

CHAPTER 17

NOISE

TABLE OF CONTENTS

17-1 OVERVIEW.....	17-1
17-2 DEFINITIONS	17-1
17-3 PROCEDURE	17-3
17-4 TYPE 2 CATEGORICAL EXCLUSION, ENVIRONMENTAL ASSESSMENT, ENVIRONMENTAL IMPACT STATEMENT AND STATE ENVIRONMENTAL IMPACT REPORT.	17-3
17-4.1 Field Noise Measurements.	17-4
17-4.1.1 Field Measurements for Establishment of Ambient Noise Conditions	17-4
17-4.1.2 Field Measurements for Verification of the Computer Noise Model	17-4
17-4.2 Computer Verification of Measured Traffic Noise Levels.....	17-5
17-4.3 Data Needs for Prediction of Existing and Future Traffic Noise Levels	17-6
17-4.3.1 Traffic Data.....	17-6
17-4.3.2 Receptor Data	17-7
17-4.3.3 Noise Descriptor	17-7
17-4.4 Computer Prediction of Existing and Future Traffic Noise Levels	17-7
17-4.5 Determining Future Traffic Noise Impacts	17-8

17-4.6	Traffic Noise Abatement Techniques.	17-8
17-4.6.1	Traffic Noise Abatement Considerations	17-9
17-4.6.2	Community Coordination	17-13
17-4.6.3	Retrofitting (or Type II Projects).	17-14
17-4.7	Preparation of the Noise Study Report.	17-14
17-4.7.1	Noise Study Report Contents.	17-14
17-4.7.2	Methodology and Assumptions.	17-15
17-4.7.3	Application of FHWA Noise Standards.	17-15
17-4.7.4	Coordination Requirements and Documentation.	17-15
17-4.7.5	Construction Noise and Vibration Impacts.	17-16
17-4.7.6	Noise Abatement Commitments.	17-16
17-4.7.7	Noise Study Report Review.	17-18
17-4.8	Noise in the Type 2 Categorical Exclusion	17-18
17-4.9	Noise in the EA /FONSI.	17-18
17-4.10	Noise in the Environmental Consequences Section of the Draft and Final Environmental Impact Statement or State Environmental Impact Report.	17-19
17-4.11	Noise in the Reevaluation Process	17-19
17-5	REFERENCES	17-19
TABLE 17.1	Noise Abatement Criteria	17-21

TABLE 17.2 Construction Noise & Vibration Sensitive Sites 17-22

FIGURE 17.1 Noise Study Report Outline 17-23

17-1 OVERVIEW

The noise analysis guidance provided in this chapter is based largely on the regulatory material that is found in 23 Code of Federal Regulations (CFR) Part 772 entitled "Procedures for Abatement of Highway Traffic Noise and Construction Noise" (reference no. 1). In addition, Chapter 335.17, Florida Statute, (reference no. 2) requires the use of 23 CFR Part 772 in the noise impact assessment process, regardless of funding. The following procedures are conducted by the District as a part of the preparation of the Class of Action Determination (Part 1, Chapter 3). That determination will indicate which of the four class of actions are applicable to the project. These are Type 2 Categorical Exclusion (CE), Environmental Assessment (EA), Environmental Impact Statement (EIS), or State Environmental Impact Report (SEIR).

The initial noise impact assessment for all projects shall be a desk-top review. This review should determine if noise levels will be likely to increase, if noise sensitive receivers are (or will be) within the project area, and if noise impacts will occur. This review may include computer modeling, a review of land use plans, aerial photography and/or similar efforts. This will allow the reviewer to determine whether noise impacts will occur.

If this review indicates the possibility of a noise impact, then a detailed noise study is performed, consisting of field data collection and computer analysis. The computer analysis will use the Federal Highway Administration (FHWA) Traffic Noise Model (TNM). If the noise study demonstrates an impact, a Type 1 CE, Programmatic CE or non-major state action may be upgraded to a Type 2 CE, EA, EIS or SEIR depending on the severity of the impact.

During or after data collection, the Noise Study Report (NSR) is begun. The NSR contains the assumptions, data, procedures and results from the noise study, as well as the conclusions drawn from it. When the noise impact analysis and the NSR are completed, the NSR is forwarded to FHWA for review along with the EA or EIS, or maintained in the file with the Type 2 CE or SEIR.

Finally, excerpts and summaries from the NSR are put into the Type 2 CE, EA, EIS or SEIR. The Noise section of the Type 2 CE, EA, EIS, or SEIR has only enough detail to convey the degree of noise impact which the proposed project will have, along with certain required statements. The Type 2 CE, EA, EIS, or SEIR will reference the NSR for additional details, using a statement similar to the following : "The Noise Study Report for this project is available from the District Office, located at _____ ." After Location and Design Concept Acceptance has been received a copy of the NSR is sent to the appropriate local government officials within whose jurisdiction the highway project is located. Along with the report may be sent other information that will aid these officials in their efforts to minimize highway noise impacts in the future.

17-2 DEFINITIONS

1. *Approach criteria.* For the purpose of this document, approaching the criteria will mean within 1 decibel (dBA) of the appropriate Federal Highway Administration (FHWA) abatement criteria.

