The Wall Journal™

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The International Journal of Transportation-Related Environmental Noise Issues

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PennDOT's I-95 Intermodal Mobility Project... Heading for the Twenty-First Century

by Harvey Knauer

Interstate 95 (I-95) is a premiere corridor in the U.S. interstate system. Extending almost 2,000 miles from Maine to Miami, I-95 is the primary inter- and intra-state artery linking major metropolitan areas along the East Coast. In southeast Pennsylvania, I-95 is the major north south route serving the Philadelphia metropolitan area.

The 51 mile segment of I-95 in Pennsylvania carries traffic volumes in excess of 145,000 vehicles per day, and serves as a major access route to Philadelphia's airport and shipping ports. I-95 also functions as a primary commuter route, connecting Center City Philadelphia with its highly populated suburban areas in Pennsylvania, Delaware and New Jersey. In addition, this segment of I-95 exists in a truly multi-modal environment that includes parallel and connecting commuter rail lines, bus services, airports, ports and waterways, intercity passenger rail freight and numerous alternative highway routes.

Like much of the national transportation infrastructure, the Pennsylvania portion of I-95 is characterized by physical and capacity deficiencies. Portions of I-95 in Pennsylvania are experiencing significant pavement distress which will require the restoration, and in many areas, reconstruction of the highway. Numerous structural needs have also been identified as necessary to satisfy the traffic loads on this highway. Moreover, portions of I-95 in Pennsylvania are highly congested, with the entire corridor projected to be at an unacceptable level-of-service by the turn of the century. Equally important, the Philadelphia region was recently determined to be in severe non-attainment with regard to ozone. Recognizing the highway's myriad needs, the unique intermodal opportunities available in this corridor, and the impracticality of trying to build its way out of highway congestion, the Pennsylvania Department of Transportation (PennDOT) sponsored the I-95 Intermodal Mobility Design Concepts Competition. Its purpose: to attract the most innovative and imaginative thinking in the engineering community to solve I-95's problems.

Prior to advertising the competition to the consultant community, Penn DOT assembled a group of the nation's experts in highway design, traffic control, ridesharing, transit and IVHS activities. In January of 1990, this group, along with Penn DOT staff and representatives from other state, city, and county agencies, developed a philosophy for the rehabilitation and reconstruction of I-95.

Acknowledging the traditionally myopic approach to transportation projects in the past, and realizing the severe constraints and dire needs of the future, PennDOT set about to make this highway the model highway for the 21st century.

The intent of the project was to modernize the existing facility to include providing an essentially maintenance free riding surface, integrating transportation modes to increase corridor throughput of people and goods, increasing vehicle occupancy, and tying parallel facilities into a single well-managed transportation corridor using the most advanced transportation technologies available. This charter was summarized into four basic project objectives: Alleviate congestion in the corridor; Integrate mass transit and auto travel; Mitigate noise and improve air quality; and Showcase advanced transportation technology (AIMS).

The actual competition process began in July 1990, with the advertisement of the availability of the Request for Proposal (RFP) document. The RFP generated more than 200 requests from individuals and firms from 25 states, Puerto Rico and Canada. The RFP detailed the "AIMS" of the Intermodal Mobility Project and the rules of the competition, as well as solicited expressions of interest/statements of qualification from firms or teams interested in participating in the competition. In addition to the competition rules, there were very specific guidelines for the preparation and submittal of the statements of qualification. In mid-October 1990, valid submittals were received from 10 teams comprised of 50 individual consultants and consultant firms from 12 states. In November, seven of these teams were short listed and invited to make oral presentations to the project's Executive Committee. Based on the oral presentations and review of the qualification packages, five teams were selected as finalists to participate in the Design Concepts Competition.

In January 1991, the five teams began developing design concepts for the rehabilitation, reconstruction and modal integration of the I-95 Corridor. The teams were given no restrictions or parameters on their design concepts, nor were they given instructions or preconceived notions on what direction the design concepts should take. The only guidance provided were the four major project objective—the "AIMS". In trying to achieve these objectives, PennDOT stressed that it was looking for creativity in the proposed concepts, as well as sound

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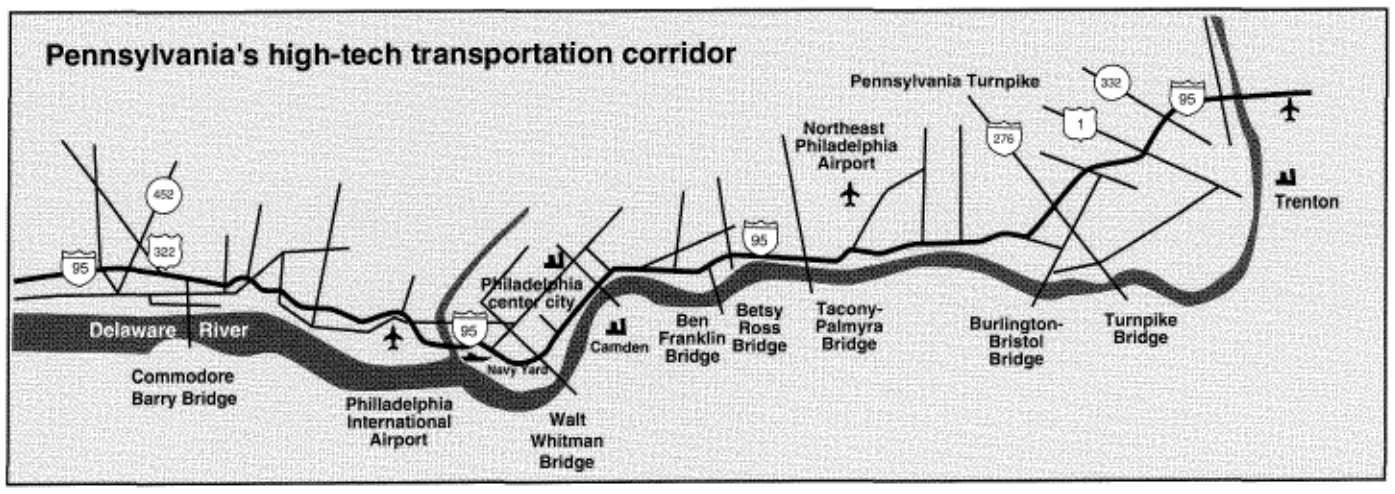

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engineering principals and economic feasibility. Each team had approximately six months to develop and refine its concepts, which had to be submitted in a Final Report to PennDOT in mid-July 1991.

