Ohio Department of Transportation  
Noise Barrier Frequently Asked Questions (FAQs)

1Q: How do I get a noise barrier?  
A: In order for a noise barrier to even be considered for a noise sensitive area, many steps have to be taken. First, we must determine if a noise analysis is required to be prepared. Per the Federal Regulation 23CFR772, a noise analysis is required when an ODOT project is proposed adjacent to a noise sensitive area and the project consists of a new highway built on a new location, or an existing highway that is significantly altered by substantially changing the horizontal or vertical characteristics of the road, or the number of through traffic lanes is being increased. This type of project is called a Type I project and would warrant the preparation of a noise analysis. If a noise analysis is determined to be warranted, then the analysis will determine if a noise sensitive area is impacted by noise levels above FHWA Noise Abatement Criteria. If it is determined that noise levels are above FHWA Noise Abatement Criteria, then noise abatement (i.e. a noise barrier) must be investigated to determine if it is feasible and reasonable. If a noise barrier is determined to be considered feasible and reasonable, then a majority of the benefited residents must desire the noise barrier in order for the noise barrier to be constructed. Noise barriers will not be built if most affected residents do not want them or if there is a lack of interest.

ODOT also constructs noise barriers as part of the Type II Noise Wall Noise Wall Retrofit (NWR) Program. The goal of the Type II or retrofit noise barrier program is to provide acoustic protection for residential areas that were in existence prior to the construction of the adjacent roadway. Communities that qualify under the Type II noise barrier program and desire a noise barrier are required to complete application and petition forms for Type II noise mitigation. Once the forms are reviewed and approved by ODOT, the requirement for desire has been met and the only item left to be determined is the aesthetics which can be determined via mail survey. The Type II prioritization process considers existing noise levels and the preliminary cost per benefited receptor based on preliminary computer modeling. This is used to achieve a fair and equitable prioritization process. Prioritization can also be based on other factors such as type of development to be protected, constructability and practicability of highway traffic noise abatement at the site, and increase in highway traffic noise since the development was constructed. A noise analysis is required to be prepared for all Type II noise barrier projects. If it is determined that noise levels are above FHWA Noise Abatement Criteria, then noise abatement (i.e. a noise barrier) must be investigated to determine if it is feasible and reasonable. If a noise barrier is determined to be considered feasible and reasonable, then a majority of the benefited residents must desire the noise barrier in order for the noise barrier to be constructed. Noise barriers will not be built if most affected residents do not want them or if there is a lack of interest.

2Q: How do noise barriers work?  
A: Noise barriers reduce noise by blocking the direct travel of sound waves from a source (such as a highway) to adjacent homes or businesses, forcing the waves over the top or around the barrier. The barrier must be high enough and long enough to block the view (line of sight) of the highway. This is the phenomenon that allows a noise barrier to provide a perceivable noise reduction. Noise barriers do very little good for homes on a hillside overlooking a road or for buildings which rise above a barrier. Openings or gaps in barriers for driveway connections or street intersections reduce barrier effectiveness. Noise barriers are most effective for the first one or two rows of homes at distances up to 200 feet from the barrier. As noise levels decrease with distance, there is a point away from the highway at which noise barriers are no longer effective. It is important to note that barriers are not designed to eliminate or block all noise.
3Q: How is a noise barrier funded?
A: ODOT typically includes the costs of noise barriers in their proposed Federal-aid highway projects. The Federal share is the same as that for the highway system on which the project is located. Noise barriers are sometimes constructed without using Federal funds - for example, using only State, local, or private funds.

4Q: What types of noise barriers are constructed?
A: Noise barriers are commonly constructed as barriers, earthen berms, or a combination of the two. Barriers are most common, and are usually constructed out of dense materials such as concrete, fiberglass, or metal. Earthen berms are a natural alternative to barriers, but require much more land to construct. Barriers can be constructed on top of berms in order to raise the overall height of the barrier.

5Q: Would an earthen berm be as effective as a noise barrier in reducing noise levels?
A: Earthen berms are just as effective as noise barriers. Studies have shown that earth berms actually reduce noise levels to a greater extent than noise barriers due to absorption and edge effects. However, the use of berms depends on the space available. For maintenance reasons, ODOT requires at least a 2:1 slope on berms. For example a 12-foot tall berm with a 2:1 slope would be approximately 48 feet wide at the base. The available area for abatement would need to accommodate this base width.

