AGENDA ITEM #3A
March 23, 2010

Introduction

MEMORANDUM

March 19, 2010

TO: County Council

FROM: Glenn Orlin, Deputy Council Staff Director GO

SUBJECT: **Introduction**—resolution to revise the Highway Noise Abatement Policy

The Department of Transportation has transmitted proposed revisions to the County's Highway Noise Abatement Policy, which are based on the deliberations of the Noise Policy Study Group. DOT's transmittal memo is on ©A, a summary of the proposed revisions are on ©B, a draft resolution that would revise the policy is on ©C-D, and the policy with its proposed revisions follows after.

The Transportation, Infrastructure, Energy and Environment (T&E) Committee review the proposed revisions on April 8.

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DEPARTMENT OF TRANSPORTATION

Isiah Leggett
County Executive

Arthur Holmes, Jr.
Director

054830

MEMORANDUM

March 5, 2010

TO: Nancy Floreen, President
Montgomery County Council

FROM: Arthur Holmes, Jr., Director
Department of Transportation

SUBJECT: Noise Abatement Policy

Attached, is the amended Highway Noise Abatement Policy which has been approved by the County Executive for transmittal to the Council for final action.

The proposed changes are the result of the work of a Task Force set up by the Executive Branch, following the request from the County Council. Members of the Task Force are listed in on the last page of the Policy Amendment.

If you have any questions, please contact me or Edgar Gonzalez, at 240-777-7185.

AH:lh

Attachment

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Office of the Director

101 Monroe Street, 10th Floor • Rockville, Maryland 20850 • 240-777-7170 • 240-777-7178 FAX
www.montgomerycountymd.gov
Located one block west of the Rockville Metro Station

Highway Noise Task Force 2008

Summary of revisions to the Highway Noise Abatement Policy
(All changes highlighted)

* The term Logical Analysis Segment (LAS) was removed from the Policy. It was replaced with the term Logical Implementation Segment (LIS) using a more specific definition of segments where the highway noise is investigated and mitigation is implemented. (Pages 2, A-2, and C-5)

* The process for public notification and "voting" by communities was modified to provide two public information meetings: an initial public information meeting where concept design information is provided and initial "voting" is done, and a second meeting where semi-final design information is provided and second and final "voting" is conducted. (Page 4)

* The limit of County's cost participation to implement the program was increased from $50,000 per dwelling to $100,000. (Pages 4, 5 and C-7)

* The County's cost participation threshold is now pegged to the co-pay threshold used by Maryland State Highway Administration (MSHA) for their highway noise abatement program. The County will revise this threshold when MSHA revises their threshold. (Page 5)

* Text was added to clarify actual amount of cost participation (exact co-pay amount, where applicable) by each property owner. (Page5)

* The method for computation of the peak noise (hourly average) was revised to exclude non-impacted receptors beyond the first row of homes that are not at 67 dBA. (Page 6)

* The formula for computing the score of each Logical Implementation Segment was revised as follows (Pages 6 and 7):

  - The Day-Night component was eliminated.
  - The maximum score for the peak noise impact (NIP) was increased from 30 points to 40 points. The top noise level was increased from 72 decibels to 75 decibels to give more weight to the receptors with the noisiest levels. The threshold for noise mitigation remains unchanged at 67 decibels
  - The scoring scale for Home Construction Date (HCD) and Home Purchase Date (HPD) were modified and streamlined.
  - The maximum score for Number of Benefited Homes (NBH) was reduced from 15 points to 10 points. The scoring scale for NBH was modified and streamlined.
  - A new component for cost-effectiveness was added to the score formula. The Average Cost per Benefited Home (CBH) has a maximum score of 10 points.
  - The scoring scale for Insertion Loss (IL) was modified and streamlined.

RESOLUTION_____
INTRODUCED_____
ADOPTED_____

COUNTY COUNCIL
FOR MONTGOMERY COUNTY, MARYLAND

By County Council

SUBJECT: Revisions to the County Highway Noise Abatement Policy

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BACKGROUND

1. On February 22, 2000 the County Executive directed the Department of Public Works and Transportation (DPWT) to convene a Noise Study Group of residents and County staff to develop a comprehensive Highway Noise Abatement Policy for roads in Montgomery County. The Noise Study Group transmitted its draft policy to the Executive in the summer of 2001.

2. The Executive transmitted his recommended Highway Noise Abatement Policy to the Council on September 13, 2001. The Council reviewed the policy on September 25, 2001 and forwarded revisions to the Executive in a letter of September 26, 2001.

3. During its review of the Montrose Parkway West project in 2002, the Council revised the policy to change the requirement that benefited homeowners pay part of the cost of noise walls, in certain circumstances.

4. On June 22, 2006 the Chief Administrative Officer transmitted a set of proposed revisions to the policy to provide better clarification of several provisions.

5. On August 1, 2006 the Council approved a set of revisions to the policy in Resolution 15-1565.

6. In 2006 the Council requested the Department of Public Works and Transportation to reconvene the Noise Study Group to address other issues that had been raised by its staff in administrating the policy as well as certain issues raised by citizens.

