

TOWNSHIP OF LYON
OAKLAND COUNTY, MICHIGAN
ORDINANCE NO. [2026-XXXX]

ENVIRONMENTAL NOISE, LOW-FREQUENCY SOUND, INFRASOUND, AND VIBRATION CONTROL ORDINANCE

AN ORDINANCE TO PROTECT PUBLIC HEALTH, SAFETY, WELFARE, REPOSE, AND PROPERTY THROUGH SOURCE-NEUTRAL, MEASURABLE STANDARDS FOR STATIONARY NOISE, LOW-FREQUENCY SOUND, INFRASOUND, RESONANCE, AND VIBRATION

THE TOWNSHIP OF LYON, OAKLAND COUNTY, MICHIGAN, ORDAINS:

Findings and purpose

WHEREAS, stationary mechanical, electrical, industrial, commercial, institutional, and residential sources can produce continuous, intermittent, tonal, impulsive, or modulating sound and airborne, structure-borne, or ground-borne vibration; and

WHEREAS, the World Health Organization identifies annoyance and sleep disturbance as adverse effects of environmental noise and reports increased population-level risks of ischemic heart disease and hypertension, demonstrating that protection from environmental noise is not limited to prevention of hearing loss;¹ and

WHEREAS, peer-reviewed field research concerning low-frequency noise from ventilation and air-conditioning installations in the 20-to-200-hertz range reports substantial indoor annoyance and interference with sleep and open-window use, demonstrating that the frequency, persistence, and character of sound can be material even when a conventional broadband level appears modest;² and

WHEREAS, A-, C-, and Z-frequency weightings describe sound differently, and measurement guidance recognizes the importance of frequency content and low-frequency assessment; a single A-weighted value therefore may not adequately identify tonal, bass-heavy, or low-frequency impacts;³ and

WHEREAS, a clear receiving-property standard applied without regard to the identity of the owner, operator, industry, or land use is a reasonable and equitable means to prevent harmful off-site effects while allowing any lawful source capable of compliance to operate; and

WHEREAS, large, continuous, or receptor-adjacent sources warrant baseline measurement, predictive study, independent review, commissioning, and monitoring proportionate to their potential effects, while ordinary sources should remain subject to the same performance limits without unnecessary study costs; and

WHEREAS, MCL 41.181 authorizes the Township Board to adopt ordinances regulating the public health, safety, and general welfare of persons and property];⁴ and

WHEREAS, the Board finds that the standards and procedures below bear a real and substantial relationship to public health, safety, welfare, repose, and protection of property.

Section 1. Title

This Ordinance shall be known as the “Lyon Township Environmental Noise, Low-Frequency Sound, Infrasound, and Vibration Control Ordinance.”

Section 2. Purpose, construction, and authority

(a) Purpose. This Ordinance establishes source-neutral performance standards, proportionate review duties, and enforceable procedures for preventing unreasonable off-site sound and vibration effects.

(b) Regulatory character. This is a general regulatory ordinance. It does not classify, zone, prohibit, or authorize land uses by identity or district. Any lawful source may operate if it complies with this Ordinance and all other applicable law.

- (c) Authority.** This Ordinance is adopted under 1945 PA 246, MCL 41.181 et seq., and other applicable township authority];
- (d) Independent standards.** Compliance with one metric does not excuse noncompliance with another applicable sound, tonal, spectral, vibration, resonance, or nuisance standard.
- (e) More protective law.** This Ordinance supplements other lawful noise, nuisance, building, fire, environmental, and property-maintenance requirements. A more protective nonconflicting requirement remains enforceable.
- (f) No medical diagnosis required.** Enforcement rests on the objective and observational standards stated here and does not require proof that a source caused a particular person's medical condition.

Section 3. Definitions

For purposes of this Ordinance:

Acoustical Professional means an independent licensed professional engineer experienced in environmental acoustics or a Board Certified Member of the Institute of Noise Control Engineering competent to perform the required work.

Aggregate Rated Source Capacity means the sum of the nameplate electrical capacities of commonly owned, controlled, or operated motors, fans, pumps, compressors, cooling equipment, transformers, generators, turbines, and other equipment that generates sound or vibration at a site.

Background Sound Level means sound measured at a receiving location without contribution from the source under investigation, established by a valid preoperational baseline or technically accepted source-attribution method.

dBA, dBC, and dBZ mean sound-pressure levels in decibels measured with the A-, C-, and Z-frequency-weighting networks, respectively.

