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677

TECHNICAL ASSISTANCE BULLETINS

Noise

A technical assistance series prepared by:

Maine State Planning Office

Maine Department of Environmental Protection

Oxford County Soil and Water Conservation District

Androscoggin Valley Council of Governments

with input from a number of professional and citizen planners.

Inside

Background Information
Planning Considerations
Review Process
Review Standards

TA Bulletin #4

This TA Bulletin is one in a series of documents intended to provide guidance to volunteer board and committee members on specific planning topics. Emphasis is placed on the development review process.

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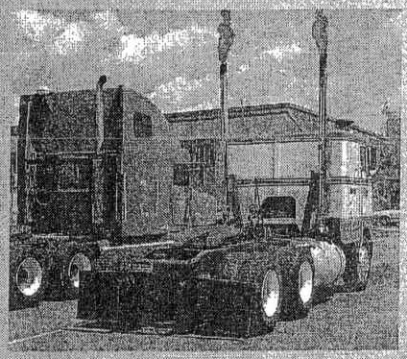
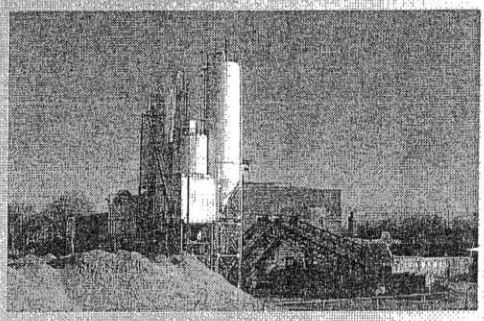




Introduction

Noise has significant environmental impacts even though it is a transient occurrence. It does not accumulate in the environment, but its impacts can be long lasting affecting people's lives and property values. Noise causes a deterioration in the quality of life as much as, if not more than, many other environmental problems.

Noise standards can only be effective when the limitations and enforcement procedures are easily implemented.

678

Background Information

Importance of Noise and Noise Control

Prolonged noise exposure is a serious threat to human health; it can result in high stress levels and, at high sound levels, impaired hearing. Common environmental noise sources can cause or contribute to stress-related illnesses such as cardiac and circulatory diseases. Noise can also negatively impact concentration, communication, and sleep creating annoying and sometimes even hazardous conditions. These factors are important in setting noise standards for the community. It may be important to protect certain uses such as offices, schools, and churches from significant noise increases to allow effective communication. It is also important to protect neighborhoods so that residents can communicate and enjoy their property. Residential areas should also be protected from noise so that residents are able to obtain uninterrupted sleep. Interrupted sleep can result in serious health impacts and also affect personal safety at home and at work. Another consideration for municipal officials is property values. Neighborhoods subject to noise disturbance will generally have lower values.

Principles of Noise

Noise travels in waves through the air. It has three components: intensity, frequency, and duration. The disturbance caused by noise is not just related to intensity, which we commonly call "loudness," but it also depends on the frequency (or pitch) and the duration (or how long the noise lasts).

- **Intensity**, the sound level, is actually the sound pressure level (SPL): the pressure that sound waves exert as they travel through the air. It is measured in decibels (dB) on a logarithmic scale. This means that a sound of 60 dB is not twenty percent (20%) louder than one of 50 dB, it is ten (10) times (one thousand percent [1,000%]) louder. (Fortunately, the human ear does not perceive it as that great of an increase.)

- **Frequency** (not how often the sound occurs but the frequency of the sound wave) is measured in hertz (Hz) and is the number of cycles per second of a sound wave. The "pitch" of a sound is directly related to the frequency. Most noise covers a range of frequencies, but a concentration in a narrow frequency band, such as a whistle, is more bothersome than a mix of sounds across a wide range of frequencies.

- **Duration** is the length of time the sound lasts. Intermittent sounds (such as back up horns) are typically more annoying than steady ones (such as the hum of a motor). To account for the length of time that noises last, many noise standards use an equivalent sound level, although this adds complexity to measurements which may need to be taken. The equivalent sound level "averages" the sound level over a given period of time, typically one (1) minute or one (1) hour.

