

TECHNICAL MEMORANDUM

to Jet Brite Car Wash, Inc.
from Kevin Walsh, Environmental Planner
date October 19, 2020
subject Jet Brite Car Wash – Noise Study
 780 and 850 East Ogden Avenue, City of Naperville, Illinois

INTRODUCTION

Knight E/A, Inc. (Knight) was retained by Jet Brite Car Wash, Inc. to prepare a noise analysis for a proposed car wash to be located at 780 and 850 East Ogden Avenue (US Route 34) in Naperville, Illinois. This development will provide one car wash tunnel with three pay stations/queuing lanes able to accommodate at least 63 vehicles. It will also provide 46 vacuum parking spaces, five prep spaces, and five employee parking spaces.

The site is currently not used and contains a vacant restaurant and forested land at the rear of the property. Adjacent land uses include commercial properties along Ogden Avenue and residential properties to the east of the proposed site and west of Ogden Avenue.

The purpose of this study is to estimate potential noise impacts from the proposed car wash on adjacent properties. In addition, this technical memorandum summarizes mitigation measures that will be incorporated into the final design in order to minimize noise levels.

Exhibit 1 shows an aerial of the proposed site. The site plan depicting the proposed development is presented in **Exhibit 2**.

NOISE CRITERIA

Chapter 14 of the City of Naperville’s Code of Ordinances (Ord. 01-68, 4-4-2001) discusses the performance standards the City uses for noise levels in all zoning districts. The decibels generated from a land use shall not exceed the exterior noise set forth in **Table 1** as measured at the property line of the parcel from which the noise is generated. Decibels are a measure of relative loudness and are measured at 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** below.

Table 1: Exterior Noise Limits

| Land Use | 7:00 a.m. to 7:00 p.m. | 7:00 p.m. to 7:00 a.m. |
|------------------|------------------------|------------------------|
| 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) |