Throughout the six months, the PennDOT I-95 Project Coordinator attended working sessions of each team. However, he did not participate in the respective team's discussion nor comment on the proposed concepts; he merely observed and clarified the competition rules. In addition to the Final Report, the teams made oral presentations in mid-August 1991, and each team received $200,000 for successfully completing the competition.

On August 26, 1990, 10 days after the last team's presentation, the Pennsylvania Department of Transportation announced Ebasco Infrastructure of New York , NY and Langhorne, PA as the winner of the competition. With Ebasco as its primary consultant, PennDOT has begun preliminary engineering activities to further refine the best concepts proposed by all the participating teams. The challenge is to select the best mix of "smart highway" and vehicle innovations, and proposed infrastructure improvement, while ensuring financial and technical feasibility.

The I-95 Intermodal Mobility project is a tremendous undertaking that will encompass a broad range of highway, transit, urban design, advanced technology and public involvement elements. The team's reports had different emphases and approaches to these elements, however, there were several recommendations common to all five competitors. The most significant of these commonalities is the construction of some type of a special use, or High Occupancy Vehicle (HOV), roadway along I-95. The specific recommendations for location and access / use parameters differed from team to team, but, the overall benefit to the corridor was common to each report.

Currently, PennDOT is investigating the feasibility of creating special use lanes on I-95. Today's travel patterns exhibit a high degree of demand to center city Philadelphia during the morning peak hour, and out of the city during the evening peak. The demand is particularly heavy to communities north of center city Philadelphia. Therefore, the initial segment being considered for special use lanes begins in center city at I-676 (Vine Expressway) and continues north for 13 miles through the chronically congested section of I-95. This section is one of the older segments of I-95 in Pennsylvania and is typified by poor pavement conditions and bridges in need of rehabilitation.

The special use lanes would be used to carry a substantial portion of I-95 traffic while the mainline is rehabilitated. After construction is completed, the special use lanes would revert to HOV usage. The HOV lanes could be reversible, providing two lanes of travel southbound during the morning peak period and northbound during the evening peak. It is anticipated that access to and from such special use lanes would be limited to major interchanges, thereby reducing the number of permanent access points and creating a less turbulent, more efficient flow of traffic.

A primary goal of the I-95 Intermodal Mobility Project is to maximize transit ridership in the I-95 corridor and to integrate auto and transit travel. I-95 in Pennsylvania runs parallel to the Northeast Corridor which provides Amtrak train service between Boston and Washington, D.C. The Southeastern Pennsylvania Transportation Authority (SEPTRA) also provides extensive service through the corridor. This comprehensive train service provides access to center city Philadelphia from New Jersey to the north and Delaware to the south. Hence, many of the transit improvements and incentives will be aimed at luring commuters out of their cars onto the trains during reconstruction. Near-term efforts include improvements and expansions to park-and-ride lots along transit lines that parallel the highway.

Also, an in-depth study of current transit services and capacity is being conducted and will recommend ways to enhance system efficiency and increase ridership. Longer-term transit initiatives include large-capacity mixed-use transportation centers with direct connections to and from the highway. Throughout these initiatives, the project will focus on improving access and signing for transit facilities and enhancing station amenities and safety. In this process, a variety of strategies proposed during the competition will be considered.

Like the special-use lanes, many of the improvements will be considered for implementation during the early stages of of the project, providing additional capacity during the reconstruction of I-95. These improvements, coupled with an aggressive marketing campaign, should encourage commuters currently using the highway to use mass transit. This temporary switch could become permanent if the traveling public is provided with an alternative that is reliable, comfortable and time and cost competitive with auto travel.

In addition to passenger transit services, this multimodal corridor hosts the Philadelphia International Airport and several marine/freight terminals. Both the air and marine ports are accessed from I-95, and SEPTA provides train service between center city Philadelphia and the airport. In addition to improving highway access to the port facilities, the I-95 rehabilitation and reconstruction will improve safety along the corridor, and elimination of lane drops will be incorporated into the effort. During the later stages of the project, advanced transportation technologies that facilitate goods movement, and the possibility of using the special use lanes in off-peak hours, will be investigated.

The ultimate goal of the Intermodal Mobility Project is to create the model 21st-century urban transportation corridor. In addition to rehabilitating the highway and maximizing the intermodal efficiency for the entire corridor; the study, analysis and implementation of advanced transportation technologies for all modes will be a significant aspect of the I-95 project. To date, many of these technologies are still in their infancy . In fact, many are not developed to the point where they can be tested in a corridor. Still other technologies or concepts are in the early stages of implementation on our nation's highways, and it will be some time before they are fully integrated into the transportation planning process.

Consequently, while intelligent transportation systems components are expected to be incorporated into many project elements, the ultimate program will most likely be formulated in the later stages of the rehabilitation effort. This program for I-95 will be coordinated with an ambitious Traffic Incident Management System (TIMS) program recently initiated by PennDOT. The TIMS program is a 14 component system that combines relatively low-tech initiatives such as the establishment of incident response teams and screened accident investigation sites with high-tech elements such as a state-of-the-art traffic management control center.

In the early years of the I-95 project, demand management and congestion management strategies will be more prominent than advanced transportation technologies. Primary among these efforts will be incident management initiatives that include traffic surveillance and control systems such as CCTV and variable message signs managed from an operations control center. Other incident management initiatives may include median plantings to reduce "rubber necking" and accident investigation sites to remove the obstacle from the highway and out of view from motorists. Although prominent, incidents are not the only cause of congestion, and the early stages of the project will focus on several demand management strategies.

The later stages of the project will include the development of an advanced traffic management system which may consider such strategies as satellite technology, advanced traveller information systems and in-vehicle navigation. All these elements would be tied to or coordinated through a regional traffic control center that would serve I-95 as well as the other roads and highways comprising the region's substantial transportation network. This traffic control center would also serve as a communications link to traffic control centers in other states (primarily NJ and DE, but including the Boston to Washington, D.C. corridor).

In addition to collecting and disseminating traffic information, the control center may also function as a technology education center for the unusually large number of colleges and universities concentrated in the greater Philadelphia region. The I-95 rehabilitation and reconstruction program presents scientists, engineers and developers with a unique and optimum opportunity to study emerging technologies in a living test bed. Opportunities also exist for investigating alternate funding mechanisms, such as public / private joint ventures.

