

## 2. STUDY PROCEDURES AND ANALYSIS

The study relies mainly on the review of existing, published literature that is currently available. To facilitate this task, extensive internet research was conducted and supplemented by coordination with FHWA, The Volpe National Transportation Systems Center, ODOT, other State DOT's / SHA's, and representatives of the National Academy of Sciences Transportation Research Board (TRB) Committee on Transportation-Related Noise and Vibration – ADC40. Where necessary, additional data was obtained through coordination with representatives of FHWA, various State Departments of Transportation, and ODOT. Below is a summary of the procedures and analysis applied to this study.

### 2.1. Research Effort

At the initiation of this contract, several reviews were performed to identify “alternate” noise mitigation techniques that may be available as alternatives to traditional sound barriers. This task included a review of Federal and State DOT policies and guidance documents, as well as other research sources to develop a complete list of alternate mitigation options. This research led to the development of the list of mitigation options identified throughout this report. Following the development of “alternate noise mitigation categories”, detailed searches and coordination was conducted to gather as much information as possible. Sources of information included, but were not limited to internet searches, FHWA, The Volpe National Transportation Systems Center, ODOT, other State DOT's / SHA's, representatives of the National Academy of Sciences Transportation Research Board (TRB) Committee on Transportation-Related Noise and Vibration – ADC40, trade magazines (e.g., Noise Regulation Report), and the Institute of Noise Control Engineering (INCE).

These searches led to the identification of over 2,500 individual articles, research materials, and technical studies associated with general noise topics. Each of these research materials were briefly evaluated and sorted in an attempt to identify approximately 150 specific research efforts for inclusion in this detailed study. Attempts were also made to acquire a thorough cross-section of research materials for each of the alternate noise mitigation categories identified through this report.

The results of this phase of the review indicated that an excessive amount of printed literature is available for certain topics (e.g., noise barriers and pavement studies), while other topics appear to have very limited availability of printed information (e.g., noise masking and noise cancellation technology). Given this, judgment was used to select the best available information for topics with excessive information, while avoiding over analysis of any one specific topic. Less scrutiny was applied to those topics with limited printed information available.

### 2.2. Research Results

Following the initial gathering of available research materials, that data was briefly reviewed and sorted by topic and/or content. Attempts were made to narrow the search results to the most relevant research available, considering the excessive amounts of information on certain

topics and minimal amount of research available on other topics. The results of the initial sort have lead to a refined list of research materials that will be used throughout the remainder of this study.

**Appendix A** contains a list of approximately **152** articles/research materials that were reviewed to complete the analysis on alternative noise mitigation measures. These articles have generally been sorted by topic of the research. Much of the research deals with multiple mitigation options and therefore, has been included in a "General Research" category. **Appendix A** provides a complete listing of the research materials that were reviewed in detail as part of this project.

### **2.3. Research Paper Review Form**

As part of the initial gathering of available research, a Research Paper Review Form was developed to assist in the review process. A copy of the Research Paper Review Form is contained in **Appendix B**. The form identifies the subject of the research, the source of the research, the state/geographic region of the research, a summary of the techniques applied, and a summary of the results of the research. This form was developed to ensure all literature reviews were performed in a consistent/organized manner, and ultimately provides a one-page summary for each article/study reviewed during the course of the project. **Appendix C** provides a CD ROM which includes all of the research materials reviewed during the course of this study. Attached to each article is the completed Research Paper Review Form, which provides a summary of the primary and any secondary topics covered by the paper and a brief summary of the findings.

### **2.4. Interviews**

Based on the results of the initial research review, it is clear that excessive research materials are available for some topics, but limited for other topics. Additionally, much of the available research and documentation provides general overviews of mitigation methods, but appears to be limited in information related to the implementation of these techniques. To supplement the literature review, coordination was conducted with key representatives of other State DOT's and members of FHWA staff. These interviews were performed with DOT Noise group leaders and other staff, to determine which noise mitigation techniques have been successfully applied in other states, as well as the pitfalls and hurdles that have been experienced.

Coordination was also conducted with ODOT and other DOT representatives to explore and promote the concepts of noise compatible land use planning and other mitigation techniques that would require a working relationship between State and local agencies.