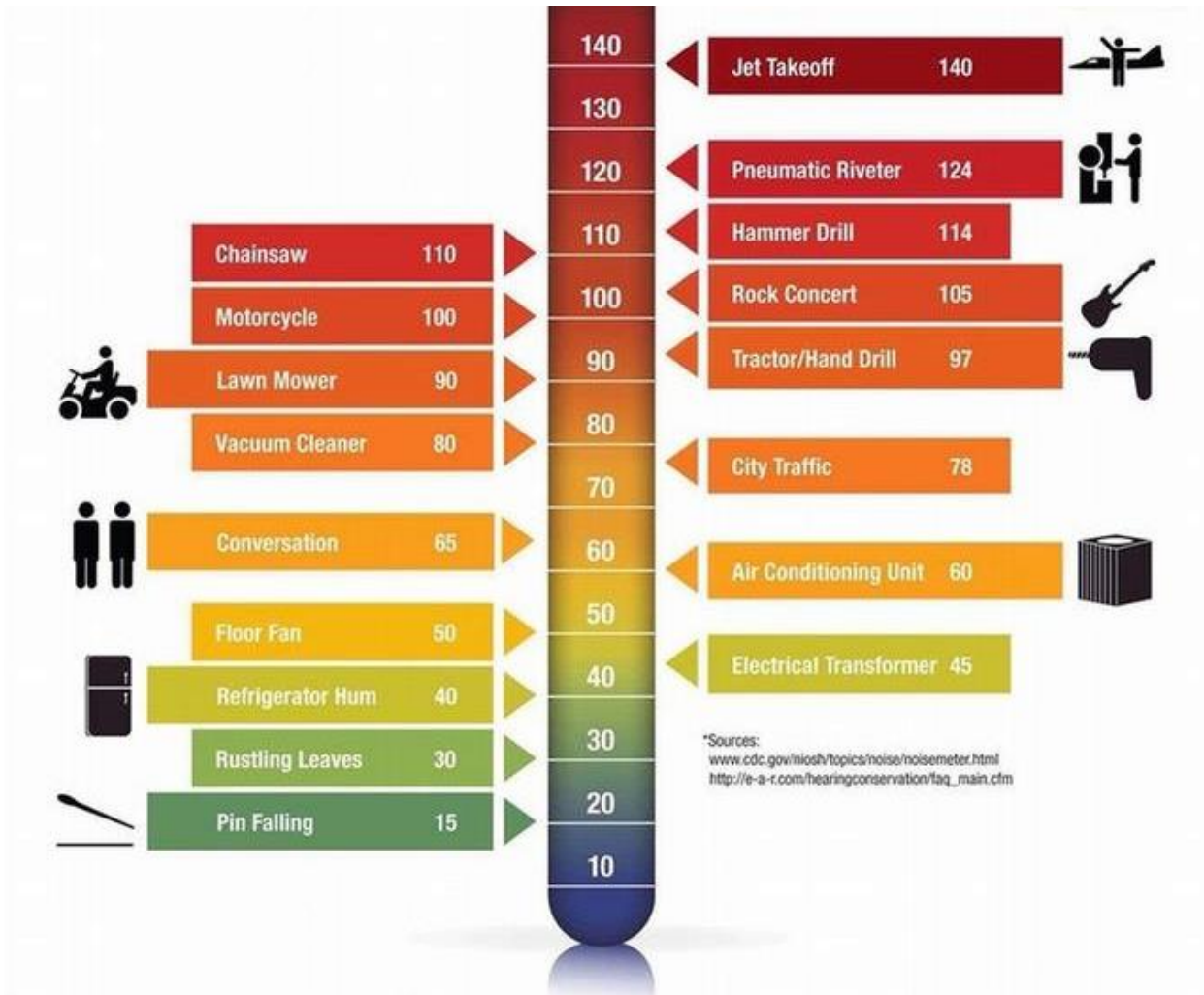


Figure 1: Common sound levels dB(A) scale

CAR WASH NOISE SOURCES AND LEVELS

Noise levels generated by car washes are primarily due to the equipment noise from within the car wash tunnel and central vacuum systems. Equipment noise exiting out of the tunnel openings spread in all directions, diminishing in intensity with distance and by tunnel entrance and exit wall shielding. In particular, industrial blowers are used at the exit of the car wash tunnel and are the most significant source of noise onsite. Based on previous acoustic analyses of car washes, blower equipment sound levels can measure as much as 90 dB(A) from ten feet away.

Exhibit 3 depicts 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 would likely be reduced when facing the facility at a 90 or 45 degree angle due to the intervening building structure. To minimize levels at the tunnel exit, a 30-foot long 10-foot high noise wall will be constructed from the northern car wash building wall perpendicular to Ogden Avenue. This will help mitigate and reduce noise levels to

the motel property next door. In addition, a rapid roll door will be located at the tunnel entrance. This will further reduce noise but will primarily be open as blowers are running and automobiles are 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 less as compared to the tunnel exit.

The Jet Brite facility will have a total of 46 vacuum stalls onsite. These 46 stalls will be powered by seven Industravac Series E central vacuuming turbines that control the motor and separator systems. **Exhibit 4** includes the manufacturing details for the central vacuuming turbines, which account for the largest and controlling source of noise from the vacuuming system. The manufacturing details lists the average sound level at 84 dB(A) at 3 feet away. The hoses located at individual vacuum stalls do not account for significant source of noise.

The locations of the central vacuuming units are depicted on the site plan (**Exhibit 2**). Three vacuum turbines will be located inside of the building to service hoses at the 20 parking stalls located along the face of the car wash building. Three vacuum turbines will be located in the vacuum area enclosure located adjacent to the trash enclosure that will service the 20 stalls across the drive aisle from the car wash building. The seven remaining vacuum stalls will be serviced by one vacuum turbine located to the east of these parking stalls and west of the pay booth. These outdoor vacuum areas will be surrounded by a masonry wall without a roof.

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 for the proposed site. 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. In addition, the Noise Mapping tool adjusts for overlapping sources of noise at one time and how noise reflects off of hard surfaces such as walls and buildings.

Point sources of noise were added to the model to represent the point noise sources at 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 number was estimated based on previous noise analyses of other similar type car wash facilities. Four point sources measuring 84 dB(A) (4-ft above ground) were added to represent the outdoor central vacuuming turbines onsite.

One potential source of surrounding noise that was not included in the model is traffic noise from Ogden Avenue. Traffic noise levels were avoided in order to better estimate the individual sources from the proposed Jet Brite facility.

Multiple buildings and barriers located on the property and adjacent properties were incorporated into the model to measure how sound would be reflected and blocked in the surrounding areas. This includes all existing buildings in the vicinity other than the vacant building onsite, which will be removed. The proposed car wash tunnel building was also incorporated into the model. Barriers added to the model include the proposed 10-ft high masonry wall at the tunnel exit, a proposed 8-ft high tall wooden fence along the eastern edge of the property, and the 5-ft tall masonry enclosures surrounding the vacuum turbines located outdoors.

To measure the noise effects on surrounding properties, individual receiver points were added to measure potential noise levels. These receivers were placed at sensitive receptors locations such as residential and commercial properties in the vicinity. The points were placed near entrances to buildings or areas of likely outdoor use. **Table 2** describes the receiver points used.