Daytime means 7:00 a.m. through 7:00 p.m., local time.

Emergency means an unplanned condition requiring immediate action to protect human life, public safety, essential utility service, or property from imminent material harm. It does not include routine testing, maintenance, demand response, peak shaving, economic dispatch, scheduled work, or a reasonably foreseeable lack of adequate permanent service.

Equivalent Continuous Sound Level or Leq means the energy-average sound-pressure level over a stated period. LAeq and LCeq mean A- and C-weighted Leq.

Low-Frequency Sound means sound having substantial acoustic energy from 10 through 200 hertz.

Major Stationary Source means one or more commonly owned, controlled, or operated Stationary Sources on a site that meet any of the following:

Aggregate Rated Source Capacity is one megawatt or more;

the source is designed to operate at least 12 hours in any day and is located within 1,000 feet of a Sensitive Receptor;

aggregate generator or turbine capacity is five megawatts or more; or

a screening analysis by an Acoustical Professional predicts source contribution within 5 dB of an applicable limit at a Nonparticipating Property or Sensitive Receptor.

Material Change means a physical or operational change reasonably capable of increasing an off-site sound level by 1 dB or more in any regulated metric, materially changing frequency character, or increasing vibration, considered cumulatively since the most recent approved study.

Municipality means the Township of Lyon.

Nighttime means 7:00 p.m. through 7:00 a.m., local time.

Nonparticipating Property means property not commonly owned or controlled with the source and not subject to a recorded, informed, and voluntary easement expressly allowing the regulated sound or vibration.

Pure Tone exists when a one-third-octave-band level exceeds the arithmetic average of the two immediately adjacent one-third-octave bands by 3 dB or more after valid correction for Background Sound Level.

Qualified Vibration Professional means an independent licensed professional engineer, geophysicist, or other person approved by the Municipality who has demonstrated competence in ground-borne, structure-borne, and whole-body vibration.

Receiving Property means the Nonparticipating Property at which compliance is evaluated. Its classification, not the source property's classification, determines the applicable limit.

Responsible Person means an owner, operator, lessee, manager, or other person who owns, operates, controls, causes, or permits a Stationary Source.

Sensitive Receptor means an existing or lawfully approved dwelling, sleeping accommodation, hospital, nursing or assisted-living facility, school, day-care facility, library, place of worship, or public park intended for quiet recreation.

Stationary Source means any building, structure, property, machine, equipment, installation, operation, or activity fixed to or regularly operated at a site that generates sound or vibration. Mobile equipment becomes a Stationary Source while regularly or repeatedly operated at a site.

Section 4. Applicability and limited exceptions

(a) General application. Except as expressly provided below, this Ordinance applies to every Stationary Source, public or private, without regard to industry, technology, owner, operator, or land-use identity, to the fullest extent allowed by law.

(b) Transportation. This Ordinance does not regulate aircraft in flight, railroad operations, or vehicles traveling on a public right-of-way to the extent regulated or preempted by state or federal law. A vehicle, locomotive, or mobile machine idling, loading, servicing, generating power, or repeatedly operating at a site remains subject to this Ordinance to the extent allowed by law.

(c) Emergency activity. Emergency warning devices and action reasonably necessary during an Emergency are exempt from the numerical limits only for the duration of the Emergency. The Responsible Person shall minimize impacts, preserve available records, and report operation lasting more than one hour to the Municipality within one business day.

(d) Temporary construction. Lawfully permitted construction, demolition, and public-works activity between 7:00 a.m. and 7:00 p.m. is exempt from Section 5's Leq limits if the operator uses reasonably available quieter equipment and controls. It remains subject to Section 6's structural-damage prohibition and any permit conditions. Nighttime work requires written authorization based on necessity and protective conditions.

(e) Ordinary residential equipment. Noncommercial lawn, garden, repair, and snow-removal equipment is exempt between 7:00 a.m. and 9:00 p.m. on weekdays and 9:00 a.m. and 9:00 p.m. on weekends and legal holidays when maintained and operated as intended.

(f) Permitted public activity. A temporary public event expressly authorized by the Municipality is governed by its permit conditions. The permit shall state hours, locations, and enforceable sound controls.