For most municipal standards, noise is measured using a scale weighted to account for the higher frequencies to which the human ear responds. It is called the A-weighting scale and is noted by the abbreviation dBA. It is also measured in sound level equivalents (designated Leq). Sound levels often vary over time. The Leq is the equivalent constant sound energy to that emitted by the varying sound over a given period of time, usually one (1) hour.

The following table provides some examples of typical sounds.

COMMON SOUND LEVELS	
Sound Environment	**Sound Pressure Level (dBA)**
Threshold of hearing	0
Broadcast studio interior or rustling leaves	10
Quiet house interior or rural nighttime	20
Quiet office interior or watch ticking	30
Quiet rural area or small theater	40
Quiet suburban area or dishwasher in next room	50
Office interior or ordinary conversation	60
Vacuum cleaner at 10 ft.	70
Passing car at 10 ft. or garbage disposal at 3 ft.	80
Passing bus or truck at 10 ft. or food blender at 3 ft.	90
Passing subway train at 10 ft. or gas lawn mower at 3 ft.	100
Night club with band playing	110
Threshold of pain	120

There are some important characteristics about noise and noise measurement which must be kept in mind. An important principle is experienced daily; noise varies with distance. It is much louder close to the source than it is at a distance. Therefore, the standard must identify the **sound level limit** and the **location** at which the limit is applicable.

In addition to the three (3) components (intensity, frequency, and duration), the time of day that the noise occurs also contributes to the degree of disturbance and its impacts. Nighttime noise is more annoying than daytime noise and may cause more noticeable health impacts through the disruption of sleep. Thus, most standards provide a daytime criteria and a nighttime criteria, although the time periods vary from one municipality to another and may even vary by zone within a municipality.

To account for tonal noises (noises having a narrow frequency band), many standards add a fixed decibel equivalent to the measured noise level in order to account for the additional annoyance such a sound causes. This is also true for repetitive noises. (Repetitive noises are those noises which are generally of a short duration, but which occur at regular intervals such as a back-up horn on construction vehicles.)

Due to the logarithmic nature of noise measurement and the way noise levels are perceived by humans, care must be taken in using absolute limits. The following table provides some typical human perceptions of noise increases.

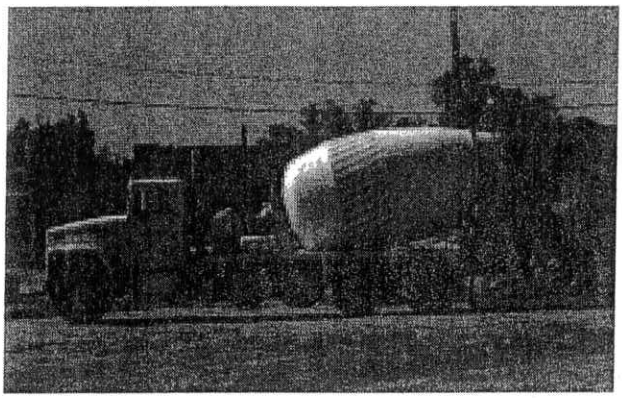
PERCEPTIONS OF NOISE INCREASES

Increase in Noise Level (dBA)	Human Perception
0 to 2	Not usually noticeable
3	Just noticeable
6	Clearly noticeable
10	Twice as loud
20	Four times as loud

Noise standards consist of two (2) types. One controls the absolute sound level that can occur. The second controls the amount of increase in sound level that a use can add to the environment. A combination of these types can also be used.

If the noise standard sets a 65 dBA threshold for a rural area, but the background noise in the rural area is currently only forty-five (45), then the ordinance would permit an increase in noise level of 20 dB, perceived as a 4-fold increase. Thus, residents in the area would perceive a very significant increase in noise. However, unless extreme protection is warranted, limiting increases, especially daytime increases, to less than 5 dB is not generally recommended.

If a relative criteria which limits the difference in sound level—the change in sound level with and without the sound source operating—is used, then a clear distinction must be made between ambient and background sound levels. While sometimes used interchangeably, they are quite different.



Reviewers must take care to ensure the proper terminology is used in reports submitted in support of applications. The standards used in this publication refer to the predevelopment ambient noise level. This is the same as the background noise level prior to the development.

