



September 7, 2001

MEMORANDUM

TO: Montgomery County Planning Board

VIA: Jeffrey Zyontz, Chief
County-wide Planning Division

Jorge Valladares, P.E., Chief
Environmental Planning

FROM: Stephen D. Federline, Supervisor
Environmental Planning

SUBJECT: Staff Recommendations on Proposed County Highway Noise
Abatement Policy

Recommendations

Staff recommends approval of the County's Draft Highway Noise Abatement Policy with amendments which address the following comments:

1. The County Noise Policy is intended to be a flexible or *living* document which has as its ultimate objective the construction of noise barriers where needed which are technically effective, cost efficient, and supported by the affected community. If adjustments and amendments to the policy are needed to better facilitate implementation, all proposed changes should be referred to MNCPPC for review and comment.
2. All costs under \$50,000 per benefited residence should be paid by the county as part of their primary responsibility for mitigating impacts of operations on county roadways. However, if the Executive determines that additional funding by benefited residences is essential to the success of the program, the cost sharing should be applied on an affected community-wide basis and exclude any cost sharing based on date of home purchase. Any cost sharing should be based on the date of home construction per SHA procedures.
3. The policy should consider alternatives, which would allow construction of the full or partial barrier in situations where the unanimous dedication of needed land by all affected homeowners has not occurred.
4. Funding priorities which favor residences and sensitive non-residential land uses over active recreational areas are acceptable. However, the case may be made that certain active recreational areas may also include teaching activities (e.g., Blair High School fields), which would be noise-sensitive.

5. Funding for noise abatement associated with new construction or expansion projects shall be provided as part of the CIP project separate from the countywide funding pool and prioritization ratings. The noise analysis, noise standard, and funding ceiling of \$50,000 per benefited residence should remain consistent throughout the county.
6. The policy's strong position in support of the staff's noise compatibility effort, and acknowledgement of its significant role as part of the overall County program of noise compatibility are recognized.

Introduction

This proposed noise policy is intended to supplement the existing State Highway Administration (SHA) noise abatement policy and procedures, and be applied to all roads built and maintained by Montgomery County, except freeways. It provides an overall guiding policy and technical framework for action on roadway noise abatement, with specifics as to when, how, and who should pay for noise abatement projects along highways. It is intended to provide fair and equitable noise protection across the board to county residents based principally on the level of noise impact. The policy is to be a *living document* that can be easily amended and adjusted as unforeseen issues arise in its implementation. Based on a nationwide internet search, this policy plows new ground for a local transportation agency, which often depend on state and federal agencies for noise barrier implementation, which are built using at least 80% federal funding.

The policy does draw significantly in its recommendations on SHA's experience in implementing the SHA policy. However, the county policy does vary in some significant ways from the SHA policy, and those significant variations are highlighted in the summary table (circle pages 7 - 9). Each significant policy issue contains a staff recommendation to the Board. In addition, there are dozens of technical and implementation questions that have arisen in the review of this policy that could most efficiently be handled at the staff level before finalization.

Staff strongly supports this effort by the County Executive to formulate this noise abatement policy. The Department of Public Works and Transportation (DPWT), under the leadership of Edgar Gonzalez, convened a diverse study group with technical and citizen representation (see last page of policy). The group met over 30 evenings to shape the policy. The need for a formalized local policy arose due to an increasing number of citizen complaints and calls for a consistent policy at the local level, to be supplemented with budgeted appropriations to provide necessary funding for its implementation. Funding to implement this policy is its major issue, since virtually all will be from the county budget, with some citizen contributions as discussed herein.

Major Noise Policy Elements

Staff has selected several significant elements of the policy, which we believe need awareness and input from the Planning Board. The Board is welcome to ask questions on any element in the policy. Edgar Gonzalez of DPWT will be here to make a brief presentation, after which staff is ready to discuss the recommendations in this memorandum.

The following pages identify the issues of concern, highlight both SHA's and the county's approach in their respective policies to dealing with them, and concludes with a staff recommendation on each issue. These issues include:

- **recommended noise standard;**
- **minimum mitigation goals;**

- **prioritization of the noise receivers (or receptors) of concern;**
- **implications of the policy on our parks system;**
- **sharing of noise mitigation project costs to the benefited residents both above and below a \$50,000 ceiling of public expenditures;**
- **noise mitigation funding for new and expanded highway projects;**
- **requirement for dedication of additional ROW/easement by the adjoining homeowners;**
- **benchmarks of community support; and the**
- **inter-relationship of this policy with the MNCPPC staff noise guidelines.**

Noise Standard and Mitigation Goals

Both the recommended **noise standard** and **minimum mitigation goals** appear to be consistent with federal policy¹, and roughly in line with existing SHA policy, except in situations where no roadway currently exists, or where improvements are made to an existing roadway. A compromise position focused on a **single absolute standard ≥ 67 dBA under peak noise hour conditions**, providing less potential protection to new roadways, but establishing a lower maximum noise ceiling than SHA allows (up to 72 dBA) on expansions to existing roads.

Staff recommends that the **noise standard be verified by FHWA as not inconsistent with or less stringent than their standards**, so as not to preclude the potential for any future funding/cost sharing based on use of a less stringent standard.

Noise Receptors

The issue of **prioritization of the noise receivers (or receptors) of concern** has importance to MNCPPC and the Planning Board specifically in our role as owners and operators of the county park system. The priority of this policy is to protect **residences**, but other sensitive non-residential land uses may be considered for protection in situations where **serenity and quiet are of extraordinary significance, serve an important public need, and where the preservation of those qualities is essential** if the property is to continue to serve its intended purpose. Protection of residences are prioritized since its use includes the most sensitive daily activity, sleeping. Noise-sensitive activities in the park system will qualify for consideration under this provision, but active recreational uses have been specifically excluded as not being as noise-sensitive as other activities which require quiet for communication and concentration.

Cost Sharing

The issue of **cost sharing** (i.e., payment by selected homeowners of a portion of the cost of the barrier project) is probably the most difficult and contentious issue in the policy. On one hand, the costs are quite significant. This program will be paid entirely with local funds on county roads, as opposed to the SHA program that is 80% federally funded. These barriers are expensive: generally in the range of **1.0 to**

¹ A June 12, 1995 FHWA Noise Policy Guidance Document suggests that a noise impact occurs when the predicted levels *approach or exceed* the 67 dBA level, and recommend analysis be conducted for levels at least 1 dBA below the standard to recognize "approaching" the standard.

1.5 million dollars per one mile length of 12' barrier, or about \$24 to \$27 per square foot installed. The unknown associated with this policy is how many projects will apply for a county noise assessment, and thus, what the long term funding implications are associated with implementation. The Executive has changed the proposed draft to require minimum 50% support in a potentially affected neighborhood as part of the request for a county noise analysis, which should reduce the number of applications.

On the other hand, the argument can be made that the **responsibility for noise mitigation** (as with other environmental mitigations for SWM, wetlands, and forest) **should rest primarily in the hands of the agency responsible for the roadway as a necessary public facility**, so long as the local planning agency has taken reasonable action to prevent and minimize further noise impacts.

The first cost-sharing issue involves the **benefited neighborhood paying all barrier costs above a ceiling limit**. The ceiling currently used by SHA is **\$50,000 per benefited residence**, the highest level acceptable to FHWA. Staff believes that some ceiling is appropriate and reasonable, and an important factor in assuring the most effective use of public funds for noise reduction benefit. According to DPWT, most barriers are likely to fall under this \$50,000 threshold. As a rough estimate, it would take a minimum of about 30 impacted residences per mile of roadway at 1.5 million dollars per mile to equal the \$50,000 threshold.

The county has precedent for paying amounts above the ceiling in the two "noise abatement districts" along the western leg of I-495 in the Cabin John/West Bethesda area. In those districts, all residents of the benefited community are repaying the county for these funds through a special taxing district.

The next cost-sharing issue is a **proposed cost share to certain benefited residences for 10% of all expenses under \$50,000**. Those residents who have moved to a neighborhood in the **last ten years, or after the first master plan showing a road in its ultimate configuration** would pay 10% of the cost up to \$5000 maximum (10% of the first \$50,000, or up to \$5000 maximum)

The issue of private homeowners sharing the cost of noise barriers has the potential to become a very divisive issue in a community looking to mitigate noise from an existing or proposed transportation project. For example, ten homes may have been built on an affected street at the same time, but depending on when each individual owner purchased his home, he may or may not be liable for part of the cost of a needed noise wall. If he is liable, depending on his ability to pay, he may choose not to participate in the noise wall project, possibly jeopardizing the project for the rest of his neighbors. The homeowner's cost up to \$5,000 may not be considered a significant cost in more affluent areas, but could be a substantial burden in less affluent areas. In areas with more rental properties, absentee owners would have less of an incentive to share in the cost of a noise wall.

Prospective homeowners are advised that they may come to M-NCPPC's office and review the Master Plan for the area in question. The information they receive is critical to their making an informed decision on whether or not to purchase the house. Staff does not normally provide written assessments on how Master Plan-recommended transportation improvements could affect a particular property. This would seem to be the only way, however, to provide the homeowner with a record of what information was provided.

Assuming up-to-date information is provided, as is normally the case, it would be difficult for a prospective homeowner to make an informed decision regarding potential noise impacts. Master Plans sometimes do not specify the number of lanes, but call for a range of two to four lanes, for example. People can assume the worst case of four lanes and have an idea of what the character of such a road would be, but there is not an easy and sufficiently detailed way to project what the noise impact from such a facility would be on a specific property. This would be a very time-consuming task for staff to do for every prospective homebuyer. It is difficult to see how we could provide the homeowner with sufficient palpable information to make an informed choice that may have future economic and quality of life implications.

Master Plan highway alignments are marked on our 200-scale topo maps and are in our GIS system,

but these alignments are for planning purposes only. They are not intended as project design documents. During project or facility planning is when an actual alignment is determined. This alignment may be significantly different locally, but not be significant enough to warrant a Master Plan Amendment. An example of this is the Goshen Road widening project in the vicinity of the Goshen Elm. The road was intended to be centered in the Master Plan right-of-way, but in an effort to save the tree, the road will be moved about eighteen feet to the west, moving the northbound lanes closer to the homes on the west side of the road. It is still unclear whether the ultimate roadway will be built to four or six lanes, but a six lane facility would place the southbound lanes about ten feet closer to homes on the west side also, requiring additional right-of-way. The road would be moved closer to existing homes on the west side and away from the new homes on the east side, but the determination on who would pay would depend on when someone purchased a home.

SHA's criterion on cost sharing for noise walls is based on when a home was built and that determination is made at a point when the preliminary design for the project is known. Once a "record of decision" has been filed on a roadway project, homes built after that date are not eligible for noise walls but existing homes are. On retrofit noise wall projects that are not associated with roadway construction, it is the date homes in a neighborhood were *constructed*, not when they were *purchased*, which is the major factor in deciding whether or not to build noise walls.

Staff recommends that **all costs under \$50,000 should be paid by the county** as part of their primary responsibility for mitigating impacts of operations on county roadways. However, if the Executive determines that additional funding by the benefited residences is essential to the success of the program, the cost sharing should be applied on a community-wide (rather than house to house) basis. Further, staff recommends that the cost sharing proposal apply only to new homes built after the facility planning has been completed for a particular roadway project. If noise walls are to be constructed for an existing facility as a retrofit project, staff recommends that any cost-sharing proposal be inversely pro-rated for when the homes were built, not purchased.

In staff's opinion, many of the fairness, equity, "who came first" and "who should have known" issues implicit in the cost sharing discussion are best addressed in the weighting factors for priority projects (see Scoring Factor Tables, page 11 of policy). For example, the proposed weighting factors already give priority to homes constructed prior to the master plan showing the roadway. The policy could also give low priority to all new developments that have undergone Planning Board scrutiny under its staff noise guidelines in place since 1983. SHA has considered this factor in its noise analyses.

