7-J

MOTION: **October 28, 2025**
Regular Meeting
SECOND: **Ord. No. 25-**

RE: **AMEND COUNTY CODE SECTION 14-1 – SECTION 14-8, OF CHAPTER 14, NOISE-COUNTYWIDE**

ACTION:

WHEREAS, under County Code Section 14-1 the purpose of the Noise Ordinance is "to protect citizens against excessive noise which is detrimental to life, health and enjoyment of property"; and

WHEREAS, on July 12, 2022, the Prince William Board of County Supervisors (Board) issued Directive (DIR) 22-28 directing County staff to comprehensively review the noise ordinance and propose appropriate amendments, if any for the Board to consider; and

WHEREAS, the County Executive established the Data Center Ordinance Advisory Group to assist County staff with making recommended changes to the Noise Ordinance; and

WHEREAS, County staff hired three (3) acoustics experts to assist with revising the Noise Ordinance and addressing the enforcement aspects of the County Code. The consultant team included:

1. JMT,
2. The Noise Consultancy LLC,
3. Nelson Acoustics; and

WHEREAS, the County consultants researched noise ordinances across the nation and Europe to assess how others were addressing low frequency steady tonal noise; and

WHEREAS, County staff conducted noise testing in conjunction with the consultant team at over 50 field locations, which included schools, hospitals, data centers, parks, residential communities, and restaurants. The test results helped inform the consultant team's work on the draft noise scale; and

WHEREAS, on October 14, 2025, by adoption of Resolution Number (Res. No.) 25-533, the Board authorized a public hearing on the attached amendments to County Code Section 14-1 – Section 14-8, Chapter 14, Noise; and

WHEREAS, County staff recommends that the Board approve the attached amendments to County Code Section 14-1 – Section 14-8 of Chapter 14, Noise; and

WHEREAS, the Board finds that adopting the attached amendments to County Code Section 14-8-Section 14-8 of Chapter 14, Noise, secures and promotes the health, safety, and general welfare of the County and its inhabitants;

NOW, THEREFORE, BE IT ORDAINED that the Prince William Board of County Supervisors hereby amends County Code Chapter 14, Noise, by adopting the attached amendments to County Code Section 14-1-Section 14-8;

BE IT FURTHER ORDAINED that the attached amendments to Section 14-1-Section 14-8 of the Chapter 14, Noise, of the County Code shall become effective date of the Noise Ordinance at12:01 A.M. on May 1, 2026.

ATTACHMENT: Amendments to County Code Chapter 14, "Noise"

Votes:
Ayes:
Nays:
Absent from Vote:
Absent from Meeting:

For Information:
Deputy County Executive – Wade Hugh

ATTEST: _____

Clerk to the Board

Chapter 14 -NOISE

Sec. 14-1. Declaration of policy.

It is hereby declared to be the public policy of Prince William County to protect its citizens against excessive noise which is detrimental to life, health and enjoyment of property. In order to promote the public health, safety, welfare and the peace and quiet of the inhabitants of the county, the following measurements and standards relating to noise are hereby adopted.

Sec. 14-2. Violations of chapter.

a. Any person ~~violating~~ who is found to have violated any provision of this chapter shall be guilty of a Class ~~2~~ 4 misdemeanor for the first offense. Any person who is found to have violated any provision of this chapter within 365 days of the date of a previous conviction for a violation of this chapter shall be guilty of a Class 3 misdemeanor.

b. In lieu of the criminal penalties set forth in section 14-2(a), a violation of any provision of this chapter may be punishable by a civil penalty of not more than $250 for the first offense and $500 for the second offense. Any third or subsequent offense shall be subject to the penalties in 14-2(a) above. This civil penalty provision shall not apply to noise generated in connection with the business being performed on industrial property or railroads.

Sec. 14-3. Definitions.

For the purposes of this chapter, the following words and phrases shall have the meanings respectively ascribed to them by this section:

A-weighted decibel means the sound level, in decibels, measured with a sound level meter using the A-weighting network or scale as specified in the ANSI S1.4 ~~1983 (specification for sound level meters)~~ .The level so read shall be post scripted dB(A) or dBA.

Ambient sound level means the measured value that represents the sound from all sound sources, exclusive of extraneous sound and the sound from the source property under investigation when observed from the location at which the compliance measurements were conducted (i.e., property line of source or at or within property line of receptor). Ambient sounds are differentiated from extraneous sounds by the fact that ambient sounds are being emitted the majority of the time, although they may not be continuous. Examples of ambient sounds include, but not limited to, consistent, but not necessarily continuous, steady off-site traffic of properly muffled vehicles, mechanical equipment not located on the property under investigation, seasonal insects, and a flock of non-transient birds. Ambient sound is included in all measurements.

ANSI means the American National Standards Institute, Inc. ~~, New York, New York.~~ ANSI standards referenced in this chapter are available at ANSI.org, and are incorporated herein by reference, as supplemented or amended.

Beat means an interference pattern between two sounds of slightly different frequencies, perceived as a periodic variation in volume.

Chief means the chief of police of Prince William County or his authorized agents.

Corrected source sound level means the sound level of the source under investigation, calculated by subtracting the measured ambient sound level from the measured total sound level.

Daytime means the local time of day between the hours of 7:00 a.m. and 10:00 p.m. weekdays and from 9:00 a.m. to 10:00 p.m. on Saturdays, Sundays and legal holidays observed by the county government unless otherwise specified.

dBA means the sound level as measured using the "A" weighting network with a sound level meter. The unit of reporting is dB(A). The "A" weighting filters de-emphasizes against the lower frequencies according to a relationship approximating the auditory sensitivity of the human ear.

dBC means the sound level as measured using the "C" frequency-weighting network of a sound level meter. The level so read is reported in decibels and designated dB(C) or dBC. The C-weighting network provides a relatively flat response across the mid-frequency range with much less de-emphasis of low frequencies than A-weighting, and is intended to represent human hearing at higher overall sound levels. It is commonly used where low-frequency content or peak/impulsive noise is of concern and is defined in international sound-level-meter standards.

dBZ means the sound pressure level as measured with the Z-weighting network of a sound level meter. The level so read is reported in decibels and designated dB or dBZ. Z-weighting (or zero weighting) is a flat (unweighted) response between 10 Hz to 20kHz. The Z-scale is used when measuring octave band sound pressure levels.

Decibel means a unit that describes the sound pressure level or intensity of sound. The sound pressure level in decibels is 20 times the logarithm to the base ten of the ratio of the pressure of the sound in microbars to a reference pressure of 0.0002 microbar; abbreviated dB.

Director means the director of the department of public works or his authorized agent.

Extraneous sound means an intermittent sound that is neither ambient sound nor sound from the source under investigation. Examples of extraneous sound include, but are not limited to, the following intermittent sounds: car horns, passing sirens, aircraft, and transient birds. Extraneous sounds are excluded from all measurements either manually or by data processing.

IEC means the International Electrotechnical Commission. IEC standards referenced in this chapter are available at IEC.ch, and are incorporated herein by reference, as supplemented or amended.

Impulsive sound means either a single pressure peak or a single burst (multiple pressure peaks) having a duration of less than two seconds. Examples include sounds emitted from impacts (one item striking another, e.g., using a mallet to aid in the unloading of a powder from a tanker truck) and items being dropped (e.g., kegs mishandled at a loading dock).

Investigator means a County employee authorized to enforce the provisions of this chapter.

Lmax means the maximum sound level reported by a sound level meter and either observed and recorded manually or electronically logged with the fast time constant.

Motor vehicle means every vehicle that is self-propelled or designed for self-propulsion and is used for transportation on public highways.

Nighttime means those times excluded from the definition of daytime.

Noise means ~~any steady-state or impulsive sound occurring on either a continuous or intermittent basis~~. any sound not in conformance with any provision herein

Noise disturbance means any sound which:

(1) Endangers or injures the safety or health of humans; or

(2) Endangers or injures personal or real property; or

(3) Exceeds the applicable maximum permissible sound levels as they appear in the table in section 14-4.

Octave band means a range of sound frequencies between band edge frequencies an octave apart. Octave band center frequencies are as specified in ANSI S1.11.

Receptor means the property at which sound is received from the source under investigation for potential violation of this chapter, or the location on that property at which it is received.

Sound means a series of vibrations within a medium, including air that may be perceived by the human sense of hearing.

Sound level means the sound pressure level measured in decibels with a sound level meter set for A - weighting, expressed in dBA.

Sound level meter means an instrument used to measure ~~s~~sound levels or sound pressure levels that meets or exceeds performance standards for a Type 1 or Type 2 meter as specified by ~~the~~ either ANSI S 1.14 or IEC 61672

Sound level meter calibrator means an instrument used to conduct field calibration checks of a sound level meter, and which conforms to either ANSI S1.40 or IEC 60942.