The **ambient sound level** is *all* sound sources in an area and, if measured after the development occurs, includes the source in question. The **background sound level** is the level of sound from all sources except the specific source in question. Relative criteria assess the difference between the ambient (the sound level in the area with all sources) and background (the sound level in the area with all sources except the one in question) sound levels.

This difference between ambient and background noise points out the importance of definitions. Definitions must be accurate and specific if the standard is to be enforceable. Most of the definitions (at the end of the bulletin) have been taken from the rules adopted pursuant to the Maine Site Location of Development Law. They are presented to encourage consistency between local and state standards.

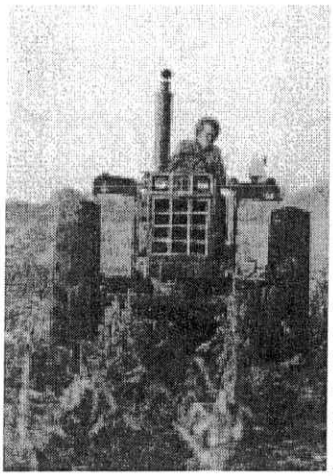
As with any standard, the more complex the standard, the greater the chance for misinterpretation and the more difficult enforcement becomes. Also, remember that the standards will be enforced by people with little or no background in acoustics. Therefore, a relatively simple standard which only requires the use of a simple sound level meter, rather than the use of an octave band meter (one that measures varying frequencies), is preferable. However, the standard must be specific. With today's measurement techniques and legal requirements, vague qualifications on noise such as *nuisance* or *disturbance* without any quantification will not suffice. While seemingly simple, they are vague and subjective, and virtually unenforceable.

Sound level meters and calibration equipment must comply with the latest version of ANSI standard S1.4. This standard, divides sound level meters into categories called types labeled by the numbers 0, 1, or 2. Type 2 meters are the least sensitive, and type 0 are the most sensitive.

680

Planning Considerations

It is important to recognize the potential noise impacts on normal life events in a community. Some noise is necessary such as from emergency vehicles. Even noise from construction equipment may be necessary in order to maintain a vital community. But, much of the noise created today is capable of disturbing people as they work, play, and reside in the community. Noise is an important and often overlooked issue that requires "sound" planning.



The first part of the planning process is to consider existing and potential noise impacts in the community; this should be done in the comprehensive planning process.

The second part of managing noise in the community is to adopt clear and enforceable noise standards. The standards should be included in the standard section of site plan review, whether site review is a stand alone ordinance or part of the zoning ordinance.

Comprehensive Planning Considerations

The comprehensive plan develops the information necessary to support noise standards in ordinances. As such, it is important to provide a thorough inventory and analysis as a basis for the goals, policies, and strategies to be included in the plan. The policies and strategies form the legal basis for the land use standards adopted in local ordinances.

- The first step in the comprehensive planning process is to conduct an inventory. The plan must consider the types of uses which currently exist in the community and their location. Where are residential neighborhoods located, where are hospitals, schools, and similar institutional uses requiring quiet located, and where are outdoor recreational facilities located? Also, the town must consider where existing significant noise sources are located, the probability of new sources being developed, and the potential locations for such new sources. Existing sources in rural areas such as gravel pits, farming operations, and sawmills should not be overlooked.

- An assessment of the existing sources and potential for new sources and their locations will provide guidance in the development of the Future Land Use Plan and on whether the town may need to vary noise standards by zone.

- Once these factors are inventoried and assessed, the town must develop policies which will protect its residents, businesses, and property values but allow for new uses. The town may decide on a zoning ordinance which provides different criteria for different zones, or the town may decide on a single standard to use throughout the community. The standards in this bulletin are for town wide use as part of site review procedures.

Following are some example policies and strategies for consideration in developing a comprehensive plan.

Sample Policies

⇒ To protect the residents, businesses, institutions, and outdoor recreational areas from noise sources which would disturb living and working conditions.

⇒ To maintain the tranquil settings in residential neighborhoods (and other quiet areas).

⇒ To reduce the noise levels in the ... (a particularly noisy area of town) section of town as development patterns change.

Note: Be careful not to consider all rural areas as particularly quiet because farming, forestry, and other uses permitted in these areas produce significant noise.