7. In Fiscal Year 2008 a reconstituted Study Group was convened, and it ultimately produced a set of recommendations in the summer of 2008.

8. On March 5, 2010 the Department of Transportation transmitted recommended changes to the Highway Noise Abatement Policy that were approved by the Executive.

ACTION

The County Council for Montgomery County, Maryland amends Resolution 15-1565, revising the County's Highway Noise Abatement Policy.

Attachment – revised County Highway Noise Abatement Policy

This is a correct copy of Council Action.

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Linda M. Lauer, Clerk of the Council

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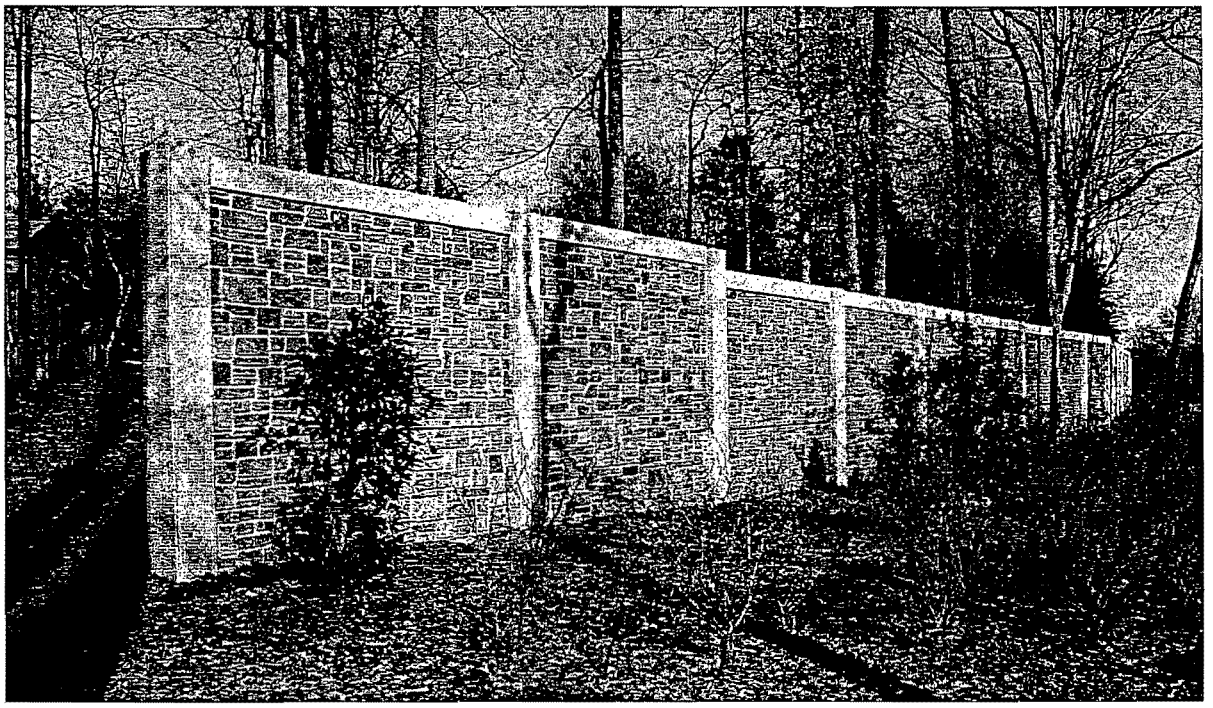
Highway Noise Abatement Policy



MONTGOMERY COUNTY, MARYLAND

OCTOBER 2001

AMENDED MARCH 2010

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. 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~~ IMPLEMENTATION SEGMENTS. A logical ~~analysis~~ implementation segment is a portion of a noise assessment study area with reasonably consistent noise impacts ~~In most cases, a logical analysis segment is a segment~~ where it is feasible and reasonable to build a single continuous noise wall. ~~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: major natural features, significantly different topographic conditions or geometric grades, intervening non-noise-sensitive land uses, or varying proximity of homes.~~ Logical implementation segments usually are lengths of roadway separated by intersections, major natural features, significantly different topographic conditions or geometric grades, intervening non-noise-sensitive land uses, or varying proximity of homes to the road.

A NOISE ASSESSMENT will be performed for any new road construction or improvement project judged likely to produce unacceptable noise exposures to existing or approved-future residential development. For existing roads, a noise assessment will be initiated only after all of the following conditions are met: (1) a written request by at least 50 percent of the property owners of the first row of homes abutting the road segment to be analyzed; (2) the written support of the Citizens or Homeowners Association, if one exists; and (3) a preliminary assessment from the Department of ~~Public Works and~~ Transportation that noise abatement may be warranted, and it may be reasonable and feasible.

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 ($L_{Aeq1hrPk}$) 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 preformed 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. Properties on which the implementation of the noise mitigation measures creates temporary or permanent property impacts will be considered AFFECTED (AFFECTED BY CONSTRUCTION).