Funding for New or Expanded Highway Noise Abatement

Staff concurs that the noise analysis and criteria for abatement should be consistent for new and existing projects. However, **funding for noise abatement associated with new construction or expansion projects shall be provided as part of the CIP project, separate from the countywide funding pool and prioritization ratings.** Noise mitigation should be included in the project cost just as all other forms of environmental mitigation (SWM, wetlands, forest, etc.)

Required Dedication of Additional Area by the Adjoining Homeowner

The concept of free dedication of land or easement for barrier construction is reasonable, given the public expenditure and benefit to the affected homeowner. However, it leaves open the potential for one resident to veto an otherwise highly rated project supported by the majority of the community. A homeowner's responsibility to cost share will increase the likelihood of this occurrence.

Other options for dealing with this possibility (short of the denial or delay of the entire project) should be examined by the county. SHA has had to deal with such circumstances, and has made adjustments to alignments or left out segments in the barrier, rather than penalize the larger neighborhood. Staff recommends **consideration of alternatives, which would allow construction of the full or partial barrier, even without the unanimous dedication of land by all affected homeowners.**

Benchmarks for Community Acceptance

Staff supports the concept of community acceptance of the barrier project by the majority of affected homeowners. Staff notes that although the county's 60% acceptance criteria is lower than the SHA 75 % approval criteria, the number of homeowners paying for SHA barriers are fewer as well, leading to wider acceptance.

Responsibility of Developers/ MNCPPC Noise Guidelines

Planning staff has used a 1983 document entitled *Staff Guidelines for the Consideration of Transportation Noise Impacts in Land Use Planning And Design* to guide staff's review and recommendations to the Planning Board on potential transportation noise impacts. The guidelines are advisory only, and the Board considers noise recommendations along with other land use and site design considerations. The established guidelines are slightly more restrictive than transportation agencies use, and use a 24 hour equivalent sound level (Ldn) noise metric, rather than transportation agencies' peak noise hour (Leq peak noise) metric.

Both effective noise compatibility planning and noise barrier construction efforts are necessary to have a truly effective transportation noise compatibility program. The county policy supports and encourages the Planning Board to strictly adhere to the staff guidelines during the development review process to minimize future transportation noise conflicts. It suggests the developer conduct detailed noise analysis as part of subdivision review. Further, the policy recommends a formal approval by the Planning Board of the staff guidelines as a result of a public process.

Staff agrees with the policy's strong position in support of the staff's noise compatibility effort, and recognition of its significant role as part of the overall county program of noise compatibility. In regard to the recommendation for a formal update and approval of the staff noise guidelines, staff will recommend such an update, but will do so with the recognition that this would be a significant work program item with associated budget implications that must be considered among other priorities by the Planning Board.

Today's staff noise guidelines allow for the conduct of a noise study by the developer on a case-by-case basis, but this recommendation should be considered as part of the guidelines update effort. In the interim, staff will continue make a concerted effort to inform the Board when noise impacts have been considered, and what methods have been employed in noise mitigation in site design.

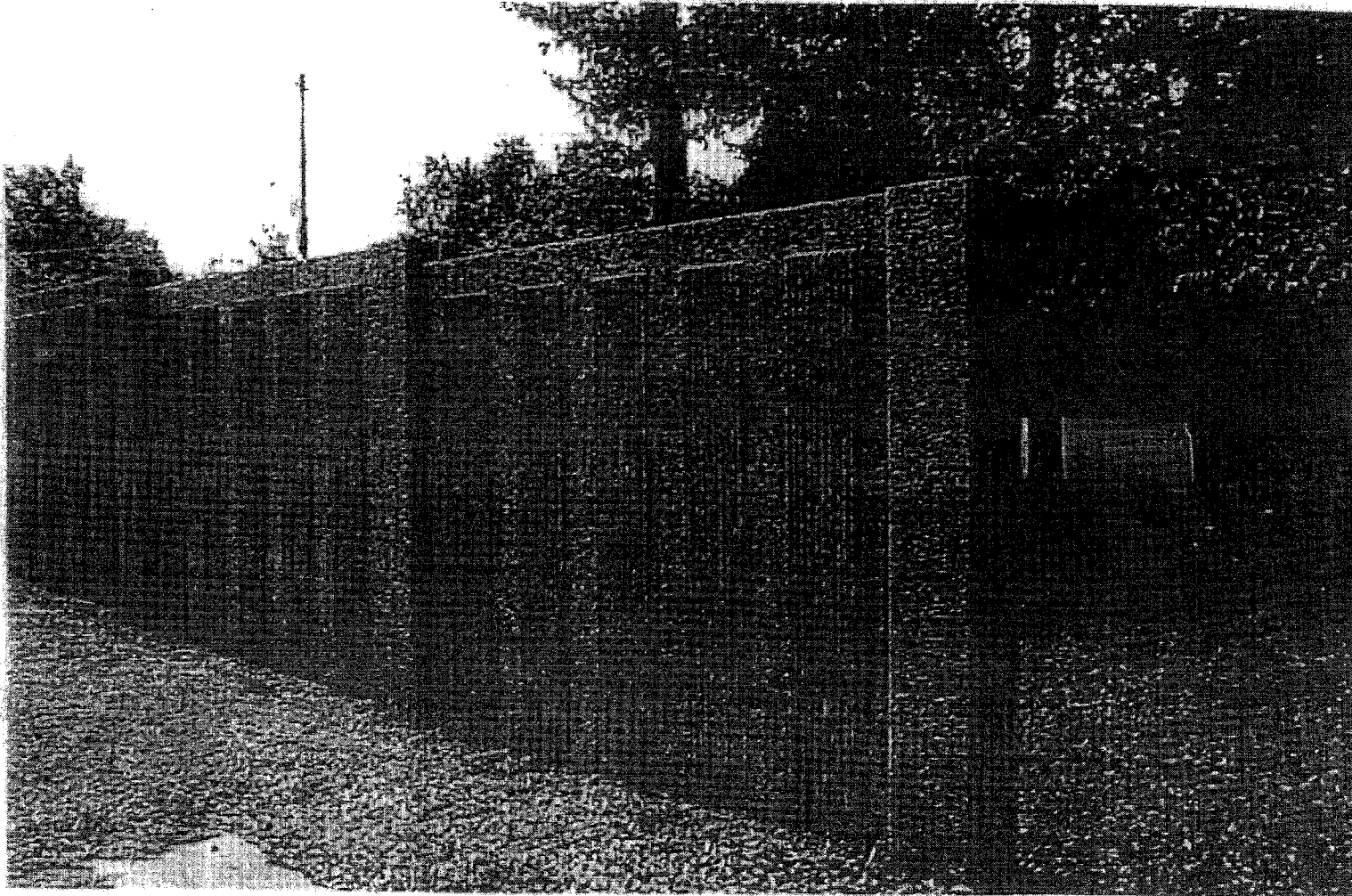
COMPARISON OF EXISTING SHA AND PROPOSED COUNTY NOISE POLICIES

Significant Policy Issues	State Highway Administration	Montgomery County	Staff Comments
NOISE STANDARD	<p>New Highway Projects (Type I) Equal or exceed 66 dBA; or increase of projected noise >10dBA over existing levels, and exceeds 57 dBA.</p> <p>Expansion of Existing Highway (Type I): >66 dBA plus increase of 3dbA or more in build condition; or >72 decibels without any "increase" (3 dBA threshold waived)</p> <p>Existing highways (retrofit/ Type II) >66 dBA (limited access highways only)</p>	<p>Equal or exceed 67 dBA, with no difference between new, expanded, or existing highway conditions</p>	<p>Support concept of single noise standard based on projected noise level. 67 dBA standard is consistent with federal standard, but is less restrictive than state standard of 66 dBA. Although SHA currently considers any cost sharing not to be feasible on county roads, having a less-restrictive standard may lose any future potential for Federal/State funds. Many potential projects exist where impacts are ≥67 dBA.</p> <p>Positive aspect of single standard is equal treatment of county residents based on noise levels, rather than using a standard which only focuses on the increase in noise levels due to an individual project(s) (e.g., "noise creep" at I-270 and Old Georgetown Road due to multiple projects).</p> <p>Negative aspect is loss of additional protection along new roads where impacts are most dramatic (e.g., Montrose Parkway) due to significant increase over existing (ambient) conditions. New roads in developing areas will benefit from good noise-compatible site design (e.g., major roads in Germantown have 40' noise barrier area along ROW, and suggested 100' house setback per master plan).</p>
MITIGATION GOAL	<p>7-10 dBA reduction for first row receivers (10 dBA is the primary target)</p>	<p>≥ 7 dBA reduction for first row receivers</p>	<p>Support. Noise increases/reductions are not considered perceptible until they are at least 3-5 dBA, with a 10 dBA change perceived as twice/half as loud.</p>
RECEPTORS	<p>Broad-based to include residences, schools, churches, historical areas, cultural resources, and other places which people use that can be adversely affected by highway noise.</p>	<p>Directed at residences, but with provision for protection of additional uses where serenity and quiet are of extraordinary significance, and protection is essential to intended purpose.</p>	<p>Support primary focus on residential protection, and more activity- focused criteria in county policy (i.e., the sensitivity of the activity is the basis for noise mitigation).</p>
RECEPTORS— PARKS IMPLICATIONS	<p>Same language as specified above</p>	<p>Policy specifies limited local dollars be focused on residences and sensitive non-residential land uses including parts of parks such as band shells, amphitheaters, retreat/contemplative settings, and areas for camping (areas where</p>	<p>Staff concurs with this part of the policy for several reasons:</p> <ol style="list-style-type: none"> 1. Focus is on most sensitive park uses where quiet is truly essential to intended use. (E.g., Merrivether Post Pavilion in Columbia) 2. Active recreational areas (golf courses, ballfields) and the uses within them are not as noise-sensitive, in terms of the most sensitive activities such as sleep, communication, relaxation and concentration.

Significant Policy Issues	State Highway Administration	Montgomery County	Staff Comments
<p>Cost Sharing: Ceiling for Public Expenditures of \$50,000 (Upper Limit)</p>	<p>BARRIER not reasonable if cost exceeds \$50,000 per benefited residence. Two Noise Abatement Districts were established in the Cabin John/Bethesda area of Montgomery County along I-495 to provide local government loans to benefited homeowners to pay SHA for amount exceeding \$40,000 (1989 ceiling) per benefited residence.</p>	<p>activities involving communication and sleeping require quiet). <i>General park areas and areas for active recreation are specifically excluded from the policy.</i></p> <p>Same as SHA. Benefited residences must pay barrier costs exceeding \$50,000 residence.</p>	<p>3. First priority for use of limited funds should go to protect the most sensitive activities of county residents, and activities that are conducted throughout the day and year.</p> <p>Support. An upper limit of expenditures to provide noise abatement per unit protected is a reasonable consideration to the appropriate and rationale use of government funds for this purpose. This limit has been used consistently statewide regardless of socio-economic variables and property values. Staff believes that most applications for noise abatement will come in below this limit.</p>
<p>Cost Sharing: Some Benefited Residents to Pay 10% of all Costs below \$50,000/benefited residence</p>	<p>SHA covers all amounts up to \$50,000 per benefited residence based on 80% federal cost share, and 20% state share. SHA apparently uses their "record of decision" date during the project planning process as the point after which a community would not be eligible for abatement funded by SHA. (Third party funding could be considered).</p>	<p>Certain benefited residents will pay 10% of the barrier cost up to \$50,000 (or up to \$5,000 per residence) when either of the two situations occurs:</p> <p>When the existing homeowner has purchased a home:</p> <ul style="list-style-type: none"> a) Less than 10 years prior to noise analysis; or b) After the first master plan showing road in its ultimate configuration was adopted. 	<p>DO NOT SUPPORT</p> <p>Staff does not support the concept for differential cost sharing within an affected neighborhood since it is <i>divisive to the community, inequitably applied based on years of residence</i>, and depends on the <i>general information of the master plan for homeowners to make informed decisions on the magnitude of noise impacts which may have significant financial effect per the proposed policy.</i></p> <p>Fundamental to this issue is who has primary responsibility for noise abatement on a county or state road. Staff believes highway noise abatement is the primary responsibility of the highway agency, particularly when the local planning agency has taken appropriate action to implement noise compatible land use planning and site design (as M-NCPPC has done for the last 20 years.)</p> <p>In this respect, it is comparable to the mitigation of other impacts, such as SWM control, reforestation, or wetland replacement. Noise is an unavoidable bi-product of the use and operation of a necessary public facility, and as such, should be part of the public cost associated with the use and operation of a roadway. In addition, the proposed differential cost allocation within a community and between neighbors would be most divisive to a neighborhood.</p>