Sample Strategies

⇒ The site plan review provisions should be amended to include noise standards which control noise from new development, changes in use, or expansions of use which will protect abutters, or future abutters, from noise which may disturb communications, sleep, or otherwise interfere with work and lives. The standard should be more restrictive for nighttime hours between 7:00 P.M. and 7:00 A.M.

⇒ The noise standard contained in the site plan review provisions should be amended to limit the increase in noise in the rural areas of town which are particularly quiet (identify the locations).

⇒ The noise standard in the site plan review provisions should include a requirement that uses proposed for locations which currently exceed the ambient noise level in the standard will emit a lower noise level than currently exists in the location.

Review Process

The Review Process starts with the submittal of the required information by the developer. Noise may not be an issue with many types of commercial and service related development, although in some instances, noise from traffic or delivery vehicles may be a concern to abutters. Reviewers will need to determine if noise is an issue by considering the type of development and the location. At a minimum, it may be in the municipality's best interest to obtain a statement from the developer that the noise standards will be met. The reviewing authority can then make the statement part of the application: this gives the municipality enforcement authority if, for some reason, excessive noise is generated. For proposed developments where noise is not expected to be an issue, the reviewing authority can waive further submittals. This section of the bulletin provides model ordinance language for submittal requirements; it also provides a discussion of how to apply the requirement and of how to use the information during the review process.

The next section of the bulletin provides model "standards" that the development must meet to obtain approval. The Review Standards section presents several levels of standards. A Basic Standard is presented first, followed by additional standards or more detailed standards. This Review Process section is divided into subsections which correspond to the alternative standards presented in the Review Standards section.

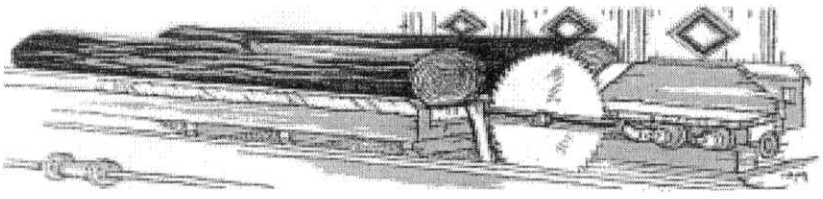
The left column provides a listing of documents (submittals) which municipalities should require in order to adequately review proposals. Each submittal helps the reviewing authority determine whether the standard contained in the ordinance will be met. The reviewing authority has to review and understand the submittals. The background information provided in this bulletin and the discussions of the submittals and the standards will help the authority interpret the submittals. Submittal requirements should be included in local ordinances. The town may also develop a submittal checklist so that it can easily determine if an application is complete.

The right column provides a discussion of the submittal requirements – why they are needed and how they are used in determining compliance with the standard. For Noise, the submittal requirements are the same for both the Basic and More Detailed Standards.

Submittals	Discussion
Submittals for All Review Standards I through III	
A. Technical information shall be submitted describing the applicant's plan and intent to make adequate provision for the control of sound. The applicant's plan shall contain adequate information on which to determine compliance with the standard. The information shall be prepared by a qualified professional. Information should include:	**A.** The plans (maps) submitted for the application and the review of other standards should usually be adequate for the review of noise, except that, if noise barriers are proposed, a detailed design may be necessary. Submittals should include a locator map (USGS quadrangle map or other suitable map) with the site clearly marked and a detailed site plan as noted below.
1. A site plan with the location of noise emitters, noise controls, and any sound measurement locations clearly shown. Also, a tax map showing property parcels that may be impacted and the most recent USGS map, both having the location of the site clearly marked. (The tax map and the USGS map may be required as a basic submittal for all development.)	1. A detailed site plan showing the site, the locations of intended uses within the site, abutting property and its uses including structures and areas of intense outdoor uses, such as recreation areas that may be adversely impacted by noise, should be submitted so that the reviewer can understand the scope of the project and the properties which could be impacted. Pre- and post-development topographic maps of the site will be helpful where it is expected that topographic or physical features of the site will help to reduce noise and/or where topographic changes which may affect noise are proposed.
2. Descriptions of the existing land uses, the local zoning, and the recommended future land use in the comprehensive plan for the area potentially affected by sounds from the development.	2. The abutting uses and uses beyond the abutters possibly up to one-half mile from the site should be described and their location clearly presented. Additionally, the zoning for the area potentially impacted should be shown and described. Uses beyond abutters can be shown on the tax map or the USGS map where appropriate.

