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Town of Salisbury
Planning and Zoning Commission
Attn: Dr. Michael Klemens
27 Main Street
Salisbury, CT 06068

5 December 2024
PJ024-1440-L02

Subject: Responses to Questions from the Planning and Zoning Commission -- Acoustics

Reference: #2024-0257 / Wake Robin LLC & Ms. Serena Granbery
(ARADEV LLC) / 104 & 106 Sharon Road & 53 Wells Hill Road /
Special Permit for Hotel (Section 213.5) / Map 47 / Lot 2 & 2-1 / DOR: 08/05/2024

Dear Chairman Klemens:

In Response to Questions from P&Z Commissioners, concerning the Reference Application:

From **Chairman Klemens** (December 3, 2024):

Q1. The event barn appears to be the genesis of many (but not all) of the neighbor's concerns, including traffic, noise, parking, and lighting. Can this project function if the event barn were completely eliminated?

A1. Eliminating the Event Barn could reduce the increased density of the proposed development. But it would not eliminate the noise from music, behavior and vehicle volume. Noise from people being boisterous, cars starting, and car doors closing on the scale proposed, would be materially in excess of the current use. And, critically, there are no practical mitigants to the noise from up to 150 vehicles.

Q2. Could the event facility be relocated into the existing hotel where there is already an existing banquet facility?

A2. Same answer as for Q1.

From **Commissioner Cockerline** (12/3/2024):

Q2. Next question related to that is the idea of incorporating the event space into the main building. If it were buried in the core of the larger building it seems logical that sound containment would be more easily achieved. This also puts the burden of sound containment front and center in hotel guests enjoyment of their stay. I would support an increased footprint to accommodate this.

A2. See the answer to Klemens question A1 concerning the excessive scale of the development.

Q3. What effect would a solid fence within the planted area surrounding the north parking lot have on sound traveling to adjoining areas? Are there other areas that could benefit from similar treatment? Auto noise and the behavior of guests are a concern.

A3. A heavy (masonry or fabricated noise barrier) wall 8 ft high will provide a moderate reduction of about 13 dBA. Please see the attached calculations and the discussion below. This places the vehicle noise emissions still well above CT State noise limits. Other areas which may benefit include the "Cottages" and any other facility near the neighbors. It is cautioned that this sound barrier wall must be substantial and very heavy, such as masonry or a fabricated wall at least 5 pounds per square foot face weight, with no gaps or leaks.

From **Commissioner Shyer** (12/3/2024):

Q5. How would you mitigate the noise from clean-up of the restaurant or event spaces i.e. bottles, garbage haulage?

A5. It is very difficult to mitigate the noise from clean-up of the restaurant without a substantial building around the dumpster area to eliminate noise emissions and severe restrictions on the timing of the operation (allowable) hours and the methods employed.

Q8. If the entire project was permitted how long would you expect demolition to take? How long would you expect construction of the new facility to take?

A8. The construction proposal for the project must take into account the large amount of ledge that is present. This raises the question of **how much blasting** is required? This also raises the question about the noise impact of the construction and blasting from this project, including **heavy equipment and trucks**. Further, there was no analysis presented by the Applicant of how the vibration from blasting could be mitigated, if at all, to limit the **damage** to the foundations and wells of nearby residential structures.

Q. Additional: Question for tree experts both interceder and applicant's Mr Townsend (?) about the role of mature trees in absorbing noise.

A. Additional: It was noted in the 12/02/2024 Hearing discussion that trees are mostly (90-99 %) air, through which the noise emissions will travel mostly unimpeded. As such trees do not "absorb" sound. The International Standard on noise propagation, ISO Standard 9613-2, states that for a distance through dense trees less than 10 m (33 ft) the sound attenuation provided by the trees is only a fraction of a decibel (dB).

