VEENSTRA & KIMM INC.
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TECHNICAL MEMORANDUM

To: Jet Brite Services, Inc.
590 Kildeer Drive
Bolingbrook, IL 604400

From: Clay Shipley, P.E.
Veenstra & Kimm, Inc.

Date: January 13, 2023

Subject: Noise Study
Jet Brite Car Wash Development
IL 59 and 83rd Street
Naperville, IL

Introduction

Veenstra & Kimm, Inc. (V&K) prepared a noise study for the subject car wash development. This development will provide a single car wash tunnel with three pay stations, queuing lanes, and vehicle prep, vacuum, and employee parking stalls.

The site is located on the NE quadrant of IL 59 and 83rd Street and is currently vacant. Nearby land uses include commercial on the SE and SW quadrants, a vacant portion of Calvary Christian School on the NW quadrant. Land uses immediately adjacent to the site on the same quadrant of IL 59 and 83rd Street include one commercial parcel to the north and six single family residential parcels to the east.

The purpose of this study is to evaluate potential noise impacts from the proposed car wash development on adjacent properties. An aerial location of the proposed site is provided as **Exhibit 1** and the car wash development site plan is provided as **Exhibit 2**.

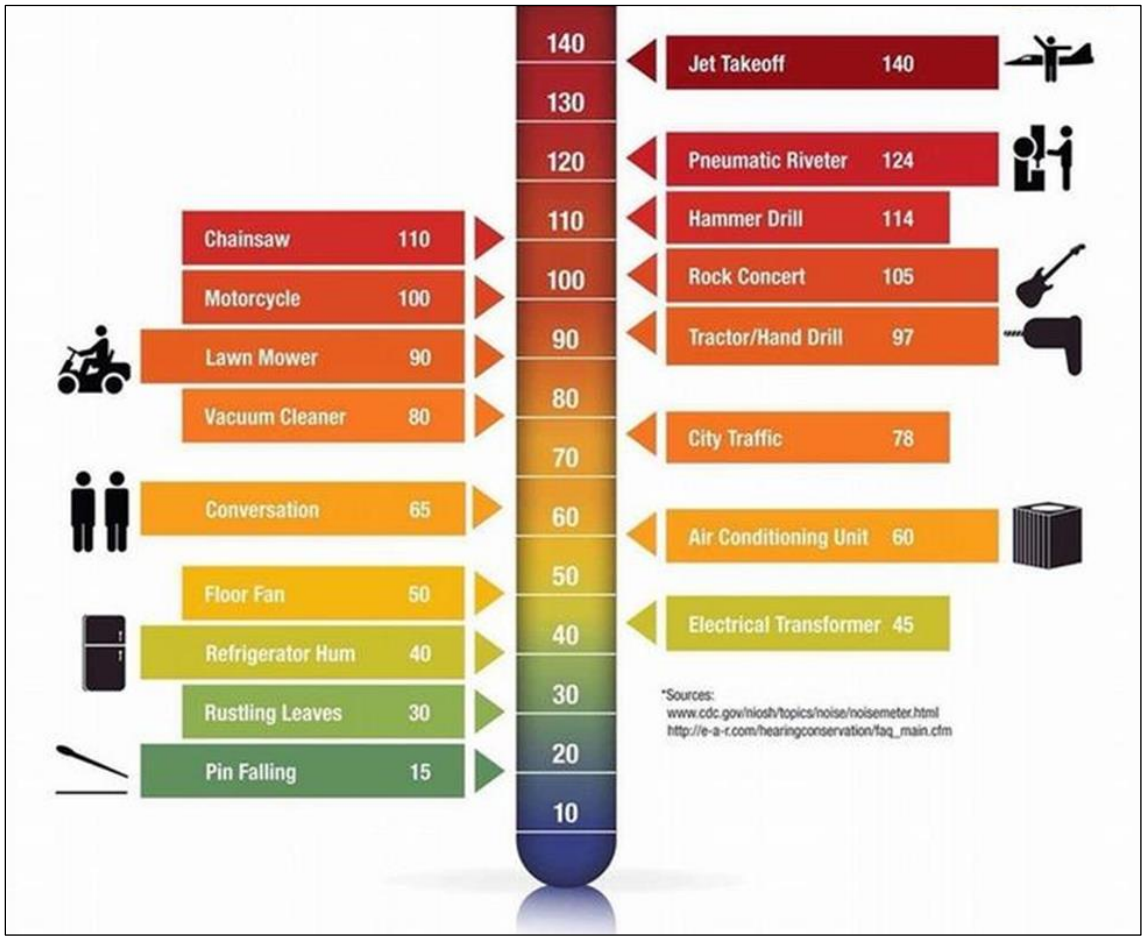
Noise Criteria

Title 6, Chapter 14 of the City of Naperville's Code of Ordinances (Ord. 01-68, 4-4-2001) details prevailing performance standards for noise levels in all zoning districts. The decibels generated from a land use shall not exceed the exterior noise thresholds set forth in **Table 1** as measured at the property line of the parcel from which the noise is generated. Decibel readings are a measure of relative loudness and are measured on a logarithmic scale. A-weighted decibels (dBA) are used for this noise measurement, which is a frequency-based adjustment to the decibel level that more closely reflects the absorption of noise by the human ear. To illustrate this, common sound levels for everyday noise are shown in **Figure 1**.

Table 1: Exterior Noise Thresholds

Land Use	7:00 am to 7:00 pm	7:00 pm to 7:00 am
Residential	55 dB(A)	50 dB(A)
Commercial	62 dB(A)	55 dB(A)
Light industrial	70 dB(A)	70 dB(A)
Industrial	80 dB(A)	80 dB(A)

Figure 1: Common sound levels dB(A) scale



Noise Sources and Levels

Noise levels generated by car wash developments are primarily due to the equipment noise from within the car wash tunnel and central vacuum systems. Equipment noise emanating from the tunnel openings spread in all directions, diminishing in intensity with distance and by tunnel entrance/exit wall shielding. Industrial blowers are used at the exit of the car wash tunnel and are the most significant source of noise on site. Blower equipment sound levels can measure as much as 90 dB(A) from ten feet away.