The model 21st century highway must be more than technologically sophisticated; it also must be sensitive to its natural environment and the communities through which it passes. The major environmental considerations of the I-95 Intermodal Mobility Project will be improving air quality and reducing noise levels. Demand and congestion management and intermodal efficiency will be the primary tools by which air quality improvements will be achieved. Less traffic and more free flowing traffic will also help reduce noise along the corridor. However, the construction of noise barriers will be the focus of those mitigation efforts. In addition, PennDOT is only considering designs that will require taking minimal or no additional right-of-way. The goal of the project is to improve and maximize the efficiency of the existing facility, not to simply create more lanes.

In addition to noise and air, the I-95 rehabilitation project contains a strong urban design element. This

project aims to make I-95 a better neighbor to its adjacent communities. For instance, noise walls will be designed with consideration for the character of the community. PennDOT adopted this approach on recently completed regional expressway projects (I-676, I-476, I-95) and found it to be both an aesthetic enhancement, as well as an effective community relations tool.

Other urban design treatments may include median plantings. In addition to reducing headlight glare and rubber-necking, median planting of low maintenance, hearty shrubs and grasses enhance the visual perception of the highway. Flag plazas tying in the historic nature of the region with the corridor are also simple and cost effective aesthetic treatments to be considered. Improved signing, removal of graffiti, simple bridge treatments (i.e.: painting fences and rails on bridges along the corridor a uniform color) and upgrading welcome centers and rest stops are cost-effective measures that can be taken to enhance the appearance of the Corridor for travellers and the community.

This rehabilitation and modernization program is a complex, multi-faceted, long-term endeavor that affects highway users, transit riders and the communities throughout the corridor. To achieve the project's goals— reconstruction with minimal impact to the user and the community; inspiring and achieving mode switches; implementing demand management strategies and advanced transportation technologies— the public will have an active part in the planning and implementation of the I-95 Intermodal Mobility Project. PennDOT is planning a comprehensive public information/ community relations program to provide citizens, legislators, businesses and other agencies in the region with regular, up-to-date information on the plans and progress of the project. The Pennsylvania Department of Transportation recognizes that the public is an integral part of any project since it has to live with the facility provided. Like its development of I-476 and I-676, PennDOT's goal is to make the I-95 Intermodal Mobility project an award winning, integrated 21st century transportation corridor.

FDOT Noise Barrier Design, Construction & Maintenance Workshop

by Win Lindeman

Fort Lauderdale was the site of a two-day workshop on highway noise barriers sponsored by the Environmental Management Office of the Florida Department of Transportation. Florida DOT employees in Project Development, Design, Construction and Maintenance joined with consultants, material suppliers and builders to discuss mutual concerns and advancements in the noise barrier development process. The more than 70 attendees rated the workshop a huge success.

Win Lindeman, FDOT's noise program coordinator and the sponsor of the workshop, opened the first day of the session with a discussion of visual quality in noise barrier design. Ken Campbell, District 4 (Fort Lauderdale) noise specialist, reviewed the noise abatement needs identification process used by Florida DOT.

"Designing for Quiet" was the topic of discussion led by Tom Andres and Angelo Garcia. Tom is with the District 4 Structural Design group; Angelo is with FDOT's Structural Design Office in Tallahassee. They discussed important design aspects related to noise barriers in Florida, and reviewed major design criteria issues, including wind loading, the numerous design codes to be used, and recommended a number of reference works available to designers.

They also highlighted their work developing a Standard Index for Noise Barrier Walls. Mr. Garcia also pointed out several elements in the *AASHTO Guide Specifications for Structural Design of Sound Barriers* which might affect design of barriers in Florida. Mr. Andres stressed the importance of good geotechnical data and the need to involve the geotechnical expertise available when designing a noise barrier wall. Wind loading factors also generated a lot of interest from those in attendance.

Mike Bone, Vice President of State Paving Corporation of Fort Lauderdale, discussed his firm's cost-saving design and construction techniques for noise barrier walls. Through the pursuit of value engineering proposals, State Paving saved nearly $500,000 on one barrier project alone. Mr. Bone explained the construction methods used and the alternate design which led to the major cost savings.

Two FDOT Construction Project Engineers, Bill Walsh and Bob Taraska (District 4) highlighted the special concerns for the construction engineer as they relate to noise barrier installation. As the project engineers on over $10 million worth of noise barrier contracts, their experiences were of great interest to the project development and design people. Special design problems such as drainage structures, utilities and right of way issues were noted. Both men stressed the importance of "walking the job" by the noise specialist and designers to ensure that the placement of the noise barrier will not be hampered by unexpected obstacles such as overhead power lines, stream crossings and underground utilities.

Win Lindeman led a review of the major maintenance issues and how many of them can be handled in design, right-of-way, and specifications. Minimizing the "no-man's land", anti-graffiti coatings and good surface design were stressed.

As a special service to aid district noise specialists and designers, noise barrier material and service suppliers were invited to participate in the workshop. Over a dozen suppliers from as far away as Colorado and Nevada took advantage of this opportunity to make a presentation to FDOT's noise specialists and designers on their products and services. This unique forum was well received by all who attended, both within FDOT and the suppliers, where everyone had a chance to compare notes on the various qualities of each product or service.

Jim Pennington of the State Construction Office informed all suppliers of the process required to get their product on the FDOT-approved products list. This was a topic of keen interest to many of the suppliers since Florida has a somewhat unique process.

During the two-day workshop, attendees were encouraged to visit many of the nearby noise walls along Interstate 95 in Dade, Broward and Palm Beach counties. Self-guided tours were made possible by the excellent maps and detailed write-up on each wall provided by Ken Campbell of FDOT's District 4 office.

This is the second bi-annual workshop sponsored by FDOT with a similar workshop scheduled for 1994. Other state DOTs participating in this workshop included North and South Carolina. Anyone interested in putting together a similar workshop may call Win Lindeman at (904) 488-2914 for details. Many of those in attendance asked about the possibility of a similar workshop format on a regional or national scale. The feasibility of such a workshop will be explored in the future with Federal Highway Administration staff and other state DOTs.

Win Lindeman is an Environmental Administrator for Florida Department of Transportation.

