# The Wall Journal

The International Journal of Transportation-Related Environmental Issues

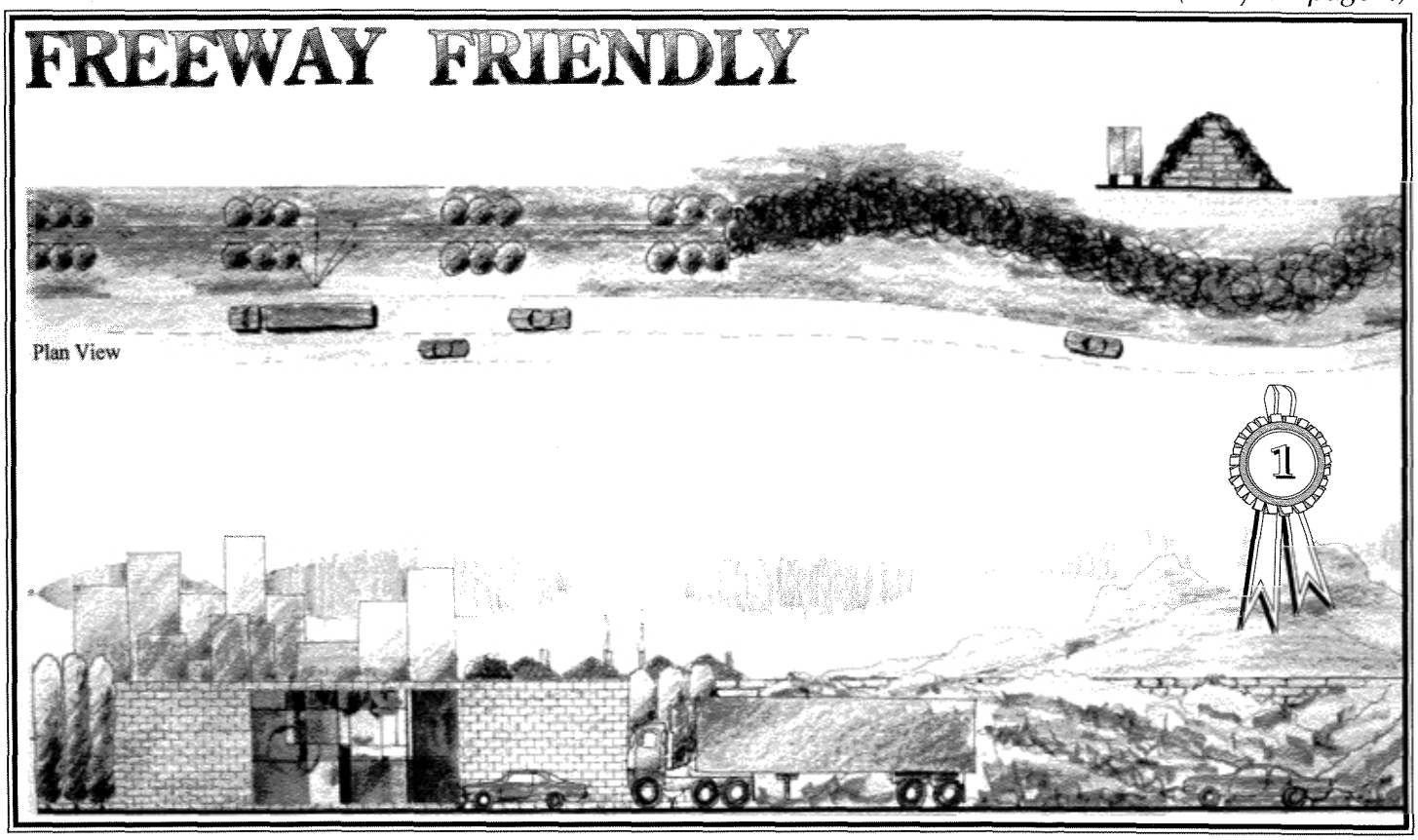
10

November/ December 1993


## Caltrans Unveils Winners of SILENT* Challenge

### *Student Innovation Landscape-Enhancing Noise Technology

*(Story on page 4)*




FIRST PLACE ENTRY: A Dual Concept, with a planted mound (upper right corner) of recycled tires in a rural area, and a community-oriented mural on the 'canvas' of the commonly-constructed noise barrier. By Jennifer McCartney and Caryn Foster

**Also In This Issue:**

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## EDITOR'S CORNER by El Angove

Thanks to our advertisers (bless them), I get less and less space to air my own comments or to proselytize to our readers. However, I have recently canvassed 1,225 of them by letter to determine how many on our mailing list are serious about receiving The Wall Journal. The returns are now coming in, and I have discovered that a number of them have moved and left no forwarding address, others have not responded, but the majority have properly registered and/or subscribed, and that is much appreciated. I am now more confident that we are reaching those professionals who are the movers and shakers in our field. The 'no-shows' are being quickly replaced by new names. Welcome aboard.

On other matters, I regret that Dr. Roger Wayson was unable to attend his class on "Sound Fundamentals" for this issue, but he has assured me that his series will continue in the next issue and beyond.

I am very much pleased by the quality and diversity of our growing list of advertisers. I anticipate that we will soon have most of the important vendors of highway noise barriers in our pages. I have also encouraged the advertisers to submit technical articles and project reports on their products and services in order to more fully inform highway officials and consultants on the state-of-the-art in highway noise barrier construction (this does not constitute endorsement on our part).

From our readers in state highway departments and consulting firms, we have upcoming articles on air quality, wetlands replacement, sound-absorptive barriers and other items of interest to all. We will soon be at 28 pages per issue, and will continue to grow. I again request that more of you submit photos and material on projects of any type having to do with transportation-related environmental issues. Many readers have called and written to express their interest in what is going on in the "rest of the world". Won't you please let them know. ■

# The Winning Entries in Caltrans' Student Innovation Landscape-Enhancing Noise Technology Competition

By George Hartwell

Left to right: First Place winners Jennifer McCartney and Caryn Foster; Robert O. Watkins (Chief Deputy Director, Caltrans); Third Place co-winner Adina Cox; Second Place co-winner Mike Berta; Third Place co-winner Beverly Chu; Second Place co-winner Tony Moyer; and competition coordinator Allen Wrenn (Chief, Community Noise Abatement, Caltrans).

(Sacramento, CA) — California's masonry sound barriers stand strong and effectively block the battery of transportation system noise they were designed to repel. Sometimes though, their rigid profile stands in stark conflict with the Golden State's extraordinarily scenic environs, magnificent natural phenomena and aesthetically-pleasing man-made facilities and communities.

Pressed by federal and state regulations that mandate noise reduction features and Californians who prefer unobstructed views to tall walls, the California Department of Transportation (Caltrans) found itself braced on the horns of a dilemma. It must reduce highway noise and — at the same time — develop environmentally-sound facilities.

Caltrans looked to a fresh resource for potential answers; one not yet walled-in by conventional thinking, according to Edward N. Kress, Chief (now retired) of Caltrans' Transportation Facilities Enhancement Office. Caltrans challenged college students in a statewide competition to develop new means, methods and materials for transportation system noise reduction.

Caltrans called its competition "The SILENT* Challenge." SILENT* proved to be an acronym for Student Innovation Landscape-Enhancing Noise Technology ("The Wall Journal," February, 1993).

"The SILENT* Challenge delivered all, and more, of what we'd hoped for," said Allen Wrenn, Caltrans' manager for noise barrier programs and the competition's coordinator. "We discovered significant interest among talented students in solving what is both a transportation problem and a social issue. The ideas submitted were, in many cases, truly ingenious and well thought out."

The SILENT* Challenge, open to all California college students regardless of academic discipline, attracted 20 entries from colleges and universities throughout the state. Team and interdisciplinary entries were encouraged.

The California Transportation Foundation, a non-profit, transportation issue-oriented association co-sponsored the event and provided cash prizes to the top three entries. Caltrans presented winner certificates and official recognition of achievement. An independent panel of judges representing engineering and architecture professions and transportation policy expertise evaluated the entries and selected the winners. All three top place honors were given to students from California State Polytechnic University, Pomona.

"Competitors were required to submit designs in conformity with clearly-stated prerequisites that met Caltrans' objectives," Wrenn said. "The jurors were looking for designs that would be safe and ensure protection for highway users as well as area residents. The proposals had to be cost effective, functional, aesthetic, graffiti-proof or repellent and could be constructed with recycled materials or newly-developed materials."

In the evaluation process, juror Gregg Haskell, a structural engineer and partner in the Sacramento-based engineering firm of Cole Yee Shubert, Inc., noted that the judges looked carefully to the designer's proposed use of recycled materials and economic feasibility, as well as the aesthetic appeal of the product. "We wanted to know, is this (design) a Mars shot or was it buildable within the practical realm of estimating (costs and complexity)."

"We had one submittal that designed an entire ecosystem, almost turning the freeway into a tunnel using lots of concepts that haven't been invented yet. It was ingenious but impractical in today's engineering environment," Haskell said.

