Noise Barriers and the Community Involvement Process

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In this paper, the community involvement process used in the New Jersey Department of Transportation (NJDOT) noise program is examined. The procedure for carrying out the community involvement process is discussed, and the results of a case study project are presented. On those highway projects for which construction of noise abatement devices is recommended, NJDOT requires the approval of the mayor and council of the municipality in which the abatement will be built before construction may begin. The mayor and council also have the power to oppose the recommended noise abatement, in which case the noise mitigation structures will not be constructed. The decision of the mayor and council is obtained through the NJDOT community involvement process, which includes meetings with the mayor and council as well as public information centers for the affected residents. NJDOT has found this method to be successful and will continue its use on future projects for which noise abatement is an issue.

The New Jersey Department of Transportation (NJDOT) conducts noise studies on both new alignment projects and improvement projects (e.g., widening, vertical or horizontal alignment changes, safety upgrades, or resurfacing). If noise impacts are identified, mitigation measures are investigated for feasibility and effectiveness in addressing the noise abatement provisions of FHWA's *Federal Highway Program Manual,* Volume 7, Chapter 7, Section 3 (or FHPM 7-7-3) (*1*). On projects for which noise abatement has been recommended, NJDOT requires the approval of the mayor and council of the municipality in which the abatement structure will be built before construction may begin. The mayor and council also have the power to oppose the recommended noise abatement, in which case the noise mitigation structures will not be constructed. The decision of the mayor and council is obtained through the NJDOT community involvement process, which includes meetings with the mayor and council and conferences called "public information centers" for the affected residents.

In the first part of this paper, a detailed discussion of the steps of the NJDOT community involvement process is provided. This is followed by a case study of a construction project in which the NJDOT community involvement process played a major role in the outcome of noise abatement construction.

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NJDOT COMMUNITY INVOLVEMENT PROCESS STUDY METHOD

The NJDOT community involvement process for noise studies consists of four basic steps:

1. The noise study is conducted.
2. The meeting with the mayor and council is held.
3. The public information center is held.
4. The noise study is completed.

It is important that each of these four steps be included in the process to ensure that all of the involved individuals are properly informed of NJDOT's recommendations and that the correct procedure is followed for incorporating any changes to the recommendation as a result of public opinion.

Noise Study Conducted

Before the completion of the environmental document (Environmental Assessment, EA, or Environmental Impact Statement, EIS), a Technical Environmental Noise Study (TES) of the project area is conducted to identify existing and predicted noise impacts and preliminary areas for noise abatement. While the predicted noise impacts are being determined, all roadway design alternatives are considered, along with the "no-build" or "do-nothing" case (*2*). The criteria used to gauge the effect of the traffic-generated noise levels on the study area are the Noise Abatement Criteria (NAC) given in the *Federal Highway Program Manual* (FHPM). According to the guidance available from the FHWA New Jersey Divisional Office, a project is defined as having noise impacts should either of the following conditions occur:

- Predicted L_{eq} noise levels approach or exceed the NAC given in Table 1. According to the New Jersey FHWA District Office, a 3-dBA change in noise levels is the threshold of perception. Therefore noise levels that approach the criteria are defined as occurring at 3 dBA less than these criteria (*2*).
- A substantial increase in predicted noise levels over existing noise levels occurs, even though the impact criteria level is not reached. This increase is considered to be 10 dBA or greater, which is roughly a doubling or more of the perceived noise levels. Increases in noise levels that approach 10 dBA may be evaluated and discussed as circumstances dictate (*2*).

When estimated noise levels are projected to approach or exceed the NAC, or when there are substantial increases in predicted noise levels over existing noise levels, an evaluation

TABLE 1 NOISE ABATEMENT CRITERIA (*1*)

Activity Category	Noise Abatement Criteria (dBA) L_{10}	L_{eq}	Description of Activity Category
A (Exterior)	60	57	Tracts of land for 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. Such areas could include amphitheaters, particular parks, or portions of parks, open spaces, or historic districts that are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B (Exterior)	70	67	Picnic areas, recreation areas, playgrounds, active sports areas, and parks that are not included in Category A, and residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.
C (Exterior)	75	72	Developed lands, properties, or activities not included in Category A or B above.
D	–	–	For requirements on undeveloped lands, see paragraphs 11*a* and *c* of *Federal Aid Highway Program Manual*, Volume 7, Chapter 7, Section 3.
E (Interior)	55	52	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

of noise mitigation measures is made to address the noise abatement provisions of FHPM 7-7-3 (*2*). Calculations to determine impacts are performed with the FHWA Noise Model (*3*) and the noise barrier cost reduction procedure STAMINA 2.0/OPTIMA (*4*).

