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Sound & Vibration
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11 August 2020

L 20885
J/N 728

Ms. Maryann Dillon
Housing Initiative Partnership, Inc.
6525 Belcrest Road, Suite 555
Hyattsville, Maryland 20782

Subject: Md. Rte. 5 Preliminary HUD Noise Estimate
Schultz Road Senior—Clinton, Maryland

Dear Ms. Dillon:

Noise from Md. Rte. 5 traffic was estimated at the proposed Schultz Road Senior development at 8230 Schultz Rd. with respect to U.S. Department of Housing and Urban Development criteria using HUD noise prediction procedures. The results found that the exterior highway day-night average sound level at Schultz Road Senior is expected to be 70 dBA. Consequently, the noise exposure is "normally unacceptable"—per the HUD 65–75 dBA[L_{dn}] criterion—and requires mitigation. Mitigation in this situation most appropriately is building soundproofing reducing the indoor exposure.

The details of this study are documented in the attached report. If you have any questions or if I can be of further help, please let me know.

Sincerely,

Michael A. Staiano

Michael A. Staiano

Attachment: Staiano Engineering Report No. L 20885

xc: J.H. Ratnow—Site-Insight

MD. RTE. 5
PRELIMINARY HUD NOISE ESTIMATE
SCHULTZ ROAD SENIOR
CLINTON, MARYLAND

By

Michael A. Staiano

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Report No. **L 20885**

11 August 2020

For
Housing Initiative Partnership, Inc.
Hyattsville, Maryland
J/N 728

Schultz Road Senior is four-story, 90-apartment development proposed at 8230 Schultz Rd. in Clinton, Md. The project will require a U.S. Department of Housing and Urban Development (HUD) environmental noise evaluation. HUD assessments must include: [1]

- Aircraft—"all airports (civil and military) within 15 mi of the site."
- Roadways—"all roads that might contribute to the site noise environment; roads further away than 1000 ft normally may be ignored."
- Railways—"all rapid transit lines and railroads within 3000 ft (except totally covered subways)."

Md. Rte. 5 (Branch Av.) is within the highway screening distance. Evaluation of the noise exposure to the project is necessary using HUD Noise Guidebook procedures to determine if the development meets the goal for residential development, 65-dBA day-night average sound level, L_{dn}. This report documents the required estimation of the site noise exposure.

SUMMARY

Noise from Md. Rte. 5 traffic was estimated at the proposed Schultz Road Senior development at 8230 Schultz Rd. with respect to U.S. Department of Housing and Urban Development criteria using HUD noise prediction procedures. The results found that the exterior highway day-night average sound level at Schultz Road Senior is expected to be 70 dBA. Consequently, the noise exposure is "normally unacceptable"—per the HUD 65–75 dBA[L_{dn}] criterion—and requires mitigation. Mitigation in this situation most appropriately is building soundproofing reducing the indoor exposure.

TERMINOLOGY

Sound is quantified in terms of levels, having units of decibels (dB). Sound levels that are weighted to account for the non-uniform frequency sensitivity of human hearing are defined as "A-weighted" and given units of "A-weighted decibels" (dBA). For environmental noise evaluations, noise exposures are often described in terms of day-night average sound level. *Day-Night Average Sound Level* (L_{dn}) is a 24-hr energy-average sound level with a 10-dBA penalty added to sound levels occurring between 10 PM and 7 AM.* (This nighttime weighting is applied to account for the assumed increased sensitivity to noise intrusions during nighttime.) When traffic noise is evaluated in terms of day-night average sound level, the 10-dBA nighttime penalty effectively makes a single vehicle drive by occurring at night equivalent to ten identical events occurring during the day.

CRITERIA

U.S. Department of Housing and Urban Development standards consider outdoor day-night average sound levels:[2]

- o Not exceeding 65 dBA, "acceptable;"
- o Between 65–75 dBA, "normally unacceptable;" and
- o Above 75 dBA, "unacceptable."

HUD policy allows the "normally-unacceptable" 65–75 dBA exposures to be made acceptable by means of noise mitigation measures such as noise barriers or building soundproofing features. Projects in or partially in an “unacceptable” noise zone must be submitted to the HUD Assistant Secretary for Community Planning and Development for approval. This policy is applied equally for multi-family and single-family/detached housing.

The HUD requirements presume that standard building construction provides combined overall, 20-dBA outdoor–indoor sound attenuation. Thus, a 65-dBA[L_{dn}] exterior exposure is expected to correspond to an interior “acceptable” sound level of 45-dBA[L_{dn}]. Additional building design requirements may be necessary for “acceptable” indoor exposures where outdoor noise exceeds 65 dBA.