"We had one, very interesting submittal that used no continuous structural wall," Haskell said. "It used competing sound pressure; acoustic concepts to take noise generated by vehicles and produce a combatant noise that would cancel out those (vehicle-produced) frequencies. The judges agreed it was an interesting idea but potentially too costly."

In their final analysis the judges chose designs that employed recycled materials and treated conventional sound barriers in an unconventional manner.

Caryn Foster, a fourth-year architecture student and her partner, Jennifer McCartney, a graduating landscape architect, took the top prize for their design that combined elements of an urban and rural noise barrier system.

In rural settings, the team elected to use recycled automobile and truck tires configured so they would be structurally strong and effectively host an overgrowth of landscape plant

*(continued on page 6)*

**Second Place Entry:**
By Mike Berta and Tony Moyer

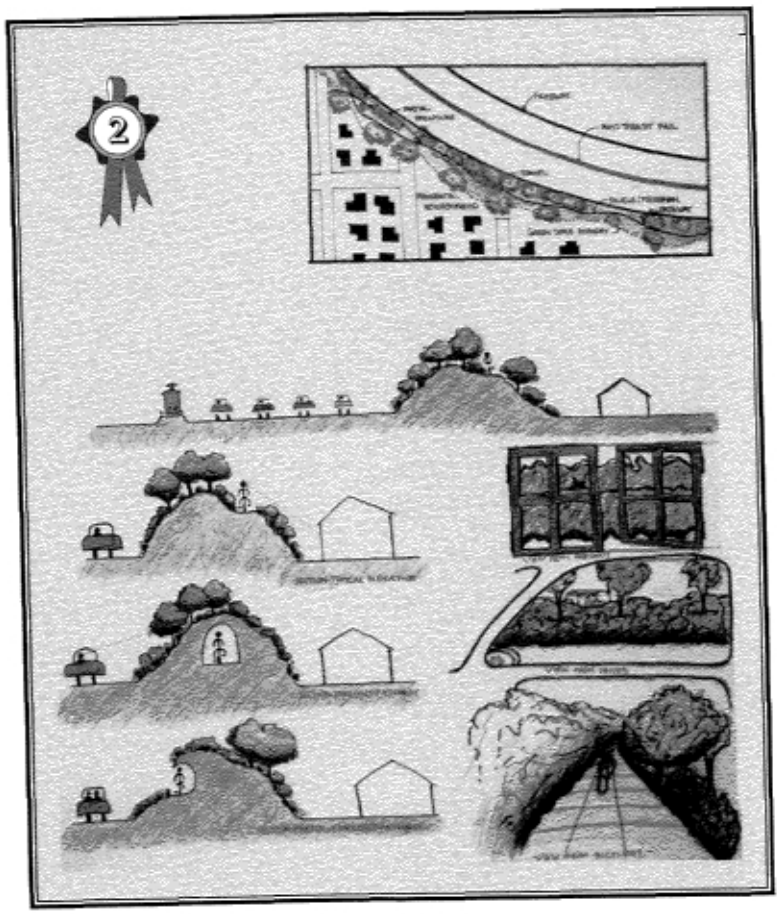
**CONCEPT:**
First priority is given to decreasing noise sources:

- Cities will be planned to decrease the need for automobile use by locating residential neighborhoods near work places and shopping areas.
- Long range planning will increase opportunities for alternatives to the automobile. These will include mass transportation and bicycle/pedestrian opportunities.

Transportation corridors will be located near industrial and light industrial areas. This will decrease the need for noise barriers.

In noise-impacted neighborhoods, buffer zones will consist of vegetated earth berms. These berms will provide communities with bicycle and pedestrian pathways. Advantages of buffer zones:

- Berm blocks noise, width of green space separates community from further noise sources.
- Provides alternative to automobile.
- Aesthetically pleasing for vehicle traffic and community.
- Increases green open space for communities.
- Environment can be enhanced with proper uses of low maintenance native vegetation.
- Community open space can be jointly funded by community/Caltrans.




**Third Place Entry:**
By: Adina Cox and Beverly Chu

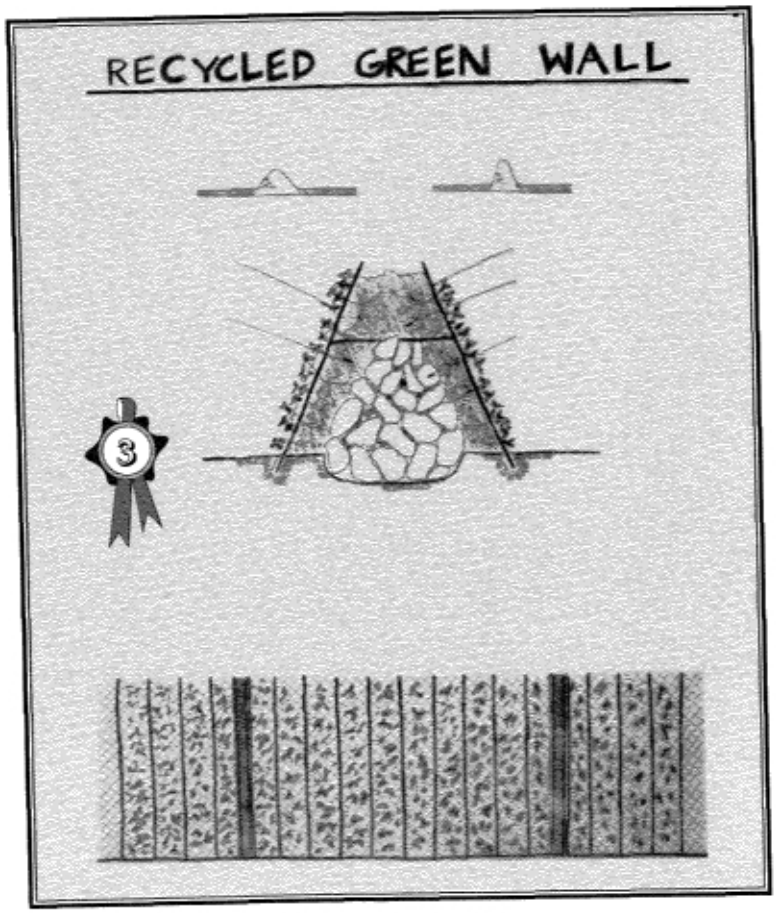
**CONCEPT:**
Create a berm wall that requires less right-of-way, using recycled and surplus materials.

**CONSTRUCTION METHODS:**

1. Dig low ditch
2. Dig post holes for rebar/guardrails
3. Place rebar/guardrail and grout
4. Fill ditch with broken concrete
5. Fill green waste and soil mixture
6. Place chainlink
7. Rebar ties across rail
8. Install drip irrigation system
9. Hydroseed the wall

**HIGHLIGHTS OF THE WALL:**

1. Made of recycled materials
2. Increased centerline of repose
3. Minimum of foundation materials
4. Resists impact
5. Dampens noise
6. Resistant to grafitti
7. Low cost because of materials used
8. Easy to maintain




Ed. Note: The artists' drawings here and on the cover were originally 18" x 24" and in full color. Unfortunately, this is a one-color publication, and the drawings are greatly reduced in size, thus losing much of the detail. We hope that the entrants' concepts prevailed.

## *SILENT Challenge*, *(from page 4)*

materials to give them a pleasant, natural appearance.

"Tires from cars and trucks are responsible for (most of) the highway noise," Foster observed. "Often, when you drive down the freeway, you see blown out tires and tire parts. And, there are so many tires in dumps. You can use tires in a variety of ways. They are graffiti-proof, sound-absorbent, softer if you crash into them and they are in great supply."

McCartney took another view of the problem: she sought to preserve the historic architectural appearance of communities adjacent to freeways and proposed a system of barriers that take form from ancient Greek design. McCartney recommended a variation on a classic Doric frieze with 'columns' represented by grouped trees. The spaces between the trees could be urban 'canvases' on which community-oriented art would be applied.

"The idea was to develop community pride," McCartney explained. "Rather than have people display graffiti, the (mural concept) would let them create art that is symbolic of the neighborhood. It would allow residents to show off their neighborhoods in a positive manner." The concept is consistent with Caltrans' Transportation Art Program which encourages and promotes enrichment of the cultural and visual environment for motorists and local commuinities by facilitating and coordinating the placement of artwork by others within the transportation right of way.

Caltrans plans to experiment with some of the student designs, according to Ed Kress. "Our program calls for testing new products and for constructing demonstrations, so these will be worked in," he said. "Undoubtedly, we'll have to do some engineering and we may want to go back and consult with the student originators of the ideas in the process."

Caltrans also plans to expand its competition program and has launched a second noise barrier design competition for 1994 which it named "SILENT* Challenge II — The Sequel," according to program manager Allen Wrenn.

"We've expanded greatly our list of colleges and universities to which we'll turn for ideas in the next competition," Wrenn noted. "It appears we've discovered a talent pool that is eager to demonstrate innovation, ability and thoughtful creativity to help California resolve major problems.