Mitigation Design. When traffic noise impacts have been determined to exist in a logical ~~analysis~~ implementation 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. The design analysis will be for the ultimate right-of-way as indicated in the most recent approved and adopted edition of the Master Plan, except for projects that have completed Phase-I of the Transportation Facility Planning under the facility planning process and the study shows that the ultimate right-of-way shown is excessive. 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~~ implementation 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~~ $100,000 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

The information on highway noise mitigation will be presented to each community in up to two community meetings.

Mitigation Approval. When the traffic noise assessment has been completed with findings that traffic noise impacted receptors exist and mitigation is reasonable and feasible, the first community meeting will be scheduled to present the assessment results and propose the concept barrier design to the benefited residents. The concept design will provide the approximate geometry, location and cost of the proposed mitigation measures based on pre-established average costs for design, construction, and requisite project management. The community will vote on the concept design. 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. Noise barriers for which right-of-way from property owners are needed for construction and/or maintenance of the barrier must have approval of 100% of the property owners from whom right-of-way is needed.

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.

Communities with 60% or higher approval of concept design will then compete for funding for final (comprehensive) design and construction. Communities selected by Council for mitigation will be presented with the semi-final design of barriers at a second public information meeting. The semi-final design will provide a more exact geometry, location and semi-final estimate of project implementation costs. The community will vote on the semi-final design. If the semi-final design of project is approved by 60% of the impacted-and-benefited and 100% of property owners from whom property is needed, the project would proceed to final design and construction.

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, except in extraordinary circumstances, 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 own homes built 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~~ $100,000. Costs above ~~$50,000~~ $100,000 per benefited residence will be covered fully by the benefited property owners. The County's cost participation threshold will be pegged to and will follow the cost participation threshold established and used by the Maryland State Highway Administration for its highway noise mitigation program. ~~If a road were first identified in a Master Plan to be built or widened within ten years of the Noise Assessment, then benefited residences built after the Master Plan designation would be required to pay all costs above $100,000 per residence. In other words, the County will pay the full cost if the cost per residence is less than $100,000 and the road has been first identified in a Master Plan to be built or widened less than 10 years prior to the assessment.~~

The project cost and the cost-participation amount, if any, provided to affected and benefited home owners will be based on the semi-final design cost estimate. Should the actual bids for a project exceed the engineer's estimate, and the contract is awarded to the lowest bidder, the amount of cost-participation for the community would remain at the level they had agreed to pay; the County would be responsible for any additional costs to implement the project. If the actual total project implementation cost is lower than the semi-final cost estimate presented to the community, the co-pay will be based on this lower actual amount.

Cost participation by the property owner(s) will be assessed on the property tax of each of the subject properties where cost participation is required by the impacted and benefited home owners. The tax assessment will be for a 20-year period and at the same interest rate as the bond rate used for the financing of the subject noise mitigation project by the County. The option of payment in less than 20 years or one upfront lump sum payment will also be made available to each property owner who has to participate in the cost of the noise mitigation project. The cost participation by the subject property owner(s) shall commence at the completion of the construction of the subject noise mitigation project. The County will notify the affected property owners at such completion.

Flowcharts A and B will be used in the determination of reasonableness, as given in Figures 1 and 2. In the case where the co-pay would constitute an economic hardship on a property owner, it could be deferred until the sale of the unit or, in extraordinary circumstances, part or all of it could be waived.

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 based on the concept design information (with best available data at that time):

- *Noise Impact during Peak-Noise Hour:* This factor, NIP, has a maximum score of ~~30~~ 40 and 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~~ implementation segment per Table 1. In cases where the ~~LAS~~ LIS contains less than five dwellings, the actual number of dwellings will be used to compute the arithmetic average. The not-impacted receptors (below 67 dBA) that are beyond the first row of homes (e.g. 2nd or 3rd row) will not be included in computing the peak-noise hour equivalent sound level. Average noise levels shall be rounded to whole numbers.

- ~~*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~~ 2. 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~~ Prior to Road Master Plan:* This factor, HCD, has a maximum score of 10 and is determined based upon the number of impacted homes in the logical ~~analysis~~ implementation segment constructed prior to the date of the first Adopted Master Plan which includes the road at its evaluated highway capacity per Table ~~4~~ 3.

- *Home Purchase Date:* This factor, HPD, has a maximum score of 10 and is determined based upon the number of impacted homes in the logical ~~analysis~~ implementation segment purchased 10 years prior to the date of the noise assessment and it is evaluated per Table ~~4~~ 3.

- *Number of Benefited Homes:* This factor, NBH, has a maximum score of ~~15~~ 10 and is determined from the total number of benefited dwellings in the logical ~~analysis~~ implementation segment per Table ~~5~~ 4.

- *Average Cost per Benefited Home:* This factor, CBH, has a maximum score of 10 and is determined from the average implementation cost per benefited home in the logical implementation 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~~ implementation segment per Table 6.

