

080606chapelhilli40noise

August 10, 2003

To: Chapel Hill Town Council

From: Seymour Freed

“Local governing bodies are responsible to insure that noise compatible designs are utilized along the (I-40 widening project)...” NCDOT

A. Local Government Responsibility

The first phase of the widening of I-40 is almost half finished. The second phase has been designed and it will commence within a few years.

80 % of the funds for the widening come from the federal government. They set various environmental standards which must be met in **23CFR Part 772—Procedures for Abatement of Highway Traffic Noise and Construction Noise**. 23 CFR§772.15 Information for local officials states:

In an effort to prevent future traffic noise impacts on currently undeveloped lands, highway agencies shall inform local officials within whose jurisdiction the highway project is located of the following:

- (a) The best estimation of future noise levels (for various distances from the highway improvements) for both developed and undeveloped lands or properties in the immediate vicinity of the project,*
- (b) Information that may be useful to local communities to protect future land development from becoming incompatible with anticipated highway noise levels...*

B. NCDOT/FHWA Predictions of Noise at Habitat Site

In compliance with 23CFR§772.15, NCDOT in its Categorical Exclusion Interstate 40 Widening to six-lanes of March 2000 (CE) predicted in its TABLE N4 that there will be an increase in noise levels of approximately 3 to 4 decibels (dBA) at adjacent properties in the Habitat vicinity by the year 2020 as a result of the widening. In addition, in Table 11 on page 34, NCDOT has indicated that the maximum distance from the center of I-40 of the future 67 dBA noise contour will be 126.4 meters (414.7 feet) between NC 86 to US 15-501.

NCDOT stated that: “This information should assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within local jurisdiction. For example, with the proper information on noise, the local authorities can prevent further development of incompatible activities and land uses with the predicted noise levels of an adjacent highway.” (CE p. 34).

What is an incompatible land use with respect to predicted noise levels? The federal government defines it in Highway Traffic Noise in the U.S. Problem and Response by U.S. Dept. of Transportation and FHA, April 2000 (HTN). It states: "Highway Project Noise Mitigation...The regulations contain noise abatement criteria which represent the upper limit of acceptable highway traffic noise for different types of land uses and human activities." (p. 1) (NOTE: Underlining added).

What are the Noise Abatement Criteria for both the federal government and NCDOT with respect to residences, parks, picnic and recreation areas, active sports areas and playgrounds? 67 dBA. (HTN, p.1 and NCDOT Traffic Noise Abatement Policy (NCDOT TNAP). But NCDOT went one step further in the CE (p. 33) which stated: "Traffic noise impacts occur when the predicted traffic noise levels either (a) approach or exceed the FHWA noise abatement criteria value (with 'approach' meaning within 1 dBA), or (b) substantially exceed existing noise levels."

Thus, according to federal and NCDOT criteria, those areas of the Habitat site which will be subjected to future noise levels of 66 dBA, as estimated by NCDOT in their CE (not including the 100-foot no-build I-40 buffer, approximately two acres of the developable land) are unsuitable for use as "residences, parks, picnic and recreation areas, active sports areas and playgrounds" without noise abatement. (Refer to a map I prepared, "Maximum Noise Levels in dBA for Year 2020 Predicted by NCDOT in Tables 11 & N4 of CE", and a graph I prepared, "FHWA Noise Predictions").

C. Chapel Hill's Response to I-40 Widening Categorical Exclusion

Since March 2000, in compliance with federal and state requirements, the Town of Chapel Hill has been put on notice by NCDOT of an increased future noise problem in the I-40 corridor. This information was provided to Chapel Hill in order to "protect future land development" (CFR§772.13(b) (FHWA) and to "plan, design and construct noise-compatible development" (NCDOT TNAP).

It follows that the Chapel Hill town government thus has a mandate from the federal and State governments to deal responsibly with noise from I-40. Other than providing a 100-foot I-40 no-build buffer, which protects the residents from noise over 72 dBA, I am unaware of any positive actions which have been taken by the Town as part of its I-40 noise responsibility, either before or after March of 2000 on I-40 noise.

The town council has stated that other developers have not been required to conduct noise studies. This bears discussion. The CE stated: (p. 33) "In accordance with NCDOT TNAP, the federal/State governments are no longer responsible for providing noise abatement measures for new development which building permits are issued within the noise impact area of a proposed highway

after the Date of Public Knowledge. The Date of Public Knowledge of the location of this proposed highway project will be the approval date of the CE...For development occurring after this public knowledge date, local governing bodies are responsible to insure that noise compatible designs are utilized along the proposed facility.”

There was no reason for developers to conduct noise studies for projects filed prior to March 2000. For all projects which have been filed or will be filed after that date, ignoring NCDOT I-40 noise estimates by the Town is not in the interest of Chapel Hill citizens. The Town was given information in accordance with 23CFR §772.1 “Purpose. To provide procedures for noise studies and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials...”

If, as stated at the Town Council, there is no consideration given to I-40 noise in this and other projects, it means that developers are given carte blanche to design housing in locations that are defined by the federal government as unsuitable for housing, this policy should be reviewed and corrected. If the Town knowingly allows housing to be built in areas which exceed the upper limit of acceptable noise for residences it, as well as the developers, could be assuming a liability. As NCDOT pointed out in the CE page 33, “local governing bodies are responsible to insure that noise compatible designs are utilized along the proposed facility.” Control is needed to prevent more housing being built too close to I-40.

D. The Need for Noise Abatement

For arguments sake, let us agree that noise abatement is necessary for the Habitat site. How can it be accomplished? Because of the topography of the site, including grades and wetlands, it is physically impossible for Habitat to provide noise abatement along its property line. As stated above there is no federal or State funding available for noise abatement along the Right-of-Way (ROW). There is always the Town and County funding. NCDOT TNAP, Noise barrier Construction, Materials and Aesthetics states: “If a local government insists on the provision of a noise abatement measure deemed not reasonable by NCDOT, a noise barrier may be installed provided the local government assumes 100% of the costs...”

E. A Brief, Sad History of I-40

But is there another way? A short review of the history of I-40 might be of interest. The files are closed- why bring up ancient history? The fact is, that NCDOT never built I-40 in accordance with its commitments as incorporated into the Final Environmental Impact Statement (FEIS). It has done many things to

make I-40 noisier than it should be, and they even discriminated against Orange County in the ROW acquisition.

NCDOT has not complied with its original I-40 contract (FEIS) with the people of Chapel Hill. Even today, over two miles of noise walls are under construction in Durham on I-85, and yet not one-foot has ever been built or planned for I-40 in Orange County although there are many residences that are noise impacted by NCDOT assessment. At least one noise wall in Durham that did not meet NCDOT economic feasibility criteria is now being built at a site less noisy than the Habitat site (Club Boulevard School). It was accomplished by major political and media pressure.

NCDOT picked the routing of I-40 after a decade of controversy. "The residents of southern Durham and Orange Counties expressed intense opposition to the I-40 (final alignment) through their area. This opposition included the submission of petitions containing over 3000 signatures....The (final alignment was) opposed by the governments and planning boards of Chapel Hill and Orange County. They expressed the opinion that the interstate route was incompatible with the land use plans and the type of development they foresaw for their area." (Final Environmental Impact Statement- FEIS p.204).

The present routing was selected primarily because a wide Right-of-Way (ROW) could be provided, whereas it could not be in the existing Durham I-85 route. NCDOT acknowledged the environmental sensitivity when it chose the route, and promised it would act responsibly in an area where there was sufficient land available. It committed NCDOT to provide a ROW of approximately 400-feet (FEIS, p. 12), and a grassy median with a minimum of 70-feet (FEIS, p.12) or 88-feet (FEIS, p. 142).

Contrary to environmental law, NCDOT reduced the ROW from 400-feet to an average of 280-feet in Orange County. Durham fared better with their ROW reduced to an average of 320-feet throughout the majority of the County (CE, p. 4). There was no valid engineering reason for this disparity. The median was reduced from 70/88-feet to 42-feet (CE, p.4). When this undocumented change was called to the attention of the NCDOT Secretary, he responded on August 16, 2001:

You noted in your letter that the final design plans for the road were not identical to the proposed road design plans. The I-9 (I-40 Original Construction) Final Environmental Impact Statement which was approved February 16, 1979 estimates for the right of way and median widths was NCDOT's best approximations at the time of the document approval. When the change occurred, our staff determined that the changes to the right of way and median widths had no added impacts on the environment. The Design Noise Report (DNR) was completed using the final design plans which reflected changes in the horizontal alignment. (NOTE: Thus, NCDOT apparently defines Final as preliminary, or best approximation. The reason for the 400-foot ROW

was environmental. To have reduced the ROW without environmental impact was a truly magical achievement of NCDOT.)

Chapel Hill citizens will be paying dearly for this major reduction in median width once the widening is completed. If the median had been built at 70-feet, as committed in the FEIS, a grassy median of 46-feet would still remain after the widening. Instead, we can look forward to a 138-foot wide Jersey Turnpike-like expanse of concrete. This increases the noise transmission considerably.

The reduction in Right of Way has resulted in increased noise levels, since an average of 120-feet of noise buffering was removed from Orange County. With the additional Right of Way, it might have also been possible to save the existing heavily wooded areas, a good noise buffer, as was done on the northern portions of I-85,

The original I-40 Design Noise Report (DNR) had many gross errors, all of which resulted in underestimates of future noise levels. The most serious was NCDOT's failure to use the correct FHWA future noise prediction figures in its calculations. Consequently, the future noise predictions were consistently under-calculated by 6.5, 5, 2, 5, 5, 7, 10, 12, 10, 13, 12, and 10 dBA at all twelve relevant receptors in my study. (A Reasonable and Feasible Request for Abatement of Significant I-40 Traffic Noise Impacts, June 11, 2001, pages 19, 20). NCDOT also predicted that the noise level in year 2000, 581-feet from the roadway would remain unchanged at 42 dBA. (DNR Table 1). The result of a flawed DNR was to underestimate the number of receptors that were noise impacted and to guarantee that noise abatement would be economically unfeasible along the entire 20-miles of the project. NCDOT estimates of year 2000 noise were much lower than they should have been due to NCDOT's many consistently low calculations.

After construction was underway, NCDOT decided to raise a section of the roadway rather than truck out excess fill. Again, without public notification, the highest elevation of local roadway at Sta.607+00 was raised by 3.35-feet and the other heights were increased accordingly. In responding to a questioning of this change from the elevations used in the DNR, the NCDOT Secretary, stated in August 16, 2001 letter:

The vertical elevation of I-40 was raised approximately three feet during construction. The height of the earth berms parallel to I-40 were increased three to four feet so the relationship between the road surface and the top of the road berms remained as originally proposed. These berms were raised to offset any increased noise levels resulting from the changes in vertical elevation but were not part of noise abatement measures for the I-9 construction project. Also, as mentioned in the April 11, 1989 letter from D.R.Morton, our analysis indicated the noise level at Receptor #35C (closest to I-40) experienced an increase of only 0.1 dBA with the change in vertical elevation. This analysis indicates that raising the berms nearly offsets the entire

increase in noise caused by the change in vertical elevation. (NCDOT never answered my response which disagreed with the "facts" presented and the logic).

E. Possible Courses of Action for Chapel Hill

The original contract NCDOT made with the citizens of Chapel Hill (FEIS) was never completed due to flagrant NCDOT unilateral changes. For the both the original construction and the current widening, NCDOT did not consider the use of earth berms, despite the specific "EARTH BERMS" section in the NCDOT NAP which states: Consideration should be given to providing earth berms for noise abatement purposes on projects that have earth waste and where sufficient right-of-way exists to construct the berm." The widening of I-40 will result in the center grassy median being removed and replaced with concrete. This excess material, ten miles long, could be used to build an earth berm which would not only mitigate noise at Habitat, but should also be built to alleviate the noise at neighboring communities on both sides of the project. It would make economically feasible noise abatement for residences identified by NCDOT as noise impacted but economically unfeasible for abatement.