"We look for a larger number of submittals in the next competition, more excellent ideas, and ultimately, an entirely new approach to the challenge of highway noise reduction in our state.

"The SILENT* Challenge has proved to be a resounding success and Caltrans is eager to embrace the good ideas that have come forth so far and those that will be presented to us in 1994.

"We've enhanced a partnership among professionals in the transportation community and the bright, young minds in our academic institutions. We could not ask for a better or more productive bonding of public need and individual effort," Wrenn said. ■

*(Allen Wrenn is Chief, Community Noise Abatement Branch, Transportation Facilities Enhancement Office, California Department of Transportation at Sacramento, and may be reached by phone at 916 654-6680 for further information).*

# NEW FHWA MODEL AND SOFTWARE - Part II — A CONTINUING SERIES

By: Grant S. Anderson (HMMH Inc.), Gregg G. Fleming (US DOT), Robert E. Armstrong and Steven A. Ronning (FHWA)

This is the second Wall Journal article about the Federal Highway Administration's next-generation noise model and software. The new model/software is now being designed and developed by Harris Miller Miller & Hanson Inc. (HMMH) under the direction and guidance of FHWA, the Volpe National Transportation Systems Center, and a review panel of eight noise specialists from state highway agencies. This model/software will ultimately replace the current FHWA model (Report FHWA-RD-77-108) and software (STAMINA 2.0/OPTIMA), plus various digitizing and tabular front-ends now used for input entry.

The first Wall Journal article was a project status report and a brief discussion of the new model/software's components and capabilities. This current article summarizes the project's Brainstorming Conference on User Interaction.

On October 12-14, Gregg Fleming and Amanda Keller hosted the Brainstorming Conference on User Interaction, a major step toward interface design. Technical aspects of the conference were organized and run by Grant Anderson (the project's principal investigator), Chris Menge and Chris Rossano.

The following people participated in the conference:

Bob Armstrong, Steve Ronning and Howard Jongedyk from FHWA
Gregg Fleming and Amanda Keller from the Volpe Center
Grant Anderson, Chris Menge, Chris Rossano, Doug Barrett, Tom Breen, and Chris Bejdek from HMMH
Ed Rickley from Technology and Management Systems, Inc.
David Read from W.T. Chen and Company, Inc.
Bill Bowlby from Vanderbilt University
Roger Wayson from University of Central Florida
Bob Coulson from Florida Atlantic University
Rudy Hendricks from California DOT
Win Lindeman from Florida DOT
Ken Polcak from Maryland State Highway Administration
Tim Roache from Massachusetts Highway Department
Domenick Billera from New Jersey DOT
Bill McColl from New York State DOT
Harvey Knauer from Pennsylvania DOT
Wayne Young from Texas DOT
Cary Adkins from Virginia DOT
Areg Gharabegian from Engineering-Science, Inc.
Klaus Kleinschmidt from Cambridge Collaborative

Prior to brainstorming about user interaction, Gregg Fleming discussed the new model/program's need for a revised noise-emission database: level grade, up grade, constant speed, and interrupted flow. After summarizing site criteria, Gregg asked attendees to identify good measurement sites upon their return home, and to send him descriptions and plans of candidate sites. Sites are also needed for double-barrier and triple-barrier measurements, which will be used to calibrate the model/program. If you have candidate measurement sites for vehicle noise emissions or double/triple barriers, please call Gregg at 617 494-2876.

During discussion of these measurements, Howard Jongedyk emphasized the need for additional measurement funding. If you can obtain state funding for this purpose, please contact Howard at 703 285-2085.

Next, the participants split into two groups for concurrent sessions on (1) the new program's menu structure and (2) its input process, including input for noise-contour computations. Starting with a draft menu structure, Grant Anderson led one group toward consensus on menus: their organization, wording, completeness, simplicity versus complexity, conformance to Microsoft Windows conventions, and similarity with STAMINA/OPTIMA terminology. In addition, this group discussed button bars to duplicate some menu functions, two menu versions (regular and complete), and the program's disk files as they would appear to program users.

Starting with several flow charts and sample screen designs, Chris Menge led the second group toward consensus on many details concerning the the program's input process:

Digitizing from plans and from CAD drawings on the screen
Plan/Map Registration
Creating and Editing of Input
Traffic Assignment to Roadways
Input Error Checking
Useful Push Buttons
Automatic Roadway Subdivision
Special Input Needed for Noise Contouring

In addition, this group discussed the usefulness of receiver background levels, user-specified vehicles, and computation of sound reflections from vertical surfaces. They also brainstormed the planned Intergraph environment and how it might complement the new program's capabilities.

The two groups then rejoined, to summarize their brainstorming and to ask for ideas from participants in the other section. After that, the participants again split for concurrent sessions on (1) the new program's printouts/plots and (2) its barrier design process, including parallel barrier degradation. Starting with a draft list of printouts/plots and their contents, Chris Menge led one group toward consensus on what printouts/plots are needed and what details they should contain.

Starting with several flow charts and sample screen designs, Grant Anderson led the other group toward consensus on many details concerning the program's barrier-design process;

Design Goals (target sound levels, or insertion losses, or breaks in line-of sight)
First-Cut Designs Computed by the Program
Manual Adjustment of Barrier Heights
Useful Screen Views and Push Buttons
Tabular Results and Useful Diagnostics
Barrier-Top Smoothing
Barrier Length Adjustment
Interaction between Barrier Design and Sound-Level Computations
Automatic Ground Lines at Edges of Roadways
Input/Computation Process for Parallel-Barrier Degradation
Relation between Sound-Level Computations and Parallel-Barrier Degradation

In addition, this group discussed shielding of roadways by other roadways. The two groups then rejoined, to summarize their brainstorming and to ask for ideas from participants in the other session.

In addition to these user-interface topics, participants had ideas concerning particular computation algorithms for the new program. Detailed notes plus tape recordings were made of the entire conference, so that no ideas would be lost. The Conference is now being summarized in a form that will lead directly to interface design. We will report further progress in a special session for this purpose at the TRB Annual Meeting* in Washington, D.C. in January, 1994. ■

*(Ed. Note: See A1F04 Committee column on page 10)*

# Caltrans Builds $6 Billion HOV Program

## Los Angeles County System to be Nation's Most Extensive

By Russell Snyder

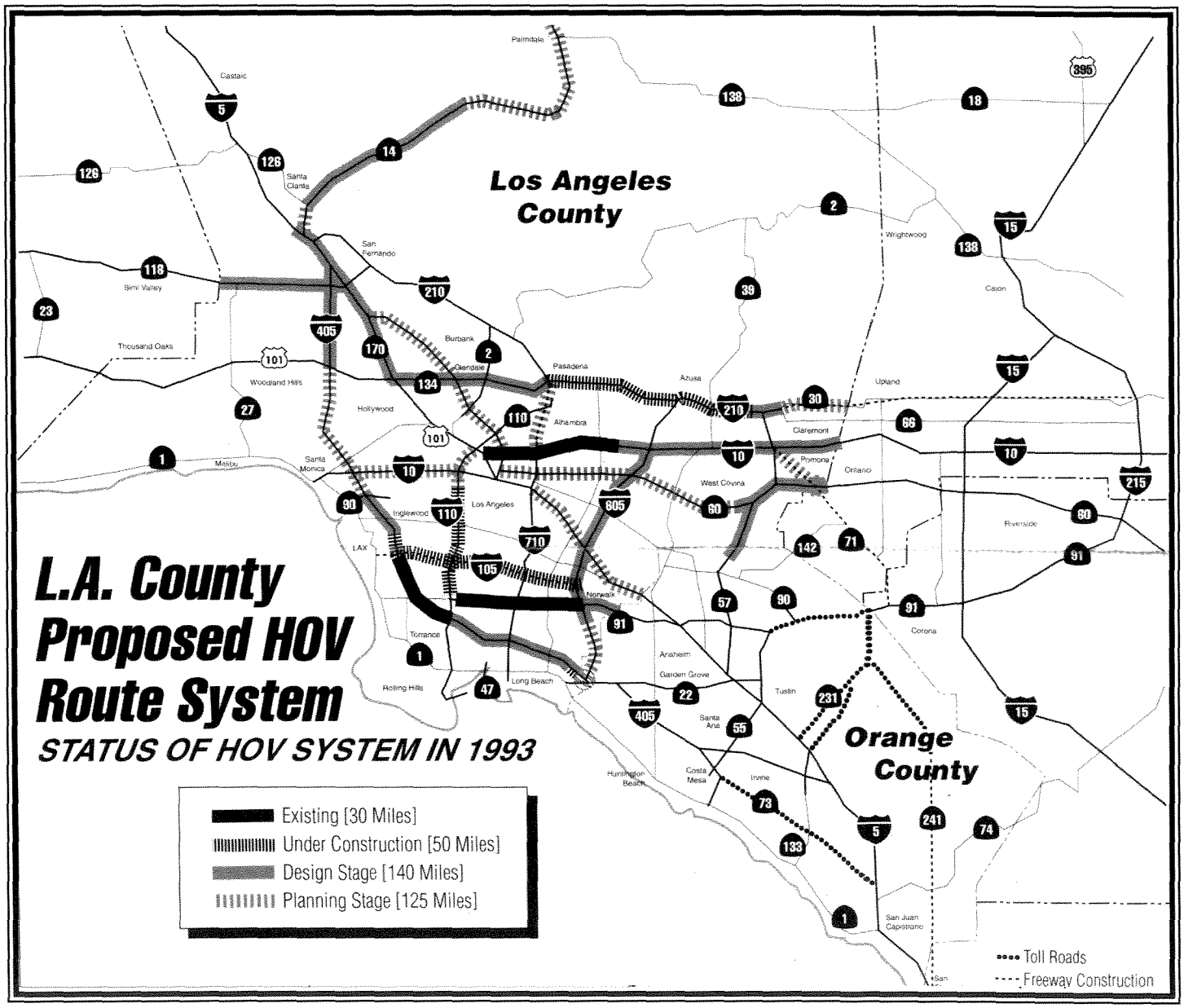
The California Department of Transportation, District 7 is embarking on the nation's most extensive High Occupancy Vehicle program, which will add car-pool lanes to virtually every freeway in the Los Angeles area and change forever the way L.A. drivers think about getting around.