Exhibit 3 illustrates sound propagation from the car wash blowers located at the exit tunnel. When directly facing the tunnel, the anticipated sound levels will reduce to 79 dB(A) from 50 feet away. Sound levels from the car wash exit will be reduced when facing the tunnel exit, for example, at 90-degrees or 45-degrees due to the intervening building structure. Note that a rapid roll door will be located at the tunnel exit. This will help to reduce noise when vehicles are not exiting the tunnel.

The car wash tunnel entrance is also considered a significant source of noise. However, as there are no blowers at the entrance, noise levels are typically significantly less when compared to the tunnel exit.

The site will have a total of 39 vacuum stalls powered by seven Industravac Series E central vacuuming turbines that control the motor and separator systems. Provided as **Exhibit 4** are manufacturer details for the central vacuuming turbines, which account for the largest and controlling source of noise from the vacuuming systems. The manufacturer specifications list the average sound level at 84 dB(A) at 3 feet away. The hoses located at individual vacuum stalls do not account for a significant source of noise. Two vacuum turbines will be located on the inside of each "vac enclosure" shown in **Exhibit 2**.

Noise Modeling

To estimate the potential noise levels from the proposed car wash, the Noise Mapping (Sound Level Modeling) tool developed by MAS Environmental Ltd was utilized. This web-based tool incorporates point sources of noise, barriers, and buildings to accurately model predicted sound levels. The model develops noise contours from point sources and is capable of estimating sound levels at specific receiver points.

The model is in accordance with ISO 9613, the international standard that describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (as described in ISO 1996) under meteorological conditions. The Noise Mapping tool also adjusts for overlapping sources of noise at one time and how noise reflects off of hard surfaces such as walls and buildings.

Point source noise generators were added to the model to represent the sound generated from the car wash tunnel exit, car wash tunnel entrance, and the two central vacuuming systems located outdoors in the parking lot. A point source measuring 96 dB(A) (8-ft above ground) was placed at the immediate exit of the car wash tunnel to represent the noise from drying blowers and other equipment. The model could not incorporate reduced noise levels from the rapid roll door, so the model assumes the worst-case conditions with the door remaining in the open position. An additional point source measuring 79 dB(A) (8-ft above ground) was added to represent equipment noise from the car wash tunnel entrance. This noise level was estimated based on previous noise analyses of other similar type car wash facilities. Four separate point sources measuring 84 dB(A) (4-ft above ground) were added to represent the outdoor central vacuuming turbines. Two vacuum turbines will be located on the inside of each "vac enclosure" shown in **Exhibit 2**.

Buildings and barriers located on the property were incorporated into the model to measure how sound would be reflected and blocked as it propagates to the property line and onto adjacent properties. The proposed car wash tunnel structure was also incorporated into the model. Barriers added to the model are identified in the noise contour maps included as **Exhibit 5**. Several maps are included to provide clarity on various point source, barrier, and receiver notes. Noise contours are the same on all maps.

To measure the noise effects on surrounding properties, individual receiver points were added to measure resulting noise levels. These receivers were placed at sensitive receptor locations such as residential and commercial properties in the vicinity and at property lines around the site at critical locations. Sound levels are estimated near entrances to buildings or areas of outdoor use. Each sensitive receptor location (point) can be seen in **Exhibit 5** and include the properties identified in **Table 2**.

Table 2: Noise Model Sensitive Receptors

Receptor	Address	Land Use
Green State Credit Union	1903 Springbrook Square Drive	Commercial
Oxford Bank	2920 83rd Street	Commercial
US Bank Branch	4455 Montgomery Road	Commercial
Keep It Clean	9s301 IL Route 59	Commercial

Receptor	Address	Land Use
Single family home	9S310 Aero Drive	Residential
Single family home	9S324 Aero Drive	Residential
Single family home	9S336 Aero Drive	Residential
Single family home	9S350 Aero Drive	Residential
Single family home	9S362 Aero Drive	Residential
Single family home	9S374 Aero Drive	Residential

Findings

The noise contour map attached as **Exhibit 5** illustrates results from the noise model. The noise contours shown on the exhibit are at 5 dB(A) intervals ranging from 30 dB(A) to 80+ dB(A). The decibel level contours illustrate how noise propagates from each of the major noise sources located on the car wash development. Sound energy spreads with distance, resulting in reduced sound levels with increased distance. In general, sound sources reduce by approximately 6 dB(A) with every doubling of distance over a hard surface. **Table 3** and **Table 4** list the A-weighted decibel levels measured at each of the sensitive receptor locations near the proposed development and at car was property lines around the site at critical locations, respectively.

Table 3: Noise Model Results at Sensitive Receptors

Receptor	Address	Land Use	Noise Level dB(A)
Green State Credit Union	1903 Springbrook Square Drive	Commercial	31.8
Oxford Bank	2920 83rd Street	Commercial	33.7
US Bank Branch	4455 Montgomery Road	Commercial	32.6
Keep It Clean	9s301 IL Route 59	Commercial	35.3
Single family home	9S310 Aero Drive	Residential	34.9
Single family home	9S324 Aero Drive	Residential	36.8
Single family home	9S336 Aero Drive	Residential	37.8
Single family home	9S350 Aero Drive	Residential	37.0
Single family home	9S362 Aero Drive	Residential	38.2
Single family home	9S374 Aero Drive	Residential	36.6

Table 4: Noise Model Results at Property Lines, Critical Locations

Property Line Location	Noise Level dB(A)
Northwest	51.8
Northcentral	39.4
Northeast	45.3
East-1	33.7
East-2	35.1
Southeast	37.1
Southcentral-1	34.4

Property Line Location	Noise Level dB(A)
Southcentral-2	35.1
Southcentral-3	34.7
Southwest	38.0
West-1	51.1
West-2	52.6

Conclusion

The primary source of noise from the proposed development will be the car wash tunnel exit. The other sources of noise include the tunnel entrance and central vacuum systems. Given the orientation of the car wash tunnel and the location of the tunnel exit to IL 59 and 83rd Street, the fact that the vacuum turbines are enclosed, and the distance from point source noise generators to sensitive receptors and property lines – exterior noise thresholds will not be exceeded in the worst-case scenario as a result of the proposed development.

