

OKLAHOMA DEPARTMENT OF TRANSPORTATION

POLICY DIRECTIVE		NO. <u>C-201-3</u>	
SUBJECT HIGHWAY NOISE ABATEMENT		PAGE NO <u>1 of 22</u> DATED <u>07-13-11</u>	
EFFECTIVE DATE 07-13-2011	ISSUED BY: Deputy Director-Planning	APPROVED Director - § Gary M. Ridley	
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POLICY

THE DEPARTMENT IS RESPONSIBLE FOR CONDUCTING NOISE STUDIES FOR FEDERALLY ASSISTED HIGHWAY CONSTRUCTION PROJECTS AND SHALL DEVELOP, REVIEW AND APPROVE ANY NOISE ABATEMENT MEASURES DETERMINED NECESSARY FOR HIGHWAY CONSTRUCTION PROJECTS.

APPLICABILITY

The Department will conduct or direct noise studies on Type 1 federal aid projects (as defined in this policy directive) including local public agencies' projects. This policy directive constitutes the Oklahoma Department of Transportation policy on highway traffic noise and construction noise and describes the implementation of the requirements of the Federal Highway Administration (hereinafter FHWA) Noise Standard at 23 Code of Federal Regulations (CFR) Part 772 as they relate to federal aid highway construction in Oklahoma. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the ODOT approach to implementation. This policy shall be applied uniformly and consistently to all federal aid projects throughout the state.

DEFINITIONS

Benefitted Receptors - All receptors, impacted and non-impacted, which, by placement of the noise abatement measure, receive a minimum noise level reduction at or above 5 dB(A).

Categorical Exclusion (CE) - Categorical exclusion means a category of actions which do not individually or cumulatively have a significant effect on the human environment and for which neither an environmental assessment nor an environmental impact statement is required.

Common Noise Environment - A group of receptors within the same Activity Category in Table 1 that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and

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speed; and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections, cross-roads and may be modeled using representative receivers.

Date of Public Knowledge - The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), or the Record of Decision (ROD), as defined in 23 CFR 771. After this date, local governments are responsible for noise compatible land use planning, and ODOT is not responsible for noise impacts occurring after this date.

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

Environmental Assessment (EA) - A concise public document that serves to briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI), to aid an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary, and to facilitate preparation of an EIS when one is necessary.

Environmental Impact Statement (EIS) - A full disclosure document that details the process through which a transportation project was developed, includes consideration of a range of reasonable alternatives, analyzes the potential impacts resulting from these alternatives, and demonstrates compliance with other applicable environmental laws and executive orders. An EIS is required for major actions that significantly affect the quality of the human environment.

Existing Noise Levels - The highest noise level over an hour that is resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Finding of No Significant Impact (FONSI) - When applicable, the conclusive determination after completion of the Environmental Assessment process that a highway project will not create any significant environmental impacts.

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.

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Leq(h) - The equivalent sound level for a one-hour period of time.

Multi-Family Dwelling - A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefitted receptors.

NEPA - National Environmental Policy Act of 1969, which establishes the basic national policy for protection of the environment during the development of federal actions. It provides an interdisciplinary framework to ensure that decision-makers adequately take the human and natural environmental factors into account.

Noise - Any unwanted sound.

Noise Abatement - Type of attenuation, such as an earthen berm or solid-mass wall, used to reduce traffic noise levels.

Noise Abatement Criteria (NAC) - FHWA has determined noise levels for various activities or land uses which represent the upper limit of acceptable traffic noise level conditions, which are found in 23 CFR 772. These regulations do not require meeting the abatement criteria in every instance; rather, they require highway agencies make every reasonable and feasible effort to provide noise mitigation when the criteria are approached or exceeded.

Noise Contour - A linear representation of equal noise levels similar to elevation contour lines on a topographic map.

Noise Reduction Design Goal - The optimum desired dB(A) noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The ODOT noise reduction design goal is 7 dB(A), and must be achieved for at least 75 percent of the benefitted receptors identified within the first row of receptors for the abatement measure to meet ODOT reasonableness criteria.

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.

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.

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Receiver - A discrete or representative location representing receptors that are included in the computer model used for noise analysis.

Receptor - A discrete or representative location of a noise sensitive area(s) for any of the land uses listed in Noise Abatement Criteria Activity Categories (Table 1).

Record of Decision (ROD) - The final step in the EIS process where by the Federal Government issues final approval of the environmental documentation.