Traffic in Parking Lot – Effect of a Noise Barrier Wall

Acoustical Engineering Design Calculations

The effect of a *noise barrier wall* on property line near NW parking lot was calculated. Note that in order to be an effective sound barrier, the wall would need to be solid and heavy – masonry or fabricated wall (at least 5 pounds per face square foot) along the entire property line near parking lots/residences.

Calculations were conducted using vehicle noise data at a distance of 50 feet. These data are provided by the United States (US) DOT (Department of Transportation) FHWA (Federal Highway Administration) Traffic Noise Modeler (TNM) Technical Manual.

According to the US FHWA TNM Manual (Fig. 8): An *average automobile* traveling between 0 and 30 MPH at full throttle produces (emits) 68 dBA @ 50 feet. "Full Throttle" is TNM terminology for a vehicle accelerating from a stop or a vehicle on an upgrade.

Note that the CT State Noise Regulations (Sec. 14-80a) limit the maximum allowed noise emissions for automobiles to 74 dBA @ 50 ft.

For 10 cars at same time, add 10 dBA to the above levels. (+ 10 dBA)

Sound level calculation results for **autos operating in parking lots near residences** are shown in the Table below.

Automobiles operating in Parking Lots Per US DOT FWHA TNM (Average automobiles)	**NO BARRIER WALL** 50 ft distance	**8 foot high Sound Barrier Wall** 50 ft distance	**12 foot high Sound Barrier Wall** 50 ft distance	**CT State Regs Sound level limits**	**Passes CT Regs? Compatible with neighborhood?**
Single automobile - TNM	**68 dBA**	55 dBA (quiet voice)	51 dBA	55 dBA daytime 45 dBA nighttime	***NO***
10 autos – TNM	78 dBA	**65 dBA** (normal voice)	**61 dBA**	55/45 dBA	***NO***
Single automobile – CT max	**74 dBA**	61 dBA	57 dBA	55/45 dBA	***NO***
10 autos – CT max	**84 dBA** (lawnmower)	**71 dBA** (vacuum cleaner)	**66 dBA**	55/45 dBA	***NO***

Note that the sound barrier wall can provide modest noise attenuation in this case, but it is not enough reduction, and with average cars in the parking lot do not pass the requirements of the CT State Noise Regulations.

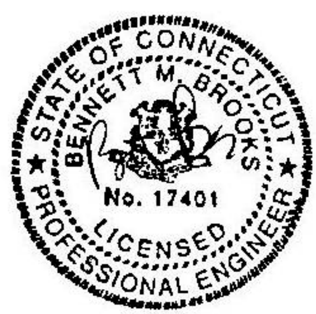
Note also that there are *diminishing improvements* with a higher wall (12 feet) compared to the zoning reg wall max of 8 ft. Building the wall higher at 12 feet yields only about 4 dBA improvement (reduction of noise) which is barely noticeable, compared with the 8 foot high wall.

Even with the 8 foot wall, or the 12 foot wall, the sound of cars in the parking lot ***greatly exceeds*** the CT State Noise Regulation sound limits by over 20 dB during nighttime hours.

Please contact me if you have any questions concerning these findings.

