GLEN ROCK POLICE DEPARTMENT

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Review of Railroad Quiet Zones

Prepared by Chief Dean Ackermann

History:

I have been a police officer in Glen Rock since 1986 and have family members who have lived in the community for just over 75 years and can attest to the fact that the issue of train horns has been raised, *often by those who may be new to the community*, on any number of occasions.

Approximately 20 years ago Glen Rock attempted to regulate this issue and it resulted in a court battle with NJ Transit which the town lost. I must point out that the railroad in Glen Rock belongs to NJ Transit, an entity of the State of New Jersey – not a private company. It is also important to note that by statute the Commissioner of the NJ Department of Transportation (NJDOT) is also the board chairperson of NJ Transit. In essence, NJDOT and NJT are one in the same. No municipal government has the authority to regulate a railroad or an entity of the State of New Jersey.

Viability:

In the past NJ Transit has not considered this type of crossing viable for Glen Rock based upon the nature of our grade crossings and traffic conditions. This is a position which is shared by the Glen Rock Police Department. Our traffic safety supervisor Sgt. Scott Mc Govern, who is a graduate of the Rutgers School of Traffic Engineering for Police Officers, and I have reviewed this situation and our continued position remains that there is little chance of obtaining authorization for a program which the town most likely would be unable to fund.

There is no factual data to support a case that the intersection would be safer and that the improvements implemented lower the probability of accidents. This is a key requirement for the implementation of a quiet zone. Further, according to the US Government Accountability Office, there are no studies that have quantified the benefits resulting from the

establishment of a quite zone at grade crossings. Further, most railroad officials maintain that the train horn is the most effective safety measure.

There are also considerations for the municipality concerning funding, maintenance and liability. There is currently no source of state or federal funding expressly designated to assist in establishing quiet zones. A community seeking to establish the zone is fully responsible for the cost of installation, maintenance and upkeep for the supplemental safety devices. The costs of installation vary and can range from $30,000 to over $1 million depending on the zone and the types of safety improvements involved. Further, the town would then need to allocate yearly funds and hire personnel to maintain the supplemental safety devices. This is beyond the scope of the type of work our local DPW is trained or certified for.

According to the NJ Transportation Planning Authority, communities throughout the nation have had experiences with increased insurance costs due to assumed liability as a result of taking an action to eliminate the sounding of locomotive horns.

Before considering such an endeavor the Borough Attorney would need to examine this issue and confer with our local Joint Insurance Fund and the Municipal Excess Liability Joint Insurance Fund to determine if they would even consider underwriting this liability.

From past experiences, I would expect that they would require the town to hire an independent engineer to examine the issue and make a recommendation - a recommendation which I feel would be consistent with that of the GRPD's Traffic Safety Supervisor.

RECOMMENDATION:

For these reasons I have previously recommended that the Borough does not proceed with further consideration of this matter. That recommendation continues and the review of this matter by the Glen Rock Police Department has been closed.

However, should Borough Officials desire further consideration of this issue it will be necessary to employ the services of both the Borough Engineer and Borough Attorney to do so.

Quiet Zone Designation in New Jersey

An Informational Guide

North Jersey Transportation Planning Authority

About the NJTPA

The North Jersey Transportation Planning Authority (NJTPA) is the federally authorized Metropolitan Planning Organization for 6.5 million people in the 13-county northern New Jersey region. Each year, the NJTPA oversees the investment of more than $2.5 billion in transportation improvement projects and provides a forum for interagency cooperation and public input into funding decisions. It also sponsors and conducts studies, assists county planning agencies and monitors compliance with national air quality goals.

The NJTPA Board of Trustees includes 15 local elected officials, including one representative from each of the 13 northern New Jersey counties—Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren—as well as from the cities of Newark and Jersey City.

The Board also includes the Commissioner of the New Jersey Department of Transportation (NJDOT), the Executive Directors of NJ Transit and the Port Authority of New York & New Jersey and a Citizens' Representative appointed by the Governor.

This document was prepared by the North Jersey Transportation Planning Authority, Inc. with funding from the Federal Transit Administration and the Federal Highway Administration. The NJTPA is solely responsible for its contents. The document is meant for informational purposes only.

Note: Crossings shown in this brochure are not necessarily in quiet zones. Photos at top of page 3, middle of page 4, top of page 6 and bottom of page 7 courtesy of Mike Rosenthal, © NJ Transit, 2009. All other photos courtesy of Scott J. Parker, Jacobs Engineering Group Inc.

About this Brochure

The federal requirement that train horns be sounded at every grade crossing in or near communities nationwide has sparked a number of questions with regard to the establishment of quiet zones. The North Jersey Transportation Planning Authority (NJTPA), as northern and central New Jersey's Metropolitan Planning Organization (MPO), is pleased to provide this brochure as a guide to communities thoughout the state.

