

# Arkansas Department of Transportation



## Policy on Highway Traffic Noise Abatement

Effective Date: September 13, 2018

Arkansas Department of Transportation  
Policy on Highway Traffic Noise Abatement

Date of Issuance: April 15, 2011

Revision Dates: May 3, 2013; October 1, 2015, August 27, 2018

Effective Date: September 13, 2018

This policy document replaces the Arkansas Department of Transportation's (ARDOT) *Policy on Highway Traffic Noise Abatement* dated October 1, 2015.

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This policy complies with the Federal Highway Administration (FHWA) Noise Standard as outlined in the regulations contained in 23 CFR 772 "Procedures for Abatement of Highway Traffic Noise and Construction Noise" (Appendix A). Additional provisions were incorporated to insure this policy also complies with the NEPA requirements for noise analysis contained in 23 CFR 771.

If any portion of this policy conflicts with applicable federal laws or regulations, that portion shall be considered void. The remainder of this policy shall not be affected thereby and shall remain in full force and effect.

This policy has been reviewed and approved by the FHWA.

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## **1. INTRODUCTION**

During the rapid expansion of the Interstate Highway System and other roadways in the 20th century, communities began to recognize that highway traffic noise and construction noise had the potential to cause environmental impacts. In the 1972 Federal-aid Highway Act, Congress required FHWA to develop a noise standard for new federal-aid highway projects. While providing national criteria and requirements for all highway agencies, the FHWA Noise Standard allows flexibility for highway agencies to incorporate state-specific objectives into their highway traffic and construction noise policies. This policy contains the ARDOT criteria for defining highway traffic noise impacts; how noise abatement will be evaluated; and how noise abatement decisions will be made.

ARDOT is required to evaluate whether the predicted noise levels could result in highway traffic noise impacts as part of the general environmental review process associated with all federal Type I projects. If noise impacts are identified for federal-aid projects, the consideration of reasonable and feasible noise abatement measures is required. In most cases, projects requiring an Environmental Assessment (EA) or Environmental Impact Statement (EIS) will contain a noise analysis report; however, a noise analysis is required on all Type I projects. Noise impacts will be reported in EA, EIS, and Categorical Exclusion (CE) documents.

A glossary containing the acronyms and definitions of terms used in this policy can be found in Appendix C.

## 2. PURPOSE AND APPLICABILITY

This document describes the ARDOT policy for implementing the FHWA Noise Standard found in 23 CFR 772. The FHWA Noise Standard includes requirements for noise analysis, noise impact assessment and noise abatement evaluation, noise abatement criteria, and requirements for informing local officials. FHWA has given highway agencies some flexibility in implementing the Noise Standard, this policy describes the ARDOT approach to implementation.

Noise impacts are taken into consideration in the planning, location, design, and construction phases of highway project development. Decisions made during each of these phases attempt to minimize impacts from highway traffic noise on noise-sensitive areas.

This policy outlines the process that ARDOT will use to make decisions on highway traffic noise abatement and to justify the expenditure of public funds in the most cost-effective manner while addressing the total needs of the state's highway system.

This policy is not to be used for determination of compensation for damages on a land parcel during right-of-way negotiations.

This policy applies to all Type I (described below) federal highway projects in the State of Arkansas. A federal highway project is any project that receives federal-aid funds or is otherwise subject to FHWA approval. They include federal projects that are administered by Local Public Agencies as well as ARDOT.

Per 23 CFR 772, **Type I projects** are defined as:

- 1) The construction of a highway on new location; or,
- 2) The physical alteration of an existing highway where there is either:
  - a) Substantial Horizontal Alteration. A project that halves the distance between the highway traffic noise source and the closest receptor between the existing condition and the future "build" condition; or,

- b) Substantial Vertical Alteration. A project that removes shielding, therefore exposing the line-of-sight between the receptor and the highway traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,
- 3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a High-Occupancy Vehicle lane, High-Occupancy Toll lane, bus lane, or truck climbing lane; or,
- 4) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,
- 5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
- 6) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
- 7) The addition of a new or substantial alteration of a weigh station, rest stop, rideshare lot, or toll plaza.

If any part of a project is determined to be a Type I project under this definition, then the entire project area is a Type I project.

**Type II Project** - A federal or federal-aid highway project for noise abatement (not including roadway construction) on an existing highway. For a Type II project to be eligible for federal-aid funding, highway agencies must develop and implement a Type II program in accordance with 23 CFR 772.7(e). The ARDOT does not participate in Type II projects and therefore has no associated noise analysis requirements.

**Type III Project** - A federal or federal-aid highway project that does not meet the classifications of a Type I or Type II project. An example of a Type III project would be a bridge replacement project where the new bridge is replaced on the existing alignment or on an alignment that is not substantially different from the existing alignment. Type III projects do not require a noise analysis or consideration of noise abatement measures.



If there are any questions about whether a project is subject to this policy or the FHWA Noise Standard, contact the Division Head of ARDOT's Environmental Division at (501) 569-2281.

### **3. ANALYSIS OF HIGHWAY TRAFFIC NOISE IMPACTS**

#### **3.1. Qualifications Necessary to Conduct Noise Analysis**

Only qualified personnel can perform highway traffic noise analysis for ARDOT. Qualified personnel are those who have successfully completed training through a qualified provider in the area of highway noise analysis and the use of the FHWA-approved traffic noise modeling software, and who are proficient in the use of the latest version of that software.

Personnel must also have demonstrated experience in conducting noise analysis studies for highway transportation projects and must have a working knowledge of procedures outlined in this policy and 23 CFR 772, plus the relevant parts of FHWA's *Measurement of Highway-Related Noise* (FHWA Report Number FHWA-PD-96-046, 1996) and FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* (June 2010, revised December 2010).

The ARDOT advises consultants conducting noise analyses for the Department to work closely with the ARDOT Environmental Division.

#### **3.2. Highway Traffic Noise Analysis, Type I Projects**

Due to the long lead time needed to complete a highway traffic noise analysis, it is important to determine early in project scoping if a noise analysis will be necessary. An initial determination of a proposed project's need for a noise analysis should be made as soon as the project has been programmed and a preliminary field review has been conducted. While very little project information may be available at that time, conducting a screening level noise analysis may inform the design engineers that highway traffic noise could be of concern on the project. By considering traffic noise before there are draft or final plans, it may be feasible to shift the alignment, modify the design, or make other considerations to minimize or avoid traffic noise impacts.

For Type I projects, a highway traffic noise analysis is required for all build alternatives under detailed study in the NEPA process. If any segment or component of an alternative meets the definition of a Type I project, then the entire alternative is considered to be

Type I and is subject to the noise analysis requirements. Build alternatives are all reasonable alternatives that have been retained for detailed analysis in the CE, EA or EIS, and *not* rejected during the alternatives screening process. For a Tier I EIS or other studies that will examine broad corridors, the appropriate scope and methodology of the noise analysis should be discussed with FHWA and other participating agencies early in the project planning process.