Sound pressure level means ~~the intensity in decibels (dB) of a sound.~~the ratio of a measured pressure in air to a reference pressure as measured with a sound level meter, reported in units of dB or dBZ. It is an unweighted measurement.

Sound production device means any device whose primary function is the production of sound, including, but not limited to, any musical instrument, loudspeaker, radio, television, digital or analog music player, public address system, or sound-amplifying equipment

Steady tonal sound means a sound characterized by a droning nature and which may be referred to as a whine, hum, rumble, or buzz, which may either be broadband or include a single frequency or a narrow cluster of frequencies. Such sound sources include, but are not limited to, heating, ventilating or air-conditioning units, refrigeration units, transformers, and backup generators. The steady tonal sound level in any single C-weighted measurement found to exceed the limits of County Code section 14-4(b) may not exceed plus or minus 3 dB, unless multiple sources on a site under investigation are perceptibly beating at which time the levels may not exceed plus or minus 5 dB. For enforcement, assessed using C-weighted (dB(C)), slow response, measured at or within the receiving property line of the complainant.

Total sound level means the measured level that represents the summation of the sounds from the source under investigation and the ambient sound level, excluding any extraneous sound, when measured at the location of compliance measurements.

Zoning district classification is the scheme of land use classification contained in the Prince William County Zoning Ordinance.

Sec. 14-4. Maximum permissible sound levels

(a) Generally.

(1) Except as otherwise provided, any sound~~noise~~ which emanates from any operation, activity or source and which exceeds the maximum permissible sound levels established in this section below is hereby prohibited. Such levels shall be measured at the property boundary of the sound source or at any point within any other property affected by the sound~~noise~~. When the sound from a source ~~a noise source~~ can be ~~identified and its noise~~ measured in more than one zoning district classification, the limits of the most restrictive classification shall apply.

TABLE 1- MAXIMUM PERMISSIBLE SOUND ~~PRESSURE~~ LEVELS (Leq)

Zoning District Classification	Maximum dBA Daytime	Maximum dBA Nighttime
Residential	60	55
Mixed Use District	60	55
Commercial	65	60
Office	65	60
Industrial	79	72

The limits in Table 1 may not be exceeded during any three or more sampling intervals, the duration of which shall be no less than 30 seconds, within any one-hour period. If the duration of the sound is less than 90 seconds, the requirement for three measurements is waived. Measurements of impulsive sound or in response to nuisance complaints may be instantaneous readings (observed and manually recorded maxima or logged Lmax).

~~(b~~2) Heating and cooling systems, including but not limited to air conditioners and heat pumps, and Radon systems serving a residential dwelling(s) shall not be subject to the nighttime levels enumerated ~~above~~ in Table 1 or in subsection(b) below ~~This provision shall expire on February 18, 2026, at 11:59 p.m.~~

(b) Additional limits in residential zoning districts.

No source of steady tonal sound may exceed the limits outlined below when measured at any location at or within a residential property boundary in a residential zoning district.

Maximum permissible C-weighted sound level at the receiving property:

Daytime 73 dB(C); Nighttime 68 dB(C).

The limits above may not be exceeded over a five-minute interval.

Octave-Band tables are advisory only (see Appendix A) and may be measured by the County for diagnosis and mitigation planning.

(c) Construction.

~~(c)~~(1)Any person, with lawfully obtained permits, who between the hours of 7:00 a.m. and 9:00 p.m. weekdays and between the hours of 9:00 a.m. and 9:00 p.m. on Saturdays, Sundays and legal holidays observed by county government operates or causes to be operated any equipment used in construction, repair, alteration, or demolition work on buildings, structures, alleys or appurtenances thereto in the outdoors in any residential zoning district within 100 yards of a lawfully occupied dwelling shall not be subject to the levels enumerated ~~above~~ in Tables 1 and or subsection (b). Any construction, repair, alteration,or demolition work on buildings, structures, alleys, or appurtenances thereto in the outdoors in any residential zoning district within 100 yards of a lawfully occupied dwelling at all other hours shall be subject to the levels enumerated in Tables 1 and subsection(b)

(d) (2) Persons performing construction of public projects, repair or maintenance work for such projects or persons performing work for private or public utilities for the repair of facilities or restoration of services shall not be subject to the levels enumerated above in tables 1 and subsection (b)

(3) Unless County Code section 14-4(c)(2) applies, it is prohibited to operate or cause to be operated at nighttime any equipment used in construction, repair, alteration, or demolition work on buildings, structures, alleys, or appurtenances thereto in the outdoors in any residential zoning district within 100 yards of a lawfully occupied dwelling. This subsection shall not apply to construction of public projects, the repair or maintenance work performed on such projects ,or work performed by private or public utility companies for the repair or restoration of service.

(d) Emergency Generators.

(1) Emergency generators are exempt from the limits under Table 1 and subsection (b) when running during electrical grid outages, equipment failures, or at the request of a utility.

(2) Exercising of emergency generators shall only be conducted during the daytime, during which time the limits in Table 1 apply. The limits in subsection (b) do not apply to such exercising. The exercising of such generators shall be limited to the minimal acceptable duration time specified by the manufacturer.

Sec. 14-5. Prohibitions generally.

The following acts are violations of this chapter:

(1) Sounding a horn or other signaling device on any motor vehicle except as an emergency or danger warning signal.

a. Operating or causing to be operated a public or private motor vehicle or motorcycle on a public right-of-way at any time in such a manner that the sound level emitted by the motor vehicle or motorcycle, when measured at a distance of 50 feet or more, exceeds the level set forth in the following table:

TABLE 2 – VEHICULAR MAXIMUM PERMISSIBLE SOUND LEVELS (Instantaneous maximum, Lmax, single sample)

	Maximum Sound level in dBA	
Vehicle Class	Speed limit 35 MPH or less	Speed limit over 35 MPH
All motor vehicles of GVWR or GCWR of 6,000 lbs. or more	86	90
Any motorcycle	82	86
Any other motor vehicle or any combination of vehicles towed by any motor vehicle	76	82

b. This section shall not apply to any motor carrier vehicle engaged in interstate commerce.

(2) Any noise from the spinning of tires, racing of engines, or the absence of a muffler and/or exhaust system conforming to the provisions of Virginia Code §§ 46.2-1047 and 46.2-1049 on a motor vehicle or motorcycle.

~~[~~(~~2~~3)] Operating, loading or unloading any vehicle, including but not limited to trucks, or the opening and destruction of bales, boxes, crates and containers in the outdoors in zones other than industrial within 100 yards of a lawfully occupied dwelling between the hours of 10:00 p.m. and 6:00 a.m.

~~[(3)] Operating or causing to be operated between the hours of 10:00 p.m. and 6:00 a.m. on weekdays and between the hours of 10:00 p.m. and 9:00 a.m. on Saturdays, Sundays and legal holidays observed by county government any equipment used in construction, repair, alteration or demolition work on buildings, structures, alleys or appurtenances thereto in the outdoors in any residential district within 100 yards of a lawfully occupied dwelling. This section shall not apply to construction of public projects, the repair or maintenance work performed on such projects or work performed by private or public utility companies for the repair of facilities or restoration of services.~~

~~[~~(4)~~]~~ Using, operating or causing to be operated any sound production device ~~mechanical loud speakers or other sound amplification devices~~ on trucks or other moving vehicles or in commercial establishments for the purpose of commercial advertising or attracting the attention of the public during the nighttime. The use of such at all other times shall be subject to the following conditions:

a. The only sounds permitted are music or human speech.

b. Sound shall not be issued or devices shall not be used within 100 yards of hospitals, schools, churches or courthouses.

c. The human speech and music amplified shall not be obscene.

~~[~~(5)~~]~~ Operating or permitting to be operated any powered model aircraft in the outdoors during the nighttime. Any person desiring to use county parks or facilities to operate such aircraft at any time must first obtain permission from the ~~park authority~~ County Department of Parks and Recreation .

~~[~~(6)~~]~~ The playing of any sound production device ~~radio, phonographs, television, tape or disc players, musical instruments or drums, sound amplifiers or similar devices~~ which produces, reproduces or amplify~~y~~ies sound in such a manner as to emit sound audible at a distance of 50 feet or more from the boundary of the property from which it is being emitted~~outside of a building~~ or audible through partitions common to two or more residences within a building.

~~[~~(7)~~]~~ Talking, yelling, shouting, screaming, singing, or any other form of human sounds produced by any person or group of people between the hours of 10:00 p.m. and 6:00 a.m. in such a manner as to be audible across property boundaries or audible through partitions common to two or more residences within a building.