After the approval of the EA or EIS, a Final Noise Study (FNS) is conducted to finalize the number of noise impacts for the chosen roadway design alternative and determine details of noise barrier design, such as lengths, heights, and location, and the number of noise impacts mitigated. NJDOT considers three factors in justifying the recommendation and construction of noise abatement: adequate attenuation, engineering and design feasibility, and cost effectiveness (*2*). These three factors are considered as follows:

- *Does the mitigation measure provide adequate attenuation?* NJDOT's initial goal in designing a barrier is to reduce the noise by at least 10 dBA, which will be perceived as a halving of the noise level. However, the 10-dBA goal is not an absolute value, and reductions that approach or exceed 10 dBA will be considered on the basis of the barrier's cost effectiveness.
- *Is the mitigation measure feasible from an engineering and design standpoint?* Physical features of the project area are studied to determine what types of mitigation devices, if any, may be constructed. For example, if available state-owned right-of-way (ROW) is limited, construction of an earthen berm may not be possible without extensive easements or parcel purchases. Therefore a freestanding noise barrier may be the only option for abatement. Other points to consider include topography, access areas to the roadway, and utilities.
- *Is the mitigation measure cost effective for the number of impacts mitigated?* NJDOT determines cost effectiveness on a case by case basis by comparing the "cost per residence mitigated" figures of all mitigation measures on a single project. There are no established state or federal standards for this figure. If abatement is recommended on a particular project for only one area, cost figures are compared to a similar project to determine cost effectiveness.

If the noise mitigation measure meets all three criteria, then it is recommended for construction. NJDOT's Bureau of Environmental Analysis coordinates with the bureaus of Landscape, Design, and Structures to decide on a barrier material and any aesthetic finishes to the barrier faces. NJDOT generally selects either concrete or wood for the noise barriers on the basis of the nature of the surrounding area (urban, suburban, or rural), favorable past experiences with construction ease, and public responses to barriers that have already been constructed. Before construction and preferably before final design, however, NJDOT requires approval from the municipality in which the abatement is to be constructed. This leads to direct involvement with the community.

Meeting with Mayor and Council

Representatives from NJDOT meet with the local mayors and councils of the municipalities for which the noise abatement is recommended. The purpose of this meeting is to present the recommended noise abatement to the mayor and council and request any necessary easements. The mayor and council are also informed of the date that the public information center meeting will be held. NJDOT then requests a resolution that states whether the mayor and council are in favor of or opposed to the recommended noise abatement scheme. Receipt of the resolution is requested in 30 days' time from the date of the public information center.

It is recommended that the borough or township engineer review NJDOT's recommendation for abatement. As a result, the mayor and council will occasionally ask for specific changes to the noise abatement presented by NJDOT, such as barrier alignment shifts or additional landscaping. NJDOT

always considers the input from the mayor and council and makes every effort to incorporate these changes into the project, if they are feasible and requested for valid reasons.

Public Information Center

After the meeting with the mayor and council, NJDOT representatives hold a public information center at a convenient local site within or near the borough. The residents who will be affected by the recommended noise abatement are invited to attend. The purpose of this meeting is to inform the residents of NJDOT's proposal for noise mitigation measures. General location and abatement specifics are presented, followed by a question-and-answer session. It is suggested that the residents contact their mayor and council to voice their concerns about and opinions of the noise abatement.