Residence - A dwelling unit 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 Construction - The granting of a building permit, prior to right-of-way acquisition or construction approval for the highway.

Substantial Noise Increase - Along with the NAC defined above, one of two criteria to determine noise impacts created by a proposed highway project. A receptor is considered impacted if the predicted future hourly equivalent traffic noise level exceeds the existing ambient noise level by 15 dB or more.

Traffic Noise Impact

- (1) Impacts which occur when the future predicted exterior Leq(h) traffic noise levels approach by one (1) decibel, meet or exceed any of the Federal Highway Administration (FHWA) Noise Abatement Criteria (see Table 1); or,
- (2) Impacts which occur when there is a substantial noise increase as defined in this section.
- (3) In those cases where there are no frequent exterior human activities present, impacts occur when interior noise levels approach by one (1) decibel, meet or exceed the FHWA Leq Noise Abatement Criteria Category D interior criterion level (see Table 1).

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Type I Project - A federal aid project that meets one or more of the following criteria, see 23 CFR 772 for the full definition of at Type I project:

- (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 traffic noise source and the closest receptor between the existing condition to 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 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 HOV 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, ride-share lot.
- (8) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project.

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Type II Project - A Federal or Federal-aid highway project for noise abatement on an existing highway without meeting the criteria listed in the Type 1 definition. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e). ODOT does not have a Type II program.

Type III Project - A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

IMPLEMENTATION (SPECIFIC)

A. Analysis of Traffic Noise Impacts

The ODOT will determine and analyze expected traffic impacts and document the results in a traffic noise analysis for highway projects in accordance with the following methodology:

1. Identify existing activities, developed lands, and those areas for which development of this type is permitted with local authorities (i.e., an approved building permit) which may be affected by noise. Classify the activities according to the Noise Abatement Criteria (NAC) in Table 1 for each alternative under detailed study; and for each Activity Category that is present in the study area. **(See Table 1 on Next Page)**

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TABLE 1
Federal Highway Administration Noise Abatement Criteria (NAC)
[Hourly A-Weighted Sound Level, decibels dB(A)]

Activity Category	Activity Criteria ¹ Leq(h) ²	Activity Description
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B ³	67 (Exterior)	Residential
C ³	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 studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E ³	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	--	Undeveloped lands that are not permitted

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

² 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.

³ Includes undeveloped lands permitted for this activity category.

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Select receptor locations to represent each activity area or discrete location to be evaluated for noise. For all Activity Categories, primary consideration shall be given to exterior areas where frequent human use occurs in the determination of traffic noise impacts. The following are specific requirements for each Activity Category.

For Activity Category A - ODOT will submit in writing justification to the FHWA on a case-by-case basis for approval of an Activity Category A designation.

For Activity Category B - The receptor location will be placed between the right-of-way line and the building, near an area of frequent human use, like patios, pools, sitting areas, if applicable. These locations will be no nearer than 10 feet from the represented structure. For multifamily dwellings, all dwelling units will be analyzed for traffic noise impacts, including units above the ground level; however, only impacted units will be considered for noise abatement. For common areas shared by residents, the owner or association representing the users/residents will be solicited for information regarding the average number of daily, time of day of peak usage, average number of hours per visit. This will be used to identify the number of potential impacts for the area and to determine impacts and evaluate potential abatement for that specific location, if applicable.

Activity Category C - Includes the exterior impact criteria for a variety of land use facilities and may include public or private facilities. ODOT will coordinate with the owner or official of jurisdiction over the resource/facility to determine the location and number receptors involved at particular outdoor recreation or gathering area. Information requested will include average number of daily users, time of day of peak usage, average number of hours per visit and the overall context of the use of the resource and/or facility. This information will be used to identify the number of potential impacts the receptor represents and to determine impacts and evaluate potential abatement, if applicable.

For Activity Category D - ODOT will conduct an indoor analysis after a determination is made that exterior abatement measures will not be feasible and reasonable and shall only be done after exhausting all outdoor analysis options. In situations where no exterior activities are to be affected by traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, ODOT will use Activity D as the basis of determining

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noise impacts. Interior noise levels will be predicted in accordance with **D. 6. Traffic Noise Prediction.**

For Activity Category E - Receptor locations will be placed at outside use areas. Information from property owners or lessee(s) will identify how many receptors to assign to these areas, time of day and seasonal variation in use will be considered as part of the noise analysis and feasible and reasonableness evaluation if noise impacts are identified. Interest in noise mitigation measures will be established with the property owner(s) prior to initiating noise mitigation analysis.