~~[~~(8)~~]~~ Playing, operating or permitting to be operated, any sound device~~radio, tape player, compact disc player, loud speaker or other electronic device used for the amplification of sound,~~ mounted on or in any motor vehicle ~~which emits sound within a~~ while the motor vehicle ~~being~~ is operated or parked on a public street alley, parking lot open to the public, or public park, and which emits sound audible from outside the motor vehicle at a distance of 50 feet or more. The provisions of this subsection shall not apply to sound emissions from motor vehicles alarms or other security devices, the emission of sound for purposes of alerting persons to the existence of an emergency, or the emission of sound in performance of emergency work.

Sec. 14-5.1. Noise from animals.

~~(a)~~ It shall be unlawful for any person to allow any animal or bird except farm animals in agricultural districts to create sound~~noise~~ such that it is audible at least once a minute for ten consecutive minutes (i) inside the confines of the dwelling unit, house or apartment of another; or (ii) at 50 or more feet from the animal or bird.

Sec. 14-6. Trash or refuse.

Sound~~Noise~~ relating to the collection of trash or refuse is regulated under section 22-42 of this Code.

Sec. 14-7. Measurement procedures.

The measurement of sound or noise pursuant to this section shall be as follows:

(1) The measurement of sound or noise shall be made with a Type 1 integrating sound level meter capable of C-weighted (and A-weighted) measurements which meet the standards prescribed by the ANSI; octave-band capability is recommended for advisory analyses. The instruments shall be maintained in calibration and good working order. A calibration shall be made of the system at the time of any noise measurement. Measurements recorded shall be taken so as to provide a proper representation of the noise source. The microphone during measurement shall be positioned so as not to create any unnatural enhancement or diminution of the measured noise.

~~A windscreen for the microphone shall be used when required. A minimum of three sound level readings will be taken. The geometric mean of these readings will be used as the average sound level. If the background noise is equal to the levels set forth in section 14-4 above, three dB shall be subtracted out of the average sound level.(2)~~

~~(2) The slow meter response of the sound level meter shall be used to determine that the average amplitude has not exceeded the dBA readings or the limiting noise spectra set forth in section 14-4 above.(3)~~

~~(3) Unless otherwise specified, the measurement shall be made at the property boundary on which such noise is generated, or at any point within the receiving property affected by the noise.~~

Measurements shall be conducted at the location specified by the provision being applied. At that location, measurements may be conducted at any elevation (e.g., 2nd floor bedroom window, 3rd floor balcony).

Compliance determinations with Tables 1, 2, or 14-4(b) shall be based upon the source sound level.

Sec. 14-7.1. Sport shooting ranges.

(a) The provisions of this chapter shall not subject a sport shooting range to noise control standards more stringent than those in effect at the time the construction or operation of the range initially was approved, or at the time any application was submitted for the construction or operation of the range. The operation or use of a sport shooting range shall not be enjoined on the basis of noise, nor shall any person be subject to action for nuisance or criminal prosecution in any manner relating to noise resulting from the operation of the range, if the range is in compliance with all ordinances relating to noise in effect at the time construction or operation of the range was approved, or at the time any application was submitted for the construction or operation of the range.

(b) For purposes of this section, "sport shooting range" means an area or structure designed for the use of rifles, shotguns, pistols, silhouettes, skeet, trap, black powder, or any other similar sport shooting.

Sec. 14-8 VariancesExemptions.

(1) Exemptions Variances from the provisions of this chapter may be granted in accordance with the requirements below:

(1a) Any person responsible for any soundnoise from the operating of any equipment used in construction, repair, alteration or demolition work on building structures, alleys or appurtenances thereto shall apply to the director for an exemption variance or partial exemption variance from the provisions of this chapter. All other requests for variances exemptions shall be directed to the chief. The director or the chief may grant such varianceexemption or partial varianceexemption if he finds that:

a. The soundnoise does not endanger the public health, safety or welfare; or

b. Compliance with the provisions of this chapter from which an exemption variance is sought would cause a serious hardship without producing equal or greater benefit to the public.

(2b) In determining whether to grant such varianceexemption the director or chief shall consider the following:

a. The time of day the soundnoise will occur;

b. The duration of the soundnoise;

c. The loudness of the sound noise in relation to the maximum permissible sound levels set forth in section 14-4 of this chapter;

d. Whether the sound noise is intermittent or continuous; and

e. Such other matters as are reasonably related to the impact of the sound noise on the health, safety and welfare of the community and the degree of hardship which may result from the enforcement of the provisions of this chapter.

(3c) VariancesExemptions or partial variance exemptions issued pursuant to this section shall be granted for such period as the director or chief deems reasonable. Any such varianceexemption shall be reviewed if complaints are received by the director or chief and may be revoked if, when the foregoing standards are applied, circumstances no longer justify the variance or partial variance.

(4e) Any person aggrieved by a decision of the director or the chief made pursuant to this section may obtain review of such decision by the county executive or his authorized agent by delivering a written statement of appeal to the office of the county executive within ten days of the date of the decision. The county executive shall review all statements of grievances and shall, within ten days after receipt of such written statement of grievance, either affirm or set such decision aside, and make any such further determination as may be necessary to effectuate the provisions of this section. The decision of the county executive shall be final and binding.

(f) The director or chief may revoke the variance if the applicant violates the terms of the variance or if there was a misrepresentation in the variance application.

Appendix A (Advisory) - Octave-Band Guidance

This appendix provides recommended octave-band design targets and diagnostic methods to identify and mitigate tonal/low-frequency noise. These values are advisory and do not constitute the legal compliance test. Facilities may use this guidance in Noise Mitigation Plans submitted during entitlement or permitting.

TABLE 1- RECOMMENDED OCTAVE BAND SOUND PRESSURE LEVELS FOR RESIDENTIAL ZONING DISTRICTS (dBZ, L50, 30 seconds)

Octave Band (Hz)	Daytime Maximum dBZ	Nighttime Maximum dBZ
31.5	71	66
63	66	61
125	61	56
250	56	51
500	51	46
1000	47	42
2000	44	39
4000	42	37
8000	41	36

PRINCE WILLIAM COUNTY

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Tom Gordy
Yesli Vega

STAFF REPORT

Board Meeting Date:	October 28, 2025
Agenda Title:	Amend County Code Sec.14-1 -Sec.14-8, of the Chapter 14, "Noise"
District Impact:	Countywide
Requested Action:	Approve the amendments.
Department / Agency Lead:	Executive Management
Staff Lead:	Wade Hugh, Deputy County Executive

EXECUTIVE SUMMARY

The request is for the Prince William Board of County Supervisors (Board) to approve the amendments to the County Code Chapter 14, "Noise". The proposed amendments will add a C-weighted noise scale to allow for the enforcement of steady tonal noise. The C-weighted scale will specifically help address the noise issues associated with low frequency steady tonal noises. These noises are usually associated with very large facilities that generate noise through industrial processes or electromechanical equipment.

If adopted, as proposed, the revised Noise Ordinance would serve as an intermediate step to lower the noise levels, while also offering the business community an opportunity to modify existing facilities and design new facilities to comply with the revised ordinance. A violation of the proposed Noise Ordinance would represent a Class 4 Criminal Misdemeanor for the first violation and a Class 3 Criminal Misdemeanor for subsequent violations.

Staff recommends the Board approve the amendments to the Noise Ordinance (County Code Chapter 14, "Noise"), as advertised.

BACKGROUND

A. Purpose of the Noise Ordinance–To protect citizens against excessive noise, which is detrimental to life, health and enjoyment of property. To promote public health, safety, welfare and the peace and quiet of the inhabitants of the County, the measurements and standards in the noise ordinance were adopted.

B. Board Direction–In 2022, the Board directed staff to comprehensively review the noise ordinance and propose appropriate amendments, if any, for the Board to consider.

C. Data Center Ordinance Advisory Group (DCOAG)–The County Executive established the DCOAG to assist County staff with making recommended changes to the Noise Ordinance.

D. Hired Acoustics Consultants–The County hired three acoustics experts to assist with revising the Noise Ordinance and addressing the enforcement aspects of the Code. The consultant team included:

- JMT,
- The Noise Consultancy LLC, and
- Nelson Acoustics.

The County also consulted with Les Blomberg, Founder and Executive Director of the Noise Pollution Clearinghouse.

E. Research and Benchmarking–The consultants researched Noise Ordinances from across the nation and Europe. They reviewed other ordinances to see how other localities were addressing low frequency steady tonal noise. The consultants also researched standards associated with the World Health Organization, American National Standards Institute and the Environmental Protection Agency. It was clear from the research that Prince William County would be leading this effort.