Table 2: Noise Model Receiver Locations

| Receiver Location | Address | Land Use |
|-----------------------------------------|--------------------|-------------|
| Stardust Motel | 890 E Ogden Avenue | Commercial |
| Burrito Parrilla Mexicana Restaurant | 820 E Ogden Avenue | Commercial |
| Clouds by Exhale | 817 E Ogden Avenue | Commercial |
| NEXT | 815 E Ogden Avenue | Commercial |
| Dunkin' | 811 E Ogden Avenue | Commercial |
| Cash Loans | 905 E Ogden Avenue | Commercial |
| Townhome | 735 Red Oak Court | Residential |
| Townhome | 733 Red Oak Court | Residential |
| Single family home | 5S644 Vest Avenue | Residential |
| Single family home | 5S636 Vest Avenue | Residential |
| Single family home | 5S624 Vest Avenue | Residential |
| Single family home | 5S608 Vest Avenue | Residential |
| Midas | 800 E Ogden Avenue | Commercial |
| Office Building | 710 E Ogden Avenue | Office |

FINDINGS

Exhibit 5 depicts the noise contour map and results from the Noise Mapping tool model. The noise contours shown on the exhibit are at 5 dB(A) intervals ranging from 35 dB(A) to 85 dB(A). The decibel level contours depict how noise propagates from each of the major noise sources located on the car wash property. 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** lists the A-weighted decibel levels measured at each of the sensitive receiver locations near the proposed development.

Table 3: Noise Model Receiver Levels

| Receiver Location | Address | Land Use | Noise Levels – dB(A) |
|--------------------------------------|--------------------|-------------|----------------------|
| Stardust Motel | 890 E Ogden Avenue | Commercial | 57.2 dB(A) |
| Burrito Parrilla Mexicana Restaurant | 820 E Ogden Avenue | Commercial | 55.4 dB(A) |
| Clouds by Exhale | 817 E Ogden Avenue | Commercial | 58.0 dB(A) |
| NEXT | 815 E Ogden Avenue | Commercial | 56.9 dB(A) |
| Dunkin’ | 811 E Ogden Avenue | Commercial | 53.0 dB(A) |
| Cash Loans | 905 E Ogden Avenue | Commercial | 54.7 dB(A) |
| Townhome | 735 Red Oak Court | Residential | 40.0 dB(A) |
| Townhome | 733 Red Oak Court | Residential | 38.6 dB(A) |
| Single family home | 5S644 Vest Avenue | Residential | 36.6 dB(A) |
| Single family home | 5S636 Vest Avenue | Residential | 34.6 dB(A) |
| Single family home | 5S624 Vest Avenue | Residential | 30.6 dB(A) |
| Single family home | 5S608 Vest Avenue | Residential | 24.3 dB(A) |
| Midas | 800 E Ogden Avenue | Commercial | 24.3 dB(A) |
| Office Building | 710 E Ogden Avenue | Office | 40.1 dB(A) |

The major source of noise from the proposed facility will be the car wash tunnel exit. This noise source will primarily affect the Stardust Motel and the Clouds by Exhale lounge. The Stardust Motel’s main entrance and area of outdoor use is located on the northern side of motel, where noise levels from the car wash will be greatly reduced. The southwest facing wall is primarily a brick wall with one window located near the southwest corner of the building. A receiver point was added here to identify noise levels at this worst case scenario. This window is located approximately 30-ft feet from the tunnel exit and the proposed noise wall will greatly reduce noise levels at this location. Noise levels are estimated at 57.2 dB(A) near the window. The Clouds by Exhale lounge is located directly across from the proposed tunnel exit and had the highest noise level estimate in the model at 58.0 dB(A). Based on a site visit, there is a not an area of outdoor use at this location and the entrance is located over 150-ft from the car wash tunnel. As Ogden Avenue traffic is also an important source of noise, it is unlikely the car wash will increase noise levels at this location because the traffic noise will overpower the car wash noise when traffic levels are high.

The other primary sources of noise include the tunnel entrance and central vacuum systems located outdoors. Due to their more central locations on the property, distance from sensitive receptors, and being enclosed by masonry walls, these noise sources will have minimal effect on adjacent properties. The closest property to the tunnel entrance and outdoor vacuum systems is the single family home at 5S644 Vest Avenue. Noise levels were measured at 36.6 dB(A) from the backyard of this location. Some noise level reductions are anticipated due to the proposed 8-ft tall wooden fence at the eastern property line. The fence will not have gaps in order to block a line of sight to the car wash.

CONCLUSIONS

The proposed Jet Brite car wash facility will increase noise levels in the immediate vicinity of the property. However, as the Noise Mapping tool results show, it is unlikely to cause a significant nuisance on adjacent properties and their land uses.

Jet Brite has also incorporated multiple measures into the final design to help mitigate noise levels near the property. These include a 10-ft tall, 30-ft long masonry wall at the car wash tunnel exit, an 8-ft tall wooden fence at the eastern property line, and masonry enclosures surrounding the central vacuum systems that are located outdoors. These measures should further minimize noise impacts to the surrounding properties.