Very truly yours,
BROOKS ACOUSTICS CORPORATION

Bennett M. Brooks, PE, FASA, INCE
President



Attachments

Cramer and Anderson
Wake Robin Inn Special Permit Eval.
Salisbury, CT

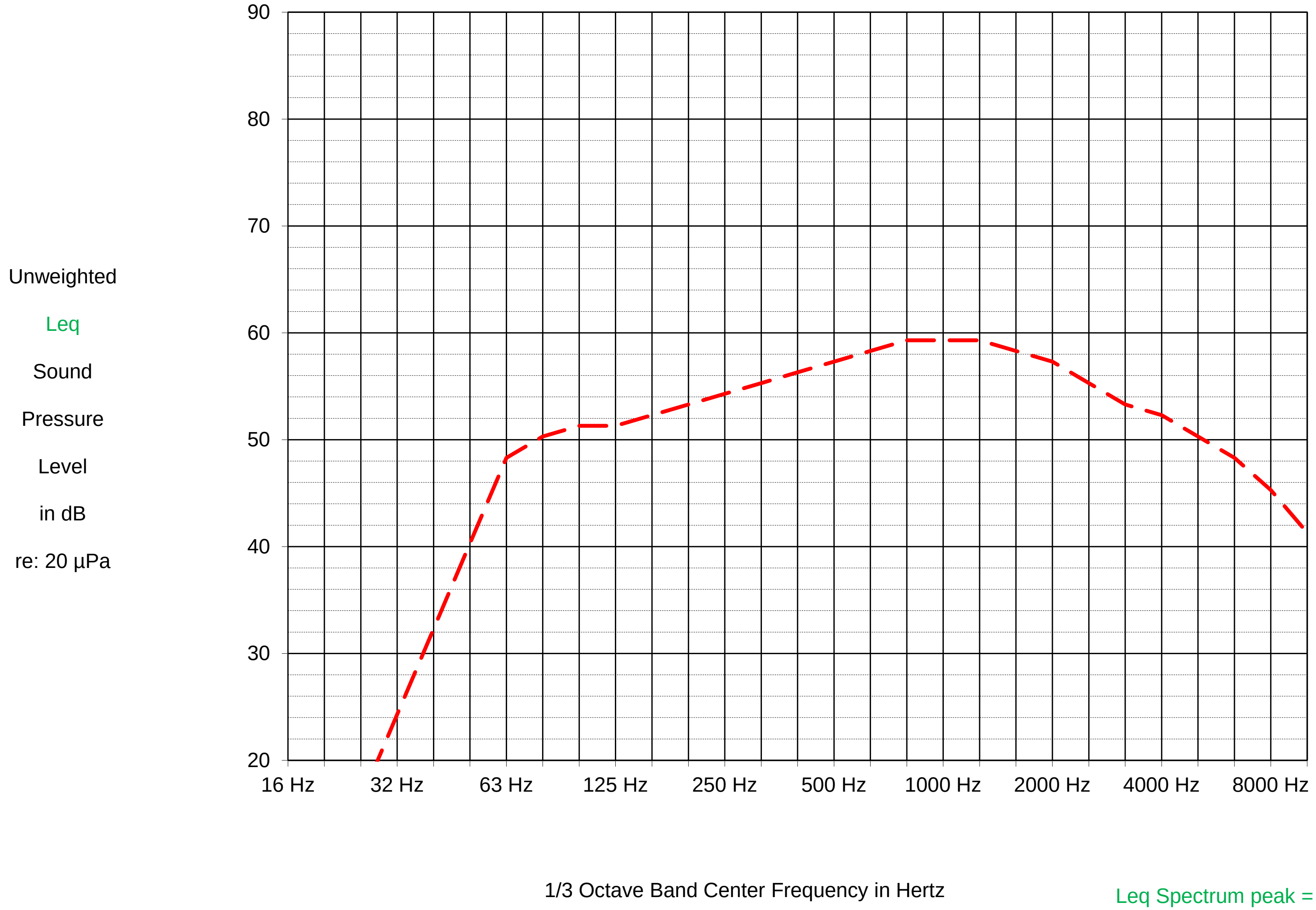
Automobile Noise Levels

Average Automobile (single) -- 50 feet distance

Per US DOT FHWA TNM (Traffic Noise Modeler) Technical Manual

Date: n/a
Time: n/a
Position: n/a

LAeq = 68



Leq Spectrum peak = 59 dB at 800 Hz

BAC Graph TNM Auto Ave Spectrum Leq.

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BAC Graph TNM Auto Ave Spectrum Leq.