F. Noise Testing–County staff, in conjunction with its consultant team, conducted over 50 field tests, which included schools, hospitals, data centers, parks, residential communities and restaurants. The test results helped inform the consultant team's work on the draft noise scale.

G. Board Work Session–The Board held a work session on March 18, 2025, County staff provided an update on the efforts to draft a revised Noise Ordinance. Based on the material presented, the Board provided the following direction to County staff:

- Ensure the proposed Ordinance changes consider unintended consequences of changing the Noise Ordinance. For example, impacts of the draft Ordinance on schools and hospitals and permitted construction activities.
- Provide direction to continue the development of the Octave Band scale to address steady tonal noise.
- Recognize there will be costs associated with the development of a revised Noise Ordinance.

H. Board Update–The Board was updated on the status of the draft Noise Ordinance amendments on June 10, 2025. Staff committed to presenting the draft Ordinance amendments to the Board in October for consideration.

I. Basis and Background-Nelson Acoustics developed a noise scale to address low frequency steady tonal noise. The noise standards are rooted in science and medical research. The attached Basis and Background document provides the supporting documentation for the use of Octave Bands.

J. Addressing Steady Tonal Noise-The consultant team recommended implementing an Octave Band noise scale to address the low frequency tonal noise associated with large industrial buildings. The scale was tested and proven to meet the requirements of maintaining noise levels that are conducive for sleeping in residential homes.

K. Meetings with the business community/County Schools/PW Water–The County held several meetings with the business community, County Schools representatives, PW Water, data center representatives and the PW Chamber of Commerce. The meetings were focused on providing updates on the draft Noise Ordinance amendments and soliciting feedback from the groups. Two key points raised by the business community were as follows:

- The data center industry feels they can modify new building designs to meet the proposed standards. They just want to know the standards moving forward. Some of the noise consultants cautioned industry saying the levels are lower than they have seen across the United States and it may not be that easy meeting the new standards.

- The data center industry requested grandfathering status for existing facilities. When they realized that was not an option, they indicated they will need time to comply with the new regulations. A system redesign and fabrication of new parts is not something that can be accomplished in six months. It could take up to 12-18 months.

L. Enforcement Approaches – There are many ways to approach the enforcement aspect of the Noise Ordinance as it relates to steady tonal noise. The DCOAG made a recommendation to staff; however, the staff provided a different recommendation to the County Executive. A summary of the recommendations is outlined below.

- DCOAG Recommendation to County staff – The DCOAG resident and non-profit members recommend the adoption of the table of noise limits developed through the research, data collection, local noise testing, analysis, and authoritative experience of acoustics and noise management consultants David Nelson and Eric Zwerling. The justification for this table of sound/noise limits is exhaustively and persuasively justified in the attached *Memorandum Report 1618-01: Prince William County Noise Ordinance Update - Basis and Background,* by David Nelson, dated August 3, 2025.

  Table 4: Nighttime Limit Spectrum and *Table 5: Daytime Limit Spectrum* in Nelson's report show how the recommended levels were determined and provide evidence-based consideration to operating businesses by reducing the number of "false positives" and implementing reasonable enforcement measures. The DCOAG residents' and non-profit members recommend the resulting noise limits from this analysis, as follows:

Octave Band (Hz)	Daytime Maximum dBZ	Nighttime Maximum dBZ
31.5	65	60
63	60	55
125	55	50
250	50	45
500	45	40
1000	41	36
2000	38	33
4000	36	31
8000	35	30

The DCOAG residents' and non-profit members recommended the staff support the Board adopt Nelson's documented scale of noise limits, with the following accommodation to assist currently operating business, as defined below, which are cited with a violation and determine significant mitigation initiatives, or measures, are needed to achieve compliance:

The DCOAG stated that their proposal sets standards that accommodate business operations, and that of other entities, while protecting the public health and reasonable noise environments of residential areas, parks and other similar places within the County, especially at night.

The ordinance update preserves the longtime limits for non-continuous noise to provide a *consistent regulatory environment* for all constituencies, with the exception of a change for sources producing constant tonal noise. The justification for this change is provided in the supporting *Memorandum Report 1618-01: Prince William County Noise Ordinance Update - Basis and Background* by David A. Nelson, INCE Fellow, INCE Board Certified.

The DCOAG feels that in the event the County issues a citation in violation of the Noise Ordinance, Section *14-4.(b) Steady tonal sound*, to an entity associated with an operational facility as of the time of adoption of the ordinance, such entity may request an *Agreement to Hold in Abeyance Prosecution of the Case, Pending a Showing of Compliance* with the County. Such an Agreement will not be available to entities associated with facilities in the design and development stage or otherwise not operational at the time of the noise ordinance adoption. Any *Agreement to Hold in Abeyance Prosecution of the Case, Pending a Showing of Compliance,* established between a violating entity and the County as described above, shall remain in effect for a period not to exceed one year. The proposed agreement and any prosecution efforts will be decided by the Commonwealth Attorney's office. Once an action is filed in court, it's subject to the review and approval of the court.

- County Staff Recommendation–County staff recommended the establishment of an intermediate noise level for steady tonal noise. The intermediate level scale would still be an Octave Band scale; however, the associated levels would be raised by 6 decibels over the levels recommended by the Noise Consultants. This would create a steady tonal noise standard that essentially falls in the middle between the current Noise Ordinance and the proposed Octave Band levels presented by the consultant team. The recommendation was to adopt the intermediate scale and leave the scale in place for 12 months and then revisit the scale to consider a further reduction to the levels recommended by the noise consultant team.

The recommendation was intended to address residents' concerns, while also providing the business community with ample time to address their existing facilities to comply with the Board's ultimate vision for lowering the noise levels.

- Board Direction – The Board approved a C-weighted the version of the draft Noise Ordinance to be advertised for a public hearing on October 28, 2025. The draft Noise Ordinance establishes a C-weighted scale to address steady tonal low frequency noises. The C-weighted levels correspond very closely to the Octave Band levels proposed by the County Executive. The Noise Ordinance the Board directed be advertised includes the use of Octave Bands as a supplement to the noise enforcement readings to help verify and pinpoint the source of the low frequency noise. The County Executive supports the adoption of the Board's advertised Noise Ordinance.

M. Budget Requirements–If the Board adopts the draft Noise Ordinance amendments, the County will need additional resources to enforce the amended ordinance. The resources would need to be made available at the time the Board approves the draft Noise Ordinance, even though the Ordinance, as proposed, would not be effective for 6 months. The lead time is necessary to allow the Public Works Department time to hire staff, purchase equipment, provide staff training and draft internal policies and procedures. The FY26 resources and budget costs would need to be requested from the County contingency fund and are estimated at $219,000 to include the following:

- Staffing–Public Works will need two Principal Engineers to assist with the noise readings and conducting ambient noise measurements. In addition to enforcing the Noise Ordinance, the positions will also review noise models associated with land use cases. The estimated FY26 cost for the two FTEs is $93,000. The funding will cover three months of salaries in FY26.

- Vehicles, fuel, maintenance -A County vehicle will be needed for each of the two staff. The estimated FY26 cost is $65,986. This total includes both one time and ongoing costs and a breakout can be found in the table under the fiscal impact section of this report.

- Technology cost, noise meters, office Space, and supplies–The estimated FY26 cost for these materials is $60,014.

The FY27 budgeted expenses would be included in the FY27 budget proposal. The estimated FY27 expenses are $417,000.

STAFF RECOMMENDATION

Staff recommends the Board approve the amendments to the Noise Ordinance (County Code Chapter 14, "Noise"), as advertised.

Service Level / Policy Impact

Currently, a violation of the Noise Ordinance is a Class 2 Criminal Misdemeanor. The business community raised concerns with the negative message a Criminal violation will send to other businesses wanting to locate in the County. The residents have argued that low frequency noise levels are impacting the health of residents and the ability to enjoy their property. In some cases, the residents state they have been impacted by this noise source for more than three years. The recommended Noise Ordinance includes a Class 4 Criminal Misdemeanor for first time violations and a Class 3 Criminal Misdemeanor for subsequent violations The proposed effective date for enforcement of the Ordinance will be six months from the date the Board adopts the Ordinance. This will allow ample time to hire County staff, purchase equipment, and get staff trained to take the noise reading. The six month period will also allow staff to communicate with business owners and the community on the proposed changes.

Fiscal Impact

If the Board adopts the revisions to the Noise Ordinance, there are County resource needs that will impact the budget. The estimated FY26 and FY27 costs are mapped below.

Item	FY 2026 Estimate	FY 2027 Estimate
Salary and benefits for 2 Principal Engineers	$93,000	$382,000
2 Vehicles/Fuel/ Maintenance	$65,986	$3,944
Computers, Noise Meters, Office Space, supplies	$60,014	$31,056
Total	$219,000	$417,000
Proposed Funding Source	County Contingency	FY 27 Proposed Budget Initiative Request

Legal Impact

Legal issues are appropriately addressed by the County Attorney's Office.