Significant Policy Issues	State Highway Administration	Montgomery County	Staff Comments
			<p>Both of the County's 10% cost share proposals pass the burden onto the homeowner to garner sufficient information about noise impacts to justify some responsibility for its abatement. Such information is only available by living there with the road in its ultimate configuration and traffic level, or by detailed noise analysis. The master plan cannot possibly give such detailed information.</p> <p>One possible way at resolving the issue of residents who have suffered longer is to give additional weighting to the length of a neighborhood's exposure to the ranking system for county approval (i.e., a longer exposure would give a higher priority to a project, all other factors being equal).</p>
Funding Issue: New or Expanded Highway Projects	Type I Projects: New Highway Construction or Reconstruction	Policy specifies that the same noise analysis and criteria for abatement shall apply to existing or new projects.	Staff concurs that the noise analysis and criteria for abatement should be consistent for new and existing projects. However, funding for noise abatement associated with new construction or expansion projects shall be provided as part of the CIP project separate from the countywide funding pool and prioritization ratings. Noise mitigation should be included in the project cost just as all other forms of environmental mitigation (SWM, wetlands, forest, etc.)
Feasibility Issue: Project is Infeasible Unless Adequate ROW, or Permanent Easement Dedicated	Any ROW required for Type II barriers must be donated; holdouts will be treated through "work-arounds" if feasible.	Policy requires free contribution of additional ROW or easement from adjacent owners for construction and maintenance, or project is INFEASIBLE.	<p>Recommend waiver provision for purchase be added to the policy in exceptional circumstances. While the concept of dedication appears reasonable, it allows one resident to veto an otherwise highly rated project supported by the majority of the community. A homeowner's responsibility to cost share will increase the likelihood of this occurrence. Since the county does not have quick take capability, land or easement purchase may take some time. SHA may be of help in their experience in similar circumstances.</p> <p>As a practical consideration, staff notes that many rights-of-way may not accommodate noise barriers, particularly the 120' major highway six-lane cross section, a logical candidate for noise impacts.</p>
Reasonableness Issue: % Community Support	If <75% of impacted residents approve, barrier could be considered not reasonable.	Barriers <u>must</u> be approved by 60% of impacted residents, including ones that must pay some portion of the costs.	Staff supports the concept of community acceptance of the barrier project by the majority of affected homeowners. Staff notes that although the county's 60% acceptance criteria is lower than the SHA 75 % approval criteria, the number of homeowners paying for SHA barriers are fewer as well, leading to wider acceptance.

Highway Noise Abatement Policy



MONTGOMERY COUNTY, MARYLAND

2007

HIGHWAY NOISE ABATEMENT POLICY

MONTGOMERY COUNTY, MARYLAND

INTRODUCTION

A comprehensive Highway Noise Abatement Policy has been developed to provide for a consistent response to citizen complaints and requests for traffic noise mitigation throughout the county. This Policy responds to concerns with both existing roadway conditions and proposed road improvements under consideration by the County, and addresses what citizens perceived to be inconsistent treatment on matters of noise mitigation in different parts of the County. This process is subject to public review and approval by the Executive and the County Council.

Under this Policy, traffic noise mitigation most likely will take the form of noise barriers (either earthen berms or free-standing walls) but also may include alteration of roadway vertical or horizontal alignment or the inclusion of buffer zones for mitigation associated with road new construction or improvement projects. Since noise barriers are the primary noise control device, noise exposures will be evaluated at ground level and first-floor elevation receptors to avoid excessive barrier height. This policy will govern noise impacts from all roads built and maintained in Montgomery County—excepting freeways. However, impacts from other than vehicles on public roads (particularly, rail and aviation noise sources) are not addressed by this Policy.

This Policy guides the identification of highway projects to be considered for noise abatement, the quantification of noise exposures from the identified projects, the determination of the need for noise mitigation, and the design of noise mitigation measures. When a project has been determined to warrant mitigation and mitigation is reasonable and feasible, the Policy guides the involvement of the community in determining the acceptability of the proposed mitigation measures and-if appropriate-the willingness of those benefiting to share the cost of noise control. For projects receiving community support, the Policy defines the County funding process and prioritization criteria, and procedures for and alternatives to those projects not receiving funding in the current County budget cycle. In addition, the Policy reiterates the responsibilities of developers to prevent the creation of noise impacts when proposing residential development adjacent to roadways likely now or in the future to produce objectionable noise exposures.

Appended to this Policy are: a set of definitions for the terminology (Appendix A) used in this document (highlighted with CAPITAL LETTERS upon first reference below), an overview of ambient and traffic noise quantification methods (Appendix B), and the process followed for the Development of the Highway Noise Abatement Policy (Appendix C).

1. TRAFFIC NOISE ASSESSMENT

Project Identification. The primary focus of this Policy is *residential* land use. However, consideration also will be given to property for which serenity and quiet are of *extraordinary significance*, serves an important public need, and where the preservation of those qualities is *essential* if the property is to continue to serve its intended purpose. Examples of sensitive non-residential land uses include parts of a park such as band shells, amphitheaters, retreat/contemplative settings, and areas for sleeping outside. General park areas and areas for active recreation are excluded from this Policy. Extended traffic noise impact study areas, such as for roadway new construction or improvement projects, will be subdivided into LOGICAL ANALYSIS SEGMENTS. A logical analysis segment is a length of roadway along which noise impacts are reasonably consistent. Within a study area, logical analysis segments may be separated by significantly different topographic conditions; intervening non-sensitive land uses; varying proximity of homes or different subdivisions; or significant variations in traffic volumes, vehicle mix, or geometric grades.

A NOISE ASSESSMENT will be performed for any road construction or improvement project judged likely to produce unacceptable noise exposures to existing or approved-future residential development. In addition, noise assessments of existing roads will be performed when Sufficient community complaints of traffic noise impacts have been received by the County.

Determination of Need. The traffic and ambient sound levels in the potentially affected vicinities of candidate traffic noise mitigation projects will be quantified by means of both measurements of existing exposures and mathematical predictions of future traffic noise exposures. Noise exposures will be quantified at a RECEPTOR located in an area of *common* human activity within a residential lot. This location generally will be between the right-of-way line and the closest wall of the residence to the highway. Existing ambient sound levels will be quantified by means of a noise survey including both long-and short-term measurements at one or more locations. These measurements will quantify the noise environment in terms of both PEAK-NOISE HOUR EQUIVALENT SOUND LEVEL ($LA_{eq1hrPk}$) and DAY-NIGHT AVERAGE SOUND LEVEL (L_{dn}). One or more receptors may be measured as necessary to sample noise exposures within an analysis segment.

Exposures also will be predicted for the maximum noise generating condition for the roadway-corresponding to LEVEL-OF-SERVICE (LOS) D-whether this condition exists currently or is expected within a 20-year time frame. (Average traffic speeds to be used in the analyses will be the posted speed limit or the speed associated with LOS D, whichever is higher). The predictions will be performed at the ambient noise survey locations and additional locations sufficient to permit evaluation of the effectiveness of possible noise mitigation features. The traffic noise will be predicted using the best-available traffic noise prediction methods. (An overview of the ambient noise measurement and traffic noise prediction methods is provided in Appendix B.)

Traffic noise impacts will be considered to exist wherever noise-sensitive receptors are found to have peak-noise hour equivalent sound level exposures of 67 dBA or higher from traffic noise either currently (per ambient noise survey measurements) or in the future (per the LOS-D traffic noise predictions). Dwellings or other noise-sensitive locations that have traffic noise exposures equal or greater than 67 dBA will be considered IMPACTED RECEPTORS. Measured or predicted noise exposures will be rounded to the nearest whole integer for the noise assessment evaluations.

Mitigation Design. When traffic noise impacts have been determined to exist in a logical analysis segment, the assessment will proceed to the evaluation of possible noise barrier designs. The design analysis will employ the best-available mathematical prediction methods and assume LOS-D traffic conditions, provided they are expected to occur within a 20 year span. Otherwise, the 20 year traffic projection will be used. Noise barriers normally will be located within the right-of-way, but other locations may be considered if topographic features are conducive to other, more cost-effective configurations. Noise barriers will be designed to provide a sound level reduction (INSERTION LOSS) of at least 7 dBA for the most seriously traffic-noise impacted receptors, i.e., generally the row of homes closest to the right-of-way. The barrier design will be optimized to minimize the total barrier installation cost per benefited receptor for the logical analysis segment.

The barrier must be found to be feasible and reasonable. A noise barrier will be considered *feasible* when it meets all of the following factors:

- The barrier can be built to provide an insertion loss of at least 7 dBA for the most seriously traffic-noise impacted receptors.
- The barrier can be built without either unduly restricting pedestrian or vehicular access, or interfering with safe sight distances for motorists.
- Any right-of-way required for the construction and maintenance of the barrier must be either dedicated to the County at no cost or the County is granted a permanent easement.

A noise barrier will be considered *reasonable* when it meets the following factors:

- The barrier protects noise-impacted receptors.
- The barrier will not result in undue negative impacts on the environment or historic resources.
- The County costs to install the barrier will not exceed \$50,000 per BENEFITED RECEPTOR (where benefited receptors are considered to be the owners of those dwellings which are impacted and will enjoy a barrier insertion loss of at least 3 dBA).
- The barrier design, and payment responsibility – if any- are approved by the benefited property owners.

2. COMMUNITY INVOLVEMENT

Mitigation Approval. When the traffic noise assessment has been completed with findings that traffic noise impacted receptors exist and mitigation is reasonable and feasible, a community meeting will be scheduled to present the assessment results and propose the barrier design to the benefited residents. Barriers must be approved by 60% of the benefited homeowners, including those who may have to contribute towards the construction of the noise barrier. Alternative non-mitigating treatments, such as FENCING or LANDSCAPING, will be made available to communities where the 60% approval is not obtained.

If a community rejects the barrier project, it may not request reconsideration for at least six years. If a community accepts non-mitigating treatments in lieu of a noise barrier, it may not request reconsideration for noise mitigation for at least 12 years.