(g) Protected or preempted activity. This Ordinance does not regulate conduct to the extent local regulation is expressly preempted, including agricultural activity protected by the Michigan Right to Farm Act and applicable generally accepted agricultural and management practices. The exception extends no further than controlling law requires.

Section 5. Sound performance standards

(a) Measurement locations. Sound attributable to a Stationary Source shall not exceed the following limits at any point on the boundary of a Receiving Property or at a Sensitive Receptor, whichever location is more protective. A Sensitive Receptor controls regardless of the property's zoning classification.

Receiving property	Day LAeq / LCeq, 15 minutes	Night LAeq / LCeq, 15 minutes
Sensitive Receptor or property containing a dwelling	45 dBA / 60 dBC	40 dBA / 50 dBC
Commercial, institutional, or mixed-use property without a Sensitive Receptor	55 dBA / 65 dBC	50 dBA / 60 dBC
Industrial property without a Sensitive Receptor	65 dBA / 75 dBC	60 dBA / 70 dBC

(b) Existing background above a limit. If valid Background Sound Level already exceeds an applicable limit, the source shall not increase the total 15-minute LAeq or LCEq by 3 dB or more. Attribution and logarithmic subtraction shall follow a method approved by the Municipality's Acoustical Professional.

(c) Maximum level. Source-attributable LAFmax and LCFmax shall not exceed the applicable 15-minute limit by more than 10 dB, except during an Emergency under Section 4(c).

(d) Character correction. If source sound contains a Pure Tone, recurring impulsiveness, or recurring low-frequency amplitude modulation, each applicable broadband limit shall be reduced by 5 dB.

(e) Low-frequency spectral standard. At a Sensitive Receptor where attributable Low-Frequency Sound is plainly audible or otherwise detected, the source shall not increase the sound-pressure level in any one-third-octave band from 10 through 160 hertz by 10 dB or more above Background Sound Level. The Municipality may authorize indoor measurement when outdoor measurement cannot reliably characterize the condition.

(f) Multiple sources. Commonly owned, controlled, or interdependent sources shall be evaluated cumulatively. A source shall not be segmented by parcel, phase, lease, or equipment ownership to avoid compliance.

Section 6. Infrasound, resonance, and vibration standards

(a) Perceptibility. A Stationary Source shall not cause sustained or recurring ground-borne or structure-borne vibration perceptible to an ordinary person on a Receiving Property under ordinary conditions of use.

(b) Resonance and secondary effects. A Stationary Source shall not cause sustained or recurring rattling, shaking, oscillation, pressure sensation, or resonance of a building element, window, door, fixture, or furnishing on a Receiving Property.

(c) Structural protection. Vibration shall not exceed a current, recognized professional criterion selected by the Municipality's Qualified Vibration Professional to prevent cosmetic or structural damage for the affected structure and frequency range.

(d) Major-source quantitative backstop. Where a valid baseline is required, source-attributable vibration shall not exceed that baseline by more than 0.001g in any axis at a Receiving Property or Sensitive Receptor unless the Municipality adopts a more appropriate frequency-dependent velocity or acceleration criterion on written professional advice.

(e) Infrasound. Compliance with dBA limits does not authorize source-attributable acoustic energy below 20 hertz that causes a violation of this Section. Evaluation shall use instrumentation and methods capable of measuring the relevant frequencies and levels.

Section 7. Measurement and attribution

(a) Instruments. Enforcement measurements shall use properly calibrated Class 1 instruments meeting then-current ANSI/ASA or IEC sound-level-meter and one-third-octave requirements. Vibration instruments shall be appropriate to the frequencies, amplitudes, and response criteria evaluated.

(b) Calibration and field record. Instruments shall be field-calibrated immediately before and after measurement. The record shall include instrument and calibrator identification, calibration certificates, location, height, duration, weather, source operating state, photographs, exclusions, and raw data.

(c) Conditions. Measurements shall avoid precipitation, excessive wind, microphone reflections, and other invalidating conditions unless a professional protocol accounts for them. Meteorological conditions relevant to propagation shall be recorded.

(d) Attribution. Source contribution may be established by source-on/source-off testing, synchronized operational logs, accepted acoustical subtraction, frequency matching, directional methods, repeated observation, or another technically reliable method approved by the Municipality's professional.