Definition of a Quiet Zone

A quiet zone, designated by the Federal Railroad Administration (FRA), is a section of a rail line where alternative safety measures have been put in place waiving the requirement that locomotives blow their horns when approaching grade crossings. This does not preclude the use of horns at times when safety dictates their use.

A Brief History

Railroad locomotives have sounded their horns or whistles as they approach crossings as a safety measure for more than a century. In 1984, Florida imposed a horn ban on the Florida East Coast Railroad (FEC). The FRA noted a 60 percent increase in grade crossing accidents on the FEC. As a result, the FRA issued an emergency order overturning Florida's ban and requiring the railroad to sound the horn at all crossings. Subsequent to this action, grade crossing incidents fell to pre-ban levels.

In 1994, Congress directed the FRA to issue regulations requiring that locomotives sound their horn at all grade crossings nationwide, and specifying the volume, length and pattern of the sound. They further mandated that the FRA develop procedures whereby a community could implement a quiet zone without compromising safety. The final rule (Title 49 Code of Federal Regulations [CFR], Parts 222 and 229, effective June 2007) provides national standards and a uniform process for communities seeking quiet zone designations.

Who Can Apply?

Under the rule, the entity with jurisdiction over the road that crosses the tracks can apply for the quiet zone. Under this definition, all communities, counties, and special districts with roadway authority can apply.

Quiet Zone Considerations

To obtain a quiet zone designation, the applicant typically bears the cost of improvements to the crossing that, in the FRA's judgment, make the crossing at least as safe as it would be if locomotives continued to sound their horns (see discussion on FRA Quiet Zone Calculator, page 8). Such improvements vary by crossing. They can include physical barriers called supplementary safety measures (four quadrant gates, median barriers) and/or alternative safety measures (programmed enforcement, public education). Each roadway approach to the crossing must be equipped with an advance warning sign advising drivers that trains do not sound their horns at the crossing.

To be considered for a quiet zone designation, crossings must, at a minimum, be equipped with automatic gates and flashing lights that conform to the standards contained in the Federal Highway Administration's Manual on Uniform Traffic Control Devices. (FHWA-under Title 23 CFR, Part 655, Subpart F).

Cost Considerations

There is currently no source of state or federal funding expressly designated to assist in establishing quiet zones. The applicant seeking to establish the zone is responsible for the cost of installation, maintenance and upkeep for the supplemental safety devices. The costs of these measures will vary. Costs can range from $30,000 per crossing to over $1 million depending on the number of crossings included in the zone and the types of safety improvements involved.

Liability Considerations

Applicants nationally have had different experiences with increased insurance costs due to assumed liability as a result of taking an action to eliminate the sounding of locomotive horns.

Any community considering a quiet zone should seek legal counsel and discuss the issues involved with their insurance underwriters.

Quiet Zones Are Not for Every Community. Why?

Aside from cost and legal considerations, based on the FRA rule, the crossing to be evaluated must adhere to the following:

- The crossing must be at least ½ mile from the nearest adjacent crossing not being considered for quiet zone designation.
- The crossing must be upgraded to include prescribed baseline criteria (flashing lights, gates, power out indicators, etc.).

Obtaining a Quiet Zone Designation

In New Jersey, applicants interested in obtaining quiet zone designation should contact the NJDOT Railroad Engineering and Safety Unit in Trenton (see back page). The unit is the primary point of contact for all grade crossing related matters, and will assist communities in navigating the federal application process.

The process consists of the following major actions for which the applicant must provide documentation. Samples of these documents are available on the NJTPA website at **www.njtpa.org/quietzone**.

A. Notice of Intent to Create a Quiet Zone: This document notifies the NJDOT, the FRA, the operating railroad(s) and any other impacted parties of the intent to establish a quiet zone. It describes the location of the crossing and the supplemental safety measures to be put in place.

B. Initiation of Proceedings: This document initiates the process and notifies all concerned parties that a Diagnostic Team will be convened to review all engineering-technical proposals relating to establishment of a quiet zone. The Diagnostic Team formulates recommendations which, after providing for team and public review and comment, are forwarded to the NJDOT Commissioner for use in rendering a decision. A Diagnostic Team meeting is only official if a representative of the operating railroad(s) and a NJDOT Railroad Engineering and Safety Unit representative are present.

C. Memorandum of Record: This is a document prepared by the applicant, constituting the minutes and recommendations of the Diagnostic Team meeting. This document is open to public comment.

D. Public Notice: A notice is published by the applicant announcing the recommendation of the Diagnostic Team meeting, the address and times where related documents can be viewed and inviting written comments.

