IMPROVED MECHANISMS FOR STAKEHOLDER ENVIRONMENTAL EDUCATION

FINAL REPORT 523

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16. Abstract

This report discusses the development of a video tape and companion brochure design for use in public meetings. Both the tape and brochure are intended to explain the ADOT nose policy and related issues important to highway projects in Arizona.

The brochure is intended for distribution at public meetings and forums where citizens and other officials need general information on noise impacts from ADOT highway projects. It is easy to understand and provides basic background information on noise issues, including basic scientific principles, Federal mandates, and ADOT policies. The primary goal of the brochure is to supplement the information provided in the companion video tape, and to give a permanence to the key elements conveyed in the video tape.

The video tape was developed after reviewing others from state DOT's, including, Louisiana, Pennsylvania, and Texas, which were gathered from a national solicitation. Also, two similar tapes produced for FHWA were reviewed. These tapes were viewed with ADOT staff and the TAC during the first meeting, in order to make sure there was agreement on the specifics of the video tape mechanism.

The purpose of the tape is to eliminate the need for the same canned presentation by ADOT staff and/or consultants at every meeting, and to provide a high quality visual element to the information presented. The tape is ideally suited to be placed on a loop for continuous play at informal multi-station-style workshops, or to be played at the beginning of a more formal meeting. It will also be useful in a training environment, and in the education of ADOT staff and consultants.

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TABLE OF CONTENTS

I. Introduction....1
A. Background....1
B. Objectives....2

II. Methodology....3
A. Video Tape....3
B. Brochure....3

III. Results....4

IV. Summary and Conclusions....5

V. Communication and Public Involvement Plan (Implementation Plan)....6

Appendix A Final Noise Video Tape Outline....7

Appendix B Video Narrative Script....11

Appendix C Brochure.... Inside back cover

I. INTRODUCTION

This project was originally intended to develop two mechanisms for educating the public regarding policies and practices of the Arizona Department of Transportation (ADOT) regarding noise control and air quality. The two mechanisms were to be an informational brochure/flyer, and a video tape. A decision was made shortly after project initiation to limit the scope to noise control. The brochure and tape were developed and are available from ADOT (a copy of the brochure is included with this report).

The project proposal had eight tasks:

1. Work with ADOT staff to establish primary audience, e.g. those residents and businesses most directly impacted by the projects.
2. Coordinate with other organizations potentially involved in similar efforts to assure maximum cost benefit for the project. Consider representative organizations appropriate for solicitation for input into the public process. Gather and review available materials from these agencies.
3. Develop a series of communication mechanisms for communicating and working with impacted citizens and other stakeholders to address critical environmental concerns. Work with ADOT staff to design and prepare materials relevant to evaluation.
4. Participate in a limited series of open houses, workshops, conferences, and/or community forums which include examples of the prototype communication mechanisms.
5. Upon completion of each meeting, conduct brief surveys of participants to establish comparative performance of each mechanism, with respect to availability, accuracy, credibility, and effectiveness.
6. Prepare, administer, analyze and report back results of surveys, focus groups, or other assessment tools.
7. Develop a communication and public involvement plan including recommendations on the most effective mechanisms to communicate and educate interested and impacted citizens regarding air and noise impacts of roadway projects.
8. Document all project activity and recommendations in a Final Report.

It was decided to delay the evaluation tasks (Tasks 4 through 6) until after completion of the video. Task 7, the communication and public involvement plan, is discussed later in this report.

This report includes the outline that was developed for the video. The outline was prepared after meetings with ADOT staff where similar videos were shown and discussed. It also has the final script used to develop the video. The script was modified several times, based on comments received from ADOT staff and others involved in the process, including the narrator and the producer of the video.

A. BACKGROUND

The brochure is intended for distribution at public meetings and forums where citizens and other officials need general information on the noise impact of ADOT highway projects. It is easy to understand and provides basic background information on noise issues, including basic scientific principles, Federal mandates, and ADOT policies. The primary goal of the brochure is to supplement the information provided in the companion video tape, and to give a permanence to the key elements conveyed in the video tape.

