quiet communities

DATA CENTER NOISE

What local officials can do about data center noise

https://datacenternoise.org/what-local-officials-can-do-about-data-center-noise/

Pathway from problem to solution:

Given the prominence of data centers in the current public discourse, it is likely that several of your constituencies are asking that “something be done” about data centers. With regard to the noise, there are actually a number of options to consider. One option is to write a new ordinance and get it passed. Whether an ordinance should be given top priority, however, depends on where things stand: whether a facility is already running nearby, whether one has been proposed and is moving through review, or whether no site has been chosen at all. This page walks through each of these scenarios, because it might make sense to do other things concurrently as a new ordinance is being discussed — a permit condition, a request for better data, or a harder look at the site itself.

What to know

If a facility is already operating nearby

You don’t need to write anything new to get useful information out of a facility that’s already running. Ask the facility to request, from an independent professionally licensed firm, noise level measurements using C-weighted decibel (dBC) and A-weighted decibel (dBA) metrics simultaneously, and for narrow band frequency analyses. Class 1 and Class 2 sound level meters compute both simultaneously, at no added cost. While the difference between dBC and dBA metrics can indicate the presence of low frequency sound components, it cannot detect the presence of tonal noise, like “hum”; for that, the acoustic consultant would need to conduct a narrow-band frequency analysis.

Because low frequency noise intrudes into people’s homes, it is also important to take measurements indoors to evaluate the potential of the noise to disrupt sleep, and to take those measurements over time to determine fluctuations in the noise, which can be particularly disruptive. Full details on which standards apply and what to ask for are in Measuring and Assessing Data Center Noise.

If a facility has been proposed but not yet approved

A permit application already sitting on someone's desk is where effort can pay off fastest. A rigorous review can present a number of opportunities to effectively and proactively address noise issues.

- Check whether an independent assessment was carried out. In some jurisdictions, data centers are routinely approved under zoning categories that were written for office or light-industrial use, rather than for facilities comparable to data centers. In some places, under a use already allowed “by right” in that zone, a formal noise evaluation may not be required — the reasoning being that noise was considered at the time the zoning was established. For a data center in an office or industrial zone, noise typically wasn’t considered.
- Ask for equipment test reports, not sales literature. Three different documents circulate under similar names: sales literature (a single number, no method, no operating point); a technical specification that may include octave-band data but offers inadequate metrics and no ability to determine tonal noise; and a test report indicating how the testing was performed (method, accuracy grade, operating condition, and uncertainty level). Only this last one actually helps to critically evaluate the manufacturers’ claims. Ask for test reports on each significant piece of equipment, e.g., chillers, cooling towers, HVAC fans, diesel generators.
- Require that pre-construction baseline (ambient) noise levels be measured using the appropriate metrics, e.g., dBA, dBC, narrow band frequency spectrum, at various times of day and multiple locations as specified in standard protocols. This is the one item that can’t be fixed later. For example, if the baseline ambient noise is measured in dBA, it could be claimed that the low frequency noise detected in the post-construction phase existed previously.
- Require worst-case modeling, not typical case. The worst acoustic condition for a data center is a hot night at maximum cooling — not the equipment's rated operating point.
- Look hard at the site itself, not just the numbers. Apart from quieter equipment itself, distance is the only mitigation that reliably works against low-frequency sound; barriers don’t stop it, and enclosures bring problems of their own, such as heat and access issues. Ask how far the facility sits from the nearest resident or other sensitive area (e.g., school, hospital), including areas your jurisdiction’s plans anticipate for future housing.

If no site has been chosen yet – the highest-leverage moment

This is where a new ordinance can be most valuable. Setting standards before any applicant is in the room means no one’s project is being delayed and no one’s counsel will be able to negotiate what the standard should be. Henry County, Virginia adopted a property-line noise limit, a tonal-noise prohibition, a third-party analysis requirement, and mandatory post-construction testing in August 2026 — before any data center had been proposed there (Henry County Board of Supervisors Minutes [text of ordinance]).

We've developed fifteen provisions that draw on practices in other jurisdictions and on existing standards. This is a menu, not a checklist: no jurisdiction needs to adopt all fifteen, and some are more valuable when used together than any one alone. If your jurisdiction can take on only a few, three carry the most weight — an independent analysis requirement, a post-construction verification requirement, and funding for your own technical advisor — because, together, they make everything else enforceable rather than aspirational.

