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Chapter 23: Noise

FDM 23-1-1 Introduction

March 16, 2018

1.1 Originator

The Chief of the Environmental Process and Documentation Section is the originator of this chapter. Questions and comments on the contents of this chapter should be directed to Jay Waldschmidt, (608) 267-9806, jay.waldschmidt@dot.wi.gov.

1.2 Objective

The objective of this chapter is to help project managers develop their projects in compliance with federal and state laws regarding noise impact determination and mitigation. The chapter will explain how to:

- Determine if a noise analysis is required
- Conduct an analysis if required
- Determine whether or not a noise impact occurs
- If an impact occurs, conduct an analysis of abatement measures to determine whether or not they are feasible, reasonable, and likely to be incorporated
- Involve the public in abatement incorporation decision-making
- Properly document the results of the noise impact determination and mitigation process

1.3 Background

The procedures incorporated in this chapter are applicable to operations on all highways and incorporate the pertinent policies and procedures of the Federal Highway Administration (FHWA). Consequently, any highway improvement project developed by any unit of government consistent with this procedure should qualify for federal funding on the basis of meeting applicable noise considerations.

There are two aspects to noise investigation: traffic noise and construction noise. How to evaluate the more complex and prolonged potential impact of traffic noise is explained in Chapter 23, Sections 15, 20, 25, 30 and 35. The more temporary potential impact of construction noise is addressed in Section 40.

Highway noise, similar to other noise transmissions, requires the presence of three elements--a source, a path, and a receiver. The transportation agency can have the most influence upon the second of these, the noise path. Specifically, it can do a number of things in highway location and design to lengthen and/or interrupt that path and thereby lessen the noise levels affecting the receptor. There are, however, few means by which it can change the characteristics of the receiver. Potential options would appear to be limited to removing or preventing the existence of receptors (human activity).

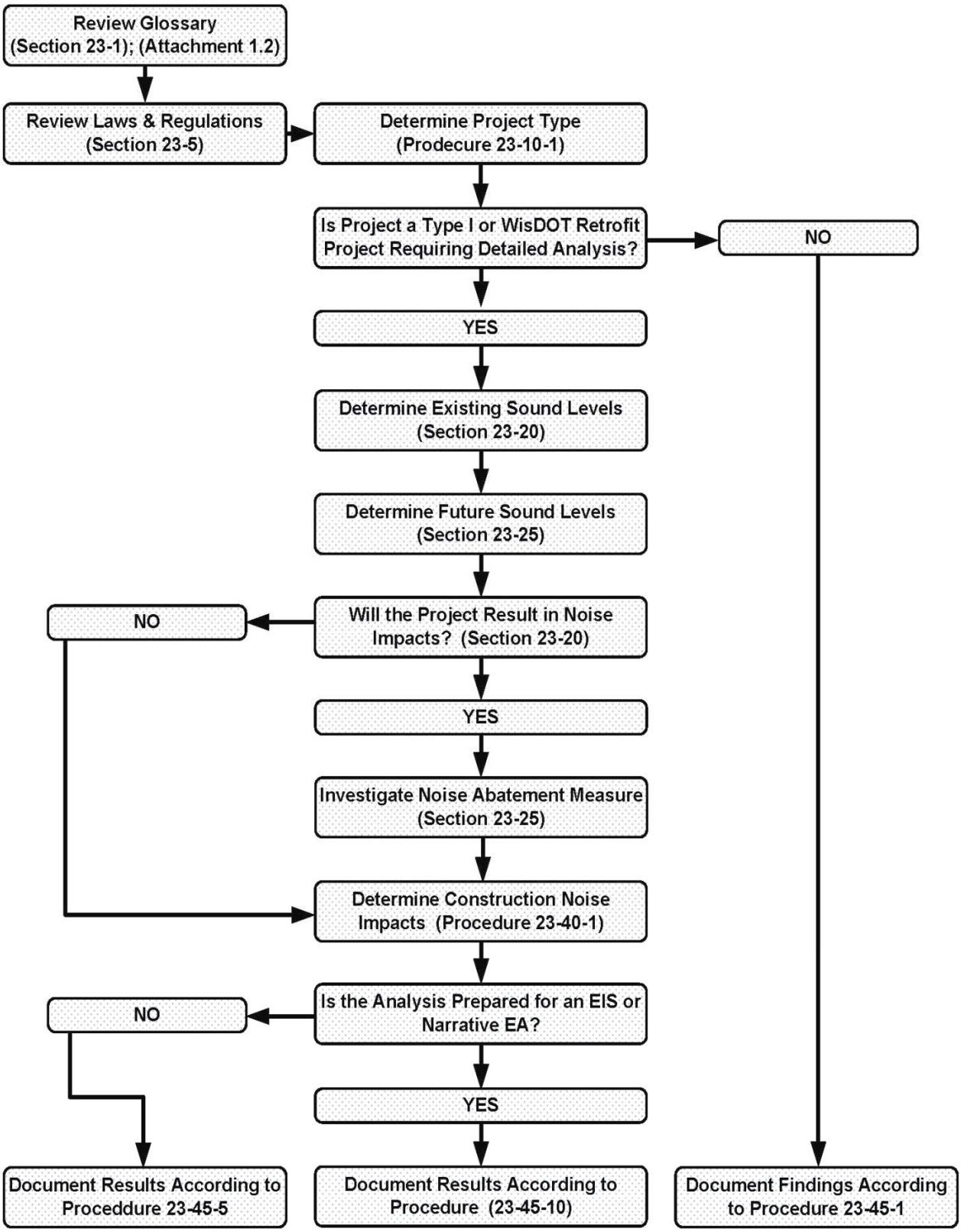
The source does present some very limited opportunities for noise reduction. Noise at the source is created by the motor vehicle, and the interaction between the vehicle and the pavement. Consequently, some of the vehicle noise influencing factors such as grades, stop-and-go situations, and speed can be effectively manipulated. Generally, however, these have only minimal effect on overall sound levels.

An overview of the procedures used in preparing a highway noise analysis is included in Attachment 1.1.

A glossary of abbreviations, acronyms and definitions is included in Attachment 1.2.

LIST OF ATTACHMENTS

PROCEDURE FOR PREPARING A HIGHWAY NOISE ANALYSIS



Abbreviations, Acronyms and Definitions

A-Scale: A weighting system which best approximates the frequency response of the average human ear.

ADT: Average Daily Traffic

AADT: Annual Average Daily Traffic

Approach: Means one (1) decibel less than the levels in the Noise Level Criteria for Considering Barriers Table in FDM 23-30-2.

Benefited Receptor: A receptor or common use area receiving a minimum eight (8) decibels reduction in sound level as a result of the proposed abatement measure.

CE: Categorical Exclusion

Common Noise Environment: A group of receptors within the same Land Use Category listed in the Noise Level Criteria For Considering Barriers, Table 2.1 (see FDM 23-30-2) 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 and cross-roads.

Common Use Area: An outdoor place in a multi-unit residential complex where frequent human use by all complex residents occurs and a lowered noise level would be of benefit.

dB/DD: Decibel reduction per doubling of distance

DHV: Design Hour Volume

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

Decibel (dB): The unit of measure of sound intensity. The decibel scale audible to humans spans approximately 140 dBs.

Design Year: Means 20 years after the completion of construction of the highway facility.

EA: Environmental Assessment

EIS: Environmental Impact Statement

Existing Noise Level: The highest hourly traffic noise level caused by existing conditions in a particular area.

FHPM 7-7-3: Federal Aid Highway Program Manual, Volume 7, Chapter 7, Section 3

FONSI: Finding of No Significant Impact

Feasibility: The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

Future Noise Level: The highest hourly traffic noise level based on estimated design year traffic volumes.

Impacted Receptor: The recipient that has a traffic noise impact.

Leq: The equivalent steady-state noise level, as measured in decibels on the A-weighted scale (dBA), which in a stated period of time contains the same acoustic energy as the time-varying noise level during the same period.

Leq(h): The hourly value of Leq

L/S: Line of Sight - The shortest distance between the noise source and receiver.

Multifamily 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 benefited receptors.

NAC: FHWA Noise Abatement Criteria

NLC: WisDOT Noise Level Criteria

Noise: Unwanted sound

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 materials), and combination berm/wall systems.

Noise Level: The sound level obtained through use of A-weighting characteristics. The unit of measure is the decibel (dB), commonly referred to as dBA when A-weighting is used.

Noise Reduction Design Goal: The department's criteria of a nine (9) decibel sound level reduction required at one (1) receptor or common use area as a result of the proposed abatement measure before a reasonableness determination can be made.

PHV: Peak Hour Volume

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 residence.

ROD: Record of Decision

Reasonableness: The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receptor: A discrete or representative location of a noise sensitive area(s) for any of the land uses listed in FDM 23-30, Table 2.1 where frequent human use occurs and a lowered noise level would be of benefit.

Residence: The official location of a household.

Retrofit project: A proposed project for the construction of noise barriers along an existing highway.

Substantial Noise Increase: An increase of 15 dB(A) or more in the design year over the existing noise level.

Traffic Noise Impacts: Design year build conditions that approach or exceed the Noise Level Criteria for Considering Barriers Table for the applicable Land Use Category in FDM 23-30-2 or a substantial noise increase in the design year over the existing noise level.

WisDOT Retrofit Project: A state-funded, stand-alone noise abatement project on an existing highway proposed and constructed as identified in the Wisconsin Noise Barrier Study, Summary Report, May 29, 1990. Also known as the WisDOT Retrofit Noise Barrier Program.