A Type I highway traffic noise analysis consists of the following steps, which are described in more detail in subsequent sections of this policy:

- 1) Identify study area and receptors by land use Activity Category (as described in Section 4) and distance to the edge of the closest travel lane of the proposed project.
- 2) Do a screening level noise analysis for certain types of projects to see if further analysis is necessary.
- 3) Model existing and future “build” noise levels at identified receptors.
- 4) Determine traffic noise impacts.
- 5) Evaluate abatement feasibility and reasonableness if there are traffic noise impacts.
- 6) Address coordination with local officials, including simple modeling of a distance-based future “build” noise level out to 66 dB(A) for undeveloped Activity Category G lands.
- 7) Address construction noise.
- 8) Document findings in a traffic noise analysis report and summarize in a statement to be used in the environmental document.

### **3.3. Traffic Noise Analysis Reports**

Reports are used to document the procedures and results of noise analyses conducted for a project. The final product may include a Screening Level Noise Analysis Report, a Noise Study Report, and/or a Noise Abatement Report.

### Screening Level Noise Analysis Report

A Screening Level Noise Analysis Report documents the results of the screening analysis and the information is used to determine if further noise analysis is required. If impacts are noted, but abatement is clearly not feasible (e.g., driveway access, utility issues, etc.), noise impacts and the rationale behind the feasibility determination are included in a brief Screening Level Noise Analysis Report as an appendix of the NEPA document. A short description of the noise impacts is also included in the NEPA document. Examples of these may be obtained from the ARDOT Environmental Division.

### Noise Study Report

If noise impacts are identified and noise abatement may be feasible, a Draft Noise Study Report containing the technical components of the noise study and an initial analysis of noise abatement options is prepared. The noise study methods, data supporting the conclusions, and results are documented and used to inform the public, local officials, and noise specialists. Only those abatement measures that are preliminarily determined reasonable and feasible are carried forward for public input. The Final Noise Study Report incorporates and documents the design of the abatement measures and the input received during the public involvement process.

While the NEPA document will include a statement of likelihood for noise abatement, a Final Noise Report is not a requirement of the NEPA process.

The design and effectiveness of the noise abatement are verified throughout the design process. A reevaluation may require refinement of the noise study modeling to ensure the noise abatement placement and heights are correct and to meet the commitments in the NEPA document.

The ARDOT Environmental Division can provide consultants with example reports for use in the development of the Screening Level Noise Analysis Report and Noise Study Reports.

### Noise Abatement Report

After construction of noise abatement, an analysis of the effectiveness of abatement measures may be documented in a Noise Abatement Report. Included in the report are

the pre- and post- abatement noise levels and, if applicable, the impacts of reflected highway traffic noise to receptors opposite the abatement measure.

## 4. NOISE STUDY PROCEDURES

For noise modeling and abatement evaluation and design, ARDOT requires the use of the latest approved version of FHWA's Traffic Noise Model (TNM) or any other model acceptable to FHWA, pursuant to 23 CFR 772.9.

### 4.1. Highway Traffic Noise Impacts For Type I Projects

Highway traffic noise impacts may occur when either there is a substantial increase in noise as a result of the project (described in Section 4.2 and shown in Table 1); or when the predicted noise level at a receiver approaches or exceeds the Noise Abatement Criteria (NAC) (described in Section 4.3 and shown in Table 2). Approach is defined by ARDOT to be the one-hour equivalent sound levels ( $L_{eq}(h)$ ) that are 1 dB(A) or less below the NAC.

### 4.2. Substantial Increase

The ARDOT criteria for determining the severity of a noise level increase over existing noise levels are shown in Table 1. A 10 dB(A) or greater increase in highway traffic noise is considered a substantial increase and results in identification of noise impacts.

<b>Table 1 Noise Level Increase Rankings</b>	
<b>Increase in Existing Noise Levels (dB(A))</b>	<b>Ranking</b>
0 - 5	Minor Increase
6 - 9	Moderate Increase
10 or more	Substantial Increase

### 4.3. Land Use Activity Categories

FHWA selected seven different land use/activities and designated a NAC. These are designated as Activity Categories A through G, and are used to determine when noise impacts occur. The Activity Categories and their associated NAC are described and listed in Table 2. The NAC values are hourly equivalent A-weighted sound levels in decibels.

The NAC are for impact determination only; they are not design goals or design standards for noise abatement measures.

**Table 2  
Noise Abatement Criteria**

<b>Activity Category</b>	<b>Activity Criteria<sup>1</sup> Leq (h), dB(A)</b>	<b>Evaluation Location</b>	<b>Activity Description</b>
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B <sup>2</sup>	67	Exterior	Residential.
C <sup>2</sup>	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio stations, recording studios, recreation areas, Section 4(f) sites <sup>4</sup> , schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E <sup>2</sup>	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D, or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities, (water resources, water treatment, electrical), and warehousing.
G <sup>3</sup>	---	---	Undeveloped lands that are not "permitted".

<sup>1</sup> The Leq(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement.

<sup>2</sup> Includes undeveloped lands that have been permitted for this Activity Category.

<sup>3</sup> Indicates no building permits on or before the date of public knowledge.

<sup>4</sup> Section 4(f) property means publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance, as initially defined in Section 4(f) of the Department of Transportation Act of 1966 and addressed in 23 CFR 774, Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites (Section 4(f)).



**Activity Category A (lands on which serenity and quiet are of extraordinary significance and serve an important public need).** The ARDOT will submit justifications to FHWA on a case-by-case basis to designate any lands as Category A. Proposals and justifications for designating land as Category A will be submitted through the FHWA Arkansas Division Office to FHWA Headquarters.

**Activity Category B (exterior areas of residential lands).** This category also includes single family and multi-family residences and mobile home parks. The location for modeling or measuring noise is an exterior area of frequent human use such as a yard or patio, typically between the highway and the residence. When analyzing areas with multifamily dwellings, the analyst must identify all units predicted to experience highway traffic noise impacts. Only units with designated outdoor use areas, such as a patio or a balcony, will be modeled as a receptor. If a multifamily dwelling complex, such as an apartment complex, has an outdoor common use area, receptors for that area will be modeled as outlined for Community Activity Areas under Category C.

**Activity Category C (exterior areas of non-residential lands such as schools, parks, cemeteries, etc., as listed in Table 2).** Category C land uses are identified as either individual sites, such as buildings, or can involve properties with multiple areas of varied activity and usage, such as parks. Category C follows an activity focused theme, using associated facilities and related uses as the basis of identifying a receptor.

Parks and Recreation Areas – Parks range in size and amenities from neighborhood parks, to linear green belts accommodating drainages or trails, to large regional parks with multiple trails and outdoor use facilities. Recreation areas may also encompass multiple activity areas. Receptors will be located within the park or recreation area for each area with a discrete outdoor activity as conceptually defined under this section. If the park or recreational area has no discernable formal activity areas, as defined within this section, one receptor will be sited to represent typical highway traffic noise using best professional judgment and by consultation with the jurisdictional authority for the property.

Picnic Areas and Fire Pits – One receptor will be counted for each cluster of tables and/or fireplaces located in a single functional area.

Campgrounds – One receptor will be counted for each formal campsite or cabin capable of human occupation. Informal campsite areas located within formalized campgrounds will be counted as one collective receptor per separate functional area.