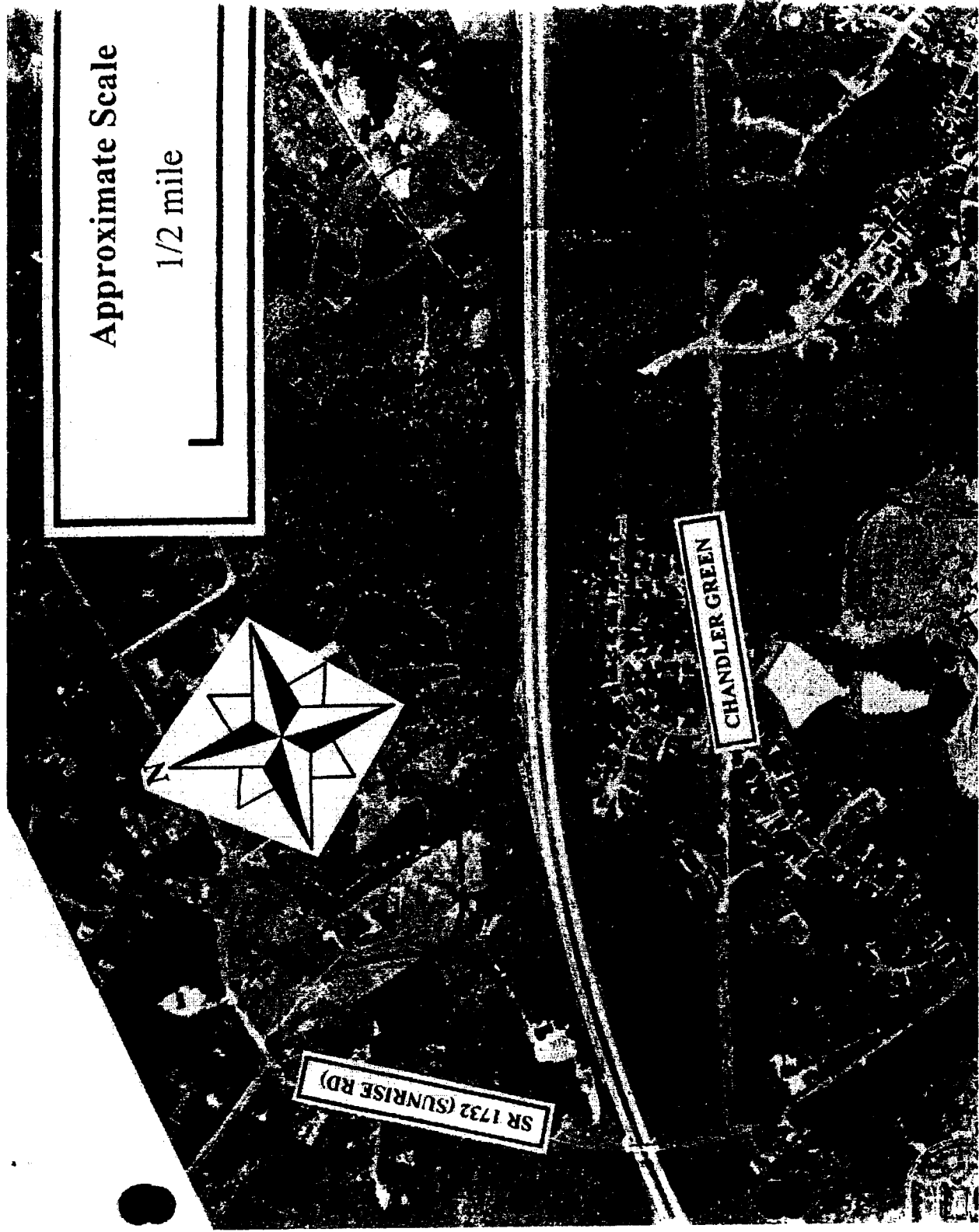
I believe that if Durham can get NCDOT to change its mind and add noise abatement, Chapel Hill can the same for areas that are at least, and possibly more, deserving. There are many people who are currently impacted by I-40 noise, and there will be many more.

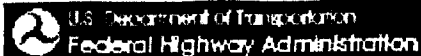
The Chapel Hill town government has the choice of ignoring I-40 noise, or dealing with the issue at Habitat as well as in the entire I-40 corridor, trying to better control unsuitable land use, and possibly attempting to get noise abatement from the NCDOT. The present NCDOT administration should be persuaded to repair some of the environmental damage done by previous administrations.

I believe there is a need for Chapel Hill to act on the impending increased I-40 noise, starting with Habitat, as well as others, future and filed since 3/2000.

Abbreviations, acronyms

CE	<u>Categorical Exclusion Interstate 40 Widening to six-lanes From I-85 to NC 147 (Buck Dean Freeway), Durham and Orange Counties, State Project 8.1501601, TIP Project Number I-3306 of March 2000</u>
CFR	Code of Federal regulations
dBA	decibels (A-Weighted)
HTN	<u>Highway Traffic Noise in the U.S. Problem and Response by U.S. Dept. of Transportation and Federal Highway Administration, April 2000</u>
NCDOT	North Carolina Department of Transportation
TNAP	NCDOT Traffic Noise Abatement Policy





23 CFR PART 772--PROCEDURES FOR ABATEMENT OF HIGHWAY TRAFFIC NOISE AND CONSTRUCTION NOISE

Sec.

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Table 1 to Part 772--Noise Abatement Criteria

Appendix A to Part 772--National Reference Energy Mean Emission Levels as a Function of Speed

AUTHORITY: 23 U.S.C. 109(h), 109(i); 42 U.S.C. 4331, 4332; sec. 339(b), Pub. L. 104-59, 109 Stat. 568, 605; 49 CFR 1.48(b).

(Source: 47 FR 29654, July 8, 1982; 47 FR 33956, Aug. 5, 1982, and 62 FR 42903, August 11, 1997)

Sec. 772.1 Purpose.

To provide procedures for noise studies and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to Title 23, United States Code (U.S.C.).

Sec. 772.3 Noise standards.

The highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials in this regulation constitute the noise standards mandated by 23 U.S.C. 109(i). All highway projects which are developed in conformance with this regulation shall be deemed to be in conformance with the Federal Highway Administration (FHWA) noise standards.

Sec. 772.5 Definitions.

- (a) Design year. The future year used to estimate the probable traffic volume for which a highway is designed. A time, 10 to 20 years, from the start of construction is usually used.
- (b) Existing noise levels. The noise, resulting from the natural and mechanical sources and human activity, considered to be usually present in a particular area.
- (c) L10. The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration.
- (d) L10(h). The hourly value of L10.
- (e) Leq. The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period.
- (f) Leq(h). The hourly value of Leq.
- (g) Traffic noise impacts. Impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria (Table 1), or when the predicted traffic noise levels substantially exceed the existing noise levels.
- (h) Type I projects. A proposed Federal or Federal-aid highway 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.
- (i) Type II projects. A proposed Federal or Federal-aid highway project for noise abatement on an existing highway.

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Sec. 772.7 Applicability.

- (a) Type I projects. This regulation applies to all Type I projects unless it is specifically indicated that a section applies only to Type II projects.
- (b) Type II projects. The development and implementation of Type II projects are not mandatory requirements of 23 U.S.C. 109(i) and are, therefore, not required by this regulation. When Type II projects are proposed for Federal-aid highway participation at the option of the highway agency, the provisions of Subsec. 772.9(c), 772.13, and 772.19 of this regulation shall apply.

Sec. 772.9 Analysis of traffic noise impacts and abatement measures.

- (a) The highway agency shall determine and analyze expected traffic noise impacts and alternative noise abatement measures to mitigate these impacts, giving weight to the benefits and cost of abatement, and to the overall social, economic and environmental effects.
- (b) The traffic noise analysis shall include the following for each alternative under detailed study:
1. Identification of existing activities, developed lands, and undeveloped lands for which development is planned, designed and programmed, which may be affected by noise from the highway;
 2. Prediction of traffic noise levels;
 3. Determination of existing noise levels;
 4. Determination of traffic noise impacts; and
 5. Examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts.
- (c) Highway agencies proposing to use Federal-aid highway funds for Type II projects shall perform a noise analysis of sufficient scope to provide information needed to make the determination required by Sec. 772.13(a) of this chapter.

Sec. 772.11 Noise abatement.

- (a) In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.
- (b) In those situations 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, the interior criterion shall be used as the basis of determining noise impacts.
- (c) If a noise impact is identified, the abatement measures listed in Sec. 772.13(c) of this chapter must be considered.
- (d) When noise abatement measures are being considered, every reasonable effort shall be made to obtain substantial noise reductions.
- (e) 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.
- (f) The views of the impacted residents will be a major consideration in reaching a decision on the reasonableness of abatement measures to be provided.
- (g) The plans and specifications will not be approved by FHWA unless those noise abatement measures which are reasonable and feasible are incorporated into the plans and specifications to reduce or eliminate the noise impact on existing activities, developed lands, or undeveloped lands for which development is planned, designed, and programmed.

Sec. 772.13 Federal participation.

- (a) Federal funds may be used for noise abatement measures where:
1. A traffic noise impact has been identified,

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2. The noise abatement measures will reduce the traffic noise impact, and
3. The overall noise abatement benefits are determined to outweigh the overall adverse social, economic, and environmental effects and the costs of the noise abatement measures.

(b) 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. 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.

(c) The noise abatement measures listed below may be incorporated in Type I and Type II projects to reduce traffic noise impacts. The costs of such measures may be included in Federal-aid participating project costs with the Federal share being the same as that for the system on which the project is located, except that Interstate construction funds may only participate in Type I projects.

1. Traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive land designations).
2. Alteration of horizontal and vertical alignments.
3. Acquisition of property rights (either in fee or lesser interest) for construction of noise barriers.
4. Construction of noise barriers (including landscaping for aesthetic purposes) whether within or outside the highway right-of-way. Interstate construction funds may not participate in landscaping.
5. Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type I projects only.
6. Noise insulation of public use or nonprofit institutional structures.

(d) There may be situations where (1) severe traffic noise impacts exist or are expected, and (2) the abatement measures listed above are physically infeasible or economically unreasonable. In these instances, noise abatement measures other than those listed in Sec. 772.13(c) of this chapter may be proposed for Types I and II projects by the highway agency and approved by the Regional Federal Highway Administrator on a case-by-case basis when the conditions of Sec. 772.13(a) of this chapter have been met.

Sec. 772.15 Information for local officials.

In an effort to prevent future traffic noise impacts on currently undeveloped lands, highway agencies shall inform local officials within whose jurisdiction the highway project is located of the following:

- (a) The best estimation of future noise levels (for various distances from the highway improvement) for both developed and undeveloped lands or properties in the immediate vicinity of the project,
- (b) Information that may be useful to local communities to protect future land development from becoming incompatible with anticipated highway noise levels, and
- (c) Eligibility for Federal-aid participation for Type II projects as described in Sec. 772.13(b) of this chapter.

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Interstate 40
Widening to six-lanes
From I-85 to NC 147 (Buck Dean Freeway)
Durham and Orange Counties
Federal-Aid Project NHF-40-4(107)259
State Project 8.1501601
TIP Project Number I-3306

CATEGORICAL EXCLUSION

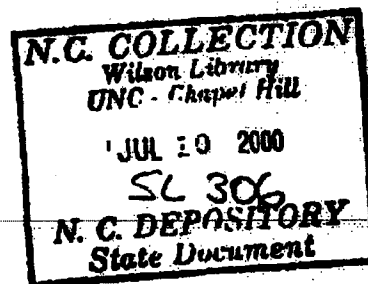
U. S. Department of Transportation

Federal Highway Administration

And

N. C. Department of Transportation

Division of Highways



APPROVED:

3-28-00

Date

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3/29/00

Date

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Division Administrator, FHWA

Interstate 40
Widening to six-lanes from I-85 to NC 147 (Buck Dean Freeway)
Durham and Orange Counties
Federal-Aid Project NHF-40-4(107)259
State Project 8.1501601
TIP Project Number I-3306

Prepared by the Project Development and Environmental Analysis Branch
Division of Highways
North Carolina Department of Transportation

SUMMARY

1. Description of Action - The North Carolina Department of Transportation, Division of Highways, proposes to widen the existing four-lane Interstate 40 to six-lanes from Interstate 85 in Orange County to NC 147 (Buck Dean Freeway) in Durham County. The proposed project is included in the 2000-2006 Transportation Improvement Program (TIP) with construction in Durham County (Section B) to begin in federal fiscal year 2002. Construction in Orange County (Section A) is not scheduled in the 2000-2006 TIP.

