CITY OF TUCSON, ARIZONA
DEPARTMENT OF TRANSPORTATION

ENGINEERING DIVISION
ACTIVE PRACTICES GUIDELINES

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APPROVED BY: City Engineer DATE:

SUBJECT: TRAFFIC NOISE ABATEMENT FOR ARTERIAL AND COLLECTOR ROADWAYS

A. PURPOSE:

To establish a design guideline for providing traffic noise abatement for Tucson Department of Transportation (TDOT) capital improvement projects for construction or widening of arterial and collector roadways.

B. BACKGROUND:

Under certain circumstances, it is appropriate and necessary to provide mitigation measures to reduce traffic noise in association with the construction of new or widened arterial or collector roadways. These circumstances include federally funded roadway improvement projects for which federal or state standards require traffic noise mitigation and non-federal projects for which City of Tucson policies require traffic noise mitigation. Currently, both federal standards and the City of Tucson Department of Transportation Roadway Development Policies, Ordinance 6593, require that noise abatement measures be provided for residences or other sensitive land uses when existing or design year projection of exterior traffic noise exceeds an hourly A-weighted sound level of 67 dBA. Ordinance 6593, revised April 6, 1998, indicates that noise barrier walls should be utilized, except that other methods may be utilized if they are determined to cost less than noise barrier walls. It is necessary for the Department of Transportation to establish a guideline for the uniform and consistent application of traffic noise mitigation measures.

C. ALTERNATE METHODS OF TRAFFIC NOISE MITIGATION:

Several alternative methods have been found to be effective in reducing traffic noise. A discussion of these methods and advantages and disadvantages of each method follows.

1. NOISE BARRIER WALLS

Noise barrier walls have been demonstrated to be effective in reducing traffic noise, depending on the terrain, height of the walls, and design of the walls to provide effective noise protection. Generally, to be effective, noise barrier walls must intercept a "line of sight" transmission of sound from the interface of the wheels of moving vehicles and the pavement surface to the ear of the listener. To protect residences, the objective generally is to shield the windows of the first stories of the residences. The height of the walls must be sufficient to intercept the line of transmission of sound, accounting for whether the residences are located at higher or lower elevations than the roadway surface. Noise barrier walls are commonly eight or more feet in height, depending on the relative elevations of the roadway and the residences. In addition, to be effective, the walls must be long enough to intercept the sound of traffic as it approaches and recedes from the location of the residence. For optimal effectiveness, the walls should extend a distance of approximately 200 feet on each side of the property to be protected. The effectiveness of the walls is also substantially reduced if it is necessary for the walls to have openings for driveways, alleys, sidestreets or drainageways.

Properly designed noise barrier walls can generally reduce traffic noise by 3 to 5 dBA, depending on the site conditions.

In practice, several disadvantages have been associated with noise barrier walls located on urban streets. These disadvantages include the following:

- It is difficult to design effective noise barrier walls for locations where driveways, alleys, sidestreets or drainage facilities require openings in the walls that substantially reduce their effectiveness.
- Walls can cause conflicts with sight distance requirements at intersections and driveways.
- Noise barrier walls located close to the roadway can constitute fixed object hazards to vehicles.
- Noise barrier walls interrupt the views from the residences.
- The walls frequently attract graffiti and require continuous and costly maintenance.
- The walls interfere with the Tucson Police Department's crime surveillance program. The Tucson Police Department has determined that surveillance and reporting of crimes by neighborhood residents and passing motorists has been the most effective means of monitoring and reporting neighborhood criminal activity.
- TDOT cannot clean up trash and remove graffiti from the sides of the walls facing the residences without trespassing. In practice, this means that the side of the walls that cannot be directly accessed from the main roadway cannot be effectively maintained.

- The construction of noise barrier walls significantly changes the visual character of the neighborhood. Frequently, the walls become the dominant visual feature of the roadway corridor.

2. LANDSCAPED EARTHEN BERMS

Landscaped earthen berms can provide traffic noise reduction as effective as noise barrier walls. The design considerations are similar to noise barrier walls, in terms of the terrain, the necessary height and length of the berms to intercept the sound, and the fact that openings in the berms reduce their effectiveness as noise barriers.

Advantages of landscaped earthen berms include the facts that they can provide a more natural appearance than noise barrier walls and they do not attract graffiti.

Disadvantages of landscaped earthen berms include the fact that they require more right-of-way to construct and they typically are more costly than noise barrier walls. In order to be stable and resist erosion during rainstorms, earthen berms may require side slopes of 2:1 or flatter. This means that an eight foot high berm would require a minimum of 32 feet of right-of-way to construct. In most cases, this would require acquisition of additional land from the neighboring properties.

3. RUBBERIZED ASPHALT PAVEMENT

Paving of roadways with rubberized asphalt pavement has been shown to provide effective traffic noise reduction, generally reducing traffic noise between 3 and 4 dBA, depending on the site conditions. Recycled rubber from used tires is ground up and mixed in proper proportions into the asphaltic concrete used for the roadway pavement.

Advantages of rubberized asphalt pavement include the facts that it is less costly than constructing noise barrier walls or landscaped earthen berms, and it does not have any of the disadvantages listed above for noise barrier walls. This method of noise abatement does not interrupt the views from the residences, attract graffit, create any safety hazards for vehicles, or interfere with the Tucson Police Department's crime surveillance program, and its effectiveness is not reduced by the need to provide access for driveways, alleys, sidestreets and drainageways. In general, rubberized asphalt pavement is the most cost-effective means of providing effective traffic noise reduction.

A disadvantage of rubberized asphalt pavement is that, in order to maintain its effectiveness in reducing traffic noise, all future pavement overlays of the roadway would have to be done with rubberized asphalt pavement, which is more expensive than conventional, non-rubberized, asphaltic concrete pavement.

4. DEPRESSED ROADWAYS

Depressing the roadway below grade can be an effective means of reducing traffic noise. However, the very substantial increases in cost and impacts on buried utilities, drainage and access to adjacent properties make this approach impractical for all but very special circumstances.

D. POLICY:

In consideration of the advantages and disadvantages of the various methods of traffic noise abatement presented above, it shall be the policy of the Tucson Department of Transportation Engineering Division that, for the development of major roadway projects for which traffic noise abatement is required by the Roadway Development Policies (Ordinance 6593), the preferred method of traffic noise abatement shall be to pave the roadway with rubberized asphalt pavement.

D. EXCEPTIONS:

In accordance with Ordinance 6593, the Mayor and Council may direct that alternative methods of traffic noise abatement may be used for a specific roadway improvement project. Such direction may be accomplished through the public hearing and approval process for an Alternative Alignment Report or Environmental, Design and Mitigation Report for the project, or through a public hearing, notice of which shall be published no less than fifteen days before the hearing in a newspaper of general circulation in Pima County.

In addition, the Director of the Department of Transportation may direct that an alternative method of traffic noise abatement may be used if the alternative method is specifically required by a federal or state agency as a condition of eligibility for federal or state funding for the roadway improvement project.