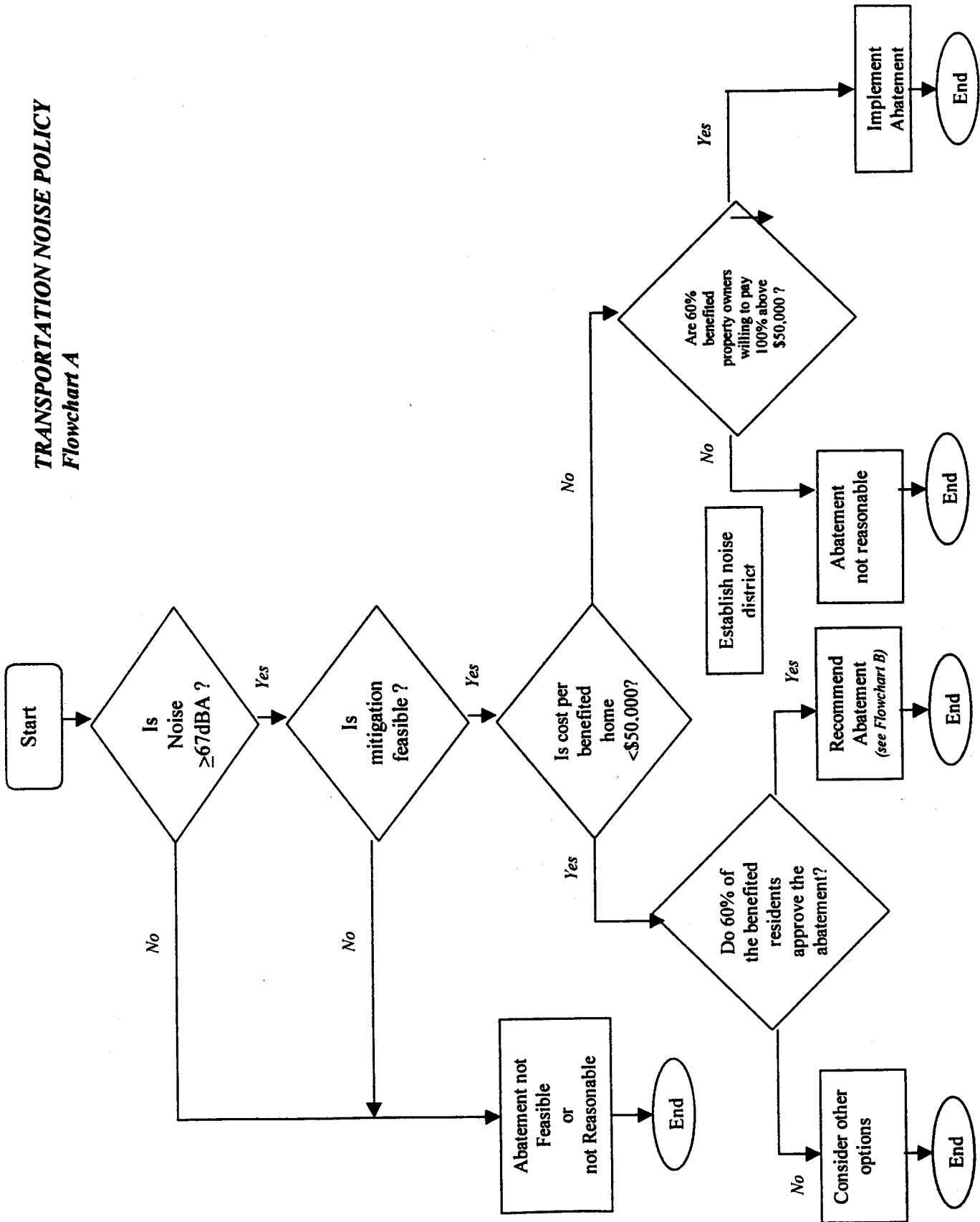
Cost Sharing. BARRIER COSTS are all implementation costs, including those associated with modifications that may be necessary to drainage systems and utility relocation. In cases where the installation of a noise barrier requires the use of privately owned land, it is expected that the necessary property will be donated to the County for its implementation or granted to the County at no cost via easement.

Property owners who purchased their homes less than ten years prior to the Noise Assessment or after the Master Plan for the subject road was adopted and approved will be required to contribute 10% of the cost of the noise barrier up to the first \$50,000. Costs above \$50,000 per benefited residence will be covered fully by the benefited property owners. Flowcharts A and B will be used in the determination of reasonableness, as given in Figures 1 and 2.

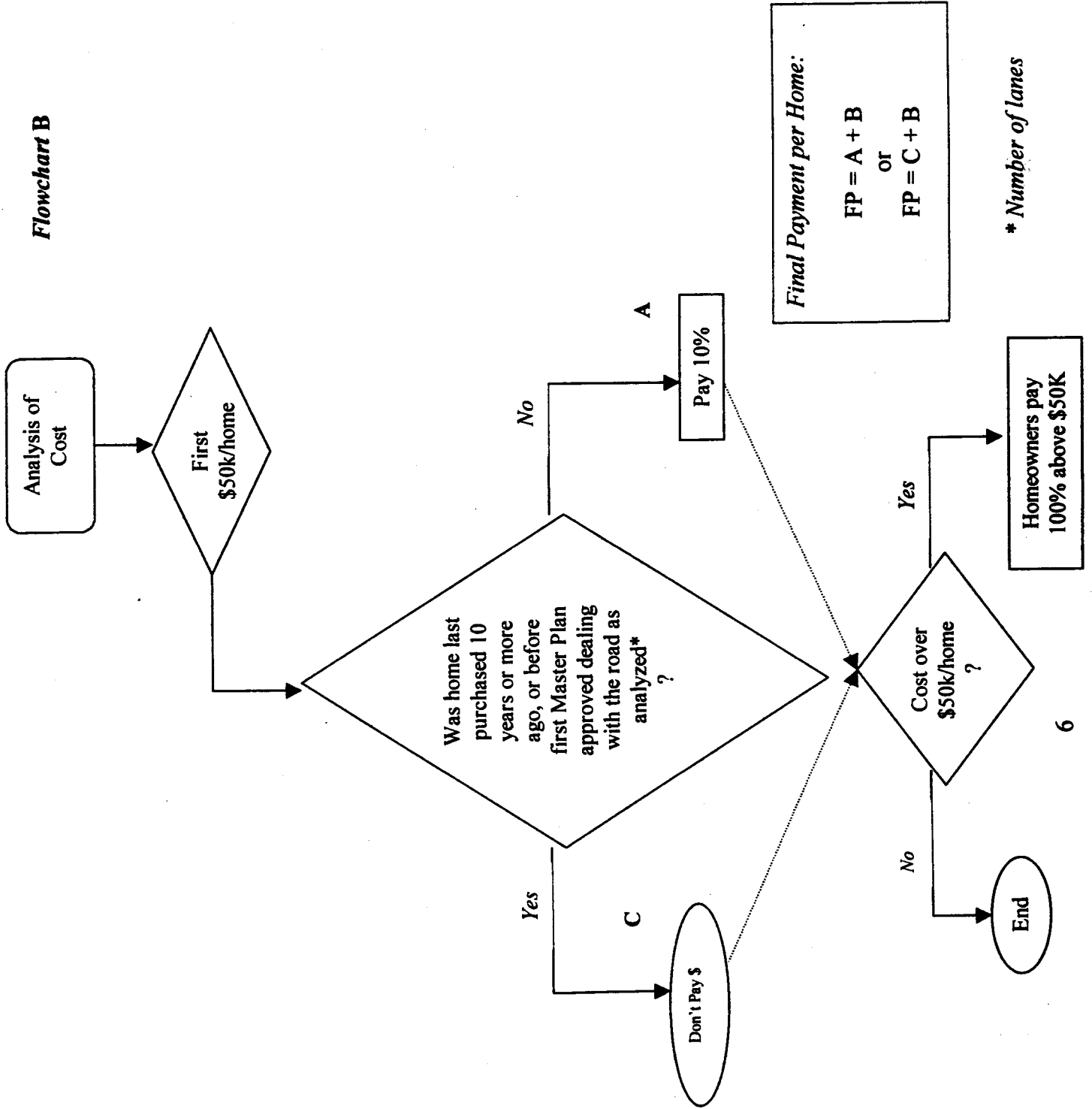
3. COUNTY APPROVAL

Funding Priority. Not all barrier projects found to be feasible and reasonable and obtaining community approval may be implemented in a given year due to fiscal constraints. The County Council will prioritize which projects will be implemented in a given year, given the budgetary allocations to the transportation noise abatement program. Funding priority recommendations will be determined by ranking the candidate barrier projects based upon the total scores derived from the sum of the scores for seven factors:

**TRANSPORTATION NOISE POLICY
Flowchart A**



Flowchart B



- *Noise Impact during Peak-Noise Hour*-This factor, NIP, has a maximum score of 30 and is determined from the arithmetic average of the peak-noise hour equivalent sound levels ($LA_{eq1hrPk}$) for the five receptors with the highest traffic noise exposures in the logical analysis segment per Table 1.
- *Noise Impact for Day and Night* - This factor, NDN, has a maximum score of 15 and is determined from the arithmetic average of the day-night average sound levels (L_{dn}) for the five receptors with the highest traffic noise exposures in the logical analysis segment per Table 2.
- *Projected Time to Reach LOS-D*-This factor, TLOSD, has a maximum score of 10 and is determined from the time in years for the peak-hour traffic on the roadway under study to reach LOS-D per Table 3. The EVALUATED HIGHWAY CAPACITY will be that for: the roadway design for new roads or road improvements (CIP projects) or the existing road configuration for barrier retrofit (non-CIP) projects.
- *Home Construction Date re. Road Master Plan*-This factor, HCD, has a maximum score of 10 and is determined based upon the number of homes in the logical analysis segment constructed prior to the date of the first Adopted Master Plan which includes the road at its evaluated highway capacity per Table 4.
- *Home Purchase Date*- This factor, HPD, has a maximum score of 10 and is determined based upon the number of homes in the logical analysis segment purchased 10 years prior to the date of the noise assessment, and it is evaluated per Table 4.
- *Number of Benefited Homes*-This factor, NBH, has a maximum score of 15 and is determined from the total number of benefited dwellings in the logical analysis segment per Table 5.
- *Extent of Benefit*-This factor, EOB, has a maximum score of 10 and is determined from the average barrier insertion loss for all benefited receptors in the logical analysis segment per Table 6.

For each candidate barrier project, the project score will be:

$$S = NIP + NDN + TLOSD + HCD + HPD + NBH + EOB$$

Project scores will be presented to the County Council by category: County Roads, State Roads, and Other Roads.

Reconsideration/Re-submittal. In the event that funding for the barrier project is not approved by the County Council, it will be reconsidered in the next budget cycle two years later. Re-submitted projects will compete with all then-current projects on an equal basis. However, the community may elect to have alternative measures implemented, which will not yield sound level reductions (e.g., wooden fences or landscaping) instead of the noise barrier. For the non-mitigating alternatives, public funding will be 100%, except for any necessary right-of-way. It is expected that any required easements will be given to the County at no cost. Flowchart C will be followed in these cases, as shown in Figure 3.

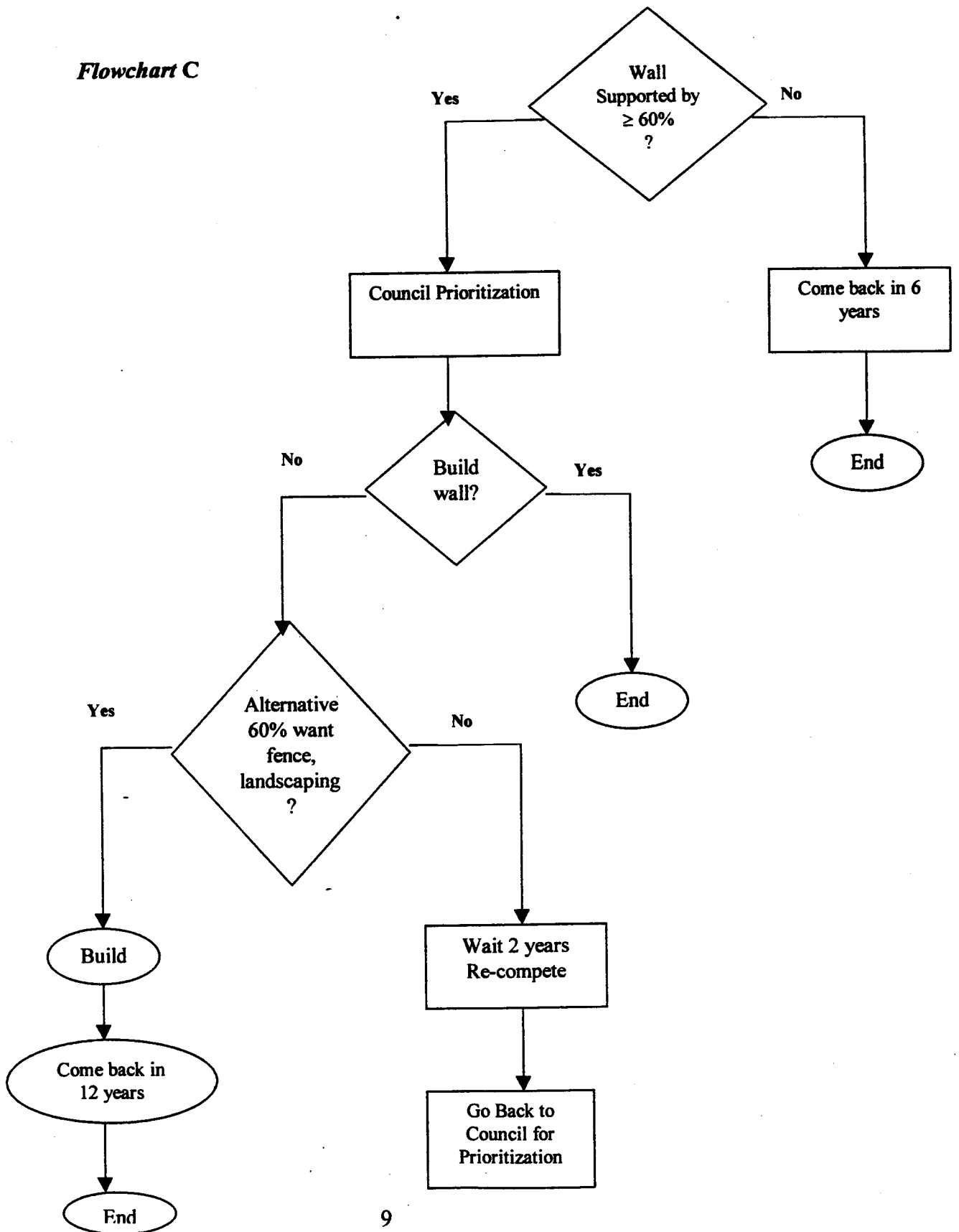
Non-Mitigating Alternatives. Some communities may desire an alternative to a noise barrier due to perceived negative aspects of a barrier (such as excessive height) or to obtain some and more immediate relief in the case of a low-ranked project with poor prospect for funding. These alternatives consist of wooden fences and vegetative landscaping. They may provide some visual obstruction of the road-in some cases giving the *perception* that the traffic noise is less objectionable. However, fences and landscaping are not likely to result in a measurable reduction in sound levels and will postpone community eligibility for barrier projects in the future, per Figure 3.