The project proposes to add one lane in each direction. All widening will occur within the existing median. The Durham County portion (Section B) will include a 3-inch bonded concrete overlay of the existing pavement. The pavement design for the Orange County portion will be determined in the final design stages after construction is scheduled. The total project length is 21.4 miles (34.4 kilometers). This project has an estimated construction cost of \$ 86,700,000. No right-of-way acquisition is anticipated.

2. Project Benefits - The proposed project will reduce congestion by increasing the safety and handling capacity on this section of Interstate 40. Traffic volumes on I-40 in Durham County are currently beyond the handling capacity of the roadway. Traffic volumes on I-40 in Orange County are projected to increase beyond the handling capacity of the roadway by the year 2004.

3. Environmental Effects - No residences will be relocated as part of this project. Approximately 115 acres of maintained roadside community will be impacted. There will be no effect to architectural and historical resources listed in or eligible for the National Register of Historic Places. There will be no substantial impact to air quality. Noise impacts are expected at 156 locations. The optimized preliminary design for noise walls along the project was not found to be cost effective per NCDOT Noise Abatement Policy; hence, no noise walls are recommended. No right-of-way acquisition is anticipated.

TIP Project I-2204 BA proposes to widen Interstate 40 to eight lanes from NC 147 in Research Triangle Park to just south of I-540 near the Wake/Durham County line. This project is currently funded only for planning and environmental studies. No schedule for construction has been set.

TIP Project R-2906 proposes to widen NC 55 to multi lanes from US 64 in Wake County to SR 1121 in Durham County. This project will cross under I-40. The 2000-2006 TIP schedules right of way acquisition beginning in Federal Fiscal Year (FFY) 2002 and construction beginning in FFY 2003.

TIP Project U-2807 proposes a major facility upgrade to US 15-501 from SR 1010 (Franklin Street) in Chapel Hill to US 15-501 Bypass in Durham. A Major Investment Study (MIS) determined that highway improvements along the US 15-501 corridor are needed in the future. The study concluded that transit alternatives should also be evaluated. No right of way or construction funds are currently budgeted for this project.

TIP Project U-2302 will widen NC 86 in Orange County to a multi lane facility from south of SR 1777 (Homestead Road) to north of SR 1730 (Whitfield Road). This project, which crosses I-40, is currently under construction.

III. EXISTING FACILITY INVENTORY

A. Length of Section Studied

The length of the proposed project is 21.4 miles (34.4 kilometers). The length of the Orange County section (Section A) is 11.4 miles (18.3 kilometers). The length of the Durham County section (Section B) is 10 miles (16.1 kilometers).

B. Existing Typical Section

Currently, this section of Interstate 40 has 2 lanes in each direction separated by a 46-foot grass median.

C. Right of Way

Right of way width along Interstate 40 ranges from 280 feet (85 meters) throughout Orange County to 500 feet (150 meters) near the NC 147 interchange. Through the majority of Durham County, right of way width is 320 feet (100 meters).

D. Structures

Table 1 outlines the bridges within the project limits that carry Interstate 40 over various features.

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surrounding terrain. Obviously, to assess the problem certain assumptions and simplifications must be made.

The BCR traffic noise prediction model uses the number and type of vehicles on the planned roadway, their speeds, and the physical characteristics of the road (horizontal and vertical alignment, grades, cut or fill sections, etc.). Also, receptor location and height is employed and, if applicable, barrier type, barrier ground elevation, and barrier top elevation is included. The noise predictions made in this report are highway-related noise predictions for the traffic conditions during the year being analyzed. Design hour and level-of-service (LOS) C volumes were compared and the volumes, which resulted in the noisiest conditions, were used with posted speeds to predict future noise levels. During all other time periods, the noise levels will be no greater than those indicated in this report.

First, this computerized model was used to determine the number of land uses (by type) which would be impacted during the peak hour in the design year 2020. The basic approach was to select receptor locations at 7.5, 15, 30, 60, 120, 240, and 480 meters from the center of the near traffic lane (adaptable to both sides of the roadway). The result of this procedure was a grid of receptor points along the project alignment. Using this grid, noise levels were calculated for each identified receptor along the project.

The Leq traffic noise exposures associated with this project are listed in the Appendix. Information included in this table is a listing of all receptors in close proximity to the project, their ambient and predicted noise levels, and the estimated noise level increases for each.

Traffic Noise Impacts and Noise Contours

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria value (with "approach" meaning within 1 dBA), or [b] substantially exceed the existing noise levels. These noise abatement criteria are defined in Table 9. Consideration for noise abatement measures must be given to receptors that fall in either category.

In accordance with NCDOT Traffic Noise Abatement Policy, the Federal/State governments are no longer responsible for providing noise abatement measures for new development which building permits are issued within the noise impact area of a proposed highway after the Date of Public Knowledge. The Date of Public Knowledge of the location of this proposed highway project will be the approval date of the CE, or the Design Public Hearing, whichever comes later. For development occurring after this public knowledge date, local governing bodies are responsible to insure that noise compatible designs are utilized along the proposed facility.

The maximum number of receptors in each activity category predicted to be impacted by future traffic noise is shown in Table 11. These are noted in terms of those

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receptors expected to experience traffic noise impacts by approaching or exceeding the FHWA NAC or by a substantial increase in exterior noise levels. Under Title 23 CFR Part 772, there are 150 residences and 6 businesses that are predicted to experience traffic noise impacts in the project area. The maximum extent of the 72 and 67 dBA noise level contours are 94.7 and 144.4 meters, respectively, from the center of the proposed roadway. This information should assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within local jurisdiction. For example, with the proper information on noise, the local authorities can prevent further development of incompatible activities and land uses with the predicted noise levels of an adjacent highway.

Table 11
FHWA Noise Abatement Criteria Summary

Description	Maximum Predicted Leq Noise Levels, dBA ⁽¹⁾			Contour Distance (maximum) ⁽²⁾		Approximate Number of Receptors Impacted According To Title 23 CFR Part 772				
	15m	30m	60m	72 dBA	67 dBA	A	B	C	D	E
From I-85 in Orange County to SR 1009	81.9	77.8	72.4	74.8	114.6	0	22	0	0	0
From SR 1009 to SR 1723	82.6	78.4	73.0	78.6	120.9	0	2	0	0	0
From SR 1723 to NC 86	82.7	78.6	73.1	79.3	121.9	0	14	0	0	0
From NC 86 to US 15-501	83.1	79.0	73.5	82.0	126.4	0	22	0	0	0
From US 15-501 to NC 54	83.9	79.8	74.3	87.7	135.3	0	51	1	0	0
From NC 54 to NC 751	84.6	80.5	75.0	93.4	143.4	0	0	1	0	0
From NC 751 to SR 1118	84.7	80.6	75.2	94.7	144.4	0	0	0	0	0
From SR 1118 to NC 55	84.8	80.7	75.2	94.7	144.4	0	36	1	0	0
From NC 55 to NC 147	84.8	80.7	75.2	94.7	144.4	0	3	3	0	0
Totals:						0	150	6	0	0

NOTES: (1) 15m, 30m, and 60m distances are measured from center of nearest travel lane.
 (2) 72 dBA and 67 dBA contour distances are measured from center of proposed roadway.

Table 12 indicates the exterior level increases of traffic noise for the identified receptors in each roadway section. There are no receptors predicted to be impacted by a substantial increase in exterior noise levels. The predicted noise level increases for this

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TABLE N4
 TRAFFIC NOISE EXPOSURES
 I-40 Widening, Orange/Durham Counties, TIP # I-3306

X 3.281

#	RECEPTOR INFORMATION	NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS		NOISE LEVEL INCREASE
				NAME	CL DIST(m)	-L-	-Y-	
From SR 1723 to NC 86 (Cont'd)								
50	Residence B	I-40	64	-L-	116.0 L			+ 3
51	Residence B	"	65	"	110.0 L			+ 3
52	Residence B	"	67	"	89.0 L			+ 3
53	Residence B	"	70	"	74.0 L			+ 2
54	Residence B	"	73	"	51.0 L			+ 3
55	Residence B	"	68	"	75.0 L			+ 3
56	Residence B	"	65	"	100.0 L			+ 3
57	Residence B	"	66	"	92.0 L			+ 3
From NC 86 to US 15-501								
58	Residence B	I-40	70	-L-	72.0 L			+ 3
59	Residence B	"	60	"	164.0 L			+ 3
60	Residence B	"	63	"	135.0 L			+ 3
61	Residence B	"	70	"	70.0 L			+ 3
62	Residence B	"	69	"	80.0 L			+ 3
63	Residence B	"	65	"	110.0 L			+ 3
64	Residence B	"	64	"	118.0 L			+ 3
65	Residence B	"	64	"	115.0 L			+ 4
66	Apartments E	"	61/<40		148.0 R			+ 3/0
67	Apartments E	"	63/<40		126.0 R			+ 4/2
68	Apartments E	"	60/<40		160.0 R			+ 3/0
69	Church E	"	69/<40		75.0 L			+ 4/0
70	Residence B	"	58		158.0 R			+ 4
71	Residence B	"	60		145.0 R			+ 3
72	Residence B	"	64		120.0 R			+ 3
73	Residence B	"	67		82.0 R			+ 3
74	Residence B	"	68		77.0 R			+ 3
75	Residence B	"	65		100.0 R			+ 3

Handwritten notes in the table include:
 - Row 50: +44.1
 - Row 66: 526.6, 454.4, 566.0, 584.7
 - Row 67: 516.7
 - Row 71: 494.7
 - Row 72: 310.0
 - Row 73: 293.6
 - Row 74: 369.1

(39)

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FHWA

Highway Traffic Noise in the United States Problem and Response

by

U.S. Department of Transportation Federal Highway Administration

April 2000

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Highway Project Noise Mitigation

The National Environmental Policy Act (NEPA) of 1969 provides broad authority and responsibility for evaluating and mitigating adverse environmental effects including highway traffic noise. The NEPA directs the Federal government to use all practical means and measures to promote the general welfare and foster a healthy environment.

A more important Federal legislation which specifically involves abatement of highway traffic noise is the Federal-Aid Highway Act of 1970. This law mandates FHWA to develop noise standards for mitigating highway traffic noise.

The law requires promulgation of traffic noise-level criteria for various land use activities. The law further provides that FHWA not approve the plans and specifications for a federally aided highway project unless the project includes adequate noise abatement measures to comply with the standards. The FHWA has developed and implemented regulations for the mitigation of highway traffic noise in federally-aided highway projects.

The FHWA regulations for mitigation of highway traffic noise in the planning and design of federally aided highways are contained in Title 23 of the United States Code of Federal Regulations Part 772 (attached). The regulations require the following during the planning and design of a highway project: 1) identification of traffic noise impacts; examination of potential mitigation measures; 2) the incorporation of reasonable and feasible noise mitigation measures into the highway project; and 3) **coordination with local officials** to provide helpful information on compatible land use planning and control. The regulations contain noise abatement criteria which represent the upper limit of acceptable highway traffic noise for different types of land uses and human activities. The regulations do not require that the abatement criteria be met in every instance. Rather, they require that every reasonable and feasible effort be made to provide noise mitigation when the criteria are approached or exceeded. Compliance with the noise regulations is a prerequisite for the granting of Federal-aid highway funds for construction or reconstruction of a highway.

FHWA NOISE ABATEMENT PROCEDURES

The FHWA noise abatement procedures are codified in the Code of Federal Regulations (23 CFR 772). The procedures are described in the following sections.