The video tape was developed after reviewing videos from other state departments of transportation, including, Louisiana's, Pennsylvania's, and Texas's, which were gathered by a

national solicitation. Also, two similar tapes produced for the Federal Highway Administration (FHWA) were reviewed. These tapes were viewed with ADOT staff and the project's Technical Advisory Committee (TAC) at its first meeting to make sure there was agreement on the specifics of the video tape mechanism.

There were also meetings with ADOT production staff to design the video. Subsequent to those meetings, it was decided to contract with an outside producer, Janet Nearhood of Small Feat Productions (through Godec Associates), to actually produce the final video.

The purpose of the tape is to eliminate the need for a canned presentation by ADOT staff and/or consultants at every meeting and to provide a high quality visual element to the information presented. The tape is ideally suited for continuous loop play at informal multi-station-style workshops, or to be played at the beginning of a more formal meeting. It will also be useful in a training environment and in the education of ADOT staff and consultants.

The tape includes:

- Basics on the physical phenomena.
- Information on legal requirements.
- A brief overview of ADOT noise policies.
- Information on abatement measures, with an emphasis on noise barriers.

The brochure was developed by editing the video script until it was suitable in size for a three-fold (8.5x14 inch) front-and-back brochure. The content was also edited to convey the proper information. A premium was placed on readability, so numerous photos and heading breaks were included. Like the video, the brochure went through several iterations of review by various ADOT staff.

B. OBJECTIVES

As mentioned, the objectives of this work were the development of a noise video and a companion brochure. It was decided early in the process that the video was to be the highest quality possible, so much effort was given to the production activities. Specifically, the film used was the beta version, which is the same that is used for television pieces. Also, a top quality animation firm was used when there was an identified need, and an excellent editing studio was also used. The intent was to develop a video that will be very impressive visually and aurally, and convey a great deal of information to the public.

II. METHODOLOGY

A. VIDEO TAPE

The process for developing the tape included several steps. First, the authors reviewed existing tapes from other organizations. During the meeting with the ADOT Committee, the authors provided summaries of those tapes. After the meeting, a draft outline was prepared. (See Appendix A) Once agreement was reached on content, the authors prepared a final outline. Following several rounds of review, a final narrative was produced. (See Appendix B) The narrator was included in the review process. Small Feat Productions was then hired by ADOT to shoot the video and provide the necessary editing.

The authors provided in-field oversight and consultation during most of the filming activities. They also reviewed and approved various animation efforts, and met with the animators to make sure that the concepts were properly illustrated.

B. BROCHURE

Once the final narrative for the video was completed, the authors edited it as mentioned above. Several iterations of comments were received from ADOT, and a final version was prepared. A copy is included in Appendix C.

III. RESULTS

The results of this project take the form of two products. These are the video tape and the brochure.

The video tape is intended to assist in educating the public concerning the ADOT noise policy and abatement program. The video tape is useful for showing at public meetings, either as a one-time presentation in a formal setting, or on a continuous loop in a more informal, open house or workshop environment. The video tape is also helpful in providing educational information within ADOT to professional staff, as well as for local governmental agencies in Arizona who may be interested in noise, noise abatement, or the ADOT noise policy.

The brochure (see Appendix C) is a companion piece to the video tape. It is to be distributed at public meetings and workshops, so attendees can have a permanent record of the information they received in the video tape. It is also useful as a stand-alone document, suitable for a broad distribution throughout Arizona, as an aid to assist various individuals, groups, and agencies in learning about the ADOT noise program.

IV. SUMMARY AND CONCLUSIONS

The video tape and brochure were developed with the intent to provide ADOT with tools that would assist in communicating its noise policy and in educating the public on noise issues. The extraordinarily high production quality of the tape and narrative, along with the excellent animation sequences, should produce the desired results.

V. COMMUNICATION AND PUBLIC INVOLVEMENT PLAN (IMPLEMENTATION PLAN)

ADOT should do the following in order to best utilize the video and brochure:

- Distribute copies to all engineering offices in the department. This will accomplish two goals. First, information on the ADOT noise program will be widely disseminated to planners, designers, managers, and decision makers in the department, thus increasing understanding and appreciation of the noise issue. Second, the excellent quality of both mechanisms may cause other areas in the department to develop similar tools.

- Distribute copies to all appropriate local government agencies, with instructions for their staffs to watch the video.