Pavilions – One receptor will be counted for each complex of tables, outdoor cooking facilities, covered pavilions, gazebos; etc. located in a single functional area.

Sporting fields – One receptor will be counted for each formalized sporting field inclusive of its associated seating, access, pathways, and/or stadium complex used to support the activities of the sporting field. Less formalized activity areas that are commonly utilized for informal sporting activity, such as grassy areas of a park or recreation area, will be counted as one receptor per area. The area must exhibit features that demonstrate common active use.

Golf Courses – One receptor will be placed within each hole (tee-off areas or fairway-green combination) of the golf course that best represents the worst expected highway traffic noise condition, based on professional judgment of the noise specialist. If other outdoor activity areas exist within the course such as practice areas, picnic facilities, restaurant outdoor area, etc., each area will be identified with a separate receptor.

Forests and Other Areas Officially Managed for Outdoor Recreational Activity – Federal lands generally have a management plan with defined outdoor activity use. Receptors will be located within the actively managed area boundary for each identified activity area as conceptually defined under this section. If the management area has no discernable activity areas (trails, camping facilities, picnic areas, etc.), as defined within this section, a minimum of one generalized receptor will be placed no closer than 50 feet from the edge of pavement within the management area that best represents the worst expected highway traffic noise condition, based on professional judgment of the noise specialist. Consultation with the local jurisdiction is recommended to best resolve these issues.

Trails – Trails will be assessed for independent utility of trail segments, stopping areas, and project crossings. Each segment of trail that has independent utility (connector segments, trail extensions, etc.) will be assigned one receptor. Stopping places along a trail, such as rest areas with benches or scenic viewing areas, and trail crossings of the

project will each be assigned a receptor. The receptor for each segment or project crossing will be placed on the trail no closer than 50 feet from the edge of pavement that best represents the worst expected highway traffic noise condition.

Community Activity Areas – Apartment and residential community common areas may include pools, ball courts, or other formalized outdoor activity areas. Each of these outdoor activity areas will be counted as one receptor.

Cemetery – One receptor will be counted for each formalized use area, inclusive of its associated seating, access, and pathways, used to support the activities of the area. Individual grave sites, access ways, and informal activity areas are not considered individually sensitive receptors; however, each section of the cemetery with informal gathering areas, as defined through consultation with the operator, will be assigned a receptor. If there are no formalized or operator-defined informal gathering areas, a generalized receptor that best represents the worst expected highway traffic noise condition, will be placed within the property based on professional judgment of the noise specialist.

Section 4(f) Sites – Section 4(f) sites encompass three types of sites – parks and recreation areas, wildlife refuges, and historic sites:

- ▶ Parks and Recreation Areas – Addressed above.
- ▶ Wildlife Refuges – Wildlife or wildfowl refuges or preserves typically have limited or no human activity area and thus will not be subject to noise analysis. However, on-site trails or observation areas will be considered under NAC Activity Category C as defined in this section.
- ▶ Historic Sites – For historic sites that have exterior areas with frequent human use (e.g., historic houses), one receptor will be counted for each site with such use. For historic sites without frequent human use, no noise analysis is necessary.

Noise impacts can result in a constructive use of a Section 4(f) site under Section 23 CFR 774.15. A constructive use occurs when noise levels have the potential to substantially interfere with the use and enjoyment of a noise-sensitive Section 4(f) site. Constructive

use of a Section 4(f) site due to noise impacts may require noise abatement separately from the abatement outlined in this noise policy.

**Activity Category D (interiors of certain Category C facilities).** This activity category includes the interior impact criteria for certain land use facilities listed in Activity Category C that may have interior uses. An indoor noise analysis will be conducted only after determining there are no exterior use areas. Interior noise levels will be evaluated for land uses when it has been determined that exterior noise abatement measures are not feasible and reasonable.

Unless an actual interior noise measurement has been taken, the interior building noise level predictions shall be calculated by subtracting noise reductions factors shown in Table 3.

<b>Table 3 Noise Reduction Factors</b>		
<b>Building Type</b>	<b>Window Condition</b>	<b>Noise Reduction Due to Exterior of the Structure</b>
<b>All</b>	Open	10 dB
<b>Light Frame</b>	Ordinary Sash (closed)	20 dB
	Storm Windows	25 dB
<b>Masonry</b>	Single Glazed	25 dB
	Double Glazed	35 dB
<p>The windows shall be considered open unless there is firm knowledge that the windows are in fact closed almost every day of the year. See FHWA-DP-45-1R, <i>Sound Procedures for Measuring Highway Noise: Final Report</i>            Source: FHWA A-HEP-10-025 <i>Highway Traffic Noise: Analysis and Abatement Guidance (2010)</i></p>		

Each structure generally will be considered one receptor for discrete areas of frequent human use such as libraries, public meeting rooms, etc. Hospital patient rooms or classrooms that lack air conditioning and must open windows to cool will be considered one receptor per room.

**Activity Category E (exteriors of developed lands that are less sensitive to highway noise, as listed in Table 2).** This category would consider noise impacts to commercially zoned properties with outdoor use areas such as benches, patios, pools, etc. These properties may have more than one outdoor use area (i.e. balconies for hotel rooms and/or pools). One receptor will be placed for each outdoor use area associated with exterior areas under Category E.

**Activity Category F (land uses that are not sensitive to highway traffic noise).** There is no noise abatement criterion for these land uses, and no highway noise analysis is required under 23 CFR 772.

**Activity Category G (undeveloped land that has not been “permitted” for development).** For land that has not been permitted for development by the date of public knowledge of the project, the future design year noise levels will be determined and documented in the appropriate noise analysis report. Federal participation in noise abatement measures will not be considered for Category G lands unless another future Type I project is planned adjacent to such lands.

If undeveloped land is determined to be permitted, the land will be assigned to the appropriate Activity Category and analyzed in the same manner as developed lands in that Activity Category.

#### **4.4. Analysis Locations**

Highway traffic noise analysis will be conducted for developed lands containing noise-sensitive land uses in Activity Categories A through E and for undeveloped land where development is permitted for uses that fall within Activity Categories B, C, and E.

#### **4.5. Analysis of Noise Impacts for Type I Projects**

##### **4.5.1. Identification of Study Boundaries, Noise Study Areas, and Receptors**

Project reports, available aerial photography and mapping, and a field review will be used to determine the project limits and noise study boundaries for confirmation by the ARDOT Environmental Division. Noise study boundaries typically extend 500 feet on either side of the proposed project, but can extend further if it is indicated by TNM that impacts are

possible beyond that point. Consideration should also be given to the potential for both benefits and impacts outside of the project limits caused by changes in traffic volumes and/or mix on other facilities due to traffic diversion or generation resulting from the proposed project.

All land uses within the noise study boundaries will be identified and assigned to the appropriate Activity Categories. It is usually beneficial on large projects to group land uses together into smaller noise study areas for the purposes of noise modeling and abatement evaluation. A typical noise study area is less than 1 mile long. Decision factors for dividing a project into noise study areas include:

1. Extent of individual neighborhoods or residential subdivisions.
2. Major terrain features such as hills, mountains and river crossings.
3. Location of large tracts of undeveloped lands.
4. Boundaries defining major changes in land use or traffic volumes/mix

Receptor locations are identified using the guidance in Section 4.3 for specific Activity Categories. On lands that are permitted for development, the filed plat is used to choose receptor locations representing the exterior areas of frequent human use. For residential plats, a determination is made if each lot represents a single-family or multifamily dwelling.