(e) Municipal protocol. The Municipality may adopt an administrative measurement protocol consistent with this Ordinance. A protocol may clarify methods but may not weaken a substantive limit without ordinance amendment.

Section 8. Major Stationary Source review

(a) Environmental-performance approval. Before constructing a new Major Stationary Source or making a Material Change, the Responsible Person shall obtain environmental-performance approval from the [designated official]. This approval regulates emissions and does not replace zoning, building, fire, environmental, or other required approvals.

(b) Thirty-day baseline. Before site disturbance, the applicant shall fund at least 30 consecutive days of representative baseline measurements at affected property boundaries and Sensitive Receptors. The baseline shall include daytime, nighttime, weekday, weekend, meteorological, dBA, dBC, one-third-octave, and three-axis vibration data.

(c) Predictive study. An Acoustical Professional and Qualified Vibration Professional shall identify all sources and controls and model normal, maximum, nighttime, maintenance, testing, startup, shutdown, simultaneous, propagation-favorable, cumulative, and reasonably foreseeable expansion conditions. Results shall report dBA, dBC, one-third-octave spectra, vibration, assumptions, uncertainty, and a compliance margin of at least 5 dB.

(d) Independent review. The Municipality may retain professionals of its choosing to review the application, witness testing, inspect data, and verify compliance. To the extent authorized by law and an adopted fee schedule, the applicant shall fund actual, reasonable review costs through an escrow without controlling consultant selection or conclusions.

(e) Decision. Approval shall issue when competent evidence demonstrates compliance under the required scenarios. Conditions may require source location, enclosure, isolation, barriers, operating modes, testing schedules, monitoring, reporting, and mitigation necessary to assure continuing compliance.

Section 9. Design, operation, and records

(a) Controls. Every source shall use and maintain feasible site planning, quieter equipment, enclosures, silencers, barriers, vibration isolation, flexible connections, and operational controls necessary for compliance.

(b) Testing and routine maintenance. Testing of generators, turbines, alarms, and other unusually intrusive equipment shall occur between 9:00 a.m. and 5:00 p.m. on nonholiday weekdays unless a different schedule is approved with equally protective conditions.

(c) No emergency label for ordinary operation. Demand response, peak shaving, economic dispatch, routine capacity support, maintenance, and testing are ordinary operations and remain subject to all limits.

(d) Records. A Major Stationary Source shall retain source inventories, operating logs, testing, complaints, monitoring, calibration, maintenance, exceedance, and corrective-action records for at least five years and provide them to the Municipality upon lawful request.

Section 10. Commissioning, audits, and permanent monitoring

(a) Commissioning. Before a new or modified Major Stationary Source begins regular operation, witnessed testing under an approved protocol shall demonstrate compliance in the most demanding reasonably achievable operating modes.

(b) Audits. Independent compliance audits shall occur within 30 days after regular operation begins, approximately six months later, annually for the first three years, after a Material Change, and thereafter when reasonably required by an approval condition or compliance history.

(c) Permanent monitoring. Permanent, tamper-evident monitoring is required when Aggregate Rated Source Capacity is 25 megawatts or more, when predicted nighttime sound is within 3 dB of a Sensitive Receptor limit, or when repeated verified complaints or violations demonstrate a need. Stations shall record synchronized dBA, dBC, spectral, meteorological, calibration, and operating-state data sufficient to evaluate this Ordinance.

(d) Access and reporting. The Municipality shall have direct read-only access to required monitoring data. The Responsible Person shall file quarterly summaries of uptime, exceedances, complaints, intrusive-equipment operation, instrument outages, maintenance, and corrective action.

Section 11. Complaints and investigation

(a) Intake. The Municipality shall maintain a complaint record. A Major Stationary Source shall provide a continuously available telephone and electronic complaint channel and acknowledge a complaint within one business day.

(b) Substance over a handheld reading. A report of Low-Frequency Sound, Pure Tone, rattling, resonance, or nighttime disturbance shall not be rejected solely because an informal dBA reading is below a broadband limit.

(c) Investigation. After a credible complaint, observed condition, monitor alert, Material Change, or incomplete response, the Municipality may inspect public or consented locations, review records, and conduct or require independent testing. Entry onto private property requires consent, a warrant, or other lawful authority.

(d) Cost. To the extent authorized by law, the Responsible Person shall reimburse actual, reasonable investigation and verification costs following a confirmed violation.

