise Level Standards Applied to the Project

Receiver	Representative Measurement Site	Average Measured Noise Levels (dB) ¹		Unadjusted Daytime Noise Standards (dB) ²		Adjusted for Ambient?		Applied Daytime Noise Standards (dB) ³	
		L ₅₀	L _{max}	L ₅₀	L _{max}	L ₅₀	L _{max}	L ₅₀	L _{max}
1	1	63	85			Yes	Yes	65	85
2	2	59	80			Yes	Yes	60	80
3	3	48	75	55	75	No	No	55	75
4	4	50	75			No	No	55	75
5	5	53	85			No	Yes	55	85

¹ Calculated average of measured hourly noise levels during monitoring period at each site during BAC noise survey.
² Unadjusted General Plan daytime noise level standards applicable to residential uses.
³ Applied daytime noise standards based on BAC ambient noise survey and General Plan adjustment criteria. Where applicable, unadjusted standard increased in 5 dB increments until it encompasses measured ambient.
Red = measured noise level exceeds unadjusted County daytime noise standard

Impacts and Mitigation Measures

Thresholds of Significance

For the purposes of this assessment, noise or vibration impacts are considered significant if the project would result in:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies; or
- Generation of excessive groundborne vibration or groundborne noise levels; or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, the project expose people residing or working in the project area to excessive noise levels.

The nearest identified airport is Sacramento McClellan Airport, which is located approximately 3.5 miles west of the project area. Because the project area is not located within the vicinity of a private airstrip, an airport land use plan, or within two (2) miles of a public airport, the last threshold listed above is not discussed further.

The following criteria based on standards established by the Federal Interagency Commission on Noise (FICON), the California Department of Transportation (Caltrans), the Sacramento County General Plan and Sacramento County Code were used to evaluate the significance of environmental noise and vibration resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the Sacramento County General Plan or Sacramento County Code.
- A significant impact would be identified if project-generated off-site traffic were to substantially increase noise levels at existing sensitive receptors in the vicinity. A substantial increase in off-site traffic noise levels would be identified relative to the FICON day-night average noise level (DNL) increase significance criteria presented in Table 2.

In terms of determining the temporary noise increase due to project on-site operations and construction activities at existing sensitive receptors in the vicinity, an impact would occur if those activities were to noticeably increase ambient noise levels above background levels at those locations. The threshold of perception of the human ear is approximately 3 to 5 dB – a 5 dB change is considered to be clearly noticeable. For the analysis of increases in ambient noise levels associated with project on-site operations and construction activities, a noticeable increase in ambient noise levels is assumed to occur where those activities would result in an increase by 5 dB or more over existing ambient noise levels at existing nearby noise-sensitive receivers.

- A significant impact would be identified if project construction activities or proposed on-site operations were to expose existing sensitive receptors to excessive groundborne vibration levels. Specifically, an impact would be identified if groundborne vibration levels due to these sources would exceed the Caltrans vibration impact criteria presented in this report.

Noise Impacts Associated with Project-Generated Increases in Off-Site Traffic

Impact 1: Increases in Existing Off-Site Traffic Noise Levels due to the Project

Construction of this project would result in increased traffic on the local roadway network. BAC utilized the FHWA Model (FHWA-RD-77-108) with Institution of Engineers (ITE) Trip Generation Manual rates (11th Edition) to determine whether traffic noise impacts (relative to the FICON criteria provided in Table 2) would occur as a result of this project.

The FHWA Model was used in conjunction with the CALVENO reference noise emission curves, and accounts for vehicle volume and speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the project vicinity, and is generally considered to be accurate within 1.5 dB if the input variables are properly accounted for. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To calculate a day-night average noise level (DNL), average daily traffic (ADT) volume data is manipulated based on the assumed day/night distribution of traffic.

According to the provided site plans, the project site will be accessed from Verner Avenue. As a result, the greatest impact from project-generated off-site traffic will be along this roadway. At the time of writing this report, existing traffic count data for Verner Avenue was not available from the Sacramento Area Council of Governments (SACOG). However, after a review of aerial imagery, including observation of the number of existing residences accessed by the roadway, it is

reasonable to assume that the section of Verner Avenue within the project vicinity experiences an ADT of 5,000 vehicles or less. Conservatively assuming an ADT of 5,000, a day/night distribution of 80%/20% (respectively), a medium and heavy truck distribution of 1%/1% (respectively), and a vehicle speed of 25 MPH (posted), the day-night average noise level is calculated to be 58 dB DNL at a distance of 50 feet from the centerline of Verner Avenue. The outdoor activity areas of the closest existing residences constructed along Verner Avenue maintain a separation of approximately 50 feet from the roadway centerline.

Utilizing ITE trip generation rates for Automated Car Wash land use (ITE code 948), a total of 1,172 project-generated daily vehicle trips is calculated. Conservatively assuming a total of 1,500 daily vehicle trips, a day/night distribution of 99%/1% (respectively), a medium and heavy truck distribution of <1%/<1% (respectively), and a vehicle speed of 25 MPH (posted), the day-night average noise level is calculated to be 47 dB DNL at a distance of 50 feet from the centerline of Verner Avenue.

Pursuant to FICON increase significance criteria (Table 2), where pre-project ambient conditions are less than 60 dB DNL, a 5 dB increase in noise levels shall be considered significant. Based on the conservative estimates of existing and project-generated vehicle trip generation stated above, project-related increase in traffic noise level exposure is calculated to be 0.3 dB DNL at the outdoor activity areas of the closest residences located along Verner Avenue (i.e., 50 feet from the roadway centerline). Because project-related traffic is not predicted to result in increases in ambient noise levels that would exceed the applicable FICON increase significance criteria at existing sensitive uses within the project vicinity, this impact is identified as being ***less than significant***.

Off-Site Noise Impacts Associated with Project On-Site Operations

The project proposes the development of a car wash tunnel building and vehicle vacuum system. The primary noise sources associated with project on-site operations have been identified as on-site passenger vehicle circulation, car wash tunnel equipment, vacuum system equipment, and building rooftop mechanical equipment (HVAC). Noise generated by those operations were quantified through a combination of reference noise level data and application of accepted noise modeling techniques.

The following section includes impact discussions for each of the above-identified on-site project noise sources. The County's exterior and interior noise level standards for non-transportation noise sources affecting residential zoned uses are to be applied at the property lines of those properties.

However, in terms of determining the ambient noise increases due to project on-site operations, an impact would occur if those activities were to noticeably increase ambient noise levels above background levels at existing sensitive receptors. For the analysis of increases in ambient noise levels associated with project on-site operations, a noticeable increase is assumed to occur where those activities would result in an increase by 5 dB or more over ambient noise levels at existing nearby noise-sensitive receptors. The locations of the closest identified existing noise-sensitive receptors are shown in Figure 1, identified as receivers 1-5. The outdoor activity areas of receivers

1-5 have been identified as the noise-sensitive locations on the properties (i.e., residential backyards, school/day care outdoor play areas, and church outdoor gathering areas).

Finally, the following analyses of on-site project noise exposure at nearby sensitive uses include consideration of shielding that would be provided by the construction of a combination CMU/retaining wall (i.e., noise barrier) as proposed in the provided site drawings. The location of the proposed combination CMU/retaining wall, which varies in height/elevation along the project property line, is illustrated in Figure 2.

Impact 2: On-Site Vehicle Circulation Noise at Nearby Noise-Sensitive Uses

According to the provided site plans, the project site will be accessed from Verner Avenue on the northeast end of the project property. The location of the project site access point is shown in Figure 2.

To quantify project on-site passenger vehicle circulation noise exposure, BAC utilized specific automobile passby noise level measurements conducted by BAC. Specifically, a series of individual noise measurements were conducted of multiple vehicle types arriving and departing a parking area. The results of those measurements revealed that individual vehicle passbys generated mean noise levels of approximately 70 dB SEL at a reference distance of 50 feet. Measured maximum noise levels associated with those vehicle passbys typically did not exceed 65 dB L_{max} at the same reference distance.