Special Notice

by Bill Bowlby

Good news! Through the hard work of Congressman Bob Clement (D-Nashville), the U.S. House of Representatives has passed an amendment to Section 101 of the Intermodal Surface Transportation Efficiency Act (ISTEA) to include "traffic noise abatement on highways open to traffic" as one of the eleven Transportation Enhancement activities. This change will make funds available for Type II retrofit noise abatement.

Thanks to those of you who responded to our fax campaign by contacting your legislators, and helped to get the word out. The full Technical Corrections Bill for ISTEA, which includes this change is now in Senate committee. We expect action after Labor Day. Please contact your senators and seek their support.

Happy Ending to Noisy Nightmare: A Project History

by Cary B. Adkins

One of the largest sound barrier projects in Virginia's history is nearing completion in northern Virginia. The barriers are being constructed along I-66 west of the Capital Beltway (I-495) in conjunction with the "Interim" HOV Lane project. This abatement project consists of 13 barriers ranging in height from 8 to 28 feet and totaling 6.37 miles and 550,000 square feet at an estimated cost of $9 million. These numbers, while certainly informative, do not begin to tell the story of the barriers and how they became a reality.

Those of us who deal with transportation-related noise in the public sector often face very frustrating situations where we are unable to provide solutions to serious noise problems. In some cases, an engineering solution just doesn't exist. Much more often, however, the lack of funding and/or state and federal policies and regulations are the culprit. I-66 appeared to be one of those situations. Fortunately, the story has had a happy ending.

Many of the neighborhoods located along the I-66 corridor were already in place at the time the interstate was initially constructed west of the Beltway. Unfortunately, this was also prior to the National Environmental PolicyAct (NEPA), and thus noise abatement was not a consideration. Since the Virginia Department of Transportation (VDOT) does not have a retrofit program, sound barriers can only be provided along an existing facility like I-66 when in conjunction with a project which widens or otherwise increases the capacity of the highway.

Since the initial construction, only two interchange improvement projects along this section of I-66 have qualified for the consideration of noise abatement. One project, which resulted in the construction of two sound barriers, was completed in 1989. Barriers were found not to be cost effective for the other project, currently under construction, and involves major modifications to the interchange with the Beltway.

As traffic in the corridor has increased over the years, the need for additional capacity has become clearly evident. In an effort to meet that need, VDOT is planning to widen I-66 to include HOV lanes and additional through lanes for conventional traffic. However, at the present time adequate funds to advance the project to construction are not available. To provide some relief until funding does become available for this "ultimate" improvement, VDOT decided in 1990 to advance an "interim" solution.

This "interim" solution involves the temporary designation of the inside lane in each direction as HOV lanes and the outside shoulders as conventional lanes during peak traffic periods. A noise analysis conducted by VDOT to determine the possible effects of this "interim" project on noise levels in the corridor resulted in several interesting but not unexpected findings. First, peak period noise levels under the HOV concept would be only one decibel higher than with the existing system. Second, the worst-case noise levels would occur during an off-peak period when levels would be two to three decibels higher than during peak periods. Finally, noise levels in the corridor were already high, reaching 70 to 75 decibels in most neighborhoods.

VDOT has consistently acknowledged the serious noise problem and the need for noise abatement along I-66. However, given the interim nature of the HOV project and the limited use of the shoulders as through lanes during peak periods only, coupled with the fact that the noise environment would not be affected by the project, VDOT and the Federal Highway Administration (FHWA) could not classify the "interim" solution as qualifying for noise abatement consideration. VDOT did commit to fully address the noise issues as part of the "ultimate" solution.

This interim/ultimate HOV concept has previously been applied in Virginia on I-95, south of the Capital Beltway. The "interim" solution was utilized for a number of years and did not involve consideration of noise abatement. The "ultimate" HOV improvement is currently under construction and includes several sound barriers.

One of the most frustrating issues involved in the I-66 situation was VDOT's inability to establish a definite timetable for advancing the "ultimate" project to construction. The residents feared that the "interim" project might become the "permanent" solution and that the noise problem would never be solved. With this fear and the realization that neither FHWA nor VDOT funds could be used for noise abatement in conjunction with the "interim" project, the I-66 Citizens Coalition, a very professional and well-organized group representing many of the neighborhoods in the I-66 corridor, began searching for alternative funding sources. With the help of their congressman, the Coalition was successful in that search.

Largely through the efforts of that congressman, demonstration funds were authorized by Congress for the construction of sound barriers along I-66. Because the "ultimate" improvement could affect their height and location, it was required that the barriers be designed such that they could be relocated and heightened, if necessary. VDOT has designed the barriers, is managing their construction, and will take care of maintenance. FHWA and VDOT have authorized the use of I-66 right-of-way for installation of the barriers.

VDOT was able to design the abatement package such that 96% of the impacted properties will receive 5 to 14 decibels of noise reduction. The protected properties include 500 single-family homes and apartments and condominium units, nine ballfields, tennis courts in two developments, a recreation center, and a school playground.

While the entire abatement project is not yet complete, VDOT has received very favorable comments from residents regarding the barriers' performance. It appears that the noisy nightmare along I-66 is nearing an end.

Cary Adkins is an Environmental Planner for Virginia Department of Transportation and manager of VDOT's noise program.

Ed. Note: *Upcoming issues of The Wall Journal will carry updates on the I-66 project by Mr. Adkins, as well as photographs of the sound barriers and information on the project suppliers and contractors.*

Editor's Corner

by El Angove

Talk about getting back into a corner. This is ridiculous. There's not enough space to even begin to write about all the nice comments and spirit of cooperation generated by the first issue of The Wall Journal. It looks as if we are off to a great start.

I want to thank Randy Flodine, Kenneth Gambrill and their staff for the excellent meeting they put together in Colorado Springs. Good show! The Summer A1F04 meetings seem to get bigger and better every year.

The first issue of The Wall Journal, along with subscription, registration, and advertising information was mailed to 2,200 readers. In order to continue to cover the costs of publication and mailing, it is essential that we have your support. Please make a special effort to return your subscription/registration form as soon as possible so that you will continue to receive the Wall Journal. If you are in business, an ad in The Wall Journal is an excellent way to present your products and services to over 2,000 potential users. With your support, we can continue to expand and improve our coverage of the issues that interest and affect you.