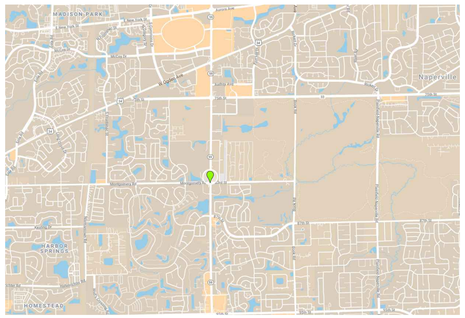
End Tech Memo

Exhibit 1 – Aerial Site Location


Jet Brite Car Wash Site
IL 59 and 83rd Street, Naperville
Calvary Christian School
Accent Reduction by Accent Pros
Aero Dr
Aero Dr
Stearman Dr
Proposed Site
Naper Aero Club Airport
Illinois Rte 59 & 83rd St
83rd St
83rd St
Montgomery Rd
West Naperville Kindercare
U.S. Bank Branch
The Goddard School of Naperville (83rd Street)
Rayito de Sol Spanish Immersion Early
Google Earth
600 ft
N

Exhibit 1

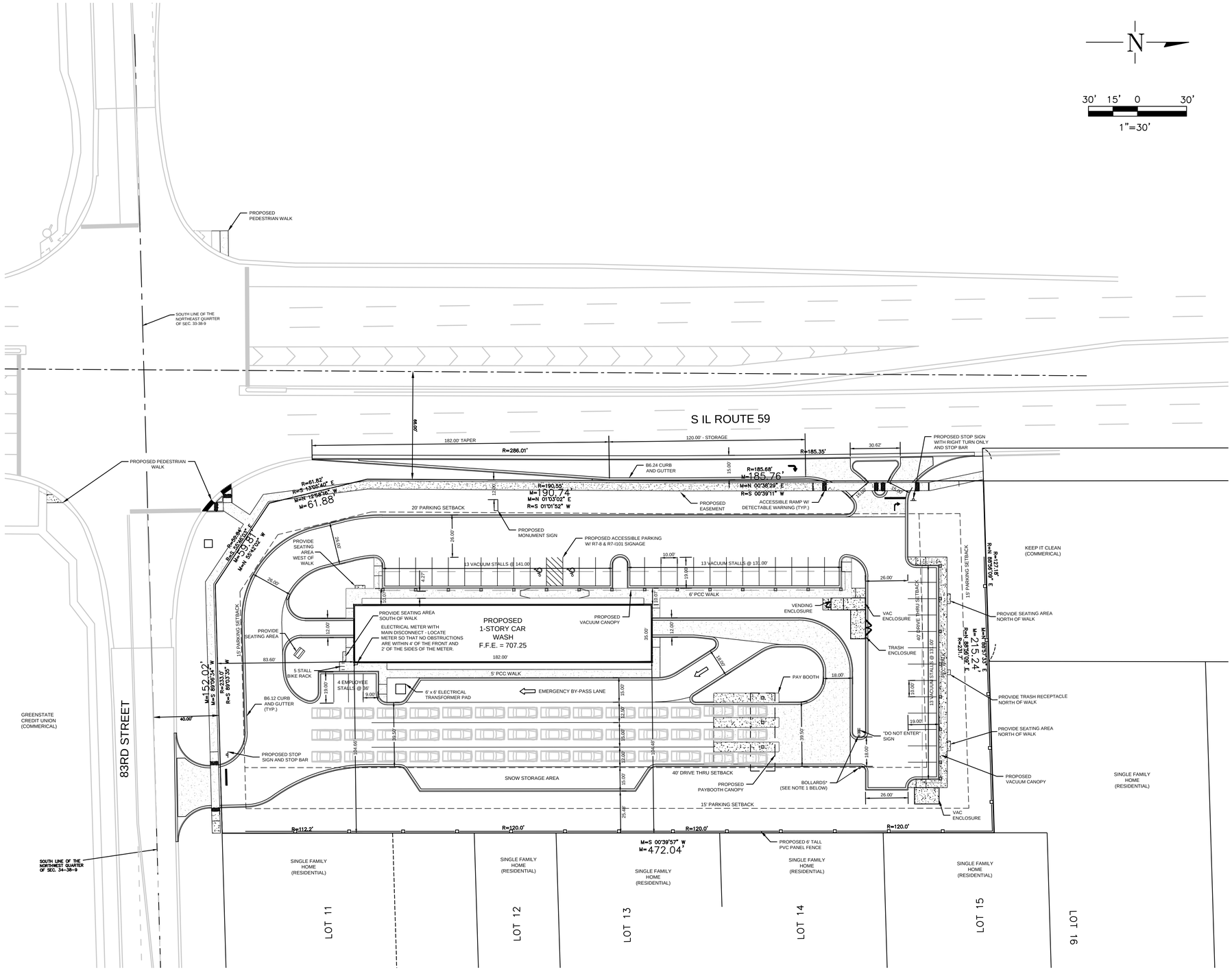
Exhibit 2 – Car Wash Site Plan



LOCATION MAP

SITE DATA

EXISTING ZONING:	RESIDENTIAL
PROPOSED ZONING:	B2 (PUD)
TOTAL LOT AREA:	99,970 S.F. (2.295 AC)
OPEN SPACE AREA:	21,367 S.F. (0.490 AC)
OPEN SPACE AREA PERCENT:	21.35%
EXISTING IMPERVIOUS AREA:	~0 S.F.
PROPOSED IMPERVIOUS AREA:	64,686 S.F.
REQUIRED STORMWATER DETENTION:	43,996 CF (1.01 AC-FT)
PROVIDED STORMWATER DETENTION:	44,000 CF (1.01 AC-FT)
BUILDING AREA:	6,370 S.F.
ACCESSORY STRUCTURE AREA:	459 S.F.
FAR ALLOWABLE:	0.325
FAR PROPOSED:	0.068
REQUIRED PARKING:	29 (4.5 SPACES/ 1000 GROSS SF)
PROPOSED PARKING:	43 SPACES (TOTAL INCLUDING ACCESSIBLE PARKING)
REQUIRED STACKING:	10 ENTERING WASH 2 EXITING WASH
PROPOSED STACKING:	42
BICYCLE PARKING PROVIDED:	5 SPACES



NOTES:
1. * PROPOSED EMERGENCY BY-PASS EXIT. BOLLARDS WITH CHAIN CROSSING AND SIGNAGE TO BE PROVIDED TO RESTRICT GENERAL ACCESS. IN THE EVENT OF AN EMERGENCY, ONSITE STAFF WILL ASSIST WITH VACATING THE PAY BOOTH AND WASH DRIVE AREA.