2. *Benefited receiver.* A benefited receiver is a noise sensitive receiver that will obtain a minimum of 5 dBA of noise reduction as a result of the use of a specific noise abatement activity regardless of whether or not they are identified as impacted. Only benefited receivers will be included in the calculation needed to determine that any particular noise abatement scheme has a reasonable cost.
3. *Decibel.* A descriptor of the difference between measured sound pressure levels. For traffic noise purposes the A-weighted scale, which closely approximates the range of frequencies a human ear can hear, is used. The A-weighted decibel is abbreviated dBA.
4. *Design year.* The future year used to estimate the probable traffic volume for which a highway is designed. A time (usually 20 years) from the start of construction is normally used.
5. *Date of Public Knowledge.* The date that the Type 2 CE, Finding of No Significant Impact, Record of Decision, or SEIR was approved.
6. *Impacted receiver.* A noise sensitive receiver that is or will be subjected to highway traffic noise that approaches or exceeds the noise abatement criterion or substantially exceeds existing noise levels.
7. L_{Aeq} . The level (A-weighted) equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period.
8. L_{Aeq1h} . The hourly value of L_{Aeq} .
9. *Noise Abatement Criteria (NAC).* The noise level, depending upon land use type, at which FDOT must consider noise abatement. The NAC can be found in Table 17.1.
10. *Noise sensitive receiver.* Any property (owner occupied, rented, or leased) where frequent exterior human use occurs and where a lowered noise level would be of benefit. In those situations where there are no exterior activities to be affected by the traffic noise, the interior of the building shall be used to identify a noise sensitive receiver.
11. *Planned, designed, and programmed.* Planned, designed, and programmed property must be evaluated in the noise analysis. Development will be deemed to be planned, designed, and programmed if a proposed noise sensitive land use such as a residence, school, church, hospital, library, etc., has received a building permit from the local agency with jurisdiction for each building at the time of the noise analysis.
12. *Reasonable and feasible.* In relationship to noise abatement, feasibility deals primarily with engineering considerations (e.g., can a barrier be built given the topography of the location; can a substantial noise reduction be achieved given certain access, drainage, safety, or maintenance requirements; are other noise sources present in the area, etc.). Reasonableness implies that common sense and good judgment were applied in a decision related to noise abatement.
13. *Special land use.* This refers to noise sensitive land uses such as schools, churches, and parks.
14. *Substantial noise increase.* This is an increase of 15 or more decibels above the existing noise level as a direct result of the transportation improvement project in question.

15. *Substantial noise reduction.* This is an effort to reduce traffic noise impacts at benefited receptors by 10 decibels or more, if possible, with a minimal acceptable level of reduction at no less than 5 decibels.

16. *Traffic noise impacts.* Impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria, or when the predicted traffic noise levels substantially exceed existing noise levels.

17. *Type I projects.* A proposed Federal-aid or state-funded project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes.

18. *Type II projects.* A proposed Federal-aid or state funded highway project for noise abatement on an existing highway. Type II projects are commonly referred to as retrofit projects.

17-3 PROCEDURE

The District will review the project and determine the effects on the noise environment. Three steps are used to determine any noise impacts :

1. Determine qualitatively how implementation of the project will result in changes in traffic and typical sections. All viable alternatives for all study years (existing and design) should be examined using approved procedures incorporating current professional judgment.
2. Determine if any of the factors listed above could cause a substantial increase in noise levels compared to the no-project alternative. If a noise impact is expected, prepare a NSR following the procedures in section 17-4.
3. If, after following procedures in section 17-4, it is determined that noise levels will approach or exceed the abatement criteria or the project will cause a substantial noise increase, then abatement must be considered.

17-4 TYPE 2 CATEGORICAL EXCLUSION, ENVIRONMENTAL ASSESSMENT, ENVIRONMENTAL IMPACT STATEMENT AND STATE ENVIRONMENTAL IMPACT REPORT

The noise analysis and documentation requirements for the Type 2 CE, EA, EIS and SEIR are described below. They begin with the collection of field data, followed by the computer verification of field data and computer prediction of future noise levels. If a determination is made that future noise levels approach or exceed abatement criteria or substantially increase over the existing noise levels, then the next and final analytical step is to consider noise abatement. This is followed by documentation of the results of the noise investigation in the NSR and the Type 2 CE, EA, EIS, and SEIR.

17-4.1 Field Noise Measurements

Field measurements are to be conducted along all existing or proposed roadway segments or links that may be affected by the proposed action. For example, one or more representative sites within each link or segment are to be sampled if traffic volumes, mix, or horizontal/vertical geometry change substantially enough to impact traffic noise levels. Field monitoring will generally be conducted in accordance with FHWA's guidance document, "Measurement of Highway-Related Noise" (reference no.3).

17-4.1.1 Field Measurements for Establishment of Ambient Noise Conditions

When field measurements are required along a new alignment where traffic noise does not exist or is only a minor element in the overall noise, noise monitoring is to be conducted in accordance with the FHWA procedures found in reference no.3. Measurements should be taken 1.5 m (5 ft) above ground level and within 30 m (100 ft) of the centerline of the proposed roadway alignment if possible. If possible, a location along the alignment should be chosen that represents a potential noise sensitive site and that has a noise environment similar to most areas along this section of the alignment. A minimum of 3 repetitions of 10 minutes worth of readings using an integrating Sound Level Meter shall be taken at each site (if possible), noting the pertinent field conditions. At least two sets of readings at each location should be taken over a range of time. While it may not always be practical, it is recommended that one set of readings be taken during the morning hours and a second set taken during the afternoon hours. It is further recommended that these readings be taken over a period of two or more days if possible. The resultant noise level for each reading shall be noted and an average ambient reading for each site shall be obtained. The average ambient reading (from all sources) shall be used to determine the increase (if any) in the noise level that can be expected in the area as a result of the proposed project. The entire project corridor should be reviewed under these conditions to determine if any unusual noise sources (aircraft, industrial, electrical generators, etc.) exist that may influence the ambient readings. If any unusual noise sources are noted during the study, they must be identified in the field report so that potential controls or frequency of occurrence can be determined. Specific questions regarding ambient noise field measurements should be directed to the District Noise Specialist.

17-4.1.2 Field Measurements for Verification of the Computer Noise Model

Existing traffic noise levels are measured in the field and then compared against computer predictions to verify the accuracy of the computer model. Traffic noise monitoring is conducted in accordance with FHWA's measurement procedures found in reference 3 as supplemented with accepted professional judgment. If possible, monitor when worst case traffic noise levels are anticipated to occur. This will give the noise specialist better insight into the traffic noise conditions that are currently affecting the adjacent properties. If this is not possible, then monitor during any heavy traffic period (not necessarily the peak period).

Monitor for a minimum of 3 repetitions of 10 minutes using an integrating Sound Level Meter (if possible) noting the following :

1. Average vehicle speed for all classes of vehicles (using a radar unit for measuring speeds);
2. Vehicle counts and class identification (automobiles, motorcycles, buses, medium trucks, heavy trucks, directional factors);
3. Unusual noises (aircraft flyovers, trains, barking dogs, etc.);
4. All input parameters necessary to run the computer models, including :
 - a. Distance from center of each roadway to receptor;
 - b. Width of roadway and lanes;
 - c. Height of the receptor;
 - d. Barrier/buffer information including trees, berms, structures;
 - e. Type of propagation path (hard versus soft);
 - f. Variations in terrain between the receptor and the source; and
 - g. Grade, if any.