TRB A1F04 Committee

Summer Newsletter, 1992

by Win Lindeman, Committee Secretary

The A1F04 group held their annual summer meeting July 12-15 in the beautiful city of Colorado Springs at the foot of Pike's Peak. Hosted by the Colorado Department of Transportation, the meeting was a smashing success by any measurement technique which you choose to use. Attendance was reported at an all-time summer meeting high of 104 (it seems these summer meetings are becoming bigger and better every year).

The accommodations at the Colorado Springs Marriott were first-rate, the hospitality outstanding, the papers excellent, the field trips plentiful and varied, and the extra-curricular activities out of the ordinary. From all of us who attended, a heartfelt **Thank You** to Kenneth Gambrill, Randy Flodine and their great staff.

■ **Summer Meeting Recap:** The 1992 Summer Meeting is history, but the memories will linger on into the fall for those who attended. Some of the highlights of the meeting, based on personal observation and a consensus of those who participated, include:

1. The excellent papers and presentations. Thanks to all of you who took the time and made the effort.(See reprints in this issue -ED)
2. The scenery. Beautiful! Thanks, Mother nature.
3. The trips, displays and food, not necessarily in that order.

A special thank you is given to all the vendors who contributed to the success of the meeting. Without your participation, the meeting would not have been nearly as enjoyable as it was.

■ **Coming Events:** The TRB Annual Meeting will take place January 10-14, 1993 in Washington, D.C. Watch for the complete schedule in the Committee fall/winter newsletter (also to be published in The Wall Journal) and plan to attend. If you want to prepare a presentation/ paper for the Annual Meeting, please contact the A1F04 chairman, Domenick Billera, as soon as possible. Domenick's address is New Jersey DOT, 1035 Parkway Avenue, CN 600, Trenton, NJ 08625 (telephone 609 530-2834).

The 1993 A1F04 Summer Meeting will take place in the San Francisco Bay Area, and will be hosted by James Nelson of Wilson, Ihrig and Associates and CalTrans District 4 office. The exact dates haven't yet been set, but will most likely again be in July, so make plans now to spend time in the Bay Area.

■ **Something New:** Something so new and exciting has just come out that I feel like a new father announcing its arrival. The new item is The ***Wall Journal,*** which you are now reading. This new publication is edited by a long-time friend of A1F04, El Angove, and the first sample issue was unveiled at the Summer Meeting in Colorado Springs.

At last we have a forum for communication and technology exchange which is mailed on a monthly basis to more than 2,000 readers who share our interest in transportation-related noise issues. This is your opportunity to share your expertise with a large audience of targeted professionals, and to benefit from their technical experience. I hope that we will all take the time to submit papers and articles to The ***Wall Journal,*** to maintain this valuable resource and to keep our fellow professionals informed.

■ **Committe Changes:** Ken Polcak of the Maryland State Highway Administration has replaced Bill Bowlby as the chairman of the Highway Noise Subcommittee. Bill has guided this committee for a number of years with outstanding success. Bill, thanks for all you have contributed in the past and we look forward to more great input in the future. For Ken, we wish you nothing but the best as you take over this extremely important subcommittee.

Jack McCann of the Aircraft Noise Subcommittee has retired and been replaced on the committee by Ernest Hinterkeuser. Both are affiliated with Pratt & Whitney in East Hartford, Connecticut. Happy trails to Jack and welcome aboard to Ernest.

Jim Byers, a long-time member of the Highway Noise Subcommittee has moved out of the noise abatement area into highway planning. His spot on the state representative (to A1F04) list has been taken by Wayne Kober. Wayne is the chairman of Committee A1F02, Environmental Analysis, and has been active in A1F04 meetings in the past.

Win Lindeman is an Environmental Administrator for the Florida Department of Transportation.

FHWA Update

by Bob Armstrong

New Guidance: The Federal Highway Admin-istration (FHWA) has recently developed a guidance paper entitled "Highway Traffic Noise Analysis: Reasonableness and Feasibility of Abatement." This paper discusses how State highway agencies might quantify various criteria and procedures (e.g., the views of the impacted residents, the future absolute traffic noise levels, and the amount of development which occurred before and after the initial construction of the highway) for use in abatement decision making. The paper has been distributed to State and FHWA field offices.

Summary of Noise Barriers Constructed by December 31, 1992: The FHWA has triennially provided a summary of highway traffic noise barriers constructed since 1980. This fall, field offices will be asked to update barrier data through the end of 1992. A new summary should be available by next summer. In keeping with FHWA's metrication policies, all data will be in metric units.

Noise Barrier Photographic Library: The FHWA is developing a photographic library of highway traffic noise barriers. Slides and/or prints of barrier installations depicting different material types; structural designs; and landscaping, safety, drainage, or aesthetic treatments will be gratefully appreciated. Also, a full description would be very useful. Materials may be sent to FHWA, 400 Seventh Street S.W., HEP-41, Washington, D.C. 20590, Attn: Bob Armstrong.

New Vendors: New vendors for highway traffic noise barriers are the following:

Concrete
Concrete Solutions, Inc.
3529 Fawn Creek
Austin, TX 78746
(512) 327-7488

Structural Sandwich Panels
("S-Wall", prefabricated, reinforced concrete, foam core, stucco finish, w/windows if desired)
Avon Wall Systems, Inc.
4333 Fairmont Avenue
San Diego, CA 92105

NOTE: *Listing of products and vendors is for informational purposes only and does not constitute either endorsement or approval by FHWA.*

To obtain a complete listing of known vendors, or for questions and comments concerning this column, contact Bob Armstrong at (202) 366-2073 or Steve Ronning at (202) 366-2078.

Transportation Noise in the Nineties

by Louis F. Cohn

After having been involved in this field for over twenty years, I can see some significant trends in how we deal with transportation-related noise. The first issue deals with our analytic technologies. We have had the benefit of prediction models such as STAMINA 2.0/OPTIMA and INM 3 for quite a few years. While these tools are always in need of some improvement, they basically do a fine job. In fact, for highway and aircraft noise, the accuracy of the models outstrips the abilities of planners and forecasters to predict future traffic volumes and characteristics.