To compute median (L_{50}) noise levels generated by project on-site vehicle circulation, the approximate number of hourly operations is required. For the purpose of this analysis, it was conservatively assumed that 100 vehicle trips could occur at the project site during a worst-case busy (peak) hour of operations. Based on 100 vehicle trips per hour, and assuming standard spherical spreading loss (-6 dB per doubling of distance), project on-site passenger vehicle circulation noise exposure at the property lines of nearby noise-sensitive uses was calculated and the results of those calculations are presented in Table 7. The results presented in Table 7 include consideration of shielding that would be provided by proposed CMU/retaining wall noise barrier, where applicable. Barrier insertion loss calculation worksheets for project on-site vehicle circulation noise are provided as Appendix C.

Table 7
Predicted On-Site Vehicle Circulation Noise Levels at Nearby Noise-Sensitive Uses

APN ¹	Zoning – Land Use	Predicted Noise Level (dB) ²		Applied County Daytime Noise Standard (dB) ³	
		L ₅₀	L _{max}	L ₅₀	L _{max}
220-0690-013	Residential – Residence	39	46	65	85
220-0023-003	Residential – School/Day Care	50	63	60	80
220-0023-002	Residential – Residence	38	47	55	75
220-0022-026	Residential – Residence	33	39	55	75
220-0022-025	Residential – Church	50	59	55	85

¹ Locations of residential properties are shown in Figure 1.
² Predicted noise level includes consideration of proposed CMU/retaining wall noise barrier (complete results in Appendix C). Based on the site design, APNs: 220-0690-013 and 220-0022-025 would not receive adequate shielding from proposed the barrier. As a result, an evaluation of barrier effectiveness for this noise source was not completed for those two properties.
³ Applied County noise level limit is based results from BAC noise survey, pursuant to County adjustment criteria.

Source: BAC 2024

As shown in Table 7, predicted noise levels from project on-site passenger vehicle circulation would satisfy the applied Sacramento County General Plan daytime exterior median (L₅₀) and maximum (L_{max}) noise level standards at the property lines of the closest residentially zoned properties. In addition, standard building construction (e.g., stucco siding, STC-27 windows, door weather-stripping, exterior wall insulation, composition plywood roof), typically results in an exterior to interior noise reduction of approximately 25 dB with windows closed and approximately 15 dB with windows open. Given the predicted exterior property line noise levels presented in Table 7, and after consideration of the aforementioned exterior to interior noise level reduction typically provided by standard residential construction (i.e., at least 25 dB with windows closed and approximately 15 dB with windows open), project on-site passenger vehicle circulation noise levels are expected to comply with the General Plan's day/night interior noise level standards of 35 dB L₅₀ and 55 dB L_{max} within the interior areas of the nearest existing noise-sensitive receptors to the project (i.e., receivers 1-5).

Table 1 of this report contains the results from the BAC short-term ambient noise survey at sites 1-5, which are believed to be representative of the existing ambient noise environments at nearby existing noise-sensitive receivers 1-5 (i.e., residences, school/day care and church). Using the calculated average measured noise levels at each monitoring location during the BAC ambient noise survey, and the predicted noise levels presented in Table 7, ambient plus project on-site passenger vehicle circulation noise level increases were calculated at receivers 1-5. According to the results from that exercise, project-generated increases in ambient daytime median (L₅₀) noise levels are calculated to range from less than 0.1 dB L₅₀ to 0.5 dB L₅₀. Further, project-generated increases in ambient daytime maximum (L_{max}) noise levels are calculated to be less than 0.1 dB L_{max}. The calculated increases above would be well below the applied increase significance criterion of 5 dB.

Based on the analysis and results presented above, this impact is identified as being ***less than significant***.

Impact 3: Car Wash Drying Assembly Noise at Nearby Noise-Sensitive Uses

Based on the experience of BAC, noise levels generated by car washes are primarily due to the drying portion of the operation. It is our understanding that the project proposes the installation of the 30 HP (55 Hz) Stealth High Powered Quiet Drying System manufactured by International Drying Corporation. According to the manufacturer's noise specifications, provided as Appendix D, the proposed 30 HP (55 Hz) drying assembly generates a noise level of approximately 57 dB at a distance of 55 feet from the equipment. The drying assembly would be located at or near the car wash tunnel exit. The location of the proposed car wash tunnel is shown in Figure 2.

It is the experience of BAC in previous car wash projects that the noise level generation of car wash drying assemblies vary depending on the orientation of the measurement position relative to the tunnel openings. Worst-case drying assembly noise levels occur at a position directly facing the car wash exit, considered to be 0 degrees off-axis. At off-axis positions, the tunnel building facade provides varying degrees of noise level reduction. At positions 45 degrees off-axis relative to the building facade of the car wash exit and entrance, drying assembly noise levels are measured to be approximately 5 dB lower. At 90 degrees off-axis from those positions, drying assembly noise levels are measured to be approximately 10 dB lower.

Car wash drying assembly noise levels at nearby sensitive uses were calculated based on the orientation to tunnel entrance/exit, as discussed above. Noise attenuation due to distance was calculated based on standard spherical spreading loss from a point source (-6 dB per doubling of distance). Car wash drying assembly noise exposure was calculated at the property lines of nearby noise-sensitive uses and the results of those calculations are presented in Table 8. The results presented in Table 8 include consideration of shielding that would be provided by proposed CMU/retaining wall noise barrier, where applicable. Barrier insertion loss calculation worksheets for proposed Stealth 30 HP (55 Hz) car wash drying assembly noise are provided as Appendix E.

Finally, it is reasonably assumed for the purpose of this analysis that project car wash operations could exceed 30 minutes during a given worst-case busy hour. As a result, project car wash operations noise was appropriately assessed relative to the County's median (L₅₀) noise level descriptor.

Table 8
Predicted Car Wash Drying Assembly Noise Levels at Nearby Noise-Sensitive Uses

APN¹	Zoning – Land Use	Predicted Noise Level, L₅₀ (dB)²	Applied County Daytime Noise Standard, L₅₀ (dB)³
220-0690-013	Residential – Residence	37	65
220-0023-003	Residential – School/Day Care	45	60
220-0023-002	Residential – Residence	40	55
220-0022-026	Residential – Residence	24	55
220-0022-025	Residential – Church	48	55
¹ Locations of residential properties are shown in Figure 1. ² Predicted noise level includes consideration of proposed CMU/retaining wall noise barrier (complete results in Appendix E). Based on the site design, APNs: 220-0690-013 and 220-0022-025 would not receive adequate shielding from proposed the barrier. As a result, an evaluation of barrier effectiveness for this noise source was not completed for those two properties. ³ Applied County noise level limit is based results from BAC noise survey, pursuant to County adjustment criteria.			

Source: BAC 2024

Table 8 data indicate that noise level exposure from the proposed car wash assembly is predicted to comply with the applied Sacramento County General Plan daytime median (L₅₀) noise level standard at the property lines of the closest residentially zoned properties. Additionally, based on the predicted exterior property line noise levels presented in Table 8, and after consideration of the exterior to interior noise level reduction typically provided by standard building construction (i.e., at least 25 dB with windows closed and approximately 15 dB with windows open), proposed car wash drying assembly noise levels are expected to comply with the General Plan's unadjusted day/night interior noise level standard of 35 dB L₅₀ within the nearest existing noise-sensitive receptors to the project (i.e., receivers 1-5).