6Q: Are noise barriers built to protect locations on the upper floors of homes?
A: Noise barriers may be able to be designed to protect upper levels of exterior use of multi-family structures, where each unit is a separate residence. For single-family homes, the primary consideration is the outdoor, ground-floor areas of human activity. Barriers built for the second floor would have to be tall enough to provide a substantial noise reduction for those areas, which in most cases would require very high barriers that would not be feasible or reasonable.

7Q: How are noise reflections from buildings and barrier barriers considered?
In areas where noise barriers will be constructed parallel to each other or where a single barrier is constructed opposite a noise sensitive area, noise barriers with a sound absorptive material on the highway side are constructed, minimizing any possible sound reflections.

8Q: When is a noise analysis required?
A: A noise analysis is required for a proposed ODOT project if that project consists of a new highway built on a new location, or an existing highway that is significantly altered by substantially changing the horizontal or vertical characteristics of the road, or the number of through traffic lanes being increased. Minor projects, such as normal roadway resurfacings (without adding new lanes), do not require a noise analysis. The noise analysis only considers noise sensitive land uses within 500’ from the edge of pavement of the proposed project. However, if noise impacts are occurring beyond 500’, then the noise analysis must include the expanded area.

9Q: Is a noise analysis required when the speed limit of a highway is changed?
A: No. Under the current regulations, a speed limit increase does not qualify as a project in which a noise analysis is required. ODOT does not have legal enforcement authority on the highways and cannot enforce lower speeds; enforcement of traffic laws is the responsibility of local law enforcement.

10Q: What constitutes a traffic noise impact?
A: A "noise sensitive receiver" (defined as homes, parks, schools, churches, etc.) is considered impacted by noise if either future noise levels (generally a 20 year projection) approach or exceed the FHWA Noise Abatement Criteria, or if there is a substantial increase in future noise levels over existing noise levels
from a proposed ODOT project as described above. These are the noise levels experienced at the commonly used exterior portions of a property on the lowest or ground level for each home or individual unit. For residences, schools, and parks, an impact is defined when the $L_{eq}$ is 66 decibels or higher. The $L_{eq}$ (equivalent sound level) is essentially the average noise level over period of time, usually one hour. A substantial increase impact occurs when there is a projected 10-decibel increase over existing noise levels. Impacts such as these require mitigation consideration and analysis, which will result in the construction of noise barriers if they are determined to be feasible and reasonable.

11Q: What does ODOT consider "feasible and reasonable"?
A: A noise barrier must be both feasible and reasonable if it is to be constructed with a highway project. Feasibility and reasonableness are determined by criteria that are quantifiable but flexible, and judgments for special and/or unusual circumstances are made on a case-by-case basis. As a result, noise mitigation is not automatically provided where noise impacts have been identified. A barrier is feasible if it can be constructed without major engineering or safety issues and provides a substantial noise reduction of at least 5 decibels for 40% of the impacted receivers. Reasonableness deals with whether or not the barrier can be constructed in a cost-effective manner, the number of receivers benefitted from the noise barrier, whether or not the noise reduction design goal of 7 decibels is being achieved for at least one receiver, and the desires of the community. ODOT’s current policy is if the cost of a noise barrier is $35,000 per residence or less, the noise barrier is deemed cost reasonable. For example, if a noise barrier will benefit 10 residences and the total cost of the noise barrier is $350,000 or less, the noise barrier is deemed cost reasonable.

12Q: What is a "substantial noise reduction"?
A: A noise barrier must provide at least a readily perceptible decrease in noise levels to adjacent receivers to be effective. This is defined as a noise decrease of at least 5 decibels. As noise level changes of 3 decibels or less are not generally perceivable, it is not prudent to construct a noise barrier that gives only a 1 or 2 decibel benefit to adjacent properties.

13Q: What is a “substantial noise increase”?
A: ODOT’s policy, which was approved by the FHWA, states that if the predicted noise levels exceed the existing noise levels by 10 decibels or more, this is considered a substantial noise increase.

14Q: Does ODOT analyze noise levels on existing highways?
A: In the absence of a major highway project as described above in Question #3, ODOT does not perform noise studies or mitigate noise for existing highways. ODOT will analyze noise levels on existing highways when the existing highway is significantly altered by a project that substantially changes the horizontal or vertical characteristics of the road, or the number of through traffic lanes is being increased. ODOT will also conduct a noise analysis for an existing road if it is being studied as part of the Type II Noise Wall Noise Wall Retrofit (NWR) Program. These are the only situations where ODOT will perform noise studies or mitigate for noise on existing highways.