DATE	REVISIONS
12/14/22	REVISED PER CITY REVIEW 12/5/22
1/13/23	REVISED PER CITY REVIEW 1/11/23

SCALE	AS NOTED
DRAWN	C.A.B.
CHECKED	L.G.K.
APPROVED	
DATE	11/4/22
ISSUED FOR	ENTITLEMENT

VEENSTRA & KIMM INC.

JET BRITE CAR WASH
IL 59 AND 83RD STREET NAPERVILLE, IL

552 W. Boughton Road ● Bolingbrook, IL 60440
630-755-0293 ● 888-630-2034

SITE PLAN

DWG. NO.
C-2
1 OF 1
PROJECT #6692

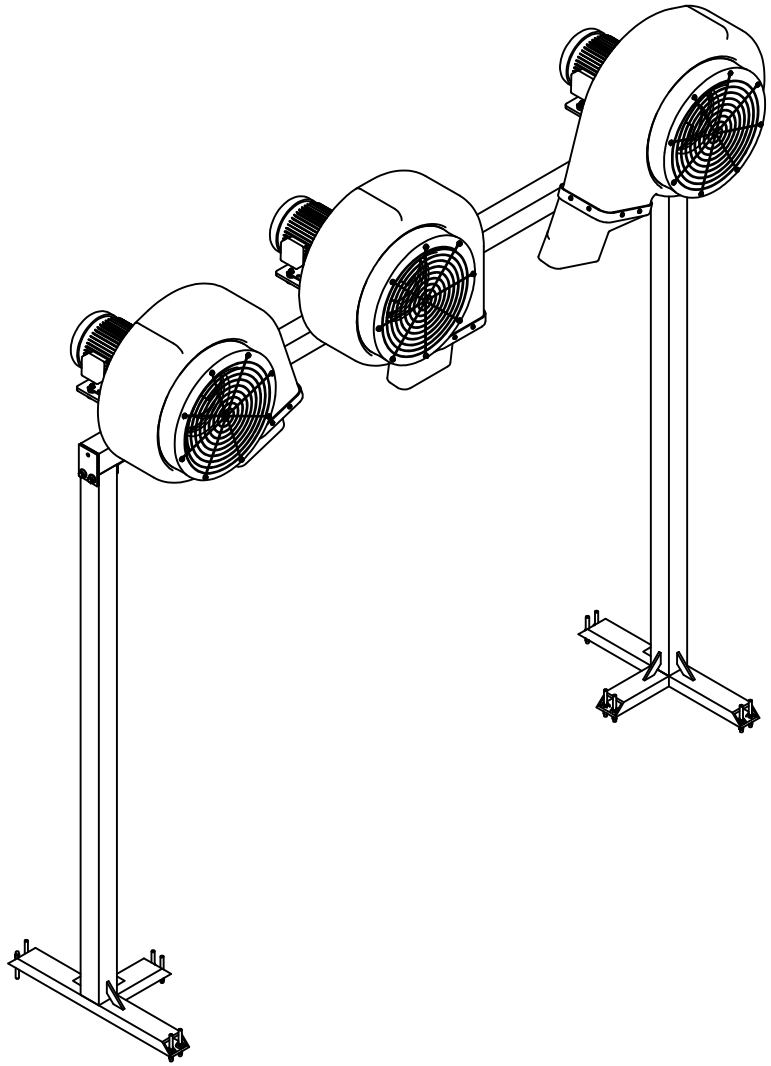
PLOTTED: Wednesday, January 18, 2023 9:02:51 AM

X-REFS: 7767.01 ALTA Survey Copy
FILE PATH: B:\0600\669 JET BRITE SERVICES, INC\6692 JET BRITE, NAPERVILLE CAR WASH\CADD\DRAWINGS\DESIGN DEVELOPMENT\CIVIL\X_SITE