As mentioned previously, the results from the BAC short-term ambient noise survey at sites 1-5 (Table 1) are believed to be representative of the existing ambient noise environments at nearby existing noise-sensitive receivers 1-5 (i.e., residences, school/day care and church). Using the calculated average measured noise levels at each monitoring location during the BAC ambient noise survey, and the predicted noise levels presented in Table 8, ambient plus proposed car wash drying assembly noise level increases were calculated at receivers 1-5. According to the results from that exercise, project-generated increases in ambient daytime median (L₅₀) noise levels are calculated to range from less than 0.1 dB L₅₀ to 0.3 dB L₅₀. The calculated range of increases above would be well below the applied increase significance criterion of 5 dB.

Based on the analysis and results presented above, this impact is identified as being ***less than significant***.

Impact 4: Vacuum Equipment Noise at Nearby Noise-Sensitive Uses

The project proposes the installation of an 8-arch central vacuum piping system. However, it is the understanding of BAC that the vacuum system could potentially include a dual drop configuration (i.e., two hoses per vacuum stall). To accommodate this potential configuration, the project is proposing the installation of an AutoVac Industrial 600 Series 40 HP turbine vacuum

producer. The equipment manufacturer's specifications for the vacuum producer are provided as Appendix F.

According to the project applicant, and subsequently verified after a review of the provided site plans, the noise-generating turbine producer will be contained within a fully-enclosed equipment enclosure at the location shown in Figure 2. The site plans further indicate that the walls, door and ceiling of the vacuum producer enclosure will be lined with a sound absorbing material. After a review of the provided vacuum producer enclosure construction plans, and based on the experience of BAC in preparing noise studies for similarly configured vacuum producer enclosures, noise impacts due to the operation of the vacuum turbine producer are not expected due to the significant transmission loss (i.e., interior to exterior noise reduction) that would be provided by the enclosure's construction. As a result, no further analysis would be warranted for the vacuum turbine producer.

Based on noise level measurements conducted by BAC staff at recently completed car wash projects with similarly configured central vacuum piping systems, the primary noise-generating aspects of such systems are use of the suction nozzles located at each of the stalls. BAC file data indicate that at a distance of 50 feet from the center of an area with 12-18 vacuum stalls in concurrent operation, overall vacuum noise levels are approximately 65 dB. Using the BAC sound level data associated with 12-18 vacuum stalls in concurrent operation, and assuming standard spherical spreading loss (-6 dB per doubling of distance from a stationary source), worst-case project vacuum nozzle noise exposure was calculated at the property lines of nearby noise-sensitive uses and the results of those calculations are presented in Table 9. The results presented in Table 9 include consideration of shielding that would be provided by proposed CMU/retaining wall noise barrier, where applicable. Barrier insertion loss calculation worksheets for project vacuum equipment noise are provided as Appendix G.

Finally, it is reasonably assumed for the purpose of this analysis that project vacuum system operations could exceed 30 minutes during a given worst-case busy hour. As a result, project vacuum operations noise was appropriately assessed relative to the County's median (L₅₀) noise level descriptor.

Table 9
Predicted Vacuum Nozzle Noise Levels at Nearby Noise-Sensitive Uses

APN ¹	Zoning – Land Use	Predicted Noise Level, L ₅₀ (dB) ²	Applied County Daytime Noise Standard, L ₅₀ (dB) ³
220-0690-013	Residential – Residence	44	65
220-0023-003	Residential – School/Day Care	51	60
220-0023-002	Residential – Residence	46	55
220-0022-026	Residential – Residence	41	55
220-0022-025	Residential – Church	53	55
¹ Locations of residential properties are shown in Figure 1. ² Predicted noise level includes consideration of proposed CMU/retaining wall noise barrier (complete results in Appendix G). Based on the site design, APNs: 220-0690-013 and 220-0022-025 would not receive adequate shielding from proposed the barrier. As a result, an evaluation of barrier effectiveness for this noise source was not completed for those two properties. ³ Applied County noise level limit is based results from BAC noise survey, pursuant to County adjustment criteria.			

Source: BAC 2024

As indicated in Table 9, predicted noise levels from worst-case project vacuum suction nozzle operations would satisfy the applied Sacramento County General Plan daytime median (L₅₀) noise level standard at the property lines of the closest residentially zoned properties. In addition, based on the predicted exterior property line noise levels presented in Table 9, and after consideration of the exterior to interior noise level reduction typically provided by standard building construction (i.e., at least 25 dB with windows closed and approximately 15 dB with windows open), worst-case project vacuum noise levels are expected to comply with the General Plan's unadjusted day/night interior noise level standard of 35 dB L₅₀ within the nearest existing noise-sensitive receptors to the project (i.e., receivers 1-5).

As mentioned previously, the results from the BAC short-term ambient noise survey at sites 1-5 (Table 1) are believed to be representative of the existing ambient noise environments at nearby existing noise-sensitive receivers 1-5 (i.e., residences, school/day care and church). Using the calculated average measured noise levels at each monitoring location during the BAC ambient noise survey, and the predicted noise levels presented in Table 9, ambient plus project vacuum noise level increases were calculated at receivers 1-5. According to the results from that exercise, project-generated increases in ambient daytime median (L₅₀) noise levels are calculated to range from less than 0.1 dB L₅₀ to 1.3 dB L₅₀. The calculated range of increases above would be well below the applied increase significance criterion of 5 dB.

Based on the analysis and results presented above, this impact is identified as being ***less than significant***.

Impact 5: Mechanical Equipment (HVAC) Noise at Nearby Noise-Sensitive Uses

Heating, ventilating, and air conditioning (HVAC) requirements for the proposed car wash tunnel building will most likely be met using a packaged roof-mounted system. As a means of determining potential noise exposure due to rooftop mechanical equipment, BAC utilized reference file data collected for previous studies. BAC reference file data for HVAC systems indicate that a 12.5-ton packaged unit can be expected to generate an A-weighted sound power level of 85 dB.

Using the sound power data stated above, and assuming standard spherical spreading loss (-6 dB per doubling of distance), project HVAC equipment noise exposure at the property lines of nearby noise-sensitive uses and the results of those calculations are presented in Table 10. The results presented in Table 10 include consideration of shielding that would be provided by proposed CMU/retaining wall noise barrier, where applicable. Barrier insertion loss calculation worksheets for project HVAC equipment noise are provided as Appendix H.

Finally, because mechanical equipment operation typically generates sustained, steady-state noise levels, impacts of project rooftop mechanical equipment are assessed in this study relative to the County's median (L₅₀) noise level descriptor.

Table 10
Predicted Rooftop Mechanical Equipment (HVAC) Noise Levels at Nearby Noise-Sensitive Uses

APN ¹	Zoning – Land Use	Predicted Noise Level, L ₅₀ (dB) ²	Applied County Daytime Noise Standard, L ₅₀ (dB) ³
220-0690-013	Residential – Residence	31	65
220-0023-003	Residential – School/Day Care	39	60
220-0023-002	Residential – Residence	39	55
220-0022-026	Residential – Residence	33	55
220-0022-025	Residential – Church	40	55
¹ Locations of residential properties are shown in Figure 1. ² Predicted noise level includes consideration of proposed CMU/retaining wall noise barrier (complete results in Appendix H). Based on the site design, APNs: 220-0690-013 and 220-0022-025 would not receive adequate shielding from proposed the barrier. As a result, an evaluation of barrier effectiveness for this noise source was not completed for those two properties. ³ Applied County noise level limit is based results from BAC noise survey, pursuant to County adjustment criteria.			

Source: BAC 2024

Table 10 data indicate that predicted noise levels from project HVAC equipment would satisfy the applied Sacramento County General Plan daytime median (L₅₀) noise level standard at the property lines of the closest residentially zoned properties. Additionally, based on the predicted exterior property line noise levels presented in Table 10, and after consideration of the exterior to interior noise level reduction typically provided by standard building construction (i.e., at least 25 dB with windows closed and approximately 15 dB with windows open), project HVAC equipment noise levels are expected to comply with the General Plan's unadjusted day/night interior noise level standard of 35 dB L₅₀ within the nearest existing noise-sensitive receptors to the project (i.e., receivers 1-5).