- Show the video as part of any public meeting where noise is an issue, and where appropriate, play a continuous-loop copy for informal viewing. This will provide a foundation of education for the public on noise issues. In more formal meeting contexts, ADOT staff and consultants should follow the video presentation with detailed information on the noise study for the particular project.

- Numerous copies of the brochure should be made available at all public meetings.

- ADOT should occasionally ask the public about the effectiveness of both the video and the brochure. It may be desirable to update them after a reasonable period of use, based on public input. Normal public meetings would present the best opportunity to gather this input, which should be solicited through a comment form. Also, the department's environmental website could include a link soliciting input and comments on a continuous basis.

APPENDIX A

FINAL NOISE VIDEO TAPE OUTLINE

Video Tape Outline

00:00 – 00:30: Fade in from black screen to quiet SW scene, transition to urban Phoenix with traffic and other sources.

00:30 – 01:00: Narrator begins speaking; talks about the tremendous population and economic growth in Arizona. Discusses the great challenge ADOT faces in providing the highways necessary to facilitate this growth. Mentions traffic noise as an inevitable byproduct of highway project development and construction.

01:00 – 03:00 Ask *But what is traffic noise, and what can we do about it?* To answer these two questions, we need to discuss some things about the physics of sound and how humans response to noise in the environment.
Noise is unwanted sound. The unit to measure noise – the decibel – combines the magnitude of the sound with human response.
Mention/show 0 dBA is threshold of hearing, 120 dBA is threshold of pain; below 50 dBA is "quiet" residential, and above 70 dBA is "noisy" urban.
Mention/show how we add noise sources – 1 truck is 60 dBA; 2 is 63 (little difference); 10 is 70 (twice as "loud"; brief discussion of difference between doubling of energy is 3 dBA increase, but doubling of loudness requires 10 dBA)

03:00 – 04:30 Ask *How do we measure traffic noise?* We use the equivalent sound level, Leq. Define Leq using graphics and showing examples of highway traffic. Show peaks versus average, and that we use the average but it takes into account the peaks.

04:30 – 06:00 Discussion of source, path, receiver concept, with video/verbage of truck, distance between highway and homes, and residential areas. Use graphics of waves from the source to the receiver.
Give more detail on the source, with the truck as the dominant noise maker (tires, engine, exhaust, low frequency, elevated stack location, etc.) Also mention autos as the source of the continuous roar from busy highways.

06:00 – 07:00 Mention that ADOT can't do anything about the source (vehicles) or the receiver (home construction), but can do something about the path. Show graphics of a location without a barrier, with waves going unimpeded from the highway to the homes. Then insert a barrier, showing the diffracted wave. Discuss diffraction as the best way to reduce noise. Show waves bending over and around the barrier.
Mention that a barrier around 15 feet tall can produce as much as a 10 dBA reduction, which can reduce loudness by half.

07:00 – 08:00 Stress the importance of LOS break, using graphics.
Mention the need for continuity in length, that gaps compromise barrier performance, and do not work on arterials. Use graphics and video of arterials.
With graphical waves propagating from highways to homes, discuss the distance issues:
(1) doubling distance only reduces Leq by 3 dBA. Show Leq readings at 100, 200, and 400 from a highway.
(2) the further away the homes are from the barrier, the less diffraction and noise reduction there is.

08:00 – 09:00 With various scenes of ADOT barriers as the background, stress ADOT's aggressive commitment to noise control.
Mention that we have the lowest impact threshold in the country, a full 3 dBA below the federal requirement.
Mention our increase over existing definition.
Mention that we are among the leaders in the country in building barriers, using statistics from the latest FHWA Noise Barrier Construction Trend Summary.

09:00 – 10:00 Note that the incredible growth in Arizona often results in the need to widen existing highways.
Show the math for a typical lane addition project: a 33% increase in traffic volume will only increase noise by a dBA or so, which isn't perceptible, but ADOT also considers how noisy the highway already is, and often builds barriers to make the noise environment better than it was before the widening.

1000 – 10:30 Discuss the option of putting in a berm rather than a wall.
Mention advantages (cost, appearance) and disadvantages (right-of-way needed).

10:30 – 11:00 Ask *Why we can't just use vegetation to reduce noise?* Show measurement in front of and behind a vegetative screen, and mention that while noise levels are not reduced, there is some esthetic benefit.

