



Memorandum

DATE: *October 1, 2023*

TO: *Glenna Mahar – Barghausen Consulting Engineers, Inc.*

FROM: *Justin Morgan, INCE*

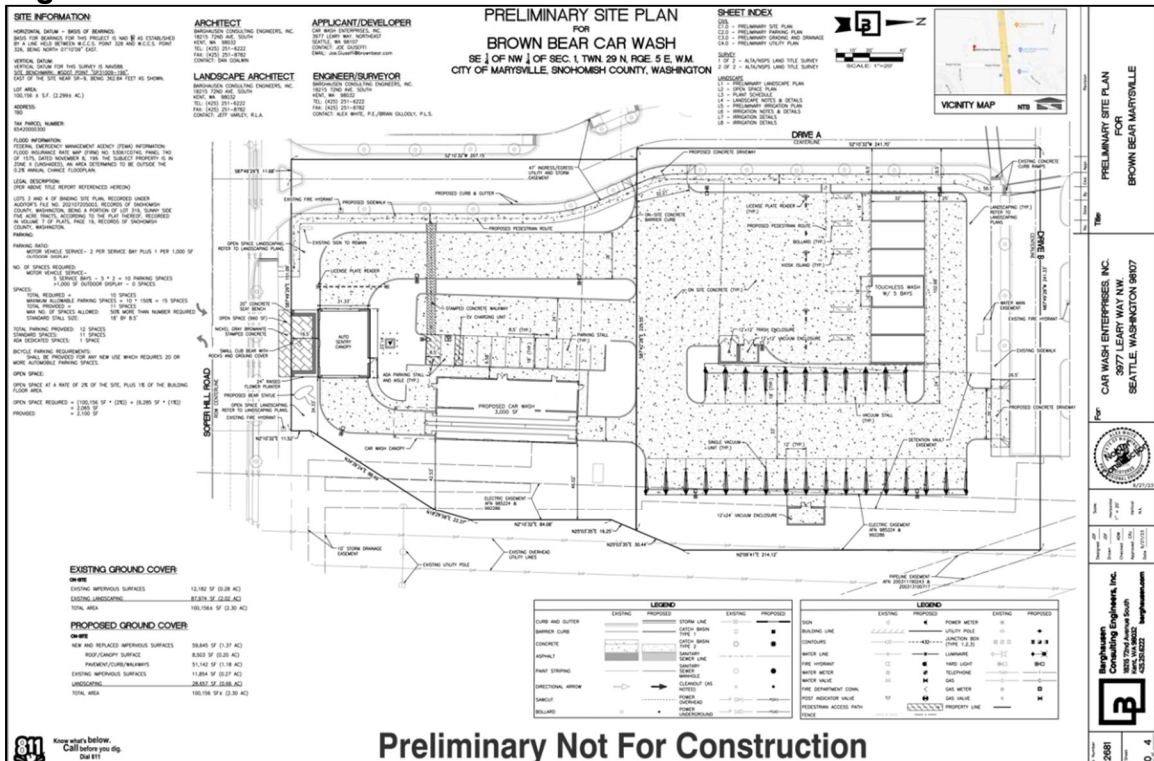
RE: *Marysville Brown Bear Car Wash Noise Code Compliance Report*

INTRODUCTION

The intent of this Noise Code Compliance Report is to evaluate sound levels associated with the operation of the proposed Brown Bear Car Wash located on parcels 00590700031903 (Lot 3) and 00590700031902 (Lot 4) in Marysville, Washington. This document includes predicted sound levels at nearby properties, an assessment of compliance with local noise regulations, and a description of mitigation measures to reduce sound levels to within codified sound limits.

The Brown Bear Car Wash project will consist of a 3,000 square-foot tunnel car wash and a 3,264 square foot car wash building consisting of five (5) touchless wash bays. Additional site improvements include (26) vacuum station stalls with three (3) vacuum motors in two (2) enclosures supporting said stalls. The site plan for the completed facility is shown in Figure 1.

Figure 1. Site Plan



SUMMARY

Sounds created by the completed facility are anticipated to comply with the sound limits identified in the Marysville Municipal Code and Lake Stevens Municipal Code with the inclusion of doors on the Touchless Car Wash Bays.

ZONING AND REGULATORY CRITERIA

The Site is part of the White Barn Development within the City of Marysville. This analysis assumes that sound limits apply at adjacent lots within the White Barn Development and at properties outside of the development. Adjacent properties outside of the White Barn Development to the west, north, and east are also within the City of Marysville. Properties south of the Site and across State Route 9, east of the Site are within the City of Lake Stevens. Sounds created by the Site that are received at properties within the City of Marysville are regulated by the Marysville Municipal Code (MMC) and sounds from the Site received at properties within the City of Lake Stevens are governed by the Lake Stevens Municipal Code (LSMC). The location of the Site, White Barn Development, and city boundaries are shown in Figure 2.

