

# **Using Public Input to Develop Scientifically Sound Noise Pollution Policy for Vermont's Rural Land Uses and Communities: Methodology and Initial Results**

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## **ABSTRACT**

In Vermont, noise pollution is currently assessed under multiple permitting processes that utilize different standards to evaluate impacts, and the current thresholds are arguably not scientifically-based. This paper discusses the methodology and initial results from a study that is exploring ways of using public input in developing noise policy that is also based in our current understanding of thresholds which are known to cause impacts. The primary objective of the study is to develop guidelines for land use planners and decision makers for producing scientifically-based noise policy that meets the needs of Vermont's rural landscapes and communities. The whole study has four primary components: 1) Review of existing noise policies and guidelines, 2) Review of studies related to noise impacts and thresholds, 3) Data gathering of Vermonters' noise concerns via surveys and interviews, 4) Development of guidelines for state and local noise policy for Vermont's rural land uses. The goal of the surveys and interviews is to qualitatively assess public thought on noise pollution impacts and policy. The results of the surveys and interviews will eventually be paired with the literature review of noise policy and noise impact studies to produce guidelines for noise policy development for Vermont.

## **1. INTRODUCTION**

Vermont is a fairly rural state that does not have a statewide noise regulation, but instead addresses noise pollution through the Agency of Transportation as required by the Federal Highway Administration, the Public Service Board, local ordinances, and Act 250, the state environmental permitting process. With the exception of localized zoning and land use planning regulations, it is through Act 250 that the majority of community noise policy is implemented in Vermont for commercial projects. Through Section 248, the Public Service Board addresses noise for public utility projects, although they often lean on Act 250 precedents for their noise policy. The current and most often used noise limit that is applied through Act 250 by case precedents is that a project should not exceed 55 dBA L<sub>max</sub> at residences and areas of frequent human use. While the L<sub>max</sub> has most frequently been applied as a maximum one-second equivalent sound pressure level, some have argued that it is an L<sub>fmax</sub> (fast response) standard<sup>1</sup>. Either way it is interpreted, the limit level is applied over a very short time period of one-second or less. The 55 dBA L<sub>max</sub> limit is a precedent that was set to evaluate the legal question regarding aesthetics of whether or not the sound of a project is so adverse to a particular area that

it offends the sensibilities of the average person<sup>2</sup>. That is, a one-second (or less) sound level of 55 dBA is considered shocking and offensive to the average person. The limit as it is applied in Vermont finds its origin in the EPA's "Information on Levels of Environmental Noise, Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" document in which a recommended outdoor guideline for "Residential with Outside Space and Farm Residences" is listed as 55 dBA Ldn which is said to protect against both hearing loss and activity interference<sup>3</sup>. When this limit was first applied in Act 250, the 55 dBA day-night level was changed to a 55 dBA Lmax limit with the governing body unknowingly throwing out the basis for the 55 dBA Ldn EPA guideline. It is not clear why this change was made, but it could potentially be traced back to a simple miscommunication between the project applicant and the governing body when the project applicant proposed a finding that they agree to limit noise at surrounding residences to "...no more than 55 dBA..." with no metric or parameter defined in the proposed finding<sup>4</sup>. A simple and reasonable interpretation by a lay-person of "no more than 55 dBA" is a maximum limit of 55 dBA applied for any one-second period. With the change from the 55 dBA Ldn EPA guideline to the 55 dBA Lmax limit, the standard applied to most environmental permits in Vermont is no longer based in science.

The current limit may not be protective enough or it may be too restrictive for development. Without evaluating whether the current limit is too restrictive or not protective enough, this initial study, which is still being conducted, considers via literature review, current scientific understanding of how noise impacts people and the environment. The primary impacts identified in the literature review include sleep disturbance, cardiovascular effects, cognitive impairment, hearing loss, varying levels of annoyance, speech interference, and ecological and wildlife impacts. This initial study seeks to understand the type of noise pollution policy that would best meet expressed needs of the public through qualitative surveys and interviews that inquire about the identified impacts for different rural land uses. The survey work is nearly complete and is introduced in this paper. The interviews are yet to be completed and are not discussed here.

## 2. SURVEY DISCUSSION

### A. Survey Platform & Distribution

The survey was developed on a commercially available online survey platform and distributed to a variety of organizations in Vermont which include regular citizens, professional planners, attorneys, businesses, environmental and preservation organizations, and community organizations. The survey went out over 17 distribution campaigns and a link to the survey was provided over email lists, social media, and printed newsletters.

### B. Survey Design

The survey is divided into four sections:

1. Potential noise impacts and policy protection
2. Regulation of noise generated at variety of rural land uses and received by a variety of land uses
3. General questions regarding environmental impacts, noise, and regulations
4. Standard demographic questions

The first section of the survey seeks to understand how important it is to have noise pollution policy protect against different potential impacts and whether or not the importance changes based on different receiving lands. The respondents are first provided definitions to each of the potential impacts. They are then asked a series of questions similar to the one shown in Figure 1 for four types of receiving lands including:

- Rural, out-of-town, or country residences

- In-town or in-village residences
- Outdoor recreational areas with primarily non-motorized uses
- Protected areas

For the purposes of this study, protected areas are defined as a location that has some degree of protection due to its natural or cultural value with some examples provided such as conserved lands, wildlife refuges, local, state or national forests or parks. Examples are also provided for outdoor recreational areas with primarily non-motorized uses which included campgrounds, trails, swimming areas, canoe/kayaking areas, and picnic areas.