11:00 – 12:00 Note that ADOT strives to build successful noise barriers, showing video of barriers in Arizona.
A successful barrier project will have many results, including of course noise reduction (ADOT tries for at least 5-7 dBA reduction at the first row; show Leq values in front of and behind a barrier). This makes an unacceptable quality of life situation acceptable.

Including esthetic and architectural integration into the community.
Including citizen involvement in decision making.
Including maintenance of driver line of sight and other safety issues (fire access, neighborhood security, etc.).

12:00 – 12:30 ADOT is also concerned about cost, so we maintain a strong research program in barrier performance, and demand that state-of-the-art analysis methods be used by highly trained and qualified noise analysts.

12:30 – 13:00 ADOT is committed to the proper maintenance of all its highways. This includes keeping its noise barriers well maintained and free of graffiti.

13:00 – 14:00 ADOT is not only concerned about the noise that its highways generate after they are in use, but also while they are under construction.
Overview construction noise control measures (good mufflers, equipment placement, restriction of hours), with video of construction activity.

14:00 – 14:30 Summary re-statement of ADOT's commitment to aggressively address noise from its highways, showing more video of Arizona barriers.
Mention the importance we place on citizen input and our desire to work with the public as partners, and not adversaries, to manage this inevitable byproduct of

our vibrant and growing Arizona economy, which is dependant on a strong highway system.

13:00 - 14:00 Fade out with credits, and for further information, contact …

APPENDIX B

VIDEO NARRATIVE SCRIPT

VIDEO NARRATIVE SCRIPT

Arizona.

A great place to live and work, where for many years thousands have been coming to embrace the Southwest's extraordinary quality of life. Growth has brought great demands on our highway system, and the Arizona Department of Transportation, or ADOT, is working hard to keep pace by constantly improving and expanding the roads, bridges, and freeways throughout the State. ADOT's goal for all its highway projects includes compatibility with the environment. One of the most important environmental concerns carefully studied on all projects is the traffic noise. Traffic noise is an inevitable byproduct of our highway development and construction. Because it is such a complex issue, and people respond to it in so many ways, we've produced this video to help explain it and ADOT's solutions.

So…What is traffic noise?

And …What can be done about it?

To answer these questions we need to first look at the physics of sound and how humans respond to noise in the environment. Noise is often called "unwanted sound". The origin of noise is the same as that of all other sounds – it's "acoustic energy".

Noise has the element of being an uninvited guest, like ants at a picnic. But other sounds like music, children's laughter, the cheers at a Diamondbacks game, are not noise to most of us because they are pleasing to our ears.

Noise on the other hand, disturbs us – and much of the noise in the environment comes from cars, trucks and motorcycles.
We use a unit called the ***decibel*** to describe traffic noise. The decibel combines the magnitude of the sound energy with the way humans respond to it. A sound level of 0 decibels is the quietest a person with perfect hearing can detect. On the other hand, a sound level of around 120 decibels is almost certain to cause pain, and prolonged exposure to noise that loud will lead to hearing damage.

Here are some ways that we might describe decibel levels typical in Arizona….starting with the quietest:

The desert is ***serene***, with levels from 20 to 30 decibels.

A peaceful subdivision in Prescott is ***quiet***, with levels from 40 to 50 decibels.

Noise levels right on the shoulder of I-10 in Phoenix can reach 70 to 80 decibels.
50 to 70 decibels is the transition from ***quiet*** to ***noisy***, and it's what most Arizona's experience everyday. For comparison, noise from a vacuum cleaner can be about 68 decibels at 10 feet, about the same as a gas lawn mower at 100 feet.
Unlike feet and inches, or pounds and ounces, decibels can't be added directly. Instead, they are combined using a ***logarithm scale***, which is "non linear" or not measured in a straight line. For example if **heavy traffic** produces 65 decibels, **doubling the traffic only increases the noise level by 3 for a total of 68 decibels.** In other words, each time the sound energy is ***doubled***, the sound level increases by <u>only</u> ***3 decibels***.

With regard to noise reduction, it normally takes a 3-decibel decrease to be noticeable and a full 10-decibel decrease to cut that **loudness** in half.

Traffic noise changes constantly, as traffic noise passes by the listener. ADOT uses a measure called ***Equivalent Sound Level or LEQ*** to account for these changes. A device measures sound over a period of time, usually an hour, and shows us the energy-based average. This is the best way to get readings on traffic noise peaks.