23 CFR 771: Title 23, Section 771 of the Code of Federal Regulations

23 CFR 772: Title 23, Section 772 of the Code of Federal Regulations

FDM 23-5-1 Federal Influence on WisDOT Procedures *March 16, 2018*

1.1 Noise Policy Chronology

The National Environmental Policy Act of 1969 established the Council on Environmental Quality (CEQ). CEQ established rules and gave the U.S. DOT and Federal Highway Administration (FHWA) authority to establish procedures for determining the appropriate level of environmental documentation and methods for analyzing the potential impacts of projects under their authority to comply with the NEPA rules.

This task was done by the U.S. DOT and the FHWA broadly through U.S. DOT Order 5610.1C, *Procedures for Considering Environmental Impacts* and FHWA regulation 23 CFR 771.

The issue of noise impact analysis and abatement was codified specifically through 23 CFR 772, the Federal-Aid Highway Program Manual (FHPA) Procedure 7-7-3 (Procedures for Abatement of Highway Traffic Noise and Construction Noise) and FHWA Technical Advisory T 6640.8A (TA).

FHPM 7-7-3, enacted on 5/14/76, promulgated policies and procedures for noise studies and noise abatement procedures and design noise levels for use in planning and design of highways pursuant to 23 CFR 772.

In 1991, the Federal Highway Administration determined that the entire FHPM was redundant and unnecessary. It was decided that 23 CFR 772 could stand on its own merits and became the sole FHWA noise regulation.

Prior to 1989, WisDOT used 23 CFR 772 as our noise policy for both Federal-Aid projects and State-only funded projects. Per legislative mandate, the Department promulgated Wisconsin Administrative Code - Chapter Trans 405 (Siting Noise Barriers) on September 1, 1989. One purpose of Trans 405 was to codify WisDOT's methodology for determining when noise abatement was reasonable. Trans 405 was purposely developed so there would be no conflict with 23 CFR 772.

On 6/12/95, the FHWA issued a memo requiring each State Highway Agency (SHA) to develop its own written noise policy using 23 CFR 772 as guidance. WisDOT requested that Trans 405 be accepted as our written noise policy on 8/18/95 and this request was approved by FHWA on 2/29/96.

On 7/13/10, the FHWA issued promulgated revisions to 23 CFR 772. Each SHA was required to revise its written policy to account for the 23 CFR 772 revisions. Through consultation with WisDOT, FHWA also indicated that Trans 405 would no longer be sufficient solely as the department's written noise policy. FHWA determined that FDM Chapter 23 would need to be revised to serve as the department's written noise policy with Trans 405 serving as a supplement to the policy until Trans 405 could be rescinded.

WisDOT requested that the revised versions of FDM Chapter 23 be accepted as the department's written noise policy on 07/08/11 and this request was approved by FHWA on 7/11/11.

The provisions of FDM Chapter 23 apply to all projects without regard to jurisdictional system. They apply to highway construction or reconstruction projects as well as to projects undertaken solely for noise abatement purposes along existing highways (retrofit program).

1.2 FHWA Approval of Plans and Specifications

Plans and specifications will not be approved by the FHWA unless those noise abatement measures which are reasonable and feasible are incorporated into the plans and specifications to reduce the noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted.

FDM 23-10-1 Guidelines

March 16, 2018

Regardless of the type of environmental document required for a project, some level of noise impact discussion is necessary. However, the analysis detail and method in which it is reported may differ.

1.1 Type I Projects

A Type I project is defined as;

1. The construction of a highway on new location; or,
2. The physical alteration of an existing highway where there is either:
    1. Substantial horizontal alteration – The project halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
    2. Substantial vertical alteration – The project 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 High-Occupancy Vehicle (HOV) lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
4. The addition of an auxiliary lane 2500 feet or longer in length; or
5. The addition or relocation of an interchange lane(s) or ramp(s) 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 or toll plaza.
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.

    Care should be exercised in scoping a proposed project to ensure that the termini of the project evaluated in the environmental document only include actions meeting the definition of a Type I project. For example, a proposal to relocate an interchange ramp should not be included as part of an environmental document being used to evaluate a pavement replacement project even if that interchange is located between the termini of the pavement replacement project.

1.2 WisDOT Retrofit Projects

WisDOT Retrofit Projects are state-funded, stand-alone noise abatement projects on an existing highway, proposed and constructed as identified in the Wisconsin Noise Barrier Study, Summary Report, May 29, 1990. Also known as the WisDOT Retrofit Noise Barrier Program. This program is not currently funded.

WisDOT does not have a federally-funded Type II program.

1.3 Type III Projects

Type III projects are projects that do not meet Type I or WisDOT Retrofit Project criteria. Type III projects do not require a detailed analysis. Standard verbiage (see FDM 23-45-5) should be used in the environmental document for Type III projects.

1.4 Type I Projects Requiring a Detailed Analysis

The purpose of conducting a detailed noise analysis for a Type I project is to determine the comparative impacts of the proposed action to assist in selecting the preferred alternative and to consider design modifications that may mitigate impacts as required.

Proposed Type I projects require a detailed project analysis for noise with the following exception;

1. The addition of a new or substantial alteration of a weigh station, rest stop or ride-share lot requires some level of noise analysis. The determination of the appropriate level of noise analysis shall be

made in consultation with the Central Office Noise Engineer and the FHWA Wisconsin Division Office (if federal funding is used for the project).

To fulfill the detailed analysis requirements for Type I projects, existing sound levels must be determined by measurement and/or by computer modeling (see FDM 23-20-5, FDM 23-20-10, and FDM 23-25-5). Future sound levels are predicted by implementing the FHWA model (see FDM 23-25-1 and FDM 23-25-5). Noise impacts are then determined from the existing and future sound levels (see FDM 23-30-1).

Traffic volumes and geometric data are obtained within the project limits. For the complete analysis, use the worst case (see FDM 23-15-1) traffic condition for the existing year and the design year. The vehicle mix for both years must be compiled into a minimum of three categories: automobiles, medium trucks, and heavy trucks (buses and motorcycles will also be categorized if the numbers are substantial). Receptors must be located at representative sites in the project area. A description of this process is detailed in FDM 23-25-1 and FDM 23-25-5.

Once the existing and future sound levels are established, the impact of the sound upon the receptors and the criteria for which mitigation should be considered must be determined according to FDM 23-30-1. If it is determined there is a noise impact abatement should be evaluated using FDM 23-25-5 and FDM 23-35-10.

1.5 WisDOT Retrofit Projects Requiring a Detailed Analysis

All proposed WisDOT Retrofit Projects being initiated as part of the Wisconsin Noise Barrier Study require a detailed noise analysis.

To fulfill the detailed analysis requirements for WisDOT Retrofit Projects, existing sound levels must be determined by measurement and/or by computer modeling (see FDM 23-20-5, FDM 23-20-10, and FDM 23-25-5). Abatement is then evaluated using FDM 23-35-5 and FDM 23-35-10.

1.6 Construction Noise Analysis

A construction noise analysis must also be undertaken (see FDM 23-40-1).

1.7 Notification of Local Officials

Notification of local officials must occur, as appropriate (see FDM 23-50-1).

FDM 23-15-1 Description of Factors

August 17, 2020

There are three major characteristics that will affect the sound level at any location. They are traffic conditions, roadway configuration, and attenuation parameters.

1.1 Traffic Conditions

1.1.1 Hourly Volumes

Traffic data used for existing and design year sound level predictions should represent the Design Hour Volume (DHV) or the maximum hourly volume under Level of Service "C", whichever creates the highest sound level. The DHV usually occurs during morning and/or evening peak traffic conditions between 7:00 - 9:00 am and 4:00 - 6:00 pm.

Whichever conditions are used, the intent is to define an hourly volume of traffic that is likely to occur on a regular basis, day after day. There are instances when the predominance of human habitation or activity does not occur during the traffic conditions defined above (such as at churches, schools, and resort areas). It may sometimes be more meaningful to predict sound levels for those locations for the off-peak hours during which they would normally be in use.

WisDOT uses a standardized format for reporting hourly volumes. The factor $K_{[30/100/200]}$ is the percent of Average Daily Traffic (ADT) that represents the DHV.

1.1.2 Directional Split

The directional split of traffic on roadways should be identified. The sound levels should be determined using the worst case directional split. When evaluating whether there is a noise impact on either side of a roadway, the highest percentage of traffic should be assigned to the lane(s) closest to the side being evaluated and the lower percentage to the lane(s) in the opposite direction farther away. The WisDOT format for directional split is D(%). This represents the percent of directional travel for the DHV.

1.1.3 Truck Percentage

The use of incorrect truck volumes or truck percentage factors is a common cause of error in sound level predictions. Truck factors normally provided by WisDOT are the percentage of trucks in the ADT and the percentage occurring in the DHV. Usually, the DHV truck factor ranges from one-half to two-thirds of the ADT truck factor. The DHV truck factor should be used when the input volume is either DHV or the maximum volume under Level of Service "C".

The T (% of DHV) is the WisDOT format for percent of DHV that represents trucks. Of that percent, medium trucks are classified as 2D (2 axle, 6 tire). All other classifications are heavy trucks (3 or more axles). If bus and motorcycle percentages are available, the traffic should also be split into these two categories. Vehicle Classification information is available on the WisDOT website in the following location: https://wisconsindot.gov/Pages/projects/data-plan/traf-fore/default.aspx.

1.1.4 Speed

The operating speed must be consistent with the volume being used. If the maximum Level of Service "C" volume is selected, use the corresponding operating speed as determined using the latest version of the Highway Capacity Manual. If the DHV is chosen, use the operating speed associated with that volume. Generally, the operating speed should not exceed the posted speed limit. Unless a speed study shows otherwise, assume the truck speed to be identical to the automobile speed.