Noise Descriptors

Noise descriptors are used to describe the time-varying nature of noise. The L10 and Leq noise descriptors are used in the abatement procedures. The former is the noise level exceeded 10% of the time in the noisiest hour of the day. The latter is the constant, average sound level, which over a period of time contains the same amount of sound energy as the varying levels of the traffic noise. The L10 is a statistical descriptor that is easy for most people to determine and understand. While the Leq descriptor is harder for inexperienced people to understand, it has the advantages over L10 of being more reliable for low-volume roadways and of permitting noise levels from different sources to be added directly to one another for inclusion in noise analyses. Leq for typical traffic conditions is usually about 3 dBA less than L10 for the same conditions.

Impact Criteria

A traffic noise impact occurs when either of the following conditions exist:

1. The projected traffic noise levels approach or exceed the noise abatement criteria (NAC) shown in Table 5, or
2. The projected traffic noise levels substantially exceed the existing noise levels in an area.

Table 5
Noise Abatement Criteria (NAC) Hourly A-Weighted Sound Level - decibels (dBA)*

Activity Category	Leq(h)	L10(h)	Description of Activity Category
A	57 (Exterior)	60 (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 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	--	Undeveloped lands.
			Residences, motels, hotels, public meeting rooms, schools, churches, libraries,

* Either L10(h) or Leq(h) (but not both) may be used on a project.

There is no mandated definition for what constitutes a substantial increase over existing noise levels in an area. Most State highway agencies use either a 10 dBA increase or a 15 dBA increase in noise levels to define a "substantial increase" in existing noise levels. Several State highway agencies use a sliding scale to define substantial increase. The sliding scale combines the increase in noise levels with the absolute values of the noise levels, allowing for a greater increase at lower absolute levels before a substantial increase occurs.

Existing Activities

The location of existing activities in the vicinity of various study alternatives for a highway project are identified by individual land uses, or by broad categories of land use for which a single NAC level may apply. In some cases, lands which are undeveloped at the time of the project may be known to be under consideration for development in the future. If this is the case and definite commitments have been made to develop the land, then, these lands are treated as developed and the highway noise impacts assessed accordingly. Primary consideration for highway traffic noise analysis is normally given to exterior areas where frequent human use occurs.

Type I/ Type II Projects

The FHWA regulation makes a distinction between projects for which noise abatement is considered as a feature in a new or expanded highway and those for which noise abatement is considered as a retrofit feature on an existing highway. The former are defined as Type I projects, the latter as Type II. For Type I projects, the consideration of noise abatement as part of the highway construction project is mandatory if Federal-aid funds are to be used and if a traffic noise impact is expected to occur. Type II projects are, however, completely voluntary on the part of the individual States, and such projects compete for funds with all the other construction needs of the States. It should be noted that the National Highway System Designation Act of 1995 (NHS) restricted Federal participation in Type II noise barriers to those 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.

Noise Analysis

Analysis of the traffic noise impacts expected from construction of a highway involves a number of technical steps. The traffic noise analysis includes the following for each alternative under detailed study:

1. identification of existing activities, developed lands, and undeveloped lands for which development is planned, designed and programmed, which may be affected by traffic noise from the highway;
2. determination of existing noise levels;
3. prediction of traffic noise levels;
4. determination of traffic noise impacts; and
5. examination and evaluation of alternative noise abatement measures for reducing or eliminating the traffic noise impacts.

If potential traffic noise impacts are identified, noise abatement is considered and implemented, if it is found to be both reasonable and feasible. The views of the impacted residents are a major consideration in reaching a decision on the reasonableness of abatement measures to be provided. When noise abatement measures are being considered, every reasonable effort is made to obtain substantial noise reductions. Substantial noise reductions have been defined by State highway agencies to typically range from 5 to 10 dBA.

Federal Participation

Federal funds may be used for noise abatement measures where:

1. a traffic noise impact has been identified,
2. the noise abatement measures will reduce the traffic noise impact, and
3. the overall noise abatement benefits are determined to outweigh the overall adverse social, economic, and environmental effects and the costs of the noise abatement measures.

The Federal share of the abatement costs is at the same participating ratio as for the system on which the project is located.

Noise Abatement

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If traffic noise impacts are identified, various noise abatement measures are considered to mitigate the adverse impacts. The construction of a noise barrier is the mitigation measure most often associated with the concept of noise abatement. For this reason a special section on noise barriers, which begins on page 12, has been included in this report to discuss this subject in more detail.

Other possible noise abatement measures include traffic management measures, creating buffer zones, planting vegetation, installing noise insulation in buildings, and relocating the highway.

Traffic management measures can sometimes reduce noise problems. For example, if acceptable alternative truck routes are available, trucks can be prohibited from certain streets and roads, or they can be permitted to use certain streets and roads only during daylight hours. Traffic lights can be changed to smooth out the flow of traffic and to eliminate the need for frequent stops and starts. Speed limits can be reduced; however, about a 32 kilometer-per-hour reduction in speed is necessary for a readily noticeable (5 dBA) decrease in noise levels.

Buffer zones are undeveloped, open spaces which border a highway. Buffer zones are created when a highway agency purchases land, or development rights, in addition to the normal right-of-way, so that future dwellings cannot be constructed close to the highway. This prevents the possibility of constructing dwellings which would otherwise experience an excessive noise level from nearby highway traffic. An additional benefit of buffer zones is improvement of the roadside appearance. However, because of the tremendous amount of land which must be purchased and because in many cases dwellings already border existing roads, creating buffer zones is often not possible. While Federal-aid highway funds may be used on a highway project to create buffer zones, this measure has not been used very often.

Vegetation, which is so high, wide, and dense that it cannot be seen over or through, can decrease highway traffic noise. However, it requires a 61-meter width of such vegetation to reduce noise by 10 decibels, which cuts in half the loudness of traffic noise. It is not feasible to plant enough vegetation along a road to achieve such reductions. If vegetation already exists, it can be saved to maintain a psychological relief, if not an actual lessening of traffic noise levels. If vegetation does not exist, it can be planted for psychological relief, not to reduce traffic noise levels.

Insulating buildings can greatly reduce highway traffic noise, especially when windows are sealed and cracks and other openings are filled. Sometimes noise-absorbing material can be placed in the walls of new buildings during construction. However, insulation can be costly, because air conditioning is usually necessary once the windows are sealed. Federal-aid highway funds may be used for noise insulation of public-use or non-profit institutional structures. Such funds may also be used for noise insulation of residences and other private-use buildings where noise impacts are severe and no other type of abatement is possible. Very few private-use buildings have been noise insulated with Federal-aid highway funds. The majority of Federal-aid highway funds used for noise insulation has been spent to noise insulate schools. In many parts of the country, highway agencies do not have the authority to insulate buildings; thus, in those States, noise insulation cannot be included as part of a highway project.

A noise attenuation measure which should always be considered is the possibility of altering the highway location to avoid those land use areas which have been determined to have a potential traffic noise impact. Since sound intensity decays with distance from the source, increased distance between the noise source and receiver will reduce the noise impact. It may also be possible to obtain attenuation by depressing the roadway slightly to produce a break in the line of sight from the source to the receiver. Potential noise reduction should be considered with the many other factors which influence the selection of roadway alignment.

Coordination With Local Officials

The FHWA noise regulation requires coordination with local officials whose jurisdictions are affected. The primary purpose of this coordination is to promote compatibility between land development and highways.

Highway agencies furnish the following information to appropriate local officials:

1. Estimated future traffic noise levels at various distances from the highway improvement.
2. Locations where local communities should protect future land development from becoming incompatible with anticipated highway traffic noise levels.

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

NCDOT TRAFFIC NOISE ABATEMENT POLICY

The North Carolina Department of Transportation (NCDOT) Traffic Noise Abatement Policy provides for the evaluation of sound barriers or other mitigation measures (e.g., landscaping) for communities and facilities adversely impacted by noise from state and federal highways. NCDOT uses this policy to determine the need for noise abatement and the feasibility and reasonableness of abatement measures.

NCDOT noise abatement policy applies only to "Type I" projects for state, federal or federal-aid highway projects. NCDOT does not participate in "Type II" projects (retrofitting of existing roads, heavy maintenance projects, guardrail projects, rehabilitation projects and existing facilities).

Type I Projects

Sound barriers may be considered for new construction or reconstruction of highways. New construction is building a highway on a new location. Reconstruction involves physically altering an existing highway. The most common examples of reconstruction are: increasing the number of through-traffic lanes or substantially changing its vertical grade or horizontal alignment. Consideration of noise abatement as part of construction or reconstruction projects is mandatory whenever traffic noise impacts are predicted.

PREVENTING NOISE IMPACTS - Information for the Public and Local Officials

To prevent future noise impacts on currently undeveloped lands, the following system will be used:

Public information. During the development stage of a proposed highway project, area residents and local officials will be kept informed about the project. Meetings (both formal and informal) will be held to provide information as well as to gather comments, opinions and concerns from the public and local officials.

Public documents. Environmental documents prepared for the project will contain a list of areas that may be impacted by noise as well as proposals for sound barriers and/or other abatement measures.

Design Public Hearing. Proposed noise abatement measures will be presented and discussed at the Design Public Hearing. The walls shown on the design public hearing map will be based on preliminary design and a detailed noise analysis. NCDOT design staff will fine tune the designs during the right of way plan preparation process. The location of the barrier should remain essentially the same as shown in the design public hearing map.

Final determination. Noise abatement measures deemed reasonable and feasible by NCDOT staff will be shown on the design public hearing map. The opinions of first row property owners will be requested so that a final determination on abatement measures may be made.

Date of Public Knowledge. The "Date of Public Knowledge" of the location and potential noise impacts of a proposed highway project will be either a) the approval date of final environmental document, e.g., CE, FONSI or ROD or b) the Design Public Hearing, whichever occurs later.

1. After this date, the federal and state governments are no longer responsible for providing noise abatement measures for new development within the noise impact area of the proposed highway project.
2. The criteria (e.g., trigger date) for determining when undeveloped land is "planned, designed and programmed" for development will be the approval of a building permit for an individual lot or site.
3. It is the responsibility of local governments and private landowners to ensure that noise-compatible designs are used for development permitted after the Date of Public Knowledge.

NCDOT will provide all traffic noise analyses to local government officials within whose jurisdiction a highway project is proposed. Specifically, environmental documents and design noise reports will contain noise tables identifying areas that may be impacted by traffic noise as well as other appropriate design information. Local officials should coordinate distribution of this information to residents, property owners and developers within the affected areas. Following this procedure will encourage planners, building officials, developers and others within affected communities to plan, design and construct noise-compatible development.

SOUND AND NOISE - Definitions and Measurements.

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Sound is created when an object moves, causing vibrations or waves in air molecules. When vibrations reach our ears we hear sounds. Noise is defined as unwanted or excessive sounds. It is an undesirable by-product of our modern way of life.

Sound levels are measured in units called decibels (dB). Adjustment for the high and low pitched sounds an average person can hear is called "A-weighted levels" or dBA. Highway traffic noise is assessed using dBA measurements. Noise is further described by its average level over time. In noise abatement studies an "hourly equivalent sound level," or Leq(h), is the constant, average sound level that contains the same amount of sound energy over the time period as does the varying levels of actual traffic noise.

NOISE IMPACT DETERMINATION AND ABATEMENT.

Noise levels for which abatement must be considered and may be provided are defined by land use or activity category in Figure 1. Noise impacts are projected for the "design year," or the traffic levels anticipated 20 years after highway construction begins. Because these traffic levels are estimates, noise impacts approaching these criteria are also considered. NCDOT uses an "approach value" of 1 dBA less than those shown in Figure 1.

Traffic noise abatement for NCDOT highway projects must be considered when either of the following two conditions exist:

1. The predicted design year noise levels approach or exceed those measurements shown for the appropriate activity category as shown in Figure 1.