If the field data was gathered without unusual noise disturbances, such as barking dogs or aircraft flyovers, the study will be considered complete. If not, and a logical explanation for any unusual readings cannot be made, the field measurements at that location(s) should be repeated in accordance with the FHWA's current measurement procedures.

17-4.2 Computer Verification of Measured Traffic Noise Levels

After October 1, 2000, all new noise studies will require the use of the latest version of the FHWA Traffic Noise Model (TNM). Any project which was initiated using STAMINA2.1 should continue to use this model throughout the life of the project (including all reevaluations) unless dictated otherwise by the professional judgment of the District Noise Specialist and the District Environmental Administrator with concurrence of the FHWA Division Office (if appropriate) (references 4 and 5). This will provide a continuity of the evaluation process that will minimize public concern that the modeling effort was changed to reduce the anticipated impacts. A new noise study is defined as one for which no Scope of Services has been developed as part of the original environmental impact assessment process.

Regardless of which model is used to predict noise levels, the user is reminded that these models are a useful tool to help the noise specialist in assessing the potential for noise impacts and developing mitigation designs. However these models have known limitations and the results should be reviewed carefully by an experienced user to insure that the results are reasonable and consistent with field experience. Remember, there is no substitute for professional judgment. For details on some of the known limitations on STAMINA, review the material in reference 4 or contact the CEMO for guidance. For limitations associated with TNM, review the information found in reference 5 as well as that found on the Transportation Research Board/FHWA website, <http://www.tiac.net/users/a1f04/tnm/index.htm> or contact the FHWA Noise Program staff. Particular attention should be paid to the location of the edge of pavement (edge of the travel lanes versus paved shoulders, etc.), the use of hard sites (water, pavement, etc.) as a default value, and the assessment of distant receivers over 91.5 meters (300 feet) from the center of the nearest roadway.

Additional field validation of predicted results, regardless of the model used, is strongly encouraged. This will insure that unforeseen prediction errors are kept to a minimum and will support reasonable decisions related to abatement. Field validation efforts should include field measurements taken at locations exhibiting traffic, roadway, and geometric conditions as similar as possible to those anticipated along the proposed project. Again, professional judgment will need to be exercised to insure that the comparison of computer predicted results and comparable site field measurements are properly reviewed and evaluated.

Using STAMINA2.1 or TNM, (depending upon the conditions noted above) predict the noise level for the same time period using the data gathered in section 17-4.1.2 above as input. This will give you an indication of the accuracy of the model under the existing conditions. If the predicted and measured levels are within + or - 3 dBA of one another, this is an indication that the model is within the accepted level of accuracy. If the difference between the measured and the predicted levels is greater than + or - 3 dBA, a careful examination of the field-measured and predicted data should be undertaken to determine the reason(s) for this margin of error. In the event that a logical explanation for the difference cannot be made, the field measurements at that location(s) should be repeated.

17-4.3 Data Needs for the Prediction of Existing and Future Traffic Noise Levels

17-4.3.1 Traffic Data

Traffic data is collected for roadway segments of the project/no-project and other roadways that may contribute noise to receptors. Maximum peak-hourly traffic representing Level of Service (LOS) "C", or demand LOS of "A", "B", or "C" will be used (unless analysis shows that other conditions create a "worst-case" level).

For example, the maximum volume of traffic at LOS "C" for SR 30 is 13,498 vehicles at the posted speed limit of 72 km/hr (45 mph). LOS "C" traffic volume for the same facility at 64 km/hr (40 mph) is 14,012 vehicles. Yet the noise level will be higher for the lower volume / higher speed condition. While this is not always the case, it occurs often enough that the noise specialist is encouraged to use the maximum volume at the highest (posted) speed that will maintain a LOS of "C" or higher. If the posted speed for the future build condition is unknown, use the existing posted speed or design speed, whichever appears most logical. Speeds in excess of the legal speed limit may be used in the prediction of noise levels if field measurements indicate that this condition is the norm. If you have questions about the future posted speed of a particular roadway, contact the District Traffic Operations unit for guidance.

Noise level predictions will be required for the following conditions:

<u>ALTERNATIVE</u>	<u>YEAR</u>
no build	existing and design year
all build	design year only

Interim year data is not needed in the NSR. Noise analyses are performed for the noisiest hour of the day. Experience has shown that the highest traffic volume and the highest average speed usually create the noisiest conditions. This often occurs at peak-hour; however, conditions such as

capacity effects on vehicle speed, higher than normal off peak truck percentages, and unusual hourly traffic distribution, may cause the noisiest hour to be different from the peak traffic hour. Therefore, it is necessary to evaluate the hourly traffic volume, speed and composition data that is available to determine the worst-case noise hour.

17-4.3.2 Receptor Data

Unless the area of exterior frequent human use is identified elsewhere, residential receptor sites should be placed at the edge of the dwelling unit closest to the major traffic noise source or as dictated by professional judgment.

Where more than one unit is clustered together, a single site can be analyzed as representative of the group. Only exterior areas of frequent human use will be predicted unless no exterior activities are likely based on field observation. Interior predictions should be coordinated with the District Noise Specialist to insure proper application.

Other noise sensitive receptors include parks, schools, hospitals, and other sites where quiet is important for normal activities. The location of the receptor in these cases will be dictated by the location of the noise source and the exterior activity that will be impacted, if any.

Receptor heights for first floor receivers are always assumed to be 1.5 m (5 ft) above ground and second story receivers at 4.6 m (15 ft) above ground level. Higher story receivers will have to be determined on a case-by-case basis.

17-4.3.3 Noise Descriptor

The noise level descriptor will be the hourly equivalent sound level, L_{Aeq1h} . L_{Aeq1h} is the steady-state, A-weighted sound level which contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over a one-hour period. All data will be reported to the nearest one tenth (1/10) of a decibel.

17-4.4 Computer Prediction of Existing and Future Traffic Noise Levels

Using STAMINA2.1 or TNM, (depending upon the conditions noted in section 17-4.2 above) traffic noise levels are predicted for the existing and design year using the appropriate traffic data and roadway configurations. This prediction applies to those receptors selected as specified in section 17-4.3.2 above. When non-highway transportation noise sources (airport operations, transit lines, light commuter rail, etc.) impact the noise environment next to a highway, this impact should be noted in the NSR. Assessment of the magnitude of this impact should be done using the appropriate regulatory guidelines provided by the Federal Aviation Administration (FAA), Federal Transit Administration (FTA) or the Federal Railroad Administration (FRA) (references no. 6,7, and 8).