4. RESPONSIBILITIES of DEVELOPERS

The Maryland-National Capital Park and Planning Commission/Environmental Planning Division has developed recommended guidelines to manage transportation noise impacts in Montgomery County, "...as an aid to developers, planners, and decision-makers in assessing the extent of transportation noise problems and devising appropriate solutions." [Reference: "Staff Guidelines for the Consideration of Transportation Noise Impacts in Land Use Planning & Development," Montgomery County Planning Board, June 1983] The guidelines consist of screening criteria and limits for acceptable noise exposures. The screening procedure is intended to assist in identifying areas where potential noise problems exist. The maximum acceptable sound levels are intended to "...be used by the Environmental Planning Division in reviewing site plans, subdivision plans, zoning cases, and master and sector plans, as the basis for making recommendations to the Planning Board for noise impact abatement." In accordance with these guidelines, the incorporation of noise mitigation features may be required of a developer for approval of his proposal to prevent unacceptable noise exposures to the future residents of the development.

The recommended noise levels emphasize the mitigation of exterior noise exposures in residential areas, in terms of *day-night average sound level*, to enable residents "...to enjoy the use of private outdoor areas free of annoyance..." Recommended maximum sound levels are defined loosely as a function of 1983 development density-55 dBA[L_{dn}] for rural areas, 60 dBA[L_{dn}] for suburban areas, and 65 dBA[L_{dn}] for urbanized areas. An interior guideline of 45 dBA[L_{dn}] may be considered in lieu of the exterior goal for residential uses not oriented towards outdoor activities and having adequate ventilation, or in situations where the mitigation of exterior noise exposures is impractical. Office, commercial, and industrial zones are generally considered to be noise-compatible land uses and are not normally reviewed for noise impacts.

Flowchart C



This policy encourages the Planning Board to observe strict adherence to the staff guidelines during the subdivision development approval process, as a most effective way to minimize future transportation noise problems.

This policy also recommends formal discussion by the Planning Board, and the formal adoption of Subdivision Noise Guidelines as a result of a public process.

Scoring Factor Tables

TABLE 1. SCORING FACTORS for NOISE IMPACT during PEAK-NOISE HOUR
 NIP is determined from the arithmetic average of the peak-noise hour equivalent sound levels ($L_{Aeq1hrPk}$) for the five receptors with the highest traffic noise exposures in the logical analysis segment.

$L_{Aeq1hrPk}$ (dBA)	NIP
≥72	30
71	24
70	18
69	12
68	6
67	0

TABLE 2. SCORING FACTORS for NOISE IMPACT for DAY and NIGHT
 NDN is determined from the arithmetic average of the day-night average sound levels (L_{dn}) for the five receptors with the highest traffic noise exposures in the logical analysis segment.

L_{dn} (dBA)	NDN
≥72	15
71	12
70	9
69	6
68	3
67	0

TABLE 3. SCORING FACTORS for PROJECTED TIME to REACH LOS-D
 TLOSD is determined from the time in years for the peak-hour traffic on the roadway under study to reach LOS-D.

TIME (Years)	TLOSD
0 -4	10.0
5 -9	7.5
10-14	5.0
15-19	2.5
≥20	0.0

TABLE 4. SCORING FACTORS for HOME CONSTRUCTION DATE and HOME PURCHASE DATE re ROAD MASTER PLAN

HCD is determined based upon the number of homes in the logical analysis segment constructed prior to the date of the Master Plan of the road at its evaluated highway capacity. HPD is determined based upon the number of homes in the logical analysis segment purchased prior to the date of the Master Plan of the road at its evaluated highway capacity.

NUMBER of HOMES	HPD	HCD
≥ 30	10	10
27 - 29	9	9
24 - 26	8	8
21 - 23	7	7
18 - 20	6	6
15 - 17	5	5
12 - 14	4	4
9 - 11	3	3
6 - 8	2	2
3 - 5	1	1
0 - 2	0	0

TABLE 5. SCORING FACTORS for NUMBER of BENEFITED HOMES
 NBH is determined from the total number of benefited dwellings in the
 logical analysis segment.

Number of Benefited Homes	NBH
≥30	15
28 - 29	14
26 - 27	13
24 - 25	12
22 - 23	11
20 - 21	10
18 - 19	9
16 - 17	8
14 - 15	7
12 - 13	6
10 - 11	5
8 - 9	4
6 - 7	3
4 - 5	2
2 - 3	1
0 - 1	0

TABLE 6. SCORING FACTORS for EXTENT of BENEFIT
 EOB is determined from the average barrier insertion loss (IL) for all benefited receptors in the logical analysis segment.

IL	EOB
<4	0.0
4 - 4.49	1.0
4.5 - 4.99	1.5
5.0 - 5.49	2.0
5.5 - 5.99	2.5
6.0 - 6.49	3.0
6.5 - 6.99	3.5
7.0 - 7.49	4.0
7.5 - 7.99	4.5
8.0 - 8.49	5.0
8.5 - 8.99	5.5
9.0 - 9.49	6.0
9.5 - 9.99	6.5
10.0 - 10.49	7.0
10.5 - 10.99	7.5
11.0 - 11.49	8.0
11.5 - 11.99	8.5
12.0 - 12.49	9.0
12.5 - 12.99	9.5
13.0 - 13.49	10.0

APPENDIX A. TERMINOLOGY

AMBIENT NOISE-The noise associated with an environment and usually the composite of sound from many sources both near and far and from all directions. Ambient noise often includes: road traffic, aircraft, rail traffic, air conditioning equipment, industrial machinery, human voices, dogs, lawn-care equipment, construction activity, birds, insects, and the rustling of leaves.

BARRIER COST-The total cost of barrier construction, including: engineering, site clearing and preparation, utility relocation, drainage system installation, footings, barrier materials and installation, and finish landscaping.

BENEFITED RECEPTOR/HOMEOWNER-Receptors which are noise impacted and experience a barrier insertion loss of at least 3 dBA.

BERM-A mound of earth of sufficient height and length to shield a receptor from sound propagation.

COST PER RESIDENCE (CPR)-In a logical analysis segment, the barrier cost divided by the number of benefited receptors.

DAY-NIGHT AVERAGE SOUND LEVEL (L_{dn})-A 24-hr equivalent sound level with a 10-dBA penalty added to sound levels occurring between 10 PM and 7 AM. This nighttime weighting is applied to account for the assumed increased sensitivity to noise intrusions during nighttime.

EQUIVALENT SOUND LEVEL (L_{AeqT})-Also known as average sound level, the level of steady sound equivalent to the overall A-weighted sound energy of the time-varying sound during the measurement period, T. Typical evaluation periods are: 15 min, $L_{Aeq1/4hr}$; 1 hr, L_{Aeq1hr} ; daytime (7 AM-10 PM), L_d ; nighttime (10 PM-7 AM), L_n ; and 24 hr, $L_{Aeq24hr}$.

EVALUATED HIGHWAY CAPACITY-The highway capacity associated with the roadway configuration-subject of the traffic noise assessment. For new road construction or road improvements (CIP projects), the roadway design capacity; or, for barrier retrofit (non-CIP) projects, the capacity associated with the existing road configuration.

FENCE-A structure, such as made of wooden posts and boards, that may provide visual obstruction but regardless of height or length does not significantly block sound propagation between residences and an adjacent road.

HIGHWAY CAPACITY-The maximum hourly rate at which vehicles can reasonably be expected to traverse a point of a roadway, primarily controlled by roadway geometric characteristics-number of lanes, lane and shoulder widths, lateral clearances, design speed, and horizontal and vertical alignments.

IMPACTED RECEPTOR/HOME/DWELLING-A receptor experiencing a peak-noise Hour equivalent sound level of 67 dBA or higher due to vehicular traffic noise.

INSERTION LOSS (IL)-The decrease in the sound level measured at a receptor location when a noise barrier is placed in the noise propagation path between the receptor and a roadway.

LANDSCAPING-Aesthetic re-grading and vegetative planting that may provide some visual obstruction but do not significantly block sound propagation between residences and an adjacent road.

LEVEL OF SERVICE (LOS)-A qualitative measure of traffic flow conditions (primarily traffic volume and average speed), differentiated into six levels and given letter designations (A through F) where A represents the best operating condition (i.e., low volume/high speed) and F the worst. The greatest noise generation from a roadway generally occurs at LOS-D, characterized by high traffic density with stable, high speed.

LOGICAL ANALYSIS SEGMENT-A portion of a noise assessment study area with reasonably consistent noise impacts. In many cases, a logical analysis segment can be mitigated by a single continuous noise barrier. Logical analysis segments usually are lengths of roadway divided by major intersections (thus, differentiated by significant variations in traffic volume and vehicle mix); or separated by: significantly different topographic conditions or geometric grades, intervening non-sensitive land uses, or varying proximity of homes or different subdivisions.

NOISE ASSESSMENT-A process consisting of: survey of existing ambient sound levels and the prediction of worst-case traffic noise to determine the presence of traffic noise impacts; and, if impacts are found, the design and optimization of noise mitigation measures.

NOISE BARRIER-A barrier may be a berm, wall, berm-wall combination, or berm with retaining wall of sufficient height and length, and adequately impervious to sound to shield a receptor from sound propagation.

NOISE MITIGATION-The reduction of highway traffic noise outdoors at noise-sensitive receptors, most commonly by means of noise barriers. Sound level reductions also may be obtained from speed or vehicle restrictions, buffer zones, or selection of vertical or horizontal alignment.

PEAK-NOISE HOUR EQUIVALENT SOUND LEVEL ($L_{Aeq1hrPk}$)-The highest traffic noise hourly equivalent sound level during a 24-hr period. The noisiest hour is usually-but not always-experienced during the peak-traffic hour.

RECEPTOR-A location of common human activity within a noise-sensitive land use. Noise-sensitive land uses are usually residential, although also considered may be land uses for which serenity and quiet are of extraordinary significance, serve important public need, and where the preservation of those qualities is essential if the property is to continue to serve its intended purpose. (Examples of sensitive non-residential land uses include parts of a park such as band

shells, amphitheaters, retreat/contemplative settings, and areas for sleeping outside. General park areas and areas for active recreation are excluded from this Policy.) Receptors will be evaluated at the approximate height (5 ft) of a person standing at ground level or first-floor dwelling elevation.