E. Final Submission: A final document is compiled by the municipality containing Proof of Public Notice, the Quiet Zone Calculator results (see page 8), public comments and responses, the agreement with the railroad(s) involved and a final plan for the crossing design. The final submission is made to the NJDOT Railroad Engineering and Safety Unit and FRA.

F. Commissioner's Order: The NJDOT will issue the order to proceed once all required materials are received and reviewed, and all conditions met and satisfied. The FRA will receive a copy of the order at that time.

The FRA Quiet Zone Calculator

The FRA has developed a tool to help applicants evaluate the feasibility of creating a quiet zone in their community. The online FRA Quiet Zone Calculator tool is directly connected to the FRA-maintained National Grade Crossing Inventory as well as FRA highway-rail grade crossing accident records. This direct connection allows the user to interactively select and analyze a single crossing or a series of crossings for quiet zone feasibility. The result of this analysis is a summary report that needs to be submitted to the NJDOT Railroad Engineering and Safety Unit and FRA. The FRA Quiet Zone Calculator is located at the following web address: **http://safetydata.fra.dot.gov/quiet/**.

Communities are encouraged to contact the NJDOT or a professional engineering firm for assistance in understanding and processing the required documentation.

Contacts:

New Jersey Department of Transportation
Railroad Engineering and Safety Unit
(609) 530-4944
www.state.nj.us/transportation

North Jersey Transportation Planning Authority
Division of Freight Planning
(973) 639-8404
www.njtpa.org/quietzone

Federal Railroad Administration
Office of Railroad Safety
(202) 493-6285
www.fra.dot.gov

FRA Quiet Zone Calculator:
http://safetydata.fra.dot.gov/quiet/

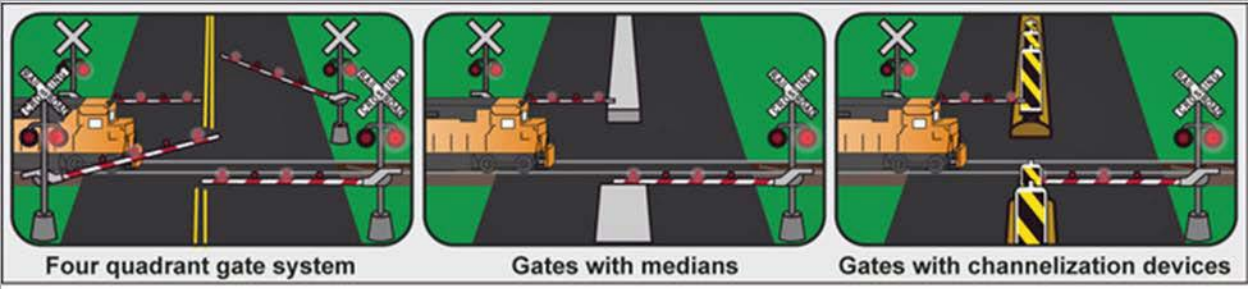
NJ Transit
Office of Government
and Community Relations
(973) 491-7195
www.njtransit.com