The NJDOT representatives informally present the recommended abatement scheme, using project displays and aerial photography. The locations of the noise abatement are noted, along with the noise level contours for the "existing," "predicted," and "predicted-with-abatement" conditions. The existing noise levels are determined by random monitoring of Category A or B areas near the project corridor (see Table 1). The predicted and predicted-with-abatement noise levels are calculated for a design year of the roadway roughly 20 years after the outset of the project. These predicted values are determined by using the STAMINA 2.0/OPTIMA computer models (*4*) and future traffic projections.

Photomontages or artist's renderings are also used to give the homeowners an idea of the appearance of the abatement measure after it has been constructed. The perspective used on the montages and renderings is usually from the resident's viewpoint; that is, the view is from the yard of a home that has been predicted to have a future noise impact, looking toward the roadway. It is useful to provide before and after montages or renderings to help the residents visualize the noise abatement and the effects that it may have on their property. If possible, samples of the barrier material are also provided, complete with color and aesthetic treatment.

NJDOT has produced an educational videotape, "A Community Primer," that is shown at the public information center. The videotape explains the basic concept of decibels and shows existing noise barriers throughout the state of New Jersey. After the community members have seen the primer, a videotape of the project area is shown that contains footage of noise-sensitive areas for which abatement has been recommended. Noise levels of the existing, predicted, and predicted-with-abatement conditions are dubbed in and played for the residents so that they can hear what the difference will be in their noise environment as a result of the construction project.

Finally, taped testimony of individual residents' opinions on the recommended abatement is taken, if this material has been requested by the municipal mayor and council. This tape is then submitted to the mayor and council to help them in their decisions on the resolution of the noise abatement issue.

Noise Study Completed

After public opinions have been heard and any requested changes to the noise abatement are studied, NJDOT receives the resolution from the mayor and council. If the resolution is in favor of the recommended abatement, then final design will proceed, followed by eventual construction. The NJDOT noise report is finalized by stating that noise abatement will be constructed as presented in the report because the municipality passed a resolution declaring approval of the abatement as a result of the community involvement process.

If the resolution is in opposition to NJDOT's recommendation, then this opposition is incorporated into the noise report by discussing the community involvement process and the steps that led to the rejection of the abatement by the community. It is also stated that although noise abatement measures were warranted and offered by NJDOT, they will not be constructed, in accordance with the resolution passed by the municipality, who opposed the abatement through the community involvement process. The finalized noise study report is then submitted to FHWA for their concurrence (*2*).

After FHWA issues approval, the noise study is also given to the local governments and planning agencies for their review. Local governments, as well as local and regional planning boards, may be interested in the effect of traffic noise and may use the information provided in the noise study report to help establish ordinances and zoning and to implement planning so that the community as a whole could benefit by a quieter environment.

CASE STUDY: NJ-17, BERGEN COUNTY, NEW JERSEY

Project Description

Description of the Proposed Action

New Jersey Route 17 is located within the New Jersey portion of the Metropolitan Area of Greater New York and functions as a major through route between the highly populated northeast region of New Jersey and New York State (Figure 1). NJ-17, for most of its length, also functions as an urban arterial roadway, carrying local traffic that is heading toward the commercial strip located along most of the highway's length. NJ-17 also functions as a secondary Central Business District for many of the towns through which it passes.

The Route 17 Widening Project involved the improvement and upgrading of 7.4 mi of the roadway. The project limits extended from south of Linwood Avenue, in Ridgewood, to the Franklin Turnpike, in Ramsey. Between these limits, the project also crossed portions of the municipalities of Ho-Ho-Kus, Waldwick, Saddle River, Allendale, and Upper Saddle River (Figure 2). As a result of the environmental studies and the community involvement process, nine noise barriers were constructed to mitigate noise impacts on the residential areas through which NJ-17 passes.

Project Need

The Route 17 Widening Project had been developed in response to the increase in traffic volumes and accident rates in Bergen County within the previous decade. For example, the average daily traffic (ADT) for NJ-17 in 1971 was 49,848; it increased to 60,524 in 1981. NJDOT technical studies have shown that NJ-17 operates at levels of service D and E.