#### **4.5.2. Screening Level Noise Analysis Process**

A screening level noise analysis (screening analysis) can be used to determine if a more in-depth noise study is warranted and to inform design engineers of potential concerns related to structures that may need to support noise barriers. Screening analysis can identify projects that are unlikely to result in noise impacts, such as projects with low volume roadways, few or no receptors, or where abatement would not be feasible or reasonable. A screening analysis should be done on projects that are simple in nature, or on projects that have several alignments or cross-section alternatives to determine comparative noise levels. It should be conducted before preliminary roadway plans are completed. The screening analysis should include a review of recent aerial photography, city or county GIS sites, and/or data from the County Property Assessor.

If noise-sensitive land uses exist in the project area, a straight line model design using TNM should be used for the screening analysis. Validation of the straight line model is not required. A straight line model describes a worst-case scenario with higher sound levels than would be expected with more detailed modeling and represents a conservative approach to the noise analysis. The straight line model should be prepared for a screening analysis using the following procedures:

- 1) The model should use the existing and the future “build” condition traffic information, posted speeds, and project receiver distances from the roadway to determine ARDOT noise abatement approach criteria impacts in the future “build” condition. The existing condition is compared to the “build” condition to determine whether impacts due to sound level increases are expected. Traffic data, including existing and design year traffic volume information for certain vehicle classes, can be obtained through the ARDOT’s Transportation Planning and Policy Division.
- 2) Roadways should extend at least 1,500 feet beyond the final receiver perpendicular to the roadway on either side of the project.
- 3) Any relevant non-highway traffic noise sources (such as rail or airport noise) should be considered and may require sound level measurements.
- 4) No topography should be included in the model, only the roadway(s), receiver(s), and traffic information.
- 5) Project receptor locations must be used. They should, at a minimum, include receiver location(s) closest to the roadway and receptors placed at 50-foot increments from the roadway centerline to determine the distance that impacts extend. If the closest receptor to centerline is a Category E, then the closest Category B or C receptor within 500 feet of the roadway should also be examined.
- 6) If the screening analysis results indicate that noise impacts are likely and the placement of typical abatement measures appears to be feasible, a more detailed noise analysis is required. If the predicted sound levels are within 4 dB(A) of the noise abatement criteria for the identified noise-sensitive land use(s) or a substantial increase ( $\geq 10$  dB(A)) is determined, a more detailed noise analysis is needed. If impacts are noted and abatement is clearly NOT feasible (see Section

5.3), the screening procedures should suffice and a more detailed noise analysis is not required. The impacts and the rationale behind the feasible determination must be included in the NEPA document with a Noise Study Report or a Screening Level Noise Analysis Report, with supporting documentation attached. All requirements, including reporting requirements, of 23 CFR 772 must still be met.

#### **4.5.3. Determination of Existing Noise Levels**

For projects on new alignments, the worst hour existing noise levels (including non-highway traffic noise sources) are determined for developed land uses and activities by field noise measurements. For projects on existing alignments, existing noise levels are typically determined by modeling.

##### *4.5.3.1. Determination by Measurement*

Noise measurements should be obtained in accordance with the relevant procedures in FHWA's *Measurement of Highway-Related Noise*, FHWA Report Number FHWA-PD-96-046, 1996 (or current version). Noise measurement locations are typically a subset of all identified receptors, and are chosen to be acoustically representative of a grouping of similarly located receptors.

Noise measurements consist of three 15-minute measurements. Longer measurement times may be necessary for statistical accuracy.

Ideally, while ambient noise level measurements should be made during the worst noise hour, it may not always be practical to do so. On many rural or smaller widening projects, there may be a small number of scattered receptors, such that modeling of existing noise levels along the entire project may not be necessary. One approach is to make a longer-term measurement (that includes peak traffic periods and daytime off-peak periods) at one location close to the existing road, and use the results to determine the worst noise hour. During this longer-term measurement, shorter-term measurements may be made at other locations, and these levels can then be adjusted later to represent the worst hour noise based on the data at the longer-term measurement location.



#### 4.5.3.2. *Determination by Modeling*

For projects on existing alignments where there are many receptors and where impacts are expected, the modeling is validated by measurements.

The modeling of the existing noise levels is done for the worst noise hour. The worst noise hour may be determined in three ways:

- 1) By a longer term field noise measurement, as described above in Determination by Measurement.
- 2) By review of detailed traffic data.
- 3) By simplified modeling of the detailed traffic data using TNM, if it is not clear as to which hour in the worst noise hour.

In this and all modeling, vehicle classes include:

- 1) Automobiles – 2-axle, 4-wheel vehicles including pick-up trucks.
- 2) Medium trucks – 2-axle, 6-wheel vehicles and automobiles pulling trailers.
- 3) Heavy trucks – 3 or more axles.

Vehicle classes may also include motorcycles and buses.

Each travel lane, shoulder, and median should be modeled separately.

##### 4.5.3.2.1. Need for Model Validation When Predicting Existing Noise Levels

When model validation is needed, it is done by comparing measured noise levels with modeled noise levels using the same traffic volumes, mix, and speeds recorded during the field noise measurements. Model validation for existing noise levels does not have to be done for the worst noise hour.

Validation of the model for predicting existing noise levels along an entire project is done at enough points to be representative of the affected neighborhoods. Consultants should coordinate with the ARDOT Environmental Division regarding model validation.

Three measurements of at least 15 minutes in length are made at each measurement location. The measurements may be consecutive or done at different times of the day. The measurements do not have to be during the worst noise hour, and should not be made during periods of slow-moving traffic congestion. This methodology is consistent with FHWA's *Measurement of Highway-Related Noise*, FHWA Report Number FHWA-PD-96-046, 1996 (or current version) and supplemented by professional judgement.

Directional traffic classification counts of the five TNM vehicle types (Automobiles, Medium Trucks, Heavy Trucks, Buses, and motorcycles) are made during each measurement. Average travel speeds in each direction, for each vehicle type, and for each measurement are also determined. Pavement type is noted and used in TNM for validation purposes.

A TNM run of the existing conditions for each noise study area is made on each validation location. Separate modeling runs are made for each measurement at each validation location using the traffic data collected during that measurement with traffic counts factored up to hourly volumes.

For the TNM run of a noise study area to be considered valid, two of the three modeled levels at each validation location must be within  $\pm 3$  dB(A) of the corresponding measured levels. If the difference between the two values is greater than  $\pm 3$  dB(A), the input parameters of the model should be reexamined.

The accuracy of the user-supplied traffic parameters can affect the final noise level prediction. Background noise and noise from other roadways may contribute to measured noise levels which are not modeled in TNM. If refinement of the model input does not resolve the discrepancies, contributions from noise sources other than the road during the measurements may be combined logarithmically with predicted noise levels in order to calibrate the model.