1.2 Roadway Configuration

1.2.1 Grade and Vertical Alignment

The grades of the proposed roadway have an effect on the truck noise levels. For uphill grades, truck noise can be increased ranging from 1 dB for a two percent grade up to 5 dB for a seven or more percent grade. Changes in vertical alignment, particularly depressing the highway to form a cut section, can also be quite effective in reducing sound levels, since this creates a barrier (the back slope) between the source and the receiver.

1.2.2 Horizontal Alignment

Since noise from a linear source is reduced between 3 and 4.5 dB per doubling of distance (dB/DD) between

the source and receiver, shifting the alignment away from an affected area can be quite beneficial.[1] Sometimes, a roadway on a new location can be placed so that attenuation is provided by natural land forms such as hills. The same thing can be done with existing man-made features such as walls or other roadway embankments.

1.3 Attenuation Parameters

Given any combination of source characteristics and roadway characteristics, the sound level at a receiver is influenced by the path the sound must travel to each receiver.

1.3.1 Distance

The most obvious characteristic of the propagation path is the distance between the noise source and the receiver. The sound level decreases as the sound propagates away from the source at the rate of 3 to 4.5 dB (see Ground Cover Section below) per doubling of distance.

There are other propagation factors that further reduce sound levels.

1.3.2 Shielding

Shielding of the noise source occurs when the line-of-sight between the receiver and the roadway is obstructed by an object or objects, which interferes with the propagation of the sound. Shielding can be provided by rows of buildings. Common shielding adjustments for a row of buildings are: 3 dB for 40 to 65 percent coverage, 5 dB for 65 to 90 percent coverage, and 1.5 dB for each additional row, up to a maximum of 10 dB.

1.3.3 Ground Cover

Ground cover is defined as the "hardness" or "softness" of the surrounding ground. Hard sites are usually bituminous or concrete pavement, gravel and water. Distance attenuation on a hard site is 3 dB per doubling of distance (dB/DD).

Soft sites refer to grassy or agricultural areas. Ground cover can affect the sound propagation rate by as much as an additional 1.5 dB/DD. This rate occurs only when both the noise source and the receiver are close to the ground and the terrain between the two is flat and soft. As a result of this additional attenuation, the equivalent sound levels decrease at a rate of 4.5 dB/DD at soft sites.

[1] "FHWA Highway Traffic Noise Prediction Model", T.M. Barry and J.A. Reagon, Federal Highway Administration, December 1978.

FDM 23-20-1 Introduction

July 28, 2011

Existing sound levels must be determined to establish a base level to which future levels can be compared.

Existing sound levels may be determined either by measurement or by computer modeling. Computer modeling using the latest version of the FHWA Traffic Noise Model (TNM) should be used when there is an existing highway and where no other noise sources are present that would override the effects of the existing highway. When an outside noise source would affect the noise levels from the highway or where no highway presently exists, sound levels should be measured. Existing levels, whether predicted or measured should be in terms of hourly Leq.

FDM 23-20-5 Measurement

July 28, 2011

Existing sound levels obtained by measurements with a sound level meter should incorporate the sound from existing roadways, as well as other sounds that constitute the existing sound level. Existing sound levels incorporate all background sound audible within a specific area at a particular time, including those natural and mechanical, highway and non-highway sounds. The chief concern in determining existing noise levels is to select locations and times for measurement that will provide values that are truly representative of the existing conditions.

5.1 Site Selection

Each highway improvement project is unique in regard to the location of the sound level measurement sites. The characteristics of the project and surrounding area should be evaluated to determine the general location or vicinity of individual measurement points.

On-site conditions must be considered in determining the exact location. Readings should be avoided within ten feet of large reflective surfaces such as billboards, cut or fill embankments, the sides of buildings, or automobiles or trucks.

Land use maps can be useful in identifying existing noise sources and noise sensitive land uses. Schools, parks, nursing homes, hospitals, and places of worship are especially sensitive to noise impact since these areas require quiet for communication. Each Land Use Category of the Noise Level Criteria for Considering Barriers listed in Table 1 (see FDM 23-30-1) applicable in the study area should be included in a sound level survey. One measurement site representative of each applicable Land Use Category near the existing or proposed highway route may be used to represent the sound levels at similar land uses along the route. If traffic conditions or topography vary substantially, sound level measurements at many locations may be required. A number of sites should be specifically located near existing highways or other noise sources in the study area to provide data representative of the existing sound levels in the community.

5.2 Sampling Periods

Since prediction of future sound levels is based on traffic volumes approximating the worst case traffic flow of the design year, any comparison of future sound levels with existing sound levels is only meaningful if traffic conditions for the two situations are equitable. It is, therefore, desirable that measurements be obtained during periods of peak hour traffic (see FDM 23-15-1).

Unfortunately, it is simply not practical to obtain all field measurements during periods when the above traffic conditions exist, so they must be measured at other times. The time of day during which ambient sound level measurements should be made is determined by the characteristics of the project and surrounding area. On-site conditions may dictate that readings not be taken at certain times. Readings should be avoided during the following conditions:

1. Wind Velocity - Usually when the wind speed is greater than 10 mph and absolutely when above 12 mph.
2. Precipitation - When it is raining or snowing, or when there is wet pavement or snow on the ground.

The selection of measurement sites and time periods must permit the normal background sound levels to be quantified as accurately as possible. Measurements should be avoided at times when temporary, nonrecurring noise sources are present (i.e., construction equipment). The frequency of recurrence is important. If, for

instance, sound levels from a fire truck siren are measured near a fire station, it probably represents very well the normal occurrence of the area; but if found in a quiet residential area, it is probably not representative, and a measurement should not be taken at a time when it is present. The same principle holds true for aircraft sound levels. If it is customary for the area, it should be recorded; if not, the noise level should be measured when aircraft are not present. If possible, the sound level meter should be placed in the "stand-by" mode or readings should be suspended, and the extraneous sound will be omitted from the readings. Certain types of areas, such as playgrounds, will be difficult to evaluate. If a noise source exists for a substantial amount of time (approximately ten percent or more) during the desired time period, the source can substantially affect the Leq level, and it should be included in at least a portion of the readings.

If existing sound levels are measured along an existing roadway, the traffic should be counted and classified during the measurement period. The estimated speed of the traffic as well as all site or terrain conditions should be noted. This traffic data should then be modeled in the latest version of TNM to adjust the computer model specific to the project.

5.3 Equipment

An ANSI Type 1 or Type 2 integrating sound level meter shall be used for measuring existing sound levels.

FDM 23-20-10 Computer Modeling

July 28, 2011

Existing sound levels can be predicted by computer modeling when field measurements are either impractical or unnecessary. Modeled levels should be validated through field measurements whenever possible though.

The computer modeling of the existing sound levels must be done by utilizing the latest version of TNM (see FDM 23-25-10).

Similar to the measurement procedure, the computer modeling of the existing levels must incorporate the sound levels from the existing project roadways as well as other roadways that constitute the existing sound level. If there is any non-traffic noise that contributes substantially to the existing level, it is recommended that measurements be taken in the field since the TNM program cannot model non-traffic sound.

When determining existing and future sound levels, it is always better to have too many receivers than too few, and this can easily be accomplished when using the computer model.

FDM 23-25-1 Introduction

July 28, 2011

According to 23 CFR 772.9(a), “Any analysis required by this subpart must use the FHWA Traffic Noise Model (TNM), which is described in “FHWA Traffic Noise Model” Report No. FHWA-PD-96-010, including Revision No. 1, dated April 14, 2004, or any other model determined by the FHWA to be consistent with the methodology of the FHWA TNM.” These documents are available on the FHWA’s Traffic Noise Model website at: http://www.fhwa.dot.gov/environment/noise/index.htm.

Future sound level prediction must therefore be accomplished through the use of the latest version of the FHWA Traffic Noise Model (TNM).

Future sound level prediction is completed for the Design Year which the department defines as being 20 years after the completion of construction of the highway facility.

FDM 23-25-5 Design Features

July 28, 2011

The designer should always attempt to realize maximum benefit from the establishment of design features when analyzing future sound levels. Design features are usually limited to new roadways or major reconstructions.

Increasing the roadway-receiver distance usually provides the greatest potential for sound level reduction. Since sound levels are reduced from 3 to 4.5 dB per doubling of distance between the source and receiver, shifting horizontal alignment away from an affected area can often be quite beneficial.

Other potential design feature measures that are less effective include using flatter grades and eliminating stop and go conditions.

Vertical alignment shifts, particularly depressing the highway to form a vertical cut section, can also be quite effective since this creates a barrier (the top of cut) between the source and receiver.

Sometimes, the roadway can be placed so that attenuation is provided by natural barriers, such as hills and wooded areas. It should be remembered that at least 100 feet of dense vegetation is required to produce a noticeable reduction in sound levels.

The same can be done with land use planning where existing man-made features, such as industrial strip development adjacent to roadway corridors, can be used as buffers for nearby receivers areas.

Excess spoil material on a project presents another opportunity for sound level reduction. If sufficient right-of-way is available, a berm can be constructed using the spoil material. A berm constructed from spoil material as a design feature should be engineered to provide the maximum sound level reduction possible. A retaining wall needed for the project can also possibly reduce future noise levels. If such a berm or retaining wall is included in the environmental document commitments, the berm or retaining wall may be considered in the analysis of future sound levels which could lead to a determination that no noise impact would occur.

Other design features may increase sound levels. Removal of a row of houses, topography changes, roadway grade increases and other design features can negatively affect receivers.

It is important that all design features that are proposed for inclusion in the project’s final design be incorporated in the future sound level analysis using the FHWA Traffic Noise Model (TNM). These design features may increase future built environment sound levels to a level at which an impact occurs (or adds to an existing impact) or could reduce future built environment sound levels to a level at which no impact will occur as a result of the proposed Type I project.