STAFF CONTACT INFORMATION

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ATTACHMENTS

1. Basis and Background Report

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product noise R&D • sound quality • noise and vibration control • test facility design • instruction

August 03, 2025

To: Prince William County, VA, Board of Supervisors

Memorandum Report 1618-01: Prince William County Noise Ordinance Update - Basis and Background

EXECUTIVE SUMMARY

Nelson Acoustics was engaged in September 2024 to assist Prince William County (PWC) in updating its Noise Ordinance by providing insight from extensive experience and references to the noise control engineering literature. The goal of the update is to set limits for steady noises that persist with little change for extended periods of time, a common feature of electro-mechanical and industrial equipment. The purpose of this Memorandum is to educate the PWC Board regarding the technical basis for the Ordinance update under consideration.

The current noise Ordinance effectively addresses intermittent noise sources commonly experienced in suburban communities. However, new industrial installations are increasingly being located near residential areas in PWC. The current Noise Ordinance limits may not be able to address this "steady tonal sound" because of round-the-clock operation with near-constant sound levels and the potential for excessive low-frequency noise.

The proposed Ordinance update characterizes this noise type as "steady tonal sound" and defines it as:

> *Steady tonal sound means a sound characterized by a droning nature and which may be referred to as a whine, hum, rumble or buzz, which may either be broadband or include a single frequency or a narrow cluster of frequencies, Such sound sources include, but are not limited to, heating, ventilating or air-conditioning units, refrigeration units, transformers and backup generators. The sound level from the source must remain essentially constant for the duration of any given measurement.*

The experience of noise annoyance depends on both objective (measurable) and subjective (perceptual) factors including sound level, sound spectrum, sound characteristics, accustomed background noise levels and degree of

change from those levels, time of day, neighborhood type, the history of how the noise came to be, it's perceived significance for the future, and interactions with the person or organization creating the noise.

"Compatible", "Marginally Compatible", and "Incompatible" noise levels are well established in engineering standards and the noise control engineering literature for transportation noise and "typical" community noise sources. The relationship between sound levels and community response in various neighborhood types has also been studied in detail. These concepts are adapted for constant-level noise.

Because the new limits are part of an enforceable regulation for criminal conduct, they are set at the edge of Incompatibility with suburban residential living. As such it should be clear that compliance does not equate to silence, nor will it necessarily eliminate annoyance or complaints, and should not be confused with a "good neighbor" prescription.

The new limits consist of not-to-exceed octave band sound pressure levels applied to steady noise. They are based on currently observed sound levels in unaffected PWC residential areas combined with compatibility-based guideline spectra. The levels are low enough that residents who have not been previously overexposed should find the situation manageable, and high enough to avoid classifying currently unaffected suburban neighborhoods as "out of compliance".

(External references are denoted by square brackets [Ref. x] and are listed at the end of the document. Internal footnotes are denoted by superscript[x] which appear in most cases at the bottom of the page where they are indicated.)

1. SOUND LEVELS COMPATIBILE WITH RESIDENTIAL LIVING

Environmental noise has historically been evaluated in terms of the "equivalent average A-weighted sound level", $L_{pA,eq}$. The A-weighting filter approximates the perceived sensitivity of human hearing to low- and moderate-level pure tones[1]. The equivalent average sound level has the same energy as the average energy observed during the measurement period. This approach is used for both brief and longer-term noise measurements.

[1] Speaking broadly in musical terms, A-weighting emphasizes "treble clef" sounds (above middle-C) and de-emphasizes "bass clef" sounds (below middle-C). A-weighted measurements regularly underestimate the impact of low-frequency noise which can be problematic because it is more easily transmitted into residences.

Long-term community response to noise has historically been evaluated using the weighted[2] "equivalent average day-night sound level", L_{dn} [Ref. 1]. The L_{dn} approach successfully tracks community response to transportation noise in urban areas. Additional modifiers ("adjustments") account for heightened community response in other contexts and when objectionable noise characteristics are present.

The American National Standard ANSI S12.9 Part 5 defines an adjusted sound level above 60 L_{dn} as incompatible with urban residential living [Ref. 2]. Suburban and rural communities are more sensitive by 5 and 10 dB respectively [Ref. 1,2,3], so the unadjusted compatibility limits for those neighborhood types are 55 and 50 L_{dn}, respectively[3].

Table 1: Day-Night Sound Levels compatible with residential living

	Compatible	Marginally Compatible	Incompatible
Urban	≤ 55	55 – 60	> 60
Suburban	≤ 50	50 – 55	> 55
Rural	≤ 45	45 – 50	> 50

Prince William County comprises all three neighborhood types. With an approximate overall population density of 1,400/square mile, PWC can be categorized between "quiet urban/normal suburban residential" and "quiet suburban residential". The expected pre-existing L_{dn} for that population density is 50 L_{dn} [Ref. 4]. Incompatibility, for the purposes of this project, is therefore based on the limit for suburban residential living: 55 L_{dn}.

2. CURRENT LIMITS APPLIED TO STEADY NOISE

The day-night sound level associated with a round-the-clock steady sound meeting the current nighttime limit (55 dBA) would be 62 L_{dn}, clearly incompatible with all three neighborhood types. The strongest contribution to annoyance for a constant-level noise occurs during nighttime hours. Table 2 gives some insight into how this weighted average is calculated[4].

[2] where 10 dB is added to LpA,eq measured at night (10 pm to 7 am), 5 dB is added to LpA,eq levels measured on weekend days (7 am Saturday to 10 pm Sunday); and LpA,eq levels measured during weekdays remain unchanged.

[3] Further references in this document will be to unadjusted L_{dn}.

[4] The time-of-day weightings reflect heightened sensitivity to noise, and the hours-per-week weightings are related to the fraction of a week each sensitivity factor is in effect. The contribution for each period is the arithmetic sum of $L_{pA,eq}$ and the corresponding weighting factors. The contributions are then combined by decibel addition [1]. The L_{dn} for a constant-level sound can be estimated by adding 7 dB to the A-weighted sound level. Values in Table 2 are rounded to the nearest whole decibel.

Table 2: Median Percent Highly Annoyed at 65 L_{dn}

Period	$L_{pA,eq}$	Weighting Time of Day (dB)	Weighting Hours/Week (dB)	Contribution
Weekday	55	+ 0	-4	51
Weekend		+ 5	-7	53
Night		+ 10	-4	61
L_{dn}				**62**

Large mechanical equipment tends to include a significant amount of low-frequency noise (LFN). Even a moderate amount of LFN would raise the effective L_{dn} from 62 to an adjusted 65 L_{dn}[5] [Ref. 1]. Thus, the current nighttime regulation could allow a constant mechanical equipment noise with impact equivalent to 65 L_{dn} or greater.

The long-term response of communities to 65 L_{dn} can be forecast [Ref. 1] as the percentage of persons "highly annoyed"[6]. The initial response to a new intrusive noise, especially if public relations are poor, is equivalent to increasing the L_{dn} by an additional 5 dB [Ref. 1,3].

Table 3: Median Percent Highly Annoyed at 65 L_{dn}

	Long-term	New
Urban	15 %	25 %
Suburban	25 %	40 %
Rural	40 %	55 %

Some communities may be more sensitive than the median values tabulated above.

From the foregoing it should be clear that a constant 55 dBA industrial noise introduced into a suburban environment would elicit numerous, strong complaints despite being acceptable under the current Ordinance.

[5] Using methods described in Annex D of the 2005 version of [1], a moderate low-frequency sound level L_{LF} of 65, which might often occur in conjunction with L_{pA} 55, is equivalent to adding 62 L_{dn} to the previous total: in decibel math, 62 + 62 = 65 L_{dn}.
[6] Broadly speaking, "highly annoyed" suggests persons willing to go beyond making sporadic individual complaints. This may take the form of sustained opposition to current or future similar noise sources through group social, political or legal action.

3. DEVELOPING THE OCTAVE-BAND CRITERIA

The increasing size and power of modern mechanical equipment brings with it increasing low-frequency noise (LFN) emission. Complaints about LFN typically arise indoors where the building structure filters out the higher frequencies. What remains is a disproportionately bass-heavy sound spectrum sometimes characterized as "rumble". If in addition the noise does not abate at nighttime the experience of intrusive noise is heightened. Listeners may associate it with something large, powerful, unrelenting, and unwelcome just outside while trying to sleep.

The recommended criteria are expressed in terms of a octave-band outdoor limit spectrum for daytime and for nighttime. Octave band analysis is necessary to account for the frequency-dependent sensitivity of human hearing.