TNM does not currently incorporate the existing background noise levels in its results. The "Existing Level" that can be input for each receiver is only used to determine the "Increase over Existing" in the results table. To account for background noise in TNM, it must be added externally. First, determine or measure the appropriate background noise

levels. In many cases, the background level can be measured in the same or similar neighborhood at a distance from the roadway where the highway traffic noise is not heard. TNM's predicted levels can then be logarithmically combined with the background noise level in a separate spreadsheet using the following equation:

$$L_{adj.} = 10 \times \log_{10} (10^{(L_{TNM}/10)} + 10^{(LB/10)})$$

Where:

LTNM = TNM-generated sound pressure levels (dB(A)), and  
LB = Background noise level (dB(A)).

Noise levels from other roadways can be added in the same manner.

Further adjustments to the TNM model or input parameters should be discussed with ARDOT prior to incorporation into the model.

If a measured/modeled difference remains greater than  $\pm 3$  dB(A) after revision of the model, the discrepancy is noted in the Noise Study Report. Reasons for discrepancies may include contributions from noise sources other than the road during the measurements, atypical vehicle noise emission levels during the measurements, specific pavement conditions not in the model (tining, grooving, excessive roughness or wear, etc.), meteorological effects, or difficult-to-model terrain or ground characteristics.

#### **4.5.4. Prediction of Future “Build” Noise Levels**

“Build” condition noise predictions are made for the design year traffic conditions representing the worst noise hour (generally, Level of Service C or D, with the highest heavy truck volumes). In urban areas, rush hour may not represent the worst noise conditions (e.g., speeds may be low and heavy truck volumes may drop as truck drivers try to avoid congestion). ARDOT obtains design year Average Daily Traffic (ADT) and design hourly volume from the Transportation Planning and Policy Division, including percentages of medium trucks and heavy trucks. If buses and motorcycles are also being included in the modeling, obtain volume data for them as well.

Where appropriate, take into account seasonal variations in traffic volumes, such as using data from summer months; consult with the ARDOT Environmental Division for guidance.

When predicting future noise levels, the analyst needs to account for any loss of shielding of the roadway due to topography, buildings, or vegetation that may be removed during construction of the project. Alteration of physical shielding, such as a hill, may significantly change noise levels for receptors. Removal of vegetation, while it will generally have little effect on noise levels, may affect the residents' perception of the noise levels.

For design year modeling, use only the "average" pavement type within TNM. Consultants should coordinate with the ARDOT Environmental Division with questions on the modeling of other TNM input parameters.

#### **4.5.5. Determination of Highway Traffic Noise Impacts**

For Type I projects, noise impacts must be determined for all Activity Category A-E land uses. Impacts occur when a proposed project results in a substantial noise increase, or when the predicted design year noise levels approach or exceed the NAC.

As defined in Section 4.2, a "Substantial Noise Increase" occurs when a design year noise level is predicted to increase 10 or more dB(A) above the existing noise levels for Categories A-E. A substantial noise increase is independent of the absolute noise level. A substantial noise increase is a noise impact, even if the future noise level is lower than the NAC.

Approach means that a design year noise level is predicted to be 1 dB(A) below the NAC shown for Activity Categories A-E in Table 2.

Noise abatement measures for Type I projects will be examined and evaluated when either or both of these conditions are met.

There is a major difference between NEPA and 23 CFR 772 requirements for determining highway traffic noise impacts. Under NEPA, a proposed alternative is compared with the baseline condition, called the No-action Alternative, to determine whether highway traffic noise impacts will occur. The proposed project causes an impact when it changes the noise level compared to the No-action Alternative. Changes that are less than 3 dB(A) may be considered negligible or unimportant under NEPA because they are barely perceptible. The absolute noise level, however, may be important to consider if it reaches

or exceeds the level of speech interference (i.e., the NAC for that land Activity Category). **ARDOT requires analysis of the No-action and comparison to existing and/or future noise levels to satisfy NEPA, although 23 CFR 772 does not require analysis of the No-action scenario.**

A highway traffic noise analysis based on NEPA requirements may also be necessary in the extremely rare instance where the project itself is expected to create a highway traffic noise impact (e.g., side slopes are flattened as part of a project to improve an intersection and the resultant highway traffic noise levels approach or exceed the NAC and are at least 3 dB(A) greater than existing).

Discussion of impacts is grouped by noise study areas. Impacts are identified by receptor type; address; Activity Category; number of residential dwelling units or other quantification of the existing activities if non-residential; existing and future noise levels; and type of impact (substantial noise increase and/or approaching or exceeding the NAC).

#### *4.5.5.1. Determination of Future Noise Levels on Undeveloped Lands*

Design year noise levels based on design hourly volumes need to be predicted for Activity Category G lands (undeveloped lands that have not been permitted for development). At a minimum, this analysis will report the distance from the proposed edge of the near travel lane out to where a noise level of 66 dB(A) is modeled to occur. These noise levels are provided to local public governments to assist them in their planning in order to prevent highway traffic noise impacts at future developments along highways. Creation of noise contours for undeveloped lands will be performed on an individual project basis. The results will be provided, along with a letter of explanation, to the appropriate Arkansas Planning and Development District. If the noise analysis is conducted by a firm under contract to ARDOT, submit the letter to the ARDOT Environmental Division for review and approval. Noise contours may only be used for project alternative screening or for land use planning purposes, and *not* for determining highway traffic noise impacts.

## **5. ANALYSIS OF NOISE ABATEMENT MEASURES**

Depending upon the date of public knowledge of the project and the Activity Category of the receptors, noise abatement measures are to be considered when highway traffic noise impacts have been identified through the noise analysis process.

### **5.1. Date of Public Knowledge**

The date of public knowledge of a proposed transportation project is used to determine if noise abatement should be considered as part of the project. This date is when the project's environmental analysis and documentation is approved (i.e., the date of approval of the CE, FONSI, or ROD). Abatement will only be considered if the receptor was developed or permitted for development before the date of public knowledge.

After the date of public knowledge, reevaluation of highway traffic noise impacts will only be completed if the project is re-designed and results in the potential for additional traffic noise impacts that were not evaluated in the original environmental process.

### **5.2. Abatement Considerations**

For Type I Projects, noise abatement will be evaluated when highway traffic noise impacts are predicted for Activity Categories A-E. When impacts are identified, every effort will be made to mitigate those impacts during highway design first. When those options are exhausted, noise barrier walls and/or berms will be evaluated. Noise abatement measures must be feasible and reasonable, as defined in Sections 5.3 and 5.4.

Use of alternative pavements or alternative texturing on concrete pavements is not a FHWA-approved noise abatement measure for federal-aid projects. In areas where noise abatement is not being pursued because the abatement does not meet the requirements of reasonableness or feasibility, alternative pavements may provide some noise benefits. Consultants should contact ARDOT for information on alternative pavements, including issues related to rumble strips.

Landscaping is also not a FHWA-approved noise abatement measure for federal-aid projects because it takes thick stands of vegetation of over 100 feet in width to achieve a noise reduction of 5 dB(A).