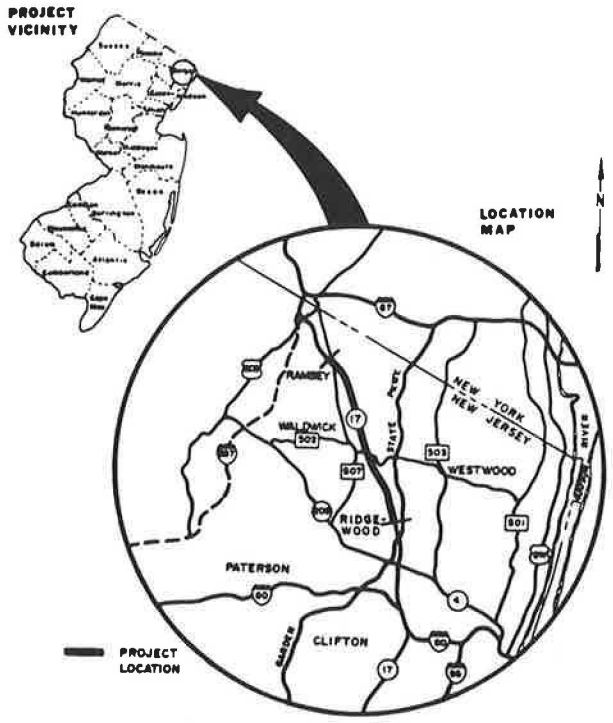

FIGURE 1 NJ-17 project vicinity and location map.

The accident rate increased from 3.46 per million vehicle miles in 1971 to 3.81 in 1981. In 1982, the total number of accidents was 557, with 311 people injured and 5 fatalities on this section of NJ-17. In 1983 there were also 5 fatalities. For 1983, 12.5 percent of the fatal accidents in Bergen County occurred on this route. In March 1983, the Center for Auto Safety included NJ-17 on the list of the 10 most dangerous roads in the United States.

Except for the construction of grade-separated interchanges, major improvements to the roadway have not occurred since the mid-1950s, when the highway was dualized. Safety improvements were needed, especially in the center median, where crossover accidents had occurred (3 percent of the total accidents). A permanent center concrete median barrier curb was required as a safety measure to prevent this type of accident. Resurfacing was also necessary because of the deterioration of parts of the roadway.

NJDOT had also received a large amount of correspondence from local residents and municipalities, expressing concern about the existing conditions on NJ-17 and showing support for the proposed improvements. Comments included opposition to the acquisition of private land for the project, support for mitigation of possible noise impacts with noise barriers, and concern for safety problems because of the lack of a center median barrier curb (*5*).