Section 12. Exceedance and corrective action

(a) Notice and preservation. A Responsible Person discovering a material exceedance shall notify the Municipality within four hours and preserve all relevant data and operating records.

(b) Interim control. The Responsible Person shall promptly reduce, isolate, repair, reschedule, or curtail the violating source using feasible measures.

(c) Corrective-action plan. Within 48 hours, unless extended in writing for good cause, the Responsible Person shall submit the cause, interim measures, permanent remedy, schedule, and verification method.

(d) Material exceedance. An exceedance by more than 5 dB, repeated nighttime violation, sustained perceptible vibration or resonance, data interference, or failure of required monitoring is material. The violating source shall be curtailed to the extent necessary until effective interim control is verified, except during an Emergency.

(e) Closure. Corrective work is complete only after technically valid verification accepted by the Municipality.

Section 13. Administration and enforcement

(a) Official. The [designated official] shall administer this Ordinance and may issue notices, municipal civil-infraction citations, and lawful stop-work, stop-use, abatement, or emergency orders.

(b) Separate violations. Each day a violation continues is a separate violation. Failure to submit a required study, preserve or provide a required record, maintain monitoring or controls, report an event, or implement corrective action is independently enforceable.

(c) Cumulative remedies. The Municipality may pursue authorized civil fines, cost recovery, equitable relief, abatement, and other remedies. Except for an Emergency, material exceedance, or imminent threat, an order shall state the evidence, required correction, deadline, and available review.

(d) False information and interference. Knowingly supplying materially false information, altering required data, bypassing a monitor, or interfering with an authorized measurement is a separate violation.

(e) No retaliation. A person shall not retaliate against another for making a good-faith complaint, providing data, or participating in an enforcement proceeding.

Section 14. Review and technical alternatives

(a) Administrative review. A person aggrieved by an interpretation or order may seek review as provided by the local code and Michigan law. An appeal does not automatically stay an order addressing an Emergency, imminent threat, or material exceedance.

(b) Equivalent method or control. The Board or designated body may approve a technical alternative only on written findings, supported by independent professional review, that it is at least as protective, measurable, and enforceable as the stated requirement.

(c) No cost-based waiver. Expense, equipment already purchased, project schedule, or a self-created condition does not justify a weaker off-site performance limit.

Section 15. Severability, conflict, and effective date

(a) Severability. If a court holds any provision or application invalid, it shall be severed and the remaining provisions and applications shall continue to the fullest extent possible.

(b) Conflict and savings. Conflicting ordinances are repealed only to the extent of conflict. Repeal or amendment does not extinguish a violation, proceeding, right, or liability previously incurred unless expressly stated.

(c) Effective date. This Ordinance takes effect 30 days, after adoption and publication as required by Michigan law.

YEAS: _____

NAYS: _____

ABSENT: _____

ORDINANCE DECLARED ADOPTED.

Michele Cash, Township Clerk

I certify that this is a true and complete copy of Ordinance No. [2026-XXXX], adopted at a [regular / special] meeting of the Board held on [date], and published as required by law on [date].

Michele Cash, Township Clerk

Sources

The following are noncodified legislative-record notes. They should be retained, revised, or removed according to local counsel's record practice.

1. World Health Organization, *Guidance on Environmental Noise* (2024 update), summarizing evidence concerning annoyance, sleep disturbance, ischemic heart disease, hypertension, hearing impairment, tinnitus, and cognitive impairment: [WHO guidance](#). The recital relies only on the outcomes it expressly identifies.
2. K. Persson Waye et al., "A Descriptive Cross-Sectional Study of Annoyance from Low Frequency Noise Installations in an Urban Environment," *Noise & Health* 5(20):35-46 (2003), PMID 14558891, concerning 20-to-200-hertz ventilation and air-conditioning installation noise, annoyance, and interference with sleep and open-window use: [PubMed record](#).
3. National Institute for Occupational Safety and Health, *NIOSH Sound Level Meter Application: Reference Guide*, distinguishing A-, C-, and Z-frequency weighting and discussing frequency content and low-frequency measurement: [NIOSH guide](#).
4. Township ordinance authority, MCL 41.181: [official Chapter 41 compilation](#); Michigan Constitution art. VII, sec. 22: [official constitutional excerpt](#). Local counsel must select the authority and adoption procedure applicable to the adopting unit.