Cramer and Anderson
Wake Robin Inn Special Permit Evaluation

BARRIER ATTENUATION CALCULATION

(Calculations as per ISO 9613-2 norm)

Source: Wake Robin Inn Event Parking Receiver: Neighbor Property	Baseline Height: ~ 800 ft

(Indicates values to be input in feet)*

$h_b := 8$ * *Height of Barrier*
$h_s := 2$ * *Height of Source*
$h_r := 5$ * *Height of Receiver*
$d_{sb} := 30$ * *Distance Source - Barrier*
$d_{br} := 20$ * *Distance Barrier - Receiver*

$c := 344$ *Speed of sound [m/s]*

$f_n := 31.25 \cdot 2^n$ *Frequency of peak [Hz]*

$\lambda_n := \frac{c}{f_n}$ *Wavelength of peak [m]*

$D_{br} := d_{br} \cdot 0.3048$ $D_{br} = 6.096$

$D_{sb} := d_{sb} \cdot 0.3048$ $D_{sb} = 9.144$

$H_{sb} := (h_b - h_s) \cdot 0.3048$ $H_{sb} = 1.829$

$H_{br} := (h_b - h_r) \cdot 0.3048$ $H_{br} = 0.914$

$R_{sb} := \sqrt{D_{sb}^2 + H_{sb}^2}$ $R_{sb} = 9.325$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $R_{br} = 6.164$

$$N_n := \frac{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}{\lambda_n}$$

Fresnel Number

$C := 10$

C = 10 for receiver over reflecting plane (close to ground)

$$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}}\right]\right]$$

Barrier Attenuation

Band n	Freq. [Hz]	$A_{barrier_n}$	$A_{barrier_n}$ (practical)
0	31.5	5.4	5.4 dB
1	63	5.9	5.9 dB
2	125	6.8	6.8 dB
3	250	8.2	8.2 dB
4	500	10	10.0 dB
5	1000	12.3	12.3 dB
6	2000	15	15.0 dB
7	4000	17.8	17.8 dB
8	8000	20.7	20.0 dB

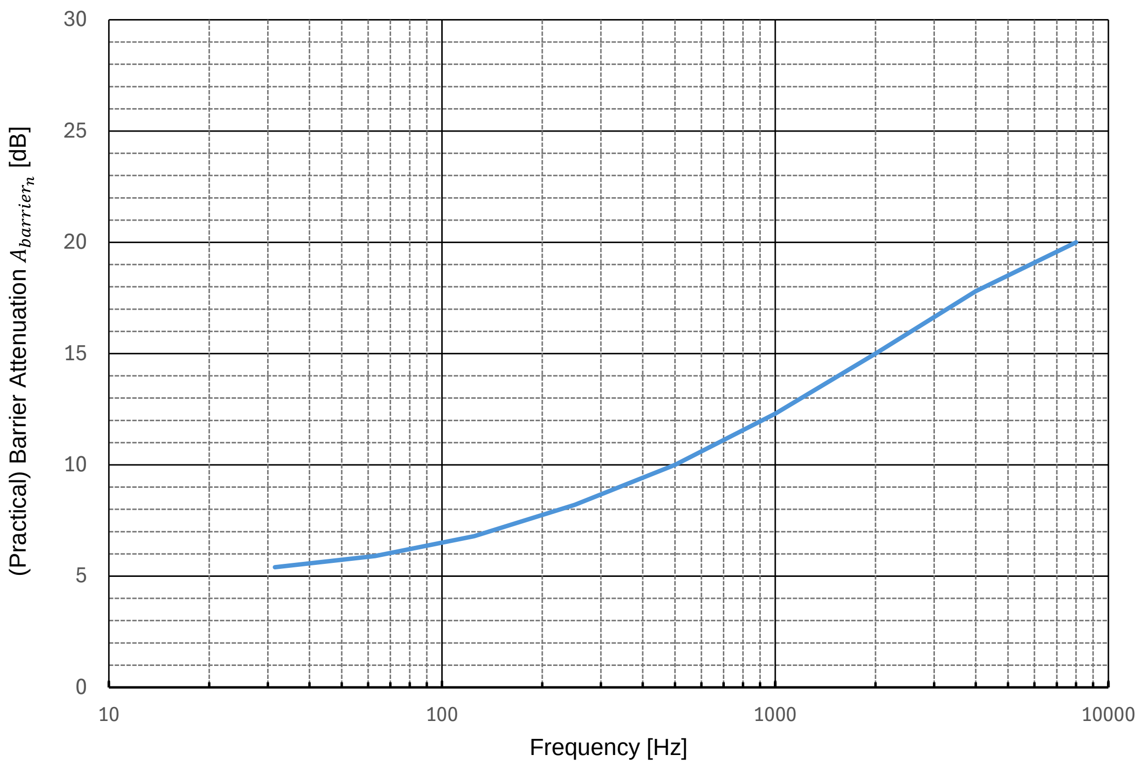
***Note**: Practical limit for barrier attenuation is 20 dB.*