17-4.5 Determining Future Traffic Noise Impacts

Calculate design year traffic noise impacts based on the difference between the future build and existing noise levels. If one or more noise sensitive receptors are affected by project related traffic

noise levels which approach or exceed the abatement criteria or which substantially exceed existing noise levels, then abatement measures must be considered. If the abatement criteria is not approached or exceeded or if projected traffic noise levels do not substantially exceed existing noise levels, abatement measures normally will not be considered. For the purposes of this document, approached will mean within 1 dBA of the FHWA abatement criteria (see Table 17.1).

If for example, the difference between the future build and existing condition predictions shows an increase of 1 dBA, from 66 dBA to 67 dBA, then the project can be stated to have no substantial increase on highway traffic noise. However, since the predicted level approaches or exceeds the FHWA abatement criteria (assuming a residential site), noise abatement must be considered. If the future increase was from 42 dBA (no-build) to 63 dBA (build), the project would be considered to have a substantial increase and would require abatement consideration. For a residential area with a predicted future noise level of 66.0 dBA, the approach criterion would be met and abatement must be considered. However, a level of 65.9 dBA would not be considered to have approached or exceeded the abatement criterion and abatement consideration would not be required.

17-4.6 Traffic Noise Abatement Techniques

Abatement measures should be considered in the following priority when analyses indicate the need for consideration of noise abatement :

1. Traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restriction for certain vehicle types, modified speed limits, and exclusive lane designations);
2. Alignment modifications;
3. Construction of noise barriers within the highway project's right-of-way;
4. Acquisition of property rights (either in fee or lesser interest) for construction of noise barriers by donation, by purchase or by condemnation;
5. Acquisition (by purchase or by condemnation) of right-of-way for landscaping adjacent to noise barriers and for buffer zones; and
6. Acquisition (by purchase or by condemnation) of the balance of a noise-sensitive property from which there is a taking, if acquisition is less expensive and disruptive than the methods shown above.

Of the abatement methods listed, emphasis should be placed on the first three while the last three are less likely to be used. In addition, sound proofing a building, while often appealing, is not to be considered due to constraints within Chapter 339 of the Florida Statutes.

If a noise barrier is proposed, only the STAMINA2.1 model or TNM may be employed to determine the barrier's dimensions, depending upon the conditions noted in section 17-4.2 above. Barrier costs should be calculated by multiplying the length of the barrier by the height to determine the surface area of the barrier and multiplying this by the current cost per square meter or per square

foot factor for cost estimating purposes. Effective October 1, 2000, all new noise studies will use a cost factor of \$269.10/m² (\$25.00/ft²). This change is based on the most recent barrier cost data and will be adjusted as needed based on an annual review. The use of the current cost estimate factor, \$215.28/m² (\$20.00/ft²), is to be continued on all noise studies that were begun using this factor.

17-4.6.1 Traffic Noise Abatement Considerations

This section should be followed only if predicted future "build" traffic noise levels approach or exceed abatement levels or if build traffic noise levels substantially exceed existing noise levels as determined in section 17-4.5; otherwise, proceed to section 17-4.7 for preparation of the NSR. When considering noise abatement measures, the following reasonableness and feasibility factors must be evaluated relative to each alternative abatement measure. A brief explanation of each factor to be considered in determining reasonableness and feasibility of traffic noise abatement at any given location is provided.

1. **Relationship of future levels to the abatement criterion:** Does the predicted future noise level from the project approach, exceed, or far surpass the appropriate abatement criterion? Will it be within 1 or 2 dBA of the criterion or is it more on the order of 5 dBA or more above the criterion? If the future levels are only expected to approach or just barely exceed (1 to 3 dBA above) the criterion, abatement may not be as desirable as it would be if the impact were to be greater.
2. **Insertion Loss:** This is the lowering of the noise level as a result of some type of abatement effort. A normal design goal will be 10 dBA or more. However, the minimum insertion loss on the first row of receivers should be 5 dBA. The more insertion loss you can achieve the better the barrier, as long as the cost, visual impact, etc., do not become too great. If a minimum 5 dBA insertion loss cannot be achieved, a noise barrier is not considered to be feasible.
3. **Safety:** A very critical factor in determining whether a particular abatement scheme is viable is the impact it may have on safety. Maintaining a clear recovery zone is very important, as is sight distance. While a barrier can be placed adjacent to the shoulder of the road in some locations, safety factors must be included in the design so that redirection of crash vehicles will occur, merging traffic can be seen, fire access and emergency vehicle needs, and disabled vehicles can be accommodated.
4. **Community Desires:** Extremely important in determining whether a noise barrier should be built at any location is whether the affected community really wants to have a barrier. This may require that a survey of some sort is conducted to assess the community desires. Normally the concerns of the first row of homes or the owner of the noise sensitive site are sought. In an affected area which desires a noise wall, informed judgment must be used to establish whether a numerical majority of the benefited receivers are in favor of its construction. If the residents are not in favor of the noise wall, the Department may choose not to build the structure. If access rights are required, the Department should attempt to determine if the affected property owners are willing to trade those rights for the wall without any exchange of money. This survey will usually be conducted during the design phase of the project although it is possible that a survey could be conducted during the environmental documentation stage.