The models, especially the FHWA model should better emulate the noise emission characteristics of the individual vehicle. We have conducted emission level re-definition studies for two states which have resulted in lowering the medium and heavy truck reference energy mean emission levels by 4 to 6 dBA. This is turn reduces final Leq values by several dBA, depending on the truck percentages. These two states are now in a position to save millions of dollars in unnecessary barrier construction resulting from erroneously high noise predictions.

The second issue for transportation noise in the nineties is the need to control mitigation costs. In a recent meeting with a top level state DOT administrator, I was told that state funds were so scarce, that one barrier costing less than $500,000 was jeopardizing a $50,000,000 interstate widening project. This was most likely an exaggeration borne of frustration, but it does signify the innate opposition we often face in trying to do something about transportation noise.

I also see a very sophisticated public battling government agencies to secure relief from their noise problems. In the last few years I have observed many public meetings where the community has been better prepared and more organized than the agencies trying to build the project. As a result, it is typical these days to see direct intervention by elected officials in the decision making process. For example, one city in the southeast recently received $5,000,000 in barriers after the mayor, city commissioners and the governor met over a set of highway plans to discuss specific locations and their political persuasions. The governor wanted certain neighborhoods protected because they supported him in his election. This whole affair was brought on by the fact that the state DOT engineers underestimated the community's will. The state originally recommended $0 in abatement for a project which in some cases had traffic projections exceeding 100,000 vehicles per day.

Another issue for transportation noise in the nineties relates to condemnation litigation. In two court cases, juries have awarded plaintiffs in excess of twenty two million dollars, principally as a result of documented noise damages. There is a sleeping giant out there about to be awakened by aggressive condemnation lawyers. This giant will take vast sums of money from state departments of transportation who build projects too close to commercial properties.

On another matter, along with Al Harris I am proud to announce that the eleventh offering of our Highway Noise Analysis Seminar is scheduled for Louisville October 5-9, 1992. Please look for our published schedule elsewhere in this issue.

Dr. Louis F. Cohn is Professor and Chairman of the Department of Civil Engineering at the University of Louisville, KY.

Summary of Professional Papers

(part 1 of 2)

Presented at the TRB A1F04 Summer Meeting at Colorado Springs: July 13-15, 1992

The following are summaries of papers presented at the Colorado Springs meeting, printed in order of presentation. The remaining papers will be presented in the October issue.

These papers are the first in a continuing series which will provide a chronicle of all the professional papers presented at A1F04 winter and summer meetings beginning in 1978. When the series is complete, we will publish an indexed, categorized compilation of the series that will provide a handy reference to the technical presentations of the meetings. We welcome any assistance in accumulating historical data.

Strategic Three-Dimensional Aviation Noise Planning

The strategic planning of our nation's aviation system is essential in order to maximize productivity, enhance economic development, as well as preserving the earth's biosphere. Our biosphere represents the life support system of the human population, consisting of the atmosphere, lithosphere and hydrosphere. Spatially, the biosphere is a finite area that requires a sensitive planning and management approach when designing an aviation system of airports for the United States.

Unfortunately, the planning process generally used today treats "land use" as a flat two dimensional subject in a three dimensional spatial universe. This approach inhibits the planning process both in terms of problem identification as well as problem solving, an approach we can ill afford to maintain as we near the 21st century. The words "land use" no longer appear to be appropriate, and they need to be replaced by "space use", when airport master planning is involved.

Opportunities abound to plan for this environment in terms of three dimensions: aerial, surface and subterranean development. Furthermore, our methods for planning and problem solving usually emphasize the visual sense rather than all five senses. Lastly, this biosphere must be examined temporally as a 24 hour system. Countries whose governments take advantage of this opportunity will position themselves well to enhance economic productivity, manage their finite resources effectively, while remaining sensitive to the fragile biosphere, and the issue of compatibility.

This presentation examines a strategic approach to aviation planning that considers the integration of spatial, sensory, and temporal attributes of the environment. The spatial component consists of three interrelated planes: aerial, surface and subsurface planes. Sensory elements involve visual, acoustical, olfactory, gustatory, and tactile systems, while the temporal addresses utilizing time on a continuous 24 hour basis. With the use of these three attributes, more innovative approaches can be applied for more effective strategic master planning of both civilian and military airports. New computer and simulation technologies, along with three dimensional kinetic geographical information systems associated with multisensory (i.e., visual, acoustical and olfactory) modeling will position the engineer, architect, and planner to have a more visionary perspective into the master planning process for the 21st century. This technology is being applied to the planning of "Vertigate": A three-dimensional vertical gateway to Atlanta, which incorporates vertical lift aircraft into a spatially designed multi-use corridor over an interstate highway system for the 1996 Olympics.

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Land Development Issues Resulting from "All Stage 3" Airline Fleets

Washington Dulles International Airport was opened 30 years ago in an area that was primarily agricultural or undeveloped. Subsequent planning efforts have sought to protect the airport's potential for growth by prohibiting incompatible development around the airport. To this end there has been a longstanding ban on residential development in areas predicted to be exposed to aircraft noise of 65+ Ldn. The noise exposure forecast used for this purpose was based on the capacity of the airport and anticipated continued use of the older, noisier Stage 2 aircraft.

Recently, the Federal Aviation Administration adopted regulations which require the cessation of all Stage 2 aircraft operations by the end of 1999. New noise exposure projections now account for the gradual phaseout of the noisier aircraft. With the Stage 2 aircraft removed from the projections and replaced with comparable Stage 3 aircraft the new noise exposure contours are considerably smaller.

Soon after the new noise contours were published a major developer sought to take advantage of the new contours by expanding his residential development into the areas now outside of the 65 Ldn contour. Local govemment, however, was concemed that such development would lead to more and more similar uses of the land closer to the airport, and that such use could eventually constrain the operational growth.

Given the developer's eagerness to start his project and the local government's reluctance to allow it the situation was ripe for compromise. The result was a set of criteria which include disclosure language, "soundproofing", and aviation easements.

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Noise Analysis for Air Force Base Disposal and Refuse Program

The Secretary of Defense's announcement of the proposed closure of various Air Force bases pursuant to the Base Closure and Realignment Act of 1988 prompted a series of environmental impact analyses in accordance with the National Environmental Policy Act for the action associated with the disposal of military property. This paper presents an overview of Acentech Incorporated's role in performing the noise impact analyses of a wide range of reasonable reuse alternatives. Aviation reuse alternatives included international airports, maintenance hubs, and general aviation airports. Non-aviation uses such as light industrial parks, commercial uses, open pit mines, and residential developments were also evaluated. Noise impacts from aircraft operations, surface and rail traffic, and industrial equipment were considered in the evaluations.