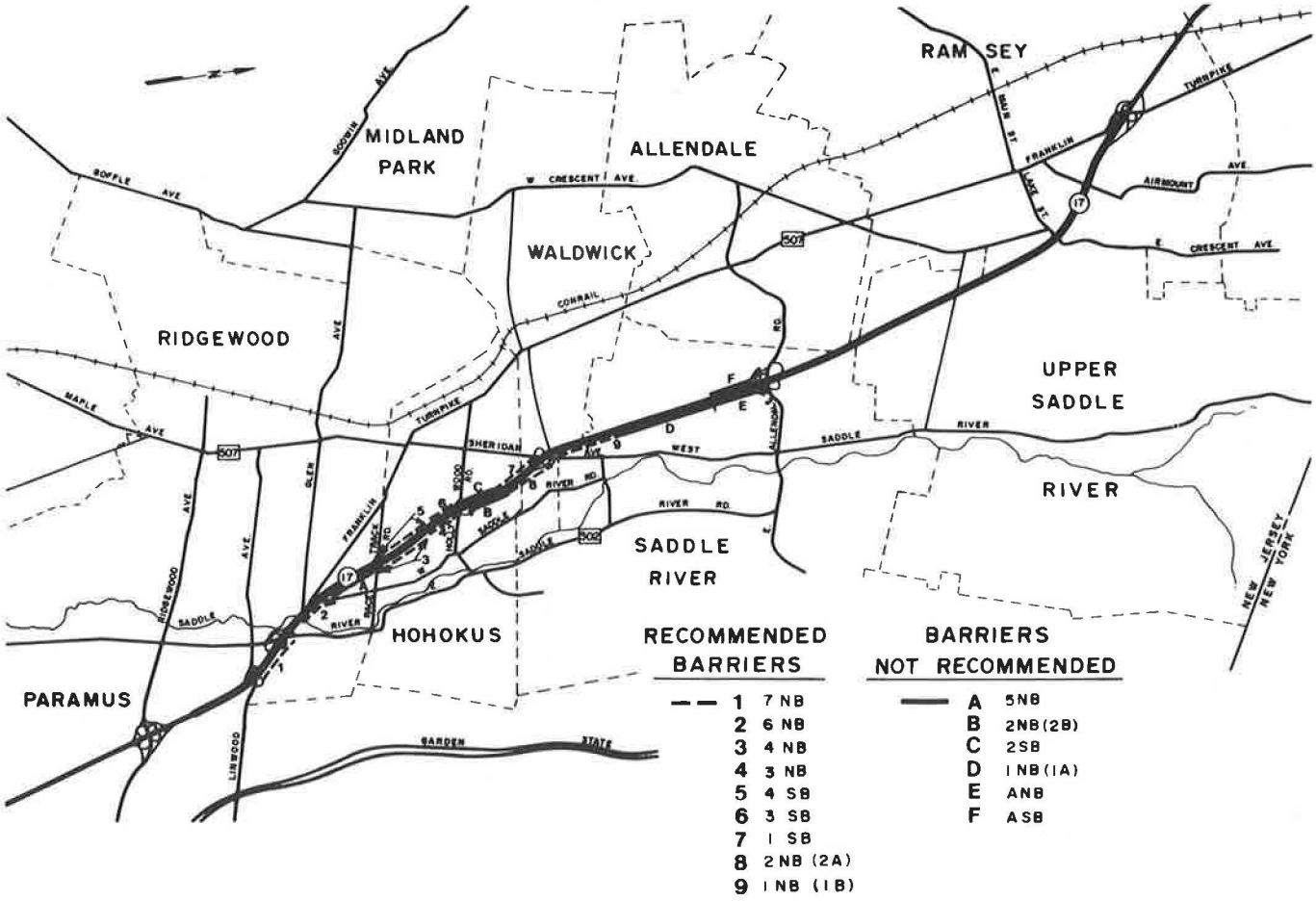

FIGURE 2 Project limits and barrier locations.

Alternatives Considered

NJDOT considered various alternatives to improve the NJ-17 roadway. These alternatives were developed in an attempt to minimize the environmental impact on the local residents and businesses, to minimize the ROW acquisition that would be required because the corridor is heavily developed, and to improve safety for the motoring public. Alternatives considered included widening and safety improvements (the chosen alternative), mass transit, and no-build.

Widening and Safety Improvements (Build Alternative) This alternative was chosen because it met transportation objectives established for the NJ-17 corridor, including increased safety for motorists as well as pedestrians, relief of extreme congestion on NJ-17 and connecting arteries, repair of severely deteriorated sections of the roadway, and lessened environmental impacts, such as air and noise pollution. Along with the build improvements, transportation system management improvements will also be enacted, as discussed next.

Mass Transit The existing mass transit system in Bergen County consists of bus and rail facilities. The mass transit alternative alone is not a practical solution to the problems of NJ-17 because the route is a land service roadway that primarily functions as a means of access to local commercial establishments from local residential areas. Congestion will not be alleviated by mass transit improvements alone. The most reasonable solution is to combine the widening and safety improvements of this project with improvements to the mass transit system and encouragement of ridesharing.

No-Build The no-build alternative was rejected because of the necessity of the improvements on NJ-17. The objectives of improving traffic flow and safety would not be realized without changes. The problems associated with the roadway would continue, and the safety of the motoring public would deteriorate. Selection of the no-build alternative could also eventually have had a negative effect on the economy of the area because as congestion increased, customers would have avoided commercial establishments located on NJ-17.

Noise Abatement Summary

The Route 17 Widening Project in Bergen County, New Jersey, crosses residential portions of four municipalities, namely

- Borough of Ridgewood,
- Borough of Ho-Ho-Kus,
- Borough of Waldwick, and
- Borough of Saddle River.

The portions of other municipalities through which the NJ-17 contract passes are primarily commercial areas adjacent to the highway.