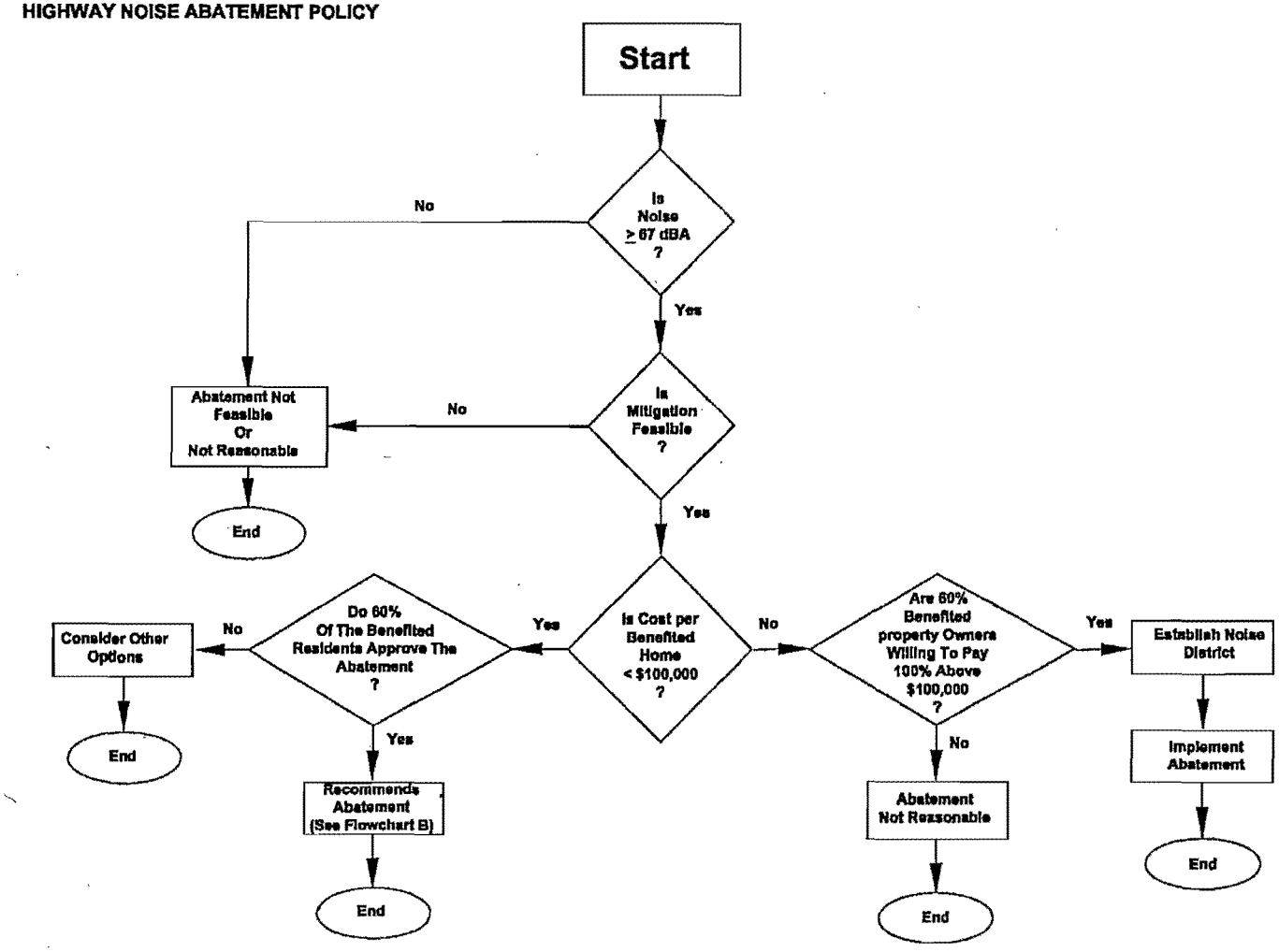
For each candidate barrier project, the project score will be:

S = NIP + ~~NDN~~ + TLOSD + HCD + HPD + NBH + CBH + EOB

Project scores will be presented to the County Council by category: County Roads, State Roads, and Other Roads biennially in the winter prior to the approval of a new Capital Improvements Program.