PREDICTED SOUND LEVELS

In 1979, HUD published a noise policy that provides procedures enabling people without technical training to assess noise exposures at housing sites.[1] The HUD Noise Guidebook includes simple methods for estimating sound levels from aircraft, railway and highway operations using nomographs. In this study, computations will be in accordance with the HUD guidelines as derived from evaluation of the mathematical expressions upon which Guidebook nomographs are based.[3]

* In this report, units of day-night average sound level are identified as dBA[L_{dn}] or simply as dBA, which is equivalent in this context.

The procedures used herein are an implementation of the HUD Noise Assessment Guidelines (NAG) which automates the manual nomograph process (as is the HUD "Day/Night Noise Level Assessment Tool"). These methods are fully compliant with the NAG.*

Analysis Procedures

Traffic noise depends upon the volume of vehicles, the presence of trucks—particularly heavy trucks, and the average speed of the traffic. Thus, highway sound levels will vary over a day depending upon the traffic flow. For any daily pattern of traffic variation, a day-night average sound level can be calculated. HUD requires that, if possible, the projected noise exposure be representative of traffic conditions expected at least 10 years beyond the date of the project or action under review.

HUD Prediction Accuracy. The state-of-the-art method for the prediction of noise from highway traffic is the Traffic Noise Model (TNM) computer procedure released by the U.S. Federal Highway Administration (FHWA) in 1998 and regularly updated since.[4] TNM provides the most accurate highway noise predictions obtainable—by virtue of more up-to-date vehicle noise emission data and more scientifically rigorous computation of sound propagation behavior. The accuracy of the HUD computational procedure used in this report was tested in a systematic comparison of its results to output from the TNM procedure (Version 2.5).[5] The HUD procedure was found to over-predict TNM results for all roadway geometries and conditions. For high-speed (70-MPH) roadways, the HUD procedure agreed reasonably with TNM for receptor distances up to about 200 ft from the roadway centerline. However, the error increased with receptor distance—reaching about 10 dBA at 1000 ft for both low- and high-speed highways. For low-speed (35-MPH) roadways, the HUD Guidelines over-estimated TNM by 4–10 dBA for all distances.

Analysis Inputs and Assumptions. Predictions were based upon 2040 traffic data, as given in Table 1.[6] At the site, MD-5 is a six-lane, divided roadway with an approx. 28-ft median. Sound levels were estimated at the closest approach of the roadway to the proposed Schultz Road Senior building, approx. 400 ft from the roadway centerline—identified as Location A in Figure 1 and also given in Table 1. Any shielding from intervening structures between the roadway and the site was ignored. The site layout was based upon Ben Dyer Associates, Inc. drawing “Exhibit for 65 db Noise Contour—Lot 71—Charles Schultz Subdivision,” SESP-4830.pdf received 21 July 2020.

Analysis Results. The estimated day-night average sound levels are given in Table 2 with intermediate results. The expected sound level is 70 dBA[L_{dn}] at the closest point of the building to a MD-5 traffic lane—well above the 65-dBA limit. The ≥65-dBA[L_{dn}] zone is expected to extend about 830 ft from the roadway centerline; consequently, the HUD 65-dBA limit is exceed over the entire site (ignoring shielding from the proposed building structure). Thus, the roadway noise exposure for the Shultz Road Senior project is “normally unacceptable” per HUD criteria and requires mitigation of noise-sensitive building spaces on the highway exposed sides of the structure. Mitigation of multifamily buildings most appropriately is by building soundproofing reducing the indoor exposure.

* In the event the NAG requirements are not met, HUD provides a "Sound Transmission Classification Assessment Tool" (STraCAT) procedure for the evaluation of the architectural performance of a structure. The evaluation of architectural performance was not included in the scope of this assessment.

Outdoor Recreation Area. The site/architecture concept plans (CDA APPLICATION_Schultz Road-R18_LR-Rendering 3-19.pdf received 10 April 2020) show an approximately 30 x 50-ft patio immediately adjacent to the rear façade of the senior building. This location is on the far side of the proposed structure from the roadway and well shielded by the building. MD-5 traffic noise at this location is unlikely to exceed 65 dBA due to the noise barrier benefit of the structure, thus suitable for outdoor recreation.* However, no noise prediction analyses were performed at this location.

Qualifications. The results of measurements or predictions of noise or vibration magnitudes or changes in level apply only to the evaluated dates and times, locations, and conditions. Exposure uncertainty exists such as due to but not limited to variable outdoor propagation, undefined transmission paths, or fluctuating source operation. Assessments of human response to noise or vibration are subject to exposure uncertainties and the varying perceptions of individual sound or vibration receivers. Noise or vibration performance is significantly degraded by poor implementation practice. The execution of any recommendations requires the proper selection and installation of materials and equipment. Good workmanship in the construction or modification of equipment, structures or buildings is necessary. The findings or conclusions may not apply if the implementation of the recommendations differs in any way.

REFERENCES

[1] U.S. Department of Housing and Urban Development, The Noise Guidebook, Report No. HUD-953-CPD, March 1985.