A noise study was conducted for the project area to identify the number of noise impacts for the existing, predicted, and predicted-with-abatement conditions. Within the four municipalities mentioned, the number of receptors predicted to have noise impacts is 357. As a result of the noise study, NJDOT recommended the construction of 11 noise barriers, totaling 2.9 mi in length, to mitigate the noise impact at 283 of these receptors. However, the community involvement process resulted in the approval for construction of only nine noise barriers, with a total length of 2.1 mi. Therefore the total number of impacts mitigated will be reduced by 108, for a total of 175 (Tables 2 and 3).

TABLE 2 PREDICTED NOISE IMPACTS ALONG THE NJ-17 WIDENING PROJECT (DESIGN YEAR 2004)(*6, 7*)

Municipality	Predicted	Predicted, with Recommended Abatement	Predicted, with Constructed Abatement
Ridgewood	79	40	50
Ho-Ho-Kus	116	5	5
Waldwick	137	5	102
Saddle River	25	24	25
Total impacts	357	74	182
Impacts mitigated	n/a	283	175

TABLE 3 RECOMMENDED AND CONSTRUCTED NOISE BARRIERS ALONG THE NJ-17 WIDENING PROJECT (*6, 7*)

	Recommended		Constructed	
Municipality	Abatement (Barriers)	Impacts Mitigated	Abatement (Barriers)	Impacts Mitigated
Ridgewood	2	39	2	29[a]
Ho-Ho-Kus	5	111	5	111
Waldwick	4	132	2	35
Saddle River	0	1	0	0

[a]The reduction in impacts mitigated is due to the shortening of one barrier by 600 ft in length.

The existing noise levels along the project corridor range from 59 to 77 dBA L_{eq}. The predicted levels were only slightly higher, ranging from 63 to 77 dBA after the additional lane was constructed. The average insertion loss of the barriers is 10 dBA, which is the "goal noise reduction" for noise barriers in New Jersey. As determined from the accepted bid prices, the noise barriers that were constructed cost approximately $2.8 million in 1985 dollars (*5, 6*). The following material provides profiles of the individual municipalities and descriptions of how the community involvement process affected the outcome of the construction of noise abatement.

Residential Municipalities: Profiles and Results

Borough of Ridgewood

The first residential municipality through which NJ-17 passes is the established upper–middle class Borough of Ridgewood. In this location, 79 residential noise impacts were identified. The residents and borough council were receptive to the construction of barriers, and the council voted favorably on the barriers recommended by NJDOT. The result was the construction of two noise barriers to mitigate 29 noise impacts.

For the most part, the community was in favor of the barriers. However, one of the barriers was shortened by 600 linear feet because of residential opposition. The noise levels at the 10 homes protected by this 600-ft section of barrier were projected to approach the NAC, and the residents felt that the

noise would not be enough of a problem to warrant the construction of the entire barrier. The barrier ended in the middle of a bermed area, and the end of the barrier was gradually stepped down to avoid an abrupt appearance.

The barriers were constructed in a post and panel style, with 8-in. concrete stacked panels. The concrete is tinted a blend of Sequoia Sand and Salmon, and both sides of the barriers have a Midland Staggered form-lined aesthetic treatment. While the barriers were under construction, every effort was made to preserve the existing mature vegetation on the residential side. Because of these efforts, the tinted barrier blends well with the surroundings. The barriers in Ridgewood range in height from 14 to 16 ft and have a total length of 0.4 mi.

Borough of Ho-Ho-Kus

The Borough of Ho-Ho-Kus, like Ridgewood, is an established middle-class community. In Ho-Ho-Kus, 116 residential impacts were identified.

The Ho-Ho-Kus residents were the first to request construction of noise barriers on a land service road in New Jersey. One very concerned resident educated himself on state and federal noise policies and then organized a community coalition to support the installation of noise barriers. After numerous noise complaints, many meetings, and reams of correspondence, the coordination between the community and NJDOT resulted in the construction of five noise barriers to mitigate 111 residential noise impacts. The community was overwhelmingly in favor of the barrier recommendation. They also wanted an additional barrier to be constructed in an area that had been studied, but the barrier had already been deemed not cost effective by NJDOT.