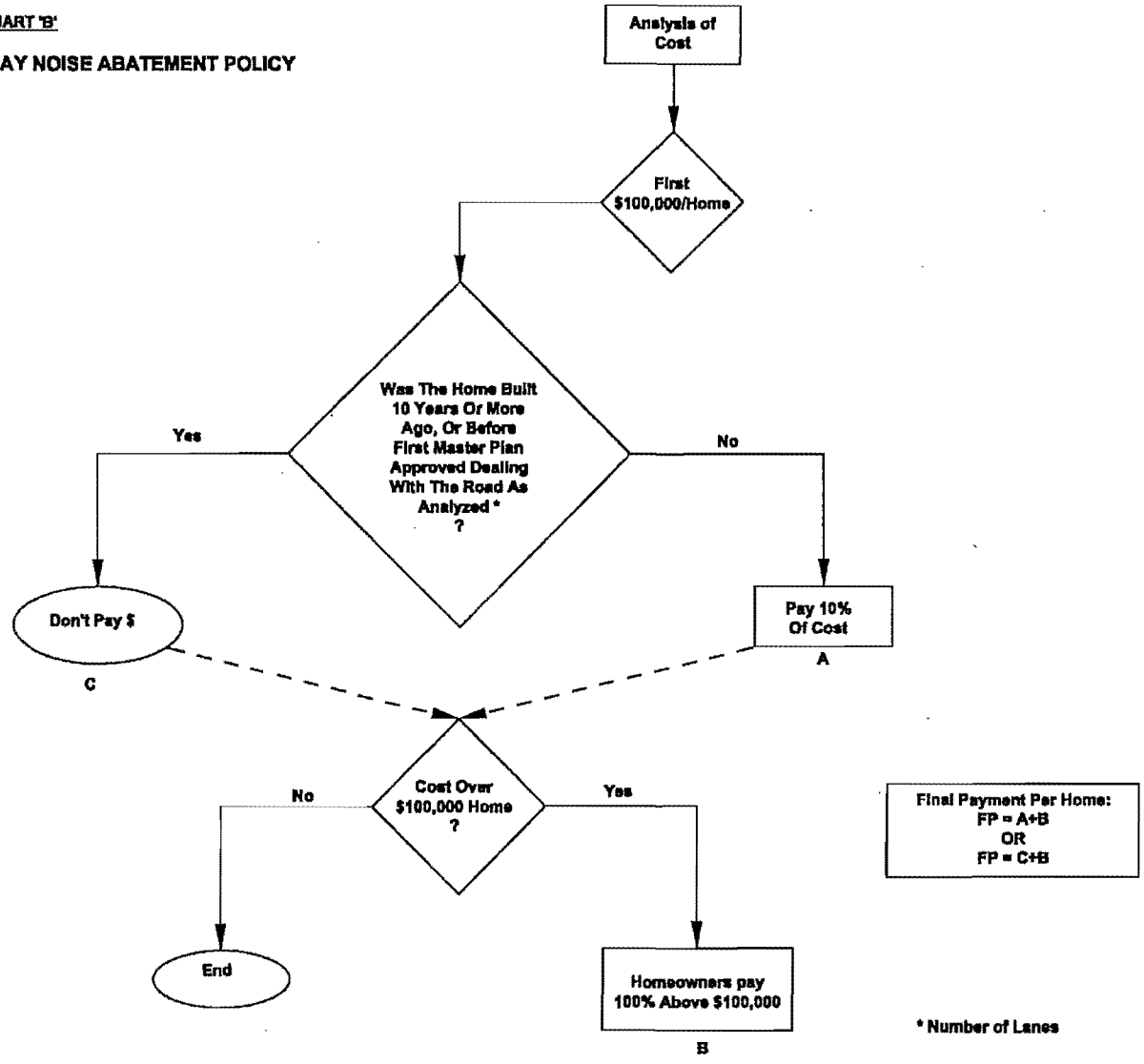
FLOWCHART 'A'

HIGHWAY NOISE ABATEMENT POLICY



FLOWCHART 'B'

HIGHWAY NOISE ABATEMENT POLICY



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. The score computation and the cost participation for each community must be updated every two years. 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.

A community, whether it has met or has failed to meet the criteria for noise mitigation, must wait a minimum of six (6) years from the completion of the latest noise study before being eligible to request a new noise study. Such a noise study will only be conducted if there has been a significant change in the traffic volumes or in the traffic composition in the roadway network surrounding the noise study site due to roadway projects or developments in the area.