OR

2. The predicted design year noise levels substantially exceed existing noise levels as defined below:

<u>Existing Leq(h)</u>	<u>Increase</u>
50 or less dBA	15 or more dBA
Greater than 50 dBA	10 or more dBA

Figure 1. Noise Abatement Criteria Hourly A- Weighted Sound Level in Decibels(dBA)		
Activity Category	Leq(h)	Description of Activity 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	67 (Exterior)	Residences, churches, school, libraries, hospitals, motels, hotels, parks, picnic and recreation areas, active sports areas and playgrounds
C	72 (Exterior)	Developed lands, properties or activities not included in Categories A or B
D	Not Applicable	Undeveloped lands
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums

Depending on the existing noise levels, NCDOT uses both a 10 dBA and 15 dBA increase to define "substantially exceeding." This sliding scale allows a greater increase at a lower existing noise level before a "substantial" increase is defined. As sound barriers generally reduce volumes by 5 to 8 dBA, their use is usually not as effective in less noisy areas. A 10 dBA increase is judged by most people as a doubling of the loudness of sounds.

Noise abatement will generally not be considered for heavy maintenance, rehabilitation projects and existing conditions.

SOUND BARRIERS - Feasible and Reasonable.

After it has been determined to consider noise abatement as outlined above, several factors must be examined to determine if construction of sound barriers is feasible and reasonable. These factors include benefits to those impacted by noise, the cost of abatement, and overall social, economic and environmental effects of sound barrier construction.

Feasibility. Feasibility deals primarily with design and engineering considerations. The following issues should be considered in order to determine feasibility:

1. Can a sound barrier be built given the topography of the location?

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2. Can noise reduction ("insertion loss") provided by the wall be a minimum of 5 dBA, but preferably 8 dBA or more, for "design receptors" (first row receptors or properties immediately adjacent to the proposed barrier)?
3. Can this noise reduction level be achieved given site-specific access, drainage, safety or maintenance requirements?
4. Are other noise sources present in the area?
5. Unless special conditions exist and effective abatement can be provided, it is not considered feasible to provide noise abatement on non-controlled or partial access control highways.

Reasonableness. Reasonableness is a more subjective measure. This consideration should show that good judgement and common sense were used in making a decision. A finding of reasonableness should include the following:

1. Sound barrier cost - The abatement measure should be cost effective. Cost effective is defined as \$25,000 (construction costs at \$15/s.f.) per each receptor effectively benefitted by a 5 dBA or greater noise reduction.
2. Barrier height - The height above ground level facing the receptor should not exceed a maximum of 7.5 meters, or approximately 25 feet.
3. Barrier scale - It generally will not be considered reasonable to construct a barrier unless the receptor is located a horizontal distance at least four times the wall height from the proposed barrier. Sound barriers can have an overwhelming visual impact on receptors located closer to the wall.
4. Difference between existing and future noise levels - It generally is not considered reasonable to provide abatement if the difference between existing and design year noise levels is 3 dBA or less, as this is considered a barely perceptible change.
5. Opinions of impacted residents - Support for the proposed sound barrier by design receptors ("first row" residents) must be documented. Noise barriers will not be constructed without support from 51% or more of the first row residents within a given area. The opinions of design receptors will be requested at formal and informal meetings and/or by mail depending upon the scope of the project.
6. Commercial areas - Unless special conditions exist, it generally is not considered reasonable to provide abatement for impacted businesses. Businesses usually prefer visibility from the highway rather than noise abatement.
7. Isolated receptors - Unless special conditions exist, it generally is not considered reasonable to provide noise abatement for isolated receptors. The cost of abatement versus the noise reduction benefits is usually excessive.
8. Clear recovery zone - A noise barrier will be located behind the vehicle clear recovery zone or incorporated into a safety device such as a Jersey barrier.

The factors listed above are not intended to be all encompassing. Rather, these are to illustrate some of the factors that should be considered in determining the feasibility and reasonableness of proposed abatement measures.

EARTH BERMS

Consideration should be given to providing earth berms for noise abatement purposes on projects that have earth waste and where sufficient right-of-way exists to construct the berm.

VEGETATIVE BARRIERS.

NCDOT's Roadside Environmental Unit will review areas where abatement measures have been considered and not found to be reasonable, to determine if a vegetative barrier should be constructed as part of the project.

Vegetation that has sufficient height, depth and density of plant materials that it blocks views of the highway can also decrease traffic noise. Studies have shown that a 200 feet (61 meters) depth of dense vegetation can reduce noise levels by 10 dBA. It is often impractical to plant this quantity of vegetation to achieve such reductions. However, it does demonstrate the potential utility of retaining a vegetative buffer area between developed areas and highways.

NOISE BARRIER CONSTRUCTION, MATERIALS AND AESTHETICS.

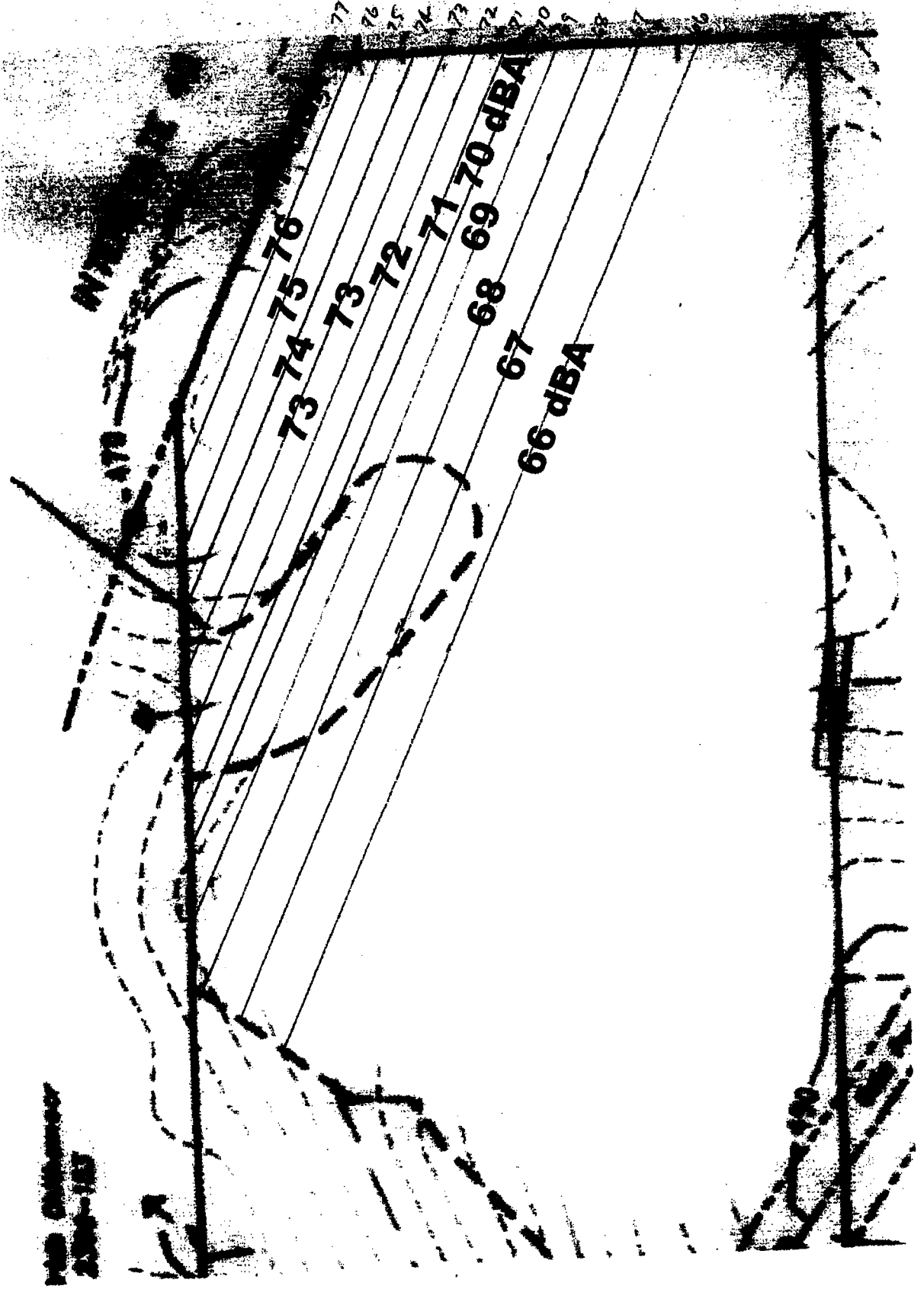
The type of materials used in construction of sound barriers and other abatement measures should be an engineering decision based on economics, effectiveness and, to a limited degree, visual impacts. Visual impact considerations will ensure that the proposed barrier meets a basic aesthetic level as well as a basic durability level so that excessive deterioration or corrosion will not occur.

The steel pile and concrete panel wall is NCDOT's standard noise wall.

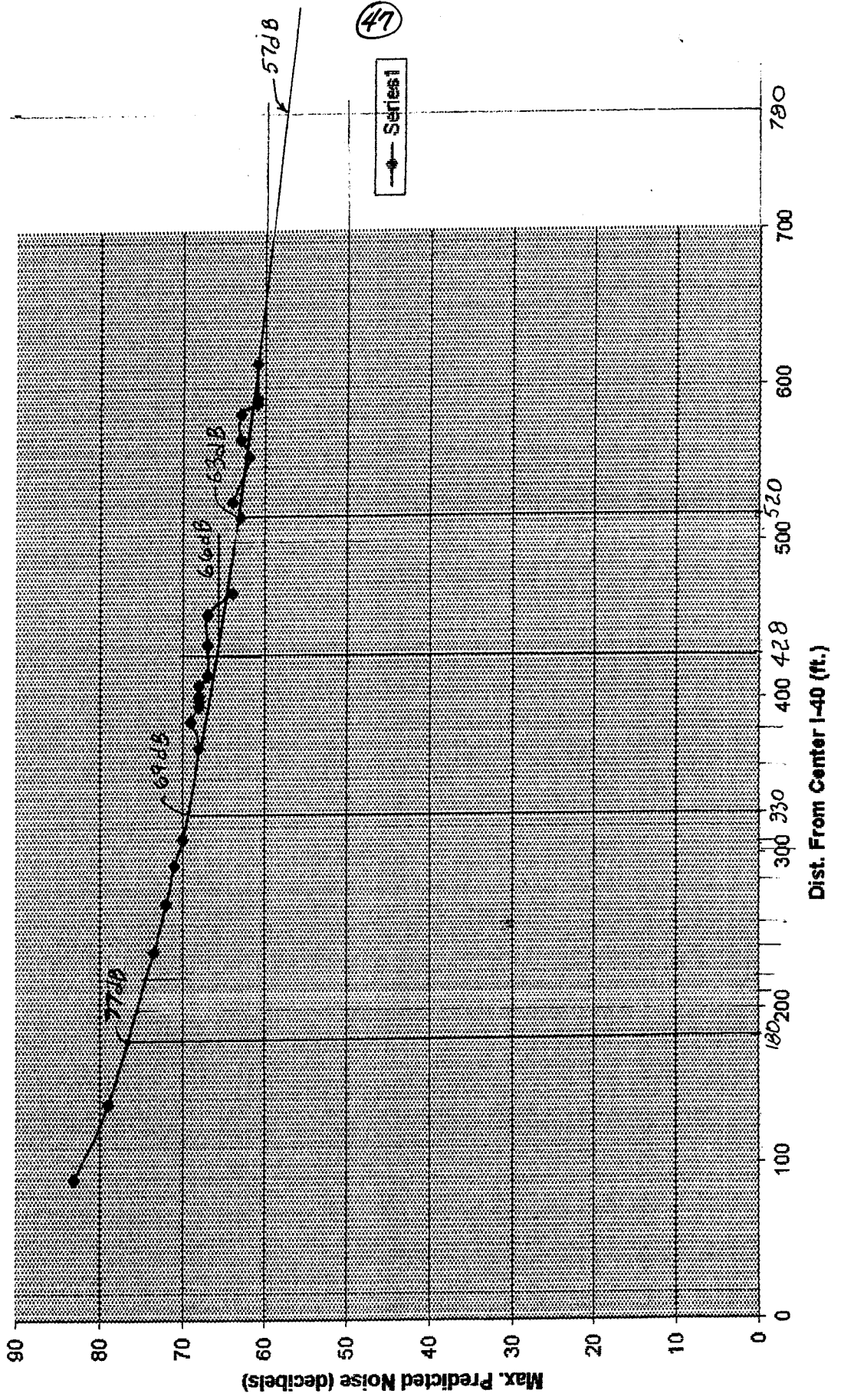
Traditional highway construction resources pay for required noise abatement measures. Should a local government request that materials be used that are more costly than those proposed by NCDOT, the requesting entity must assume 100% of the additional cost.