Again, existing mature vegetation was preserved on the residential side of the barrier, and the barriers blend well with the environment. The five barriers constructed in Ho-Ho-Kus range in height from 12 to 18 ft and have a total length of 1.3 mi. The Ho-Ho-Kus barriers created a parallel situation and were tilted 6 degrees away from the highway to reduce multiple noise reflections, which might have degraded the barriers' attenuating performance.

Borough of Waldwick

The Borough of Waldwick is also an upper–middle class community of established homes. Waldwick is unique in that its homes are the closest to the NJ-17 alignment in the entire project. Many are within 30 ft of the closest traveled lane. As a result, the existing noise levels measured at the homes in Waldwick are the highest in the project: noise levels as high as 77 dBA L_{eq} were measured.

On the northbound side of NJ-17 as it passes through Waldwick, all of the side streets have been closed to access to and from NJ-17. On the opposite, southbound side, the streets remain open to NJ-17 access.

In Waldwick, 137 noise impacts were identified. NJDOT's original barrier recommendation did not include abatement for the residences on the southbound side of the highway because the side streets retained access. The mayor and council requested that a barrier be studied for this side of NJ-17 and that if it were found feasible, they would close the side streets off to allow the barrier to be continuous.

NJDOT deemed an additional barrier feasible on the southbound side and recommended it for construction. However, after numerous meetings with the mayor, council, and residents, the two barriers that had been recommended for both sides of the highway were rejected for a number of reasons, including the following:

- The barriers would cause unmanageable traffic patterns on the local roads.
- The resulting traffic patterns would, in turn, cause a safety problem for pedestrians.
- If a single barrier were constructed, perceivable levels of noise would reflect off the barrier to the residences on the other side of the highway, making an already unfavorable noise environment much worse.

NJDOT had recommended four noise barriers to mitigate 132 impacts, but as a result of the community involvement process, only two barriers were constructed to mitigate 35 residential impacts.

As in the other municipalities, mature vegetation was restored on the residential side of the barrier to blend the barrier in with the surrounding area. The two barriers built in Waldwick range in height from 12 to 18 ft and have a total length of 0.4 mi. They are also parallel and so were tilted 6 degrees to reduce noise reflections. The barriers rejected by the borough council would have totaled 0.8 mi along the most densely populated area of the project.

Borough of Saddle River

The Borough of Saddle River is a growing, elite upper-class community with specific designs for future development. The borough has 2-acre zoning for single family residences.

In Saddle River, only 25 residential noise impacts were identified, all of which would have had noise levels approaching the NAC. This total included vacant lots that already had approved building permits for homes. The homes are located, on the average, 200 ft from the traveled way.

No noise barriers were recommended by NJDOT because these abatements would not be cost effective if the number of impacts that would be mitigated by the barrier were considered. An effective noise barrier would have to be ~0.9 mi long to mitigate 19 impacts. In comparison with the other abatements constructed on the project, the Saddle River noise abatement was unreasonably expensive and therefore not recommended.

The residents of Saddle River are strongly in favor of noise abatement, and they formed a community coalition for the construction of barriers. After numerous meetings and correspondence, the coalition sued the state of New Jersey in an attempt to direct the state to build their barriers. The suit was dismissed on premature grounds. At the time of writing, settlement was in progress, including discussions on alternatives. One possibility was a berm/wall proposal that had originally been rejected by the residents but was now being reconsidered.

CONCLUSIONS

The community involvement process has proved to be a valuable decision-making tool in the noise abatement process in New Jersey. Because the municipalities have the chance to voice the concerns of the public and because NJDOT considers their input, the final noise barriers may be more satisfactory to those who live in the area. Also, if the noise abatement recommended by NJDOT is rejected by the municipality, money is saved for the state and federal governments, and the municipality is saved from being burdened with a structure that is not favored by its residents. By dealing with the local municipal governments instead of directly with each affected resident, NJDOT receives organized input from the public in less time than a survey of the entire population would take. This time savings allows room in the project schedule for minor design or landscaping changes as a result of public opinion. NJDOT will continue to use the community involvement process on all projects for which noise abatement is recommended.

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