FDM 23-25-10 FHWA Traffic Noise Model (TNM)

July 28, 2011

The intent of this procedure is to provide an overview of the TNM program. It will not provide detailed instruction on the use of TNM.

The FHWA TNM is a registered copyright and trademark.

The FHWA TNM is a state-of-the-art computer program used for predicting noise impacts in the vicinity of highways. It uses advances in personal computer hardware and software to improve upon the accuracy and ease of modeling highway sound levels, including the design of effective, cost-efficient highway noise barriers.

The FHWA TNM contains the following components:

- Modeling of five standard vehicle types, including automobiles, medium trucks, heavy trucks, buses, and motorcycles, as well as user-defined vehicles.
- Modeling of both constant-flow and interrupted-flow traffic using a 1994/1995 field-measured database.
- Modeling of the effects of different pavement types, as well as the effects of graded roadways.
- Sound level computations based on a one-third octave-band database and algorithms.
- Graphically interactive noise barrier design and optimization.
- Attenuation over/through rows of buildings and dense vegetation.
- Multiple diffraction analysis.
- Parallel barrier analysis.
- Contour analysis, including sound level contours, barrier insertion loss contours, and sound-level difference contours.

10.1 Summary of Inputs

10.1.1 Roadways and Traffic Flow

TNM describes a roadway by the traffic flow conditions and a series of straight line roadway segments approximating the horizontal and vertical alignment of the roadway. The width of the roadway must be included as an input. The roadway can also be identified as being on a structure.

Pavement type is also a TNM input variable. TNM defaults to "average" for pavement type. It is FHWA policy that the use of any other pavement type must be substantiated and approved by FHWA.

TNM describes a traffic flow condition as a combination of vehicle speed and hourly vehicle volume for each vehicle type recognized by the program. The program predefines five vehicle types: cars, medium trucks, heavy trucks, buses and motorcycles. The program models traffic flow conditions based upon the noise emission characteristics of each vehicle type. The predefined vehicle types all consider the vehicle sound emissions as a function of vehicle speed. Also, the user may define an additional five (5) vehicle types by specifying constants to define the vehicle's sound emission characteristics.

If vehicle speeds, volumes, or both change, it is necessary to begin a new roadway at the point of change, such as at an interchange ramp where additions to or deletions from mainstream traffic take place. Another example would be the approaches to an at-grade intersection where each approach has a different volume.

10.1.2 Receivers

As a minimum, for those alternatives being carried forward for detailed study, locations at which existing sound levels were evaluated (see FDM 23-20-5.1) should also be included in the TNM model for future sound level analysis.

Because roadway coordinates are placed at the center of the roadways width, receivers should not be placed within 1/2 the distance of the roadway's width from the roadway. Additionally, a receiver should not be allowed to intersect with any other type of TNM input.

10.1.3 Barriers

TNM barriers are either walls or berms that intervene between roadways and receivers to reduce sound levels. For purposes of barrier design, TNM allows you to perturb barrier heights up and down to optimize the barriers effectiveness. TNM allows berm/wall combinations and barriers on structure to be input. You may designate whether the barrier is absorptive or reflective.

10.1.4 Building Rows

TNM building rows are long rows of buildings, with gaps, that intervene between roadways and receivers, like barriers, to reduce sound levels. Unlike barriers, however, a portion of the sound energy penetrates through building-row gaps, thereby making them less effective than comparable-height barriers.

10.1.5 Terrain Lines

TNM terrain lines define where the terrain is located, both horizontally and vertically. Where terrain lines protrude vertically through lines-of-sight, they reduce sound levels just as do intervening berms. It should be noted that small changes in terrain elevations have little effect on the overall shape of the ground and on the final sound levels.

10.1.6 Ground Zones

Ground zone inputs allow TNM to determine propagation rates. TNM built-in ground zones include; pavement, water, hard soil, loose soil, lawn, field grass, granular snow and powder snow. The pavement ground type should be used if you would like to model a generic acoustically hard ground surface. The field grass ground type should be used if you would like to model a generic acoustically soft ground surface.

10.1.7 Tree Zones

Tree zone inputs allow TNM to account for additional attenuation due to trees between the roadway and receptor. The average tree height is entered into the program. Tree zone inputs should only be used if the trees are sufficiently dense to completely block the view along the propagation path including dense undergrowth and tree-top foliage.

FDM 23-30-1 Type I Projects

July 28, 2011

A traffic noise impact occurs for a Type I project when the predicted equivalent sound levels at a receptor or common use area approach or exceed the Noise Level Criteria[a] (NLC) For Considering Barriers for any Land Use Category listed in Table 2.1 applicable in the study area, or, when predicted future sound levels exceed existing levels by 15 dB or more. “Approach" is defined as 1 dBA less than the NLC for the applicable Land Use Category.

FDM 23-30-2 WisDOT Retrofit Projects

July 28, 2011

A traffic noise impact occurs for a WisDOT Retrofit Project when the existing equivalent sound levels at a residential receptor equal or exceed the noise level criteria (NLC) for Land Use Category B of the Noise Level Criteria For Considering Barriers listed in Table 2.1. Mitigation for impacts can be considered exclusively through the process identified in the Wisconsin Noise Barrier Study Summary Report, May 29, 1990. Only state funds may be used for a WisDOT Retrofit Project. The department determines when there is funding available for the program. Only those locations currently identified in the Summary Report are eligible for funds when funding is available and no additional locations will be added to the program.

Table 2.1 Noise Level Criteria (NLC) for Considering Barriers

Land Use Category	Leq(h)[1] (dBA) (Evaluation Location)	Description of Land Use Category
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[2]	67 (Exterior)	Residential
C[2]	67 (Exterior)	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreation areas, schools, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D[3]	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F..
F	--	Agricultural, 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] "Leq" means 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 period. For purposes of measuring or predicting noise levels, a receptor is assumed to be at ear height, located five feet above ground surface.

"Leq(h)" means the hourly value of Leq.

[2] Includes undeveloped lands permitted for this activity category or publicly-owned recreation lands formally designated in a public agency’s Master Plan.

[3] Use of interior noise levels shall be limited to situations where a determination has been made that exterior abatement measures will not be feasible and reasonable and after exhausting all outdoor mitigation options.

Source: Wisconsin Administrative Code – Chapter Trans 405.

[a] WisDOT has substituted the term “Noise Abatement Criteria” used in 23 CFR 772 with “Noise Level Criteria” throughout Chapter 23 and in supporting documents. Further, Table 1 in 23 CFR 772 is the Noise Abatement Criteria for various land uses. WisDOT has adopted the land use categories, impact levels and evaluation locations in 23 CFR 772, Table 1, but refers to this table as “Noise Level Criteria for Considering Barriers” in this Section. The word “Level” is used instead of “Abatement” because the department believes the use of the term “Noise Abatement Criteria” means that the noise impact levels indicated in the table require that abatement be provided. The term “Noise Level Criteria” accurately reflects the intent of the table which is to identify a sound level at which a noise impact occurs thus requiring a determination of whether or not abatement is feasible, reasonable and likely to be incorporated into the project.

FDM 23-35-1 Introduction

July 28, 2011

23 CFR 772.13(h) states, “The FHWA will not approve project plans and specifications unless feasible and reasonable noise abatement measures are incorporated into the plans and specifications to reduce the noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted."

When a noise impact occurs per FDM 23-30, a determination must be made if mitigation is feasible per FDM 23-35-10, reasonable per FDM 23-35-15 and likely to be incorporated into the project per FDM 23-35-20. The methodologies and processes for determining these three factors are applied uniformly for all projects throughout the state.

The results of this determination must be included as part of the environmental document.

FDM 23-35-5 Mitigation Measures

July 28, 2011

Traffic noise mitigation measures commonly employed are described below. There is a hierarchy to the discussion of abatement. A discussion of traffic control measures should be presented first, then buffer zones, then barriers and finally sound-proofing.

5.1 Traffic Control Measures

Traffic control measures that could be employed in certain instances include prohibition of certain vehicle types (usually trucks) from a particular route or restricting vehicles (again, presumably trucks) from operating during noise sensitive times of the day. The prohibition of trucks from a major roadway can produce up to an 8 to 10 dB reduction in noise, at times providing an adequate traffic management abatement measure. This noise mitigation measure is typically incompatible with the purpose and need of a project. If this noise mitigation measure has been determined feasible and reasonable, the department’s State Noise Engineer should be contacted prior to incorporation of the measure into the project commitments.

Lowering the speed limit is not to be considered as a traffic control measure to reduce noise levels. Roadways are designed to accommodate user expectations and a posted speed limit set lower than the limit for which the road was designed results in users traveling at a variety of speeds causing a potential safety problem.

5.2 Buffer Zones

Acquisition of real property or interests therein (predominately unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise may be included as part of a Type I project only.

5.3 Noise Barriers

There is only a certain amount of attenuation to be realistically gained through design and traffic control modifications. Once these are met, the next logical step is to evaluate a barrier specifically for the purpose of attenuating noise.

Noise barriers can be constructed in the form of earth berms or walls made of concrete, bricks, blocks, rock gabions, wood, metal, fiberglass or composites. Berm/wall combinations are also used.

Costs will vary depending on type of material, labor costs, footings required, etc. Barriers can be aesthetically unpleasing, attract vandalism, and create drainage and maintenance problems. They can, however, be pleasing to the eye, have low maintenance, and minimal other problems, given ideal circumstances.

Theoretically, barriers can reduce noise levels by 20-23 dB. However, noise level reductions of 8-12 dB are more typical. Noise barriers made of walls are discussed further in FDM 23-35-6 and FDM 23-35-7.