EXHIBITS

Exhibit 1 – Aerial of Study Area

Exhibit 2 – Site Plan

Exhibit 3 – Blower Sound Propagation

Exhibit 4 – Central Vacuum System Details

Exhibit 5 – Noise Contours Map

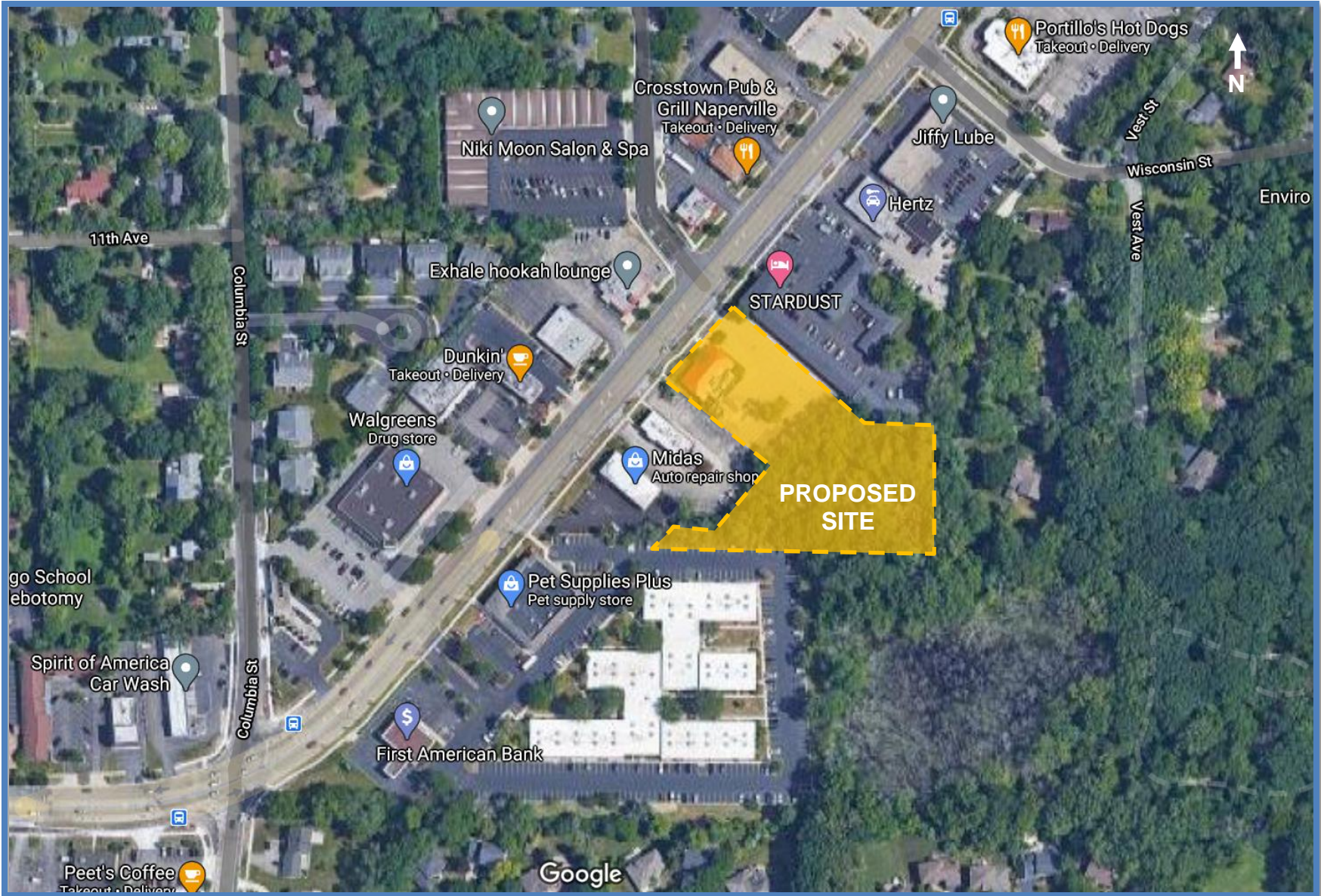
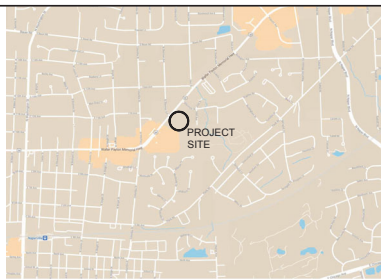
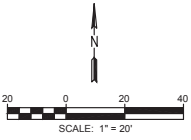
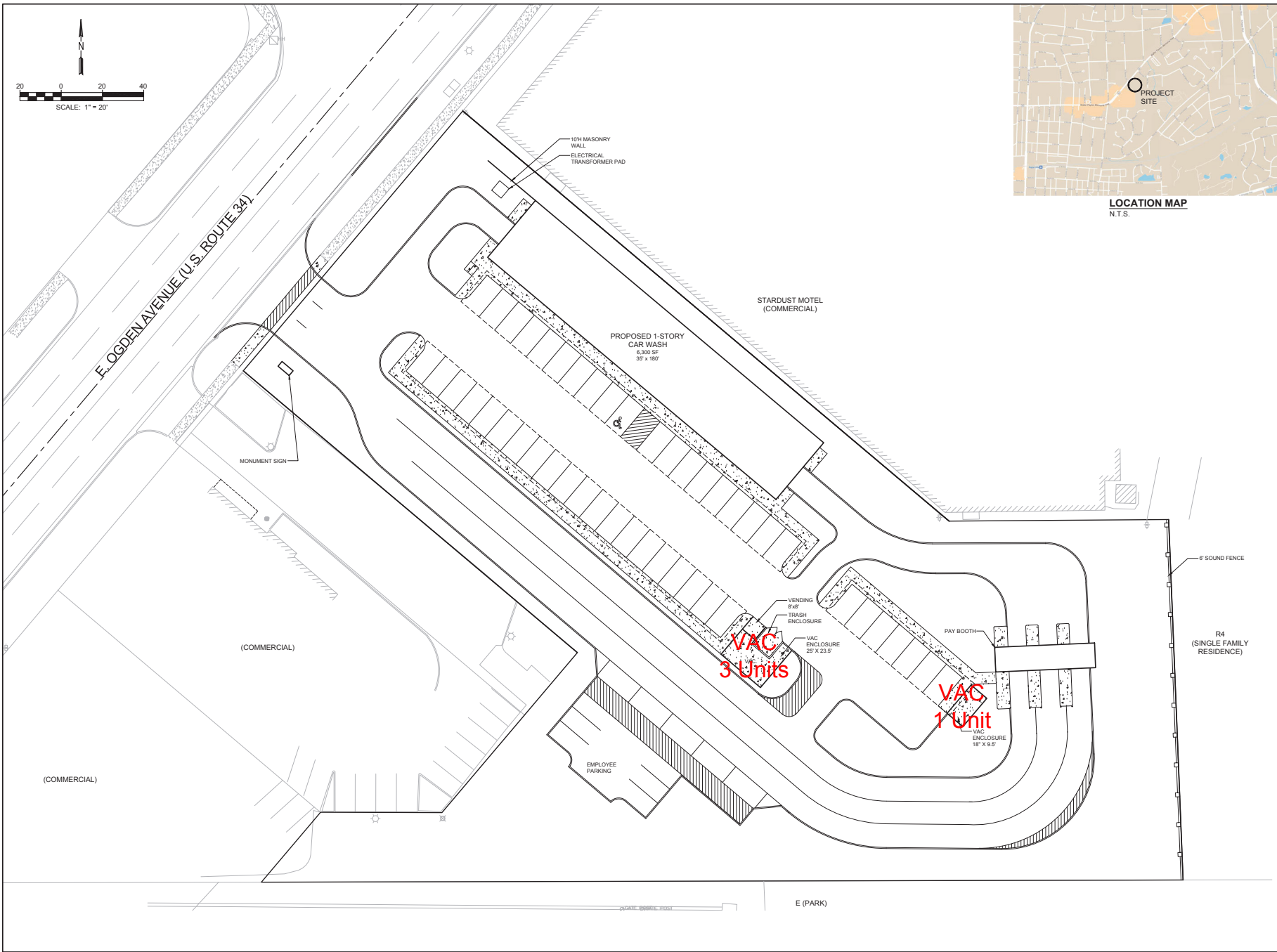


