Highway Noise

Project Manager Environmental Training
April 2, 2019
Presented by Monica Franz
ODOT Air Quality and Noise Coordinator
Outline

• Noise Regulation Basics
• The Noise Study
• Noise Abatement
• Other Noise Topics at ODOT
• Potential Changes to the Noise Manual
• Noise Topics Nationwide
Noise Regulations

• National Environmental Policy Act of 1969 (NEPA)
• 23 CFR 772 - FHWA highway traffic noise regulation (July 2010)
  – Upcoming Revision 2019-2020
• ODOT Noise Manual (July 2011)
  – Upcoming Revision 2019-2020
• ODOT Standard Specifications for Construction
• Local Noise Ordinances
Which Projects Require a Noise Study?

• Highway construction at new location

• Significant horizontal or vertical physical alteration of existing highway
Type I continued

• The addition to existing highways:
  – Through lanes
  – Passing lanes
  – Truck climbing lanes
  – Ramps/Interchanges
  – HOV, HOT, and bus lanes
  – Auxiliary lanes (that are not turn lanes)

• Restriping existing pavement to create a through lane or auxiliary lane
No Noise Study Needed

- Paving
- Painting
- Signing
- Lighting
- Bike/Ped
- Bridge replacement on existing alignment

These are considered Type III and do not require a noise study.
## Noise Abatement Criteria

<table>
<thead>
<tr>
<th>Activity Category</th>
<th>Activity Criteria(^a)</th>
<th>Leq (h)</th>
<th>Evaluation Location</th>
<th>Land Use Activity Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FHWA NAAC(^b)</td>
<td>ODOT NAAC(^c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>57</td>
<td>55</td>
<td>Exterior</td>
<td>Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where preserving those qualities is essential if the area is to continue to serve its intended purpose.</td>
</tr>
<tr>
<td>B(^d)</td>
<td>67</td>
<td>65</td>
<td>Exterior</td>
<td>Residential</td>
</tr>
<tr>
<td>C(^d)</td>
<td>67</td>
<td>65</td>
<td>Exterior</td>
<td>Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings</td>
</tr>
<tr>
<td>D</td>
<td>52</td>
<td>50</td>
<td>Interior</td>
<td>Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios</td>
</tr>
<tr>
<td>E(^d)</td>
<td>72</td>
<td>70</td>
<td>Exterior</td>
<td>Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F</td>
</tr>
<tr>
<td>F</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing</td>
</tr>
<tr>
<td>G</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Undeveloped lands that are not permitted</td>
</tr>
</tbody>
</table>
Common Sounds | Sound Level (dBA) | Loudness Compared to 70 dB
---|---|---
Air raid siren at 50 ft (threshold of pain) | 130 | 32 x as loud
Maximum levels in audience at rock concerts | 120 | 16 x as loud
On platform by passing train | 110 | 4 x as loud
Typical airliner (B737) 3 miles from take-off (directly under flight path) | 100 | 1/4 x as loud
On sidewalk by passing bus | 90 | 1/16 x as loud
On sidewalk by passing typical automobile | 80 |
Busy office | 70 |
Typical suburban area background | 60 |
Library Bedroom at night | 50 |
Isolated broadcast study | 40 |
Leaves rustling | 30 |
Just Audible | 20 |
Threshold of Hearing | 10 |

Source: Handbook of Environmental Acoustics, James P. Cowan, 1994
Types of Noise Study

• Screening Analysis
  – Only used for projects with few receptors, low volume roadways, abatement unlikely

• Detailed Noise Technical Report
  – Noise sensitive receptors within project area

• Final Noise Barrier Design
  – After initial noise study, recommended barriers are reviewed for detailed design