The studies presented interesting challenges of working with the requirements and goals of Air Force, FAA, states, and local communities.

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The Stapleton Noise Mitigation Program

Airport noise became a significant problem for communities in proximity to Stapleton International Airport as aircraft operations increased in the late 70's and early 80's. In response to public outcry, the City and County of Denver in joint sponsorship with seven surrounding jurisdictions developed the "Final Report And Noise Mitigation Plan For Stapleton International Airport". This report was the basis for establishment of the Airport Noise Office and noise abatement procedures and policies at Stapleton.

Noise abatement procedures currently in place at Stapleton Include the following:

- A preferential runway use system that lists a preferential order of runway use, specifies altitudes and headings for FAA control of aircraft in vicinity of the airport, and establishes noise limitations on specific runways;
- An aircraft runup pad and specific runup procedures;
- Local aircraft training procedures;
- Nighttime operational procedures;
- A noise complaint recording system;
- A noise rule titled, "The Stapleton Aircraft Noise Limitation Program" which grants noise allocations to the airlines and caps the amount of noise generated from aircraft operations;
- A noise insulation program titled "The Stapleton Noise Insulation Program";
- A noise advisory committee titled "The Stapleton Airport Noise Advisory Committee" which addresses ongoing issues resulting from airport noise impacts;
- A 17 site noise and operations monitoring system.

The implementation and continued monitoring of these procedures has helped to mitigate adverse noise impacts from Stapleton. In addition, the planning and construction of the New Denver International Airport will significantly reduce populations exposed to aircraft noise in and around the Denver metro area.

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The Stapleton Noise Insulation Program: A Case History

The Stapleton Noise Insulation Program (SNIP) is a municipally funded program to sound insulate over 2,000 homes surrounding Denver's Stapleton International AirporL Local funding of the project freed the design team and the program administrators to utilize some innovative engineering and administration techniques. The program's unique format and implementation plan produced a very high level of acoustical insulation and homeowner satisfaction for a lower than average cost per home. Homeowners satisfaction, based on independent surveys is 93% or higher. The basic features of the program are presented as well as the results of follow-up acoustical testing and homeowner response.

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Acoustic Characteristics of Porous Road Surface: A Modified Phenomenological Model

Two approaches are followed in Europe to model the acoustic characteristics of porous road surfaces: a phenomenological one and a microstructural one*. Both introduce as physical parameters of the porous medium: the porosity of the air filled connected pores, the air flow resistivity (airflow resistance per unit length), and structure factors intended to take into account the tortuosity of the pores (shape factor for the phenomenological model, tortuosity and pore size distribution for the microstructural model).

Differences are observed between the respective predictions of absorption coefficient for low values of airflow resistivity (which happen to correspond to real situations). The major reason is that, while both models take into account the viscosity losses, only the microstructural model considers the possibility of losses due to thermal diffusion.

In this paper a new formulation of the phenom-

enological model is proposed which includes this possibility. The differences between the predicted absorption coefficients are seen to be consequently greatly reduced.

*TRR No. 1265-1990
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Texas DOT Noise Program Research Proposal

The TxDOT is beginning to use Noise Barrier Wall (NBW) systems. The majority of the NBW systems presently being used are constructed of precast concrete panels. These panels do not absorb or dissipate the sound; they merely reflect it. A system is needed that absorbs and dissipates noise rather than simply reflecting it.

Aesthetics is also a concern with NBW systems. These walls will become a permanent part of our visual environment. Some people will be more personally affected by NBW's than others, e.g., these walls will be in their back yards or at the entrance to their subdivision. The aesthetic look and feel of NBW's becomes a very important and personal concern we must address.

When addressing aesthetics and NBW's, a dominant request from the public is a landscape alternative. Landscaping alone will not give the required noise reduction. Also, our harsh Texas climates are heating the NBW's, making it almost impossible for landscaping to grow in the vicinity of these walls. Thus, a NBW system that will accommodate landscaping is needed.

A NBW alternative that employs used rubber tires as building units is being proposed. Two separate systems are being introduced. Each system addresses the previously mentioned needs of sound absorption and dissipation, aesthetics, and landscape accommodations. Prototype walls are to be built, with tires used as the major building unit.

Several advantages exist in the use of tires for NBW systems. First, the properties of rubber, the rounded shape, and the void space in the center of the tire will be conducive to sound absorption and dissipation. Second, the circular shape of the tire provides an aesthetically appealing surface. Finally, the void space in each tire provides the means by which landscaping can coexist with these walls.

The intent of these NBW systems is to provide sound absorption and aesthetically pleasing qualities which include landscape options and alternatives. Other fringe benefits, though, have evolved from this concept. These involve the environmental and ecological benefits associated with recycling rubber tires. The purpose of NBW's is to address an environmental concern, traffic noise. These NBW's however, will be addressing many environmental concerns simultaneously including noise abatement, aesthetics (visual environment), and recycling of an ecologically sensitive element, rubber tires.

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Protecting Vibration-sensitive Facilities from Transportation Vibrations

Vibrations can have an adverse impact on certain types of health care, research, and manufacturing activities. Instrumentation used in these facilities are generally far more sensitive to vibrations than are people. Seldom are the effects of vibrations considered when locating transportation systems and these vibration-sensitive high-technology facilities close to each other. When vibration is considered, it is often in the form of a vague nuisance ordinance applying only to the effects of vibration on people. In many instances, these ordinances exempt transportation systems. A good planning tool is needed for the siting and planning of these facilities which recognizes the impacts of transportation systems.

This paper reviews the transportation vibration issues which should be considered in planning or impact assessment involving vibration-sensitive facilities, including the effects of highway construction. It presents a comparison of vibration criteria and signal processing methods appropriate for vibration-sensitive facilities with those typically used for building damage. Several examples are drawn from the authors' consulting activities which illustrate vibrations from transportation-related sources which might typically affect vibration-sensitive facilities.