682

Submittals	Discussion
3. A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation, and maintenance of the proposed development including their locations within the proposed development.	3. The major sound sources on the site should be described including tonal and short duration noises. The sounds which will occur from both construction and operation should be noted. Any significant sounds which could result from maintenance operations should be noted. The description should reference the site plan so that the location and relationship to other sound sources can be easily understood.
4. A description of the pre-development ambient daytime and nighttime equivalent sound levels at the property boundaries of the proposed site.	4. The "pre-development ambient sound level" is the same as the pre-development background sound level. (After the development is in place, there is a difference between background and ambient noise.) The equivalent sound levels are either the one minute equivalent or the hourly equivalent depending on the standard selected. Any tonal or short duration repetitive sounds or any other unusual qualities about the existing sound in the area should be noted. Where noise is expected to be a significant issue, measurements should be taken at the property boundaries.
5. A description of the daytime and nighttime equivalent sound levels and the short duration repetitive sounds and tonal sounds expected to be produced by these sound sources at the property boundaries of the proposed development. The description shall include the maximum sound level expected for short duration repetitive sounds and tonal sounds.	5. The description of the sound levels expected maybe based on recognized literature which references the specific type of development or on measurements at a similar type of facility. For situations in which noise is a significant issue, the reviewing authority may wish to have the applicant reference several source documents and take measurements at an actual facility and possibly require a model of the sound levels based on manufacturer's specifications for the equipment generating the sound and/or any controls proposed. Noise experts sometimes use published average sound levels for varying types of neighborhoods instead of taking sound level measurements at the proposed site. They also must often use published levels for specific types of development, for example, lumber yards or junkyards, since the site is not yet developed.
6. A description of proposed major sound control measures including their locations and expected performance.	6. The description should provide references which document the expected performance of the sound control measures. Where site features such as berms are proposed, the features should be clearly shown on a post-development topographic plan of the site. The type and location of all sound control measures, including topographic and landscaping features, should be carefully documented and made part of the plan approval by notation on the plan and/or by inclusion in the Findings of Fact.
7. A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.	7. A written report comparing the expected sound levels with the pre-development ambient sound levels will help determine compliance with the standard.



Review Standards

This section presents review standards which should be included in the site plan review process of a zoning ordinance or in a stand alone site plan review ordinance. Several alternatives having varying amounts of detail are presented. The standards should be applicable to new development, expansions, and changes in use. Standards are presented in the left column, and a discussion of the standard appears in the right column.

Three (3) alternatives are presented: a basic standard, several additions to the basic standard which consider areas that may be unusually quiet and areas which currently exceed the standard, and a more detailed standard that varies with expected uses or zones.

The more detailed alternative is best used in towns with zoning so that there is no doubt about the type of future abutting land uses. It is most relevant to towns which have distinct patterns of growth and which expect considerable industrial development for which noise may be a factor. The discussion provides additional guidance on use.

Standard

Discussion

I. Basic Standard

This is a relatively simple sound level standard which should be easily administered. It is most suitable for small communities with few planning and code enforcement resources. It may also be suitable for many rural communities where there are few noise sensitive uses such as schools, and it is unlikely that significant noise sources would locate near them. In these communities, it is anticipated that there would be sufficient open space to buffer significant noise on the source's land so that they would not create a nuisance to abutting uses.

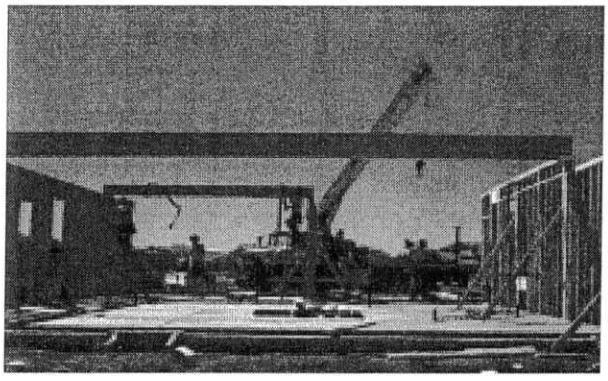
A. The proposed development shall not increase noise levels to the extent that abutting or nearby properties are adversely affected. In order to comply with this, the development must meet the following requirements.