SOUND LEVEL (L_A)-The overall magnitude-at a specific instant in time-of the time-varying, sound throughout the frequency range of human hearing and weighted (i.e., "A-weighted") to correspond the frequency sensitivity of human hearing.

TRAFFIC NOISE-The sound produced by highway vehicles operating on public roads, usually the result of mechanical noise from the vehicle internal combustion engine (including engine exhaust, intake, and cooling systems) and noise from the vehicle tires interaction with the road pavement.

WALL-A free-standing structure whose panels are capable of reducing sound transmission by 10 dBA more than the expected barrier insertion loss or at least 20 dBA. Acceptable constructions include concrete, masonry or wood. Pre-cast concrete commercial systems are commonly used for highway applications.

APPENDIX B.

NOISE EXPOSURE QUANTIFICATION

Empirical measurements and analytical predictions are alternative methods to quantify the noise emissions from a road. Each has advantages and disadvantages. Measurements have the advantages of quantifying actual, existing conditions and of being more persuasive to laypersons than predictions. However, measurements have the disadvantages of being subject to sampling errors due to source variation and meteorological conditions and of being relatively costly to perform. On the other hand, predictions have the advantages of permitting quantification of noise sources and conditions that currently do not exist (e.g., the evaluation of noise controls) and of allowing the quantification of numerous locations cost-effectively. However, predictions have the disadvantages of being subject to errors due to site configuration simplifications and activity description inaccuracies, and of being not highly persuasive to laypersons. Measurements and predictions are best used to complement each other with the empirical measurements verifying and calibrating the analytical predictions.

Ambient Noise Measurement. An ambient noise survey is performed to quantify the magnitude of the outdoor environmental noise exposure in a study area and to identify its sources. One or more survey measurement locations are identified within a logical analysis segment to sample the range of noise exposures in the analysis segment (considering receptor distances from the roadway, topographic shielding, varying roadway conditions, and other factors). At a minimum, the survey will consist of short-term measurements performed using an attended sound level meter for measurement periods usually 15 min in length, during which both objective noise metrics (equivalent sound levels and, ideally, statistical percentile sound levels) and subjective observations of noise sources are recorded along with concurrent sound levels. Measurements normally are scheduled for weekdays-usually excluding Monday mornings and Friday afternoons and evenings to avoid possible weekend traffic influences. At each measurement location, measurements are obtained at various times during daytime (with both peak and off-peak traffic) and during other times of day, if appropriate. Repetitive measurements on two or more days are desirable to provide increased confidence in the representativeness of the survey results. In addition to the attended tests, measurements also are desirable at some locations using an unattended noise monitor. Such a monitor records hourly sound level statistics continuously over preferably at least a three-day span of weekdays.

Traffic Noise Prediction. Mathematical formulas have been derived which relate the noise generated by a stream of highway traffic to the volume and speed of the traffic, and the numbers of medium and heavy trucks in the flow. Generally, the heavier the traffic volume, the higher the speed, or the greater the number of trucks-the greater the sound levels produced. Traffic noise prediction procedures have been used routinely in roadway design and have been required practice in Federal- and State-funded highway projects for over 25 yr. They can have excellent accuracy, especially in situations where noise impacts are likely-i.e., for receptors close to moderate-to-high volume roadways.

The U.S. Federal Highway Administration (FHWA) has established standard procedures for the prediction of noise from highway traffic over defined periods (usually 1-hr durations). In 1998, FHWA released the Traffic Noise Model (TNM), which-by virtue of up-to-date vehicle noise emission data and scientifically rigorous computation of sound propagation behavior-is expected to provide more accurate results than previously obtainable. The latest version of the TNM computer program is expected to be the computational procedure used in noise assessments under this Policy.

The traffic noise prediction process involves the creation of a mathematical *three-dimensional* representation (or "model") of a study area that uses points, straight line segments, and defined areas to describe roadways, receptors, and intervening features affecting sound propagation. The geometric model of a road usually consists of line segments representing the centerlines of each of the directional roadways that typically are 400-ft in length but short enough to represent vertical curves within about 2 ft of elevation and horizontal curves within about 5 ft of curvature. The overall length of the modeled road centerlines must extend beyond the outermost receptors by: four times the setback for receptors setback =250 ft from a road, 1000 ft for receptors setback 250-500 ft from a road, and twice the setback for receptors setback =500 ft from a road.

A residential development may be modeled by a representative sample of dwellings:

- The two end houses and every third house if the distance between houses in a row is <200 ft;
- The two end houses and every second house if the distance between houses in a row is >200 ft and <500 ft;
- Each house if the distance between houses is >500 ft; or
- At terrain features different from the surrounding area, e.g., at the top of a hill.

Receptors are evaluated at the approximate height (5 ft) of a person standing at ground level or first-floor dwelling elevation. Barriers are represented by straight-line segments that usually are shorter in length than those used to represent the roadways.

TNM provides for a variety of elements that also may be needed for accurate noise predictions. *Terrain lines* may be necessary to represent salient topographic features, including: hills, ridges, valleys, road cuts, road fill hinge points, and road fill base. *Ground zones* describe surface characteristics and are primarily useful differentiate sound-attenuating, soft ground ("lawn") from acoustically hard surfaces-such as pavement and bodies of water. Where a development with very closely spaced houses is being evaluated, *building rows* may be included in the site model to account for the shielding benefit from front-row houses to receptors setback further from the roadway. (TNM allows for the inclusion of *tree zones*. In practice, the woods in Montgomery County are rarely dense enough to justify their consideration for the receptor distances of consequence in this Policy. Tree zones should only be included in a site model if shown by controlled field measurements to be warranted.)

APPENDIX C
DEVELOPMENT OF THE HIGHWAY NOISE ABATEMENT POLICY
FOR
MONTGOMERY COUNTY, MARYLAND

BACKGROUND

On February 22, 2000, Montgomery County Executive, Douglas M. Duncan, directed the Department of Public Works and Transportation (DPWT) to convene a study group to investigate, develop and propose a comprehensive Noise Mitigation Policy for County Transportation Projects.

The need initiate this effort was based on an increasing number of citizen complaints and the fact that requests for noise mitigation measures have been escalating throughout the County. In some cases the complaints were based on existing traffic conditions. In other cases concerns were the result of proposed road improvements under consideration by the County, where the County had conducted detailed noise studies. Finally, other cases were based on what citizens perceived to be inconsistent treatment on matters of noise mitigation in different parts of the County.

The County Executive recognized the existence and complimentary noise mitigation efforts associated with the County Noise Ordinance, the Noise Control Advisory Board, the Maryland National-National Park and Planning Commission (M-NCPPC) Noise Guidelines, and the fact that the DPWT had been using some internal noise guidelines. Nonetheless, there was no consistent policy for transportation projects by the County. There was no process that had been subject to public review and approval by the Executive or the Council.

As a result of the request, and with the concurrence of the Montgomery County Council, the "Transportation Noise Policy Study Group" was created. The group was made up from representatives of the Departments of Public Works and Transportation and Environmental Protection; the County Council; and the M-NCPPC from the Public Sector. The private sector was represented by representatives from the Noise Control Advisory Board; the Montgomery County Taxpayers League; a citizen representing the Shady Grove Road area; and two outside consultants who had conducted numerous noise studies for the State Highway Administration (SHA), local governments and private developers. Additionally, the SHA provided continuous support and encouragement in the effort. The names of the official representatives are shown on page C-15.

NOISE POLICY DEVELOPMENT PROCESS

The first meeting of the Study Group took place on May 10, 2000. Meetings were typically conducted in the ninth floor of the Executive Building during evening hours. Approximately 30 meetings were held over a 16 month period. All meetings were open to the public, but only official members participated in the discussions and the voting.

Since all the participants had different levels of expertise, the first meetings were devoted to the review of technical terms, analysis methodologies, and the current practices of the County's DPWT, SHA and the Federal Noise Guidelines. The County's road classifications and standards were presented by DPWT and discussed in detail with the Group. In addition, there was coordination with the National Association of Counties and personnel from the Federal Highway Administration (FHWA) with expertise in noise analysis, to determine if other counties in the nation had undertaken a similar task. Our findings indicated that only states had developed Transportation Noise Guidelines. Several counties in the nation have noise ordinances, but no other county had developed its own guidelines to apply to transportation projects from the perspective of the local transportation agency.

As a result of these reviews and briefings, the Study Group agreed that we would use as a starting point the current Maryland SHA "**Sound Barrier Policy**" of May 1998. The technical support and practical experience of the State representatives became an invaluable asset during the Group's discussions.

The Group agreed to try to reach consensus on issues. But to ensure continuity of the process, while maintaining a reasonable policy development schedule, the group adopted certain meeting rules, including the number of members that constituted a quorum, and a 67% rule for approval of matters that required a vote ("consensus"). This Appendix reflects the discussions and recommendations of the Group.

TRANSPORTATION NOISE ANALYSIS

This section of the Appendix addresses technical elements of the transportation noise analysis process.

a) Transportation projects for application:

The Group discussed applicability of the policy to different transportation modes, including railroads and airports. The group recognized the fact that these modes can be source of irritation to adjacent citizens and that at some point in time, the County may consider these impacts. However, for this report, the focus is on noise impacts and mitigation associated with the road network in the County.

b) Land uses to be analyzed / protected.

Montgomery County's Transportation Noise Policy should have as a primary focus **residential** land uses. Consideration should also be given to property for which serenity and quiet are of **extraordinary significance**, serve an important public need, and where the preservation of those qualities is **essential** if the property is to continue to serve its intended purpose. Examples of sensitive non-residential land uses include parts of a park

such as band shells, amphitheaters, retreat / contemplative settings and areas for camping. General park areas, and areas for active recreation are excluded from the policy.

Commercial and industrial land uses are excluded. Applicability to churches, libraries and schools is typically excluded since the principal need for acceptable noise levels occurs on the interior of these facilities, rather than in outside areas. However, there may be cases in which quiet in exterior areas may be of extraordinary importance or significance for the proper function of the facility. In those rare circumstances, the policy may be used.

For purposes of this policy, noise impacts will be evaluated on the basis of existing land uses. Existing land uses are defined as: developments already built, or unbuilt residential developments that have received preliminary plan approval by the Planning Board, at the time of the noise study. Future residential land uses should be examined at the time of subdivision development.

c) Subdivision Approval Process.

Although the subdivision development approval process is outside the purview of this policy, it became evident that the avoidance of future undesirable noise problems can be best addressed during the development, review and approval process for residential subdivisions. For this reason, the policy urges that the Planning Board require, as part of the development review process, the developers conduct mandatory noise studies and that they provide feasible and reasonable noise mitigation as part of their developments.

In these cases, the noise analysis must take into consideration the alignment and classification of the roadway system adjacent to the proposed subdivision, as contained in the latest Adopted and Approved Master Plan for the area in which the subdivision is being considered. All Master Plan roads with classifications of Arterial or higher, should be assumed as already built for purposes of the subdivision noise analysis. The number of lanes and traffic volume estimates should be those expected to occur within the next 20 years, or those volumes estimated to bring the road to level of service D, whichever results in the worse noise condition.

d) Noise Measurement Scale

The Group recognizes that there are several measurement scales for purposes of analyzing and setting threshold sound levels. For example, the County's Noise Ordinance establishes daytime and nighttime standards in maximum A-weighted sound levels (L_a) not to be exceeded at the nearest "receiving property line" and the M-NCPPC guidelines specify day-night average sound levels (L_{dn}). However, for consistency with State and Federal procedures for transportation projects, the peak-noise hour equivalent sound level ($L_{aeq1hrPk}$) will be used; and the units will be dBA (decibels, A-weighted, to better reflect the human ear sensitivities.)

e) **Location of “Receptors” for the Noise Analysis**

One of the factors affecting sound level is the distance from the source of noise to the receptor. Depending on the size and configuration of residential lots, sound levels can vary noticeably when measured and/or calculated at the edge of the right of way line, or immediately adjacent to the exterior wall of a home. For the Transportation Noise Policy, the noise analysis will be conducted assuming that the receptors will be located in *an area of common human activity* within the residential lot. This location will generally be between the right of way line and the closest wall of the residence to the highway. This location is consistent with State and Federal practices.