Abatement for Activity Category D public use or institutional structures can be provided by insulation, storm windows, air-conditioning, ventilation, or a combination of these measures. Post-installation maintenance and operational costs for these measures are not eligible for Federal-aid funding. ARDOT will not consider insulation of residences as noise mitigation.

### **5.3. Feasibility**

Noise abatement measures must be both feasible and reasonable. Feasibility deals primarily with the acoustical and engineering considerations of the project that affect whether a substantial noise reduction can be achieved.

Careful evaluation is needed regarding barrier placement, taking into consideration acoustics and highway design parameters. Acoustically, the best locations for barriers are usually either close to the receiver, or close to the noise source, depending on the terrain.

In order for the noise abatement measure to be acoustically feasible, a minimum of 5 dB(A) reduction in design year highway traffic noise levels must be achieved for at least one impacted receiver.

If significant, non-highway noise sources exist in the project area, such as rail lines or airports, noise barrier effectiveness may be compromised. A careful evaluation of such situations will be completed to determine if a noise barrier is feasible and reasonable for the highway noise sources.

Feasibility may also be affected by: (1) topography; (2) access and utility requirements; (3) drainage; (4) safety and maintenance considerations; (5) the presence of local cross streets; (6) the excessive height/length of barrier needed to reach reduction goal; etc. Safety and maintenance considerations, such as severe drainage problems or flood-prone areas, may dictate whether or not a noise barrier is feasible. If there are existing access points and/or driveways on the highway, it is typically not feasible to construct effective noise barriers due to impacts on sight distance and/or access.

From a highway safety standpoint, ARDOT's preference is to place noise barriers outside of the highway clear zone; however, there are cases (e.g. fill situations) where this is not feasible. If the barrier is constructed in the clear zone, the barrier can be built on top of a jersey type barrier (other methods of crash protection may also be viable).

Feasibility of noise abatement will be evaluated related to the factors described above along with other considerations that may arise including, but not limited to, environmental impacts and ROW acquisition. Feasibility determinations will be based on best engineering practices and will be justified in the noise analysis outlining the specific reasons noise abatement was found to be feasible or not.

## **5.4. Reasonableness**

The reasonableness evaluation involves an examination of costs, public support, and whether a certain amount of noise reduction can be achieved. Noise abatement will only be assessed where noise impacts are predicted and where frequent human use occurs. Primary consideration will be given to exterior areas. For reasonableness determinations where sensitive receptors (Category B or C – residential, parks, churches, etc.) are transitioning to non-sensitive uses (Category E – commercial, industrial, etc.), the sensitive receptors will be analyzed as Category C and these areas will be reanalyzed when any reevaluations of the environmental documentation are required.

### **5.4.1. Mandatory Reasonableness Factors**

Three reasonableness factors must be met for a noise abatement measure to be considered reasonable.

- 1) Noise reduction design goal of a minimum of 8 dB(A) reduction in design year highway traffic noise levels for at least one benefited receiver.
- 2) Cost effectiveness is achieved when the cost of the noise abatement measure is no more than \$36,000/benefited residence. Benefited is defined as a minimum decrease in noise levels of 5 dB(A).
- 3) Viewpoints of the property owners and residents identified as benefited receptors will be collected. Two attempts (meetings, mail surveys, or other) will be made to



establish a consensus (greater than 50%) of support for or against the proposed noise abatement. If a consensus is reached before the second attempt, the efforts to collect viewpoints will be discontinued. If a consensus is not obtained after the second attempt, ARDOT will determine the appropriate abatement measure.

In order to track viewpoints and determine when a consensus is reached, each residence or property owner identified as a benefited receptor will be assigned one vote so that the total amount of votes available will equal the amount of benefited receptors. If a property owner does not occupy a benefited residence, the occupant will be allowed to submit 0.5 vote and the owner submit 0.5 vote. A consensus is reached when the amount of votes either for or against the proposed noise abatement is greater than 50% of the total votes available.

## **5.5. Commercial and Industrial Property Considerations**

Retail, office, and other commercial or industrial properties are typically located adjacent to highways for transportation access, and/or because of the high visibility to passing traffic. Commercial/industrial property owners and operators may therefore be less amenable to noise barriers that could reduce or eliminate visibility. Conflicts related to noise barrier placement can occur when noise-tolerant commercial/industrial properties are located in mixed use areas or are adjacent to noise-sensitive land uses (e.g., residential). While ARDOT will consider commercial/industrial interests in maintaining visibility from the highway, property owners and operators without impacted outdoor use areas are not allocated any votes and, therefore, do not participate in the voting process. Nonetheless, commercial/industrial property owners and operators should be surveyed to determine if they have concerns about potential adverse impacts of noise barriers (e.g., decreased visibility, access, or safety factors).

Because noise barriers are intended to benefit areas of frequent human use, it is acceptable to give less consideration for abatement in mixed use areas and areas where existing local plans call for zoning changes to less noise sensitive uses. A change in the

noise barrier design related to concerns from these owners/operators may be considered if the following criteria are met:

- 1) A mutually satisfactory compromise could not be reached between the residential property owners and the commercial/industrial property owners and operators, and all other options that could mitigate impacts on the commercial/industrial properties (additional signage, wall enhancements such as clear panels, etc.) were found to be cost prohibitive or not acceptable.
- 2) The noise barrier length will not be reduced past the property boundary between commercial/industrial and residential properties.
- 3) The remaining noise barrier should still meet reasonable and feasible criteria.

In areas of residential and commercial/industrial land use, coordination with the local land use authority should occur to determine expected future land uses of properties under consideration for noise barriers.

## **5.6. Third Party Funding**

For Type I federal-aid projects, third party funding cannot be used to reduce the cost of the noise barrier in order to meet the reasonableness criteria. Third party funding can only be used for noise barriers already determined to be feasible and reasonable to pay for additional features such as landscaping, aesthetic treatments, and functional enhancements, such as sound-absorbing treatment and access doors.

## **5.7. Sound-Absorbing Noise Barrier Treatments**

The addition of sound-absorbing treatment to noise barriers or the use of integrated sound-absorbing barrier systems is sometimes necessary to reduce potential sound level increases due to reflections across from a single noise barrier wall or behind parallel noise barrier walls on either side of a road or ramp. Analysis of the need for and effectiveness of sound absorption should generally be done using the TNM program.

ARDOT's standard practice is to analyze the need for sound absorption when parallel barriers are proposed and the width to height ratio is less than 20:1. Use of sound absorption will be considered when there are modeled increases in the levels of more than 2 dB(A) behind one or both of the walls due to reflections at one or more of the receptors, and when the sound absorption will reduce the increases to less than 1 dB(A).

For single barriers, sound-absorbing materials will be analyzed in these cases:

- 1) A bike/pedestrian path is proposed for the highway side of a barrier.
- 2) Activity Category A - E receptors are across the roadway from the wall.
- 3) A frontage road is between the noise barrier and the receptors.

Use of sound absorption will be considered when there are modeled increases in the levels of more than 2 dB(A) due to reflections, resulting in a "with reflections" level of at least 64 dB(A), and when the sound absorption will reduce the increases to less than 1 dB(A).