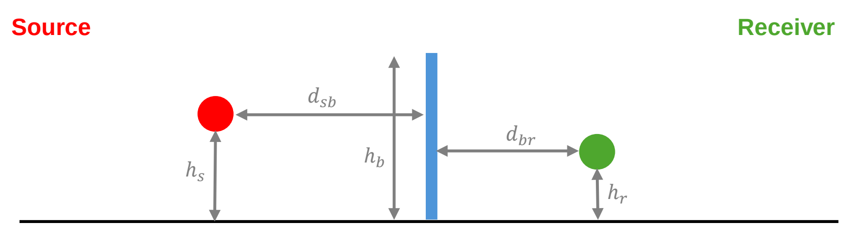
Cramer and Anderson

Wake Robin Inn Special Permit Evaluation

BARRIER ATTENUATION CALCULATION

(Calculations as per ISO 9613-2 norm)





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Wake Robin Inn Special Permit Evaluation

BARRIER ATTENUATION CALCULATION

(Calculations as per ISO 9613-2 norm)

Source: Wake Robin Inn Event Parking Receiver: Neighbor Property	Baseline Elevation: ~ 800 ft

(Indicates values to be input in feet)*

$h_b := 12$ ** Height of Barrier*

$h_s := 2$ ** Height of Source*

$h_r := 5$ ** Height of Receiver*

$d_{sb} := 30$ ** Distance Source - Barrier*

$d_{br} := 20$ ** Distance Barrier - Receiver*

$c := 344$ *Speed of sound [m/s]*

$f_n := 31.25 \cdot 2^n$ *Frequency of peak [Hz]*

$\lambda_n := \frac{c}{f_n}$ *Wavelength of peak [m]*

$D_{br} := d_{br} \cdot 0.3048$ — $D_{br} = 6.096$

$D_{sb} := d_{sb} \cdot 0.3048$ — $D_{sb} = 9.144$

$H_{sb} := (h_b - h_s) \cdot 0.3048$ — $H_{sb} = 3.048$

$H_{br} := (h_b - h_r) \cdot 0.3048$ — $H_{br} = 2.134$

$R_{sb} := \sqrt{D_{sb}^2 + H_{sb}^2}$ — $R_{sb} = 9.639$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ — $R_{br} = 6.459$

$$N_n := \frac{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}{\lambda_n}$$