5. **Accessibility:** This refers to the ingress and egress to properties that would be effected by the noise abatement measure. Will the placement of a barrier deny access to a local sidewalk or normal route of travel? Could a driveway at a mobile home park be relocated to make the construction of a barrier on FDOT right-of-way viable?
6. **Land Use Stability:** Is the land use for this area expected to change in the future, and if so how? For example, are residential areas expected to be non-conforming uses in the future? Or is the area stable and noise sensitive land uses are likely to remain for an indefinite period of time.
7. **Local Controls:** What have the local zoning and planning units done to control noise sensitive land uses from building adjacent to the corridor? This implies that if no controls are used, noise abatement is not a very high priority within the community.
8. **Views of officials with jurisdiction in the area:** This implies that consideration should be given to the views of the local politicians who may be asked to represent the views of concerned citizens within the area.
9. **Noise level increase from existing to future build conditions:** Similar to factor number 1 above, you need to look at the magnitude of the noise level increase. If the difference between existing noise levels and the future build noise levels increase from 45 dBA to 64 dBA it will be far more noticeable than an increase from 63 dBA to 67 dBA, even though the abatement criterion is met in both cases.
10. **Noise level changes from future build and no-build conditions:** This implies that the noise levels will be very similar, whether or not the project is built. If the difference between the future no-build and the future build is 3 dBA or less, most people would not notice the change. If the change is greater than 3 dBA, abatement consideration should be given more weight.
11. **Antiquity:** Who was there first, the noise sensitive site or the roadway? How long has the noise sensitive site been there relative to elevated noise levels? Is the Department dealing with original owners or recent purchasers? This implies that someone who builds or buys a noise sensitive site along an existing highway (or within the corridor where a road is planned for construction) probably doesn't consider noise a significant factor in location. The "Date of Public Knowledge" for planned highway construction cannot precede the date of approval of the appropriate environmental document since they are one and the same.
12. **Constructability:** Can the noise barrier conceived actually be constructed using routine construction methods and techniques? Factors affecting this will include terrain, utilities, safety (lane closures, etc.), bridges, overpasses, and similar difficulties. This implies that the noise specialist and/or designer have actually gone out on site and looked for impediments that may substantially increase construction costs, time, safety or impacts. For example, if a noise barrier is expected to be placed on an existing structure (such as a bridge or a retained earth wall

because of effectiveness or cost reasons, the ability of this structure to support the additional wind and dead loads safely must be established before a final commitment to build the noise barrier is made. If a new bridge is being designed and a noise barrier is contemplated for placement on the bridge, the extra costs associated with the construction of the bridge to support the load of the noise barrier should be considered as part of the cost to build the barrier. Issues related to crash worthiness of a proposed noise barrier within the clear recovery zone must also be addressed. Under normal conditions a noise barrier on structure should not exceed 2.4 meters (8 feet) above the height of the bridge deck while ground mounted barriers normally should not exceed 6.7 meters (22 feet), unless a higher barrier is required by site conditions

13. **Maintainability:** Will the barrier be constructed in a location that makes maintenance a nightmare? Is the barrier material considered hard to maintain? Will graffiti be a serious problem and how can it be reduced? It is recommended that extra quantities of the barrier material be purchased during construction so that replacement of damaged sections will be less expensive in the future and delays in replacement can be kept to a minimum.
14. **Aesthetics:** This refers to the physical appearance of the wall from both the highway side and the affected property side. It also incorporates the landscaping concept, the view of the property owners, and the local requirements relative to color, height, style, materials, etc.
15. **Right of Way (ROW) needs including access rights (air, light, view, ingress/egress), easements for construction and/or maintenance, and additional land** must be considered as part of the feasibility of barrier construction since ROW impacts include the cost to obtain access rights, easements and land. It also includes the consideration of donation, purchase, etc. Normally ROW needs and costs will be determined early in the process. If access rights and easements are required for the installation of a noise barrier, donations of these property rights may be requested from the property owners. However, all owners must be advised of their rights to receive just and full compensation for the property necessary for the construction and maintenance of the noise barrier. If ROW must be obtained for the installation of a noise barrier, this cost must be considered in the reasonableness of providing abatement. Another important consideration in ROW is the potential to construct a noise barrier that might block the motorists view of an existing legally permitted outdoor advertising sign. As early in the Project Development and Environment study as possible, the Outdoor Advertising section of the Office of Right of Way must be notified (consistent with the ROW Manual) in order to identify outdoor advertising signs affected by any proposed barrier. At a minimum, the section number and milepost for each noise barrier, along with an estimated construction date, will be given to the Outdoor Advertising Section so notice of the possible screening of a sign can be provided to the affected sign permit holder(s). Along the same lines, FHWA has determined that the placement of business names/logos on noise walls would be in violation of 23 CFR Section 1.23. If ROW issues in general cannot be overcome they may be considered a “fatal flaw.”
16. **Cost:** Cost factors will include the cost of construction (material and labor), the cost of the ROW (including easements, etc.), and any other associated costs less the cost of designing the wall. It will be assumed that a cost per benefited receiver will be calculated. The lower the cost the higher the benefit to the impacted area. A cost of \$30,000 per benefited receiver is looked upon as an upper limit although a higher level of expenditure can be used if justified by other

circumstances. A benefited receiver is defined as a noise sensitive receiver that will obtain a minimum of 5 dBA of noise reduction as a result of the use of a specific noise abatement activity such as the construction of a noise barrier wall. Only benefited receivers will be included in the calculations needed to determine if a particular noise abatement plan has a reasonable cost. Reasonable cost for unique noise sensitive receivers like schools, Section 106 properties, churches and parks are handled on a case-by-case basis. (See the instructions for special land use facilities found in item 19 below.) Contact the District Noise Specialist for guidance when these situations occur. The cost factor per square meter or square foot is provided by the Environmental Management Office to aid in estimating barrier costs and can be found in section 17-4.6 above. Contact the District Noise Specialist or the EMO for the latest information. Remember that the cost estimate does not include costs associated with ROW needs or other special design considerations required by unique site conditions. Costs vary considerably based on total wall surface area, wall height, and proximity to roadways, structures (bridges, tunnels, etc.), and utilities. For example, wall costs per unit are considerably lower for large projects compared to small projects. The cost factors also increase considerably if the noise abatement project is constructed as a separate project rather than as part of a highway improvement project. This is due to such costs as mobilization, maintenance of traffic plans, and clearing and grubbing that must be part of these projects.

17. **Utilities:** The impact of noise barriers on utilities and the reverse must be assessed early in the process. Large overhead power lines, underground water, sewer, gas, oil, etc., can have a significant impact on costs and design options.
18. **Drainage:** One of the most important elements in the location and design of a noise barrier, but frequently overlooked, is drainage. Directing water along, under, or away from a noise barrier can be expensive and cause construction and maintenance problems.
19. **Special land use considerations:** If a noise impact is identified at a special land use such as a school, church or park, the process outlined in the research report "A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations" (reference 9) may be followed. A copy may be obtained from the District Noise Specialist or EMO.
20. **Other environmental impacts:** This refers to impacts of noise barrier installation that should be considered on a site by site basis. Examples include animal migratory paths, bird/wall collisions, groundwater or surface water impacts, wetland destruction, air quality, etc.
21. **Additional considerations:** The unanticipated contingencies that can seriously impact whether a noise barrier is reasonable as conceived at a given location. An example would be the impact of a wall on a nearby hospital heli-pad for emergency medical transport.
23 CFR Part 772.11(d) states: "When noise abatement measures are being considered, every reasonable effort shall be made to achieve substantial noise reductions." FHWA Noise Abatement Criteria are contained in Table 1 of 23 CFR Part 772 (reference no. 1). FDOT considers "substantial noise reduction" to mean at least a 5 decibel reduction with a desire to achieve a 10 decibel or more reduction if it can be done at a reasonable cost.