## **6. INFORMATION REQUIRED FOR A NEPA DECISION**

Accurate and complete documentation of the noise analysis and any decisions to provide noise abatement is essential. The Noise Study Report for a Type I project is a stand-alone document. A brief summary section is prepared to be included in the body of the NEPA document.

For a Type I project, it must be documented during the NEPA process if noise abatement is recommended or not. Decisions to provide or not provide noise abatement will be well-explained and defensible. Prior to CE approval or issuance of a FONSI or ROD, the following will be identified in the NEPA documentation:

- 1) Locations where noise abatement measures that are feasible and reasonable, and are likely to be incorporated into the project.
- 2) Noise impact locations for which no abatement appears to be feasible and reasonable.
- 3) A statement of likelihood since feasibility and reasonability determinations may change due to changes in project design or noise abatement costs after approval of the environmental document. A statement of likelihood will include the preliminary location and physical description of noise abatement measures determined feasible and reasonable in the preliminary analysis, and that final recommendations on the construction of abatement measure(s) is determined after completion of the project's final design and public involvement process.

The Noise Study Report will have a description of each abatement measure considered; a discussion of the anticipated costs, problems, and disadvantages associated with that measure; and a discussion of the anticipated benefits. The discussion will encompass the reasonableness and feasibility of noise abatement. While the worksheet in Appendix B can provide guidance in the decision making process, careful explanation and consideration of all the applicable criteria that provide the best, most defensible decision is needed in the report and environmental document.

FHWA will not approve Type I project plans and specifications unless feasible and reasonable noise abatement measures that will reduce the noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted, are incorporated into the plans and specifications.

If the noise abatement is determined feasible and reasonable, then an abatement recommendation is made by the Interdisciplinary Staff (a multidisciplinary team of ARDOT and FHWA representatives) to the ARDOT Chief Engineer for the final decision. The ARDOT decision will be based on careful consideration of the criteria described in this section of the policy.

For design-build projects, the preliminary technical noise study provides details for all considered and proposed noise abatement measures for inclusion in the NEPA document. Design of design-build noise abatement measures is based on the preliminary noise abatement design developed during the noise analysis, and reevaluated during the project's final design. Noise abatement measures are considered, developed, and constructed in accordance with this standard and in conformance with the provisions of 40 CFR 1506.5(c) and 23 CFR 636.109.

## **7. INVENTORY AND REPORTING OF ABATEMENT MEASURES**

All state highway agencies are required by FHWA to maintain an inventory of all constructed noise abatement measures, and provide that information to FHWA on a periodic basis. The inventory parameters are listed in 23 CFR 772.13(f). ARDOT will compile the data in a spreadsheet on an ongoing basis as abatement measures are implemented.

## 8. INFORMATION FOR LOCAL OFFICIALS

Highway traffic noise must be reduced through a program of shared responsibility. Local governments can use their authority to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or that developments are planned, designed, and constructed in such a way that noise impacts are minimized, such as in noise mitigated developments.

It is ARDOT's policy to furnish the results of Type I highway traffic noise analyses to local government officials. The results will include the distances from the proposed edge of the traveled way to where a design year noise level of 66 dB(A) is predicted to occur.

Local officials should be made aware of their non-eligibility for federal-aid participation for a Type II project as described in 23 CFR 772.15(b).

Information on planning neighborhoods that are compatible with the highway environment can be found in these references:

- *Noise Compatible Planning (USDOT FHWA):*  
[http://www.fhwa.dot.gov/environment/noise/noise\\_compatible\\_planning/](http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/)
- *Highway Traffic Noise: Analysis and Abatement Guidance (USDOT FHWA, June 2010, revised 1/2011):*  
[http://www.fhwa.dot.gov/environment/noise/regulations\\_and\\_guidance/analysis\\_and\\_abatement\\_guidance/guidancedoc.pdf](http://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/guidancedoc.pdf)
- *Entering the Quiet Zone: Noise Compatible Land Use Planning, (USDOT FHWA, 2002):*  
[http://www.fhwa.dot.gov/environment/noise/noise\\_compatible\\_planning/Federal\\_approach/land\\_use/index.cfm](http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/Federal_approach/land_use/index.cfm)
- *The Audible Landscape (USDOT FHWA, 2001):*  
[http://www.fhwa.dot.gov/environment/noise/noise\\_compatible\\_planning/Federal\\_approach/audible\\_landscape/index.cfm](http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/Federal_approach/audible_landscape/index.cfm)

Following each revision, copies of this policy are provided to all planning organizations, through email, web links and hard-copy.



## 9. CONSTRUCTION NOISE

Construction of a highway project may cause localized, short-duration noise impacts. Construction noise can annoy people living in the area. Analysis and mitigation of construction noise impacts will be addressed on a project-by-project basis for all Type I projects.

At a minimum, for all Type I projects, the ARDOT will:

- 1) Identify land uses or activities that may be affected by noise from construction of the project. The identification is to be performed during the project development studies.
- 2) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination includes a weighing of the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.
- 3) Incorporate the needed abatement measures in the plans and specifications.

Based on the evaluation of potential adverse construction noise impacts, the analyst may need to prepare special provisions for control of noise impacts during project construction (e.g., use of adequate mufflers on construction equipment, limiting work to daylight hours in residential or other noise-sensitive areas, responding to noise complaints). If needed, the ARDOT Environmental Division will submit the special provisions to the design team for incorporation in the project plans.

Local noise ordinances may prohibit construction activity between certain times of the day, or there may be other restrictions imposed on the contractor. Contractors are required to comply with all applicable regulations governing equipment source levels and noise resulting from construction site activities for Type I projects. Alternately, the contractor may seek a variance to operate outside the local noise ordinance.

The following techniques can be used to reduce construction noise impacts:

- 1) Place stationary noise sources as far from sensitive receptors as possible.

- 2) Use portable noise barriers or take advantage of natural terrain features between the noise source and sensitive receptors to provide shielding.
- 3) Turn idling equipment off.
- 4) Drive equipment forward instead of backward whenever possible; lifting instead of dragging materials; and avoid scraping or banging activities by substituting quieter hand methods, if possible.
- 5) Confine work that does not have to be done at night to daylight hours. When work must be done at night, complete the noisiest work as early as possible.

Construction noise can be further reduced through the use of properly sized and maintained mufflers, engine intake silencers, less obtrusive backup alarms, engine enclosures, noise blankets, and rubber linings. Additional information can be found in 23 CFR 772.19 and the FHWA Highway Construction Noise Handbook on the FHWA web site at: [http://www.fhwa.dot.gov/environment/noise/construction\\_noise/handbook/](http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/)

While construction noise modeling is rarely done for Type I noise studies, a program is available for predicting noise levels from various types of equipment and construction activities. The FHWA Roadway Construction Noise Model (FHWA RCNM) is available on the FHWA web site at:

[http://www.fhwa.dot.gov/environment/noise/construction\\_noise/rcnm/](http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/).

Local ordinances may restrict nighttime construction noise levels or high noise levels on the weekend or holidays. Where such restrictions exist or where public concerns are known, construction noise studies may be used to quantify the anticipated noise levels and to recommend measures to reduce construction noise. Consultants should seek permission from the ArDOT Environmental Division before conducting construction noise modeling.