Fresnel Number

$C := 10$ *C = 10 for receiver over reflecting plane (close to ground)*

$$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}}\right]\right]$$

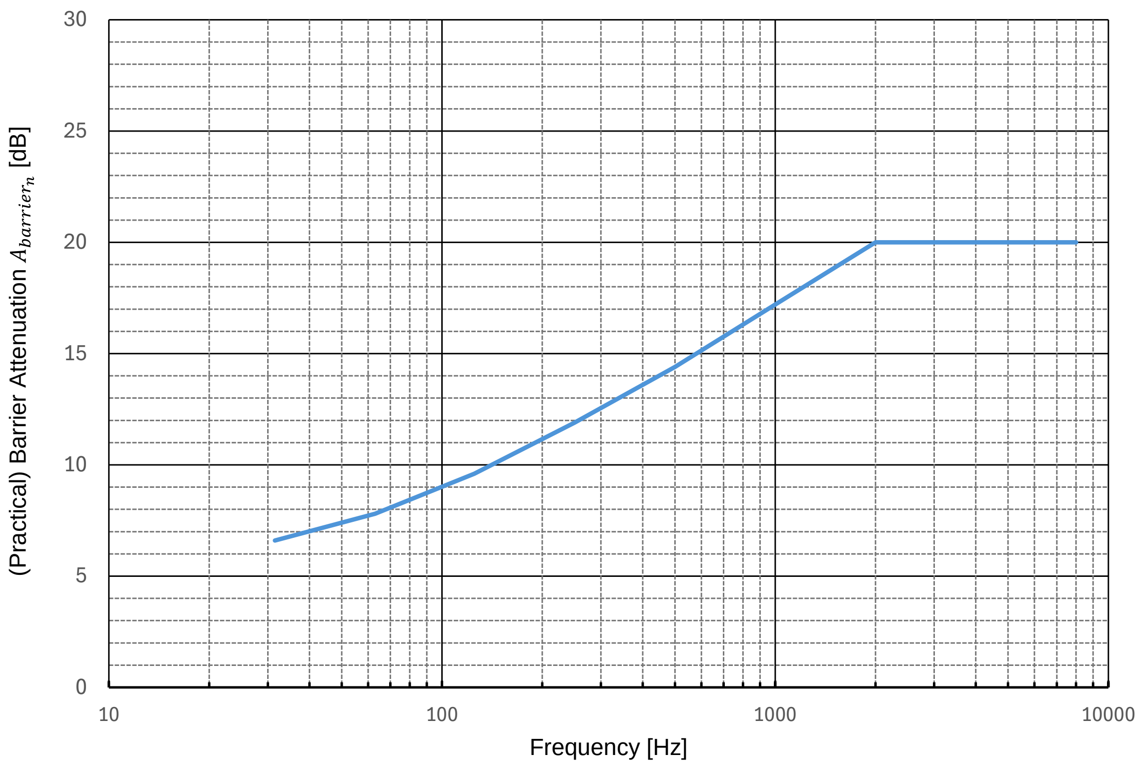
Barrier Attenuation

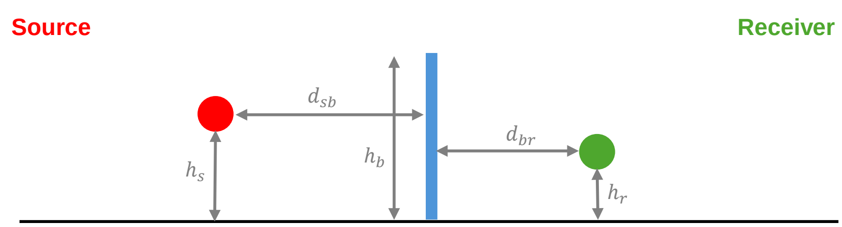
***Note**: Practical limit for barrier attenuation is 20 dB.*

Band n	Freq. [Hz]	$A_{barrier_n}$	$A_{barrier_n}$ (practical)
0	31.5	6.6	**6.6 dB**
1	63	7.8	**7.8 dB**
2	125	9.6	**9.6 dB**
3	250	11.9	**11.9 dB**
4	500	14.4	**14.4 dB**
5	1000	17.2	**17.2 dB**
6	2000	20.1	**20.0 dB**
7	4000	23	**20.0 dB**
8	8000	26.0	**20.0 dB**

BARRIER ATTENUATION CALCULATION

(Calculations as per ISO 9613-2 norm)