As mentioned previously, the results from the BAC short-term ambient noise survey at sites 1-5 (Table 1) are believed to be representative of the existing ambient noise environments at nearby existing noise-sensitive receivers 1-5 (i.e., residences, school/day care and church). Using the calculated average measured noise levels at each monitoring location during the BAC ambient noise survey, and the predicted noise levels presented in Table 10, ambient plus project HVAC equipment noise level increases were calculated at receivers 1-5. According to the results from that exercise, project-generated increases in ambient daytime median (L₅₀) noise levels are calculated to range from less than 0.1 dB L₅₀ to 0.3 dB L₅₀. The calculated range of increases above would be well below the applied increase significance criterion of 5 dB.

Based on the analysis and results presented above, this impact is identified as being ***less than significant***.

Impact 6: Cumulative Project Operations Noise Levels at Nearby Noise-Sensitive Uses

The calculated cumulative (combined) median (L₅₀) noise levels from analyzed project operations at the property lines of nearby noise-sensitive uses are presented in Table 11. It should be noted that due to the logarithmic nature of the decibel scale, the sum of two noise values which differ by 10 dB equates to an overall increase in noise levels of 0.4 dB. When the noise sources are equivalent, the sum would result in an overall increase in noise levels of 3 dB.

Table 11
Calculated Cumulative On-Site Operations Noise Levels at Nearby Noise-Sensitive Uses

APN	Predicted Noise Levels, L ₅₀ (dB) ¹				Calculated Cumulative, L ₅₀ (dB) ²	Applied County Daytime Noise Standard, L ₅₀ (dB) ³
	On-Site Vehicle Circ.	Car Wash Dryers	Vacuums	HVAC		
220-0690-013	39	37	44	31	46	65
220-0023-003	50	45	51	39	54	60
220-0023-002	38	40	46	39	48	55
220-0022-026	33	24	41	33	42	55
220-0022-025	50	48	53	40	55	55

¹ Predicted noise levels from Impacts 2-5.
² Calculated cumulative (logarithmic sum) median (L₅₀) noise level exposure from analyzed on-site operations noise sources.
³ Applied County noise level limit is based results from BAC noise survey, pursuant to County adjustment criteria.

Source: BAC 2024

As shown in Table 11, cumulative (combined) median (L₅₀) noise level exposure from analyzed project on-site operations is calculated to comply with the applied Sacramento County General Plan daytime median (L₅₀) noise level standard at the property lines of the closest residentially zoned properties. Further, based on the calculated cumulative exterior property line noise levels provided in Table 11, and after consideration of the exterior to interior noise level reduction typically provided by standard residential construction (i.e., at least 25 dB with windows closed and approximately 15 dB with windows open), noise levels from combined on-site project operations are expected to comply with the General Plan's unadjusted day/night interior noise level standard of 35 dB L₅₀ within the nearest existing noise-sensitive receptors to the project (i.e., receivers 1-5).

As mentioned previously, the results from the BAC short-term ambient noise survey at sites 1-5 (Table 1) are believed to be representative of the existing ambient noise environments at nearby existing noise-sensitive receivers 1-5 (i.e., residences, school/day care and church). Using the calculated average measured noise levels at each monitoring location during the BAC ambient noise survey, and the cumulative noise levels presented in Table 11, ambient plus combined project on-site operations noise level increases were calculated at receivers 1-5. According to the results from that exercise, cumulative project-generated increases in ambient daytime median (L₅₀) noise levels are calculated to range from 0.1 dB L₅₀ to 3.1 dB L₅₀. The calculated range of increases above would be below the applied increase significance criterion of 5 dB.

Based on the analysis and results presented above, this impact is identified as being ***less than significant***.

Noise Impacts Associated with Project On-Site Construction Activities

Impact 7: On-Site Construction Noise Levels at Nearby Noise-Sensitive Uses

During project construction, heavy equipment would be used for grading excavation, paving, and building construction, which would increase ambient noise levels when in use. Noise levels would

vary depending on the type of equipment used, how it is operated, and how well it is maintained. Noise exposure at any single point outside the project work area would also vary depending upon the proximity of equipment activities to that point.

Policy NO-8 of the Sacramento County General Plan states that noise associated with construction activities shall adhere to County Code requirements – specifically Section 6.68.090.e. Sacramento County Code Section 6.68.90.e exempts noise sources associated with construction activities provided such activities do not occur between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on each Sunday after the hour of 8:00 p.m. It is reasonably assumed for the purposes of this analysis that all noise-generating on-site project construction equipment and activities would occur pursuant to County Code Section 6.68.90.e and would thereby be exempt from County Code noise level criteria.

However, noise from heavy equipment operations during on-site construction activities would add to the noise environment in the immediate vicinity of the work area. In terms of determining the temporary noise increase due to project-related construction activities, an impact would occur if construction activity were to noticeably increase ambient noise levels above background levels at existing sensitive receptors. As mentioned previously in this report, the threshold of perception of the human ear is approximately 3 to 5 dB – a 5 dB change is considered to be clearly noticeable. For this analysis, a noticeable increase in ambient noise levels is assumed to occur where noise levels increase by 5 dB or more over existing ambient noise levels at nearby existing noise-sensitive receptors (i.e., residential, school/day care and church uses – receivers 1-5).

Table 12 includes the range of maximum noise levels for equipment commonly used in general construction projects at full-power operation at a distance of 50 feet. Not all of these construction activities would be required of this project. Table 12 data also include predicted maximum equipment noise levels at nearby existing noise-sensitive uses (receivers 1-5), which assume a standard spherical spreading loss of 6 dB per doubling of distance.

Table 12
Construction Equipment Reference and Predicted Noise Levels at Nearby Noise-Sensitive Uses

Equipment	Reference Noise Level at 50', L _{max} (dB)	Predicted Equipment Noise Level at Residences, L _{max} (dB) ¹				
		Receiver 1 (250')	Receiver 2 (80')	Receiver 3 (200')	Receiver 4 (370')	Receiver 5 (0')
Air compressor	80	61	76	68	63	66
Backhoe	80	61	76	68	63	66
Ballast equalizer	82	63	78	70	65	68
Ballast tamper	83	64	79	71	66	69
Compactor	82	63	78	70	65	68
Concrete mixer	85	66	81	73	68	71
Concrete pump	82	63	78	70	65	68
Concrete vibrator	76	57	72	64	59	62
Crane, mobile	83	64	79	71	66	69
Dozer	85	66	81	73	68	71
Excavator	85	66	81	73	68	71
Generator	82	63	78	70	65	68
Grader	85	66	81	73	68	71
Impact wrench	85	66	81	73	68	71
Loader	80	61	76	68	63	66
Paver	85	66	81	73	68	71
Pneumatic tool	85	66	81	73	68	71
Pump	77	58	73	65	60	63
Saw	76	57	72	64	59	62
Scarifier	83	64	79	71	66	69
Scraper	85	66	81	73	68	71
Shovel	82	63	78	70	65	68
Spike driver	77	58	73	65	60	63
Tie cutter	84	65	80	72	67	70
Tie handler	80	61	76	68	63	66
Tie inserter	85	66	81	73	68	71
Truck	84	65	80	72	67	70
Low		57	72	64	59	62
High		66	81	73	68	71
Average		62	76	68	63	67

Source: 2018 Federal Transit Administration Noise and Vibration Impact Assessment Manual, Table 7-1

Table 1 contains the results from the BAC short-term ambient noise survey at sites 1-5, which are believed to be representative of the existing ambient noise environments at nearby existing noise-sensitive receivers 1-5 (i.e., residences, school/day care and church). Using the calculated average measured maximum (L_{max}) noise levels at each monitoring location during the BAC ambient noise survey during the hours of 7:00 a.m. to 7:00 p.m. (hours in which noise from construction activities are exempted by County Code Section 6.68.90.e), and the calculated average of predicted construction equipment maximum noise levels shown in Table 12, ambient plus project construction equipment noise level increases were calculated at residences 1-5. The results of those calculations indicate that increases in ambient maximum noise levels from project construction activities would range from 0.1 dB L_{max} to 4.1 dB L_{max}. The calculated range of ambient maximum noise level increases is below the applied increase significance criterion of 5 dB.