Where the facility goes

1. Name the data center use explicitly in your zoning code, rather than letting it default to a category written for office or light-industrial use.

2. Make it a conditional use, not a by-right use, so each project is required to undergo an individual review.

3. Establish safe separation distance from existing and anticipated housing. Other than equipment type and modifications, distance is the only effective mitigation approach for this kind of equipment.

4. Treat co-located buildings and on-site generation as a single facility for noise purposes, since their sounds meld together.

What the applicant could be required to submit

5. An independent, third-party acoustical analysis, modeling worst-case conditions, paid for by the applicant and prepared by an independent firm.

6. Both A-weighted (dBA), C-weighted (dBC) or unweighted decibel (zero-weighted; dBZ) readings across the whole octave-band range (sound level meters provide these as standard), including, ideally, levels at 16, 31.5, and 63 Hz bands and narrow band analyses. Pre-construction predictions should likewise be built band by band from the equipment’s own frequency data, not from a single overall dBA figure.

7. Equipment test reports, not sales brochures, for each significant noise source.

8. A pre-construction baseline survey of ambient sound taken in those same measurement units following standard protocols with regard to receptor sites and times of day, and including at least one indoor measurement.

The standard itself

9. A limit that varies with the zoning of the adjoining property, controlling at night, when the margin between facility noise and a quiet background is greatest.

10. A minimum 5 dB(A) penalty for tonal sounds with tonality presumed unless the applicant proves otherwise, using narrow-band frequency analysis for comparable data centers located elsewhere. Treat 5 dB(A) as a starting point. A single adjustment applied across the board does not by itself address the problems associated with tones, and it does not solve the issues associated with low-frequency components, previously described. Its strengths are its simplicity, the absence of any need for acoustical expertise on the part of the reviewing staff, and the placement of the burden on the developer. A facility that cannot show it is free of tones should be held to a tighter standard, which gives a developer a strong reason to investigate and, where tones are found, to fix them.

11. A separate, unweighted low-frequency limit, since low-frequency sound passes through ordinary stud walls and windows with minimal loss.

12. A requirement that any proposed noise solution be shown effective in mitigating low frequency and tonal noise. Sound walls in particular don't stop a low-frequency hum — that's physics, not a construction defect. In at least one case, a data center operator reportedly spent substantial sums on sound walls only to realize they were ineffective. Community complaints and litigation ensued.

Atlas Power, Williston, North Dakota: KFYR-TV reports on sound-wall construction, continuing noise complaints, and the residents' lawsuit (2023).

Some jurisdictions also look at the difference between the sound a facility generates compared with background (ambient) levels, rather than a single fixed level. For example, a 10 decibel difference between nighttime data center noise of 40 dBA and 30 dBA background noise is clearly noticeable and capable of disrupting sleep. If a single decibel limit of 50 dBA were to be applied, it would allow the facility to operate in compliance while adversely impacting the surrounding community. A change of about 3 dB is roughly where most listeners begin to notice a difference in level, which is why a rise of about that size is sometimes used as a point of reference, as in planning practices in the United Kingdom. We mention it for context, not as a recommended limit.

Any such comparison depends heavily on where the measurements are taken. A commonly used approach is to measure at the nearest noise-sensitive locations, meaning homes, schools, hospitals and similar places, rather than at the facility boundary, and at several of them, typically five to seven, with each location shown on a map and the reason provided for choosing each of those locations. Background levels should be measured at the same locations, away from nearby sources such as busy roads that elevate background levels and make a new facility appear less intrusive. The comparison is most meaningful at night, when background levels are lowest and the facility operates under worst-case conditions. Schools and hospitals may justify a lower target than homes. More details are provided in Measuring and Assessing Data Center Noise.

After approval

13. Verification against the original prediction, both soon after startup and annually thereafter, since cooling and power capacity may be added as computing demand grows.

14. A named enforcer, a defined remedy, and financial security, such as a bonded fund, so a violation has real consequences rather than just a number on paper.

15. Applicant-funded, independent technical review for your jurisdiction, so someone on your side of the table understands everything being submitted.

Not ready to commit to numbers yet? Requiring the independent analysis, the baseline survey, and the reporting format now costs nothing, preserves all options, and builds the record you'll need to inform whatever decisions are made later.