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

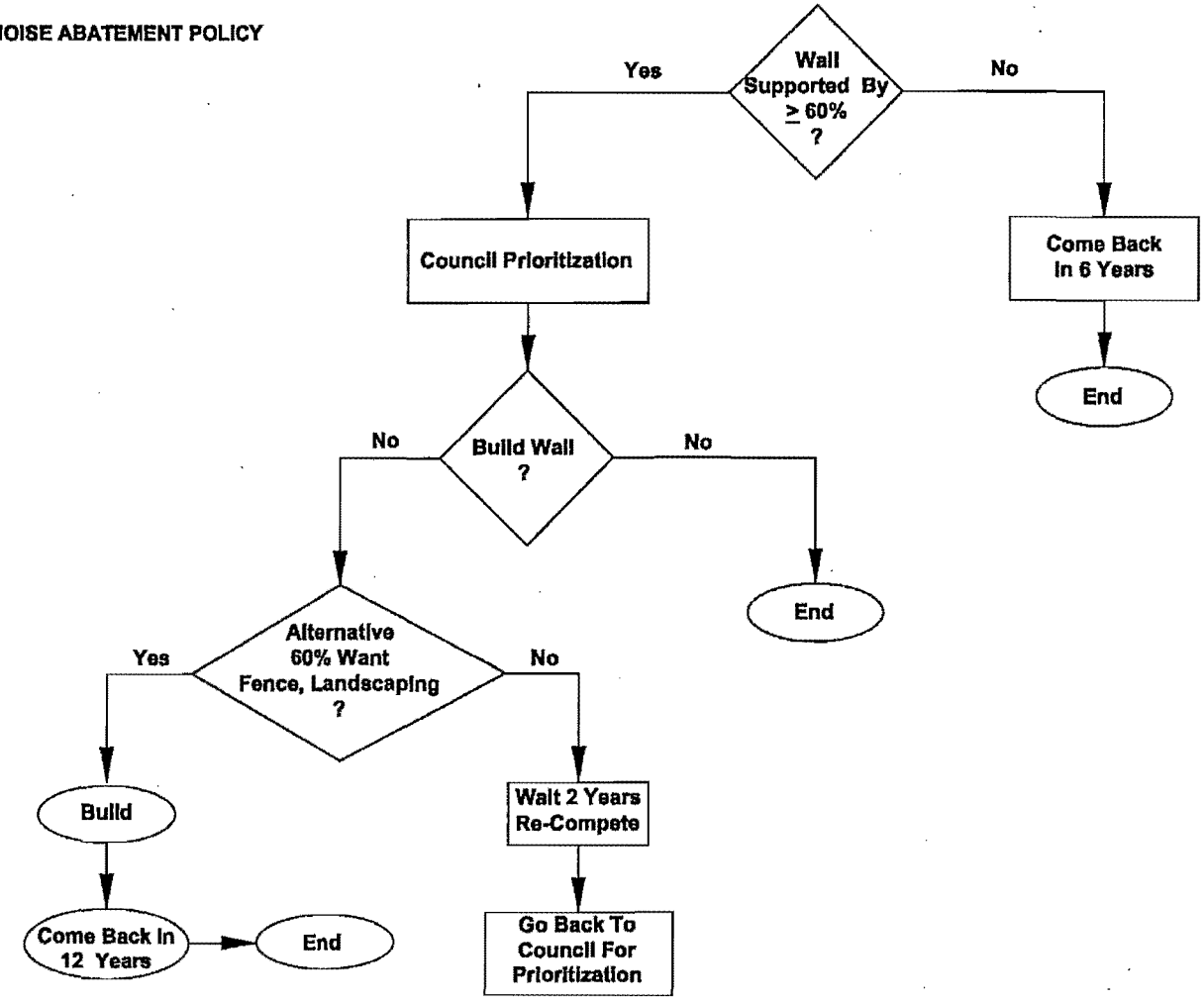
The Maryland-National Capital Park and Planning Commission/Environmental Planning Division has developed recommended guidelines to manage transportation noise impacts in Montgomery County, "...as an aid to developers, planners, and decision-makers in assessing the extent of transportation noise problems 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'

HIGHWAY NOISE ABATEMENT POLICY



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 IN 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~~ implementation segment. In cases where the LIS contains less than five dwellings, the actual number of dwellings will be used to compute the arithmetic average. The not-impacted receptors (below 67 dBA) that are beyond the first row of homes (e.g. 2nd or 3rd row) will not be included in computing the peak-noise hour equivalent sound level. Average noise levels shall be rounded to whole numbers.

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

$L_{Aeq1hrPk}$ (dBA)	NIP
≥75	40
74	37
73	34
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~~ 2. 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~~ 3. SCORING FACTORS FOR HOME CONSTRUCTION DATE AND HOME PURCHASE DATE ~~RE~~ PRIOR TO ROAD MASTER PLAN

HCD is determined based upon the number of impacted homes in the logical ~~analysis~~ implementation 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 impacted homes in the logical ~~analysis~~ implementation segment last 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~~

NUMBER of Impacted Homes	HCD	HPD
≥ 31	10	10
26-30	9	9
21-25	8	8
16-20	7	7
11-15	6	6
6-10	5	5
1-5	4	4

TABLE ~~5~~ 4. SCORING FACTORS FOR NUMBER OF BENEFITED HOMES

NBH is determined from the total number of benefited dwellings in the logical ~~analysis~~ implementation segment.

~~Number of Benefited Homes~~	~~NBH~~
~~≥30~~	~~15~~
~~28-29~~	~~14~~
~~26-27~~	~~13~~
~~24-25~~	~~12~~
~~22-23~~	~~11~~
~~20-21~~	~~10~~
~~19-10~~	~~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~~

Number of Benefited Homes	NBH
≥ 31	10
26-30	9
21-25	7.5
16-20	6
11-15	4.5
6-10	3
1-5	1.5

TABLE 5. SCORING FACTORS FOR AVERAGE COST PER BENEFITED HOME

CBH is determined from the average implementation cost per benefited home in the logical implementation segment.