For Activity Category F - There are no impact criteria for the land use facilities in this activity category and no analysis of noise impacts is required.

For Activity Category G - As part of the noise study, ODOT will determine if undeveloped land is permitted for development. The milestone and its associated date for acknowledging when undeveloped land is considered permitted shall be the date of issuance of a building permit by the local jurisdiction or by the appropriate governing entity. If undeveloped land is determined to be permitted, then ODOT will assign the land to the appropriate Activity Category and analyze it in the same manner as developed lands in that Activity Category. If undeveloped land is not permitted for development by the date of public knowledge, ODOT will determine noise levels in accordance with 772.17(a) and document the results in the project's environmental clearance documents and noise analysis documents. Federal participation in noise abatement measures will not be considered for lands that are not permitted by the date of public knowledge.

- 2 Determination of existing and future noise levels.
 - a. For projects on new alignment, determine existing noise levels by field measurements, in accordance with **C. Field Measurement Requirements.**
 - b. For projects on existing alignments, predict and/or field measure the existing noise levels and predict the design year traffic noise levels of the future condition in accordance with **D. Traffic Noise Prediction.**

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- c. Using the current approved FHWA noise model, the future noise levels must be predicted for all build alternatives under consideration in the NEPA document (all reasonable alternatives, but not alternatives rejected for detailed analysis because they are not reasonable).

3. Noise Impact Determination

Traffic noise impacts occur by meeting either of the following two conditions:

- a. The predicted traffic noise levels for the Design Year approach (reach one decibel less than) meet or exceed the FHWA NAC contained in 23 CFR 772 and in Table 1, or;
- b. The predicted traffic noise levels for the Design Year substantially exceed existing noise levels by 15 dB(A) or more.

B. Analysis of Noise Abatement Measures

When traffic noise impacts are identified, noise abatement must be evaluated to determine if it is feasible and reasonable. Noise barriers are the most commonly used form of noise abatement and are the only form of noise abatement required for consideration on Federal-aid projects in accordance with 772.13(c)(1). A noise barrier consists of a physical obstruction that is constructed between the highway noise source and the noise sensitive receiver(s) that lowers the noise level, including free standing noise walls, berms (earth or other material), and combination berm/wall systems. If noise barriers are determined to not be feasible or reasonable, other noise abatement measures include traffic management measures such as traffic control devices and modified speed limits, alteration of horizontal and vertical alignments, acquisition of buffer zones of unimproved property, and noise insulation of only Activity Category D facilities will be considered. The Department will not consider insulation of residences as noise mitigation.

In accordance with FHWA policy, planting of vegetation or landscaping is not an acceptable Federal-aid noise abatement measure because only dense stands of evergreen vegetation at least 100 feet deep will reduce noise levels. Use of quieter pavements is not an acceptable Federal-aid noise abatement measure for Federal projects unless part of an FHWA-approved Quiet Pavement Pilot Program.

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All of the following will guide consideration in order for noise abatement to be justified, eligible for federal aid, and incorporated into project design, as applicable.

1. Noise abatement must be feasible. Feasibility refers to the combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure. The engineering considerations include whether it is possible to build an abatement measure given site constraints (drainage, safety, utilities) and acoustical considerations include whether the abatement measure provides an acceptable reduction in noise levels. The following are engineering and acoustical considerations that determine the feasibility of a noise barrier.
 - a. Noise abatement measures will achieve at least a five dB(A) highway traffic noise reduction to be considered feasible,
 - b. Consideration of other noise sources in the area, if identified during existing noise surveys. For example, ambient noise levels from industrial sources that exceed future noise levels predicted from the project would make abatement measure ineffective, unless the barriers also provided incidental shielding for the receptors. If the reduction cannot be achieved, then abatement is not feasible.
 - c. Determination that it is possible to design and construct the noise abatement measure. This determination will consider adverse impacts created by or upon the safety, property access, drainage, topography, utilities, and maintenance requirements.
 - d. American Association of State Highway and Transportation Officials (AASHTO) adopted publications, including the Green Book, governs design requirements for highways and streets regarding engineering feasibility concerns like safety for location of noise barriers.
2. Mitigation measures must be reasonable. The following are reasonableness criteria that must be evaluated to determine reasonableness:
 - a. The property owners' and residents' desire for mitigation. Benefitted receptors viewpoints shall receive priority consideration. Details on how the Department will receive the viewpoints of the benefitted property owners and residents are provided in **F. Public Involvement**.