If a local government insists on the provision of a noise abatement measure deemed not reasonable by NCDOT, a noise barrier may be installed provided the local government assumes 100% of the costs. These costs include, but are not limited to, preliminary engineering, construction and maintenance. In addition, local governments must ensure that NCDOT's material, design and construction specifications are met.

**Maximum Noise Levels in Decibels (dBA) for Year 2020 Predicted by NCDOT
in Tables 11 & N4 of Categorical Exclusion, I-40 Widening to Six-Lanes dated
March 2000...Habitat for Humanities Site**



FHWA Noise Predictions



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Series1



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. BASLEY
GOVERNOR

1501 MAIL SERVICE CENTER, RALEIGH, N.C. 27699-1501
August 16, 2001

LYNDO TIPPETT
SECRETARY

Chapel Hill, North Carolina

Dear :

Thank you for your letter regarding concerns about traffic noise levels along I-40 near the . A noise analysis was performed as part of the Categorical Exclusion (CE) Document for the Transportation Improvement Plan (TIP) Project I-3306 for I-40 between I-85 in Orange County to NC 147 in Durham County. The proposed improvements to this section of I-40 will be conducted in phases. Project I-3306A in the vicinity of is not funded in the 2002-2008 TIP.

Based on Federal Highway Administration (FHWA) recommended guidelines for conducting noise analysis, the CE indicated that no receptors in in design year 2020 would approach or exceed noise levels that indicate a traffic noise impact. The analysis was based on "worst case" conditions such as a flat section with no reduction in noise levels provided by existing natural features. On January 10, 2001 North Carolina Department of Transportation (NCDOT) staff measured I-40 traffic noise levels. On March 14, 2001 your consultant, Stewart Acoustical Consultants, measured the I-40 traffic noise levels in the area. The two sets of data show close correlation. The highest exterior noise level measured by NCDOT was 60.9 dBA. The highest noise level measured by Stewart Acoustical Consultants was 61.0 dBA. The proposed widening of I-40 would increase exterior noise levels by 3-4 dBA.

If the highest measured existing noise level of 61.0 dBA and a proposed increase of 4 dBA exterior noise level are added together to obtain the future design year noise level, the design resultant noise level is 65.0 dBA. When this traffic noise level is compared to the FHWA regulations (23 CFR, Part 772) and NCDOT Traffic Noise Abatement Policy for Activity Category "B" (exterior condition), a traffic noise impact is not indicated in the

In your correspondence, you requested that NCDOT consider "cumulative" noise impacts. Such analysis is neither practical nor required by FHWA guidelines. The NCDOT Traffic Noise Abatement Policy requires noise abatement measures when a maximum sound level is encountered or when the design year noise level exceeds existing noise levels by a predetermined quantitative amount. My staff has consulted with legal counsel and feels confident we are in compliance with the federal laws you mentioned in your letter. We believe, and FHWA agrees, that the Categorical Exclusion is the proper document for this type of project. At this time, does not qualify for noise abatement under the NCDOT Traffic Noise Abatement Policy. Therefore, no traffic noise abatement measures are proposed as part of I-3306.

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August 16, 2001

Page 2

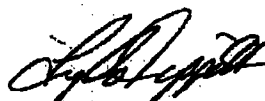
You noted in your letter that the final design plans for the road were not identical to the proposed road design plans. The I-9 (I-40 Original Construction) Final Environmental Impact Statement which was approved February 16, 1979 estimates for right of way and median widths were NCDOT's best approximations at the time of the document approval. When the change occurred, our staff determined that the changes to the right of way and median widths had no added impacts on the environment. The Design Noise Report (DNR) was completed using the final design plans which reflected changes in the horizontal alignment.

The vertical elevation of I-40 was raised approximately three feet during construction. The height of the earth berms parallel to I-40 were increased three to four feet so the relationship between the road surface and the top of the berms remained as originally proposed. These berms were raised to offset any increased noise levels resulting from the change in vertical elevation but were not part of noise abatement measures for the I-9 construction project. Also, as mentioned in the April 11, 1989 letter from D. R. Morton to _____, our analysis indicated the noise level at Receptor #35C (closest to I-40) experienced an increase of only 0.1 dBA with the change in vertical elevation. This analysis indicates that raising the berms nearly offsets the entire increase in noise caused by the change in vertical elevation.

I hope this letter fully responds to the issues you raised. I understand your personal concern regarding the impacts NCDOT projects will have on you and the entire community. NCDOT is committed to applying FHWA noise regulations consistently and fairly in all affected communities. NCDOT has developed a Traffic Noise Abatement Policy which is applied uniformly throughout the state.

If I can be of any further assistance, please contact me.

Sincerely,



Lyndo Tippett

LT/wdg

cc: Tyrone Y. Cox, Member, Board of Transportation
Nina S. Szlosberg, Member, Board of Transportation
Emily Lawton, FHWA



INTERSTATE ROUTE 40

*From Interstate Route 85 West
of Durham to Interstate Route 40
Southeast of Durham, Durham-Orange
Counties; State Project 8.1475201 (1-9);
Federal Aid Project 1-40-4(5) (268)*

FINAL ENVIRONMENTAL IMPACT STATEMENT

The proposed design speed reflects the geometric design of the roadway and provides for a margin of safety for safe vehicle operation. It should not be confused with posted speed limits or vehicular running speeds. In non-mountainous terrain, generally, little cost difference results from this increase in safety.

e. Cross Section Description

The recommended alternate is a four lane freeway with a minimum 70-foot wide median and paved shoulders.

f. Right of Way

The project will have an approximate right of way width of 400 feet, except in interchange areas.

g. Access Control

The project will have full control of access with access provided only at designated interchange locations. Service roads may be required in some locations to provide adequate local access. Location of service roads, if any, will be determined during the final design stage.

h. Intersection Treatment and Type of Control

All major intersecting roads will be grade separated or interchanged. Section IV.A. lists the proposed intersection treatment for the recommended alternate.

i. Major Stream Crossings

Northeast Creek
New Hope Creek
(2 crossings)
Old Field Creek

(52)

b. Design Elements

1. Cross Section- Two travel lanes in each direction separated by a minimum 88-foot grassed median.
2. Design Speed- 70 MPH minimum
3. Proposed Interchanges- Orange County-
I-85, SR 1723,
NC 86. (I-85 &
SR 1009 inter-
change to be
removed.)
Durham County-
US 15-501,
NC 54, NC 751,
SR 1118, NC 55,
N-S Freeway
4. Proposed Grade Separations- Orange County-
SR 1732, SR 1734
Durham County-
SR 2220, SR 1110
NC 54, SR 1106,
SR 1945, SR 2028
5. Proposed Road Terminations- Orange County-
None
Durham County-
SR 1113
6. Estimated Traffic Volumes- (See Figure 5)

It is estimated that in 1980 the traffic volumes will range from 13,400 vpd between US 15-501 and NC 54 to 23,800 vpd between NC 751 and SR 1118. In the design year 2000 the traffic is expected to range from 19,000 vpd to 31,700 vpd. The lower traffic volumes are estimated to include 19% tractor-trailer trucks, 24% dual-tired trucks or heavier and 35% total commercial vehicles.

7. Level of Service- Based on traffic volumes during the design year the facility would provide a Level of

(53)

Based on comments received at the January 19, 1971, Corridor Public Hearing and on the original draft EIS, and with the introduction of new alternates 1-A, 1-B and 1-C, a revised draft EIS was necessary.

B. Comments and Coordination Following Revised Draft EIS

A revised draft EIS evaluating the environmental impacts of Alternates 1, 2, 3, 4, and 5 included in the first draft EIS along with Alternates 1-A, 1-B and 1-C was prepared. The revised draft EIS was circulated for comments on May 10, 1976. The federal, state and local agencies that were asked to comment are included in the Summary. The comments received and responses to these comments are included in Appendix B. Other comments received are in Appendix C.

A second corridor public hearing was held in Durham on June 29, 1976 on all of the I-40 alternates. (A copy of the news release and examples of newspaper coverage for the corridor public hearing is in Appendix C, pages c.33-34). There was no preferred or recommended location presented at the hearing. The I-40 project received numerous comments from the public both during and following the hearing. The majority of the comments were in opposition to Alternates 1, 1-A, 1-B and 1-C. The residents of southern Durham and Orange Counties expressed intense opposition to the I-40 alternates through their areas. This opposition included the submission of petitions containing over 3000 signatures. The only significant citizen support expressed for any alternate was by citizens of southern Durham and Orange Counties for Alternate 4.

The alternates through Orange County were opposed by the governments and planning boards of Chapel Hill and Orange County. They expressed the opinion that the Interstate route was incompatible with the land use plans and the type and level of development they foresee for their area.

The City of Durham, Durham County, City of Hillsborough, Durham Chamber of Commerce, and Duke University supported the selection of Alternate 1-A in Durham County. Alternate 1-A occupies the same corridor as the recommended location in Durham County.

Comments on the Revised Draft EIS by Federal, State and local government agencies and responses to the comments are contained in Appendix B. Also included are written comments by local governments received at and subsequent to the corridor public hearing.

DESIGN NOISE REPORT

I-40, From New Hope Creek to 0.69 Miles
West of SR 1110
Orange-Durham Counties
State Project No. 8.1457901 (I-9AD & AE)
Federal Aid Project No. I-40-4(47)(259)

Location and Description of Project

This project consists of constructing a four lane freeway with a 46-foot median from New Hope Church Creek to 0.69 miles west of SR 1110. This facility will be constructed entirely on new location and control of access will be maintained along the project.

Procedures

A preliminary analysis of the probable noise impact of I-40 from I-85 west of Durham to I-40 southeast of Durham was contained in the Final Environmental Impact Statement (EIS) dated February 16, 1979. This design report represents a more detailed analysis of the proposed design from New Hope Creek to 0.69 miles west of SR 1110. The noise impacts of remaining sections of the project will be discussed under separate reports. Figure 1 indicates the limits of the projects which were studied for this report.

This analysis was performed using the procedures outlined in Federal-Aid Highway Program Manual 7-7-3, "Procedures for Abatement of Highway Traffic Noise and Construction Noise". Future traffic noise levels for receivers were determined using the technology contained in the FHWA Highway Traffic Noise Prediction Model (STAMINA 1.0) and are reported in terms of the Equivalent Sound Level (Leq). By definition, the Leq noise level is the level of constant sound which in a given situation and time period has the same energy content as does time varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

The predictions in this report were made using the new FHWA methodology and are reported in terms of the Leq noise level descriptor which was described above. This methodology represents the latest in "state of the art" highway noise prediction technology. The existing ambient data obtained for the EIS was converted to Leq values for use in this report. No additional noise level measurements were obtained to supplement the previously acquired ambient noise data.

Using roadway design plans, predictions are made of the maximum vehicular hourly Leq noise levels using either the

(55)

Area No. 4 -
(Station 610+00 to 617+00, Right Side)

This section encompasses the area on the south side of the project and west of SR 1732, and includes receiver Nos. 35A-35L. The land use is a residential retirement center. As indicated by Table 1, 1 building is predicted to experience an increase in noise levels of 15 dBA or more.

The majority of the residences in this area are located far enough away from the proposed project that the noise impacts are minimal. The predicted noise levels are expected to range from 42 dBA to 59 dBA which represents noise increases of 0 dBA to 17 dBA.

Noise abatement measures were considered for this area but were considered to be unfeasible. Table 3d indicates the results of a study performed to evaluate the effectiveness of a barrier constructed to protect this area. The barrier studied assumed placement along the control-of-access line with an average height of 18 1/2 feet. The proposed barrier extended roughly for 700 feet (Station 610+00 to Station 617+00) and would provide attenuation ranging from 0 dBA to 5 dBA. The barrier cost would be approximately \$277,000. Generally, in an exterior condition a 5 dBA change in the noise levels may not necessarily be noticeable. Therefore, unless a minimum 5 dBA reduction in the noise levels is achieved, money spent for construction of a noise abatement barrier is not considered to be a prudent expenditure of funds. The average attenuation achieved for the receivers in this area is approximately 2 dBA.