When we talk about noise it's best explained by using the words ***Source, Path,*** and ***Receiver***. Let's start with the ***Source*** of the noise.

Trucks sometimes dominate the noise levels coming from highways, especially at night. Truck noise comes not only from the pavement but also from the engine and the exhaust stack, which can be as much as 13 feet above the pavement. Cars, usually produce a ***steady*** roar of noise, punctuated by less frequent trucks. So highways with a large number of trucks and not a lot of cars can be the most annoying noise of all.

The ***Path*** is the area between the ***Source*** and the ***Receiver…*** and the ***Receiver*** is any location where people are bothered by traffic noise.

In respect to the ***Path*** two major factors have to be considered: Distance, and Obstructions. As the distance from the source increases, the sound waves get larger and more dispersed. For highways, this reduction is 3 decibels each time the distance is doubled. Remember our LEQ? In this example if the LEQ is 70 decibels at 50 feet, it will be 67 decibels at 100 feet and 64 decibels at 200 feet. It's a 3-decibel decrease every time the distance is doubled. The second factor is Obstructions. When a barrier is inserted between the source and the receiver, the sound waves must bend over and around it. This bending, which is called diffraction, consumes energy, and therefore reduces the LEQ and the noise. In order for the barrier to reduce noise, it must break the ***line of sight*** between the source and the barrier. This **six foot high** barrier just barely intrudes in into the line of sight and still provides a five-decibel reduction. In order to lower the LEQ still further, the barrier's height must be increased by 2 feet for every additional decibel of reduction needed. So, in order to achieve a 10-decibel reduction, the barrier must protrude 10 feet into the line of sight. In most cases this would require a barrier of at least 16 feet tall.

Also remember that because sound can bend around the end of barriers as well as over the top, barriers must be continuous and without gaps. A good rule of thumb is that the barrier must extend 400 feet past the last receiver for every 100 feet distance to the barrier. And it is this same ***4 to 1 rule*** that usually makes it unfeasible to build barriers along arterial streets with numerous driveways and intersections. ADOT's primary concerns are for residences, schools, and churches…places where people are most impacted by traffic noise.

The US Federal Highway Administration defines ***impact*** as occurring any time the LEQ reaches 67 decibels. But here in Arizona ADOT has lowered that impact level for LEQ, to 64 decibels, well below the Federal **criterion.** . ADOT also considers a ***receiver to be impacted*** when the LEQ increases by 15 decibels ***after*** a highway project is built. **And ADOT typically monitors noise levels after freeways are opened.**

ADOT has constructed more than thirty miles of barriers, most within the last several years. The department conducts one of the most active research programs in noise analysis and control, and uses the latest state-of-the-art computer models and noise measurement equipment manned by highly qualified noise analysts.

The amazing growth that Arizona has experienced means traffic volumes continue to increase on our highways. One solution is widening, or adding lanes to existing highways. If a four-lane highway is widened to five lanes, it will carry 20% more traffic. Applying the principles we talked about earlier, this traffic increase will cause the LEQ to increase by only 1 decibel, and remember that it normally takes a 3 decibel decrease to be noticeable.

However, ADOT always takes into consideration how noisy the highway was ***before*** the widening, and often builds barriers that reduce the noise levels ***below*** what they were. When conditions allow, ADOT may build an earth berm to reduce noise. Berms have the advantage of blending in with the surrounding environment, and also provide slightly more noise reduction than walls. But, berms require a large amount of dirt, and also need a lot of available land. For example, an earth berm 10 feet tall has to be at least 70 feet wide. Most highway projects, especially in urban areas, don't have that amount of space available. When it works berms are a low cost, esthetically pleasing option for noise reduction. **And in some places, walls on berms may be used.**

Many people wonder if vegetation can reduce traffic noise. Unfortunately, this is not the case. Noise levels in front of and behind this stand of trees and shrubs are about the same. Research has shown that vegetation must be very dense, very tall, and very deep in order to make a difference. A common rule of thumb is that at least 100 feet of depth is needed to achieve a five-decibel reduction; we rarely see such thick vegetation in Arizona. While vegetation doesn't really reduce noise levels, it can improve the esthetics by hiding the traffic, and can also "soften" the harsh tones of the traffic noise.