The limit spectra represent the convergence of two complementary approaches to defining Incompatibility:

- Identify octave-band levels likely to cause significant complaints in unaffected residential areas, based on a 5 dB departure from measurements made around PWC.
- Identify octave-band spectra at the edge of Incompatibility based on guidance from the engineering literature.

In the first approach, community reaction to intrusive noise is due in part to the increase from accustomed background sound levels. A 5 dB increase is associated with "widespread complaints" [Ref. 3]. Thus, a spectrum 5 dB greater than the observed median sound levels[7] provides a reference point for Incompatibility over a representative portion of the County.

The second approach makes use of two guideline documents:

- The Composite Noise Rating [Ref. 5] was introduced in the 1950s and was applied successfully to a wide variety of noise sources, including industrial sources. It was updated and promoted by Laymon Miller of BBN in the "Noise Course" notes [Ref. 6]. It defines a family of "balanced" environmental noise spectra and a method for forecasting community response.
- Research into the effects of LFN over the ensuing years have led to more stringent recommendations. A recent German (DIN) standard [Ref. 7] defines a method for evaluating LFN relative to recommended levels for residential living.

[7] 16 locations during daytime and 8 locations during nighttime, selected by County staff.

The DIN evaluation is used in the 31.5, 63 and 125 Hz bands[8]. The CNR evaluation is used in the bands centered at 250 Hz and above. Their values are spliced into a single row in Tables that follow.

The resulting recommended limits are such that higher levels would be incompatible with residential living, and lower levels would cause an increasing number of "false positives" and more difficult enforcement measurements.

3.1 Nighttime Limit Spectrum

The nighttime limit spectrum (Table 4) roughly equals the higher of the values arrived at using the two approaches. In other words, the limit spectrum is based on the DIN and CNR guidelines unless higher levels could be justified based on pre-existing levels.

Table 4: Nighttime Limit Spectrum

	Octave Band Center Frequency [Hz]								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Recommended	60	55	50	45	40	36	33	31	30
Median + 5 dB	53	55	50	42	39	37	33	31	25
DIN/CNR	61	53	47	45	41	36	33	30	28

The LFN limits (31.5, 63 and 125 Hz) based on the DIN standard are collectively 3 dB above the nighttime "reference level" below which significant residential LFN problems are avoided. The contribution to each of the octave bands to annoyance is roughly equal.

The CNR limits (250 Hz and above) are the arithmetic average of the "b" and "c" source curves. "Sporadic complaints" are forecast for a spectrum equal to these levels in any octave band, with "widespread" complaints possible if LFN is perceived as annoying.

The difference is split at 500 Hz and a more permissive value is included at 8000 Hz to better handle biogenic sounds (e.g., insects, etc.). The limit is

[8] Low frequency noise as evaluated in one-third octave bands according to the DIN standard covering the range 8 Hz to 100 Hz. Because significant mechanical equipment noise has not been observed below the 31.5 Hz band, the 8 Hz and 16 Hz octave bands have not been included in the recommended limits.

reduced slightly at 31.5 Hz to reduce below 50% the number of indoor listeners able to detect sound in that band[9] [Ref. 8].

3.2 Daytime Limit Spectrum

The daytime limit spectrum (Table 5) roughly equals the higher of the values arrived at using the two approaches. In other words, the limit spectrum is based on the guidelines unless higher levels could be justified based on pre-existing levels.

Table 5: Daytime Limit Spectrum

	Octave Band Center Frequency [Hz]								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Recommended	65	60	55	50	45	41	38	36	35
Median + 5 dB	61	60	54	48	43	41	38	33	23
DIN/CNR	66	59	52	50	46	41	38	35	33

The LFN limits (31.5, 63 and 125 Hz) are set 5 dB above the nighttime spectrum. The contribution to each of the octave bands to annoyance is roughly equal. This is 2 dB *below* the "reference level" for daytime, in consideration of the needs of day sleepers (e.g., firefighters, police, medical personnel).

The CNR limits (250 Hz and above) are the arithmetic average of the "c" and "d" source curves. "Sporadic complaints" are forecast for a spectrum equal to these levels in any octave band if LFN is perceived as annoying.

Modifications of 1 dB are made at 125 Hz, 500 Hz, and 4000 Hz to parallel the nighttime spectrum, exactly 5 dB higher. A more permissive value is included at 8000 Hz to better handle biogenic sounds (e.g., insects, etc.). The limit is reduced slightly at 31.5 Hz to avoid perceptible vibration [Ref. 9], particularly in windows[10].

3.3 Comparing Outdoor Sound Levels to $L_{pA,eq}$ and L_{dn}

A sound spectrum exactly equal to the recommended criterion in each octave band would result in the following overall sound levels:

[9] An outdoor sound level 60 dB in the 31.5 Hz octave band corresponds to approximately 49 dB indoors. If concentrated in the 40 Hz 1/3-octave band (the most sensitive within the 31.5 Hz octave band) approximately 40% of the population would be able to detect the sound.
[10] 66 dB is reported as the threshold for feelable window vibration in the 25 Hz 1/3-octave band (the most sensitive within the 31.5 Hz octave band) [9].

- 43 dBA during nighttime, and
- 48 dBA during the daytime

This is 12 dBA more stringent than the current regulation of 55 dBA night, 60 dBA day.

A round-the-clock constant-level sound conforming to each of the nighttime octave band limits (43 dBA) would correspond to 50 L_{dn}. However, the A-weighted outdoor level formulation does not address LFN. The low-frequency portion of the same spectrum has an equivalent effect as 55 L_{dn}. Decibel addition of 50 L_{dn} and 55 L_{dn} gives a total of 56 L_{dn}.

The 56 L_{dn} overall result is compared to the 65 L_{dn} calculated above as possible for the current Ordinance, revealing that the new regulation is the equivalent of 9 L_{dn} points more restrictive. Significantly lower rates of annoyance are forecast.

Table 6: Median Percent Highly Annoyed at 56 L_{dn}

	Long-term	New
Urban	5 %	10 %
Suburban	10 %	15 %
Rural	15 %	25 %

As a practical matter, noise control designers typically observe an engineering safety factor of at least 3 dB. Furthermore, it's uncommon to exactly "fit the curve" – surplus noise control (i.e., lower sound levels) is usually unavoidable in some bands to achieve the desired result in one particularly difficult frequency range. Thus, a facility designed to comply with this Ordinance can be expected to have an overall sound level several decibels below those given above.

3.4 Comparison to indoor noise guidelines L_{pA} and NC

The Ordinance regulates outdoor noise levels. Indoor noise levels are inferred by subtracting the typical outdoor-indoor level difference (Noise Reduction or *NR*) for wood frame residential structures (with windows open roughly 2 inches) [Ref. 1]:

Table 7: Attenuation of Typical Residence

	Octave Band Center Frequency [Hz]								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
NR (dB)	11	15	19	21	23	25	25	25	30

Estimated overall indoor sound levels can then be calculated and compared to two indoor noise guidelines, L_{pA} and NC rating.

The World Health Organization (WHO) recommends indoor sound levels less than 30 dBA to facilitate sleep [Ref. 10].

Recommended indoor noise levels due to operation of HVAC and other building systems are given in ANSI Standard S12.2 [Ref. 11]. The guideline for residential bedrooms is NC-25. For comparison, NC-15 is the guideline for broadcast facilities such as TV studios.

The highest possible indoor L_{pA} and NC ratings are calculated by subtracting the attenuation of a typical residence from an outdoor sound spectrum exactly equal to the recommended outdoor criterion in all octave bands:

Table 8: Highest Possible Indoor Overall Sound Levels

Period	L_{pA}	NC
Day	27	16
Night	22	10

The quantity of noise is therefore expected to be typical for air-conditioned residences and compatible with sleep. If the character of the intruding noise is deemed objectionable, it's possible that masking noise could be employed and effective without becoming itself objectionable.

Noise just complying with the criterion spectrum has the potential to be audible in an otherwise quiet home and external environment. While audibility does not necessarily mean a noise is unacceptable, listeners form their individual opinions based on a variety of factors including the human brain's reflexive ability to focus attention on sounds.

3.6 Comparison to other regulations

The new limit spectra are compared to other octave-band regulations in Tables 9 and 10. A variety of measurement and averaging schemes are used in evaluating them, so the comparisons are not strictly "apples to apples".