Based on the discussion and analysis provided above, this impact is identified as being ***less than significant***. Nonetheless, to reduce the potential for annoyance at nearby existing noise-sensitive receptors, the following measures should be incorporated into project on-site construction operations:

- **Construction Hours:** All on-site noise-generating construction activities should occur pursuant to Sacramento County Code Section 6.68.090.e.
- **Construction Equipment Mufflers and Maintenance:** All noise-producing project construction equipment and vehicles using internal-combustion engines shall be equipped with manufacturers-recommended mufflers and be maintained in good working condition.
- **Idling Prohibitions:** All equipment and vehicles should be turned off when not in use. Unnecessary idling of internal combustion engines should be prohibited.
- **Equipment Location and Shielding:** All stationary noise-generating construction equipment, such as air compressors, should be located as far as practical from the adjacent residences. Such equipment should be acoustically shielded when it must be located within close proximity to adjacent noise-sensitive receptors.
- **Quiet Equipment Selection:** Select quiet equipment, particularly air compressors, whenever possible. All noise-producing project equipment and vehicles using internal-combustion engines should be equipped with manufacturer-recommended mufflers and be maintained in good working condition. Electrically powered equipment should be used instead of pneumatic or internal-combustion-powered equipment, where feasible.
- **Staging and Equipment Storage:** Material stockpiles and mobile equipment staging, parking, and maintenance areas should be located as far as practicable from noise-sensitive receptors.
- **Equipment and Vehicle Movements:** Project area and site access road speed limits should be established and enforced during the construction period.
- **Schedule Notification:** Nearby noise-sensitive receptors (e.g., residences, school/day care center, and church) shall be notified of construction schedules so that arrangements can be made, if desired, to limit their exposure to short-term increases in ambient noise levels.

Vibration Impacts Associated with the Project

Impact 8: Vibration Generated by Project Construction and On-Site Operations

During project construction, heavy equipment would be used for grading, excavation, paving, and building construction, which would generate localized vibration in the immediate vicinity of those activities. The nearest off-site existing structures have been identified as residences, a school/day care center building, and a church building – which all appear to be relatively newer engineered structures (i.e., not highly susceptible to damage by vibration). The locations of the nearest off-site sensitive structures are shown in Figure 1, identified as receivers 1-5.

Table 13 includes the range of vibration levels for equipment commonly used in general construction projects at a distance of 25 feet. Table 13 data also include projected equipment vibration levels at the nearest off-site existing structures (receivers 1-5).

Table 13
Reference and Projected Vibration Source Amplitudes for Construction Equipment

Equipment	Reference Maximum Vibration Level at 25', PPV (in/sec)	Projected Maximum Vibration Level at Structure, PPV (in/sec) ¹				
		Receiver 1 (270')	Receiver 2 (30')	Receiver 3 (190')	Receiver 4 (380')	Receiver 5 (200')
Hoe Ram	0.089	0.003	0.068	0.004	0.002	0.004
Large bulldozer	0.089	0.003	0.068	0.004	0.002	0.004
Caisson drilling	0.089	0.003	0.068	0.004	0.002	0.004
Loaded trucks	0.076	0.002	0.058	0.003	0.001	0.003
Jackhammer	0.035	0.001	0.027	0.002	0.001	0.002
Small bulldozer	0.003	<0.001	0.002	<0.001	<0.001	<0.001

¹ PPV = Peak Particle Velocity

Source: 2018 FTA Transit Noise and Vibration Impact Assessment Manual and BAC calculations

As shown in Table 13, project construction-related vibration levels at receivers 1-5 are projected to be well below the strictest Caltrans vibration limit of 0.5 PPV applicable to building damage for older structures and residences (criteria presented in Table 3 of this report). Table 13 data also indicate that project construction equipment vibration levels are projected to range from well below the threshold of perception (<0.001 PPV) to the bottom range of distinctly perceptible (0.068 PPV) as defined by Caltrans criteria.

During a site visit on May 16th, 2024, BAC staff noted that vibration levels were below the threshold of perception within the project area. Therefore, it is expected that the project would not result in the exposure of persons to excessive groundborne vibration levels at proposed uses of the development. In addition, the project proposes the development of a commercial use. It is the experience of BAC that these uses do not typically have equipment that generates appreciable vibration.

Based on the analysis and results provided above, project construction vibration is not expected to result in excessive groundborne vibration levels at existing sensitive structures within the project vicinity, or at proposed uses of the development. As a result, this impact is identified as being **less than significant**. However, to reduce the potential for annoyance at the closest existing sensitive structures, the following measures should be incorporated into project on-site construction operations:

- **Vibration-Generating Equipment:** To the extent feasible, use of heavy vibration-generating construction equipment (including loaded heavy trucks) shall not be used within 50 feet of the nearest off-site sensitive structures. The project contractor shall use smaller vibratory rollers when compacting materials within these setback distances.
- **Dropping of Equipment:** To the extent feasible, the project shall not drop heavy equipment within 50 feet of the closest off-site sensitive structures. Alternative methods

for breaking up existing pavement, such as a pavement grinder, shall be used instead of dropping heavy objects within these setback distances.

- **Heavy Equipment Operators:** The contractor shall alert heavy equipment operators to sensitive adjacent structures within 50 feet, so they can exercise caution.

This concludes BAC's noise and vibration assessment for the Blue Oak Car Wash development in Sacramento County, California. Please contact BAC at (530) 537-23285 or dariog@bacnoise.com if you have any comments or questions regarding this report.

Appendix A

Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound. A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
IIC	Impact Insulation Class (IIC): A single-number representation of a floor/ceiling partition's impact generated noise insulation performance. The field-measured version of this number is the FIIC.
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	The highest root-mean-square (RMS) sound level measured over a given period of time.
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.
RT₆₀	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
STC	Sound Transmission Class (STC): A single-number representation of a partition's noise insulation performance. This number is based on laboratory-measured, 16-band (1/3-octave) transmission loss (TL) data of the subject partition. The field-measured version of this number is the FSTC.





A



B



C



D

Legend

- A: Site 1: Looking east towards Garfield Avenue
- B: Site 2: Looking northwest towards monitoring site along fence and Garfield Avenue
- C: Site 3: Looking south towards monitoring site along fence line
- D: Site 4: Looking east towards monitoring site and Verner Avenue

Blue Oak Car Wash
Sacramento County, California

BAC Field Survey Photographs

Appendix B-1





A

Legend

A: Site 5: Looking west towards monitoring location and Verner Avenue

Blue Oak Car Wash
Sacramento County, California

BAC Field Survey Photographs

Appendix B-2



Appendix C-1
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: On-Site Traffic Circulation
 Source Noise Level, L50 (dBA): 62
 Source Frequency (Hz): 500
 Source Height (ft): 136

Site Geometry: Receiver Description: APN: 220-0690-013 (School)
 Source to Barrier Distance, ft (C_1): 15
 Barrier to Receiver Distance, ft (C_2): 5
 Pad/Ground Elevation at Receiver (ft): 137
 Receiver Elevation (ft): 142
 Base of Barrier Elevation (ft): 137
 Starting Barrier Height (ft): 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
145	8	-13	50	Yes
146	9	-14	49	Yes
147	10	-15	48	Yes
148	11	-15	47	Yes
149	12	-16	46	Yes
150	13	-17	46	Yes
151	14	-17	45	Yes
152	15	-17	45	Yes
153	16	-17	45	Yes
154	17	-17	45	Yes
155	18	-17	45	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix C-2
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: On-Site Traffic Circulation
 Source Noise Level, Lmax (dBA): 75
 Source Frequency (Hz): 500
 Source Height (ft): 136