Once barriers are in place maintenance has to be a top priority for ADOT. Most barriers in Arizona are made of concrete or masonry, which is a low maintenance and durable material that can designed to be very attractive. Some cities may choose to provide funding for some additional enhancements.

ADOT is also responsible for maintaining the landscaping on earthen berms, medians and rights of way.

Noise is also generated by the highway construction.and ADOT sets noise control requirements for its roadbuilders:

- ADOT specifies that good, working mufflers have to be installed on all construction equipment.
- Also stationary construction equipment has to be properly placed on the jobsite.
- And job sites have restrictions on work hours.

Highways are essential to our way of life in Arizona and noise is an unfortunate byproduct of the system. As a result, ADOT's policy for noise reduction is the most stringent of any other state in the nation.

As Arizona continues to grow, so will the highway system. The Arizona Department of Transportation is committed to working with you to find effective ways to reduce traffic noise and continue to make Arizona a great place to work and live.

NOISE FACTS

PRESENTED BY THE

ARIZONA

DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL PLANNING GROUP
phone (602) 712-7760
fax (602) 712-3066
www.adotenvironmental.com

WHAT is traffic noise?

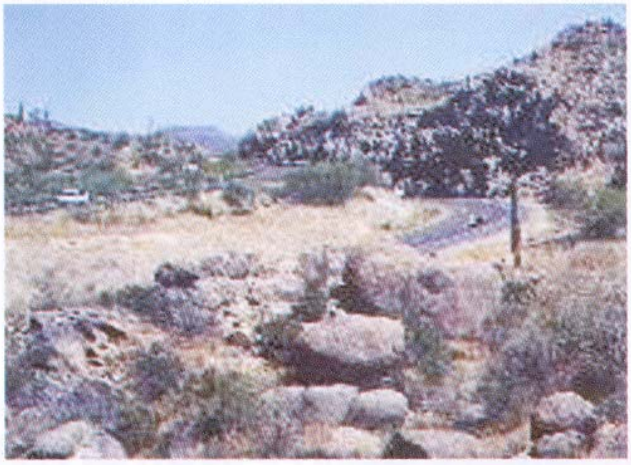
And, ***What can be done about it?*** Noise is often called *unwanted sound*. The origin of noise is the same as that of all other sounds – acoustic energy. But it has the element of being an uninvited guest, like insects at a picnic. Noise disturbs us – and much of the noise in the environment comes from highway traffic.

HOW do we describe traffic noise?

We use a unit called ***decibels*** to describe traffic noise. Decibels combine the magnitude of the sound energy with the way humans respond to it. A sound level of 0 decibels is the quietest a person with perfect hearing can detect. On the other hand, a sound level of around 120 decibels is almost certain to cause pain, and prolonged exposure to noise that loud will lead to hearing damage.

With 0 decibels as the "Threshold of Hearing", and 120 decibels as the "Threshold of Pain", what are some other decibel levels typical in Arizona?

The desert is ***serene*** - 20 to 30 decibels.
A peaceful subdivision is ***quiet*** - 40 to 50 decibels.
An urban freeway shoulder is ***noisy*** - 70 to 80 decibels.



WHAT unit of measure do we use to describe traffic noise?

Traffic noise changes at the speed of sound, as different vehicles pass by the listener. In order to best

quantify these changes, we use a measure of noise called the ***Equivalent Sound Level***, ***or Leq,*** which is an energy-based average of the sound energy taken over a period of time.

HOW do we define vehicles, highways and receivers of traffic noise?

Noise is best discussed in terms of ***Source, Path,*** and ***Receiver***. For highways, the ***Source*** is, of course, the vehicle. Trucks usually dominate the noise levels coming from highways. Truck noise comes not only from the pavement level where the tires meet the road, but also from the engine and even the exhaust stack, which can be as much as 13 feet above the pavement. On heavily traveled highways, autos usually produce a steady roar of noise, punctuated by less frequent trucks. Highways with a large number of trucks, but without heavy auto volumes, can be the most annoying of all because of the intrusive nature of the truck noise.

The ***Path*** is that area between the source and the receiver. Two major factors must be considered with respect to the path: Distance, and Obstructions. As the distance from the source increases, the sound waves get larger and more dispersed, and the **Leq** is, therefore, reduced.