[2] U.S. Department of Housing and Urban Development, "Environmental Criteria and Standards," 24 CFR 51B, 5 July 1979.

[3] Schultz, T.J., and W.J. Galloway, "Noise Assessment Guidelines—Technical Background," Office of Policy Development and Research, U.S. Department of Housing and Urban Development, 1980.

[4] Menge, C.W., C.F. Rossano, G.S. Anderson, and C.J. Bajdek, FHWA Traffic Noise Model, Version 1.0—Technical Manual, U.S. Dept. of Transportation Report No. FHWA-PD-96-010, February 1998.

[5] Staiano, M.A., “Simple Methods for Estimating Highway Noise,” Paper Presented to the Transportation Research Board, Committee ADC40–Transportation-Related Noise and Vibration—Summer Meeting, 24 July 2007.

[6] Ratnow, J.H., Site Insight, email transmittal to M.A. Staiano, 3 May 2020.

* The gazebo shown at the front of the proposed building is fully noise-exposed and not suitable as a recreation area.

Table 1. HIGHWAY NOISE INPUT DATA
Md. Rte. 5 2040 traffic

NOISE ASSESSMENT LOC.	65-dBA Contour		Hwy CPA	
R O A D W A Y T R A F F I C E X P O S U R E				
Major Roads within 1000 ft.:	MD 5		Hwy CPA	
Description	SB	NB	SB	NB
Roadway O/A ADT	168,865		168,865	
Directional Distribution	49.0%	51.0%	49.0%	51.0%
Roadway Directional ADT	82,744	86,121	82,744	86,121
Roadway O/A Centerline Dist (ft)	830		400	
Traffic Projection Year	2040		2040	
Dist. to Roadway (ft)--Near Edge	773	835	343	405
--Far Edge	809	871	379	441
Effective Roadway Distance	791	853	361	423
Dist. to Stop Signs (ft)	--	--	--	--
Roadway Gradient (>2%)	--	--	--	--
Average Speed (MPH)--Autos & MT	65	65	65	65
--HT, uphill	60	60	60	60
--HT, dwnhill	60	60	60	60
Avg. Daily traffic--ADT	82,744	86,121	82,744	86,121
Percent Trucks*--Med.	3.6%	3.6%	3.6%	3.6%
--Hvy., uphill	0.0%	0.0%		
--Hvy., downhill	2.5%	2.5%	2.5%	2.5%
--Hvy., total	2.5%	2.5%	2.5%	2.5%
Percent Night Traffic (10 PM-7 AM)	5.3%	5.3%	5.3%	5.3%
Nighttime Adjustment Factor	1.48	1.48	1.48	1.48

* Buses seating more than 15 passengers are counted as heavy trucks.

Table 2. HIGHWAY NOISE COMPUTATIONS and RESULTS per HUD METHOD

based upon Md. Rte. 5 2040 traffic;
outdoor *day-night average sound levels* (DNL) at closest approaches of building to roadway;
rounded to nearest whole decibel; **BOLD** values exceed HUD “normally unacceptable" criterion (dBA)

NOISE ASSESSMENT LOC.	65-dBA Contour		Hwy CPA	
R O A D W A Y T R A F F I C E X P O S U R E				
Major roads within 1000 ft.:	MD 5		Hwy CPA	
Description	SB	NB	SB	NB
AUTO & MEDIUM TRUCK TRA22FFIC				
Actual ADT -- Autos	77,696	80,868	77,696	80,868
-- MT	2,979	3,100	2,979	3,100
Effective ADT	107,484	111,871	107,484	111,871
Stop-and-Go Adjustment Factor	1.00	1.00	1.00	1.00
Day-Night Avg. Sound Level (dBA)	60	60	**65**	64
Barrier Attenuation	--	--	--	--
Net DNL -- Autos & Medium Trucks	60	60	**65**	64
HEAVY TRUCK TRAFFIC				
Actual ADT -- HT	2,069	2,153	2,069	2,153
Effective ADT -- Uphill	0	0	0	0
Effective ADT -- Downhill	2,979	3,100	2,979	3,100
Effective ADT -- TOTAL	2,979	3,100	2,979	3,100
Stop-and-Go Adjustment Factor	1.00	1.00	1.00	1.00
Day-Night Avg. Sound Level (dBA)	58	58	63	62
Barrier Attenuation	--	--	--	--
Net DNL -- Heavy Trucks	58	58	63	62
TOTAL ROADWAY TRAFFIC				
Day-Night Avg. Sound Level (dBA)	62	62	**67**	**66**
TOTAL COMBINED ROADWAY TRAFFIC				
Day-Night Avg. Sound Level (dBA)	65		**70**	

CPA = closest point of approach

Figure 1. SCHULTZ ROAD SENIOR and MD. RTE. 5
Location A at closest approach of development to roadway shown