The $6 billion HOV program is designed to significantly increase the capacity of the freeway system in a relatively short time and for a minimal cost. With the era of freeway building in Los Angeles drawing to a close, HOVs are seen as the next logical step in improving freeway efficiency to accommodate inevitable future increases in population and traffic.

"This is the biggest HOV system in the world," says Raja Mitwasi, District 7's HOV branch chief. Connecting the Los Angeles County system with programs in four adjoining counties, he says, "You're looking at close to 850 miles of HOV lanes, or 1,530 miles of HOV system. It's bigger than any system there is now."

The front-loaded HOV program is made possible largely by a local transportation sales tax approved by voters as Proposition C and administered by the Los Angeles County Metropolitan Transportation Authority. Funds were also made available by the Intermodal Surface Transportation and Efficiency Act of 1991 (ISTEA) and state funds. HOV lanes are just one part of an integrated transportation system for the Los Angeles area that includes rail systems, buses and freeway and highway improvements.

Mitwasi says it's tough to beat HOV lanes when it comes to value, efficiency and speed of delivery. "We found



out that by adding HOVs, and working with the federal government, we don't have that many requirements that we have to meet," he said. "We can take the median and convert it to HOV lanes, as long as we don't take the outside edge of the pavement. That makes it easy for us to construct HOV lanes."

"The congestion on the freeway system is really very bad. We need to improve that, and this is one tool to improve congestion. Also, air quality will improve in Southern California because you won't have cars idling in congestion."

The central concept in the HOV program is moving more people rather than more cars. Some HOV lanes carry 50 percent of the people carried on the entire freeway.

**Air quality will improve in California because you won't have cars idling in congestion."**

The Interstate 10 HOV lane, also known as the El Monte busway, was a pioneering experiment in determining the value of HOV lanes. The easterly section opened in January of 1973, and the westerly joined the system in May of 1974. Originally designed for buses only, car-pools with three or more people were allowed a few years later.

"The I-10 freeway is carrying 5,700 people per hour at peak hours. That's high,: says Mitwasi. "That's like almost three lanes of traffic."

But perhaps the most powerful incentive for commuters heading to and from downtown is time. Those who use the El Monte busway, for example, find they can save up to 20 minutes each way over a solo trip in a mixed flow lane.

Some other high-profile HOV projects in the works are the Harbor Freeway-Transitway (I-110), with its two elevated viaducts, and the I-105 Glenn M. Anderson (Century) Freeway, scheduled to open in October. The Century will be the first freeway designed and built with HOV lanes, and will include time-saving HOV freeway-to-freeway connector ramps at the junction with the Harbor Freeway.

"The direct connectors are going to be playing a very important role in achieving a continuity of the system," Mitwasi said. "One example is the direct connectors on the 118 Freeway at Interstate 5. The HOV driver will save four minutes within the interchange area because he won't have to cut across regular traffic lanes. Those direct connectors are saving a lot of time." Dozens of HOV connectors are proposed for the region.

Another benefit to the HOV program is quick relief to today's traffic problems. Unlike some transportation improvements which take decades to design and build, many of the HOV projects are ready to go." We're moving. We're not talking about 20 years or 30 years," said Mitwasi. "We're talking opening one or two HOV lanes every year. So we say, give us time. The projects are coming."

Some of these projects have already arrived. On April 8, a 7-mile car-pool lane opened on the northbound San Diego Freeway (405), joining a similar lane that opened a week earlier on the southbound side of the freeway. On March 11, a 10.5-mile car-pool lane opened on the westbound side of the Gardena-Artesia Freeway (91). Congestion-weary commuters reported an immediate improvement in traffic flow on all freeway lanes shortly after those HOV projects opened.

**"The requirement for noise barriers has not yet been determined. Each project will be examined during design to assess its need for noise abatement. Since these projects will be constructed for the most part on existing right of way, there may be fewer noise barriers than would usually be required for a program of this size."**

The current District 7 HOV program has a very important feature: no traffic lanes are being taken away. Rather, the new HOV lanes are being added to the existing freeways. "By taking the median, we're increasing the capacity of the freeway," Mitwasi notes. "Remember, we're adding a complete lane. If the freeway is four lanes, and we add another lane, that's five lanes. That's 20 percent — times two, that's 40 percent because we're moving double or more the number of people who are in the regular freeway lanes."

Some have expressed concern about median shoulders, which are sometimes used for emergency stops by disabled vehicles, giving way for HOV lanes. The 2-year-old Freeway Service Patrol, a program jointly sponsored by Caltrans, the California Highway Patrol and the MTA, is part of the solution. The fleet of tow trucks patrol county freeways during rush-hour and quickly remove disabled vehicles. Interestingly, preliminary data gathered by the Service Patrol drivers revealed that 77 percent of the disabled cars were on the right shoulder.

"California drivers are the best drivers in the world because they know the system," Mitwasi says. "If someone's in trouble, they give them a chance to move over to the right. They're not selfish. They help each other. They know that a person stuck in the middle of the freeway is going to affect everybody."

The 511-mile freeway system in Los Angeles County is roughly half the size of what was envisioned by the transportation planners in the late 1950s. The District 7 HOV program has emerged as an innovative way to fill the gap between rising traffic and the transportation facilities needed to accommodate it. ■

*(Russell Snyder is Public Information Officer for Caltrans District 7. For further information, he may be reached by phone at 213 897-0849 or by fax at 213 897-3674).*

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*This article has been reprinted from "INSIDE SEVEN", the Employee Newsletter for Caltrans District 7. Mr. Snyder is also the Editor of INSIDE SEVEN, and we will publish reprints of other articles of interest to our readers from time to time.*

*Coming up in Issue No. 11 of The Wall Journal is an INSIDE SEVEN article on the unique Arroyo Simi wetlands replacement program.*

The months of September and October are two of the busiest months of the year for TRB people. These are the months when procrastination authors submit papers for the January Annual Meeting (although they should be submitted in August).

Papers are routed from TRB in Washington to the appropriate Committee Chairman who sends them out for peer review. The reviewers make their (hopefully timely) comments and suggestions and return the reviews to the Chairman, who notifies the authors of suggested or mandated changes, and selects papers for presentation at the Annual Meeting and for later publication.

Meanwhile in Washington, TRB staffers assemble similar input from all committees and manage to put together a schedule of some 500 events in four days with as few conflicts as possible. As I write this, I have just received our 1944 A1F04 events schedule. A1F04 events run from Monday through Wednesday with our Awards Dinner closing things out on Wednesday evening.

Here's the schedule at the right. As you can see, our sessions key into today's hot issues in transportation noise.

### About the Awards Dinner

Gary Figallo of The Reinforced Earth Company has arranged for the dinner to be held at Hogate's restaurant at 9th and Maine Avenue, in a room overlooking the Washington Harbor. We are guaranteeing 40 people for dinner.

The cost to each attendee will be $23.00 with a choice of beef, scrod or baked chicken. The cost includes salad, dessert and coffee. There will be a cash bar with our own bartender. For the winner of the Best Paper Award, dinner is on us. All who plan to attend the dinner should confirm their intention by fax or note to:

Gary Figallo
The Reinforced Earth Company
8614 Westwood Center Drive, Suite 1100
Vienna, VA 22182
Fax 703 821-1815

We will need to confirm your choice of entree and have payment to Gary 48 hours in advance of the dinner, i.e., on Monday, January 10. Please make your check payable to Gary Figallo. ■

## A1F04 Transportation Related Noise and Vibration Committee Annual Meeting January 10 – 12, 1994 Washington Hilton, Washington, D.C.

| | |
|---|---|
| Session # 162 | Transportation Noise Issues and Opportunities:<br>Part 1—Planes, I rains and Earth Movers<br>Part 2—Noise Measurement and Methodology<br>Tuesday, 7:30 pm, Lincoln West |
| Session # 188 | New Traffic Noise Model Software and Aviation Noise/Land Use Compatibility<br>Wednesday, 8:30 am, Lincoln West |
| Committee Meeting: | Wednesday, 2:30 pm, Map |
| Subcommittee Meetings: | Highway Noise — Monday, 7:30 pm, Farragut<br>Rail Noise—Tuesday, 9:00 am, Farragut<br>Aircraft Noise—Tuesday, 2:00 pm, Farragut |

## Session 162: Transportation Noise Issues and Opportunities

Domenick J. Billera,New Jersey DOT, presiding

**Part 1—Trains, Planes and Earth Movers**

**Helicopter Noise in Rural Communities: Assessment of Existing Knowledge**
Panos D. Prevedouros, University of Hawaii

**LaGuardia Airport round-Noise Abatement Study**
Douglas E. Barrett and Christopher W. Menge, Harris Miller Miller and Hanson Inc.