Therefore, due to the cost/effectiveness of this wall, the construction of a wall for ... is not feasible and no abatement measures are recommended.

Area No. 5 - SR 1734
(Station 707+00 to 711+00, Left Side)

This area is located west of SR 1734 and north of the project and includes Receiver Nos. 41-44, 41A, and 41B. As indicated in Table 1, 2 of the 3 residences are predicted to experience noise level impacts of 15 dBA or greater. There will be virtually no impact on the interior levels for the 2 businesses. No receivers are predicted to exceed the FHWA design noise levels.

As indicated in Table 1, the SR 1734 traffic is the controlling factor for the traffic noise at these receivers. Since these receivers are beyond the control-of-access, the use of a barrier along SR 1734 is eliminated.

Table 3e shows the results of a 400 foot wall located along the control-of-access line (Station 707+00 to Station 711+00) which cost approximately \$152,000. This wall

TABLE 1 (Cont.)

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ACVR. ID NO.	LANDUSE	A M B L E N Y		P A R E D I C T E D		NOISE LEVEL INCREASE (DBA)		
		ROUTE IDENTIFICATION	DISTANCE FROM CENTER OF NEAR LANE	NOISE LEVEL INT. (DBA)	ROUTE IDENTIFICATION		DISTANCE FROM CENTER OF NEAR LANE	NOISE LEVEL INT. (DBA)
		NC-86 to SR-1732 (CON'T)						
34	RES	SR-1730	610' R	42 @	- L -	467' L	51	+9
34A		Fairidge Road	100' L	42 @	-	530' L	47	+5
34B			100' L	42 @	-	720' L	43	+1
34C			325' R	42 @	-	627' L	53	+11
35A	APT (3)		40' R	42 @	-	700' R	46	+4
35B		Center Road	45' R	42 @	-	430' R	54	+12
35C			45' R	42 @	-	360' R	59	+17 #
35D			245' R	42 @	-	557' R	51	+9
35E			85' R	42 @	-	478' R	53	+11
35F			250' R	42 @	-	620' R	47	+5
35G			60' R	42 @	-	501' R	47	+5
35H			225' R	42 @	-	646' R	42	0
35I			260' R	42 @	-	735' R	42	0
35J			80' R	42 @	-	581' R	42	0
35K			50' R	42 @	-	615' R	42	+0
35L			40' R	42 @	-	707' R	42	0
36	RES	SR-1732	142' R	42 @	-	559' R	44	+2
37			110' R	42 @	-	687' R	42 @	0

DATE: 12-8-83

LEQ TRAFFIC NOISE EXPOSURES

SHEET 3 OF 8

PROJECT ID NO. & DESCRIPTION: I9AD E&E: I-40; ORANGE-DURHAM COUNTIES

TABLE 3d

ID NO. - I9AD & AE

BARRIER EFFECTIVENESS

DATE - 4-16-84

I-40 at

(Right Side)

RCVR. NO.	EXISTING NOISE LEVEL (DBA)	PREDICTED NOISE LEVELS (DBA)			PREDICTED NOISE LEVELS WITH BARRIER (DBA)			TOTAL	BARRIER EFFECTIVENESS
		-Y-LINE	-L-LINE I-40	TOTAL	INCREASE	-Y-LINE	-L-LINE I-40		
35A	42		46.1	46	+4		45.2	45	-1
35B			53.5	54	+12		51.2	51	-3
35C			58.6	59	+17		54.3	54	-5
35D			51.3	51	+9		49.7	50	-1
35E			52.5	53	+11		51.1	51	-2
35F			47.3	47	+5		46.1	46	-1
35G			46.7	47	+5		45.8	46	-1
35H			41.7	42*	0		40.8	42*	0
35I			40.4	42*	0		39.9	42*	0
35J			41.9	42*	0		41.7	42*	0
35K			41.1	42*	0		41.1	42*	0
35L			40.9	42*	0		40.9	42*	0

6. DNR DEFICIENCIES AND UNDERESTIMATES (58)

6A. THE TRAFFIC VOLUME IS HIGHER , AND MIX OF TRUCKS IS MORE UNFAVORABLE THAN ANTICIPATED IN DNR

The DNR states: "The maximum predicted future Leq noise levels were calculated at various distances from the centerline of the proposed eastbound...lanes using projected traffic volumes. These levels shown in Figure 2a and 2b were computed using design traffic volumes based on the year 2000 with 8% heavy trucks." [Ref. 9, p. 2] (Actuality, significantly lower noise levels were used by NCDOT as described below.) Figure 2a was based on a traffic volume of 23,800 ADT (Year 200), and Figure 2b on 20,200 ADT (Year 2000). [Ref. 9, Figures 2a, 2b]

The 1996 Average Daily Traffic (vehicles per day) on the section of I-40 was 42,800. [Ref. 19, Figure 4, Mainline Traffic Volumes] Thus the traffic volume was double what NCDOT should have anticipated. This would increase the DNR Design Year estimate by 3 dBA, [Ref. 34] From personal observation, the per cent heavy truck mix at peak noise hours is much higher than 8%. This would also result in an increase over the DNR estimate.

6B. DNR ESTIMATES OF GENERALIZED NOISE LEVELS WERE AN AVERAGE OF 8 DECIBELS (AND AS MUCH AS 13 DECIBELS) LOWER THAN "THE BEST" NCDOT ESTIMATES SUBMITTED TO LOCAL OFFICIALS FOR FUTURE PLANNING

23 CFR 772.15 Information for local officials [Ref. 14, p. 4] and Highway Traffic Noise Analysis and Abatement Policy and Guidance [Ref. 15, p.21], 1995 both state: "...highway agencies shall inform local officials...of the following:

"(a) The best estimate of future noise levels (for various distances from the highway improvement) for both developed and undeveloped lands or properties in the immediate vicinity of the project..."

The DNR stated on page 2, Generalized Future Traffic Noise Levels: "The maximum predicted future Leq noise levels were calculated at various distance from the centerline of the proposed eastbound...lanes of I-40 using projected traffic volumes. These levels shown in Figure 2a and 2b were computed using design traffic volumes based on the year 2000 with 8% trucks. This information is provided to assist local authorities...[Ref. 9, p. 2]

"The curve in figures 2a and 2b reflect the maximum noise levels of the two predicted traffic volumes assuming normal noise attenuation..." [Ref. 9, p. 3]

The estimates of noise levels on Figure 2a were higher than Figure 2b. The information in Figure 2a was "provided to assist local authorities in exercising land use control over the undeveloped land adjacent to the project under local jurisdiction to prevent future development of incompatible activities and land use. [Ref. 9, p. 2] It was important that this information be correct as possible, as there could be serious liability to the NCDOT for an erroneous estimation. It is reasonable to expect that these curves contain the most nearly correct noise impact estimates possible for , according to the NCDOT interpretation and use of the Federal computer programs. It will be assumed that information which differs is incorrect. The Figure states: "NOTE: This curve represents the predicted Leq traffic noise level, accounting for "ground-effect" attenuation, at the distances specified from the centerline of the near traffic lane based on design hour traffic volumes."

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The NCDOT's DNR Figure 2a estimates of future traffic noise levels were substantially reduced in its calculations of the noise impacts at . They are in disagreement with the correct curve by amounts varying from 2 to 13 dBA, all on the underestimation side. Granted that some discounting may have been appropriate before "The Change", it is respectfully suggested that the amounts of these reductions are unrealistic. They are certainly significantly below what the NCDOT provides for local officials.

RCVR. ID. NO.	MAX. NOISE LEVEL TABLE 1	MAX NOISE LEVEL FIG 2a	REDUCTION FROM FIG 2a
35A	46	52.5	-6.5
35B	54	58.8	-5
35C	59	60.8	-2
35D	51	55.8	-5
35E	53	57.6	-5
35F	47	54.4	-7
35G	47	57.0	-10
35H	42	53.8	-12
35I	42	51.7	-10
35J	42	55.1	-13
35K	42	54.4	-12
35L	42	52.4	-10
AVERAGE			-8

6C. DNR ESTIMATES THAT NO TRAFFIC NOISE WOULD BE GENERATED BEYOND 581 FEET WHILE 4 DECIBELS WOULD BE GENERATED 700 FEET FROM THE NEAR LANE WERE ERRONEOUS AND INCONSISTENT.

The DNR Table 1, Sheet 3 [Ref. 9] indicated there is no traffic noise impact to be expected at Apartments 35H through 35L, at distances varying from 581 feet to 735 feet from the nearest lane. The estimate derived from Figure 2a indicates that the correct figure would have varied between 52 and 55 dBA. The DNR figures were too low by from 10 to 13 dBA prior to "The Change".

The DNR stated: "The predicted noise levels are expected to range from 42 dBA to 59 dBA which represents noise increments of 0 dBA to 17 dBA." [Ref. 9, p. 6] An obvious error in the predicted noise levels was not corrected in the writing of the DNR.

The DNR stated on page 3, Generalized Future Traffic Noise Levels: "The curve in figures 2a and 2b reflect the maximum levels of the two projected traffic volumes assuming normal noise attenuation provided by ground cover...or other site conditions...In comparing the

(6)

081603NCDOTAccuracyAmbient+EstimatedNoiseLevels

August 17, 2003

To: Roger Waldon

From: Seymour Freed

Re: Accuracy of NCDOT Ambient, Estimated Noise Figures for I-40 Widening

Interstate 40 is currently in the first stage of a two-stage widening to six-lanes, from I-85 to NC 147 (Buck Dean Freeway). "The total project length is 21.4 miles... (and) a construction cost of \$86,700,000. (Categorical Exclusion, SUMMARY).

The Categorical Exclusion states, p. 32: "**Ambient Noise Levels...** Ambient noise measurements were taken in the vicinity of the project to determine the existing background noise levels. The purpose of this noise level information was to quantify the existing acoustic environment and to provide a base for assessing the impact of future noise levels from the project on the receptors in the vicinity of the project... The existing Leq noise levels along the roadway facilities in the project area as measured at 15 meters ranged from 79.0 to 81.6 dBA. The ambient noise measurement locations are presented in Table 10.

Table 10, Ambient Noise Levels indicates that NCDOT took only four (4) existing-noise measurements in the vicinity of I-40 (BEFORE) in the 21.4 mile project. Thus each noise reading in theory represents the ambient noise level along a stretch of just over five miles.

It appears that NCDOT has provided a grossly inadequate "base for assessing the impact of future noise levels." Ambient Noise Level Site 3 is located just east of Sunrise Road across from Chandler's Green and is listed at an ambient noise level of 80.2 dBA. NCDOT has apparently assumed that the ambient noise levels run in a straight line from approximately 79.6 dBA, 2 $\frac{1}{2}$ miles west of Site 3 to 80.8 dBA 2 $\frac{1}{2}$ east of Site 3.

The five-plus mile section straddling Chandler's Green includes cut, fill, horizontal and vertical curves, upgrades, downgrades, superelevations, acceleration and deceleration lanes, varying orientation of roadway relative to prevailing winds and receptors, hard ground and soft ground, hills and valleys, roads, bridges, fields and streams, forests, schools, skilled nursing homes, assisted-living facilities, churches, elderly residences, residences, and commercial sites. The NCDOT ambient noise levels ignore all these factors as they do not take the topography into account.

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The Federal Highway Administration's current publication: **Measurement of Highway-Related Noise** provides a uniform state-of-the-art reference for highway noise practitioners which addresses site selection for measuring existing noise in the vicinity of a highway. It states:

4. Existing-Noise Measurements in the Vicinity of Highways

This section describes recommended procedures for performing existing-noise measurements in the vicinity of highways. Existing-noise measurements include measurements made prior... to the expansion of an existing highway (BEFORE)... The difference in sound levels BEFORE a highway project is started and AFTER it is completed, combined with the overall level associated with the completed project, gives an indication of the expected noise impact...