5.4 Soundproofing

Assuming that all possible design measures have been taken to minimize noise levels, there are still other means by which the effects of sound can be mitigated. A method of reducing interior sound levels is to soundproof buildings. Only Land Use Category D properties identified in FDM 23-30 Table 2.1, Noise Level Criteria (NLC) For Considering Barriers (see FDM 23-30) are eligible for consideration of soundproofing as a noise mitigation measure.

The Federal Highway Administration (FHWA) permits federal funds to be used for this purpose on land uses identified in Land Use Category D.

Land Use Category D is only used as the basis for noise impact determination in situations where no exterior activities are to be affected by the 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. An indoor sound level analysis for Land Use Category D properties is only conducted after exhausting all outdoor analysis options. An indoor analysis for the purpose of considering soundproofing as a mitigation measures is only conducted after a determination has been made that exterior measures will not be feasible and reasonable.

The easiest method of accomplishing noise mitigation through soundproofing is to install air conditioning, which has two benefits. First, windows can be kept shut in warm weather to reduce noise from exterior sources. Second, when coupled with other measures to improve energy efficiency, it can eliminate gaps or openings that allow noise to enter interior spaces. When possible, using double-paned windows and reducing window area can also be effective.

If interior analysis and the possible use of soundproofing as a noise mitigation measure are being considered, the department's State Noise Engineer should be contacted prior to analysis.

FDM 23-35-6 Noise Walls

March 16, 2018

Noise walls are one method used to mitigate traffic generated noise impacts. Noise walls should be considered if other abatement measures are not found to be feasible or reasonable.

All noise wall systems must be prequalified by WisDOT prior to being used on WisDOT projects. All systems must be designed in accordance with the current edition of "Guide Specifications for Structural Design of Sound Barriers" published by the American Association of State Highway and Transportation Officials (AASHTO), 444 North Capitol Street, NW, Suite 225, Washington, DC 20001 in addition to the requirements of the appropriate special provision inserted into the contract. The noise wall system to be constructed must be listed on the WisDOT Prequalified Noise Wall System List. Prior to the first public information meeting for a noise wall project, the designer should reference the department's most current Prequalified Noise Wall System List

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/appr-prod/default.aspx

The project plans will provide a conceptual design that identifies the noise wall system location including; beginning and ending points, horizontal alignment, the minimum top acoustical line and the finished grade line at the base of the wall. Noise wall surface type shall be as shown on the plan and included in the special provisions, as applicable, per FDM 23-35-7. Standardized Special Provisions have been prepared which incorporate all necessary specifications. The appropriate Standardized Special Provision must be used in the Plans, Specifications, and Estimates.

Within 25 days after the award of the contract, the contractor shall provide the Region project engineer with the name of the noise wall system to be constructed. The noise wall system selected by the contractor must be a system that was prequalified prior to the contract letting date.

The contractor shall provide the Region project engineer with three (3) copies of the design calculations, design drawings, certifications and other information as specified by the Standard Specifications, Special Provision, and plans.

The contactor shall also submit the following documents to the Region project engineer; three (3) sets of design/shop drawings and one (1) set of design calculations for review and acceptance. The Region will transmit these documents to the Bureau of Structures Design Section for their review. Any necessary revisions and/or corrections required for acceptance will be noted and returned to the contractor to be revised and resubmitted for review and acceptance. SharePoint may be used for transmittal of these documents in lieu of hard copy. Whether use of SharePoint occurs will be determined by the Region with input from the contractor.

FDM 23-35-7 Noise Walls on Bridges

August 17, 2020

The WisDOT Bridge Manual, Chapter 30.3 contains WisDOT Bureau of Structures policy for noise walls on WisDOT bridges. In general, noise walls are not allowed on WisDOT bridges. If a detailed noise analysis identifies a potential reasonable and feasible noise wall on a bridge, the State Noise Engineer or Specialist and Bureau of Structures must be consulted.

FDM 23-35-8 Noise Wall Surface Type Selection

August 17, 2020

8.1 Purpose

This procedure provides guidance for the selection of noise wall surface type. This policy applies to all noise wall installations, including noise walls constructed as part of a Type I project or a WisDOT Retrofit Project.

8.2 Background

Noise barriers fall into one of two categories, those with absorptive surfaces and those with non-absorptive surfaces.

The principles of acoustics indicate that sound reflected from the surface of a noise wall has the potential of increasing sound levels at existing noise sensitive receptors located on the opposite side of the roadway from the proposed noise wall project. Specifying an absorptive noise wall will reduce reflected sound levels by eighty percent or more, thereby reducing reflected sound to below the level noticeable to the healthy human ear.

If noise abatement is found to be reasonable and feasible and is proposed for installation, the designer shall specify a noise wall surface type based on the criteria below.

For purposes of these criteria, an **ABSORPTIVE NOISE WALL SURFACE** is defined as a noise wall system having a composite **Noise Reduction Coefficient (NRC)** of at least 0.80 on the roadway side of the noise wall and 0.70 on the residential side, as applicable. The composite NRC shall be calculated using the actual NRC value of each member of the total system as determined from ASTM C423 - E795 test data.

8.3 Criteria for Selection of Noise Wall Surface Type

An absorptive noise wall surface shall be specified for use on any of the following noise wall installations:

1. ROADWAY SIDE OF PARALLEL NOISE WALLS, when installed initially as a pair, or separately as part of an approved, multi-year noise abatement plan;
2. ROADWAY SIDE OF A SINGLE-SIDE-OF-ROADWAY NOISE WALL, when residential or other noise-sensitive receptors are located opposite from the roadway wall face; and,
3. RESIDENTIAL SIDE OF THE NOISE WALL, when residential or other noise-sensitive receptors may be affected by reflected noise from other sources located on the residential side of the noise wall.

If reflected noise has the potential to impact lands which are currently undeveloped, the designer shall consider proposed land uses for the undeveloped lands when selecting the noise wall surface type.

Single sided, double sided and reflective noise wall surface types shall be specified for all other noise wall installations.

Requests for exceptions to this policy shall be submitted to the department's State Noise Engineer.

8.4 Special Provision

The following Standardized Special Provisions (STSP's) should be used when specifying noise walls for a project.

STSP #	Title	Bid Item #
531-005	Noise Barriers, Single Sided Sound Absorptive	531.0200.S
531-010	Noise Barriers, Double Sided Sound Absorptive	531.0300.S
531-015	Noise Barriers, Reflective	531.0400.S

FDM 23-35-10 Noise Abatement Feasibility

August 17, 2020

The project manager is responsible for the feasibility decision of noise abatement using traffic control measures and the acquisition of buffer strips. The feasibility decision should be based on whether the measures proposed are compatible with the project purpose and need, meet design criteria and guidance or result in other impacts that would offset noise reduction benefits.

Other factors that must be considered based on the various noise abatement measures being evaluated include; safety, barrier height, topography, drainage, utilities, and maintenance of the abatement measure, maintenance access to adjacent properties, and access to adjacent properties.

For a noise abatement measure to be feasible, a minimum of one (1) impacted receptor or common use area

shall achieve a 5-decibel noise reduction.

Barrier design is conducted using the latest version of the FHWA Traffic Noise Model (TNM). TNM barriers are either walls or berms that intervene between roadways and receivers to reduce sound levels. For purposes of barrier design, TNM allows you to perturb barrier heights up and down to optimize the barriers effectiveness. TNM allows berm/wall combinations and barriers on structure to be input. You may designate whether the barrier is absorptive or reflective.

When an analysis is completed, and an impact determination is made for Land Use Category D properties, a feasibility determination of noise abatement through soundproofing for those properties is handled on a case-by-case basis. Many factors influence the feasibility of the various types of possible soundproofing mitigation measures. Some factors to include in determining whether or not a specific method of soundproofing is feasible include; age and orientation of the building, the presence and condition of heating, ventilation and air conditioning systems in the existing building. Owner's concerns and input may factor into both the feasibility and reasonableness determination. The department's State Noise Engineer or Specialist and FHWA should be included in the feasibility determination.

FDM 23-35-15 Noise Abatement Reasonableness

August 17, 2020

15.1 Traffic Control and Buffer Strips

The project manager is responsible for the reasonableness decision of noise abatement through the use of traffic control measures and the acquisition of buffer strips. The reasonableness decision should be based on whether or not the measures add substantial cost to the project when compared to the noise reduction benefit gained.

15.2 Noise Barriers

For noise barrier reasonableness determinations, the department's State Noise Engineer shall be consulted in making the determination.

For a noise barrier to be reasonable, the total cost may not exceed $47,000 per benefited receptor. The department may annually adjust this $47,000 maximum figure up or down based on the last three years of available noise barrier construction cost data. This review will take place on an annual basis.

To make a reasonableness determination, a noise barrier shall be designed (horizontal and vertical location) such that a minimum of one (1) receptor or common use area achieves the department's noise reduction design goal of 9 decibels.

A noise barrier shall reduce noise levels by a minimum of 8 decibels for a receptor or common use area to be considered as benefited for the purposes of determining reasonableness.

For purposes of reasonableness determination;

- Each individual residence benefited is counted as one (1) benefited receptor.
- Each dwelling unit benefited in a multi-family dwelling is counted as one (1) benefited receptor.
- Each dwelling unit in the multi-family complex eligible to use the benefited common use area is counted as one (1) benefited receptor.
- Each discrete parcel benefited in Land Use Categories A, C, D and E of FDM 23-30 Table 2.1, Noise Level Criteria (NLC) For Considering Barriers is counted as one (1) benefited receptor, except,
- Section 4(f) properties as identified in Land Use Category C of FDM 23-30 Table 2.1, Noise Level Criteria (NLC) For Considering Barriers will be evaluated on a case-by-case basis to determine the location of equivalent receptors on the discrete parcel that will each count as one (1) benefited receptor. This evaluation shall be made in consultation with the WisDOT Noise Engineer or Specialist and FHWA staff.
- Soundproofing of properties as identified in Land Use Category D of FDM 23-30 Table 2.1, Noise Level Criteria (NLC) for Considering Barriers will be evaluated on a case-by-case basis to determine the location of equivalent receptors on the discrete parcel that will each count as one (1) benefited receptor. This evaluation shall be made in consultation with the WisDOT Noise Engineer or Specialist and FHWA staff.