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Reducing The Ambiguity of Vehicle Noise Evaluations for Specialized Project Permit Applications

Noise impact from vehicles is a major factor in the permit approval process for any project which utilizes heavy construction equipment or haul trucks in populated areas. In these cases, noise impact evaluation, and corresponding conformance to specified noise criteria, is often the key issue in obtaining project permit approval. This paper presents methods to enhance theoretical traffic noise impact evaluations and provide an accurate, understandable noise profile for use in project permit applications. Specific examples of techniques to evaluate the worst case noise conditions are presented. Incorporating noise measurement data with theoretical predictions can provide a clear indication of the proposed project's potential for compliance with specified noise criteria.

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Boston-Rail Transit Noise Analysis

A section of Boston's rapid transit system is being upgraded and modernized with platform lengthening at several stations, traction power improvements, and increasing train length from 4 cars to 6 cars. This study documents the existing noise environment measured along the transit corridor during July 1991 and provides an acoustic baseline for comparison with future noise levels after project completion.

Six locations were selected along the above ground portion of the corridor at which baseline community noise measurements were obtained. Since aircraft using Logan Airport influence the noise environment in the vicinity of the corridor, it was deemed important to estimate the relative contributions of aircraft noise and train noise to the total noise level measured at each location. Separation of aircraft and train noise was accomplished by combining the use of state-of-the-art "intelligent" noise monitors and observations of audible noise sources over a 24-hour period. With the exception of Location 3, train noise levels were determined within 1 decibel of the overall measured noise level at each location. Therefore, train noise was successfully isolated from non-train noise for the baseline community noise measurement program.

Maximum (L1)noise levels of individual train passbys ranged from about 85 dBA to 95 dBA at the measurement locations. Day-night sound levels ranged from 75 dBA to 82 dBA at the noise measurement locations.

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Test Track Center Research Program

Consulting, research, and testing services for both heavy and light rail transportation are conducted at the U.S. Department of Transportation owned, Association of American Railroads operated, Transportation Test Center (TTC) located northeast of Pueblo. Consulting services include derailment analysis techniques, vehicle dynamics simulation, wheel/rail profile development, lubrication effectiveness studies, turnout performance, in situ testing characterization and modeling of passenger cars, passenger vehicle performance testing, and rail vehicle fatigue analysis. Track engineering services include track load testing, rail grinding procedure evaluations, and corrugation investigation. Energy related services include single car energy consumption studies and traction motor efficiency evaluation. Services in the environmental and safety technology area include emergency response training for hazardous material incidents, and air pollution research and testing. This unique rail testing facility has clients throughout North America, as well as Brazil, China, India and other countries. An overview of these services will be presented as a prelude to the TTC tour held in the afternoon.

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Noise Barrier Construction in a High Water Table Environment: an Alternative Method

Highway noise barrier construction has used a variety of methods depending upon cost, safety, soil conditions, aesthetics, and a number of additional considerations. Recent noise barrier construction along Interstate 95 in southeastern Florida has used a less conventional approach to foundation placement. The use of auger cast piles in a high water table environment with a high concentration of clean to silty sands will be explained. Other cost-saving design and construction applications will also be covered.

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The remainder of the summary papers from the TRB A1F04 Summer Meeting will be published in the October issue of The Wall Journal.

For further information on any of these papers, please contact the author directly.

Eleventh Annual Highway Noise Analysis Seminar

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- a 500-page, take-home manual
- a comprehensive user's manual for the software library
- Continuing Education Units
- certificate of completion

You should attend if you:
- provide noise analysis services for state highway agencies
- serve as an analyst for a state highway agency
- direct an environmental department for a state agency or consulting service

Benefit from the expertise of these highway noise specialists:

Louis F. Cohn, Ph.D,P.E., is Professor and Chairman, Department of Civil Engineering, University of Louisville. He has served as chairman of the Transportation Research Board's (TRB) Committee on Transportation-Related Noise and the TRB's Committee on Environmental Analysis. Dr. Cohn also serves as a consultant to the Federal Highway Administration and numerous state highway agencies.

Roswell A. Harris, Ph.D., P.E., is Professor of Civil Engineering, University of Louisville. He has served as a member of the TRB's Committee on Transportation-Related Noise and Environmental Analysis. Formerly responsible for highway noise analysis and abatement design for the Georgia Department of Transportation, he serves as a consultant to the Federal Highway Administration and numerous state highway agencies.

Workshop Agenda:

Monday, October 5
1:00-5:00 p.m..
- Introduction
- Fundamentals Review
- Review of FHWA Policy and Noise Study Criteria
- Introduction to Using the Microcomputer
- Introduction to the FHWA Model
- Homework Assignment

Tuesday, October 6
8:00-12 Noon
- Homework Review
- STAMINA Data Input
- Workshop: Introduction
- Workshop: Modeling the Site

1:00-5:00 p.m.
- Review of Student's Modeling Results
- Workshop: Creation of Executable STAMINA File
- Workshop: Digitizing Lab
- Use of Computer Graphics to Check STAMINA Forms

Wednesday, October 7
8:00-12 Noon
- Workshop: Computer Graphics
- Workshop: Execution of STAMINA
- Discussion of STAMINA Results
- Noise Barrier Experiences in the U.S., Japan, and France

1:00-5:00 p.m.
- Purpose and Use of OPTIMA
- Workshop: Optimizing Noise Barriers I

Thursday, October 8
8:00-12 Noon
- Workshop: Optimizing Noise Barriers II
- Workshop: Presentation of OPTIMA Results

12:00 Noon-1:00 p.m.
- Lunch plus Field Noise Measurement Workshop

1:00-5:00 p.m.
- Parallel Barrier Analysis
- Construction Noise Analysis and Control
- Stop and Go Analysis

Friday, October 9
8:00-11:30 a.m.
- Application of Expert Systems
- Automated Barrier Design
- Noise Study Preparation
- Summary of Workshop

This year's location offers dorm accommodations as well as a wealth of hotels, restaurants, entertainment, and shopping—all within a five-minute drive. The eleventh annual Highway Noise Analysis workshop will be held at the University of Louisville's Shelby Campus. Dorm lodging is available at a nightly rate of $15.00 single/$11.00 double. Single occupancy provides a private bedroom and bathroom shared with an adjoining room. In addition, a number of hotels are located within minutes of the campus. A list of these is available on request.

Register early. This seminar sells out year after year. Enrollment is strictly limited to the first 26 registrants.

REGISTRATION

Phone (502) 588-6456 or 1-800-334-UofL, extension 6456 for immediate confirmation of your registration.

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