Site Geometry: Receiver Description: APN: 220-0690-013 (School)
 Source to Barrier Distance, ft (C₁): 15
 Barrier to Receiver Distance, ft (C₂): 5
 Pad/Ground Elevation at Receiver (ft): 137
 Receiver Elevation (ft): 142
 Base of Barrier Elevation (ft): 137
 Starting Barrier Height (ft): 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
145	8	-13	63	Yes
146	9	-14	62	Yes
147	10	-15	61	Yes
148	11	-15	60	Yes
149	12	-16	60	Yes
150	13	-17	59	Yes
151	14	-17	59	Yes
152	15	-17	58	Yes
153	16	-17	58	Yes
154	17	-17	58	Yes
155	18	-17	58	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix C-3
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: On-Site Traffic Circulation
 Source Noise Level, L50 (dBA): 49
 Source Frequency (Hz): 500
 Source Height (ft): 135

Site Geometry: Receiver Description: APN: 220-0023-002 (Residence)
 Source to Barrier Distance, ft (C_1): 20
 Barrier to Receiver Distance, ft (C_2): 100
 Pad/Ground Elevation at Receiver (ft): 132
 Receiver Elevation (ft): 137
 Base of Barrier Elevation (ft): 133
 Starting Barrier Height (ft): 9

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
142	9	-11	38	Yes
143	10	-11	37	Yes
144	11	-12	37	Yes
145	12	-13	36	Yes
146	13	-13	35	Yes
147	14	-14	35	Yes
148	15	-15	34	Yes
149	16	-15	34	Yes
150	17	-15	33	Yes
151	18	-15	33	Yes
152	19	-16	33	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix C-4
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: On-Site Traffic Circulation
 Source Noise Level, Lmax (dBA): 57
 Source Frequency (Hz): 500
 Source Height (ft): 135

Site Geometry: Receiver Description: APN: 220-0023-002 (Residence)
 Source to Barrier Distance, ft (C₁): 20
 Barrier to Receiver Distance, ft (C₂): 100
 Pad/Ground Elevation at Receiver (ft): 132
 Receiver Elevation (ft): 137
 Base of Barrier Elevation (ft): 133
 Starting Barrier Height (ft): 9

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
142	9	-11	47	Yes
143	10	-11	46	Yes
144	11	-12	45	Yes
145	12	-13	45	Yes
146	13	-13	44	Yes
147	14	-14	43	Yes
148	15	-15	43	Yes
149	16	-15	43	Yes
150	17	-15	42	Yes
151	18	-15	42	Yes
152	19	-16	41	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix C-5
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: On-Site Traffic Circulation
 Source Noise Level, L50 (dBA): 42
 Source Frequency (Hz): 500
 Source Height (ft): 132

Site Geometry: Receiver Description: APN: 220-0022-026 (Residence)
 Source to Barrier Distance, ft (C_1): 40
 Barrier to Receiver Distance, ft (C_2): 310
 Pad/Ground Elevation at Receiver (ft): 112
 Receiver Elevation (ft): 117
 Base of Barrier Elevation (ft): 126
 Starting Barrier Height (ft): 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
137	11	-9	33	Yes
138	12	-9	32	Yes
139	13	-10	32	Yes
140	14	-11	31	Yes
141	15	-11	31	Yes
142	16	-12	30	Yes
143	17	-12	29	Yes
144	18	-13	29	Yes
145	19	-13	29	Yes
146	20	-14	28	Yes
147	21	-14	28	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix C-6
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: On-Site Traffic Circulation
 Source Noise Level, Lmax (dBA): 48
 Source Frequency (Hz): 500
 Source Height (ft): 132

Site Geometry: Receiver Description: APN: 220-0022-026 (Residence)
 Source to Barrier Distance, ft (C₁): 40
 Barrier to Receiver Distance, ft (C₂): 310
 Pad/Ground Elevation at Receiver (ft): 112
 Receiver Elevation (ft): 117
 Base of Barrier Elevation (ft): 126
 Starting Barrier Height (ft): 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
137	11	-9	39	Yes
138	12	-9	39	Yes
139	13	-10	38	Yes
140	14	-11	38	Yes
141	15	-11	37	Yes
142	16	-12	36	Yes
143	17	-12	36	Yes
144	18	-13	35	Yes
145	19	-13	35	Yes
146	20	-14	34	Yes
147	21	-14	34	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix D-1

Stealth Car Wash Drying Assembly Specifications



STEALTH QUIET DRYING SYSTEM



"THE MOST POWERFUL QUIET DRYING SYSTEM EVER BUILT"

- ✓ Quiet Smooth Air Technology (SAT) with Patent Pending Low Turbulence Engineered Design
- ✓ Producers Constructed from 304 Surgical Stainless Steel
- ✓ Meets or Exceeds Most US or International Sound Regulations
- ✓ Independent Sound and Performance Studies were Performed in a AMCA 300 Reverberant Sound Room
- ✓ Over 10,300 Cubic Feet Per Minute (CFM) Per 10HP Motor!

CALL US ANYTIME



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International Drying Corporation
2510 IL RTE 176, Suite G
Prairie Grove, IL 60012