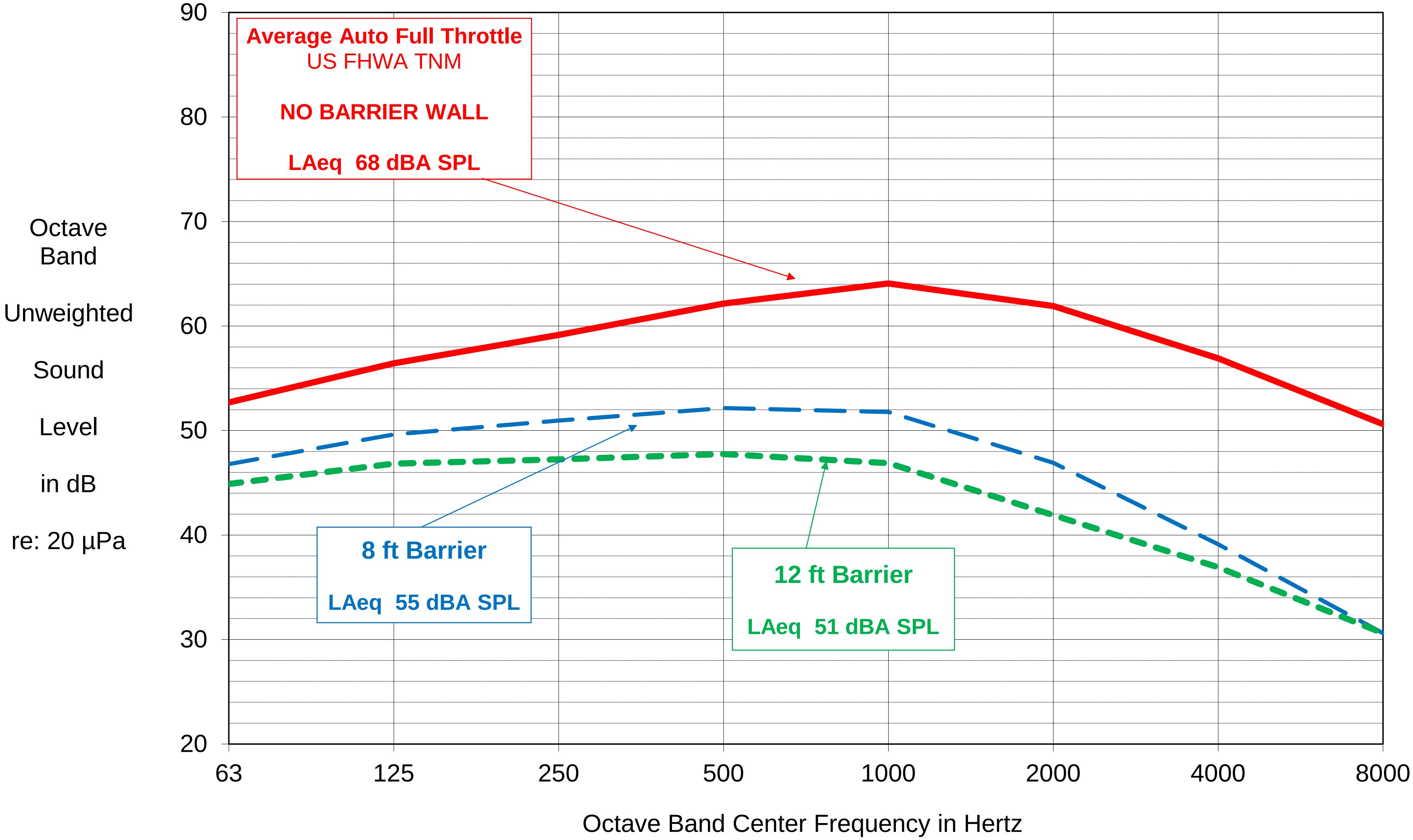


Cramer and Anderson
Wake Robin Inn Special Permit Evaluation
Salisbury, CT

Single Auto Sound Level Comparison

Effect of Barrier Height

Auto noise source -- Neighbor receiver - 50 ft Distance



BAC Graph Comparison 1

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