15Q: How is noise measured?
A: Noise, usually defined as unwanted or unacceptable sound, is measured in terms of decibels. A decibel is a logarithmic unit of measurement that quantifies the sound pressure differences in the air that we perceive as sound (or noise) on a scale ranging from zero decibels on up. Zero decibels is the threshold of human hearing, 40 decibels is normal for quiet urban nighttime, 50 decibels is normal for quiet urban daytime, 70 decibels is the level adjacent to an urban interstate at 50 feet or a vacuum cleaner at 10 feet, 80 decibels is the level normal for noisy urban daytime or shouting at 3 feet, 130 decibels is a typical level adjacent to a jackhammer at 5 feet, and 150 decibels is a typical level adjacent to a jet takeoff at
runway. For highway traffic noise studies, noise levels are quantified in terms of the equivalent sound level, or Leq. The Leq is essentially the average noise level over period of time, usually one hour.

Most environmental sounds are complex and comprised of multiple frequencies or tones. Many of the frequencies associated with environmental noise are within the range of human hearing (i.e., audible sound) while many are above or below the range of typical human hearing, referred to as ultrasound and infrasound, respectively. Additionally, the human ear cannot hear a less than 3 dBA change in sound and does not respond to all frequencies (within the range of audible sound) the same way. To account for these tonal differences, researchers have developed the "A-weighted scale" which places an adjustment on high and low-pitched sounds to best approximate the way the average person hears sounds. Sound pressure levels measured on the A-weighted scale are presented in A-weighted decibels, abbreviated dBA. The A-weighted decibel is the unit of measure applied to transportation noise studies.

16Q: How are noise level changes perceived?
A: Studies have shown that changes in noise levels of 3 decibels or less are not normally detectable by the average human ear. An increase of 5 decibels is generally readily noticeable by anyone, and a 10-decibel increase is usually felt to be "twice as loud" as before. For example, 40 decibels is normal for quiet urban nighttime, 50 decibels is normal for quiet urban daytime, 70 decibels is the level adjacent to an urban interstate at 50 feet or a vacuum cleaner at 10 feet, and 80 decibels is the level normal for noisy urban daytime or shouting at 3 feet.

17Q: How do changes in traffic or roadway geometry affect noise levels?
A: Due to the nature of the decibel scale, a doubling of traffic will result in an approximately 3-decibel increase in noise levels, which in and of itself would not normally be a perceivable noise increase. Traffic would need to increase at least three times to result in a readily perceivable (5 decibel) increase in noise. Using the same reasoning, if a highway is moved half as close to existing homes as it is now (i.e., from 200 to 100 feet), the noise levels will increase by approximately 3 decibels. Conversely, if a highway is moved double the distance from existing homes, the noise levels will decrease by 3 decibels. Noise level increases due to highway projects are usually due to a combination of increased traffic and changes in the roadway alignment.

18Q: How was the selection of the noise levels in the Noise Abatement Criteria determined?
A: ODOT’s selection of the noise abatement criteria levels were based on guidance from FHWA, and is consistent with the criteria used by all state DOT’s.

19Q: Who is responsible for maintaining the noise barrier on the residential side?
A: Noise barrier maintenance on both sides of the barrier is ODOT’s responsibility if the barrier is on an interstate route or on a state highway outside of city limits. If the barrier is on a non-interstate route and within city limits, then the responsibility falls on the city.

20Q: Who is responsible for trimming trees and overgrowth between the right-of-way fence and the noise barrier?
A: This is ODOT’s responsibility if the barrier is on an interstate route or on a state highway outside of city limits. If the barrier is on a non-interstate route and within city limits, then the responsibility falls on the city.

21Q: Can property owners paint the noise barrier on their side?
A: No. Noise barrier maintenance on both sides of the barrier is ODOT’s responsibility if the barrier is on an interstate route or on a state highway outside of city limits. If the barrier is on a non-interstate route and within city limits, then the responsibility falls on the city.
22Q: Can property owners remove the existing right-of-way fence along an existing noise barrier and behind their property?
A: ODOT may grant permission for this as long as no gaps are created between the right-of-way fence and noise barrier where people could walk out onto the highway. Where the noise barrier ends, the right-of-way fence should abut the noise barrier. The right-of-way fence should only be removed where the distance between the right-of-way fence and noise barrier is too close for reasonable maintenance purposes and should not be done simply to increase back yards.