4.1.1.1 Overall Sound Level Measurements

Land-use maps and field reconnaissance should be used to identify potential noise-sensitive areas. Schools, hospitals, and churches are especially sensitive to noise impacts... Noise-sensitive residential areas should also be included in a noise-impact assessment. When selecting potential representative sites for overall sound level measurements, keep in mind, that the site should exhibit typical conditions (e.g., ambient, roadway, and meteorological) for the entire community. It is recommended that good engineering judgment be used to select sites, keeping in mind the objectives of the study.

4.1.1.2 Change in Sound Level Measurements

For valid comparison of BEFORE and AFTER sound levels, equivalence in site geometry, meteorological and traffic conditions must be established. Equivalence in site geometry entails similar terrain characteristics and ground impedance with in angular sector of 120 degrees from all receivers looking towards the noise source.

... 4.1.2.2 Receiver

Sometimes a single, typical residential area near the existing... highway route can be used to represent other similar areas. If traffic conditions or topography vary greatly from one residential area to the next, receivers at many locations may be required.

Four noise measurements in 21.4 miles do not comply with the intent of the FHA recommendations.

NCDOT compared the existing roadway and traffic conditions with the STAMINA prediction model. The computer modeled existing noise levels averaged 1.5 dBA higher than the four readings. Since the noise modeling could account for factors not measured in the four readings (soft/hard ground, elevated and depressed roadway sections, and shielding from local terrain), it is possible if not probable, that the higher computer ambient noise readings may be more nearly correct.

Accuracy of NCDOT's Previous I-40 Noise Estimates

In 1984, NCDOT estimated I-40 future traffic noise levels for the year 2000 using the FHWA Highway Traffic Noise Prediction Model (STAMINA 1). This model which apparently tends to predict levels equal to or slightly higher than the measured (0 to about 2 dBA) when differences are averaged over several noise receptor sites. On sites which were measured by an acoustic consultant using

NCDOT approved equipment and methods, it was determined that all twelve (12) receptor sites studied were unrealistically underestimated by NCDOT by an average of 8.8 dBA! These grossly erroneous estimates were the basis for NCDOT's conclusion that: "for the benefits provided by (abatement) measures, as compared to the cost, construction of abatement barriers is not justified and no physical abatement measures are recommended." (Design Noise Report, p.9).

Receptor	Dist. From CL Near Lane (ft)	Ambient Noise Level dBA	NCDOT Year 2000 Estimate dBA	Consultant Measured Year 2000 dBA	NCDOT Under-Estimation dBA
35A (3)	700	42	46	53	7
35B (4)	430	42	54	59.6	5.6
35C (4)	360	42	59	61.0	2.0
35D (3)	557	42	51	56	5
35E (3)	478	42	53	58	5
35F (3)	620	42	47	57	10
35G (3)	501	42	47	58	11
35H (4)	646	42	42	54	12
35I (3)	735	42	42	52	10
35J (4)	581	42	42	56	14
35K (4)	615	42	42	54.5	12.5
35L (4)	707	42	42	53	11

Omission of Possibly Noise Impacted Receptors

The above listed noise sensitive receptors were not included by NCDOT in the current Categorical Exclusion, although eight should have been. Other receptors of equal or lesser distance from the roadway (with the exception of Receptors 35A, 35H, 35I, 35L) were included in the noise analysis. There are probably other receptors that should have been but have not been investigated, including those which had building permits, but had not been constructed at the time of the NCDOT aerial photos.

NCDOT's I-40 noise estimates have been consistent. Despite gross inaccuracies, they always conclude: "Based on the studies completed to this date, it is unlikely that the NCDOT will install noise abatement measures... along I-40." (Categorical Exclusion, p.38).



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FHWA Noise Prediction Model

All traffic noise calculations in the Appalachian corridor H noise study were performed using FHWA and WVDOH approved models and methodology.

For most of the locations in the study area, traffic noise predictions were performed using the FHWA approved STAMINA 2.0 highway noise prediction modes, derived from the FHWA Highway Traffic noise Prediction Model (FHWA-FD-77-108.) The noise modeling accounted for such factors as soft/hard ground, elevated and depressed roadway sections, shielding from local terrain, traffic speed and hourly traffic volumes, including percentages of automobiles, medium trucks and heavy trucks.

The STAMINA 2.0 highway noise prediction model has been in use throughout the United States and Canada for many years and has been found to be quite accurate. When compared with actual measured noise levels, the model tend to predict levels equal to or slightly higher than the measured (0 to about 2 dB) when differences are averaged over several noise receptor sites.

In 1998, the FHWA released its new generation of highway traffic noise prediction modeling called the Traffic Noise Model or TNM. TNM is entirely new, state-of-the-art, computer program that uses advances in personal computer hardware and software to improve upon the accuracy and modeling of traffic-generated highway noises. TNM is designed to eventually replace the FHWA's prior pair of computer programs, STAMINA 2.0/OPTIMA. TNM has the ability to model both constant and interrupted traffic flows. It can also account for the effect of roadway grades on vehicle acceleration and the deceleration of heavy trucks on highway upgrades. TNM takes into account such factors as atmospheric absorption, sound divergence, acoustical characteristics, the type and topography of the intervening ground, rows of buildings and areas of vegetation when modeling.

The TNM 1.0a has also been used to model the effects of traffic noise from the proposed Appalachian Corridor H highway system. The avoidance alternative for the Middle South Bend Valley Rural Historic District and U.S. Route 220 within the historic district were both examined using the TNM 1.0a computer program.

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West Virginia Department
of Transportation

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noise, compatibility criteria, and abatement strategies.

NOISE ELEMENT GOALS AND POLICIES

Adopted December 16, 1997

GOAL N.1

Protect and maintain those areas having acceptable noise environments, and provide for the reduction of noise where the noise environment is unacceptable.

POLICY N.1

It is the policy of the City of Santa Maria to establish and support a coordinated program to protect and improve the noise environment in the city.

GOAL N.2

Protect the health and welfare of the Santa Maria area through the identification and control of noise pollution.

POLICY N.2.a

It is the policy of the city to protect noise sensitive land uses from the impacts of noise generating activities through attenuation or buffering, to "isolate" noise generating activities from the intrusion of noise sensitive uses, and guard against the deterioration of the situation where conflict (between noise-generating and noise sensitive uses) presently exist.

POLICY N.2.b

Future development with the designated 60 dB CNEL or greater shall be evaluated on a project-by-project basis. When acoustical analysis is required, the report shall be prepared by a qualified acoustical engineer with experience in environmental noise assessment and noise control design.

1. Proposed residential developments in the Noise Impact Zone of the projected CNEL contour map are required to provide land use plan showing that outdoor living areas have been reduced to a 60 dB CNEL or less. Acoustical analysis should indicate the use of a noise barrier, site design, grading and/or earth fills, etc., as required to meet this land use criteria. This analysis shall be provided by the applicant.
2. Proposed residential development within the 60 dB CNEL or greater contour of the projected CNEL contour map are required to provide a plan and supporting acoustical analysis to show that interior habitable rooms will not exceed a CNEL of 45 dB. This analysis shall be provided by the applicant.

LAND USE PLANNING

The City of Santa Maria can achieve a **noise compatible** environment through comprehensive land use planning. Proposed development should be evaluated in terms of the projected impact from future noise sources and the application

081803noisecompatible

To: Roger Waldon

From: Seymour Freed

Re: Noise Compatible Land Use

The enclosed documents are related to the need for local governments to practice noise compatible land use:

1. Memorandum from USDOT, FHA, Director, Office of Natural and Human Environment to Division Engineers, dated September 26, 2002 stating:

“... Local governments should practice noise compatible land use planning along highways so that traffic noise impacts are either minimized or avoided completely.

“Attached.. are copies of a brochure describing noise compatible land use planning entitled, ‘Entering the Quiet Zone: Noise Compatible Land Use Planning.’”

2. Brochure described above. It is an attempt to get local planning agencies to “encourage a proactive posture by local decision makers.”

“A good first step when beginning this process is to identify land uses that are well suited for areas adjoining highways... shopping malls or office space, for instance, are good choices...”

“Local governments can use the following approaches to encourage noise compatible land use planning in their communities:

- Planning, zoning, or other legal means (such as subdivision or development standards, building codes, health codes, or occupancy permits).
- Acoustical site planning, architectural design, or acoustic construction.

These construction-related techniques address where structures are located, how structures are designed, and what types of materials are used in the structures.”

“What Are the Costs of Noise Compatible Land Use Planning?”

- Local governments may need to fund administrative costs for including noise compatible land use standards in their guidelines and ordinances.
- Developers may bear a cost for design alternatives that result in fewer homes (or the same number of homes if denser development is allowed).
- Developers may incur costs for using different materials in construction that are more sound-absorbent than traditional materials.”

“What Can You Do? The Charge to begin

“An essential element for noise compatible land use planning is a local government or developer that is interested in new options for community planning and design. There must be an understanding of the “big picture” and a

willingness to plan ahead to successfully implement this approach to noise reduction.

"FHWA hopes that this brochure provides a first-step toward using noise compatible land planning. We want you to spread the word that you can abate noise without totally enclosing your communities within barriers..."

"Planners, elected officials, developers and community residents have choices."

3. Chapel Hill Noise Ordinance

"Maximum Sound Level Limitations at the Property Boundary

Primary Use Category	Daytime	Nighttime
Residential	50	45

4. Highway Traffic Noise in the U.S., April 2000, U.S. DOT, FHA

"Highway Project Noise Mitigation

"The FHWA regulations for mitigation of highway traffic noise in the planning and design of federally aided highways are contained in Title 23 of the US CFR Part 772. The regs. require... 3) **coordination with local officials** to provide helpful information on compatible land use planning and control. The regs. Contain certain noise abatement criteria which represent the upper limit of acceptable highway traffic noise for different types of land uses and human activities..."

5. Highway Traffic Noise and Abatement, June 1995, U.S. DOT, FHA

I. LEGISLATION

"Effective control of the undesirable effects of highway noise requires that (3) mitigation of noise be undertaken on individual highway projects.

"... (this) component is a joint responsibility of private industry and of Federal, State, and local governments.

A. Land Use Planning and Control

"... The FHWA and other Federal agencies encourage State and local governments to practice land use planning and control in the vicinity of highways. The FHWA advocates that local governments use their power to practice land use planning in the vicinity of highways. The FHWA advocates that local governments use their power to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or the developments are planned, designed, and constructed in such a way that noise impacts are minimized."



Environment

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FHWA > HEP > Environment > Noise > Products



U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION:** Highway Traffic Noise -
Entering the Quiet Zone: Noise Compatible Land
Use Planning Brochure

Date: September 26, 2002

From: James M. Shrouds
Director, Office of Natural and Human Environment

Reply to
Attn. of: HEPN-20

To: Division Administrators
Federal Lands Highway Division Engineers

Traffic noise can be a problem near new or existing highways; responsibility for addressing this problem should be shared. Federal and State governments provide reasonable and feasible abatement measures as a part of Federal-aid highway projects. Local governments should practice noise compatible land use planning along highways so that traffic noise impacts are either minimized or avoided completely.

Attached for your information and use are copies of a brochure describing noise compatible land use planning entitled, "Entering the Quiet Zone: Noise Compatible Land Use Planning." The brochure illustrates the different aspects of noise compatible land use planning and was produced by the Texas Southern University's Center for Transportation Training and Research, in support of the FHWA. It is intended to provide useful information to local officials, developers, and the general public about the problem of highway traffic noise and effective responses to that problem. Sufficient copies have been provided for you to retain 50 copies and to forward 50 copies to your State DOT.

The brochure covers the following topics:

- What is noise compatible land use planning?
- What are the benefits of it?
- What are the costs of it?
- Has it been used successfully?
- Why use it now?

- What types of land uses have worked? ⁶⁸
- What can you do?

If you have any questions concerning the brochure, you may contact Bob Armstrong at (202) 366-2073 or Steve Ronning at (202) 366-2078, respectively.

Attachment

cc: Directors of Field Services

(UPDATE OF 3/15/02: Please contact Bob Armstrong at (202) 366-2073)

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United States Department of Transportation - Federal Highway Administration