• Construction Noise Variances – Region 1
Noise Study Milestones

- **Scoping** - is it Type I?
- **Pre-DAP** – Model existing and no build conditions, assess land use, request traffic data, noise monitoring (rights of entry needed)
- **DAP** – Model future conditions, complete noise study
- **Final Design** – barrier final design, abatement voting
  - Turnaround time for noise tech report depends on:
    - When traffic data and roadway design available
    - Number of alternatives
    - Length of roadways
    - New alignments
    - Number of barriers analyzed
The Noise Study

• Data Gathering
• Monitoring
• Modeling
• Analysis
• Abatement
• Documentation
Noise Study- Data Needed

• Detailed project description
• Roadway Design and Survey
  – project alignment map: existing and proposed,
  – aerials, land use,
  – profile grade, topographical or cross sections out to 500 feet
• Traffic data
  – Analysis years: existing year and future design year
  – Existing, No-Build and Build scenarios
  – Peak Hour and Peak Truck Hour Volumes
  – Operating speed
  – by vehicle class and roadway link
• Property access for noise monitoring
Noise Study

• Noise monitoring for Existing conditions
  – validate Traffic Noise Model

• Modeled Noise Levels for Existing, No Build and Build Scenarios

• Assess Model Results for Noise Impacts
  – NAAC Impact in Build Scenario (65 dBA for residential)
  – Substantial Increase Impact (10 dB+ increase from Existing to Build Scenario)

• When impacts are predicted then we must consider mitigation
  – Noise Barrier Analyses at multiple heights

• Study is incorporated into Environmental Document
Noise Study with Impacts Predicted

- Noise mitigation must be CONSIDERED
  - Truck Restrictions, Alignment changes, Depressed Roadway, Earth Berms
  - Noise Barriers

- To be RECOMMENDED, a noise barrier must be feasible and reasonable

- Noise studies must document all impacts and abatement evaluation
Noise Abatement: Feasibility

Does it work?
Minimum noise reduction of 5 dBA for simple majority of impacted properties

Can it be constructed?
- Topographic features
- Access requirements
- Drainage
- Utilities
- Other noise sources (airports, rail)
- Safety considerations
Noise Abatement: Reasonableness

- Noise Reduction design goal
  - 7 dBA reduction at 1 receptor
- Cost Benefit
  - $\leq$ $25K$/benefited receptor
  - $20/\text{ft}^2$ used for estimating
- Community Support
  - simple majority of benefited receptors vote yes
Public Input- Voting

• Vote Letters sent to Benefited Receptors (5 dB+ noise reduction)
  – Second mailing if insufficient response received
• 50% or more of votes received in favor of the barrier then it is included for construction
• Both owner and renter get to vote
  – Multi-unit apartment complex
  – Mobile home parks
• Each situation is unique
  – Community engagement meetings
  – Involve the noise specialist
Other Noise Topics - ODOT

- Re-evaluation if scope changes
- Local Noise Ordinances
- Construction Noise
  - Noise Variances - Region 1
- Public Inquiries and Complaints
  - ASK ODOT
Potential Upcoming Changes to the ODOT Noise Manual

- Voting Guidance
- Noise Reduction Design Goal
- Cost reasonableness criteria
- Average barrier material cost
Anticipated Changes to FHWA Regulations

- Modifying Type I project definition
- Changes to Noise Abatement Criteria
- Clarifying/Simplifying Feasible and Reasonable Multimodal Projects
- Construction Noise
- Programmatic Agreements
- Updated Guidance
  - Voting
  - Replacing/Retrofitting Existing Barriers
  - Vibration
  - Design/Build Projects
Noise Research Topics- Nationwide

- Absorptive vs Reflective Walls
- Solar Panels on Noise Barriers
- Quiet Pavement
- Impacts of noise on wildlife/zoo animals
  - ODOT Sage Grouse study
- Noise Barrier functional lifetime
ODOT Noise Team

Natalie Liljenwall
AQ & Environmental Engineering Leader

Monica Franz
Regions 2-5 AQ & Noise Coordinator

Daniel Burgin
Region 1 Noise Coordinator