Average Cost per Benefited Home	CBH
≤ $40% of max*	10
40.01% to 55% of max	8
$55.01 to 70% of max	6
$70.01% to 85.% of max	4
$85.01% to 100% of max	2
≥ 100% of max	0

* Maximum cost participation by County per benefited home

TABLE 6. SCORING FACTORS FOR EXTENT OF BENEFIT (EOB)

EOB is determined from the average barrier insertion loss (IL) for all benefited receptors in the logical ~~analysis~~ implementation 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~~

IL	EOB
≥13	10
12-12.99	9
11-11.99	8
10-10.99	7
9-9.99	6
8-8.99	5
7-7.99	4
6-6.99	3
5-5.99	2
4-4.99	1
<4	0

APPENDIX 'A'

TERMINOLOGY

The terms defined here are as they apply to this noise policy:

AFFECTED BY CONSTRUCTION: Properties on which the implementation of the noise mitigation measures create temporary or permanent property impacts will be considered AFFECTED.

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.

COMMUNITY: First row of homes abutting the road segment being analyzed. A community may also be a single logical ~~analysis~~ implementation segment ~~(LAS)~~ (LIS).

COST PER RESIDENCE (CPR): In a logical ~~analysis~~ implementation 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, $L_{Aeq1/4hr}$; 1hr, 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 logical analysis segment is a portion of a noise assessment study area with reasonably consistent noise impacts. In most cases, a logical analysis segment is a segment where it is feasible and reasonable to build a single continuous noise wall. 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: major natural features, significantly different topographic conditions or geometric grades, intervening non-noise-sensitive land uses, or varying proximity of homes.~~

LOGICAL IMPLEMENTATION SEGMENT: A logical implementation segment is a portion of a noise assessment study area with reasonably consistent noise impacts where it is feasible and reasonable to build a single continuous noise wall. Logical implementation segments usually are lengths of roadway separated by intersections, major natural features, significantly different topographic conditions or geometric grades, intervening non-noise-sensitive land uses, or varying proximity of homes to the road.

NOISE ASSESSMENT: A process consisting of the 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. Sound levels have units of A weighted decibels (dBA).

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 significantly blocking sound propagation. 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~~ implementation 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 duration). 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 to 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 ~~analysis~~ implementation 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 very 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 ~~analysis~~ implementation segments of a project. ~~These are defined as segments where noise impacts are reasonably consistent. In most cases, a logical analysis segment is a segment where it is feasible and reasonable to build a single continuous noise wall. 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: major natural features, significantly different topographic conditions or geometric grades, intervening non-noise sensitive land uses, or varying proximity of homes.~~ A logical implementation segment is a portion of a noise assessment study area with reasonably consistent noise impacts where it is feasible and reasonable to build a single continuous noise wall. Logical implementation segments usually are lengths of roadway separated by intersections, major natural features, significantly different topographic conditions or geometric grades, intervening non-noise-sensitive land uses, or varying proximity of homes to the road.

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 set 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 [$L_{Aeq1hrPk}$] 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 and county roads within municipalities, provided the municipality has developed and implemented noise guidelines and standards that are at least as stringent as the County's for subdivision approvals at the time of the municipality's approval of the affected subdivision. 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~~ $100,000 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, a 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.