Appendix D-2
Stealth Car Wash Drying Assembly Specifications

Stealth High Powered Quiet Drying System Specifications

30 HP System - Total Sound

60 Hz 55 Hz

68.70 dBA 62.40 dBA at Q=1, 30 feet

65.10 dBA 58.80 dBA at Q=1, 45 feet

63.40 dBA 57.00 dBA at Q=1, 55 feet

80 HP System - Total Sound

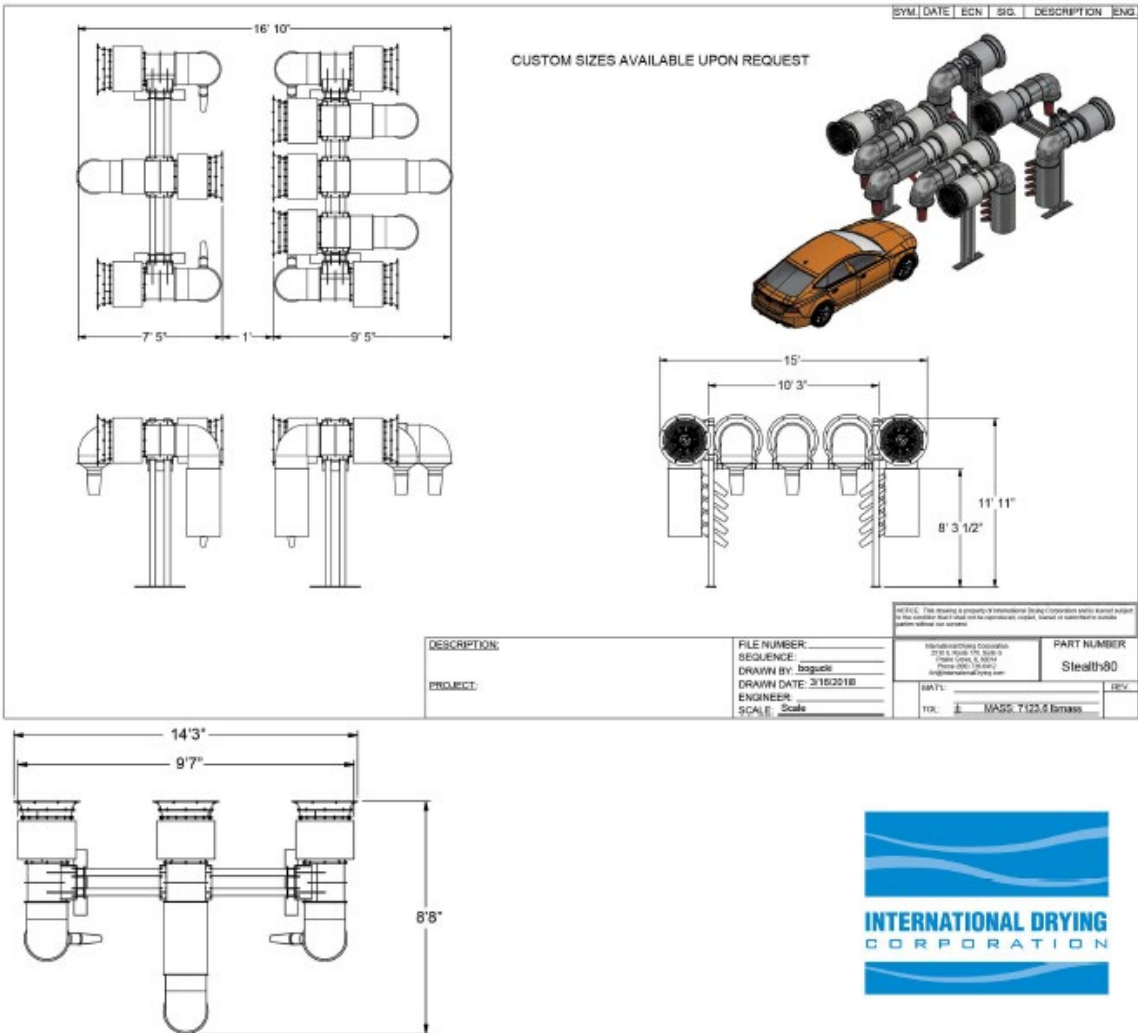
60 Hz 55 Hz

73.79 dBA 73.79 dBA at Q=1, 30 feet

70.27 dBA 61.27 dBA at Q=1, 45 feet

68.53 dBA 59.53 dBA at Q=1, 55 feet

Meets OSHA Sound Exposure Requirements



SPECIFICATIONS

30 HP Bare Fan Performance Results 30,390 CFM

80 HP Bare Fan Performance Results 81,040 CFM

*lab results available on request

Appendix E-1
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: Stealth 30 HP (55 Hz) Drying Assembly
 Source Noise Level, L50 (dBA): 54
 Source Frequency (Hz): 500
 Source Height (ft): 140

Site Geometry: Receiver Description: APN: 220-0690-013 (School)
 Source to Barrier Distance, ft (C_1): 70
 Barrier to Receiver Distance, ft (C_2): 5
 Pad/Ground Elevation at Receiver (ft): 137
 Receiver Elevation (ft): 142
 Base of Barrier Elevation (ft): 137
 Starting Barrier Height (ft): 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
145	8	-10	45	Yes
146	9	-11	43	Yes
147	10	-13	42	Yes
148	11	-13	41	Yes
149	12	-14	40	Yes
150	13	-15	40	Yes
151	14	-15	39	Yes
152	15	-16	39	Yes
153	16	-16	38	Yes
154	17	-17	38	Yes
155	18	-17	38	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-2
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: Stealth 30 HP (55 Hz) Drying Assembly
 Source Noise Level, L50 (dBA): 46
 Source Frequency (Hz): 500
 Source Height (ft): 140

Site Geometry: Receiver Description: APN: 220-0023-002 (Residence)
 Source to Barrier Distance, ft (C_1): 85
 Barrier to Receiver Distance, ft (C_2): 100
 Pad/Ground Elevation at Receiver (ft): 132
 Receiver Elevation (ft): 137
 Base of Barrier Elevation (ft): 133
 Starting Barrier Height (ft): 9

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
142	9	-6	40	Yes
143	10	-7	39	Yes
144	11	-7	39	Yes
145	12	-8	38	Yes
146	13	-9	37	Yes
147	14	-9	37	Yes
148	15	-10	36	Yes
149	16	-10	36	Yes
150	17	-11	35	Yes
151	18	-11	35	Yes
152	19	-12	34	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-3 Barrier Insertion Loss Calculation Worksheet

Project Information:
BAC Job Number: 2024-079
Project Name: Blue Oak Car Wash
Location: Sacramento County, CA

Noise Level Data:
Source Description: Stealth 30 HP (55 Hz) Drying Assembly
Source Noise Level, L50 (dBA): 29
Source Frequency (Hz): 500
Source Height (ft): 140

Site Geometry:
Receiver Description: APN: 220-0022-026 (Residence)
Source to Barrier Distance, ft (C_1): 70
Barrier to Receiver Distance, ft (C_2): 330

Pad/Ground Elevation at Receiver (ft): 112
Receiver Elevation (ft): 117
Base of Barrier Elevation (ft): 126
Starting Barrier Height (ft): 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
137	11	-5	24	Yes
138	12	-5	24	Yes
139	13	-6	24	Yes
140	14	-6	23	Yes
141	15	-7	23	Yes
142	16	-7	22	Yes
143	17	-8	21	Yes
144	18	-8	21	Yes
145	19	-9	20	Yes
146	20	-10	20	Yes
147	21	-10	19	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-1 Vacuum Producer

600 SERIES

VACUUM PRODUCER

AUTOVAC
Industrial
Vacuum & Air Systems

600 Series, 6" Standard Vacuum Producer
4 Bearing with Pedestal Mounted Motor



At the heart of every AutoVac central cleaning system is our powerful **Centrifugal Vacuum Producer**. The 600 Series turbine is a multistage exhauster available from 25 to 40 hp depending on your needs. It's engineered for years of reliable performance with very little maintenance.

We manufacture our 600 Series in-house in accordance with strict production standards. Combine the 600 Series with an AutoVac separator, engineered piping, and customized electronic motor controls for the most reliable vacuum system available.

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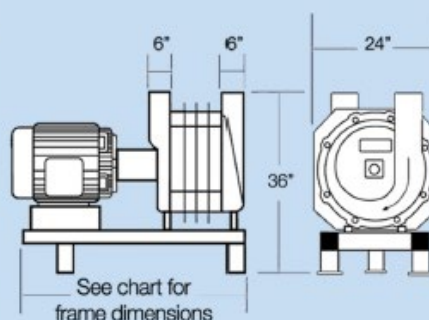
Appendix F-2

Vacuum Producer

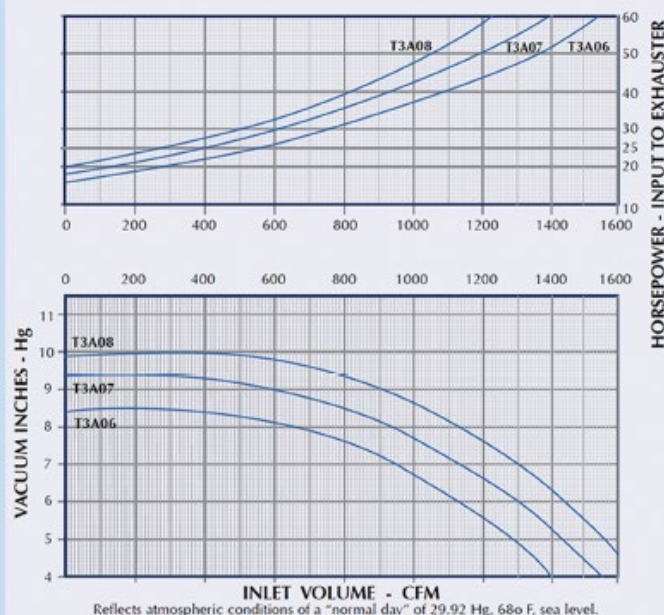
600 SERIES

VACUUM PRODUCER

Standard 3 Phase	Model: Standard Performance, 3600 RPM*					
Total Simultaneous Users 15"x1 1/2" Dia. Vac Hose	HP	Frame Dimensions	Weight lbs.	Decibels at 10ft.	Stages	Part #
7-8	25HP 3600 RPM	56.5	950	72	6	214-564001
9-10	30HP 3600 RPM	56.5	1000	74	7	214-674001
11-13	40HP 3600 RPM	62.5	1450	76	8	214-784001