Noise wall section heights and lengths shall be modeled with the most recent version of the FHWA Traffic Noise Model (TNM). These heights and lengths can be used to calculate the total area of the barrier in square feet (sq. ft.).

To determine the estimated cost of the noise wall, the total noise wall area is multiplied by $28.00/sq. ft.

If the noise wall is to be place on top of a berm, the cost of borrow, if required, should also be calculated using the latest borrow costs available.

It is the department's preference that real estate not be acquired for construction of a noise barrier. If it is determined that real estate will be acquired, the Region's Real Estate Section must be contacted for an estimate of the real estate purchase cost.

The total noise barrier cost is calculated by adding the estimate noise wall cost, berm cost and real estate cost.

The noise barrier cost per benefited receptor is calculated by dividing the total noise barrier cost by the total number of receptors benefited by construction of the noise barrier.

If the noise barrier cost per benefited receptor is equal to or less than $47,000, the noise barrier is considered reasonable and a determination of whether or not the barrier will be incorporated into the project is made.

If the noise barrier cost per benefited receptor is greater than $47,000, the noise barrier is considered not reasonable and the process ends with inclusion of this finding in the environmental document.

If a common noise environment exists within the project termini, cost averaging of multiple barriers within the common noise environment may occur as part of the reasonableness determination. A common noise environment is a group of receptors within the same Land Use Category listed in FDM 23-30 Table 2.1 (Noise Level Criteria For Considering Barriers), 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 and cross-roads.

An individual barrier within a common noise environment may not be included in the cost averaging determination if the barrier cost exceeds $94,000 per benefited receptor.

The order of cost averaging of eligible multiple barriers within a common noise environment will be to first average the most cost-effective noise barrier with the second most cost-effective barrier. If the average cost is below $47,000 per benefited receptor, then both noise barriers are considered cost effective. The process then continues with adding the next most cost-effective barrier and performing averaging again. This process continues until a barrier causes the cost average to exceed $47,000 per benefited receptor. All barriers up to, but not including that barrier and any other barriers not yet averaged in, may be carried forward for a determination of whether the barrier(s) will be incorporated into the project.

If a noise barrier is not feasible or reasonable, third party non-participating funding may not be used on a Federal, Federal-aid or state-funded Type I project to make the noise barrier feasible or reasonable. Third party non-participating funding is acceptable on a Federal, Federal-aid or state-funded Type I project to make functional enhancements such as access doors or aesthetic treatments (provided such enhancements and treatments are part of the preapproved noise barrier system), to a noise abatement measure already determined feasible and reasonable.

Third party non-participating funding is allowed on WisDOT Retrofit Projects if the noise abatement measure would require additional funding from the third party to be considered feasible and/or reasonable. Third party non-participating is acceptable on WisDOT Retrofit Projects to make functional enhancements such as access doors or aesthetic treatments (provided such enhancements and treatments are part of the preapproved noise barrier system), to a noise abatement measure already determined feasible and reasonable.

15.3 Soundproofing

For soundproofing to be reasonable, the total cost may not exceed $47,000 per benefited receptor. The department may annually adjust this $47,000 maximum figure up or down based on the last three years of available noise barrier construction cost data. This review will take place on an annual basis.

The cost of the noise abatement measures through soundproofing shall be based on the latest cost available for the soundproofing measure being proposed. Only the costs of design, materials and installation are eligible for Federal and State funding.

FDM 23-35-20 Likely To Be Incorporated Into The Project *March 16, 2018*

When a noise barrier has been determined feasible and reasonable, a determination of whether or not the abatement measure is likely to be incorporated into the project shall occur. The word "likely" is used because the final determination to construct noise abatement occurs in final design and approvals prior to construction. Changes could occur in final design that result in the need to revisit preliminary design decisions made related to noise impacts and abatement.

The determination of "likely to be incorporated" is done through at least one public involvement meeting and vote of the benefited receptors.

When soundproofing has been determined feasible and reasonable, the department shall work with the building owner to determine whether or not the abatement measure will be incorporated into the project.

20.1 Public Involvement Meeting

The department shall hold one or more public involvement meetings, in a location convenient to the locality to be affected by the proposed noise barrier, to provide an opportunity for local participation in the selection and development of the noise barrier installation project. The department shall arrange for published notice of each involvement meeting. The department shall also give direct written notice of each public involvement meeting to each person owning real property or leasing a residence in the following locations:

- Within 500 feet in any direction from the proposed noise barrier, or,
- Within the areas directly behind the proposed noise barrier and directly across the highway from the proposed noise barrier where the highest hourly traffic noise level approaches or exceeds the levels in FDM 23-30 Table 2.1, Noise Level Criteria For Considering Barriers.

Exhibits available at the public involvement meeting should include:

- A Handout Packet that typically it includes the following;
  - Cover sheet
  - Handout packet contents
  - Welcome
  - Project location map
  - Noise barrier(s) location map
  - Purpose of public information meeting including a brief project summary
  - Explanation of the noise barrier selection process
  - Future actions including project schedule
  - Construction time frame if it is determined that the noise barrier will be include in the project
  - WisDOT contact information
  - Comment sheet
- Aerials showing the location of the barrier(s) including;
  - Street names
  - Property addresses and lot lines
  - Before and after sound levels at receptors
  - Barrier section heights
- Conceptual renderings and photos showing the barrier(s) in relation to buildings.
- Pre-approved barrier product samples and brochures that show available barrier systems, colors and textures. The textures shown should be only those available through the standard noise barrier panel manufacturing process. Only two colors of stain are allowed per noise barrier.
- Extra voting ballots for those owners and tenants of benefited receptors that want to submit a vote at the public information meeting.
- Applicable real estate brochures if real estate acquisition is required as part of the project.

20.5 Voting

For a proposed noise barrier project to be considered for construction, the department must receive a vote of support for the project from a simple majority of all votes cast by the owners or residents of the benefitted receptors as follows:

- For each benefited receptor that is an owner-occupied residence, the owner shall have one vote
- For each benefitted receptor that is not an owner-occupied residence, the owner shall have one vote and one resident shall have one vote
- For each benefitted receptor that is a multi-family dwelling, the owner shall get one extra vote if the owner is also an occupant of one of the benefited receptors.

The ballot shall be sent to each eligible voter by certified mail, return receipt requested. A self-addressed, stamped envelope shall also be included with the ballot. The Region Office will determine who is responsible for collecting ballots.

The public meeting notice shall be included in the mailing transmitting the ballot. There should be an explanation included in the cover letter that the ballot can be submitted at the public involvement meeting or by using the

self-addressed stamped envelope. A date for returning the ballot of no less than thirty (30) days after the public involvement meeting should also be included.

The noise barrier selection process needs to be clearly defined in the cover letter included with the ballot sent to the eligible voters. It is important for voters to understand that the selection of the barrier system to be constructed is the sole responsibility of the contractor awarded the project. Owner and resident input will likely be limited to no more than two barrier colors and texture that is available through the standard noise barrier panel manufacturing process.

All reasonable efforts should be made to ensure that each eligible voter returns a ballot indicating whether or not they support construction of the noise barrier. Such efforts could include phone calls and personal visits to those owners and tenants not returning a ballot by mail or at the public involvement meeting.

Documentation of the various methods used to gather votes should be included as part of the project files.

Documentation of the final vote tally and decision of whether or not to construct the noise barrier(s) should also be included as part of the project files.

FDM 23-40-1 General *August 15, 2019*

Construction noise can usually be considered a temporary, unavoidable, and adverse impact associated with highway projects.

1.1 Permissible Noise Levels

To date, there have been no limits placed on construction noise for highway projects. However, the Environmental Protection Agency (EPA) has instituted noise emission standards for newly manufactured medium and heavy-duty trucks and portable air compressors.

Local municipalities may have specific noise ordinances. The department and its contractors are not subject to compliance with local noise ordinances unless specifically cited in the project plans, specifications and contracts. The department and its contractors are encouraged to work with local municipalities and citizens to address construction noise concerns when voiced.

1.2 Measurement

Measurement of construction noise is not required for highway projects. However, using a range of construction equipment noise levels, Attachment 1.1 was developed. It presents the distance from a construction site and the range of noise levels expected. This figure is typically used in place of construction noise measurements. This figure may be included in environmental documents.

1.3 Prediction

The limits of a highway noise analysis do not typically warrant such a detailed study. Highway construction noise activities can be accurately modeled using the FHWA Roadway Construction Noise Model (FHWA RCNM) Version 1.1 if determined necessary though. Should the project manager determine that a detailed analysis may be warranted, the Region's Environmental Coordinator and department's State Noise Engineer should be contacted prior to commencement of such an analysis.

1.4 Abatement

For most projects, construction noise will not substantially affect the neighborhood. Language included in the latest edition of the Standard Specifications should be adequate for controlling construction noise impacts.

In rare instances, however, there may be potential for creating extremely high levels (i.e., when working in a confined area with residents very close) or for a very lengthy time of exposure (i.e., several months). Therefore, some means of regulating construction noise may be desirable.

If the project manager determines that special construction noise abatement measures are need above those included in the latest edition of the Standard Specifications, the Region's Environmental Coordinator and department's State Noise Engineer should be contacted prior to incorporation of any special abatement measures into the project commitments or plans and specifications.