Table 9: Comparison to other octave band limits, Nighttime

NIGHT	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Proposed	60	55	50	45	40	36	33	31	30
Warrenton	---	59	55	49	43	37	33	29	25
Illinois*	63	61	55	47	40	35	30	25	25
Oregon	65	62	56	50	46	43	40	37	34
New Jersey	86	71	61	53	48	45	42	40	38

* based on the most restrictive Illinois property designation

Table 10: Comparison to other octave band limits, Daytime

DAY	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Proposed	65	60	55	50	45	41	38	36	35
Warrenton	---	64	60	54	48	42	39	34	30
Illinois*	72	71	65	57	51	45	39	34	32
Oregon	68	65	61	55	52	49	46	43	40
New Jersey	96	82	74	67	63	60	57	55	53

* based on the most restrictive Illinois property designation

4. Related Topics

4.1 Extracting the Source Contribution from the Total Sound

The Ordinance governs the *contribution* of noise from a particular source. This prevents a facility from being penalized for noise generated by others or already present in the environment.

In most cases the source contribution will be established by subtracting the ambient sound levels[11] without the source operating (either by turning off the source or by measuring at a suitable proxy location) from the total sound level[12] with the source included. If the difference between the total sound (*TS*) level and ambient sound (*AS*) level is greater than 3 dB, the source contribution (*SC*) can be computed as [Ref. 4]:

$$SC = 10\log_{10}(10^{0.1TS} - 10^{0.1AS})$$

[11] Ambient sound refers to pre-existing sounds generally present in the area, excluding the sound source under investigation and intermittent extraneous sounds.
[12] Total sound comprises both the ambient sound and the sound source under investigation, excluding extraneous sounds.

If the 3 dB differential is not achieved in a particular band or for overall sound level, the source contribution cannot be accurately determined, and the situation is deemed unenforceable.

The minimum 3 dB differential occurs when the source and ambient levels are numerically equivalent[13]. In other words, the ambient level is the *de facto* criterion when it is higher than the Ordinance criterion. It's possible for residents to be able to perceive the noise source separately from the ambient even when the overall source sound level is less than the ambient. This is an unfortunate consequence of the fact that the human brain is far more sophisticated than a sound level meter.

4.2 Lower criterion levels

Some members of the community expressed a desire to mandate even lower sound levels. Criterion levels would have to be reduced by about 5 dB to produce a significant shift in community reaction. Rural residents would be the primary beneficiaries of this approach, but diminishing returns are apparent in other areas.

The lowered criterion would approximate the median measured spectra, which means (by definition) that in any given band the ambient would equal or exceed the lowered criterion at half of the evaluated locations. In these areas the ambient would be the *de facto* criterion (see discussion above); the lowered criterion values would not be fully enforceable. Residents might find it frustrating that enforcement is not possible against a noise that they may be able to perceive.

Measurements supporting enforcement would also become more complex. The number of potential ambient sources whose contributions need to be accounted for and avoided or subtracted out increases exponentially, and more exotic windscreens or lower maximum windspeeds would also be required to support low-frequency measurements.

Finally, existing facilities not currently generating complaints would be more likely to be categorized as non-compliant ("false positives"). Concern was expressed that such businesses would find themselves in an uncertain state and that businesses typical in suburban areas would have more difficulty complying with the Ordinance in quiet areas, inhibiting natural growth. In addition, a larger proportion of new and/or expanding facilities would require

[13] The addition of two equal sound levels yields 3 dB greater than the original level. This happens because decibels are logarithmic expressions of sound energy - doubling the energy corresponds to a 3 dB increase.

noise control plans, each of which would involve more complexity and higher cost that might be difficult to justify.

4.3 Higher criterion levels

Objections may arise that the criterion is too stringent and that criterion levels should be higher. This objection would suggest that a greater degree of Incompatibility should be accommodated before enforcement takes place. In such a scenario a rapidly increasing number of people would be highly annoyed for each decibel increase, especially in quiet areas. Indoor daytime sound levels could rise above 30 dBA, affecting day sleepers like firefighters, police, and medical personnel. In other words, $L_{dn} > 55$ serves as an inflection point for additional negative community reaction.

5. CONCLUSION

Recommended criteria for constant-level industrial and electro-mechanical equipment noise ("steady tonal sound") have been developed specifically for PWC during this project. They have been derived with extensive reference to well-known guidelines and engineering standards as well as samples of existing sound levels believed to be common within Prince William County. The criterion levels fall into a narrow range where higher levels would be incompatible with residential living and lower levels would cause an increasing number of "false positives" and more difficult enforcement measurements. Particularly in lower frequency bands the criterion values are notably more stringent than other regulations due to the inclusion of recent research on low-frequency noise annoyance.

Effective noise control planning should be required *in advance* to avoid situations in which a facility causes excessive noise as it initially comes online. Residents thus over-exposed may develop enhanced sensitivity to noise, requiring *even more* noise control to achieve a satisfactory result after the fact.

It is hoped that these recommendations will provide Prince William County with a robust, enforceable criterion that balances the needs of residents with future growth. In addition, it is hoped that these criteria will provide clarity for facility designers seeking to identify noise control needs well in advance of construction and operation.

The recommendations described in this memorandum have been specifically tailored to the needs and conditions of Prince William County, VA. While it is believed the methods described herein might be generally applicable, the limit spectra are not portable: detailed study would be needed to adapt them for other municipalities on a case-by-case basis.

NELSON ACOUSTICS (Member NCAC)

www.nelsonacoustical.com



David A. Nelson, INCE Fellow, INCE Board Certified
Principal Consultant



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Prince William County

Noise Ordinance Update

October 28, 2025

PRESENTED TO: Prince William County Board of County Supervisors



Photos borrowed from: https://historicprincewilliam.org/county-history/aerial-photo-survey/

Prince William County Noise Ordinance Update

AGENDA

- Background
- Current situation
- Recommendations
  - Draft Noise Ordinance
  - Resources - Funding
  - State Legislative Items
- Questions

Prince William County
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Background

- Board direction to address impacts associated with data center development (2022)
- County staff established the Data Center Ordinance Advisory Group (July 2023) to advise County staff with staff's recommendations with regulatory ordinance changes that will address data center development impacts, including:
  - Noise Ordinance
  - Zoning Ordinance
  - Design and Construction Standards Manual
- County hired noise consulting team to work with County staff and the DCOAG in addressing updates to Noise Ordinance
- County consulted with Les Blomberg, Founder and Executive Director of Noise Pollution Clearinghouse



The current noise Ordinance effectively addresses intermittent noise sources commonly experienced in suburban communities. However, new industrial installations are increasingly being located near residential areas in PWC. The current Noise Ordinance limits may not be able to address this "steady tonal sound" because of round-the-clock operation with near-constant sound levels and the potential for excessive low-frequency noise.
– Nelson Acoustics Memorandum Report 1618-01

Background

Noise Consultant Team

JMT

- Researched noise standards across US & Europe
- Drafted initial Noise Ordinance revisions
- Identified recommended legislative changes
- Develop Noise Modeling template

Nelson Acoustics

- Developed updated noise standards
- Provided technical support for noise testing/sampling

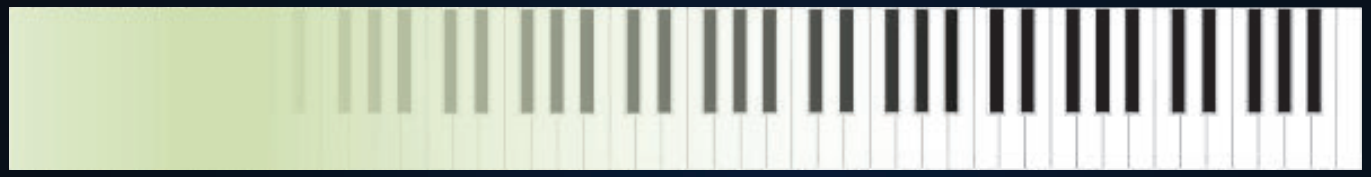
The Noise Consultancy, LLC

- Advised on enforcement aspects of the Noise Ordinance
- Provided technical expertise in re-write of the draft Noise Ordinance
- Provided technical support for noise testing/sampling

Background

Distinctions between metrics/scales in handling low-frequency sounds

A



C



Filtered scales limited in ability to characterize low-frequency sound

Octave-band sound levels, continuous (unfiltered "Z" weighting)



Background

Board of County Supervisors Work Session Recap – March 18, 2025

- County Staff and consulting team provided an update on the progress to-date:
  - Peer community regulatory best practices
  - Noise quantification standards & metrics
  - Existing noise environment within the County

- Board provided additional direction on continued efforts:
  - Address concerns around ancillary impacts of draft Noise Ordinance (e.g., schools, hospitals, construction activities)
  - Continue development of metrics utilizing an Octave Band scale
  - Identify additional costs associated with development & enforcement of new Noise Ordinance

- JLARC recommendations related to the noise ordinance:
  - Recommend a State legislative change that expressly allows localities to require pre-development sound modeling