Exhibit 1: Aerial of Proposed Site



KNIGHT
Engineers & Architects
Knight E/A, Inc.
631 E. Boughton Road
Suite 205
Bolingbrook, IL 60440
Phone: (708) 342-1250
knights.com

PROJECT:
JET BRITE CAR WASH
180 E. OGDEN AVE.
NAPERVILLE, IL 60563
CLIENT:
JET BRITE SERVICES, INC.
580 KILDEER DR.
BOLINGBROOK, IL 60440

SITE PLAN

PROJECT #:
7699-01
DATE:
10-19-20

EXHIBIT G

EXHIBIT 2

Environmental Noise with Drayer OFF: 70 dba

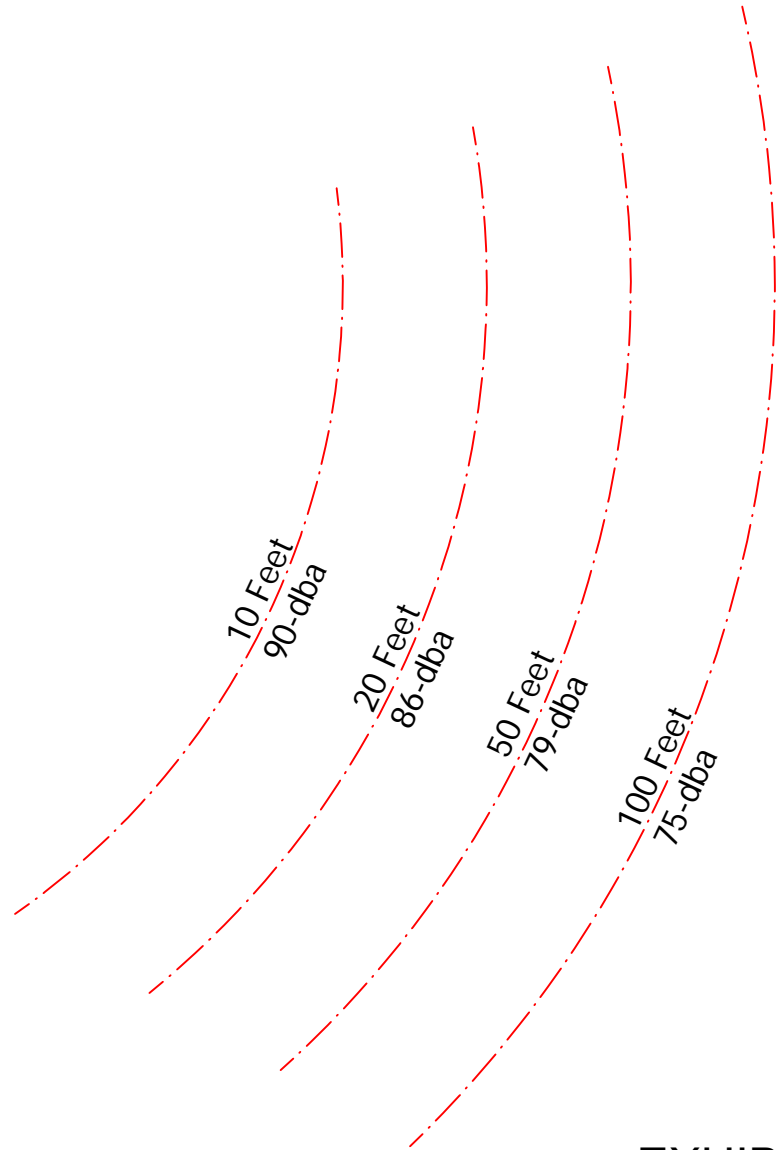
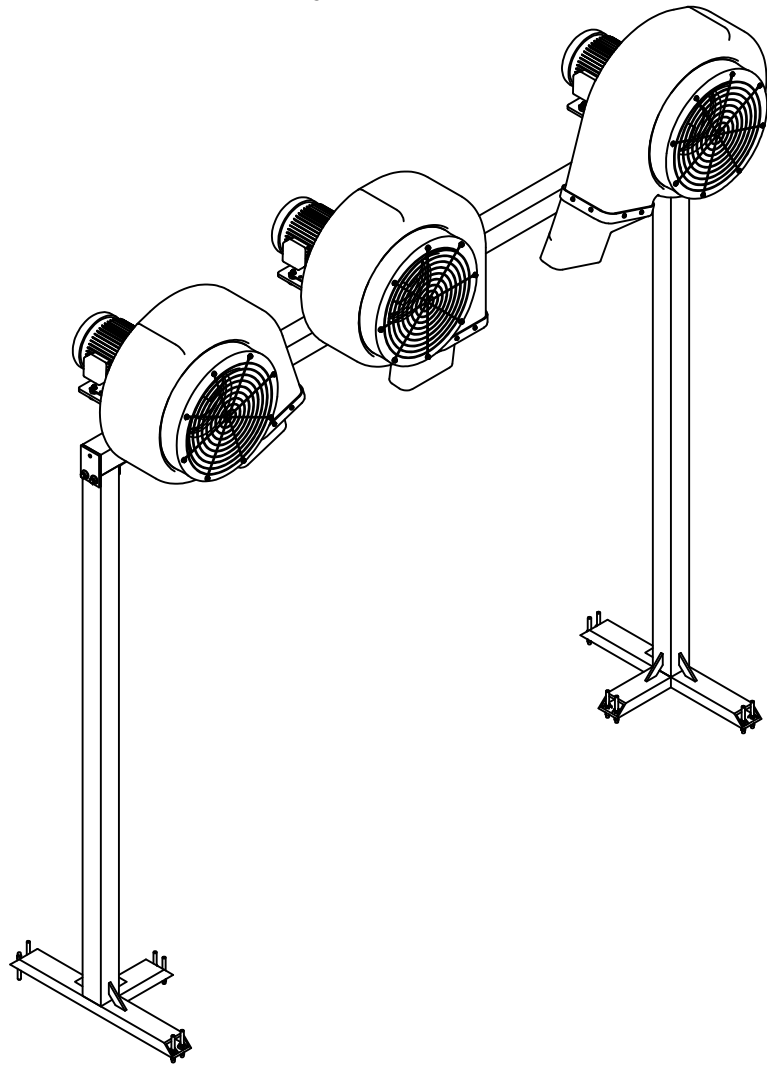


EXHIBIT 3

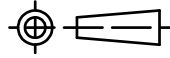
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|  THIRD ANGLE PROJECTION BREAK ALL SHARP CORNERS. PART TO BE FREE OF BURRS. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES | MACHINING TOLERANCES FRACTION ± 1/16" .XX DECIMAL ± 0.030 .XXX DECIMAL ± 0.005 ANGULARITY ± 2" FINISH 125 | DRAWN LVerdecia APPROVED | 8/26/2011 | SONNY'S ENTERPRISES THE CARWASH FACTORY | |
| | | 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 | |
| SHEET 2 OF 2 | | SIZE A | | SCALE N.T.S. | |