1.5 Documentation

1.5.1 Environmental Report (ER) or Environmental Assessment (EA)

When the department's ER and EA Template and Factor Sheets are used to prepare an environmental document, construction noise is documented in Question 22 on the ER and EA Template, Environmental Factors Matrix, under Construction Sound.

1.5.1.1 No Noise Sensitive Receptors in The Project Area

If no noise sensitive receptors are located in the project vicinity, check the box in Question 22 on the ER and EA Template, under Construction Sound indicating "No Impacts Identified". Include in the effects column, **"***No receptors are located in the project area. No impacts resulting from construction noise are anticipated.***"**

Include "No special or supplemental commitments required" in the commitments column on Question 23, under Construction Sound.

It is not necessary to include the Construction Sound Factor Sheet.

1.5.1.2 Noise Sensitive Receptors in The Project Area

Construction noise impacts may occur if noise sensitive receptors are located within the vicinity of the project; include the Construction Sound Factor Sheet in the environmental document. For these projects, check the boxes indicating "Adverse Impact" and "Factor Sheet Attached" in Question 22 of the ER and EA Template, Environmental Factors Matrix, under Construction Sound. Include in the comments column, **"***Construction noise impacts may occur. See Construction Sound Factor Sheet.***"**

Include "No special or supplemental commitments required" in the commitments in the Construction Sound row in Question 23 of the ER and EA Template, Environmental Commitments, if the Standard Specifications will apply.

If the hours of operation will be different than those in the Standard Specs, use this standard language in the commitments column, "*WisDOT Standard Specifications 107.8(6) and 108.7.1 will apply with the exception that the hours of operation requiring the engineer's written approval for operations will be changed to ____PM to ___ AM.*" Be sure to insert the appropriate hours.

Prior to including any special construction noise abatement measures other than a change in hours of operation in the Construction Sound commitment row in Question 23 of the ER and EA Template, Environmental Commitments, the project manager shall contact the Region's Environmental Coordinator and WisDOT State Noise Engineer or Specialist.

It is also necessary to include the Construction Sound Factor Sheet in the environmental document when noise sensitive receptors are located in the project vicinity.

Attachment 1.1 may be included to assist the document preparer to answer question 2 on the Construction Sound Factor Sheet.**1.5.2 Environmental Impact Statement (EIS)**

1.5.2 Environmental Impact Statement (EIS)

A construction noise discussion should be included in the Construction Impacts subsection of the EIS or narrative EA. Typical construction equipment used on similar projects should be identified. FDM 23-40 Attachment 1.1 should be included as part of the discussion.

If the hours of operation will be similar to those in the Standard Specs, use this standard language, "*WisDOT Standard Specifications 107.8(6) and 108.7.1 will apply.*"

If the hours of operation will be different than those in the Standard Specs, use this standard language, "*WisDOT Standard Specifications 107.8(6) and 108.7.1 will apply with the exception that the hours of operation requiring the engineer's written approval for operations will be changed to ___ PM to ___ AM.*" Be sure to insert the appropriate hours.

Prior to including any special construction stage noise abatement measures, the project manager shall contact the Region Environmental Coordinator and WisDOT State Noise Engineer or Specialist.

LIST OF ATTACHMENTS

Attachment 1.1	Construction Noise/Distance Relationships

Construction Noise/Distance Relationships

Distance from Construction Site (feet)	Range of Typical Noise Levels (dBA) [1]
25	82 - 102
50	75 - 95
100	69 - 89
200	63 - 83
300	59 - 79
400	57 - 77
500	55 - 75
1000	49 - 69

Point sources = 6 dBA reduction per doubling of distance (Source: EPA and WisDOT).

FDM 23-45-1 Projects Not Requiring a Detailed Noise Analysis

August 15, 2019

1.1 Traffic Noise

For projects that are not Type I or WisDOT Retrofit Projects, traffic noise is documented on the Environmental Report and Environmental Assessment Template (ER and EA Template) in Question 22, Environmental Factors Matrix. Under the Traffic Noise Factor, check the box indicating "No Impacts Identified". Include in the effects column, *"A detailed noise analysis was not required for this project. No impacts are anticipated."* It is not necessary to include the Traffic Noise Factor Sheet.

Environmental document templates, forms and guidance can be found on the Bureau of Technical Services Environmental Programs web site:

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/formsandtools.aspx

FDM 23-45-5 Projects Requiring a Detailed Noise Analysis - ER and EA Template and Factor Sheets

August 15, 2019

For Type I and WisDOT Retrofit Projects, a discussion or definitive statement about traffic noise is an integral part of every environmental document. The impact assessment portion of the environmental document should at least summarize the noise analysis results and conclusions. Information produced during the early stages of the design process must be sufficient to satisfy environmental documentation requirements by identifying existing and future sound levels, project area receptors, receptors not impacted or impacted by alternatives carried forward for detailed study, evaluation of possible abatement measures, those abatement measures likely to be included in the project, and, an explanation why abatement is not feasible or reasonable for those receptors impacted, but for which noise abatement will not be provided.

This procedure details the documentation methodology for providing traffic noise analysis, impact identification and mitigation determination using the department's ER and EA template and Factor Sheets.

Question 22 of the ER and EA Template, Environmental Factors Matrix, in Question 23 of the ER and EA Template, Environmental Commitments, and the Traffic Noise Factor Sheet will be used to provide appropriate documentation.

An aerial or plan map identifying the location of the receptors analyzed shall be included in the environmental document.

Environmental document templates, forms and guidance can be found on the Bureau of Technical Services Environmental Programs web site:

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/formsandtools.aspx

5.1 No Impacts Identified

In Question 22 of the ER and EA Template, Environmental Factors Matrix, check the boxes indicating "No Impacts Identified" and "Factor Sheet Attached". Include in the effects column, "*A detailed noise analysis was required for this project. No impacts are identified.*

In Question 23 of the ER and EA Template, Environmental Commitments, include "*None*" in the commitments column.

The Traffic Noise Factor Sheet shall be completed and included in the environmental document.

5.2 Impacts Identified, Abatement Not Feasible or Reasonable

In Question 22 of the ER and EA Template, Environmental Factors Matrix, check the boxes indicating "Adverse Impact" and "Factor Sheet Attached." Include in the comments column, "*A detailed noise analysis was required for this project. Some impacts are anticipated. See attached Traffic Noise Factor Sheet Pages* ___." Be sure to insert the page numbers.

On ER or EA Template question 23, include "*None*" in the commitment column.

The Traffic Noise Factor Sheet shall be completed and included in the environmental document.

The Traffic Noise Factor Sheet, Question 6 shall include a discussion of design features and noise abatement measures evaluated.

Design features evaluated that could reduce future sound levels (see FDM 23-25-5) should be discussed first. The discussion should include whether or not the design features would be incorporated into the project. If the features would not be included, an explanation why they would not be included shall be provided.

Noise abatement measures to include in the discussion that follows are; traffic control measures, buffer zones, noise barriers and soundproofing (if applicable). The discussion should include whether or not the noise abatement measures would be incorporated into the project. If the features would not be included, an explanation why they will not be included shall be provided. This discussion should be based on feasibility and reasonableness.

If a barrier analysis using the FHWA Traffic Noise Model (TNM) was completed, the discussion shall incorporate a table showing the results of the noise barrier analysis including; barrier length, average height, number of receptors benefited, estimated cost, cost per benefited receptor. The table should be followed by an explanation as to why noise barriers are not feasible or reasonable. The discussion should end with this statement, "*Because mitigation techniques on this project are not feasible and reasonable, noise abatement is not proposed.*" The aerial or plan map included in the document showing the location of receptors and barrier evaluated and should also be referenced.

5.3 Impacts Identified, Abatement Feasible and Reasonable

For Traffic Noise in Question 22 of the ER and EA Template, Environmental Factors Matrix, check the boxes indicating "*Adverse Impact*" and "*Factor Sheet Attached*". Include in the comments column, "*A detailed noise analysis was required for this project. Some impacts are anticipated. See attached Traffic Noise Factor Sheet, Pages ___.*" Be sure to insert the page numbers.

If the commitments to noise abatement are related to traffic control measures or buffer zones, include in the commitments column for Traffic Noise in Question 23 of the ER and EA Template, Environmental Commitments, "*Noise abatement has been determined to be feasible and reasonable.***"** Another sentence or brief discussion should follow explaining what noise abatement measure(s) will be incorporated and what impact it will have on noise levels.

If the commitments to noise abatement are related to soundproofing, include in the commitments Traffic Noise row in Question 23, Environmental Commitments, of the ER and EA Template, "*Noise abatement has been determined to be feasible and reasonable.***"** Another sentence or brief discussion should follow explaining what locations will be soundproofed and the type of soundproofing.

If the commitments to noise abatement are related to noise barriers, include in the commitments Traffic Noise row in Question 23, Environmental Commitments, of the ER and EA Template, "*Noise abatement has been determined to be feasible and reasonable. A separate public involvement process will be initiated to determine whether or not the benefited owners and tenants support noise barrier construction. If final design results in substantial changes in roadway design from modeled conditions, noise abatement measures will be reviewed."*

The Traffic Noise Factor Sheet shall be completed and included in the environmental document.