In accordance with ODOT’s Location and Design Manual, Section 606.3.3, “Fence should normally be continued behind a noise barrier. Sufficient distance should be provided between the fence and the noise barrier to permit normal maintenance operations. If there is no critical maintenance responsibility between the noise barrier and the right-of-way or limited access line, the fence may be terminated at each end of the noise barrier.”

23Q: Can property owners use the small strip of land between ODOT’s right-of-way and the noise barrier where there is no right-of-way fence?
A: Not technically. This space is owned by the state if the barrier is on an interstate route or on a state highway outside of city limits. If the barrier is on a non-interstate route and within city limits, then the space is owned by the city. In addition, ODOT does not typically mow the small space between ODOT’s right-of-way and/or right-of-way fence and the noise wall but can maintain that area as needed and/or upon request.

24Q: Can a residence qualify for sound insulation?
A: No. Per ODOT and FHWA’s guidance and regulations, only special land uses that are nonprofit institutional noise sensitive land uses such as places of worship, hospitals, libraries and schools are eligible for consideration for insulation in lieu of noise barriers as a noise abatement measure.

25Q: Can anything be done about “Jake Brake” use?
A: Jake brake ordinances are locally governed in Ohio. Any enforcement of jake brake use is the responsibility of the local authority. Section 4917 of the United States Code is part of the Noise Control Act of 1972, and sets maximum noise emissions for motor carriers engaged in interstate commerce. According to an opinion issued by the Ohio Office of the Attorney General, local regulations restricting the use of engine brakes to control noise for motor carriers engaged in interstate commerce "may be inconsistent with federal law, and thus preempted and unenforceable." For this reason ODOT will not install NO ENGINE BRAKE signs on the mainline and ramps of Interstate Routes.

26Q: Can ODOT prohibit trucks along roads or reduce speed limits to reduce noise levels?
A: No. Both of these options may reduce noise levels, however, several factors must be considered. If the road is a main route into and out of a city, or if there are commercial and industrial businesses along the route, a prohibition of trucks would have adverse economic impacts. Interstates, US Routes, and State Routes are explicitly designed and designated as truck routes. Speed limits are established in and governed by ORC 4511.21.

27Q: How does dense trees/vegetation affect noise and can trees be planted to act as noise barriers?
A: According to FHWA, vegetation, if it is high enough, wide enough, and dense enough that it cannot be seen over or through, can decrease highway traffic noise. A wide strip of trees with very thick
undergrowth can lower noise levels. 30 meters of dense vegetation can reduce noise by five decibels. However, it is not feasible to plant enough trees and other vegetation along a highway to achieve such a reduction. Trees and other vegetation can be planted for psychological relief but not to physically lessen noise levels.

Vegetation can decrease highway traffic noise if it is high enough, wide enough, and dense enough that it cannot be seen over or through. A dense stand of vegetation, at least 100 feet thick with very thick undergrowth, is needed to have a noticeable difference in noise levels. However, while trees and other vegetation can act as a visual barrier between resident and the highway, space limitation, and costs make it not feasible to plant enough trees and other vegetation along a highway to achieve a such a noise reduction. According to studies, the removal of limited vegetation does not increase the noise levels discernable to the average human ear.

A study that was completed by the Virginia Research Council back in 2007 looked at the effect of trees on highway noise mitigation. The study concluded that there was minimal noise reduction that could be attributed to the trees. The studies also concluded that in order for a vegetation belt to reduce traffic noise it should be densely planted, with no windows to let noise through. Another study that was completed by the FHWA and CALTRANS concluded that observed noise reductions by vegetation ranged from 0 to 2.7 decibels and averaged 0.9 decibels. A change of 3 decibels or less is not discernable to the average human ear according to FHWA. A study by ODOT in September 2019 in Botkins Ohio concluded that a 250’ wide forested area immediately adjacent to an interstate with 2000 VPH and 33% trucks reduced noise by an average reduction of 3 decibels.

According to research, trimming or removal of shrubs or trees along highways by maintenance or construction does not cause perceptible noise level increases to nearby homes. The sudden visibility of highway traffic previously shielded visually by vegetation, and the possibility of a shift in frequencies, may bring on a renewed awareness of the presence of the traffic noise source.