JOB NO. 6662 VEENSTRA & KIMM, INC., DESIGN FIRM REGISTRATION NUMBER 184.001939

Exhibit 3 – Blower Sound Illustration

Enviromental Noise with Drayer OFF: 70 dba



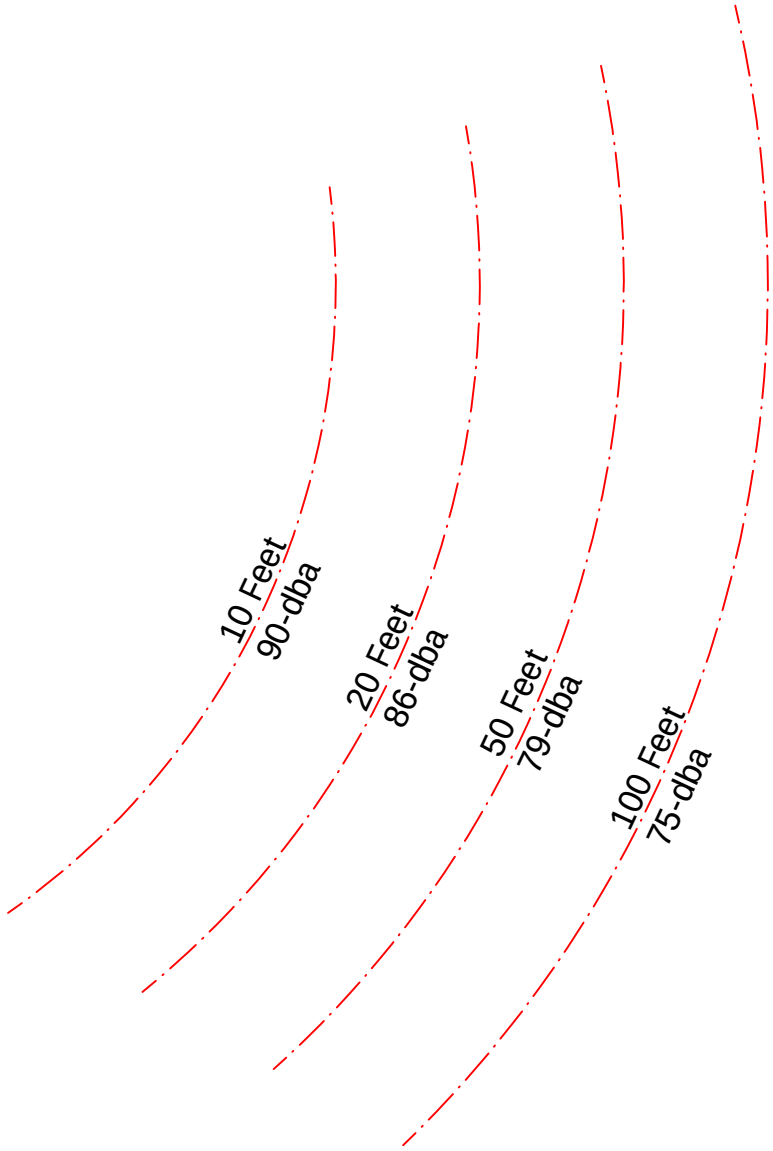


Exhibit 3

THIRD ANGLE PROJECTION	*MACHINING TOLERANCES*	DRAWN LVerdecia	8/26/2011	**SONNY'S ENTERPRISES** THE CARWASH FACTORY
BREAK ALL SHARP CORNERS. PART TO BE FREE OF BURRS.	FRACTION± 1/16" .XX DECIMAL ± 0.030 .XXX DECIMAL ± 0.005	APPROVED		
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES	ANGULARITY ± 2° FINISH 125	CATEGORY BLOWER		DESCRIPTION BLOWER ASSEMBLY, ONE ARCH 45HP
		THIS SHEET CONTAINS CONFIDENTIAL INFORMATION, IMAGES AND TRADE SECRETS OF SONNY'S ENTERPRISES, INC. ANY UNAUTHORIZED USE OR DISCLOSURE OF ANY PORTION THEREOF IS STRICTLY PROHIBITED. THIS WORK IS THE EXCLUSIVE PROPERTY OF SONNY'S ENTERPRISES, INC. ALL RIGHTS RESERVED.		PART NUMBER BL1-45HP-1
MATERIAL			SHEET 2 OF 2	SIZE A / SCALE N.T.S.

Exhibit 4 – Vacuum Turbine Details

Industravac® Series E
Component Models

Vacuum Producer | Separator | Interconnecting Kit

Industravac® Series E Vacuum Producer and Separator components interconnected with piping. (Note: Components ship in (3) pieces.)

Number of Operators

Catalog Number	Numbers of Operators*	Motor HP
SE410-C	4	10
SE415-C	6	15
SE420-C	8	20
SE510-C	3	10
SE515-C	5	15
SE520-C	7	20
SE525-C	8	25
SE615-C	4	15
SE620-C	5	20
SE625-C	7	25

Performance based on 70 °F inlet temperature at sea level.
*Based on 100 SCFM/Operator with 1½" diameter x 15 feet hose.

Materials of Construction

- Casing, separator, base: ASTM A1011 hot-rolled steel
- Impellers: 5052-H34 aluminum
- Shaft: AISI-1045 hot-rolled bar steel
- Removable debris receptacle: High density polyethylene
- Finish: Epoxy primer with Spencer blue urethane topcoat

Product Features

Vacuum Producer

- Multistage centrifugal
- Standard overhung direct drive
- Bottom exhaust with silencer (Patent No. 4,874,410)
- Average sound level from 84 dBA at 3 feet
- Factory performance tested

Motor

- 10, 15, 20 or 25 HP, 3500 rpm
- 200-230/460 or 575 volt, three phase, 60 Hz
- TEFC
- Bearing life: 100,000 hours (L-10)

Separator

- Tubular bag separator, shaker type: 30" diameter
- Multiple-inverted filter bags: Quantity 12
- Filter bag area: 56.5 sq. ft
- Filter bag material: cotton sateen (P/N BVA90051)
- Filter bag diameter: 6" (Cat. No. 6445-N)
- Internal manual bag shaker
- Large, hinged inspection door (accepts padlock)
- Removable debris receptacle, capacity: 2.6 cu. ft. (small hinged access door accepts padlock)
- Average filtration efficiency: 99.9% at 3 microns
- Axial inlets with target plate:
  primary inlet – 5" tubing with sleeve
  secondary inlet – inlet valve (P/N VLV90083) for 1½" diameter hose
- Interconnecting kit (P/N KIO90021): (2) 90° mitered elbows (P/N ELT90689) and (3) rubber sleeve/clamp kits (P/N KAC90062)