The Traffic Noise Factor Sheet, Question 6 shall include a discussion of design features and noise abatement measures evaluated. Design features evaluated that could reduce future sound levels (see FDM 23-25-5) should be discussed first. Abatement measures to include in the discussion are; traffic control measures, buffer zones, noise barriers and soundproofing (if applicable). The discussion shall incorporate a table showing the results of the noise barrier analysis including; barrier length, average height, number of receptors benefited, estimated cost, cost per benefited receptor and which barrier(s) are proposed for construction. A discussion should also be included identifying any barriers evaluated that are not proposed for construction and the reason why. The discussion should end with this statement, "*Noise abatement has been determined to be feasible and reasonable. A separate public involvement process will be initiated to determine whether or not the benefited owners and tenants support noise barrier construction. If final design results in substantial changes in roadway design from modeled conditions, noise abatement measures will be reviewed.*"

FDM 23-45-10 Projects Requiring a Detailed Noise Analysis – EIS and Narrative EA *August 15, 2019*

This procedure details the methodology for providing traffic noise analysis, impact identification and mitigation determination documentation when preparing an Environmental Impact Statement (EIS) or narrative Environmental Assessment (EA).

EIS and narrative EA noise analysis documentation generally contains both a narrative impact discussion and supporting exhibits.

For an EIS or narrative EA, the noise discussion has typically been separated under two sections: "Affected Environment" and "Environmental Consequences". A common streamlining practice of environmental document preparers has been to combine these two sections into one section of the EIS or narrative EA. Supporting data should be included in the appendices or incorporated by reference. Some of the information that may potentially be included is described below.

10.1 Affected Environment

- An introduction to the basics of acoustics including explanations of; decibels, relative differences in sound levels, A-weighting (dBA) and variations in sound levels over time (Leq).
- Description of the 5 major traffic noise sources including; autos, medium trucks, heavy trucks, buses and motorcycles.
- The traffic noise components of those 5 major sources including; running gear and accessories, engine and aerodynamic/body noise.
- Description of any applicable background noise generators affecting the existing noise environment including; factories, airports, truck stops, etc.
- A land use description of project areas to ensure the proper land use categories in Table 1, Noise Level Criteria (NLC) For Considering Barriers (see FDM 23-30) are used for a determination of potential noise impacts. Noise sensitive areas including; residential areas, schools, hospitals, churches, and nursing homes should be identified.
- Brief summary of existing sound levels (measured or modeled). The locations of existing sound level measurements should be indicated on an exhibit. A more detailed discussion of existing sound levels will be provided in the Environmental Consequences section.
- Comparison of field data versus modeled sound levels (validation).
- Type of equipment used including the model/type of sound level meter.

10.2 Environmental Consequences

- Analysis methodology, including programs and procedures used.
- A description of applicable state policy for determining noise impact and the feasibility and reasonableness of mitigation.
- A comparative noise impact discussion of each alternative carried forward for detailed analysis shall be included. A tabular format similar to the table included in the Traffic Noise Factor Sheet or use of the actual table functions well to provide this discussion. The receptor descriptors, number of families or people typical at the site, Noise Level Criteria for the applicable land use category, existing sound levels, future sound levels, difference between future and existing sound levels, difference between future sound levels and Noise Level Criteria, and impact or no impact should be identified for each receptor or group of receptors analyzed.
- If impacts are identified, noise abatement should be addressed using the same format as that used in the Traffic Noise Factor Sheet, Item 6 detailed in Section 5.2 Impacts Identified, Abatement Not Feasible or Reasonable or Section 5.3 Impacts Identified, Abatement Feasible and Reasonable above.
- If abatement in the form of noise barriers has been determined feasible and reasonable, the discussion should end with this statement, "*Noise abatement has been determined to be feasible and reasonable. A separate public involvement process will be initiated to determine whether or not the benefited owners and tenants support noise barrier construction. If final design results in substantial changes in roadway design from modeled conditions, noise abatement measures will be reviewed.*"
- Exhibits accompanying the narrative portion are an important part of any noise discussion. An important tool is the use of tabular data in the EIS or narrative EA. Some of the types of exhibits that are very useful and meaningful are;
    - FDM 23-30 Table 2.1, Noise Level Criteria (NLC) For Considering Barriers should be included.

- A table for each alternative carried forward for detailed study providing the comparative noise impact discussion referenced above.
- A table or graph showing the relative strengths of familiar sounds. This is very useful when reports are available to the general public. Such exhibits should relate to the technical knowledge of the probable reviewer. The “Typical A-Weighted Sound Levels” form could also be used.
- It is not necessary to include the individual output sheets produce by the FHWA Traffic Noise Model as exhibits in the EIS or narrative EA. Those sheets should be included in the project files.

FDM 23-45-15 Providing Sound Level Information to Local Officials

July 28, 2011

The FDM requires that local officials be notified of future traffic noise impacts on undeveloped lands. This notification should be included as part of the environmental document.

The methodology for preparing this documentation is found in FDM 23-50-5.

FDM 23-50-1 General

February 15, 1988

Undeveloped lands lying adjacent to a proposed highway improvement project pose no *immediate* problem concerning traffic noise impacts. However, at some future date, these lands may be developed and sold to persons unaware of the traffic noise. This same type of situation can arise to a limited degree in developed areas as a result of changes in land use.

Problems of this type can be forestalled by cooperation between WisDOT and local planning and zoning agencies. One means is for WisDOT to provide, and local agencies to use, future traffic sound level information concerning highway improvement projects to prevent development from occurring within noise impacted areas. Another vehicle for doing the same thing where there is no highway improvement planned is the plat review process.

FDM 23-50-5 Information To Local Officials – Environmental Document

July 28, 2011

23 CFR 772.17 requires that certain information be provided to local officials related to future traffic noise impacts on currently undeveloped lands. The intent is to have the transportation agency work with the planning or zoning agency to prevent incompatibility from arising between future traffic sound levels and future development.

Correspondence providing future traffic sound level information to local officials is required for all Type I projects for which a detailed traffic noise analysis was prepared and undeveloped lands that are not permitted are sited adjacent to the roadway. It is the responsibility of the WisDOT Regional Office to provide this information regardless of project sponsorship.

5.1 No Noise Impact Identified

The final environmental document for a Type I project where a determination has been made that sound levels will not approach or exceed the Noise Level Criteria outside the right of way will suffice as the mechanism for providing information to local officials.

5.2 Noise Impact Identified

For a Type I project where a determination has been made that sound levels will result in a noise impact outside the right of way, Attachment 5.1 should be used as a form letter template to provide the requisite information to local officials.

LIST OF ATTACHMENTS

Attachment 5.1 Form Letter Template for Noise Notification to Local Officials

FDM 23-50-10 Information To Local Officials - Plat Review

July 28, 2011

The Statutes require WisDOT to review all plats abutting state trunk highways and connecting streets. However, by informal agreement with the Department of Administration Plat Review Team, all plats (abutting and nonabutting) are forwarded to WisDOT for review. Nonabutting plats are reviewed informally, primarily for street widths.

Ideally, then, for each plat reviewed it would be desirable to include noise information specific to the plat. Unfortunately, WisDOT has neither the time nor the resources to predict future noise levels for each plat based on the number of plats and statutory time allotted for each review.

If noise data for a project has already been provided to local authorities, there is no need to review adjacent plats for this matter, since this is a local responsibility. However, if noise data for a route has been collected, but not yet provided to the local authorities, then the data should be added to the review of adjacent plats for information purposes only.

A copy of the plat review comments and information should be sent to any local zoning agencies having jurisdiction.

{WisDOT Region Office Letterhead}

[Date]

[Address Block]

Subject: [Project Identification Information]

[Salutation]

To promote compatibility between future development and anticipated highway sound levels and to avoid future noise impacts the Wisconsin Department of Transportation notifies local officials of future traffic noise impacts on undeveloped lands not currently permitted.

The *[environmental document type]* for the referenced project has been completed. The noise analysis prepared has identified that noise impacts would occur with completion of the proposed roadway project.

In an effort to prevent future traffic noise impacts on the currently undeveloped lands within your jurisdiction adjacent to the project, the 66 dBA L_{eq} or 71 dBA L_{eq} setback distance along the proposed project would be *[distances]* feet respectively along *[road name]* between *[termini]*. *[The previous sentence should be used for each substantial change in traffic volume along the project corridor.]* The distances referenced are measured from the centerline of the nearest lane on the future roadway.

This sound level information and setback distance should be used to ensure that the desired compatibility between potential future development and highway is achieved.

There are several types of administrative controls available, including the use of exclusive zoning, public ownership, and various forms of legal controls such as building codes, subdivision, regulations, health codes, etc. These and others are described in a publication produced by the Federal Highway Administration (FHWA) entitled "*The Audible Landscape: A Manual for Highway Noise and Land Use*". The sole purpose of this manual is to assist local government officials, developers, and designers in dealing with noise-sensitive land uses near highways.

The Department distributed copies of this booklet to nearly every municipality within the state. While this manual was originally developed in the 1970's, it is still an excellent tool to assist local government officials by indicating ways in which local government officials can guide the development of undeveloped land in the vicinity of existing highways. This manual and other information about noise compatible land use planning can be found on the FHWA website at http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/.

The official "Date of Public Knowledge" for consideration of noise impacts at the project level is defined in 23 CFR 772.5 as 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 part 771. Any new development permitted after this date in the project corridor is not eligible for consideration of noise abatement. Even though new development would not be eligible for noise abatement, noise impacts on the new development and the feasibility and reasonableness of abatement were evaluated for planning purposes.

Accompanying this letter for your information is [*Factor Sheet D-3 or Final EIS Pages* ___]. I have also enclosed a copy of the project site plan, which shows the noise modeling receptors used to determine the setback distances.

If you have any further questions in regard to this subject or regarding this project in general, please feel free to contact me at [*phone number*].

Sincerely,

[*WisDOT Project Manager or WisDOT Local Roads Program Manager*]

Enclosures

cc: [*WisDOT Region Environmental Coordinator*]

[*WisDOT Central Office Noise Engineer*]

[*Others required by the Region Office*]