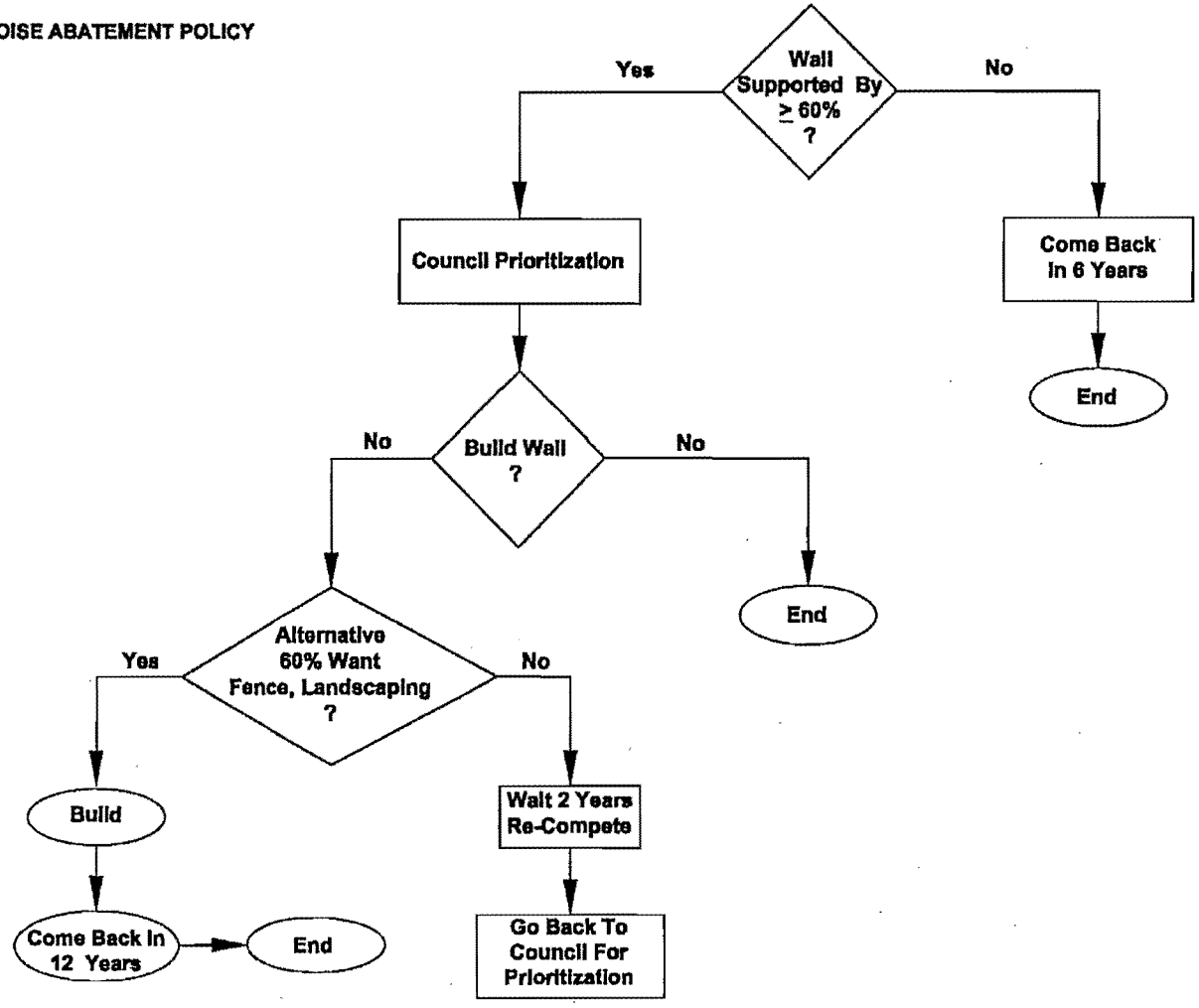
d) Reasonableness will take into consideration the effect of a sound barrier on environmental and historic resources.

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. Flowchart 'C' shown in the Policy text takes precedence over the one shown in the appendix.

FLOWCHART "C"

HIGHWAY NOISE ABATEMENT 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.Pl.	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
M-NCPPC 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*

(Noise Study Group 2000)

Peak Noise Impact	30
Noise Impact for 24 hours per day	15
Projected time to reach LOS "D"	10
# of homes built before M. Plan Rd.	10
# of homes purchased before Master Plan Road	10
Number of households benefited	15
Extent of benefit (Noise reduction)	10
TOTAL	100

*The Scoring Table was revised by Task Force 2008. See Policy text for revised scoring table.

ATTACHMENT C-1

NOISE STUDY GROUP MEMBERSHIP

County Representatives:	*Citizens Representatives:*
Edgar A. Gonzalez, P.E., Deputy Director for Transportation Policy Department of Public Works & Transportation	Alan H. Straus, Manager Environmental & Transportation Planning Dept. URS Greiner
Glenn Orlin, P.E., Deputy Staff Director County Council	Michael Staiano Staiano Engineering, Inc.
Steve Federline, Coordinator Environmental Planning Division MD National Capital Park & Planning Commission	George Sauer, member, Board of Directors Montgomery County Taxpayers League
Thomas S. Ogle, Noise Program Director Div. of Environmental Policy & Compliance Department of Environmental Protection	Rudy Volin Noise Control Advisory Board
	Dr. William M. Labuda Derwood Community Representative
State Highway Administration (Special Advisor to the Policy Group)	MC Taxpayers League (Alternate) Cleonice Tavani, President Montgomery County Taxpayers League
Ken Polcak Maryland State Highway Administration	Noise Control Advisory Board (Alternate) Bernard Rod, Chair Noise Control Advisory Board

ATTACHMENT C-2

2008 NOISE STUDY TASK FORCE MEMBERSHIP

County Representatives:	*Citizens Representatives:*
Edgar A. Gonzalez, P.E. Deputy Director for Transportation Policy Department of Transportation	Michael Kelly, P.E. Wilson T. Ballard Company
Glenn Orlin, P.E., Deputy Staff Director County Council	Michael Staiano, P.E. Staiano Engineering, Inc.
Michael Mitchell, P.E. Highway Noise Abatement Program Manager Division of Transportation Engineering Department of Transportation	Eleanor Rice Council District 1 Citizen Representative
Steve Federline, Coordinator Environmental Planning Division MD National Capital Park & Planning Commission	Dr. William M. Labuda Council District 3 Citizen Representative
State Highway Administration: (Special Advisor to the Policy Group)	Dr. Jay Feinstein Council District 4 Citizen Representative
Ken Polcak Maryland State Highway Administration	George Sauer, member, Board of Directors Montgomery County Taxpayers League