Marysville Municipal Code

Sound levels within the City of Marysville are regulated by the MMC. Chapter 22C.140.060 of the MMC includes requirements specific to drive-through facilities. Specifically, when facilities abut residential zones drive-through facilities with noise generating equipment, the developer must document compliance with noise standards

prior to developing the property. Noise generating equipment specifically identified in MMC Chapter 22C.140.060 include mechanical car washes, vacuum cleaners, and exterior air compressors.

MMC Chapter 6.76.040 adopts, by reference, the maximum permissible sound levels defined in Chapter 173-60-040 of the Washington Administrative Code (WAC). Sound limits in the WAC are based upon the Environmental Designation for Noise Abatement (EDNA) classification of the property containing the sound source and the EDNA classifications of the properties receiving the sound. EDNA classifications within the City of Marysville are defined in MMC Chapter 6.76.030 are as follows, and differ from the EDNA classifications found in the WAC:

- Class A EDNA: “Lands where human beings reside and sleep, including all properties in the city which are zoned in single-family residential or multiple-family residential classifications.”
- Class B EDNA: “Lands involving uses requiring protection against noise interference with speech, including all properties in the city which are zoned in neighborhood business, community business, general commercial, mixed use, business park, public/institutional, downtown core, main street and flex classifications.”
- Class C EDNA: “Lands involving economic activities of such a nature that higher noise levels than experienced in other areas are normally to be anticipated. Persons working in these areas are normally covered by noise control regulations of the Department of Labor and Industries. Such areas shall include all properties in the city which are zoned in light industrial and general industrial classifications.”

MMC Chapter 6.76.050 adopts by reference the exemptions set forth in WAC 173-60-050. Details of the WAC are discussed in a later section of this report.

Lake Stevens Municipal Code

Sounds created by the Site that are received within Lake Stevens are regulated by the LSMC. Chapter 9.56 of the LSMC is a nuisance type ordinance and does not identify specific sound limits. A public nuisance noise is defined in LSMC Chapter 9.56.020.H as “any sound which unreasonably either annoys, injures, interferes with, or endangers the comfort, repose, health or safety of one or more persons.” LSMC Chapter 9.56.040 lists noises and activities that are considered public nuisance and disturbance noises. These noises and activities are not applicable to the Site.

Because the LSMC does not include specific sound limits, the sound limits identified in the WAC are used by this report as criteria for assessing compliance with noise regulations within Lake Stevens.

Washington Administrative Code

Sound limits in the WAC are based upon the EDNA classification of the property containing the sound source and the EDNA classifications of the properties receiving the sound. EDNA classifications in the WAC differ from those defined in MMC Chapter 6.76.030 and are based on present, future, and historical land use, and take into consideration the usage of other properties in the vicinity. The EDNA classifications defined in the WAC only apply to properties within Lake Stevens. EDNA classifications are defined in WAC 173-60-030 as follows:

- Class A EDNA – Lands where human beings reside and sleep. Typically, Class A EDNA will be the following types of property used for human habitation:
 - Residential
 - Multiple family living accommodations
 - Recreational and entertainment (camps, parks, camping facilities and resorts)
 - Community service (group homes, assisted living facilities, hospitals, health, and correctional facilities)
- Class B EDNA – Lands involving uses requiring protection against noise interference with speech. Typically, Class B EDNA will be the following types of property:
 - Commercial living accommodations
 - Commercial dining establishments
 - Motor vehicle services
 - Retail services
 - Banks and office buildings
 - Miscellaneous commercial services, property not used for human habitation
 - Recreation and entertainment, property not used for human habitation (educational, religious, governmental, cultural, and recreational facilities)
- Class C EDNA – Lands involving economic activities of such a nature that higher noise levels than experienced in other areas is normally to be anticipated. Persons working in these areas are normally covered by noise control regulations of the department of labor and industries. Uses typical of Class A EDNA are generally not permitted within such areas. Typically, Class C EDNA will be the following types of property:
 - Storage, warehouse, and distribution facilities
 - Industrial property used for the production and fabrication of durable and nondurable goods
 - Agricultural and silvicultural property used for the production of crops, wood products, or livestock

Maximum permissible sound levels are defined in WAC 173-60-040 and are shown in Table 1.

Table 1. WAC Sound Limits, dBA

EDNA of Noise Source	EDNA of Receiving Properties		
	Class A	Class B	Class C
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

Source: WAC Chapter 173-60-040

Modifications to the sound limits shown in Table 1 are also identified in WAC Chapter 173-60-040. These modifications include a 10 dB reduction to permissible sound levels received at Class A EDNA properties between the hours of 10:00 p.m. and 7:00 a.m. Under WAC Chapter 173-60-050(4)(a) sounds created by motor vehicles are exempt from code limits when regulated by WAC Chapter 173-62.