PERFORMANCE INLET CURVES CENTRIFUGAL EXHAUSTER



FEATURES

- TURBINE BLOWER CASING IS HOUSED BETWEEN TWO 1/2" THICK 356 ALLOY ALUMINUM HEAD CASTINGS FOR STRENGTH, DURABILITY AND HEAT DISSIPATION.
- IMPELLERS ARE 6061-T6 AIRCRAFT GRADE ALUMINUM AND DYNAMICALLY BALANCED TO ENSURE OPERATION BELOW 1.5 MILS AT 3,600 RPMs.
- DIRECTIONAL-CONTROLLED INLET AND OUTLET AIR OPENINGS ACCELERATE AIRFLOW AND IMPROVE PERFORMANCE.
- TWO-BOLT OUTBOARD FLANGE BEARINGS ARE SELF-ALIGNING.
- EXTREMELY DURABLE CAST IRON TEFC DRIVE MOTOR IS ALIGNED AT THE FACTORY FOR VIBRATIONFREE OPERATION.
- SUREFIT SPLIT DRIVE COUPLINGS FROM MOTOR TO TURBINE DRIVE SHAFT ARE CONSTRUCTED OF DURABLE POLYURETHANE.
- MOTORS AND COUPLINGS CAN BE SERVICED WITHOUT REMOVING THE TURBINE BLOWER SECTION.
- STURDY IRON RAIL FRAME WITH THREE POINT LEG DESIGN AND ISOLATOR PADS PREVENT TURBINE FROM ROCKING ON UNEVEN MOUNTING SURFACES.

Appendix G-1
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: Vacuum Nozzles
 Source Noise Level, L50 (dBA): 61
 Source Frequency (Hz): 500
 Source Height (ft): 136

Site Geometry: Receiver Description: APN: 220-0690-013 (School)
 Source to Barrier Distance, ft (C_1): 80
 Barrier to Receiver Distance, ft (C_2): 5
 Pad/Ground Elevation at Receiver (ft): 137
 Receiver Elevation (ft): 142
 Base of Barrier Elevation (ft): 137
 Starting Barrier Height (ft): 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
145	8	-10	51	Yes
146	9	-12	49	Yes
147	10	-13	48	Yes
148	11	-14	47	Yes
149	12	-15	46	Yes
150	13	-15	46	Yes
151	14	-15	46	Yes
152	15	-16	45	Yes
153	16	-16	45	Yes
154	17	-17	44	Yes
155	18	-17	44	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix G-2
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: Vacuum Nozzles
 Source Noise Level, L50 (dBA): 54
 Source Frequency (Hz): 500
 Source Height (ft): 136

Site Geometry: Receiver Description: APN: 220-0023-002 (Residence)
 Source to Barrier Distance, ft (C_1): 60
 Barrier to Receiver Distance, ft (C_2): 115
 Pad/Ground Elevation at Receiver (ft): 132
 Receiver Elevation (ft): 137
 Base of Barrier Elevation (ft): 133
 Starting Barrier Height (ft): 9

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
142	9	-8	46	Yes
143	10	-8	46	Yes
144	11	-9	45	Yes
145	12	-10	44	Yes
146	13	-10	44	Yes
147	14	-11	43	Yes
148	15	-11	43	Yes
149	16	-12	42	Yes
150	17	-12	42	Yes
151	18	-13	41	Yes
152	19	-13	41	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix G-3
Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
 Project Name: Blue Oak Car Wash
 Location: Sacramento County, CA

Noise Level Data: Source Description: Vacuum Nozzles
 Source Noise Level, L50 (dBA): 47
 Source Frequency (Hz): 500
 Source Height (ft): 136

Site Geometry: Receiver Description: APN: 220-0022-026 (Residence)
 Source to Barrier Distance, ft (C_1): 60
 Barrier to Receiver Distance, ft (C_2): 350
 Pad/Ground Elevation at Receiver (ft): 112
 Receiver Elevation (ft): 117
 Base of Barrier Elevation (ft): 126
 Starting Barrier Height (ft): 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
137	11	-6	41	Yes
138	12	-7	40	Yes
139	13	-7	39	Yes
140	14	-8	39	Yes
141	15	-9	38	Yes
142	16	-9	38	Yes
143	17	-10	37	Yes
144	18	-10	36	Yes
145	19	-11	36	Yes
146	20	-11	36	Yes
147	21	-12	35	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix H-1 Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
Project Name: Blue Oak Car Wash
Location: Sacramento County, CA

Noise Level Data: Source Description: Rooftop Mechanical Equipment (HVAC)
Source Noise Level, L50 (dBA): 47
Source Frequency (Hz): 500
Source Height (ft): 156

Site Geometry: Receiver Description: APN: 220-0690-013 (School)
Source to Barrier Distance, ft (C_1): 80
Barrier to Receiver Distance, ft (C_2): 5

Pad/Ground Elevation at Receiver (ft): 137
Receiver Elevation (ft): 142
Base of Barrier Elevation (ft): 137
Starting Barrier Height (ft): 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
145	8	-8	39	Yes
146	9	-10	37	Yes
147	10	-11	36	Yes
148	11	-12	35	Yes
149	12	-13	34	Yes
150	13	-14	33	Yes
151	14	-14	33	Yes
152	15	-15	32	Yes
153	16	-15	32	Yes
154	17	-16	31	Yes
155	18	-16	31	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix H-2 Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
Project Name: Blue Oak Car Wash
Location: Sacramento County, CA

Noise Level Data: Source Description: Rooftop Mechanical Equipment (HVAC)
Source Noise Level, L50 (dBA): 39
Source Frequency (Hz): 500
Source Height (ft): 156

Site Geometry: Receiver Description: APN: 220-0023-002 (Residence)
Source to Barrier Distance, ft (C_1): 70
Barrier to Receiver Distance, ft (C_2): 120

Pad/Ground Elevation at Receiver (ft): 132
Receiver Elevation (ft): 137
Base of Barrier Elevation (ft): 133
Starting Barrier Height (ft): 9

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
142	9	-1	39	No
143	10	-1	39	No
144	11	-1	39	No
145	12	-3	37	No
146	13	-4	36	No
147	14	-5	35	No
148	15	-5	35	No
149	16	-5	34	No
150	17	-5	34	Yes
151	18	-5	34	Yes
152	19	-6	34	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix H-3 Barrier Insertion Loss Calculation Worksheet

Project Information: BAC Job Number: 2024-079
Project Name: Blue Oak Car Wash
Location: Sacramento County, CA

Noise Level Data: Source Description: Rooftop Mechanical Equipment (HVAC)
Source Noise Level, L50 (dBA): 33
Source Frequency (Hz): 500
Source Height (ft): 156

Site Geometry: Receiver Description: APN: 220-0022-026 (Residence)
Source to Barrier Distance, ft (C_1): 70
Barrier to Receiver Distance, ft (C_2): 345

Pad/Ground Elevation at Receiver (ft): 112
Receiver Elevation (ft): 117
Base of Barrier Elevation (ft): 126
Starting Barrier Height (ft): 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss (dB)	Noise Level (dB)	Barrier Breaks Line of Site to Source?
137	11	0	33	No
138	12	0	32	No
139	13	0	32	No
140	14	0	32	No
141	15	0	32	No
142	16	-1	32	No
143	17	-1	32	No
144	18	-1	32	No
145	19	-3	30	No
146	20	-4	29	No
147	21	-4	28	No

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).