In the study of a highway corridor, the County will take short duration noise measurements at sensitive locations that are representative of the area. For control purposes, and to allow the calculation of day-night sound levels, there will be at least two 24-hour noise-monitoring stations as part of the noise studies for a highway corridor.

f) **Noise analysis Model To Use**

Several models for noise analysis have been developed during the years by the FHWA. For consistency of methodology and results, the County policy will use the latest analysis model in use by the SHA. At this time, the County will use the Traffic Noise Model. To ensure the validity of the noise model, the model should be calibrated so that the predicted sound level for existing conditions at a given location correlates accurately with receptor measurements taken at the same location.

g) **Noise analysis on existing vs. new road projects**

There are different criteria in the Maryland SHA noise policy for noise on existing road conditions than the noise conditions that may result as a consequence of the construction of a new project. The difference is in part due to the fact that different criteria exist for the use of federal aid associated with road projects in the State. Montgomery County does not receive federal aid for road construction. (The County receives federal aid for some bridges, and pedestrian / bicycle facilities.)

There will not be such a distinction in the County’s Transportation Noise Policy. The noise analysis and criteria for abatement will be applied in the same manner to noise conditions on existing roads or to the sound levels expected as a result of changes to the road system (new roads, widening, etc.)

h) Definition of “logical segments” or “unit of analysis”

Road widening and new road construction is linear in nature. The length of a transportation project could be as little as a few hundred feet or as much as several miles in length. In the latter case, noise impacts can vary significantly within segments of the project, in part because of significantly different topographic conditions, varying proximity of homes in different subdivision developments to the road, significant variations in traffic volumes, vehicle mix of trucks and automobiles, geometric grades, etc.

The County Transportation Noise Policy will be applied to logical segments of a project. These are defined as segments where it is feasible and reasonable to build a continuous noise wall or berm. Under this policy, logical segments will be typically defined as: sections of road between the combination of any of the following: major intersections, major natural features, or non-sensitive land uses.

Public Sector expenditures for noise abatement will always compete with expenditures for other purposes. It is conceivable that on a long road project the noise abatement criteria may be met in several segments, yet not all of the noise mitigation may be built at the same time, due to budgetary constraints.

i) Noise Abatement Criteria

Federal noise abatement criteria sets 67 dBA as the hourly A-weighted sound level where abatement criteria must be considered for road projects that use federal aid. Federally sponsored research indicates that this is the sound level at which many people perceive that speech interference is beginning to occur. The SHA considers sound barriers for noise sensitive areas along existing highways, with full controls of access, where existing sound levels equal or exceed 66 decibels. Montgomery County does not build highway projects with federal aid, and does not build and operate “full control access roads” (typically freeways with access control at grade separated interchanges).

Montgomery County will consider transportation noise abatement only when the sound level **equals or exceeds 67 dBA** for the peak-noise hour [L_{aeq}1hrPk] as a result of traffic operations on the highway system.

In the case of multi-story buildings or homes with several levels, noise impacts and abatement will be considered only for the ground level of the residential unit.

j) Applicability to County, State and Other Roads

County Citizens and taxpayers live adjacent to both State and County roads. The policy provides a process for noise assessment and recommends that the County must consider protection from sound levels equal or above 67 dBA along any road in the County, regardless of who builds and maintains the road.

The Group discussed and recommended that whenever residents being affected by noise on a State road contact the County, the County will submit a formal request to the SHA for their conduct of a noise study.

If after the State conducts the study the SHA noise criteria are met, the County would consider a financial contribution of up to 20% of the State's cost. If SHA abatement criterion is not met and County criteria are met, the project would be considered as a candidate for prioritization of abatement by the County. If the project is in the high priority list then the County would request SHA to participate in the cost of mitigation on a 50%-50% basis with the County, up to a maximum by SHA of \$25,000 per home benefited.

If SHA agrees, the project will be recommended for financing by the County. If SHA disagrees, the project will compete with others in the County on an equal basis.

During the comment period, however, the SHA made it clear to the Group that based on their policy, the retrofit program is limited to fully controlled access highways, and that any inquiries for non-fully controlled access highways would result in an SHA decision not to do any analysis. Thus, the County would have to do all the analysis, recommendations and totally fund any walls along state roads that do not have full controlled access (most state roads in the County, excluding the Interstates).

However, it must be understood that the County must obtain agreement and permits from the State to implement any abatement measures within the State's right of way. Failure to obtain such agreements or permits will make the noise abatement unfeasible.

The County will consider participation for noise abatement on cities and municipalities' roads, provided the municipality has developed and implemented noise guidelines and standards that are at least as stringent as the County's for subdivision approvals. The level of participation will be discussed with each jurisdiction on a case by case basis. The Montgomery County Council will have final budgetary authority and approval of the negotiations.

k) Traffic Data: Volumes, Percentage of Trucks and Speeds

The volume of traffic on the highways and roads directly affects transportation sound levels. As a rule of thumb, doubling of the traffic volume on a given facility will increase the sound level by about 3 dBA, assuming all other factors remain the same. The

percentage of trucks on the road also has a direct effect on the sound level. In general, it is estimated that one truck can produce an equivalent sound level to that produced by 10 automobiles, depending upon vehicle specifications. Finally, the sound level increases with higher operating speeds.

For the purpose of the County's policy the Study Group recommends the use of the traffic volume which produces the highest sound level: the 20-year traffic projection or the traffic volume that would place the facility at level of service D, if that level is reached within the next 20 years. Truck percentages should be based on actual classification counts on the facility or similar facilities in the County, adjusted by known factors.

The posted speed limit should be the speed used for the purpose of analysis and mitigation consideration, unless it can be shown that the speed associated with Level of Service "D" for the road under analysis is higher.

NOISE ABATEMENT PROCEDURE

Construction of noise abatement for transportation corridors will only be implemented for projects that meet feasibility and reasonableness criteria, as further discussed below.

- **Feasibility**

Feasibility of noise abatement will be defined as the engineering ability for the construction of sound barriers that are not too disruptive of other physical and environmental features, and the acoustical ability to provide effective noise reduction. Sound barrier feasibility will be based upon the following factors:

- a) If the placement of a noise barrier will restrict pedestrian or vehicular access or would cause a safety problem, such as limiting sight distance, the barrier will be considered infeasible. This analysis will be made using standard engineering AASHTO procedures for the determination of sight distance.
- b) The feasibility of a noise barrier will take into account the costs associated with modifications that may be necessary as a result of its implementation to existing landscaping, drainage systems, utility relocations, and land ownership. In cases where the implementation of a sound barrier requires the use of privately owned land, it is expected that the necessary property will be donated or permanent easements granted to the County for its implementation. Otherwise, the sound barrier may be considered infeasible. (The County does not have the ability to quick take property for sound barrier installation.)
- c) For a noise barrier to be considered feasible, it must achieve a minimum reduction of seven decibels for receptors with the highest sound levels (typically the first row receivers in existing developments).

Only barriers that are determined to be feasible will be recommended to the County Council for consideration.

- **Reasonableness**

Each logical transportation segment will be evaluated to determine if construction of a sound barrier is reasonable. Reasonableness will be based upon the following:

- a) For a noise barrier to be considered reasonable, the measured or projected sound level must equal or exceed 67 dBA.

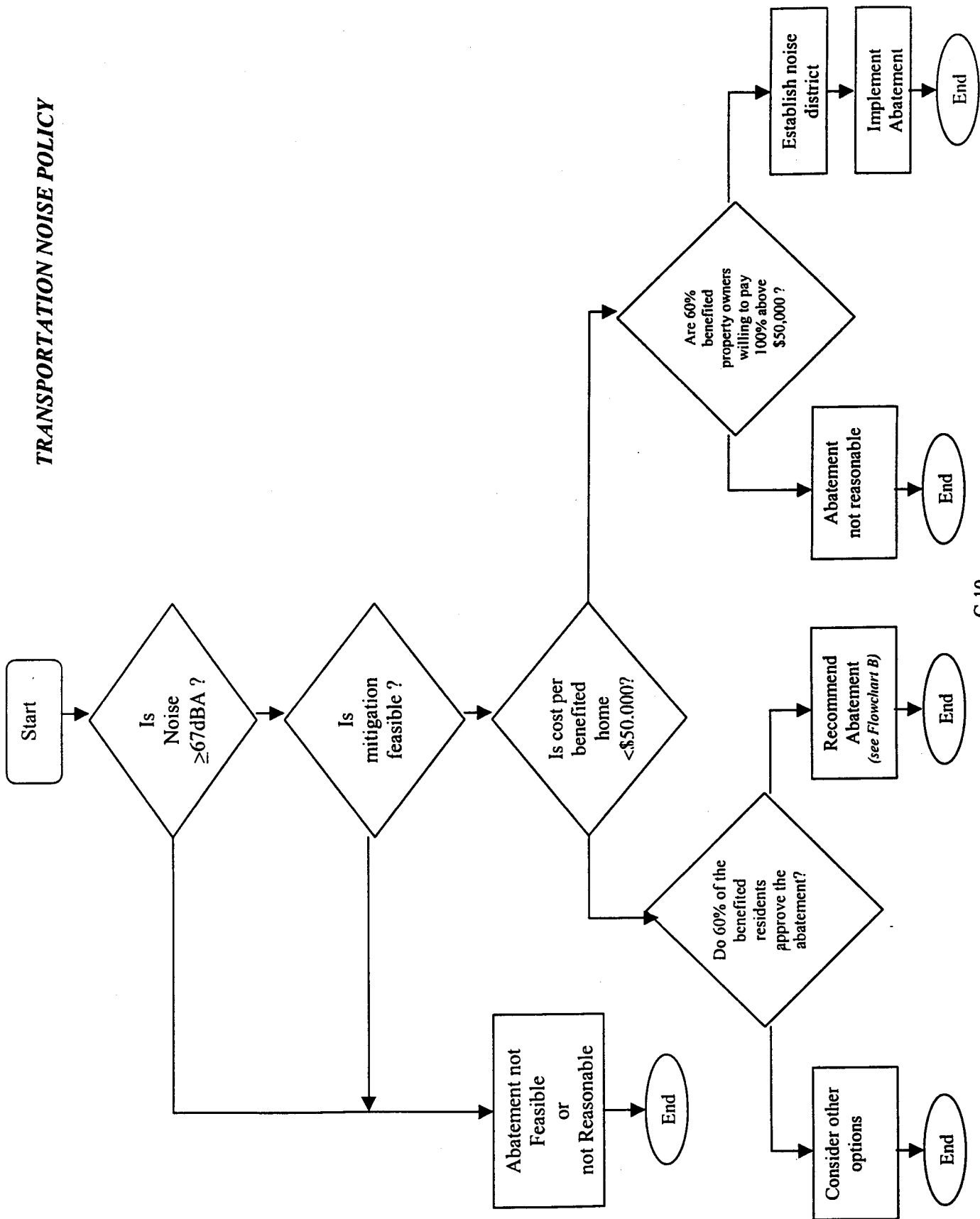
- b) Cost effectiveness, community acceptance and possible community financial participation are important measures of reasonableness. This policy considers that \$50,000 per benefited residence is a reasonable threshold for public participation on implementation of noise abatement measures. The policy also recommends that the time of the purchase of a noise impacted home must be taken into consideration in the determination of reasonableness. Finally, since there is the possibility of financial impact on those properties that are considered benefited by the construction of noise abatement, an 60 percent approval rate of the mitigation measures by the same benefited property owners is expected.

Flowcharts A and B will be followed in determining the reasonableness of a given segment of road.