Project Sound Limits

The Site, White Barn Development, city boundaries, and EDNA classifications based on the definitions identified in the MMC and WAC, are shown in Figure 2.

Figure 2. EDNA Classifications



Based on EDNA classifications and information contained in the MMC and LSMC, the resulting sound level limits for noise emanating from the Site and received at adjacent lot lines within the White Barn Development or at properties outside of the White Barn Development are shown in Table 2. It should be noted that the lot directly east of the Site

is unable to be developed due to a power easement, therefore sound limits east of the Site are applied at the White Bard Development boundary.

Table 2. Project Sound Limits, dBA

Property or Lot Line	Jurisdiction	Project Sound Limit (day/night)
North	Marysville	60/60
Northeast		
West		
Southwest		
East		
South	Lake Stevens	57/47

SOUND LEVEL MEASUREMENTS

Sound levels were measured from equipment similar to the equipment that will be installed at the Site. Measurements were made during the morning of April 11, 2023, and included touchless wash bays and a car wash tunnel. The results of these measurements were used to predict sound emissions from the completed facility. Additional measurements were made at the Site to document existing sound levels. Equipment used during the measurements are identified in Table 3.

Table 3. Measurement Equipment

Make and Model	Description	Serial Number
Svantek 971	Sound Level Analyzer	72542
Svantek SV18	Preamplifier	72239
Aco Pacific 7052E	Microphone	68284
Larson Davis CAL200	Acoustic Calibrator	16827

All equipment was calibrated at a certified laboratory within one year of the measurement date. Field calibrations were made before and verified immediately after the measurements were completed.

Equipment Measurements

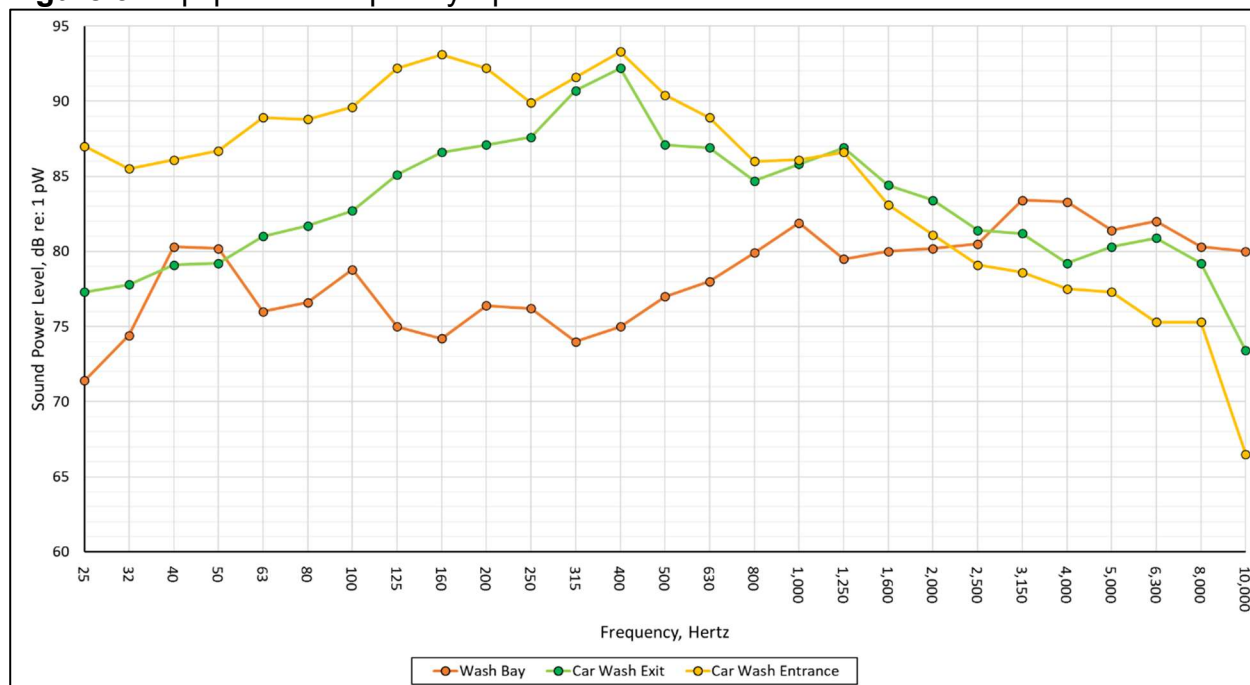
Measurements were made at multiple distances from each piece of equipment and ranged from 5 to 27 feet from the equipment. Because the data was collected at a variety of distances, measured sound pressure levels were used to compute equipment sound power levels, which are independent of distance. Measurement distances, sound pressure levels, and calculated sound power levels are shown in Table 4. A graph showing the frequency spectrum of the equipment is shown in Figure 3.