For highways, this reduction is 3 decibels each time the distance is doubled. For example, if the **Leq** is 70 decibels at 50 feet, it will be 67 decibels at 100 feet, and 64 decibels at 200 feet. Coincidently, the smallest change in noise level that can be detected by humans is 3 decibels.

The second factor is Obstructions. When a barrier is inserted between the source and the receiver, the sound waves must bend over and around it. This bending, which is called ***diffraction***, consumes energy, and, therefore, reduces the **Leq**. In order for the barrier to reduce noise, it must break the ***line of sight*** between the source and the barrier. A barrier that just breaks the line of sight provides a reduction of 5 decibels. In order to lower the **Leq** still further, the height of the barrier must be increased by two feet for every additional decibel of reduction needed.

A noise barrier can be a vertical wall, an earthen berm, or a combination wall and berm. Arizona has examples of each.

Because sound energy can bend around the end of barriers as well as over the top, barriers must be continuous and without gaps. They must continue past the last protected receiver for quite a distance, or be wrapped around the end receiver. A good rule of thumb is that the barrier must extend 400 feet past the last receiver for every 100 feet distance to the barrier. This ***4 to 1 rule of thumb*** usually means it is not feasible to build barriers along arterial streets which have numerous driveways and intersections.

The ***Receiver*** is of course any location where people are bothered by the traffic noise. ADOT's primary concerns are for residences, schools, churches, and so on. An important question about receivers is ***When are they impacted by the traffic noise?*** The US Federal Highway Administration has defined an ***impact*** as occurring any time the **Leq** approaches 67 decibels. ADOT has actually adopted the lowest impact criteria in the country, 64 decibels for **Leq**, well below the Federal criterion. ADOT also considers a receiver to be impacted when its **Leq** increases by 15 decibels after a highway project is built. ADOT typically monitors noise levels after freeways are opened. According to ADOT policy, ***anytime an impact occurs, abatement must be considered.***

WHEN does ADOT involve the public in traffic noise issues?

ADOT works with local agencies to prevent sensitive receivers from encroaching near its highways. ADOT has

constructed more than 30 miles of barriers, most within the last several years, and is among the nation's leaders in highway noise control. The Department also conducts one of the most active research programs in noise analysis and control, and uses the latest state-of-the-art computer models and noise measurement equipment manned by highly qualified noise analysts.

The amazing growth Arizona has experienced means traffic volumes continue to increase on its highways. A solution is widening, or adding lanes to an existing highway.

Highway widening projects do not cause perceptible increases in noise levels. If a four lane highway is widened to five lanes, it will carry twenty five percent more traffic. This traffic increase will cause the **Leq** to increase by only one decibel, well below what people can hear. (Remember, the smallest change in noise level a person can detect is 3 decibels.) However, ADOT always takes into consideration how noisy the highway was before the widening, and often builds barriers that reduce the noise levels **below** what they were.

HOW does ADOT measure success in traffic noise reduction?

ADOT works hard to build successful noise barriers. But how do we measure success? ADOT's goals for its barriers include:

- A significant noise reduction of at least 5 to 7 decibels at the first row of receivers.
- Effective aesthetic and architectural integration into the community.
- Effective citizen involvement in decision making.
- Careful attention to neighborhood safety issues like fire access, security, and drainage.
- Careful attention to driver safety, including line of sight and emergency vehicle access.

Once they are in place, maintaining noise barriers is a top priority for ADOT. Most barriers in Arizona are made of concrete or masonry, which is an attractive and durable material. Some cities may choose to provide funding for some additional enhancements. The Department's maintenance staff responds quickly to problems such as graffiti. Maintenance usually means that ample landscaping is installed and well kept to enhance the aesthetics of the highway environment.

DOES ADOT also address noise from construction?

Noise is made both by traffic and by the construction of the highway. To combat ***construction noise***, ADOT requires its road builders to use:

- Good, working mufflers.
- Proper placement of equipment.
- Restrictions on work hours, as needed.

The Arizona Department of Transportation is committed to noise compatible highways, and to building barriers wherever they are needed. Noise is an unfortunate byproduct of the highway system, and yet highways are essential to Arizona. ADOT wants your help in making decisions about highway noise mitigation.