Background

Peer Community Review

Case studies across United States & Europe

- Virginia jurisdictions subject to Dillon Rule (Fairfax Co., Fauquier Co., City of Manassas, King George Co., Loudoun Co., Town of Warrenton, etc.)
- Other locations not subject to Dillon rule (Chandler, AZ; Collier Co., FL; etc.)
- European Union – treated as public utility subject to stringent regulations

Key Takeaways

- Variety of approaches to noise regulations
- Planning & Zoning are critical aspects to addressing noise
- Address continuous noise from industrial/commercial uses separately from other sources of noises
- Metrics/standards can be targeted at low-frequency noise
- Enforcement component requires detailed consideration & development alongside standards/metrics

Background

Noise Testing

- 50+ rounds of observations over past 12 months to develop & support standards proposed in Draft Noise Ordinance

- Lessons Learned:
  - Low noise levels subject to influence by ancillary sources
    - Potential for unfounded cases
  - Techniques for identifying noise source
  - Enforcement will require technical training on the part of the investigator
  - Additional County staff or Noise Consultants
    - Reviewing noise models
    - Conducting ambient noise testing
    - Noise enforcement

Background

Basis and Background *Nelson Acoustics Memorandum Report 1618-01*

- The report focuses attention on, "noises that persist with little change for extended periods of time, a common feature of electro-mechanical and industrial equipment." The draft Noise Ordinance defines this "steady tonal sound" as follows:
  - ***Steady tonal sound****…. The range (Lmin-Lmax, slow meter response) in any single measurement of source octave band emissions found to exceed the limits of County Code section 14-4(b)(1) may not exceed plus or minus 3 dB, unless multiple sources on a site under are perceptibly beating at which time the levels may not exceed plus or minus 5 dB.*
- Establishes standards/metrics based on compatibility of uses (residential living)
- Assesses implications of setting limits lower or higher than proposed
  - Measurement complexity
  - Enforceability issues
  - Compatibility

Background

The Octave Band threshold limits for Residentially Zoned receptor properties to address “steady tonal sound”

- Thresholds are established at very low levels
  - Equivalent to 48 dBA Day/43 dBA Night (L_{eq})
  - Enforcement likely to occur during early morning hours to limit influence from ancillary noise sources
- Compliance required at all octave bands
  - Will drive L_{50} below 48 dBA Day/43 dBA Night
- Intermittent (“nuisance”) levels in Table 1 remain unchanged from current ordinance
- Prior impulse limit scale has been removed
  - Concerns over enforcement and ancillary impacts to construction
  - Impulse noise still subject to limits as described in Section 14-4.(a)(1)

Octave Band (Hz)	Daytime	Nighttime
31.5	65	60
63	60	55
125	55	50
250	50	45
500	45	40
1000	41	36
2000	38	33
4000	36	31
8000	35	30

Background

Basis and Background, continued *Nelson Acoustics Memorandum Report 1618-01*

- Additional attenuation from residential structure

Indoor noise levels are inferred by subtracting the typical outdoor-indoor level difference (Noise Reduction or NR) for wood frame residential structures (with windows open roughly 2 inches)
– Nelson Acoustics Memorandum Report 1618-01

- World Health Organization recommendation of less than or equal to 30dBA indoors to facilitate sleep.

Attenuation of Typical Residence (Based on Table 7 from Nelson Acoustics - Memorandum Report 1618-01)										
	Octave Band Center Frequency (Hz)									L_{pA}
	31.5	63	125	250	500	1000	2000	4000	8000	
Proposed Nighttime Limits	60	55	50	45	40	36	33	31	30	43
NR (dB)	11	15	29	21	23	25	25	25	30	
Resulting Indoor Level (dB)	49	40	21	24	17	11	8	6	0	22

Background

- June 10 Board Presentation – update on noise ordinance efforts
  - Committed to bringing the Board a draft noise ordinance in October to consider adopting
  - Board expressed concerns with ancillary impacts to schools, Hospitals and other businesses
  - Board requested testing at active construction sites

Background

Noise Ordinance

- The Octave Band threshold limits for Residentially Zoned receptor properties to address "steady tonal sound" (continued)

- Comparison to other jurisdictions with octave band limits

Night	Octave Band Center Frequency (Hz)									
	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Proposed	60	55	50	45	40	36	33	31	30	43.3
Warrenton	---	59	55	49	43	37	33	29	25	45.9
Illinois*	63	61	55	47	40	35	30	25	25	44.4
Oregon	65	62	56	50	46	43	40	37	34	49.4

*based on the most restrictive Illinois property designation

Current Situation

Coordination with Other Stakeholders

- Met several times with Commonwealth Attorney's Office
  - Discussed prosecution of noise ordinance violations.

- Held several meetings with the business community. The data center representatives in those meetings stated:
  - Feel they can modify new building designs to meet the proposed standards, but they need to know the standards. Some of the noise consultants cautioned the industry, saying the levels are lower than they have seen elsewhere in the U.S. and that it may not be easy to meet them.
  - Stated they will need time to bring existing facilities into compliance with the new regulations. A system redesign, fabrication of new parts, permitting and installation cannot be accomplished in 6 months.

Current Situation

- The DCOAG recommendation to County staff was to adopt the Octave Band table as recommended by the noise consultant team.

Octave Band (Hz)	31.5	63	125	250	500	1000	2000	4000	8000
Daytime	65	60	55	50	45	41	38	36	35
Nighttime	60	55	50	45	40	36	33	31	30

- In the event the County issues a Noise Ordinance violation for steady tonal noise, the responsible party may request an Agreement to Hold in Abeyance Prosecution of the Case,Pending a Showing of Compliance with the County.
  - The Agreement will not be available to facilities in the design or development stage. The Agreement shall remain in effect for a period not to exceed one year.
- The Commonwealth Attorney's Office handles the prosecution of criminal prosecutions and will determine how to proceed with the case.

Current Situation

Staff recommendation is to adopt an intermediate Octave Band scale for steady tonal noise.

- Less restrictive than original proposal while providing meaningful relief
  - Equivalent to 54 dBA Day/49 dBA Night (L_{50})
- Compliance still required at all octave bands
  - Will drive L_{50} below 54 dBA Day/49 dBA Night
- The intermediate scale lowers the allowable noise levels for industry, but at a level that most commercial and industrial facilities will be able to meet. If the Board desires to amend the noise ordinance in the future to lower the levels, a public hearing and Board action will be required at that time. The intermediate scale option provides industry and the community approximately 18 months of notice of the Board's intent to potentially consider further lower the octave band levels. Nothing binds the Board to take legislative action.

Octave Band (Hz)	Daytime	Nighttime
31.5	71	66
63	66	61
125	61	56
250	56	51
500	51	46
1000	47	42
2000	44	39
4000	42	37
8000	41	36

Current Situation

Noise Ordinance

- New Octave Band threshold limits for Residentially Zoned receptor properties to address "steady tonal sound" (continued)

- Comparison of intermediate levels to other jurisdictions with octave band limits

Night	Octave Band Center Frequency (Hz)									
	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Proposed	66	61	56	51	46	42	39	37	36	49.3
Warrenton	---	59	55	49	43	37	33	29	25	45.9
Illinois*	63	61	55	47	40	35	30	25	25	44.4
Oregon	65	62	56	50	46	43	40	37	34	49.4

*based on the most restrictive Illinois property designation

Current Situation

- On October 14, 2025 Board of County Supervisors passed Resolution 25-533 which directed the following:
  - Schedule a public hearing on October 28 to consider the adoption of amendments to County Code, Chapter 14, Noise
  - Advertise the Noise Ordinance amendments included in Resolution 25-533
- The Noise Ordinance advertised by the Board includes a C-weighted noise scale to address steady tonal noise. The C-weighted scale will help address low frequency noises
- The Octave Band Guidance Table may assist property owners and applicants, when applicable, in the submission of proposed noise mitigation measures.

Current Situation

Resources - Funding

If the Board adopts the draft noise ordinance, the County will need additional resources to enforce the ordinance. The resources and budget costs include the following:

FY26 - $219,000 Funding from the Contingency Fund

- Staffing – 2 Principal Engineers - $93,000
  - Public Works will need two principal engineers to assist with the noise readings, reviewing noise models, and conducting ambient noise measurements. The funding will cover three months of staffing costs in FY26
- Vehicles – 2 County vehicles - $65,986 (vehicles, fuel & maintenance)
- Computers, noise meters, office space, supplies - $60,014

FY27 - Budgeted Expenses = $417,000

- This expense will be considered as part of the FY27 proposed budget

Recommendation

Board Actions

- Approve amendments to County Code Chapter 14, Noise as advertised

Questions