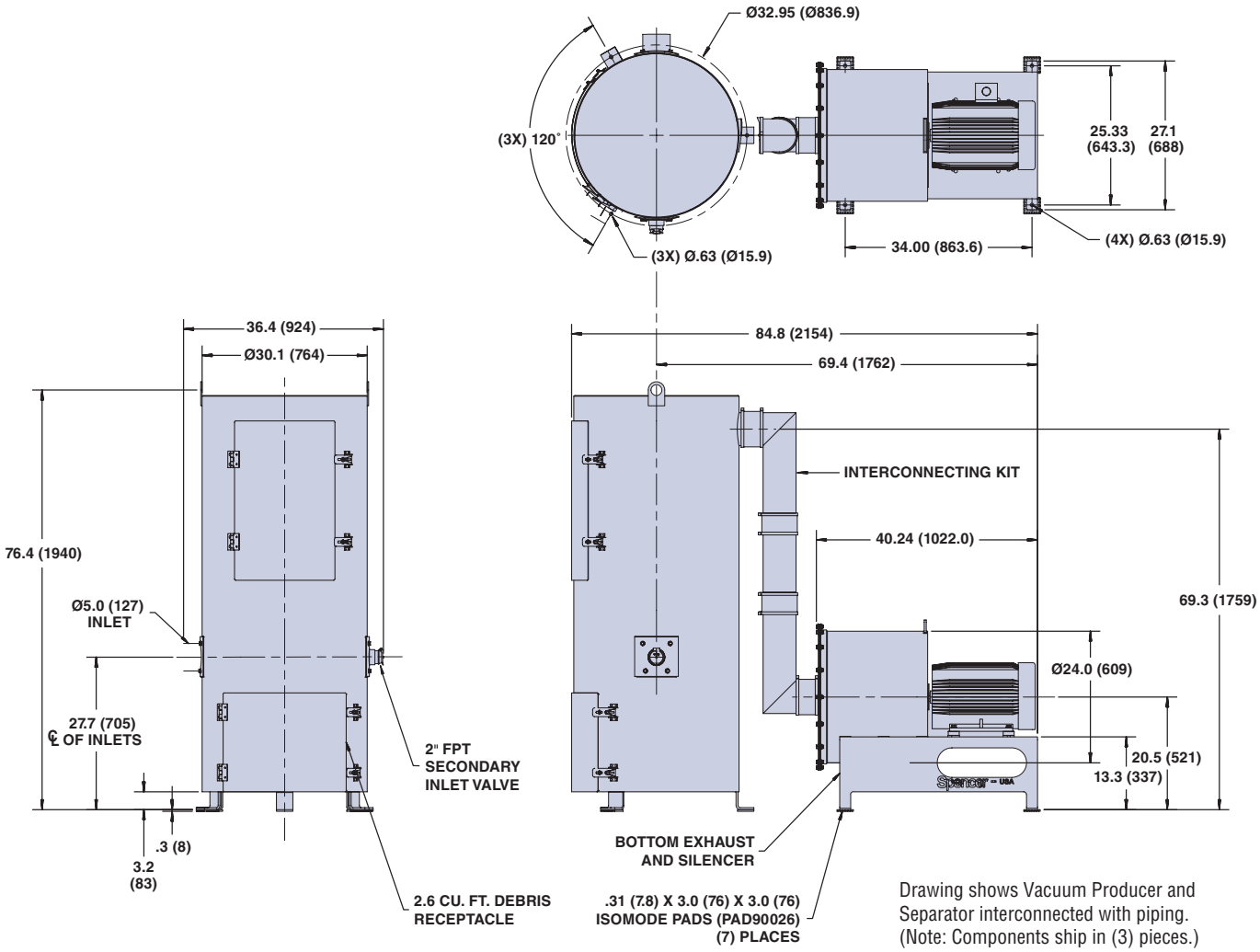
Available Options

- Explosion-proof and premium efficiency motors
- NEMA 4, 7 and 9 starter enclosures
- Grounded filter bags
- Other filter bag materials
- Inlet valve (P/N VLV90100) for 2" diameter hose
- Island adapter kit (P/N PLT90023)
- Bottom discharge conversion adapter to change to 6" tube horizontal on motor end (P/N KAC90267)

Exhibit 4

Industravac® Series E
Component Models
Vacuum Producer | Separator | Interconnecting Kit

Dimensions: Shown in inches / (mm)



Drawing shows Vacuum Producer and Separator interconnected with piping. (Note: Components ship in (3) pieces.)

Performance Data	Motor Data	Separator Filter Data
Number of Operators _____	HP _____ RPM _____	Area: 56.5 sq. ft. _____
Catalog No. _____	Voltage _____	Bag Quantity: 12 _____
Discharge Pressure (PSIA) _____	Phase _____ Hz _____	Bag Catalog No.: 6445-N _____
Inlet Temperature (°F) _____	Enclosure _____	Bag Material: _____

- Spencer may make improvements and dimensional changes to equipment designs based on market trends and requirements.

For product selection assistance, please email marketing@spencer-air.com or visit our website at www.spencerturbine.com to locate the Spencer representative in your area.