North Jersey
Transportation Planning Authority

One Newark Center, 17th floor
Newark, NJ 07102

Tel: 973.639.8400
Fax: 973.639.1953

www.njtpa.org



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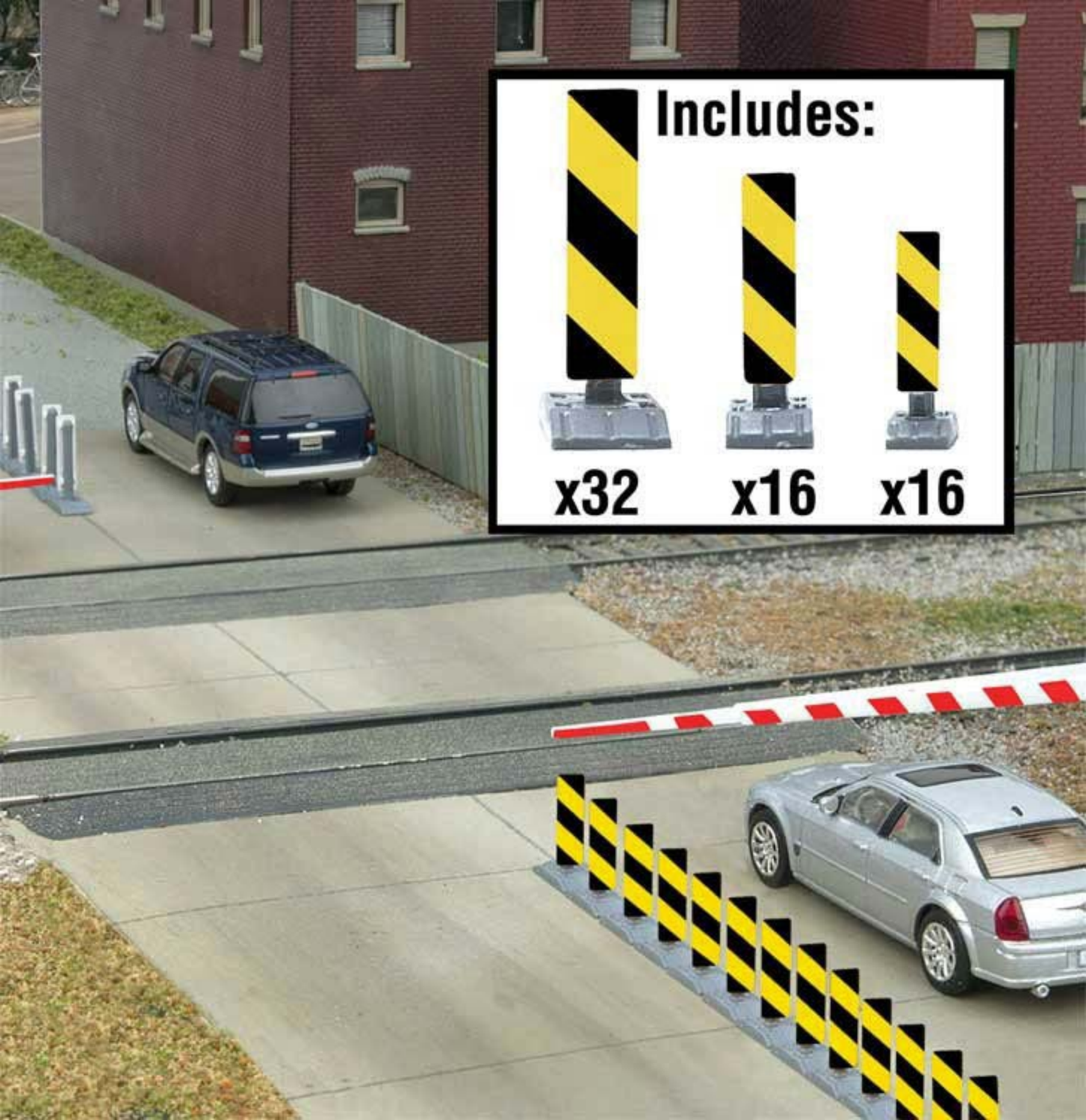
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United States Government Accountability Office

Report to Congressional Addressees

October 2017

RAILROAD SAFETY

Quiet Zone Analyses and Inspections Could Be Improved

GAO-18-97

GAO Highlights

Highlights of GAO-18-97, a report to congressional addressees

October 2017

RAILROAD SAFETY

Quiet Zone Analyses and Inspections Could Be Improved

Why GAO Did This Study

Accidents at grade crossings are a major source of fatalities in the railroad industry. FRA—the federal agency responsible for providing regulatory oversight of grade-crossing safety—issued regulations on the use of train horns in 2005. Railroads generally support sounding the horn, whereas, communities often support quiet zones to reduce noise.

Congress included a provision in statute for GAO to examine FRA's train horn regulations, including those on quiet zones. Among other things, this report: (1) describes benefits and costs of quiet zones, and (2) examines how FRA evaluates the effectiveness of its train horn regulations. GAO analyzed FRA's documentation on quiet zones, including FRA's train horn regulations and 2011 and 2013 studies on quiet zone safety; reviewed literature; and interviewed FRA program officials in headquarters, Grade Crossing Managers in FRA's 8 regions, and a nongeneralizable sample of another 32 stakeholders from 6 states, railroads, public authorities, and private industry consulting firms. State and public authorities were selected based on the number of quiet zones, geographic diversity, and FRA's recommendations.

What GAO Recommends

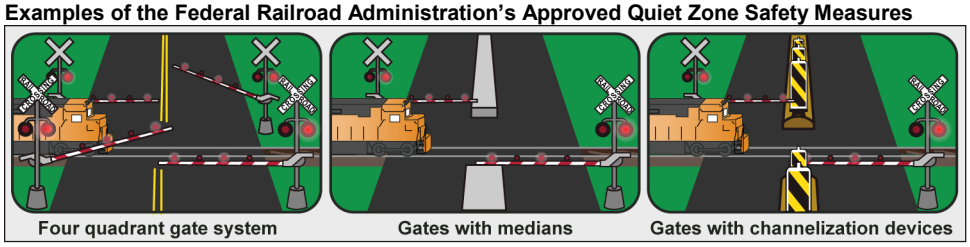
GAO recommends that FRA: (1) revise its methodology for analyzing the safety of quiet zones, and (2) develop guidance on conducting quiet zone inspections. The Department of Transportation partially concurred with the first recommendation, saying it would consider it, and fully concurred with the second. GAO continues to believe changes to the methodology are needed, as discussed in the report.