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- b. Cost/Benefit ratio of \$30,000.00 per benefitted receptor or less, based on historical unit costs of \$25 per square foot of wall height required to achieve a feasible reduction. As increased barrier height requires disproportionate increase in foundation costs (up to two times the “standard” wall), a maximum wall height considered for noise abatement is 22 feet.
- (1) A benefitted receptor is any receptor that achieves at least a five (5) dB(A) reduction. This calculation is made on a per barrier basis, and includes the total number of benefitted receptors, not just modeled receivers.
- (2) This allowable cost benefit ratio will be reanalyzed at a regular interval not to exceed five (5) years from the effective date of this policy. This cost benefit ratio will be applied statewide.
- c. Noise Reduction Design Goal: The optimum desired dB(A) noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The ODOT noise reduction design goal is 7 dB(A), and must be achieved for at least 75 percent of the benefitted receptors identified within the first row of receptors for the abatement measure to meet ODOT reasonableness criteria.

These three reasonableness criteria will be used to evaluate the reasonableness of noise abatement.

The additional factors that may be considered to increase the allowable cost and benefit factors listed above are as follows: if the overall magnitude of the future noise levels without mitigation exceeds 75 dBA; if the date of permitted construction of the residential area pre-dates the date of initial highway construction, and if local officials have implemented measures to control incompatible growth and development adjacent to highways, then an additional \$10,000 per benefitted receptor will be allowed in the Reasonableness Criteria, for a total of \$40,000 per benefitted receptor.

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For common use areas and Category C, D and E areas, ODOT will use a reasonableness cost factor to compare the cost to provide a benefit to an area while considering its usage. The methodology of determining the “abatement cost factor” is directly from *A Method to Determine Reasonableness and Feasibility Of Noise Abatement at Special Use Locations*, FL-ER-65-97, authored by Roger L. Wayson, P.E., Ph.D. & John M. MacDonald, M.S., commonly referred to as “The Florida Method”, and uses currently accepted residential abatement cost scenarios and extrapolates that information into a cost for special land use sites. Development of the “abatement cost factor” followed these steps, with information applicable in Oklahoma:

1. Use ODOT accepted barrier cost per residence (\$30,000).
2. Assume residences are used 24 hours/day.
3. Determine the average height of a barrier (13 ft., from *2005-2007 Constructed Noise Barriers, Form FHWA-1580(8-08)*)
4. Determine average frontage of a residence that received “reasonable” abatement of 92 ft. ($\$30,000/\text{benefitted receptor} / \text{Average barrier height}$).

The “abatement cost factor” derivation quantifies typical residential usage and considers a hypothetical barrier section that would occupy the frontage of a typical residence. Note that this is purely a hypothetical situation and does not imply that this barrier section would provide adequate abatement at the residence, rather it estimates the size of a barrier that would occupy the frontage property of a typical residence.

The Oklahoma Reasonable Abatement Cost Factor is \$600,402 per person-hour per square foot of barrier. ($\$600,402/\text{pp-hr}/\text{ft}^2$)

For these special cases, the owners/officials with jurisdiction will be solicited for information regarding average number of people using the facility or area and hours of use per visitor or person to determine impacts and benefitted receptors (at least a 5 dB reduction in noise levels – a subset of the number of visitors, based on the site and location of high use areas), and the desire for mitigation. If impacts are identified and abatement is desired, then the actual abatement cost factor will be calculated by dividing the square feet of proposed barrier by the benefitted average person-hours per day, multiplied by the allowable \$30,000/benefitted receptor cost benefit ratio. If this product is less than the allowable Reasonable Abatement Cost Factor, then abatement is reasonable.

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Example:

$$(1000' \text{ long} * 12' \text{ tall barrier} / (300 \text{ people/day} * 2 \text{ hours})) * \$30,000 = \$600,000 / \text{pp-hr/ft}^2$$

$$\$600,000 \leq \$600,402 / \text{pp-hr/ft}^2$$

Barrier is Reasonable

Additionally, FHWA policy states third party funding cannot be used to make up the difference in cost between the reasonable cost allowance and the actual cost. Third party funding can only be used to pay for additional features such as landscaping, aesthetic treatments, etc. for noise barriers that meet cost-effectiveness criteria.