For Land Use Activity Category A (where quiet is very important), consideration of abatement

will be required whenever the design year predicted noise levels equal or exceed 56 dBA (L_{Aeq}) or substantially exceed the existing noise levels. For Activity Category B (such as residences, parks, recreational vehicle (RV) parks, day care centers, etc.), the criteria depicted in Table 17.1 shall be used in determining where abatement considerations are warranted. In the case of RV parks that also serve as a mobile home site, noise abatement will be considered when fifty (50) percent of the impacted spaces are occupied fifty (50) percent of the year or more by “permanent” residents. A permanent resident would be one who occupies the dwelling unit at least fifty (50) percent of the calendar year. Since 23 CFR Part 772 refers to "approaching or exceeding the noise abatement criteria", judgment will be necessary in instances where total predicted noise levels are close to, but below, the FHWA NAC. For Land Use Activity Categories C and D (which are commercial and undeveloped properties), abatement measures normally will not be implemented. Consultation with FHWA in these situations will be required (if appropriate) before abatement will be implemented.

In determining and abating traffic noise impacts, primary consideration for abatement is to be given to exterior areas where frequent human use occurs and where a lowered noise level would be of benefit. Therefore, application of criteria for Activity Category E (interior) should only be considered where there are no exterior activities 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. Activity Category E abatement considerations should be initiated only after consultation with FHWA.

17-4.6.2 Community Coordination

The degree and type of community coordination and participation will vary from project to project. For projects requiring consideration of abatement, the community involvement activities should allow for presentation and discussion of noise impacts related to the project. Opportunities for such involvement should be provided, as appropriate, during the environmental evaluation (Type 2 CE, EA, EIS or SEIR) phase as part of the public involvement and/or public hearing process. Continued community coordination will need to take place during the right of way and/or the final design phase.

Where abatement is anticipated, one phase of community coordination will include a survey of the desires of the benefited receptor(s). This can be done using any number of techniques. It may include door-to-door contact, telephone polls, a mailed survey form, a public workshop in the neighborhood, or a combination of these techniques.

The communities' desires related to abatement should be analyzed and given considerable weight in the decision-making process. Discussions should relate to issues, such as noise abatement options, partial abatement, and areas where abatement is not reasonable and/or feasible. It should also include a presentation of material options, physical dimensions, obtainable levels of reduction, and cost factors so the public can aid the Department in making a reasonable decision based on facts and not on suppositions.

In the event that some affected property owners desire noise abatement and others do not, further assessment may be necessary in order to determine what impact, if any, this will have on the reasonable cost issue as well as the social consequences. Consultation with FHWA (if appropriate) is

recommended. When noise abatement measures are being developed in the final design, such measures will not be approved without documentation (letters in the file, public hearing transcripts, survey results, etc.) that the affected local community has been provided the opportunity to provide input into the final design. The local community is considered to consist of those individuals directly affected by the project-related noise as well as those affected aesthetically by the abatement measures. In the case of noise barriers, primary emphasis is to be given to the input of those benefited receptors immediately adjacent to the noise barrier(s). If unanimous agreement cannot be reached by a neighborhood on the use of noise barriers, the decision to provide barriers or not will rest solely with FDOT.

17-4.6.3 Retrofitting (or Type II Projects)

23 CFR Part 772 provides for Federal participation in retrofitting existing highway facilities with noise abatement measures as long as certain criteria are met. The requirements for the construction of Type II (retrofit) noise barriers have changed as a result of Section 339(b) of the National Highway System (NHS) Designation Act of 1995. FHWA published an interim final rule on Thursday August 29, 1996 (finalized on August 11, 1997) to make 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, consistent with the NHS legislation. Section 772.13(b) is revised to read as follows:

“For Type II projects, noise abatement measures will only be approved for projects that were approved before November 28, 1995 or are proposed along lands where land development or substantial construction predated the existence of any highway. The granting of a building permit, filing of a plat plan, or a similar action must have occurred prior to right-of-way acquisition or construction approval for the original highway on new location. Noise abatement measures will not be approved at locations where such measures were previously determined not to be reasonable and feasible for a Type I project.”

Retrofit projects considered by FDOT will be consistent with the FHWA requirements shown above.

17-4.7 Preparation of the Noise Study Report

17-4.7.1 Noise Study Report Contents

The results of the noise analyses shall be reported in a NSR and summarized in the Type 2 CE, EA, EIS or SEIR. All feasible alternatives will be analyzed, including the no-build alternative.

The NSR should have a logical sequence which adequately describes the procedures used in developing the NSR, performing the required analyses, and arriving at the appropriate conclusions. Graphics and references should be utilized to make the report easily understood by both a technical reviewer and a layman. All noise readings should be reported to the nearest 1/10th of a decibel. Do not include coding sheets, however. Figure 17.1 illustrates a recommended outline for the NSR.

17-4.7.2 Methodology and Assumptions

The following information related to methodology and assumptions shall be included in the NSR:

1. Model(s) and methodology used;
2. Alternatives and years considered;
3. Existing and design year vehicle volumes, speeds, and composition data;
4. Receptor locations and descriptions, including land use category;
5. Basis for determination of existing and future noise levels; and
6. Noise descriptor used.

A reviewer should be able to replicate the results using the basic model with the input data reported in the NSR.

17-4.7.3 Application of FHWA Noise Standards

The NSR will include a comparison of each alternative's total noise levels with the appropriate noise abatement criteria and with existing noise levels. It will also identify all abatement considerations and commitments.

17-4.7.4 Coordination Requirements and Documentation

Summarize in the NSR any coordination or communications that may have taken place with other agencies and the public. Include their comments and pertinent responses to any negative comments. A statement should also indicate that a copy of the final NSR will be circulated to the appropriate local planning/zoning officials for their use in land use control once the Location and Design Concept Acceptance occurs.