**Construction Noise Impact Assessment for Hong Kong's Replacement Int'l Airport**
Walter A.W. Jetter, Greiner International Ltd.
F. Morse, Provisional Airport Authority, China

**Prediction of Rail Transit Groundborne Noise and Vibration - A Case Study**
Steven L. Wolfe, Wilson, Ihrig & Associates, Inc.

**Part 2—Noise Measurement and Methodology**

Generating Key Contours with Stamina 2.0
Roswell A. Harris and Louis F. Cohn, University of Louisville
Christopher D. Grant, Howard Nedles Tammen & Bergendoff

**Development of Procedures for Prioritizing Noise Barrier Locations on Freeways**
Rahim F. Banekohal and Weixong Zhao, University of Illinois
Michael H. Lee, Stanley Consulting Inc.

**Stone Mastic Asphalt Pavement and Its Effect on Highway Traffic Noise Levels**
Kenneth D. Polcak, Maryland State Highway Administration

**Statistical Assessment of the Effects of Transportation Vibrations on High Technology Facilities**
Hal Amick, Sean K. Bui and Ramon E. Nugent

## Session 188: New Traffic Noise Model Software and Aviation Noise/Land Use Compatibility

Domenick J. Billera, New Jersey DOT, presiding

**Part 1— Development of New Traffic Noise Model Software**

**Moderator:** Gregg Fleming, U.S. Department of Transportation
**Panel:** Robert Armstrong, Federal Highway Administration
Grant S.Anderson, Harris Miller Miller and Hanson Inc

**Part 2 — Aircraft Noise and Compatible Land Use Planning**

**Moderator:** Neal H. Phillips, Metropolitan Washington Airports Authority
**Panel: Dorn C McGrath,** Jr., The George Washington University
James P. Muldoon, Federal aviation Administration
Sharron Spencer, City Council Grapevine, Texas

*In response to the announcement by the Editor in this space in Issue No. 8, I wish to state that yes, Virginia, there is a Bob Armstrong and he's alive and well and living in Nokesville, Virginia.*
*— Bob*

**OECD Report on Highway Traffic Noise**

I recently traveled to Rome, Italy for the initial meeting of the Organization for Economic Cooperation and Development (OECD) scientific expert group on "Roadside Noise Abatement." Other countries that were represented included Italy, Spain, Denmark, Austria, Belgium and Switzerland. England, Finland, France, Japan, The Netherlands, Norway and Sweden have also expressed a desire to participate but were unable to attend the Rome meeting.

The group will prepare a report which discusses the state-of-the-art of highway traffic noise measurement, prediction, analysis, and abatement as well as the status of current highway traffic noise research efforts in participating countries. This activity should provide a meaningful exchange of knowledge and information. This report should be available by the end of 1994.

The OECD is an organization formed in 1961 to promote policies designed: (1) to achieve the highest sustainable economic growth and employment, and a rising standard of living in member countries, while maintaining financial stability and contributing to the development of the world economy; (2) to contribute to sound economic expansion in member as well as non-member countries in the process of economic development; and (3) to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original members of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Turkey, the United Kingdom, and the United States. There are now 24 members that include Japan, Finland, Australia, New Zealand, Italy, Spain, Switzerland, The Netherlands, Norway, Sweden and others.

**Highway Traffic Noise Barrier Listing**

Since 1980, the Federal Highway Administration (FHWA) has triennially distributed a national summary listing of highway traffic noise barriers constructed using highway program funds. The last listing covered the period from the early 1970s to the end of 1989 (over 720 linear miles at a cost of over $555 million). We are currently developing a listing through the end of 1992; its availability for distribution will be announced in a future issue of The Wall Journal. ■

**New Noise Barrier Vendors**

**POLYMER** (TIMBREX) Wood/Polymer Composite, Recycled Wood and Plastic)
Mobil Chemical Company
Composite Products Division
Phone 813 620-1152

**COMPOSITE** (RECYWALL, Recycled Plastic w/Compost and Organic Waste Material with Crushed Glass)
Sanders Enterprises, Inc.
Phone 314 868-4100
*(Contact Bob Armstrong at 202 366-2073 for a complete listing of known vendors).*

# SUMMARIES OF PROFESSIONAL PAPERS — PART II

Presented at the TRB A1F04 Committee Summer Meeting in Berkeley, California, July 11-14, 1993

The Summer Meeting of the TRB A1F04 Committee on Transportation-Related Noise and Vibration was co-hosted this year by Caltrans and acoustical consultants Wilson, Ihrig & Associates, Inc. of Oakland. The first 13 paper summaries were printed in Issue No. 9. Following are the balance of the paper summaries in the order in which they were presented at the conference.

## EXAMINATION OF A STRUCTURAL SANDWICH MADE OF RECLAIMED TIRE RUBBER AS A NOISE BARRIER FOR HIGHWAYS

We have examined a Structural Sandwich made of 80% reclaimed tire rubber mixed with 20% by weight of virgin rubber and revulcanized with special additives, curatives and antioxidants and antiozonants. This material composition is mixed in a standard Banbury shear mixer and poured into a mold and pressed at high temperature and pressure incorporating a welded steel wire mesh into a slab. Two such slabs are bonded to a standard B1 roof deck. A typical one inch slab weighs 6 psf and has an STC rating of 41 dB, whereas the sandwich weighs 14 psf and has a STC rating of 53 dB. This material is structurally sound and tests following AASHTO guidelines shows that the material with 8 ft span has a deflection of L/200 at the mid line with a wind load of 100 miles per hour (28.8 psf static load). The material did not fail in test condition of 165 psf static loading.

By bonding a virgin neoprene rubber mix of an appropriate color and using the choice mold, material of almost any color and pattern design may be obtained. The material projects no fire hazard as it would not burn but smolder in presence of sustained flame. It gives out no unpleasant odor in outdoor use. It would not crack in cold weather. More importantly, due to the non-polar nature of the rubber, its surface is graffiti resistant and no new coating need be applied. Accelerated aging tests predict a service life of well over 25 years.

Our study shows that it is possible to use up rubber from 60,000 used tires per mile of noise barrier of 16 ft high. Noise barriers may be made with attractive color and texture and technological problems posed in earlier studies may have been eliminated by current studies. No doubt, concrete is an excellent material for building walls, but when the need is to cut down sound transmission, a structural sandwich made of reclaimed tire rubber may be a viable cost competitive alternative.

**Author:** Dr. Indu B. Mishra
(410) 997-7256
Kanan Associates, Inc., Columbia, MD
**Author:** Dr. Pedro Albrecht
University of Maryland, College Park, MD

## BEFORE AND AFTER STUDY OF F3 PROJECT BETWEEN WAHROONGA AND BEROWRA, NORTH OF SYDNEY, AUSTRALIA

In 1987, the road authority (Department of Main Roads) in the State of New South Wales, Australia, introduced its first policy and guidelines on road traffic noise control. These provided for walls up to 2 m high (sometimes on top of mounds up to 3 m high), with a noise goal of 68 dBA in the $L_{A10}$ (18-hr) scale, as provided in the then new guidelines.

In order to test the effectiveness of the measures and the appropriateness of the goals, a full-scale trial was begun on a project just started. This was a 15 km length of freeway - part of the Sydney to Newcastle Freeway - between two outer suburbs of Sydney, Wahroonga and Berowra, and bypassing the regional center of Hornsby. Noise control features were built into the design for the first time; construction proceeded including timber walls and mounds.

A study of the environmental noise before the freeway was completed and opened to traffic was put in hand both along the freeway corridor and the old highway and some local roads previously used by through traffic.

A study was similarly carried out immediately after opening to traffic. This became an intermediate study, since decisions were taken to implement improved noise control measures (new road surface, higher walls and specially located walls) over a period of almost 3 years - followed by a final monitoring program.

The presentation will discuss the progressive improvement along the freeway corridor and compares this with the improvement along the old highway. Costs in terms of dollars per decibel reduction, per dwelling affected, are also discussed together with the changes in the policy which have grown out of this first trial. This has involved a change from the $L_{A10}$ (18-hr) scale to $L_{Aeq}$ (24-hr) and $L_{Aeq}$ (8-hr) night, between 10 p.m. and 6 a.m. Subsequent major roadworks have since been treated similarly and examples of this will be shown with a brief discussion of effectiveness.