Table 4. Measured Equipment Sound Levels, L_{eq}

Equipment	Measurement Distance, Feet	Sound Pressure Level, dBA	Sound Power Level, L_{wA}
Touchless Wash Bay ¹	19	70	93
Car Wash Tunnel Entrance	27	70	97
Car Wash Tunnel Exit	5	84	96

1. Loudest 1-second of measurement period

Figure 3. Equipment Frequency Spectrum



Measurements of Existing Sound Levels

Existing sound levels at adjacent property lines outside of the White Barn Development and at interior lot lines adjacent to the Site were measured during the morning of April 20, 2023. The measurement locations are shown in Figure 4 and the results of the measurements are shown in Table 5. Dominant sound sources near the Site were traffic traveling on State Route 9 and Soper Hill Road.

Figure 4. Measurement Locations



Table 5. Existing Sound Levels, L_{eq} , dBA

Measurement Location	Measured Sound Level
West Lot Line	57
Northwest Lot Line	58
North Lot Line	59
Northeast Receiving Property	63
North Development Line	54
West Development Line	53
Southwest Receiving Property	65
South Receiving Property	64
East Lot Line	61
East Development Line	66

ACOUSTICAL MODEL

The primary tool used to predict sound levels at neighboring property lines was the 3-D computer noise modeling software environment, Cadna/A. Cadna/A utilizes the CADNA (Control of Accuracy and Debugging for Numerical Applications) computation engine developed by the Pierre et Marie Curie University of Paris. The model used for this project utilized the International Organization for Standardization 9613 Part II algorithms, implemented in the Cadna/A software, which accounted for the effects of distance, topography, and surface reflections on sound levels. The acoustical model is typically accurate to within 3 dB. Conservative assumptions were used in the model created for this project to ensure sufficient design margin within the predicted sound levels. Therefore, predicted sound levels can be compared to applicable criteria directly, without consideration of additional design margin.

The locations of the on-site equipment and structures were determined from drawings provided by Barghausen Consulting Engineers, Inc. Topographical information and property line locations were obtained from Snohomish County Geographical Information System data.

ANALYSIS

The quantity of equipment, equipment sound power levels, and operating conditions used in the model are shown in Table 6.

Table 6. Modeled Equipment

Equipment	Sound Power Level, L _{wA}	Quantity	Operating Time
Touchless Car Wash	93	5	60 minutes/hour
Vacuum Motor ¹	78	3	60 minutes/hour
Vacuum Drops ²	80	26	30 minutes/hour
Car Wash Tunnel Entrance	97	1	60 minutes/hour
Car Wash Tunnel Exit	96	1	60 minutes/hour

1. Based on manufacturer's data for a Vacutech FT-CO-T350HP4 50 horsepower turbine.
2. Based on sound levels measured by MD Acoustics from a Vacutech system.

MITIGATION MEASURES

Without the inclusion of additional noise mitigation sound levels are anticipated to exceed codified sound limits. Therefore, mitigation measures were developed and included in the project's design to reduce predicted sound levels to within codified sound limits.

To reduce predicted sound levels to within codified sound limits, doors will be included on the entrance and exits of the Touchless Car Wash Bays.

RESULTS

The site will only operate during daytime hours, therefore predicted sound levels are only compared with daytime code limits. Predicted sound levels include the doors on the Touchless Car Wash Bays. Predicted sound levels and code limits are shown in Table 7 and predicted sound level contours 5 feet above grade are shown in Figure 5. Predicted sound levels do not include contributions from the existing or future ambient acoustic environments.

Table 7. Predicted Sound Levels, dBA

Property or Lot Line	Jurisdiction	Code Limit	Predicted Sound Level
North	Marysville	60	57
Northeast			47
West			60
Southwest			56
East			52

Figure 5. Predicted Sound Level Contours



As shown in Table 7 and Figure 5, sound emissions from the project are anticipated to comply with MMC and LSMC sound limits at all adjacent lot lines and receiving properties.

CONCLUSION

Based on the analysis outlined in this report, mitigated sound levels from the completed facility are anticipated to comply with the sound limits identified in the Marysville Municipal Code and Lake Stevens Municipal Code.

Respectfully Submitted;

A handwritten signature in black ink, appearing to read "Justin Morgan". The signature is fluid and cursive, with the first name "Justin" and the last name "Morgan" clearly distinguishable.

Justin Morgan, INCE
Lead Noise and Vibration Consultant