- c) The noise analysis procedures in existence “optimize” the cost effectiveness of sound mitigation barriers, including their height. If very tall sound barriers would have to be located close to impacted receptors, and would have negative visual and/or property value impacts, the sound barrier may be considered not to be reasonable. The classification of the road, the right of way width, and the proposed features on the opposite side of the road will be considered in making a determination of reasonableness.
- d) Reasonableness will take into consideration the effect of a sound barrier on environmental and historic resources.
- e) It is expected that fiscal constraints will result in the fact that not all-feasible and reasonable road segments can be implemented in a given year. The County Council will need to prioritize which projects will be implemented in a given year, given the budgetary allocations to the noise abatement program. Some communities may elect to have alternative measures be implemented instead of the “optimized wall”. Wooden fences and / or landscaping maybe alternatives available to the community for implementation by the County. In these cases, public funding will be 100 percent, except for any possible right of way needs. It is expected that necessary easements will be given to the County at no cost.

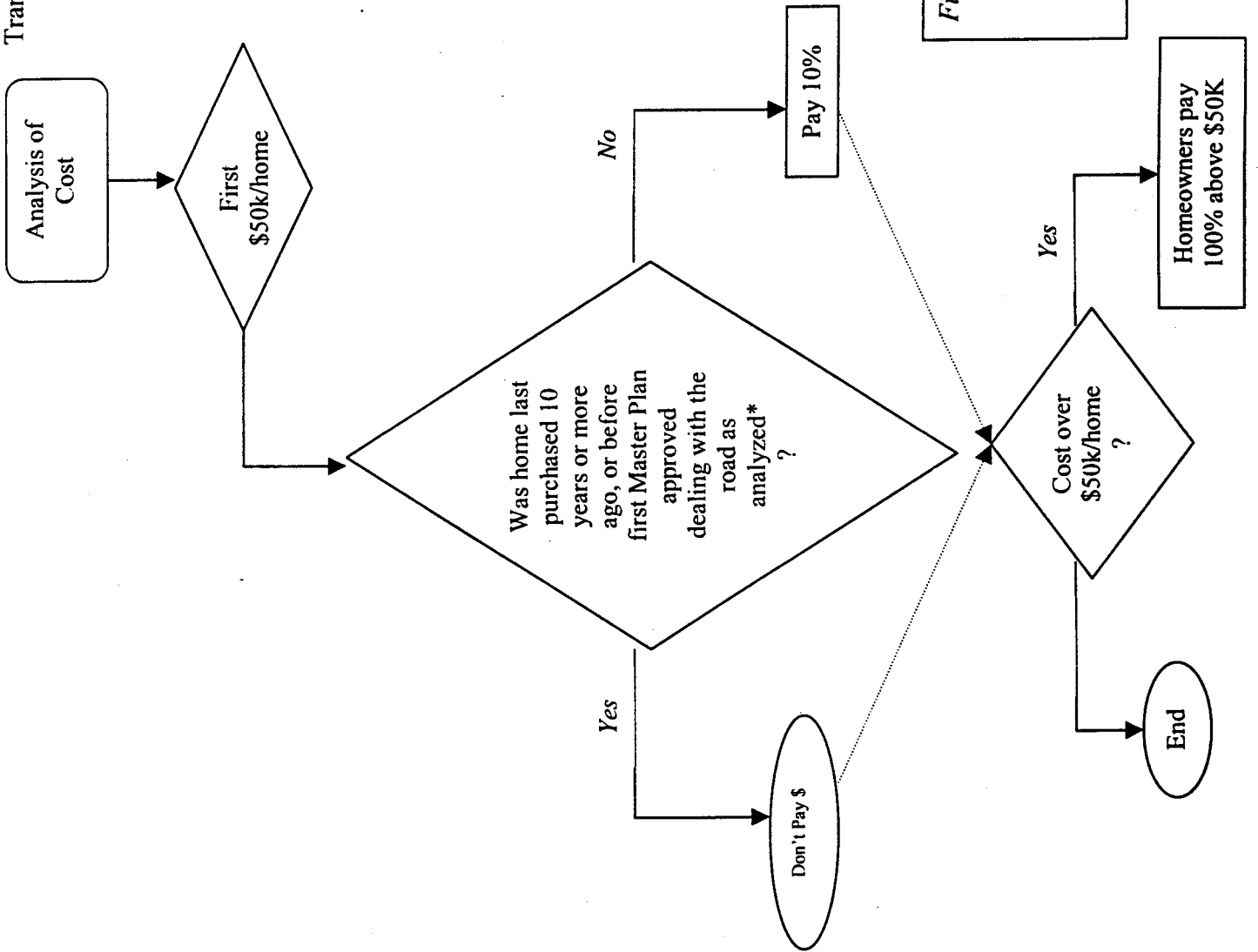
Flowchart C will be followed in these cases.

TRANSPORTATION NOISE POLICY

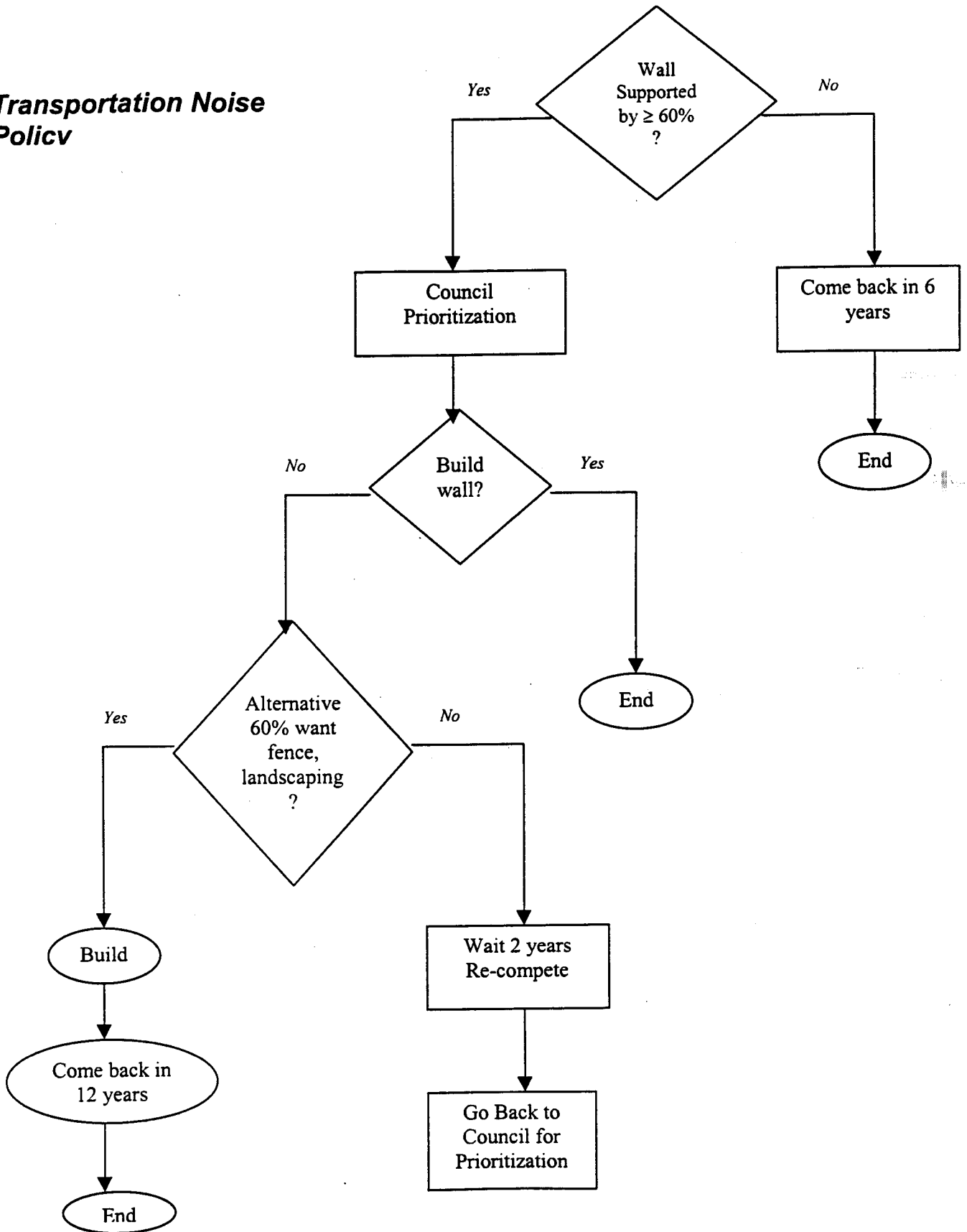


Transportation Noise Policy

Flowchart B



**Transportation Noise
Policy**



PRIORITIZATION OF MITIGATION

The Group is cognizant that there is likely to be more requests for noise mitigation than there is money to fund the requests. As a result the Group discussed the factors that should guide the Executive in making recommendations to the Council to prioritize implementation of mitigation measures.

The Group identified 18 different criteria that could be considered. Each factor was discussed and prioritized through a value-vote process. Each member was given a total of 18 votes to distribute among the 18 criteria. A maximum of five votes could be assigned to any one criterion. Table C-1 shows the factors and the resulting raw vote.

In order to simplify the prioritization criteria, the Group further discussed the results of the raw votes. Examination of the criteria with the highest votes and those, for which at least six members voted as important in the prioritization, the Group identified seven criteria to be used. By normalizing the number of votes obtained for the seven and rounding it off to multiples of five, the Group recommends that the criteria and weight shown in Table C-2 be used in the screening of projects to be recommended for implementation.

It is well understood that this methodology is the first level of prioritization, for recommendations to the Council. However, the Council will make the final decisions based on these recommendations and other factors that they consider relevant to the final decisions.

Finally, to facilitate differentiation of the facilities, the Group agreed that in any given year the results be transmitted to the County Council grouped by County Roads, State Roads and Other Roads.

Table C-1 - Prioritization Criteria – Raw voting

Prioritization Criteria	#1	#2	#3	#4	#5	#6	#7	#8	#9	Sum	Percent
Sound level	5	4	3	4	4	3		4	5	32	19.8
24 hour noise impact	2	3	1	3	3	1	5	1		19	11.7
Impact of County Operations		2	1							3	1.9
Impact of commercial operations		1	1							2	1.2
Road Improvement approval (CIP)		1	1					1		3	1.9
Projected time to real LOS "D"		1		3	2		3	1	3	13	8.0
Houses existed prior to road in M.PI.	2	2	1	2	1	1				9	5.6
Public Knowledge/disclosure		1	1	2	1	2	2		3	12	7.4
Percent level of citizen approval			1		2	2				5	3.1
MNCPPC noise guidelines used?		1	1			1	3	1		7	4.3
Number of non-residential beneficiaries							3	1		4	2.5
County cost per benefited household			1		1	1		5		8	4.9
Number of households benefited	5	1	1	2	2	1			3	15	9.3
Residential cost per household			1	1		1		1		4	2.5
Environmental impacts to implement										0	0.0
Citizen Association endorsement		1	1			1				3	1.9
Extent of benefit (noise reduction)	4		1		2	1	2	2	4	16	9.9
Effect of future M.Plan transp. Impacts			2	1		3		1		7	4.3
Totals	18	18	18	18	18	18	18	18	18	162	100

Table C-2 - Prioritization Criteria: Final Weighting

Sound Level	30
Noise Impact for 24 hours per day	15
Projected time to reach Los "D"	10
Houses predated M. Plan Road	10
Public notice vs. time of home purchase	10
Number of households benefited	15
Extend of benefit (Noise reduction)	10
TOTAL	100

ATTACHMENT C-1

NOISE STUDY GROUP MEMBERSHIP

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County Council

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Staiano Engineering, Inc.

George Sauer, member, Board of Directors
Montgomery MC Taxpayers League

Rudy Volin
Noise Control Advisory Board

Dr. William M. Labuda
Derwood Community Representative

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Cleonice Tavani, President
Montgomery County Taxpayers League

Noise Control Advisory Board (Alternate)
Bernard Rod, Chair
Noise Control Advisory Board

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