Concurrently with the monitoring in terms of decibels, an opinion survey was conducted in the period before the freeway, through the time immediately after opening to traffic, to the final situation. The results of the opinion survey will be discussed briefly.

**Author:** George Glazier (02) 437-4611
**Organization:** Wilkinson Murray Pty Ltd. Sydney, Australia

## MEASURING EXCESS ATTENUATION OF TRAFFIC NOISE DUE TO GROUND EFFECTS, OR: IN SEARCH OF THE ELUSIVE ALPHA

This research project was funded by the FHWA under the title: "Traffic Noise Attenuation as a Function of Ground and Vegetation", and was performed by Caltrans Division of New Technology, Materials & Research (DNTM&R). Although the draft report has at this time not been reviewed yet at the Federal level, FHWA has given verbal approval to present the research findings at the TRB A1F04 1993 Summer Meeting. However, by doing so, the FHWA does not necessarily endorse the conclusions and the contents of this presentation.

The main objective of this research project was to experimentally derive improved values for the site parameter alpha ($\alpha$)used in the distance adjustment algorithm of the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). Noise levels of individual vehicle passbys were measured at distances of 25 to 400 feet from the centerline of the near lane of two-lane highways, and at heights of 2.5 to 20 feet above the ground. A total of over 500 measurements were made simultaneously by ten microphones at four acoustically absorptive ("soft") sites. The data measured at these sites were used to calculate the excess noise attenuation rates in terms of $\alpha$. Additional measurements were made at two four-lane highway sites for verification. Wind speed, wind direction, temperature, and humidity were also measured.

Final analysis of the data revealed that $\alpha$ is distance as well as height dependent. Because of its dependency on average sound path height above the ground, $\alpha$ proved also to be vehicle (source) dependent for a given receiver height and dis-

tance. For the purposes of noise propagation, α can be grouped in two vehicle types, one for autos and medium trucks combined, and one for heavy trucks (vehicle definitions per FHWA Model). Plots of α vs. distance can best be described by hyperbolic equations of the form α = a+b/x, where a and b are positive and negative constants, respectively. Plots of alphas vs. average noise path heights can be expressed by linear equations: α = a+bx, where a and b are also positive and negative constants, respectively.

The conclusion of this research project is that the α scheme as used in the FHWA Model causes average overpredictions of 2 dBA at 100-200 feet and 4 dBA at 200-400 feet. It is recommended that improved propagation schemes be used in future models. This is currently being evaluated by FHWA.

**Author:** Rudolf W. "Rudy" Hendriks
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**Organization:** Caltrans
Sacramento, CA

## A BRIEF CASE STUDY: TRAFFIC NOISE ATTENUATION ACROSS OPEN TERRAIN FOR A RURAL STATE HIGHWAY

A brief study of open field attenuation as a function of native field grass is presented. The study was undertaken as part of field tests performed along a rural segment of U.S. 290 in central Texas. Sparse traffic flow results in individually moving point sources of noise propagating over open terrain. Excess attenuation values are found to be in agreement with recent studies conducted by the California Department of Transportation.

**Author:** Jack E. Randorff, Ph.D .
(713) 965-2939
**Organization:** Randorff and Associates, Inc., Houston, TX

## EVALUATION OF PERFORMANCE OF EXPERIMENTAL HIGHWAY NOISE BARRIERS

Since October 1986, the U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, in support of the Federal Highway Administration and 17 sponsoring state transportation agencies, has conducted the National Pooled-Fund Study (NPFS), HP&R 0002-136, "Evaluation of Performance of Experimental Highway Noise Barriers". The first publication supporting the NPFS, Report FHWA-RD-90-105, "Parallel Barrier Effectiveness, Dulles Noise Barrier Project", presented the results for parallel barriers subject to controlled traffic conditions. The second publication, Report FHWA-RD-92-068, "Parallel Barrier Effectiveness Under Free-Flowing Traffic Conditions", presented the results for parallel barriers located along Interstate 495 in Montgomery County, Maryland. A third and final report is currently being prepared. This presentation will summarize:

(1) the results of additional analyses of previously collected NPFS data;
(2) the findings of the multi-year NPFS; and
(3) future work to be performed in support of the NPFS.

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**Organization**: U.S. DOT Research & Special Programs Administration
Volpe National Transp. Systems Center
Cambridge, MA

## ELEVATED HIGHWAYS AND SOUND LEVEL LIMITS

Long range planning projects often include the task of selecting road design alternatives that are compatible with specific land uses. Due to visual/aesthetics and other considerations, traffic noise mitigation measures such as roadside barriers and berms are not always appropriate. Therefore, alternative traffic noise mitigation measures must be considered. Information will be presented on the use of elevated highway configurations for achieving CNEL = 65 dB and CNEL = 60 dB sound level limits. Different road design and traffic volume alternatives will be addressed. The presentation will show that while the use of the elevated highway configuration can be beneficial for the land uses compatible with the CNEL = 65 dB limit, the use of the elevated highway configuration may not be practical for achieving the CNEL = 60 dB limit.

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## DETERMINATION OF THE $L_{eq}$ OF A VEHICLE FROM ITS ACOUSTIC SIGNATURE

Traffic noise levels are generally expressed in $L_{eq[t1,t2]}$: equivalent, A-weighted, sound pressure levels taken between two instants $t_1$ and $t_2$. In France for instance $[t_1,t_2]$=[8h-20h]. The $L_{eq}$ of a moving source is related to the acoustic power of the source, it depends also on the directivity pattern of the source and on the eventual attenuation of the acoustic energy when propagation occurs above an absorbing surface.

In most of the prediction models the $L_{eq}$ data of the different vehicle categories are not measured directly but are evaluated from measured maximum sound pressure levels $L_{pmax}$: if the vehicle is assumed to radiate like a small omnidirectional source one can indeed establish a simple relation between the acoustic power radiated by the moving source and the maximum sound pressure level $L_{pmax}$ measured at a distance *d* from the running line. The $L_{pmax}$ of a few thousands of vehicles were thus measured in situ to establish the experimental $L_{eq}$ abacuses of the French "Guide du Bruit des Transports Terresires" (Road Transportation Noise Guide) edited in 1980. At that time, the possible error on the $L_{eq}$ due to the hypothesis of omnidirectional radiation and the importance of the ground attenuation effect (which can occur in the presence of drainage asphalts for instance) on the actual values of the $L_{eq[t1,t2]}$ could not be established.

In this paper we show how, in the case of constant speed conditions, the measurement of the acoustic signature of a vehicle (sound pressure level as function of the vehicle position) can become an effective tool which shows the eventual effects on the $L_{eq}$ of the directivity of the vehicle or of the ground attenuation.

The presentation will be illustrated by actual measurements made on different road surfaces including porous asphalts.

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(33) 72-36-23-00
**Organization:** Institut National de Recherche sur les Transports et leur Sècuritè (INRETS)
Bron Cedex, France

## MARYLAND MINUTES By Ken Polcak, Chairman, A1F04 Highway Noise Subcommittee

Returns thus far on balloting on the Best Paper of 1993 have been dismal at best. I have now temporarily assumed the role of the tabulator of results at the request of Dr. Roger Wayson, who is one of the co-authors in the running for the award (to avoid any appearance of impropriety or conflict of interest). The two candidate papers being considered for the Harter Rupert Award for Best Paper of 1993 are:

**Determination of Traffic Noise Barrier Effectiveness "An Evaluation of Noise Abatement Measures Used on I-440"**
Authors: L. Herman, W. Bowlby, and R. Brisson

**Development of Reference Energy Mean Emission Levels for Highway Traffic Noise in Florida**
Authors: R. Wayson, T. Ogle, and W. Lindeman

All full members of Committee A1F04 are urged to review the papers and register their selection for the best paper award, given each year during the Annual Meeting of the Transportation Research Board in Washington, D.C. in January, 1994. Copies of the papers and ballot sheets are available upon request. Completed ballots should be returned to me as soon as possible to the following address:
Ken Polcak, Office of Environmental Design, State Highway Administration, 707 North Calvert St., Baltimore MD 21203-0717.

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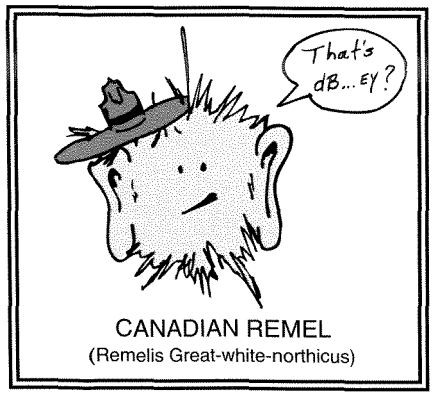
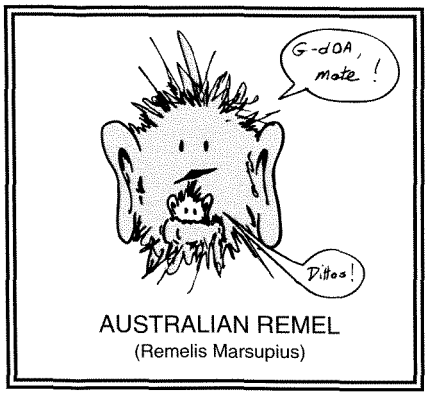
Speaking of **R**eference **E**nergy **M**ean **E**mission **L**evels, I have acquired some new computerized pictures of our new friend, REMEL, as he appeared recently in Canada and Australia. He has become quite ubiquitous, and we hope to ferret him out in other corners of the world.