When the NSR is finalized after Location and Design Concept Acceptance, copies shall be sent to the appropriate local government officials within whose jurisdiction the highway project is located. The following information should be transmitted along with the NSR:

1. The best estimation of distance from the project (typically the centerline or the ROW line) at which future noise levels for both developed and undeveloped Category B lands or properties in the immediate vicinity of the project will reach the FHWA abatement criterion of 67 dBA. Much of this information is likely to be included in the NSR.
2. After the Date of Public Knowledge, FDOT is no longer responsible for providing noise abatement for new development which occurs adjacent to the proposed highway project. Provision of such noise abatement becomes the primary responsibility of local government(s) and private developers.

3. Other information and explanation that will aid the local officials in planning for future traffic noise impacts.

The above items are intended solely to assist local officials in promoting compatibility between land development and highways. Upon request, the Department will provide additional available material and technical guidance which may assist local officials in this respect.

17-4.7.5 Construction Noise and Vibration Impacts

The early identification of potential construction and/or vibration impacts that may result from the construction of the project is important. A list of example vibration sensitive receivers has been developed and can be found in Table 17.2. This will allow avoidance and/or mitigation options to be developed during the project development and/or design phases. These options can then be placed in the construction plans and applied during the construction of the project by the Contractor.

The discussion of construction noise and vibration impacts is required for inclusion in the Type 2 CE, EA, SEIR or EIS whether the noise abatement criteria is exceeded or not. It is generally not based on site specific predictions of noise levels but should, as a minimum, include a general reference to the Standard Specifications for FDOT construction to control noise and/or vibration impacts (reference no.10) and any local ordinances that relate to construction noise and/or vibration levels allowed.

For projects anticipated to have substantial construction noise impacts, the noise and/or vibration analysis for the Type 2 CE, EA or EIS will include an assessment of impacts using methods described in the FHWA Technical Advisory T6160.2 (reference no. 11). Any special construction noise and/or vibration mitigation measures deemed appropriate will be described in the NSR. In considering construction noise and/or vibration mitigation, it should be noted that special provisions may be added as appropriate to the project's construction specifications. Any unique noise and/or vibration control efforts to be considered during construction shall be coordinated with the appropriate District management staff prior to inclusion in the NSR.

Only special provisions should be spelled out in the Type 2 CE, EA, SEIR or EIS and the NSR.

17-4.7.6 Noise Abatement Commitments

23 CFR Part 772.11 requires that "Before adoption of a final environmental impact statement or finding of no significant impact, the highway agency shall identify :

1. Noise abatement measures which are reasonable and feasible and which are likely to be incorporated in the project, and
2. Noise impacts for which no apparent solution is available".

Noise abatement commitments will be made two (2) times during a project's development. The first time will be during the time that the Type 2 CE, EA, SEIR or EIS is being finalized. By then the

noise studies will have progressed to the stage where noise-impacted areas have been identified. At this stage, it is unlikely that exact locations, abatement types, right-of-way requirements, etc., can be determined, although approximate barrier location and height information should be available. The second time will be prior to Plans, Specifications, and Estimates (PS & E) approval.

For noise impacted areas requiring abatement considerations in accordance with 23 CFR Part 772, the Type 2 CE, EA / FONSI, SEIR or Final EIS must contain language such as :

"The Florida Department of Transportation is committed to the construction of feasible noise abatement measures at the noise-impacted locations identified in (table, figure, chart, etc.) contingent upon the following conditions (You may select any or all of the items listed below, or, if appropriate, create contingencies of your own.) :

1. Detailed noise analyses during the final design process supports the need for abatement;
2. Reasonable cost analyses indicates that the economic cost of the barrier(s) will not exceed the guidelines;
3. Community input regarding desires, types, heights, and locations of barriers has been solicited by the District Office;
4. Preferences regarding compatibility with adjacent land uses, particularly as addressed by officials having jurisdiction over such land uses has been noted;
5. Safety and engineering aspects as related to the roadway user and the adjacent property owner have been reviewed; and
6. Any other mitigating circumstances found in Section 17-4.6.1 have been analyzed."

If abatement is not reasonable and feasible then the following statement (or variation thereof) shall be used: "Based on the noise analyses performed to date, there appears to be no apparent solutions available to mitigate the noise impacts at the locations identified in (table, figure, chart, etc.)." If, during the final design phase, any of the contingency conditions listed above cause abatement to no longer be considered reasonable or feasible for a given location(s), such determination(s) will be made prior to requesting approval for construction advertisement. Commitments regarding the exact abatement measure locations, heights, and type (or approved alternatives) will be made during project reevaluation and at a time before the construction advertisement is approved.

As noted in Section 17-4.6.1, the normal noise abatement design goal will be 10 dBA or greater insertion loss. However, the minimum insertion loss should be 5 dBA or more. During the final design phase, exact barrier locations, heights, and types will be determined. Abatement commitments

must be documented in the reevaluation prior to construction advertisement, regardless of project funding sources. It is the responsibility of the District Environmental Management Office to insure that all noise abatement commitments that are made are provided to the projects design staff (in-house or consultant). This will include copies of the NSR, any pertinent design-related information gained from the public involvement process, and basic design information such as wall height, location, and aesthetic treatment.

17-4.7.7 Noise Study Report Review

Once the NSR is completed, it will be reviewed by the District Office where the technical adequacy of the report will be determined. If necessary, a meeting and/or field review may be held to verify information and/or resolve conflicts. The NSR is to be considered complete at this point for purposes of proceeding with the Type 2 CE, EA / FONSI, SEIR or EIS. It may ultimately be revised during the final design phase and subsequent reevaluations to reflect details regarding exact abatement measures, their location, and types. If the NSR is substantially modified from the version previously distributed to the affected local governments, a revised version should be sent out to them.

17-4.8 Noise in the Type 2 Categorical Exclusion

For Type 2 Categorical Exclusions, include the following documentation with the appropriate forms:

1. If NONE is marked for noise, then a very brief summary of the NSR should be attached.
2. If MINIMAL is marked for noise, then a brief summary of the NSR should be attached with noise values presented in written form, including any noise abatement commitments.

If noise problems occur, this will also be stated in summarized form, including noise abatement commitments.