C. Field Measurement Requirements

The primary purpose of field measurements is to measure existing ambient noise levels and ascertain other pertinent information in the vicinity of the project. Existing ambient noise measurements are obtained to quantify the existing acoustic environment and to provide a basis for assessing potential impacts due to predicted project traffic noise level increases, and to validate the noise modeling results.

1. Field measurements shall be made using sound meters of sufficient accuracy to yield valid data for the particular project. Sound meters shall have suitable specifications consistent with American National Standards Institute (ANSI) S1.4-1983, Type II or better. All devices must have been calibrated within the past twelve calendar months or in accordance with the manufacturer's recommendation.

2. Field measurements of existing highway traffic noise are made to represent an hourly equivalent sound level, Leq(h). For existing highways, a minimum measurements of 15-minute time periods to represent the Leq(h). Measurements along low-volume highways (less than 1200 vehicles per day) or along new alignments may require longer measurement periods (e.g., 30-60 minutes) to attain desirable statistical accuracy. In some cases (e.g. highly congested facilities where trucks avoid peak automobile travel periods), both a peak traffic period and a non-peak period noise measurement may be required to verify the worst hour noise levels. If information is not available to identify the noisiest hour of the day or if there is public controversy at a specific location, 24-hour measurements may be necessary.

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3. Field documentation shall include traffic conditions, climatic conditions, land uses and other non-highway sources of noise at the time of measurement. In addition, make, model, serial number and certificate of calibration for all sound meters and associated calibration units used for field noise readings will be recorded with all results.

D. Traffic Noise Prediction

1. All traffic noise analyses shall use the most current version of the FHWA Traffic Noise Model (TNM®) or any other model determined by the FHWA to be consistent with the methodology of the TNM® model, pursuant to 23 CFR 772.9.
2. The Average Pavement Type setting shall be used in the FHWA TNM® for future noise level prediction. However, should there be a need for substantiating the use of a different pavement type the ODOT shall obtain approval by the FHWA. It is noted that specific pavement types in FHWA TNM® are allowed to predict the existing condition.
3. Noise contour lines (future condition) may be used for project alternative screening or for land use planning to comply with 23 CFR 772.17, but shall not be used for determining highway traffic noise impacts. The future 66 dB(A) noise contours lines can either be determined by using a Noise Contour function of the noise model or by modeling discrete receiver points and extrapolating between them. When using a Noise Contour function, adequate grid spacing is required to provide sufficient resolution and when using discrete receivers, the receivers need to be close enough together to enable relatively accurate extrapolation between receiver points. For projects that have a substantial amount of undeveloped land adjacent to the highway project, the traffic noise analysis should include predicted noise impact contours at approximate distances from the highway centerline or center of near lane. As a minimum, these distances should equate to the predicted 66 dBA and 71 dBA noise levels.
4. In predicting noise levels and assessing noise impacts, traffic characteristics that would yield the worst hourly traffic noise impact for the design year shall be used for all Activity Categories. For urban highway projects this generally requires analysis of Level of Service C or D. However, for Activity Category C, if the site is operated primarily during off peak traffic conditions, it is not reasonable to predict sound levels based on peak traffic conditions. There are three possible ways to adjust for off peak

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traffic volumes and they depend on the amount of information known (using the principles of "The Florida Method" (FL-ER-65-97)).

Method #1: Direct Calculation if Off Peak Volumes are known. The peak hour levels can be adjusted by use of the following formula if the off peak volumes are known:

$$\text{Leq (off peak hour)} = \text{Leq (peak hour)} + 10\log N/N_o \quad (5)$$

where: N_o = peak hour traffic volume

and N = off peak traffic volume

Method #2: Adjustment Table if Off Peak Volumes not known. Table 2 contains a list of adjustment factors for peak traffic volume data using quick response techniques when the reduced traffic volume is not known.

TABLE 2 Traffic Volume Adjustment Factors for Weekdays ¹		
Time	hr/peak hr	$10^* \log(\text{hr/peak r}) \text{dB(A)}$
5-9 am	0.55	-2.6
9 am-2 p.m.	0.64	-1.9
2 p.m.-8 p.m.	1.00	0
8 p.m.-12 p.m.	0.29	-5.4

¹Supporting data for off peak traffic volume found in "An Analysis of Urban Area Travel by Time of Day", January 1972, FH-11-7519

It should be noted that this correction should not be used for Interstate highways because of the high truck volumes and relatively constant noise levels.