Car Care Vacuum Systems with an Engineering Edge

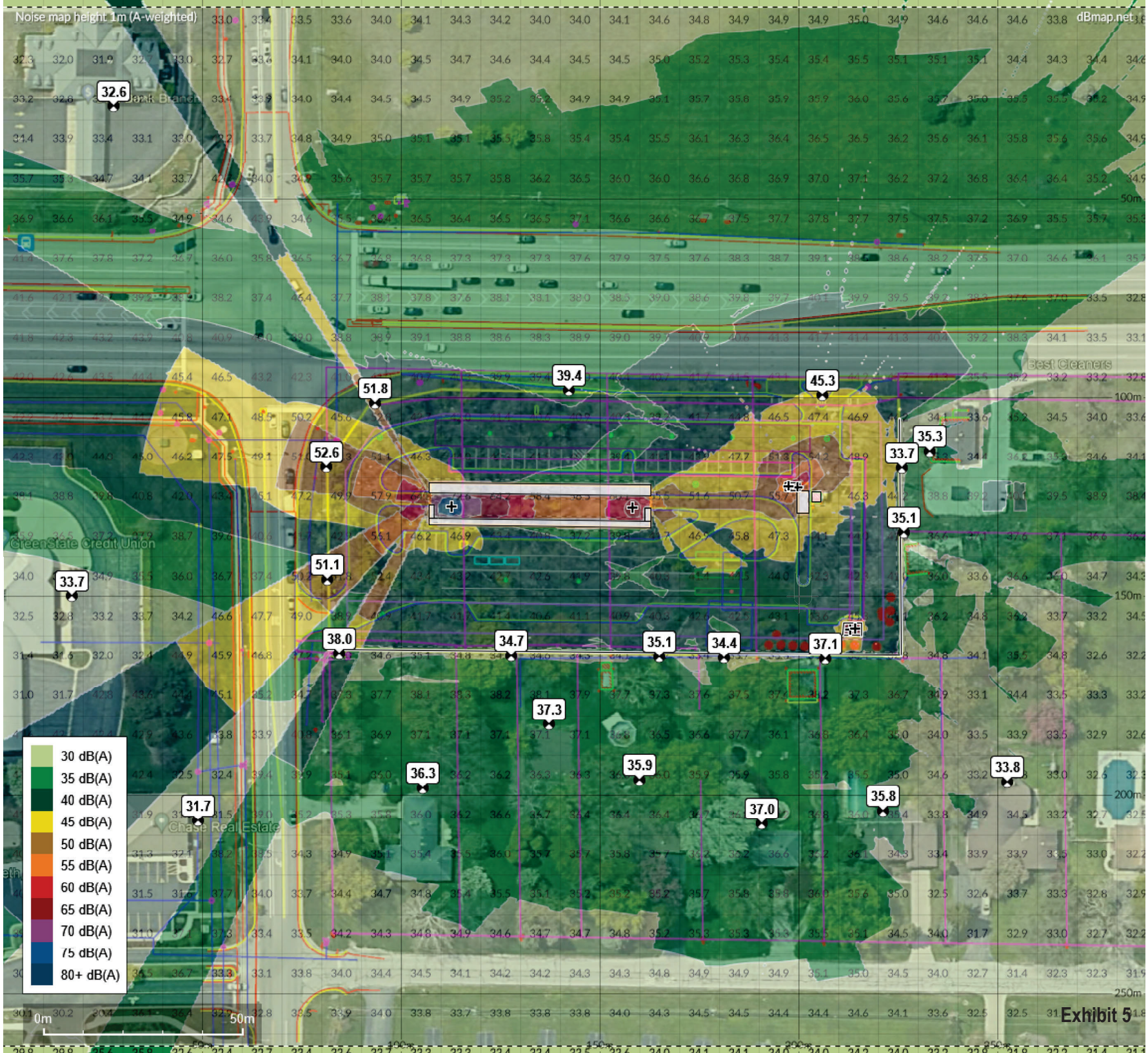
The Spencer Turbine Company, 600 Day Hill Road, Windsor, CT 06095 USA

TEL 800.232.4321 ◆ 860.688.8361 ◆ FAX 860.688.0098 ◆ www.spencerturbine.com

TDS_299 Printed in USA 042817KBA

Exhibit 4

Exhibit 5 – Noise Contour Map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dBmap.net
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39.4
45.3
51.8
52.6
35.3
33.7
35.1
51.1
33.7
38.0
34.7
35.1
34.4
37.1
37.3
36.3
35.9
33.8
35.8
31.7
37.0
30 dB(A)
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
80+ dB(A)
0m
50m
50m
100m
150m
200m
250m
Best Cleaners
GreenState Credit Union
Chase Real Estate