View GAO-18-97. For more information, contact Susan Fleming at (202) 512-2834 or flemings@gao.gov.

What GAO Found

GAO found that the benefits of quiet zones—i.e., highway-rail at-grade crossings (grade crossings) where train horns are not sounded—have not been quantified and that the costs to establish quiet zones vary. The Federal Railroad Administration's (FRA) train horn regulations allow public authorities (e.g., cities or towns) the opportunity to establish quiet zones if they install safety measures that reduce risks associated with the absence of the train horn (see fig.). While GAO did not identify any research that has quantified the benefits of quiet zones, most stakeholders GAO interviewed said that these quiet zones provide benefits to communities, such as reducing noise or increasing economic development. According to FRA guidance, the factors that affect the costs to establish quiet zones can vary based on the number of grade crossings and types of safety measures used. Public authorities, which typically incur the costs and receive the benefits of quiet zones, must therefore decide whether the benefits of quiet zones exceed the costs.

Examples of the Federal Railroad Administration's Approved Quiet Zone Safety Measures



Source: GAO. | GAO-18-97

To evaluate the effectiveness of its train horn regulations, FRA has analyzed data on grade crossings in quiet zones and is transitioning to a formal process for inspecting quiet zones.

- **Analyses:** FRA's analyses showed grade crossings in quiet zones were generally as safe as they were when train horns were sounded. However, these analyses did not control for changes to grade crossings' characteristics over time—e.g., train speeds or frequency. Such changes may decrease the analyses' reliability. A revised methodology that accounts for these changes could provide FRA with better information on the long-term effects of the train horn regulations, including the safety of quiet zones.
- **Inspections:** Recognizing the need for additional oversight, FRA has taken steps to formalize its process for inspecting quiet zones. FRA has primarily relied on public authorities to oversee quiet zones and ensure compliance with the train horn regulations, in addition to informal inspections by FRA's Grade Crossing Managers. In September 2017, FRA began conducting formal inspections of quiet zones using Grade Crossing Inspectors. However, FRA has not developed guidance for how inspections are to be conducted, including how frequently inspections are to be performed or what should be examined. Without guidance, FRA cannot ensure that inspections are being conducted consistently across FRA's eight regions.

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Abbreviations

ASM	alternative safety measure
CCM	ccmMercury
GCIS	Grade Crossing Inventory System
GCM	Grade Crossing Manager
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
NOI	Notice of Intent
OMB	Office of Management and Budget
RAIRS	Railroad Accident/Incident Reporting System
RFIA	Regulatory Evaluation and Regulatory Flexibility Assessment for Use of Locomotive Horns at Highway-Rail Grade Crossings Final Rule
SSM	supplemental safety measure

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

October 31, 2017

The Honorable John Thune
Chairman
The Honorable Bill Nelson
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

The Honorable Bill Shuster
Chairman
The Honorable Peter DeFazio
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Ed Perlmutter
House of Representatives

Accidents where railroad tracks cross roads (termed "grade crossings") are a major source of fatalities in the U.S. railroad industry.[1] According to data from the Federal Railroad Administration (FRA)—the federal agency that oversees rail safety, including the safety of grade crossings—in 2016 there were more than 2,000 accidents at grade crossings, resulting in 264 fatalities, or about 36 percent of all railroad fatalities.

To prevent accidents at grade crossings, railroads have historically sounded their horns to warn motorists of oncoming trains. However, according to FRA, since the 1970s, many cities, counties, and towns around the nation enacted whistle bans (i.e., local ordinances which prohibit or restrict the use of train horns or whistles at grade crossings).[2] The whistle bans were allowed due in part to community complaints about

[1]According to FRA guidance, grade crossing accidents can also be referred to as grade crossing incidents, or grade crossing collisions. To be recorded as a grade crossing accident, an accident must meet three conditions: (1) involve on-track equipment, (2) involve a highway user, and (3) the accident occurs at a designated grade crossing.

[2]For example, in 1984 the state of Florida authorized local communities to ban the sounding of horns by intrastate railroads if the grade crossings were equipped with flashing lights and gates. This ban primarily affected the Florida East Coast Railway Company.

the negative effects of the train horn noise on resident's quality of life. While whistle bans may have reduced noise, in 1990 FRA conducted an analysis on Florida's whistle bans that showed that they led to a 195 percent increase in accidents at grade crossings during nighttime hours.