EXHIBIT G

MATERIAL



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

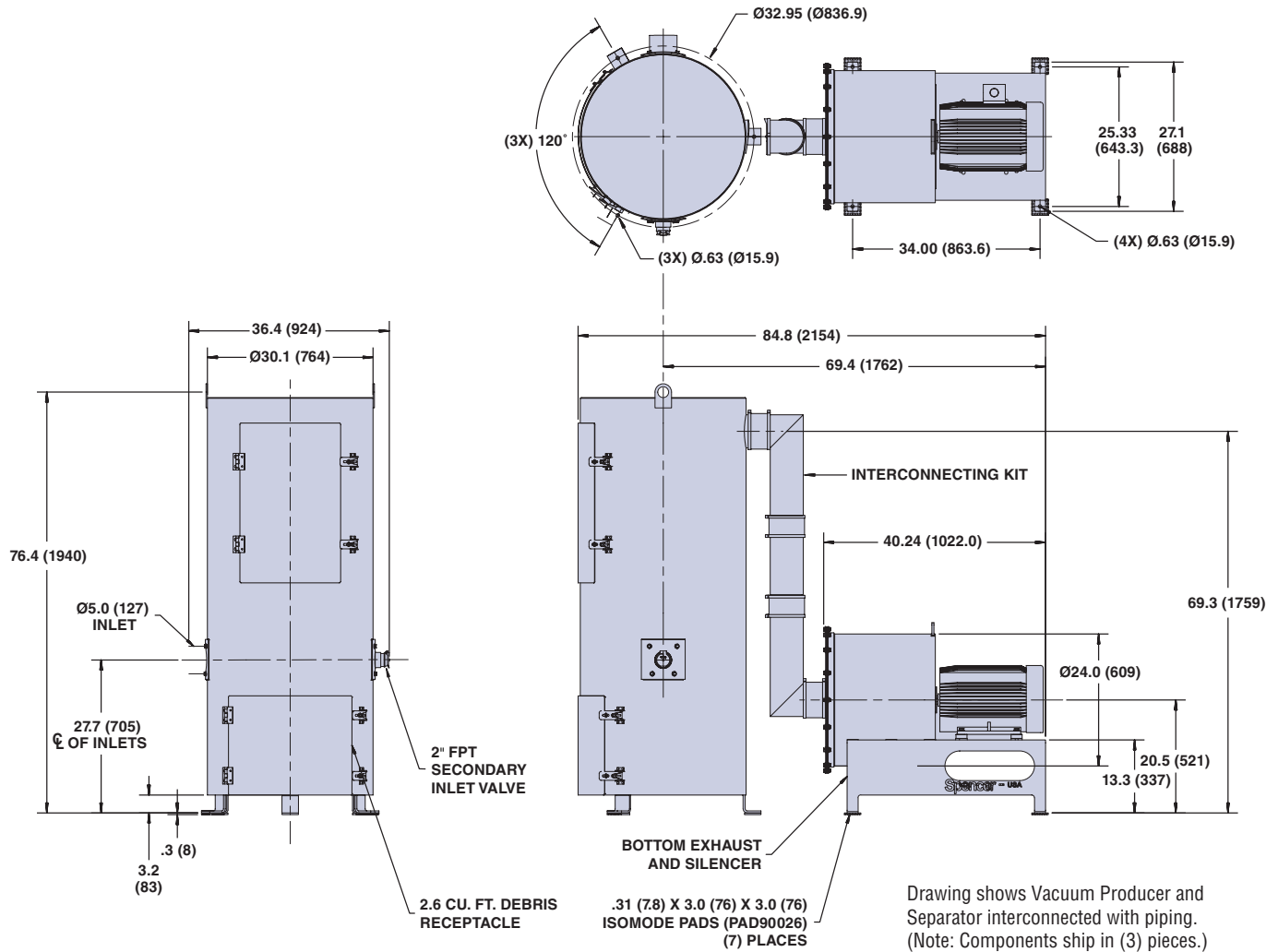
- Explosion-proof and premium efficiency motors
- NEMA 4, 7 and 9 starter enclosures
- Grounded filter bags
- Other filter bag materials
- Inlet valve (P/N VLV90100) for 2" diameter hose
- Island adapter kit (P/N PLT90023)
- Bottom discharge conversion adapter to change to 6" tube horizontal on motor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

Industravac® Series E

Component Models

Vacuum Producer | Separator | Interconnecting Kit

► **Dimensions:** Shown in inches / (mm)



| 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.