As you can see from these pictures, REMEL has now acquired some of the characteristics of citizens of his local habitat. Watch this space for further developments. ■




CANADIAN REMEL
(Remelis Great-white-northicus)




AUSTRALIAN REMEL
(Remelis Marsupius)

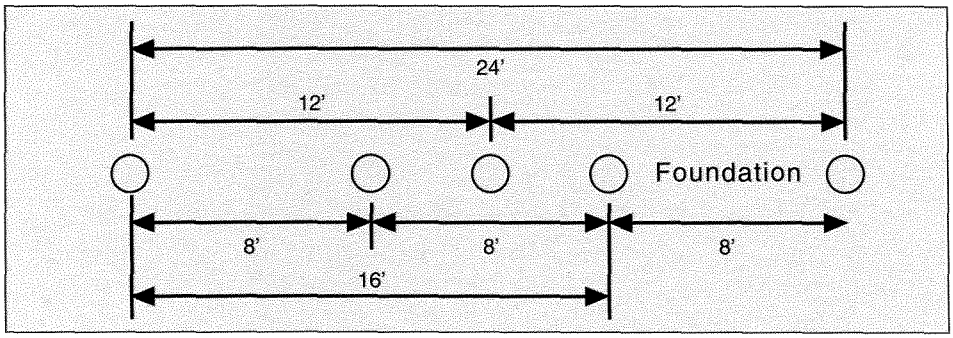
*(Continued next page)*

## Noise Barrier Demonstration and Display Facility

The Maryland State Highway Administration (MdSHA) has recently completed construction of a noise barrier demonstration and display area. The area is located on the grounds of the Office of Traffic near Baltimore/Washington International (BWI) Airport. The purpose of this facility is to provide vendors of noise barrier systems a place to demonstrate the appearance or aesthetics of their barrier systems in a full-scale setting.

The facility features movable I-Beam posts 16 feet high, which can be set on 8-, 12-,16- or 24-foot centers, thus accommodating one, two or three panels depending on their length (see illustration below). All costs involving panel fabrication, transportation, erection and removal are the responsibility of the vendor. It is desired to limit in-place time for each system demonstration to approximately two weeks.

For further information, contact the MdSHA Office of Environmental Design, phone 410 333-8072, fax 410 333-3139.



# Noise Barrier Construction Forecast

Compiled by **LEAP** Associates International, Inc. of Tampa, Florida and Denver, Colorado

This database has been compiled by a polling of state highway officials and other research. We do not guarantee accuracy of content or completeness of listings. This material is intended for use only as a general guide to upcoming noise barrier construction projects. For consultants, contractors and vendors, we recommend that you contact directly the appropriate state highway officials for verification and further information. The majority of the projects in this forecast are for precast concrete or masonry block construction, both reflective and sound-absorptive; on many of these projects, no decision for barrier construction type has yet been made. Blank spaces indicate that no data was available in those categories at this time.

**If you have questions, contact LEAP Associates International, Inc. at 303 426-0222**

| LOCATION | STATE | HIGHWAY | LINEAR FEET | WALL HEIGHT | SQUARE FEET | BID YEAR |
|---|---|---|---|---|---|---|
| Clearwater | FL | Hwy 580 | 1,100 | 8 | 8,800 | 93 |
| Miami | FL | Palmetto Expwy | 6,000 | 16-20 | 108,000 | 94 |
| Seminole County | FL | I-4 | 1,430 | | | 96 |
| Miami | FL | Palmetto Expwy | 10,000 | 15-18 | 175,000 | 98 |
| Miami | FL | Palmetto Expwy | 2,500 | | | 99 |
| Jacksonville | FL | I-95 | | | | |
| Jacksonville | FL | I-295 | | | | |
| W Palm Beach | FL | I-95 | 26,000 | 18 | 468,000 | |
| Marion | IA | Hwy 100 | | | | 94 |
| Various Sites | IL | Illinois Tollway | | | | |
| Various Sites | IL | I-90 | | | | |
| Three Cities | IN | I-80/94 | 21,000 | | | 94 |
| Four Cities | IN | I-80/94 | 11,200 | 14-20 | 190,400 | 95-98 |
| Overland Park | KS | I-435 | 5,000 | 16 | 80,000 | 95 |
| Milton/Quincy | MA | I-93 | | | | 94 |
| Newton | MA | MA Turnpike | 3,000 | 12-22 | 51,000 | |
| Natick | MA | MA Turnpike | 2,300 | 10-18 | 32,200 | |
| Ludlow | MA | MA Turnpike | 2,840 | 12-16 | 39,760 | |
| Baltimore | MD | Rail Line | 225 | 6-12 | 2,025 | 94 |
| Taylor | MI | I-94 | | | | 93 |
| Warren | MI | I-696 | | | | 93 |
| Pontiac | MI | I-75 | | | | 93 |
| Farmington Hills | MI | I-696 | | | | 94 |
| Ypsilanti | MI | I-94 | | | | 94 |
| Royal Oak | MI | I-75 | | | | 94 |
| Madison Heights | MI | I-75 | | | | 95 |
| Detroit | MI | I-75 | | | | 96 |
| St. Clair Shores | MI | I-94 | | | | 97 |
| Ann Arbor | MI | US 23 | | | | 98 |
| Three Cities | MN | Hwy 212 | 40,000 | | | 99 |
| St. Louis | MO | Route 141 | | | 22,000 | 94 |
| Kansas City | MO | Route 150 | 200 | 8 | 1,600 | 96-99 |
| Durham | NC | US15/US501 | 400 | 15 | 6,000 | 93 |
| Durham | NC | US15/US501 | 300 | 15 | 4,500 | 93 |
| Charlotte | NC | South Outer Loop | 1,900 | 11 | 20,900 | 94 |
| Charlotte | NC | South Outer Loop | 790 | 22 | 17,380 | 94 |
| Charlotte | NC | South Outer Loop | 740 | 12 | 8,880 | 94 |
| Charlotte | NC | South Outer Loop | 1,010 | 20 | 20,200 | 94 |
| Charlotte | NC | South Outer Loop | 810 | 19 | 15,390 | 94 |
| Charlotte | NC | South Outer Loop | 1,450 | 21 | 30,450 | 94 |
| Charlotte | NC | South Outer Loop | 1,050 | 18 | 18,900 | 94 |
| Raleigh | NC | I-440 | 2,370 | 17 | 40,290 | 94 |
| LOCATION | STATE | HIGHWAY | LINEAR FEET | WALL HEIGHT | SQUARE FEET | BID YEAR |

# Noise Barrier Construction Forecast

| LOCATION | STATE | HIGHWAY | LINEAR FEET | WALL HEIGHT | SQUARE FEET | BID YEAR |
|---|---|---|---|---|---|---|
| Raleigh | NC | I-440 | 2,780 | 17 | 48,790 | 94 |
| Swansboro | NC | US 17 | 100 | 10 | 1,000 | 95 |
| Wilmington | NC | Smith Creek Pkwy | 810 | 16 | 12,960 | 95 |
| Omaha | NE | I-80 | | | | |
| Nashua | NH | Everett Turnpike | | 12-14 | | 94-97 |
| Bayonne | NJ | NJ Turnpike | | | | 93 |
| Edison | NJ | NJ Turnpike | | | | 94 |
| Edison | NJ | NJ Turnpike | | | | 94 |
| Edison | NJ | NJ Turnpike | | | | 94 |
| Tom's River Plaza | NJ | Garden State Pkwy | 2,500 | 14-16 | 37,500 | 94 |
| Edison | NJ | NJ Turnpike | | | | 95 |
| Edison | NJ | NJ Turnpike | | | | 95 |
| Edison | NJ | NJ Turnpike | | | | 95 |
| Tom's River | NJ | Garden State Pkwy | | | | 95 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Woodbridge | NJ | NJ Turnpike | | | | 96 |
| Saddlebrook Twnshp | NJ | Garden State Pkwy | | | | 96-98 |
| Secaucus | NJ | NJ Turnpike | | | | 97 |
| Hightstown | NJ | NJ Turnpike | | | | 98 |
| Bordentown Tnshp | NJ | NJ Turnpike | | | | 98 |
| Hightstown | NJ | NJ Turnpike | | | | 98 |
| Laurel Tnshp | NJ | NJ Turnpike | | | | 98 |
| Bordentown Tnshp | NJ | NJ Turnpike | | | | 98 |
| Union Township | NJ | Garden State Pkwy | | | | |
| Tarrytown | NY | Rt 119 | | | | 93 |
| Mineola | NY | Grade Crossing | | | | 93 |
| Long Island | NY | Long Island Expwy | | | | 94 |
| New York | NY | Rt 59 | | | | 94 |
| Poughkeepsie | NY | Rt 55 | | | | 94 |
| Long Island | NY | Long Island Expwy | | | | 94 |
| Nassau Cnty | NY | Ninth St Pkwy | | | | 95 |
| Long Island | NY | Long Island Expwy | | | | 95 |
| Long Island | NY | Long Island Expwy | | | | 95 |
| Queens | NY | Long Island Expwy | 2,000 | 18-20 | 38,000 | 95 |
| Long Island | NY | Long Island Expwy | | | | 95 |
| Marcy | NY | Rt 49/I-790 | | | | 95-98 |
| Mineola | NY | Grade Crossing | | | | 96 |
| White Plains | NY | I-287 | | | | 97 |
| Brewster | NY | Rt 22 | | | | 97 |
| Long Island | NY | Long Island Expwy | | | | 97 |
| Long Island | NY | Long Island Expwy | | | | 97 |
| Long Island | NY | Long Island Expwy | | | | 97 |
| Long Island | NY | Long Island Expwy | | | | 97 |
| Long Island | NY | Long Island Expwy | | | | 97 |
| Rochester | NY | I-490 | | | | |
| Rochester | NY | I-490 | | | | |
| Rochester | NY | I-490 | 7,500 | | | |
| Brewster | NY | I-684 | | | | |