Partially as a result of FRA's analysis and the spike in accidents associated with selected whistle bans, in 1994 FRA was required in statute to issue train horn regulations governing the sounding of train horns at all public grade crossings.[3] The statute also provided FRA authority to make exceptions. In August 2006, FRA issued its final rule on the use of locomotive horns at highway-rail-grade crossings.[4] The rule provided states and public authorities[5] with an opportunity to establish "quiet zones," where train horns are not routinely sounded as trains approach grade crossings.[6] However, certain conditions must be met to mitigate the increased risks resulting from the absence of the train horn. While grade-crossing accidents have remained relatively constant in recent years, federal and private-sector railroad officials remain concerned about grade crossings' safety, including whether grade crossings in quiet zones are as safe as grade crossings where the train horn is sounded. These concerns are often in conflict with public authorities who want to establish quiet zones to reduce noise.

The Fixing America's Surface Transportation Act included a provision for GAO to review FRA's final rule.[7] This report discusses: (1) what is known

[3]Pub. L. No. 103-440, § 302(a)(1994). *Public*-highway-rail-grade crossings are locations where a public highway, road, or street crosses one or more railroad tracks at-grade. *Private*-highway-rail-grade crossings are highway-rail-grade crossings which are not a public-highway-rail grade crossing. 49 C.F.R. § 222.9. Throughout this report we will refer to public-highway-rail grade crossings as grade crossings, and specify when we are referring to private highway-rail-grade crossings.

[4]The final rule was codified in parts 222 and 229 of Title 49, Code of Federal Regulations. An interim final rule was issued in December 2003. The final rule was initially issued in April 2005; however, after petitions for reconsideration were received a revised final rule was issued in August 2006. 71 Fed. Reg. 47614 (Aug. 17, 2006). Reference to the final rule is the revised final rule issued in August 2006.

[5]Public authority means the public entity responsible for traffic control or law enforcement at the public highway-rail-grade or pedestrian crossing. According to FRA officials, public authorities can include cities, towns, or counties.

[6]A "quiet zone" is a section of rail line at least one-half mile in length that contains one or more consecutive public grade crossings at which train horns are not routinely sounded when approaching the grade crossings.

[7] Pub. L. No.114-94, § 11403(a) (2015).

about the benefits and costs of quiet zones; (2) what challenges, if any, public authorities and others encounter in establishing quiet zones; and (3) how, if at all, FRA is evaluating the effectiveness of federal train horn regulations.

The scope of this work focused primarily on new quiet zones—that is, quiet zones that were established after FRA issued the train horn regulations in August 2006.[8] For each of our objectives, we reviewed pertinent FRA regulations and documents; conducted a literature review of academic material on quiet zones;[9] interviewed FRA program officials in headquarters and conducted in-depth interviews with a nongeneralizable sample of 40 stakeholders—including officials from 8 freight railroads, 5 private industry consulting firms with experience helping public authorities establish quiet zones, 6 state agencies, 13 public authorities that established quiet zones within these 6 states, and Grade Crossing Managers (GCM)[10] in each of FRA's 8 regions. We selected the states based on a number of factors including the number of quiet zones established since federal regulations were issued, the number of grade crossings within quiet zones, and geographic diversity.[11] We selected the public authorities for interviews based on factors similar to the state selections, such as the number of new quiet zones, the number of grade crossings in new quiet zones, geographic diversity, and recommendations from FRA's GCMs and FRA's program officials. We asked each of these stakeholder groups a similar set of questions to

[8]The federal train horn regulations also included provisions for pre-rule quiet zones—grade crossings at which state statutes or local ordinances restricted the routine sounding of train horns, or at which locomotive horns did not sound due to formal or informal agreements between the public authority and the railroad(s) prior to the train horn regulations. The train horn regulations excludes about 390 crossings in Chicago, Illinois (called the "Chicago Region Exemption"), which were governed by the Illinois Commerce Commission.

[9]We conducted a literature review of pertinent studies in peer-reviewed journals, trade publications, and conferences, among others, published from January 1, 1996, through October 17, 2016.

[10]GCMs, officially known as Crossing and Trespasser Regional Managers, are responsible for, among other things, serving as subject matter experts on the federal train horn regulations and coordinating regional assistance to local public authorities regarding implementation of quiet zones.

[11]Five of the states we selected had the highest number of new quiet zones—California, Colorado, Florida, Illinois, and Texas. We also conducted interviews in Maryland before we conducted other interviews to test our interview protocol. Maryland was selected for this purpose because the location allowed us to minimize the resources required.

gather the individual's views on each of our objectives; these views cannot be generalized to others. With respect to the freight railroads, we selected the seven largest freight railroads, in addition to the railroad involved with the Florida whistle ban. The private industry consultants were selected based on recommendations from FRA and other stakeholders we interviewed.