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EXHIBIT 4

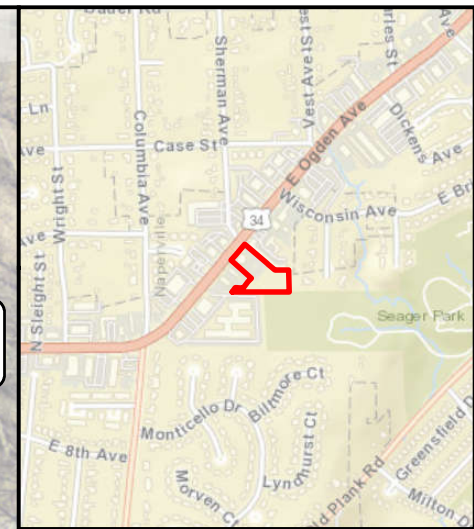
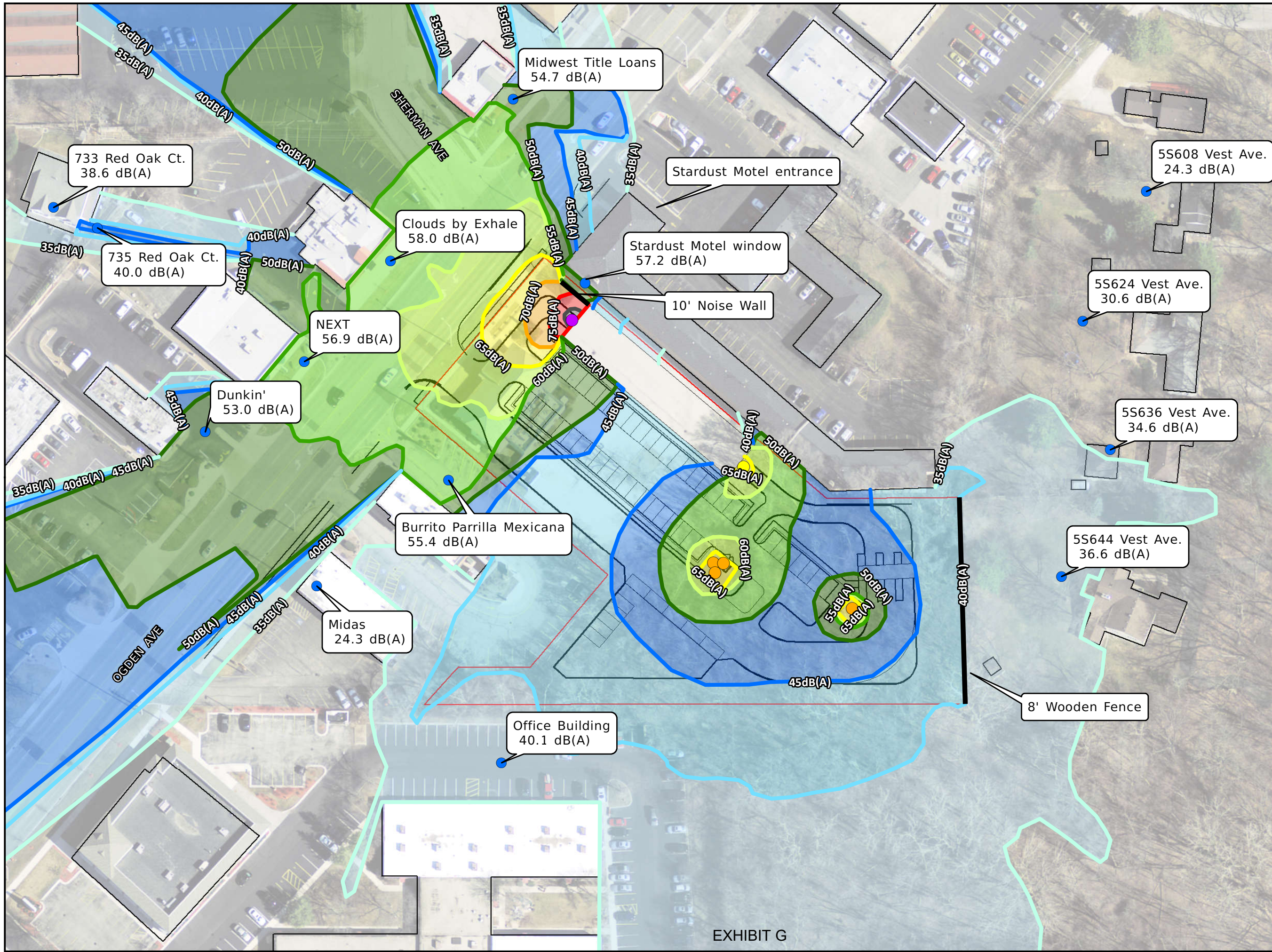
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The **Spencer** Turbine Company, 600 Day Hill Road, Windsor, CT 06095 USA

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Legend

- Receivers
- Noise Source
 - Tunnel Entrance
 - Tunnel Exit
 - Vacuum
- Noise Barriers
- Contours
 - 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)
- Project Area

**EXHIBIT 5
NOISE CONTOURS MAP**

780 AND 850 EAST
OGDEN AVENUE
VILLAGE OF NAPERVILLE
DUPAGE COUNTY, ILLINOIS



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