## Noise Barrier Construction Forecast

| LOCATION | STATE | HIGHWAY | LINEAR FEET | WALL HEIGHT | SQUARE FEET | BID YEAR |
|---|---|---|---|---|---|---|
| Oklahoma City | OK | I-235 | | | | 2000+ |
| Beaverton | OR | Sunset Highway | 1,575 | 16 | 25,200 | 93 |
| Portland | OR | I-84 | 1,200 | 14 | 16,800 | 93 |
| Portland | OR | I-84 | 825 | 12-16 | 11,550 | 93 |
| Salem | OR | I-5 | 12,264 | 12-16 | 17,696 | 94 |
| Bend | OR | Calif. Highway | 7,715 | 16 | 123,440 | 95-96 |
| Reading | PA | Warren St | | | | 95 |
| Allentown | PA | Rte. 22 | | | | 95 |
| Nashville | TN | Briley Pkwy | 5,000 | 4-12 | 40,000 | 94 |
| Bellevue | WA | State Rte 405 | 673 | 16-19 | 12,000 | 93 |
| Lynnwood | WA | I-5 | 8,930 | 8-16 | 107,160 | 93 |
| Several Cities | WA | I-5 | 2,200 | 10 | 22,000 | 93 |
| W. Spokane | WA | State Rte 90 | 3,100 | 12 | 37,200 | 93 |
| Seattle/Tukwila | WA | I-5 | 2,000 | 10 | 20,000 | 94 |
| Seattle | WA | I-5 | 7,000 | 16 | 112,000 | 94 |
| Bellevue | WA | State Rte 405 | 3,200 | 12 | 38,400 | 94 |
| Bellevue | WA | State Rte 405 | 200 | 8-10 | 1,800 | 94 |
| Auburn/Kent | WA | State Rte 167 | 4,000 | 10-12 | 44,000 | 94 |
| Everett | WA | I-5 | 9,000 | 12 | 108,000 | 94 |
| Spokane | WA | State Rte 90 | 7,035 | 12 | 84,420 | 95 |
| Covington/Maple Vly | WA | State Rte 18 | 8,000 | 12 | 96,000 | 95 |
| Spokane | WA | State Rte 90 | 8,300 | 12 | 99,600 | 97 |
| Des Moines/Kent | WA | State Rte 161 | 500 | 10 | 5,000 | |
| Redmond | WA | State Rte 202 | 1,440 | 3-12 | 1,080 | |
| Kenniwick | WA | State Rte 240 | | | | |
| Yakima/Selah | WA | State Rte 823 | | | | |
| Winnebago County | WI | Hwy 41 | | | | 94 |
| Appleton | WI | Hwy 10 | 2,100 | 8-25 | 34,650 | 95-96 |
| Beaverdam/Waupun | WI | Hwy 151 | | | 24,000 | 96 |
| Wisconsin Rapids | WI | State Hwy 54 | 1,000 | 10 | 10,000 | 97 |
| Milwaukee County | WI | I-94/I-43 | | | 108,-900,000 | 97-98 |

## About The Noise Barrier Construction Forecast

So far, we have published listings of upcoming highway noise barrier projects in 31 states. In the next issue of The Wall Journal, we will add Arizona and California, with more than 175 projects (actually, they are practically all in California, which is the nation's largest builder of highway noise barriers). We believe our poll of states for noise barrier construction to be the most extensive ever undertaken by any organization, and it should give you an indication of the size of the highway noise abatement programs in this country. Response has been slow from the remaining 19 states, some of which are sparsely populated and some of which are just beginning to develop their noise abatement programs. We hope that you find the results of our polls to be of interest, value and usefulness.

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### If You are a First-Time Reader ...

The Wall Journal is a tightly-targeted publication. Our readership is principallycomprised of professional engineers engaged in the management of transportation-related environmental issues.

If you wish to continue to receive The Journal, we request that you register or subscribe as indicated on page 23.

If you have already done so, please ignore this notice. Thank you.

If you are looking for Part 3 of Dr. Roger Wayson s series on SOUND FUNDAMENTALS , the good professor was unable to attend class this issue, due to more pressing business at the University of Central Florida. He has promised to appear for the next issue, and the three following issues.



# LETTERS TO THE EDITOR

*I have received a number of Letters to the Editor which have warmed the cockles of my heart, but none have warmed them so much as the one which is printed below. Not only does this reader praise The Wall Journal — he also gives praise to our authors. That kind of recognition encourages more of you to submit articles and technical information to share with your fellow professionals, Which is exactly our purpose and objective in starting this publication. Thanks very much, Bob.*

Dear Mr. Angove:

We have just received the September/October issue of The Wall Journal. This publication continues to furnish us with news about noise analysis and abatement on the international level and is very much appreciated.

One article that really has our interest is the "Sound Fundamentals" series being presented by Dr. Roger Wayson. These will be very helpful in training additional personnel we are hiring to assist in analysis of noise impacts from highway projects.

We also look forward to articles from the FHWA. The series on "New FHWA Model and Software" is informative and we await future installments.

We appreciate the complimentary subscription which you have made available to our department. We congratulate you on a fine publication which serves a good purpose.

Very truly yours,
Bob Hudson
Design Special Assignments Engineer, Design Division
Missouri Highway and Tranportation Department
Jefferson City, Missouri

---

*(And another nice comment on Dr. Wayson's Sound Fundamentals series) —*

Dear Sir:

Recently I was shown a copy of "The Wall Journal" for the first time. I noticed on the subscription section in the back that it is free to state government officials. As the District's

*(continued next page)*

## LETTERS TO THE EDITOR *(cont'd)*

Environmental Engineer for San Luis Obispo District (California Department of Transportation), I feel the Journal would be very useful to our department and would like you to add us to your subscription list. In addition, if an extra copy or so is available of the July/August 1993 issue, I would appreciate them since they have the first of a series of articles on Sound Fundamentals by Roger Wayson. We find it very difficult to explain the adding of decibels to the general public and copies of this may be a great help.

Frank F. Catherina, P.E., R.E.A.
California Department of Transportation
San Luis Obispo, California

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*(Ed. Note: We really appreciate hearing from our readers. This is the only way we can learn if we are giving you the kind of articles and information you would like to read. Please keep those cards and letters coming. Thank you.*



## *Attention!*

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### IN CONJUNCTION WITH
### THE 127TH MEETING OF THE ACOUSTICAL SOCIETY OF AMERICA

The symposium will be held on the campus of the Massachusetts Institute of Technology in Cambridge, Massachusetts, June 5 through 7, 1994. Contributed technical papers in all areas of architectural acoustics will be considered for presentation at the symposium and for publication in the symposium proceedings.

The symposium will be held in conjunction with the 127th meeting of the Acoustical Society of America also scheduled on the MIT campus June 6-10, 1994. Symposium registrations will include attendance at all scheduled technical sessions of the 127th ASA meeting as well as the symposium events including an opening reception and dinner and concerts at Boston Symphony Hall and at MIT's Kresge Auditorium. Distinguished, invited, and contributed papers and panel discussions will explore all aspects of Sabine's profound influence on the development of architectural acoustics and what the future holds for this important discipline. The symposium proceedings will be published and available to all symposium registrants.

For further information, contact the Symposium Secretariat, MIT Conference Services, Room 7-111, 77 Massachusetts Avenue, Cambridge, MA USA 02139. Telephone 617 253-1703, FAX 617 253-7002.





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