A. As noted in the earlier discussions, the term "Adversely affected" is vague. The standard is defined by the conditions that follow the introductory wording.

1. The maximum permissible sound level of any continuous, regular, frequent, or intermittent source of sound produced by any activity shall be limited according to the time of day and land use which abuts it as listed below.

1. The hours can be changed to reflect community values and patterns. Most standards use 6 a.m. or 7 a.m. as the separation of the nighttime to daytime standard; daytime to nighttime varies from 7 p.m. to 10 p.m.

Abutting Use	Sound Level Limits dBA	
	7 a.m. – 7 p.m.	7 p.m. – 7 a.m.
Residential	55	45
Commercial	65	55
Industrial	70	60
Institutional	55	45



2. Where the abutting property is undeveloped, the sound level shall be equal to or less than the most restrictive other abutting use. Where there are no uses on abutting properties, the sound level at the property line shall be equal to or less than the least stringent use allowed by zoning.

2. This is a provision to protect future uses of vacant land which abuts a noise generator. The first sentence makes the noise level at the abutting property line of vacant property less than or equal to the sound level required for the most restrictive abutting use. If a municipality is trying to transition an area to a more industrialized area, this requirement may not be appropriate. The second sentence allows the noise level for uses where there are no abutters to equal the noise level for the least

Standard	Discussion
	restrictive possible abutting use. Thus, this type of setting could have the maximum noise level permitted by ordinance. It effectively discourages quieter uses from locating in the area.
3. Sound levels shall be measured at least four (4) feet above the ground at the property line of the development. Sound levels shall be measured by a meter set on the A-weighted response scale, fast response. The meter shall meet the latest version of American National Standards Institute (ANSI S1.4.) "American Standard Specification for General Purpose Sound Level Meters" and shall have been calibrated at a recognized laboratory within the past year.	3. This specifies the standard to be used for the sound level meter and must be included so that all measurements have a common base and accuracy.
4. The following uses and activities shall be exempt from the sound pressure level regulations.	4. Exemptions should be provided for some activities. The standard is based on common examples. For a list of additional exemptions, see Alternative III, Item 10.
a. Noises created by construction and temporary maintenance activities between 6:30 a.m. and 8:00 p.m.	a. The times for construction activities can vary from those presented based upon community needs. Additionally, the exemption could be limited so that it would not apply to Sundays and/or Federal holidays. Suggested wording follows: except that noise from construction and temporary, scheduled maintenance activities shall comply with the standards on Sunday.
b. The noises of safety signals, warning devices, and emergency pressure relief valves and other emergency activities.	
c. Traffic noise on public roads.	
d. Resource uses in rural areas.	d. Municipalities may want to exempt agriculture, forestry, mining in rural areas since these uses are generally allowed but often create noise above the allowable standard.

II. Possible Additions to Basic Standard

Either one or all of these additions can be included in the Basic Standard (I). (Numbering is consecutive to that standard.)

Additional standard #5 provides additional protection to areas of the community where the ambient sound level is considerably below the allowed level. It is suitable for rural communities similar to the first alternative, but which may have some very quiet areas which the town wishes to preserve.

Standard #6 provides for areas which currently have noise levels above the allowable standard. The second is suitable for communities which have a noisy area(s) which the town would like to keep from becoming worse and would like to bring more in line with the standards as existing sources cease.

Standard #7 provides for sound measurement to determine compliance in the case where no pre-development ambient sound level measurements were taken.

5. When a proposed development is to be located in an area where the daytime pre-development ambient hourly sound level (Leq 60) is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level is equal to or less than 35 dBA, the hourly sound level resulting from the development shall not cause the ambient hourly	5. This standard limits the sound level emitted by new development in areas of a community that are particularly quiet. It provides for a 5 dB increase in ambient sound levels above the pre-development level. Thus, the increase will be noticeable, but it should not create a significant disturbance. It provides significant protection from noise intrusion.