We also conducted additional work related to each of the objectives:

- To describe what is known about the benefits and costs of quiet zones, we reviewed FRA's Regulatory Evaluation and Regulatory Flexibility Assessment (RFIA), which evaluated the economic impacts of federal train horn regulations, and a user guide prepared by FRA on how to establish quiet zones.[12]
- To identify what challenges public authorities and other stakeholders encounter in establishing quiet zones, we conducted a content analysis of interviews with stakeholders identified above. We also reviewed FRA's Notice of Safety Inquiry—the agency's retrospective review of the final rule—issued in March 2016.[13]
- To determine how FRA is evaluating the effectiveness of FRA's train horn regulations in quiet zones, we reviewed FRA's safety studies, published in 2011 and 2013, that compared the safety of grade crossings before and after the establishment of the quiet zone to determine whether safety was impacted. To assess the reliability of FRA's studies, we drew on established guidelines for assessing research, our reports on evaluating research programs, and our internal expertise in research design. We also compared FRA's approach to federal internal controls related to information and communication.[14] In addition, we reviewed FRA policies and procedures to determine its' oversight approach and then compared

[12]FRA, *Regulatory Evaluation and Regulatory Flexibility Assessment for Use of Locomotive Horns at Highway-Rail Grade Crossings Final Rule (49 C.F.R. Parts 222 and 229)* (Washington, D.C.: July 21, 2003); and FRA, Federal Railroad Administration, Highway-Rail Crossing and Trespasser Programs Division, *Guide to the Quiet Zone Establishment Process: An Information Guide* (Washington, D.C.: September 2013). The RFIA analyzed the potential economic effects of requiring the train horn to be sounded at all public grade crossings and eliminating whistle bans.

[13]See 81 Fed. Reg. 11734 (Mar. 7, 2016).

[14]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014).

this approach to federal internal control standards that would be applicable to the control environment.

Finally, in order to obtain information about quiet zones, we reviewed FRA's data on quiet zones established from 2005 through 2017. To assess the reliability of these data, we examined FRA reports, analyzed the data to identify any outliers, and interviewed FRA program officials about how the data were collected and used. We determined that the data were sufficiently reliable for our purposes. See appendix I for more information on our scope and methodology and appendix III for a list of organizations we contacted.

We conducted this performance audit from July 2016 to October 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The United States railroad system consists of a vast network of operations that includes more than 780 railroads operating across 220,000 miles of track—including about 212,000 grade crossings. Both freight and passenger railroads operate across the system. The freight railroad industry is dominated by the seven largest railroads, referred to as class I railroads, whereas passenger rail service includes Amtrak and 29 commuter railroads.[15]

FRA is responsible for providing regulatory oversight of the safety of both freight and passenger railroads. To accomplish this oversight, FRA issues and enforces numerous safety regulations, including requirements governing track, signal and train control systems, grade crossing warning systems, and railroad-operating practices. FRA monitors railroads' compliance with federal safety regulations through routine and special

[15]The freight railroad industry is divided into three classes based on certain thresholds of annual operating revenues, as determined by the Surface Transportation Board. For 2016, this revenue threshold was at least $447.6 million for class I railroads, at least $35.8 million for class II railroads, and less than $35.8 million for class III railroads.

emphasis inspections on railroads' systems.[16] FRA's inspectors generally specialize in one of five areas. These inspection areas are called disciplines and include: (1) operating practices, (2) track, (3) hazardous materials, (4) signal and train control, and (5) motive power and equipment.