1. At a rural, out-of-town, or country residence, how important is it for either local or state environmental regulation or policy to protect against the following potential noise impacts:

	0 (Not Important)	1 (Only Slightly Important)	2 (Moderately Important)	3 (Very Important)	4 (Extremely Important)
Cardiovascular Effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cognitive Impairment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speech Interference Outside a Residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speech Interference Inside a Residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hearing Loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sleep Disturbance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ecological & Wildlife Impacts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slight Annoyance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderate Annoyance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Significant Annoyance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Figure 1:** Example survey question from the first section of the survey on potential noise impacts and policy protection.

The second section of the survey looks at whether noise limits should vary depending on the specific land use generating the noise and the specific land use receiving the noise. This is done by asking what qualitative level of noise should a variety of land uses be allowed to project onto the four types of receiving lands used in the first section of the survey. The specific noise generating land uses that were evaluated are shown in the example question in Figure 2.

7. For each of the following types of land uses which create noise, what level of noise should they be allowed to project to an in-town or in-village residence?

	0 (Not Audible)	1 (Very Quiet)	2 (Quiet/Lightly Noisy)	3 (Moderately Noisy)	4 (Highly Noisy)
Industry/Factory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agriculture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forestry & Forestry Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind Power Projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Power Plants, Substations, & Utilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rock Quarries/Sand & Gravel Operations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Commercial Development (i.e. gas stations, banks, stores, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Office Buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Outdoor Recreational Areas with Motorized Uses (i.e. snowmobiles, ATVs, power boats, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Outdoor Recreational Areas with Non-Motorized Uses (i.e. playgrounds, hiking/skiing trails, swimming areas, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gun Clubs & Firing Ranges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Figure 2:** Example survey question from the second section of the survey on the regulation of noise generated at variety of rural land uses and received by a variety of land uses.

If a respondent answers that noise from a specific land use should be “0 (Not Audible)” or “1 (Very Quiet)” at a given receiving land, they are then asked the same question again on a following page, except the second time they are informed that by answering “0 (Not Audible)” or “1 (Very Quiet)”, it may be difficult to site some developments that create noise which could potentially affect local economics or contribute to sprawl. This modified question is asked not assuming that strict noise regulations affect local economics or contributes to sprawl, but if that were the case, to see if the respondent’s answers change.

The third section of the survey asks general questions about noise pollution, regulation, and the respondent’s involvement in permit hearings. Some examples of questions from this section are shown in Figure 3.

**11. What existing environmental factor most impacts your life personally?**

<input type="radio"/> Water Pollution	<input type="radio"/> Air Pollution
<input type="radio"/> Impacts to Visual Aesthetics	<input type="radio"/> Noise Pollution
<input type="radio"/> Light Pollution	<input type="radio"/> Impacts to Wildlife and Ecosystems
<input type="radio"/> Climate Change	<input type="radio"/> Impacts to Historical and Cultural Sites

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**12. Have you ever attended an Act 250, Public Service Board, or local planning hearing in which potential noise from a proposed development was discussed?**

Yes  
 No

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**13. Have you ever opposed a proposed development based on concerns about noise? If you answer yes, please identify the type of development you were opposed to:**

No  
 Yes

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**14. How do you balance the difference between the need or desire for certain types of development with the need for protection from noise impacts?**

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**15. Should economic considerations have a role in noise impact analysis of private and public projects?**

**Figure 3:** Example survey questions from the third section of the survey.

### 3. SUMMARY OF INITIAL SURVEY RESULTS

To date, there have only been 42 respondents out of a potential estimated pool of more than 10,000, so the current sample size is quite small. Of the 42 respondents, approximately 38.1% are from professional planning organizations, 9.5% are from attorneys, 7.1% are from general Noise-Con 2013, Denver, Colorado, August 26-28, 2013

businesses, 7.1% are from citizens or community groups, and 38.1% are from an environmental group that is known to be opposed to wind power development.

Despite the small sample size, it is interesting to see how the results are developing. Some high-level and general trends from the initial results are as follows:

- Protected areas require the greatest protection from noise impacts with slightly higher importance ratings than residences.
- Rural residences received slightly greater importance ratings for protection against noise impacts than town residences.
- All identified noise impacts received on average between moderately important and extremely important protection ratings for all receiving land uses with the following order of impacts from most important to least important for protection: hearing loss, significant annoyance, speech interference (interior), sleep disturbance, ecological & wildlife impacts, speech interference (outside), cognitive impairment, cardiovascular effects, moderate annoyance, and lastly, slight annoyance.
- Respondents were more accepting of moderate sound levels (2 “Quiet/Lightly Noisy”) from agriculture and forestry land uses over other land uses included in the survey. They were slightly less accepting of moderate sound levels from rock quarries/sand and gravel extraction and outdoor recreational areas.
- The lowest acceptable levels (1 “Very Quiet”) were applied to office buildings, power plants and substations, wind power projects, gun clubs and firing ranges, industrial land uses, and office buildings.

#### **4. CONCLUDING COMMENTS**

This paper provided an initial summary of the survey portion of a study that is looking at how current scientific understanding of noise impacts can be applied to noise pollution policy by understanding the public’s desire for protection from noise impacts. Additional and more detailed analyses of the survey results are currently underway. With a small sample size it is difficult to make any conclusive statements, but general trends were identified in the importance of protection for various noise impacts and receiving land uses and the acceptability of varying levels of sound from a variety of noise producing land uses.

While this initial study utilizes qualitative surveys and interviews, future studies are envisioned that would potentially entail quantitative surveying and focus groups. It would of course be good for future survey work on this topic to include random sampling rather than selected distribution over various organizations’ networks, and a much larger sample size is desirable. Nonetheless, a basic framework of assessing public input in the development of noise pollution policy is being developed.

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