Standard	Discussion
sound levels at the property lines of the development to be 5 dBA more than the ambient hourly sound level prior to development.	Towns with zoning may want to apply this standard to only some of their rural zones. Care should be used in applying this standard to areas where agriculture, forestry and/or mining are existing or expected uses.
6. If the daytime and/or nighttime pre-development ambient sound level at property line of the development site exceeds the daytime and/or nighttime limits by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level.	6. This provides for a development which will be located in an area where the sound level exceeds the standard set in the first section. It requires new development to emit a noise level that is lower than the existing noise level such that no further disturbance results and so that as noisier developments cease to operate, the area will have an ambient sound more closely in compliance with the rules.
7. In the absence of a measurement of "pre-development ambient" sound level, enforcement may be based on the post-development background level.	7. This standard accounts for cases where there is no pre-development sound level measurement. The pre-development level is approximated by the "background" level after development.

III. More Detailed Standard – Suitable for Use with a Zoning Ordinance

This is an alternative standard which is somewhat more complex. It parallels DEP's existing Site Location of Development rules but has been simplified. The sound levels and the times may be changed to reflect community needs. It accounts for future land use by referencing zoning and is probably best used as part of a Site Plan Review (or Conditional Use) procedure within a Zoning Ordinance. It is most suitable, with the levels used here, for a more developed community than the first alternative. Note that sound levels are generally 5 dB higher. It may be modified for use with a Site Plan Review Ordinance or for a more rural community.

A. The hourly sound levels at the property line of the development and resulting from the development shall not exceed the following limits:

1. Any location for which the zoning is <u>not</u> predominantly commercial or industrial: 60 dBA between 7:00 a.m. and 7:00 p.m. 50 dBA between 7:00 p.m. and 7:00 a.m.	1. This sets the standard where abutting uses are residential, institutional, or open space. The Zoning Ordinance would designate the abutting area as one of these types of uses.
2. At any location for which the zoning is predominantly commercial or industrial: 70 dBA between 7:00 a.m. and 7:00 p.m. 60 dBA between 7:00 p.m. and 7:00 a.m.	2. This sets the standard where abutting uses are businesses or industrial use. It allows a source to emit more noise than the source could emit in a residential or institutional area. The noise allowed in this location would be perceived as being twice as loud for the location with a residential buffer.
3. When a proposed development is to be located in an area where the daytime pre-development ambient hourly sound level is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level is equal to or less than 35 dBA, the hourly sound levels resulting from the development shall not exceed the following limits when the zoning of the abutting use is <u>not</u> predominantly commercial or industrial. 55 dBA between 7:00 a.m. and 7:00 p.m. 45 dBA between 7:00 p.m. and 7:00 a.m.	3. This standard provides for a lower sound level for locations where abutters would be residential or institutional when the existing sound level is quite low. It allows for a doubling of the perceived increase.