Method #3: Default dB(A) Offset for Off Peak Use. Realizing that only peak traffic data may be available, a default correction can be applied by subtracting 1 dB(A) from predicted levels if the site is operated off peak during the week or 2 dB(A) from predicted levels if the site is operated primarily on the weekend. If a site is operated off peak during the week and also on weekends, subtract 1 dB(A) from predicted noise levels. **It should be noted that this correction should not be used for Interstate highways because of the high truck volumes and relatively constant noise levels.**

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5. The basic input parameters and general modeling considerations are as follows:

- a. Grouping of receivers is permitted as long as the representative receiver is the same distance and elevation from the roadway being evaluated for the group and come from a common noise environment. However, under all circumstances the two end receivers of a group must be evaluated as individual receivers.
- b. Modeling multiple lanes as single roadways is permitted for a maximum of three-lanes each direction for either a divided or undivided highway.
- c. The actual width of roadway pavements should be modeled, including travel lanes and shoulders.

6. Predicting Interior Noise Levels

For Activity Category D, interior locations are only used where there are no outside activities (e.g., in places of worship, hospitals, libraries, theaters, etc.) or where the exterior areas have characteristics that prevent highway traffic noise impacts on exterior activities (e.g., located far from the highway or already shielded from highway traffic noise). In the absence of calculations or field measurements, compute interior noise level predictions by subtracting noise reduction factors from the predicted exterior levels for the building in question, using the information in Table 3.

TABLE 3		
INTERIOR NOISE REDUCTION FACTORS		
Building Type	Window Condition*	Noise Reduction
All	Open	10 dB
Light frame	Ordinary sash (closed)	20 dB
	Storm windows	25 dB
Masonry	Single glazed	25 dB
	Double glazed	35 dB

* Windows shall be considered open unless there is firm knowledge that the windows are in fact kept closed almost every day of the year.

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7. Model Validation

All noise studies will require validation to verify the accuracy of noise models used to predict existing or future noise levels. Validation of the model requires a series of noise measurements along a project, taking a minimum of three noise measurements per site along with simultaneous traffic counts. In certain situations, consider two sets of measurements at each location at different times and different days to account for variations in traffic. Model the sites using traffic volumes and speeds collected during the measurement. If the measured and predicted highway traffic noise levels are within +/- 3 dB for all the measurements at all the sites, then the model is considered valid and can be used to predict existing highway traffic noise levels along the entire project. If the model is not within +/-3 dB for all the measurements at all the sites, then the model is not considered valid until additional measurements are made or until the analyst identifies the reason for the discrepancy and makes a correction within the model.

E. Public Involvement

Communication with the community regarding noise impacts and possible noise abatement shall occur at the start of the noise study process and continue throughout the development of the project. ODOT will communicate with citizens to present information on the nature of highway traffic noise and discuss the effects of noise abatement measures in attenuating traffic noise and the types of noise abatement measures that may be considered. All noise sensitive areas and any known noise abatement measures will be presented and discussed at public hearings and/or public meetings. The concerns of the community shall be a major consideration in reaching a decision on the abatement measures to be provided.

The viewpoints of the property owners and residents of the benefitted receptors of proposed noise abatement measures shall be actively solicited and considered. The primary method for notices will be by US mail. Flyers or personal contact may be used in the event that mailings are unsuccessful in engaging property owners and /or residents in the public involvement process. ODOT will hold meetings with the benefitted property owners and residents and present a brief program on highway traffic noise to explain and demonstrate the characteristics of highway traffic noise, the effects of noise barriers in attenuating traffic noise, and the types of barriers that may be considered. As available, specific details of noise barriers being studied will be presented in addition to a discussion

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of alternatives to barrier construction. After completion of barrier design, ODOT will meet again with the property owners and benefitted residents to present final details and to solicit the residents' final views and opinions. The decision on whether the noise abatement measure is desired or not desired will be based on the preference provided by 51 percent or more of the benefitted property owners and residents that respond to the solicitation. One owner ballot and one resident ballot shall be solicited for each benefitted receptor. Points per ballot shall be distributed in the following weighted manner:

- 3 points/ballot for benefitted front row property owners
- 1 point/ballot for all other benefitted property owners
- 1 point/ballot vote for all residents

For Category C impacted properties, the property owner/official of jurisdiction only will be balloted regarding desire for abatement.