17-4.9 Noise in the EA / FONSI

In FONSI's, the Summary section includes a brief statement indicating the effect of the project as related to the FHWA Noise Abatement Criteria (reference no. 1). The availability of the NSR in the District Office should be noted. The Impacts section of the EA must reference and summarize the NSR. Specific references to the items discussed in section 17-4 are included as appropriate. Coordination which occurred during the noise study process must be documented. The Comments and Coordination section shall discuss the history of the noise process and include letters from agencies expressing comments on the NSR. Resolution of comments shall also be documented in this section.

17-4.10 Noise in the Environmental Consequences Section of the Draft and Final Environmental Impact Statement or State Environmental Impact Report

The Environmental Consequences section should summarize the NSR and include the following information :

1. A brief description of noise sensitive areas, including information on the numbers and types of activities which may be affected. The availability of the NSR in the District Office will be noted.
2. The extent of the impact (in decibels). This will include a comparison of the future predicted noise levels with both the FHWA Noise Abatement Criteria and the existing predicted noise levels.
3. Noise abatement measures which have been considered and those measures that would likely be incorporated into the proposed project.
4. Noise problems for which no prudent solution is reasonably available and the reasons why.

17-4.11 Noise in the Reevaluation Process

The reevaluation of a project conducted for phase approval or due to a major change, should include a review of the NSR to determine whether changing land use, roadway design, or previously modeled results might need to be reassessed. The reevaluation may result in no change to the NSR or in a completely new NSR being required. It is recommended that any computer modeling efforts be conducted using the same model (STAMINA2.1 or TNM) used in the original evaluation unless directed otherwise by the District Noise Specialist and, if federally funded, the FHWA Division Office. Coordination with the FHWA Division Office during the reevaluation process on federally funded projects is highly recommended.

17-5 REFERENCES

1. 23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise", July 8, 1982, August 5, 1982, and August 26, 1996; 8 pages. Available from FHWA and FDOT.
2. Florida Statute 335.17, "State highway construction; means of noise abatement." 1989. 1 page. Available from FDOT.
3. Federal Highway Administration Report Number FHWA-PD-96-046, "Measurement of Highway-Related Noise." Cynthia S.Y. Lee and Gregg Fleming; May, 1996; 206 pages. Available from National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161.
4. Federal Highway Administration Report Number FHWA-DP-58-1, "Noise Barrier Cost Reduction Procedure STAMINA 2.0 / OPTIMA : User's Manual", March, 1983; 102 pages. Available from National Technical Information Service (NTIS), 5285 Port Royal Road,

Springfield, VA 22161.

5. Federal Highway Administration Report Number FHWA-PD-96-009, "FHWA Traffic Noise Model, Version 1.0 User's Guide." January 1998, 192 pages. Available from McTrans Center, University of Florida, Gainesville, Florida.
6. 14 CFR Part 150, "Airport Noise Compatibility Planning." December 13, 1984. Available from the Federal Aviation Administration and FDOT.
7. Federal Transit Administration Report DOT-T-95-16, "Transit Noise and Vibration Impact Assessment: Final Report," April 1995, 220 pages. Available from Federal Transit Administration, Office of Planning, 400 Seventh St., SW, Washington, D.C. Also available from FDOT and the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161.
8. 49 CFR Part 210, "Railroad Noise Emission Compliance Regulations." December 23, 1983 as amended August 14, 1989. Available from the Federal Railroad Administration, 400 Seventh St., SW, Washington, D.C. 20590 and FDOT (see also 40 CFR Part 201, "Noise Emission Standards for Transportation Equipment: Interstate Rail Carriers").
9. "A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations." Roger L. Wayson and John M. MacDonald. University of Central Florida; 1997; 63 pp.
10. Florida Department of Transportation "Standard Specifications for Road and Bridge Construction." 1999; 798 pages. Available from FDOT Maps and Publications, Mail Station 12, 605 Suwannee St., Tallahassee, FL 32399-0450.
11. Federal Highway Administration Technical Advisory T6160.2. "Analysis of Highway Construction Noise", March 13, 1984; 4 pages. Available from FHWA and FDOT.

Note : "Available" does not mean "Free". Most agencies charge at least their reproduction costs for a document.

NOISE ABATEMENT CRITERIA
 [Hourly A-Weighted Sound Level-decibels (dBA)]

<u>Activity Category</u>	<u>Abatement Level (in L_{Aeq})</u>		<u>Description of activity category</u>
	<u>FHWA</u>	<u>FDOT</u>	
A	57	56 (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	67	66 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, RV parks, day care centers and hospitals.
C	72	71 (Exterior)	Developed lands, properties, or activities not included in Categories A and B above.
D			Undeveloped lands.
E	52	51 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

(Based on Table 1 of 23 CFR Part 772)

Note: FDOT defines that a substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 decibels or more as a result of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

TABLE 17.1 Noise Abatement Criteria

CONSTRUCTION NOISE & VIBRATION SENSITIVE SITES
(a partial listing of potential sites)

Noise	Vibration
Eye Centers/Clinics	“
Medical Centers	“
Hospitals	“
Geriatric Centers	“
Sound Recording Studios	“
TV/Radio Stations	“
Residences	“
Technical Laboratories	“
Hearing Testing Centers	Antique Shops
Theaters	Museums
Schools	Historic Buildings
Motels/Hotels	
Funeral Homes	
Libraries	
Meditation Centers	
Churches/Shrines	
Parks	
Day Care Centers	
Outdoor Theaters	

Note: This list is not meant to be all inclusive or exclusive, but rather an indication of the type of sites likely to be sensitive to construction noise and/or vibration.

Source: FDOT Noise and Vibration Task Team; August 17, 1999

TABLE 17.2 Construction Noise & Vibration Sensitive Sites

SUGGESTED NSR FORMAT OUTLINE

Executive Summary (optional) i

Table of Contents ii

List of Figures iii

List of Tables iv

INTRODUCTION 1

 Existing Facility..... -

 Proposed Improvements..... -

TRAFFIC NOISE ANALYSIS -

 Noise Sensitive Areas..... -

 Measured Noise Levels -

 Predicted Noise Levels -

 Noise Impact Analysis..... -

 Noise Abatement Measures -

CONSTRUCTION NOISE AND VIBRATION..... -

COORDINATION WITH LOCAL OFFICIALS..... -

FIGURE 17.1 Noise Study Report Outline