Exhibit 5

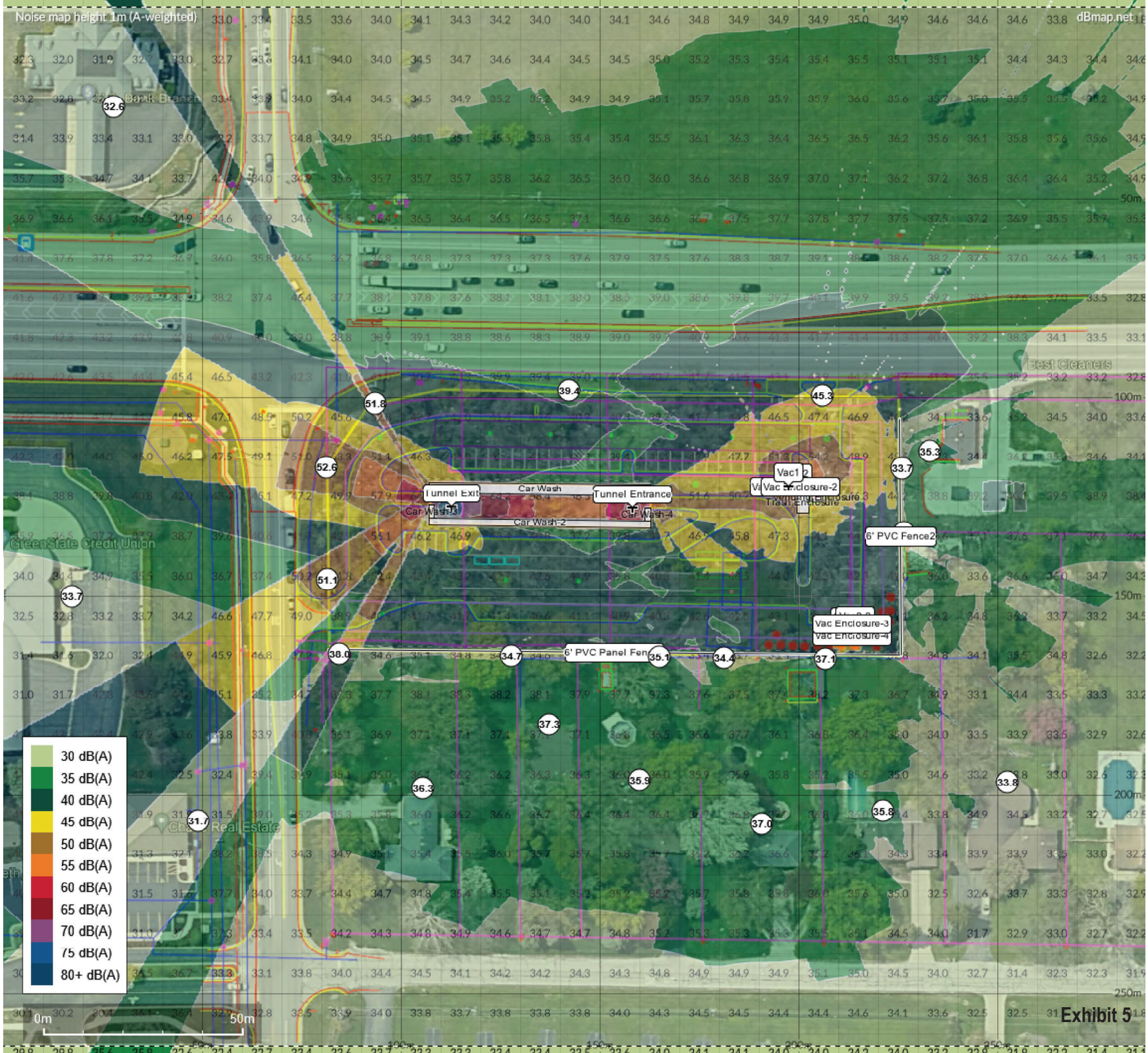
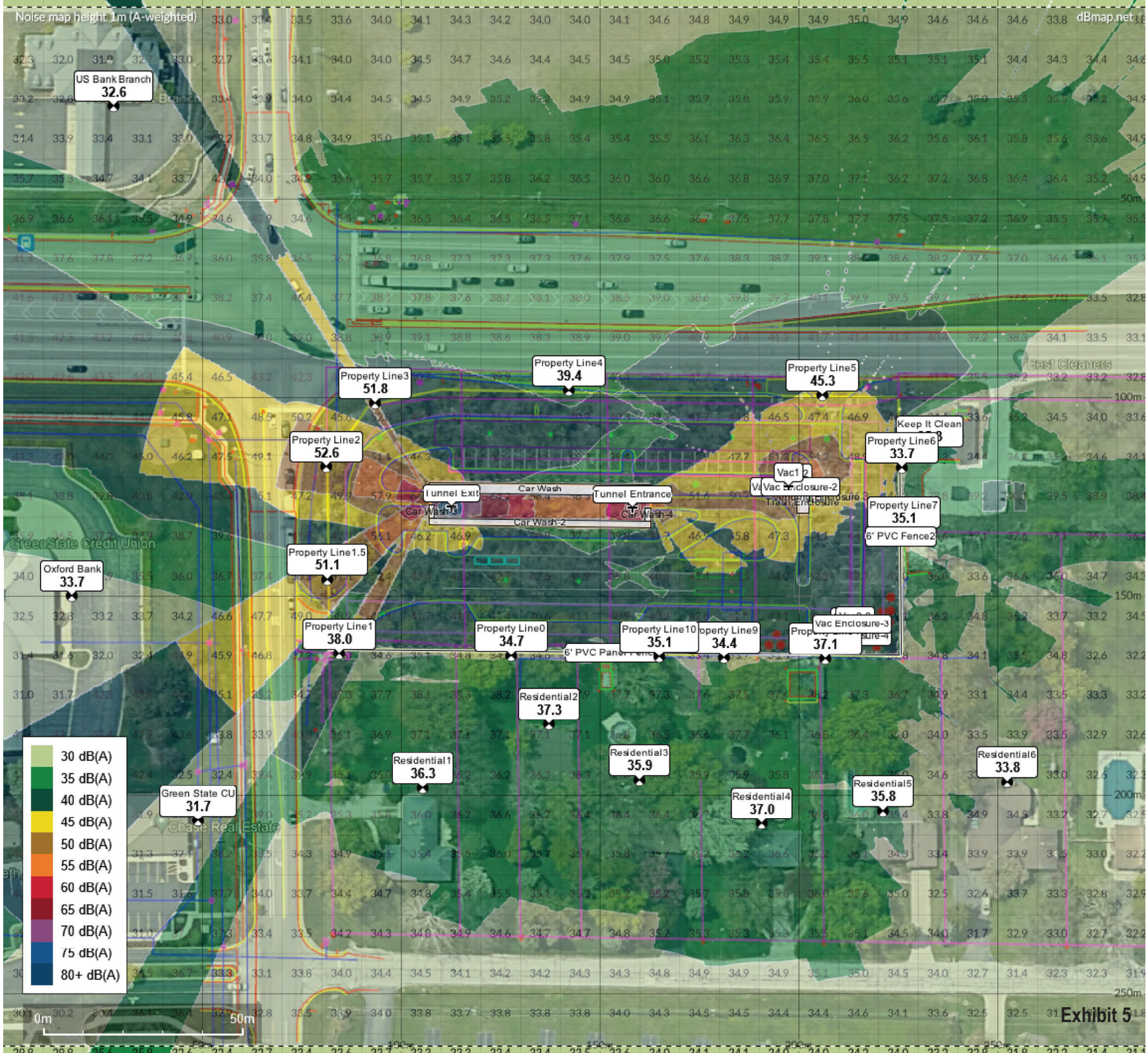

Noise map height 1m (A-weighted)
dBmap.net
Bank Branch
Best Cleaners
GreenState Credit Union
Car Wash
Tunnel Exit
Tunnel Entrance
Car Wash-1
Car Wash-2
Car Wash-4
Vac1
Vac Enclosure-2
Vac Enclosure-3
Vac Enclosure-4
6' PVC Fence2
6' PVC Panel Fence
50m
100m
150m
200m
250m
30 dB(A)
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
80+ dB(A)
0m
50m

Exhibit 5


Noise map height 1m (A-weighted)
dBmap.net
US Bank Branch
32.6
Property Line3
51.8
Property Line4
39.4
Property Line5
45.3
Property Line2
52.6
Property Line6
33.7
Keep It Clean
Vac1
Vac Enclosure-2
Tunnel Exit
Car Wash
Tunnel Entrance
Car Wash-1
Car Wash-4
Car Wash-2
Property Line7
35.1
6' PVC Fence2
Property Line1.5
51.1
Oxford Bank
33.7
Property Line1
38.0
Property Line0
34.7
Property Line10
35.1
Property Line9
34.4
Vac Enclosure-3
37.1
6' PVC Panel Fence
Residential2
37.3
Residential1
36.3
Residential3
35.9
Residential6
33.8
Residential5
35.8
Residential4
37.0
Green State CU
31.7
30 dB(A)
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
80+ dB(A)
0m
50m
Exhibit 5