686

Standard	Discussion
4. If the daytime and/or nighttime pre-development ambient sound environment exceeds the daytime and/or nighttime limits in subsection 2(a) or 2(b) by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.	4. This provides for a development which will be located in an area where the sound level exceeds the standard set in the first section. It requires new development to emit a noise level that is lower than the existing noise level such that no further disturbance results and so that as noisier developments cease to operate, the area will have an ambient sound more closely in compliance with the rules.
5. When development produces tonal sounds or short duration repetitive sounds: Five (5) dBA shall be added to the observed levels of these sounds for the purposes of determining compliance with the sound level limits herein established.	5. This standard accounts for the fact that tonal and repetitive sounds are more annoying than multi-band, constant noises. To account for this, 5 dB is added to the tonal or repetitive sound level measured (or expected). Thus tonal or repetitive sounds would not be as loud as other noises.
6. The maximum sound level of the short duration repetitive sounds shall not exceed the following limits: a. At any location for which the zoning is <u>not</u> predominantly commercial, transportation, or industrial: 65 dBA between 7:00 a.m. and 7:00 p.m. and 55 dBA between 7:00 p.m. and 7:00 a.m. b. At any location for which the zoning is predominantly commercial, transportation, or industrial: 75 dBA between 7:00 a.m. and 7:00 p.m., and 65 dBA between 7:00 p.m. and 7:00 a.m.	6. This standard controls the maximum sound level from short duration, repetitive sources.
7. Sound from construction activities between 6:30 a.m. and 8:00 p.m. shall not exceed the limits established in the table on page 11 at the property line. Between 8:00 p.m. and 6:30 a.m., sound levels shall comply with the other standards presented herein.	7. This standard provides actual limits to noises produced during construction, and it requires all equipment to comply with federal standards and original equipment design.
8. All equipment used in construction on development sites shall comply with applicable federal noise regulations and shall include environmental noise control devices in proper working condition as originally provided with the equipment by its manufacturer.	8. This specifies the standard to be used for the sound level meter and must be included so that all measurements have a common base and accuracy.
9. Noise shall be measured by a meter set on the A-weighted response scale, fast response. The meter shall meet the latest version of American National Standards Institute (ANSI S1.4.) "American Standard Specification for General Purpose Sound Level Meters."	
10. In the absence of a measurement of "pre-development ambient" sound level, enforcement may be based on the post-development background level.	10. This standard accounts for cases where there is no pre-development sound level measurement. The pre-development level is approximated by the

Standard

11. Sound associated with the following shall be exempt from regulation by the Board:

Construction Activity Sound Limits (7:00 a.m. to 7:00 p.m.)	
Duration of Activity	**Hourly Sound Level Limit**
12 hours	87 dBA
8 hours	90 dBA
6 hours	92 dBA
4 hours	95 dBA
3 hours	97 dBA
2 hours	100 dBA
1 hour or less	105 dBA

- The noises of safety signals, warning devices and emergency pressure relief valves and other emergency activities.
- Traffic noise on public roads.
- Railroad equipment which is subject to federal noise regulations.
- Aircraft operations at public airports or which are subject to federal noise regulations.
- Bells, chimes, and carillons.
- Occasional sporting, cultural, religious, or public events.
- Farming and forest management, harvesting, and transportation activities.

Discussion

"background" level after development. The post-development background noise is the noise after the development is constructed but with no noise being produced by the development.

11. This list is similar to the list from the DEP Site Location Law rules. It is more specific than the exceptions provided for the other Alternatives.

688

Definitions

Ambient Sound: At a specified time, the all-encompassing sound associated with a given environment, being usually a composite of sounds from many sources at many directions, near and far, including the specific development of interest.

Background Sound: The all-encompassing sound associated with a given environment, being a composite of sounds from many sources at many directions, near and far, prior to the construction of the proposed development. Also referred to as the **pre-development ambient sound**.

Equivalent Sound Level: The level of the mean-square A-weighted sound pressure during a stated time period, or equivalently the level of the sound exposure during a stated time period divided by the duration of the period.

Hourly Sound Level: The equivalent sound level for a one- (1) hour period.

Maximum Sound: Largest A-weighted and fast exponential-time-weighted sound during a specified time interval. Unit of measure is the pascal (Pa).

Pre-Development Ambient: The ambient sound at a specified location in the vicinity of a development site prior to the construction and operation of the proposed development or expansion.

Short Duration Repetitive Sounds: A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten (10) seconds in duration, and which are inherent to the process or operation of the development and are foreseeable. They include sounds which repeat on a regular basis and sounds which have a scattered time of occurrence.

Sound Level: Ten (10) times the common logarithm of the square of the ratio of the frequency-weighted and time-exponentially averaged sound pressure to the reference sound of 20 micropascals. For the purpose of this regulation, sound level measurements are obtained using the A-weighted frequency response and fast dynamic response of the measuring system, unless otherwise noted.

Sound Pressure: Root-mean-square of the instantaneous sound pressure in a stated frequency band and during a specified time interval. Unit of measure is the pascal (Pa).

Sound Pressure Level: Ten (10) times the common logarithm of the square of the ratio of the sound pressure to the reference sound pressure of 20 micropascals.

Tonal Sound: For the purpose of this regulation, a tonal sound exists if the one-third (1/3) octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two (2) contiguous one-third (1/3) octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz. and 125 Hz.

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