Consideration of the noise abatement measure will continue unless a simple majority of all distributed points are returned that indicates the balloted voters do not want the abatement measure. The final determination on the noise abatement will be shared with the property owners and residents by letter.

F. Information Required for NEPA

Prior to a Categorical Exclusion (CE) approval or request of a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) for a highway project requiring a noise study, ODOT will identify:

1. The environmental document will include the proposed highway traffic noise abatement and will identify locations where noise impacts are predicted to occur, where noise abatement is feasible and reasonable, and locations with impacts that have no feasible or reasonable noise abatement alternative.
2. For environmental clearance, the analysis will be completed to the extent that design information on the alternative(s) under study in the environmental document is available at the time the environmental clearance document is completed.

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A Statement of Likelihood will be included in the environmental document since feasibility and reasonableness determinations may change due to changes in project design after approval of the environmental document. The statement of likelihood will include the preliminary location and physical description of noise abatement measures determined feasible and reasonable in the preliminary analysis. The statement of likelihood shall also indicate that final recommendations on the construction of abatement measure(s) is determined during the completion of the project's final design and the public involvement processes.

G. Information for Local Government Officials

For highway projects where there are undeveloped lands, ODOT will make the results of the noise analyses and any proposed mitigation measures available to local government officials within whose jurisdiction the highway project is located. This will include expected noise levels as found in the NEPA document or in separate documentation. This information is provided to assist local officials to protect future land development from becoming incompatible with anticipated highway noise levels. ODOT is not responsible for mitigation of noise impacts that occur in developments permitted after the Date of Public Knowledge.

H. Construction Noise

In general, construction noise related to highway projects is not a major issue. Sources of noise include heavy machinery like backhoes and scrapers, cranes, pile drivers, and trucks transporting materials. Typically construction noise is addressed in a project's noise analysis report and in the project environmental document. Most projects will not require modeling or any form of analysis associated with construction-related noise. In many cases, construction noise may be adequately addressed through a narrative discussion. Typically construction noise can be minimized by implementing time of day restrictions for construction operations adjacent to noise sensitive areas. For projects that require compliance with local ordinances, more detailed analysis techniques should be included in the noise analysis report.

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I. Federal Participation

The costs of noise abatement measures may be included in federal aid participating project costs with the federal share being the same as that for the system on which the project is located when:

- Traffic noise impacts have been identified; and
- Abatement measures have been determined to be feasible and reasonable pursuant to 23 CFR 772 and this policy.

J. Abatement Measures Reporting

The ODOT will maintain an inventory of all constructed noise barriers. The inventory shall include the following parameters: type of abatement; cost (overall cost, unit cost per/sq. ft.); average height; length; area; location (State, county, city, route); year of construction; average insertion loss/noise reduction as reported by the model in the noise analysis; NAC category(s) protected; material(s) used (precast concrete, berm, block, cast in place concrete, brick, metal, wood, fiberglass, combination, plastic (transparent, opaque, other); features (absorptive, reflective, surface texture); foundation (ground mounted, on structure); and project funding source.

K. Duties and Responsibilities

1. Director-Preconstruction

- a. Environmental Programs Division will implement and oversee the requirements of this policy directive.
- b. The appropriate design division will incorporate noise mitigation measures recommended by Environmental Programs Division in project plans. The Environmental Programs Division Engineer must be notified in writing of any modification prior to completion of final construction plans. Such modification may require additional barrier analysis.
- c. Noise abatement measures not covered in the manual of "Standard Specifications for Highway Construction" will be discussed at the Plan-in-Hand meeting and detailed in the Plan-in-Hand report.

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d. Pay items will be established for noise abatement measures not covered in the manual of "Standard Specifications for Highway Construction".

2. Director-Operations

- a. Noise abatement measures not covered in the manual of "Standard Specifications for Highway Construction" will be discussed at the pre-work conference and documented in the report of the meeting.
- b. Any field modifications to noise abatement measures must be approved by the Environmental Division. Such modification may require additional barrier analysis.

L. Review of Policy

This policy shall be reviewed by the ODOT at least every five years. Specifically the Cost per Benefitted Receptor and the Cost per square foot will be evaluated and compared to actual construction costs at this time.