## **10. UPDATES TO POLICY**

Revisions to the policy will be made as needed. Additional copies of the policy can be obtained by telephoning or writing to:

Environmental Division - Noise Specialist  
Arkansas Department of Transportation  
P.O. Box 2261  
Little Rock, AR 72203-2261  
501-569-2281

# APPENDIX A - 23 CFR 772

**APPENDIX B - NOISE ABATEMENT RECOMMENDATION  
WORKSHEET**

<b>NOISE ABATEMENT WORKSHEET</b>		
<b>FEASIBILITY</b>		
	Yes	No
Can a 5 dB(A) Leq (h) noise reduction be achieved for at least one impacted receptor?		
<b>REASONABLENESS</b>		
	Yes	No
Can an 8 dB(A) Leq (h) noise reduction be achieved for at least 1 benefited receptor?		
Is it cost effective?		
Is there consensus by residents in favor of abatement?		
Additional Considerations		
<b>DECISION</b>		
	Yes	No
Are noise abatement measures feasible?		
Are noise abatement measures reasonable?		
Will a noise barrier be constructed at this site?		

REASONS FOR DECISION: \_\_\_\_\_

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## APPENDIX C - GLOSSARY

### ACRONYMS USED IN THIS DOCUMENT

#### Acronym

ADT	Average Daily Traffic
ARDOT	Arkansas Department of Transportation
ANSI	American National Standards Institute
CE	Categorical Exclusion (as defined in 23 CFR Part 771, Environmental Impact and Related Procedures)
CFR	Code of Federal Regulations
dB	Decibel
dB(A)	Decibel when referring to an A-weighted sound level
EA	Environmental Assessment (as defined in 23 CFR 771)
EIS	Environmental Impact Statement (as defined in 23 CFR 771)
FHWA	Federal Highway Administration
LOS	Level of Service
Leq	Equivalent sound level in dB(A)
Leq(h)	1-hour equivalent sound level in dB(A)
NAC	Noise Abatement Criterion
NEPA	National Environmental Policy Act
TNM	Traffic Noise Model

## DEFINITIONS

**A-Weighted Sound Level (dB(A))** - The sound level in decibels measured with a frequency weighting network corresponding to the A-scale on a standard sound level meter. The A-scale tends to suppress lower frequencies (below 1,000 hertz) and higher frequencies (above 6,000 hertz), and best approximates the sound as heard by the normal human ear. It is the most widely used weighting system for assessing transportation-related noise.

**Abatement** - Measures used to reduce highway traffic noise levels. The use of quieter pavements and the planting of vegetation are not acceptable federal-aid noise abatement measures for federal projects.

**Acoustical Feasibility** - A minimum reduction in highway traffic noise levels of at least 5 dB(A) at one receptor.

**Acoustically Representative** - A receptor location that represents the same type and magnitude of noise as another location. For good acoustical representation, the roadway geometry, topography, traffic flow, and distance from source to receptor should all be nearly the same and comprise a common noise environment.

**Activity Category** - The various activity categories are defined in Table 2 of this policy.

**Approach** - One-hour equivalent sound levels that are 1 dB(A) or less below the levels shown in Table 2 of this policy.

**Benefited Receptor** - The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dB(A) regardless of whether the receptor is "impacted".

**Common Noise Environment** - A group of receptors within the same Activity Category in Table 2 that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources such as interchanges, intersections, or crossroads.

**Date of Public Knowledge** - The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact, or the Record of Decision, as defined in 23 CFR part 771.

**Decibel (dB)** - A unit of sound pressure level which denotes the ratio between two sound pressures; the number of decibels is 10 times the base 10 logarithm of this ratio. The reference level is 20 MicroPascals, or the threshold of human hearing.

**Design Year** - The future year used to estimate the probable traffic volume for which a highway is designed, typically 20 years.

**Existing Noise Levels** - The worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

**Feasibility** - One of two criteria (also see "Reasonableness") used to evaluate a noise abatement measure. The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure. Feasibility deals with engineering considerations and the ability to achieve a substantial noise reduction.

**Impacted Receptor** - The recipient of a highway traffic noise impact as defined in 23 CFR 772.

**L10** - The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration, with L10(h) being the hourly value of Leq.

**Leq** - The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

**Multifamily Dwelling** - A structure containing more than one residence. Each residence in a multifamily dwelling will be considered as one receptor when determining impacted and benefited receptors.

**Noise Abatement Criteria (NAC)** - The Noise Abatement Criteria are shown in Table 2 of this policy.



**Noise Barrier** - A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level, including stand-alone noise walls, noise berms (earth or other material), and combination berm/wall systems.

**Noise Contour** - A line on a map representing points of equal sound level, similar to contour lines on a topographic map.

**Noise Level** - Unless otherwise indicated, "Noise Level" as used in this policy refers to the worst hour Leq(h).

**Noise Reduction Design Goal** - The desired noise level reduction determined by calculating the difference between future "build" noise levels with and without abatement. For ARDOT, the noise reduction design goal is 8 dB(A) at a minimum of one receptor.

**Permitted** - A definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit on or before the date of public knowledge. For areas where building permits and zoning do not exist, "Permitted" is considered as the date at which a developer has shown a definite interest to develop the land within a reasonable period of time and the plans have been designed and platted by a Registered Professional Engineer and on file with city or county authorities (circumstances such as these will be examined on a case-by-case basis).

**Property Owner** - An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

**Reasonableness** - One of two criteria (also see "Feasibility") used to evaluate a noise abatement measure. The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure. Reasonableness weighs the amount of required noise barrier area against the benefits that would be provided by the barrier.

**Receiver** - A modeling point in FHWA's Traffic Noise Model (TNM) at which sound levels are predicted.

**Receptor** - A discrete or representative location, such as a residence, on any of the land uses listed in Table 2 at which impacts are assessed. A receptor does not necessarily need to be a modeled receiver in TNM or a field noise measurement point.

**Residence** - A dwelling unit that is either a single-family residence or each dwelling unit in a multifamily dwelling.

**Statement of Likelihood** - A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

**Substantial Noise Increase** - An increase in noise levels of 10 or more dB(A) over the existing noise level for an ARDOT Type I project.

**Traffic Noise Impact** - Design year “build” condition noise levels that create a substantial noise increase over existing noise levels; or design year “build” condition noise levels that approach or exceed the Noise Abatement Criteria (NAC) listed in Table 2 for the future “build” condition.

**Type I project** - A project that involves the construction of a highway on new alignment or a significant change in the horizontal or vertical alignment of an existing highway; or adding new through lanes to an existing highway.

**Type II project** - A federal or federal-aid highway project for noise abatement (not roadway construction) on an existing highway.

**Type III project** - A federal or federal-aid highway project that does not meet the classifications of a Type I or Type II project.

**Worst Noise Hour** - A period of 60 minutes throughout a 24-hour day that reflects the noisiest hour resulting from the maximum amount of traffic traveling at the greatest speed. Sometimes the worst noise hour may be when the vehicle mix is dominated by truck traffic, not necessarily a high volume of automobile traffic.