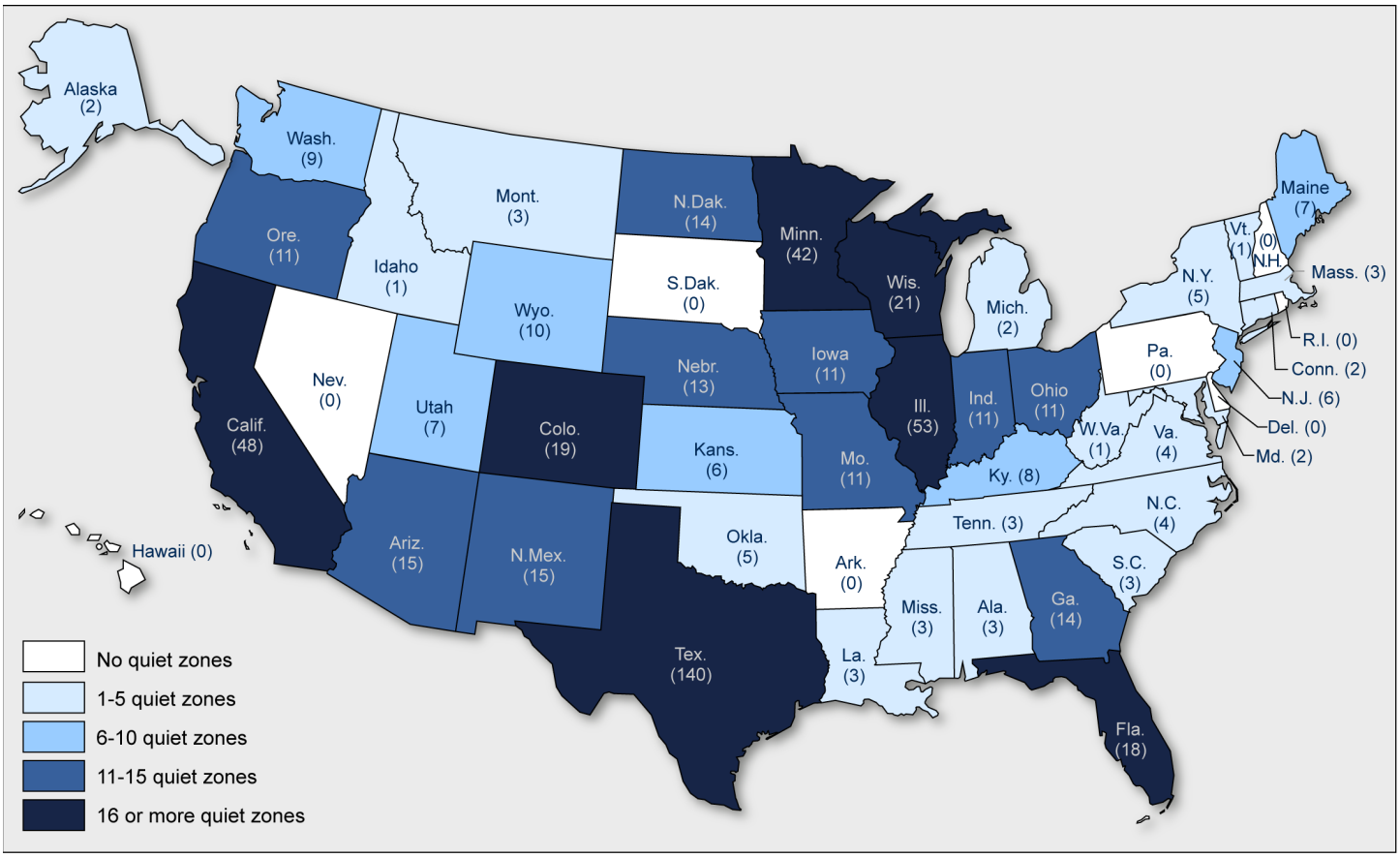
FRA also has specific responsibilities related to the safety of grade crossings, including issuing regulations regarding the use of train horns at grade crossings. FRA issued regulations in August 2006, after FRA's analysis illustrated the dangers of whistle bans. Federal regulations require that train horns be sounded in advance of all public grade crossings.[17] However, the regulations also provide an opportunity for public authorities to reduce the effects of noise associated with the train horn by establishing quiet zones. While railroads are directed to cease the routine sounding of the train horn at-grade crossings within quiet zones, the final rule states that train horns may still be sounded in emergency situations and to comply with other federal regulations and railroad operating rules.

As of June 2017, there were 570 new quiet zones located across 42 states (see fig. 1).

[16]FRA's inspection approach focuses on direct observations of train components, related equipment, and railroad property, as well as operating practices to determine whether they meet federal safety standards. [17]Train engineers are generally required to sound the horns at least 15 seconds, and no more than 20 seconds, in advance of all grade crossings. Train horns must be sounded in a standardized pattern of 2 long, 1 short and 1 long blast, with the volume ranging from 96 decibels to 110 decibels.

[17]Train engineers are generally required to sound the horns at least 15 seconds, and no more than 20 seconds, in advance of all grade crossings. Train horns must be sounded in a standardized pattern of 2 long, 1 short and 1 long blast, with the volume ranging from 96 decibels to 110 decibels.

Figure 1: New Quiet Zones Established in the United States from June 2005 to June 2017



Sources: GAO analysis of the Federal Railroad Administration data on grade crossings and Map Resources (map). | GAO-18-97

Public authorities must follow a number of steps and work with federal and state agencies, as well as railroads to establish quiet zones (see fig. 2). At a minimum, each grade crossing within a quiet zone must include active warning devices—these include flashing lights, gates, constant warning time devices, and power out indicators.[18] As shown in step 3 (fig.2), public authorities must select safety measures—either supplemental safety measures (SSM) or alternative safety measures

[18]Constant warning time is a railroad system that uses a train's approach speed to determine when it will reach a grade crossing, and then start the crossing gate cycle a specified time before the train reaches the crossing. According to the final rule, constant warning time devices are required if reasonably practical. A power out indicator provides notification to train crews that there is no commercial electrical power at a grade crossing.

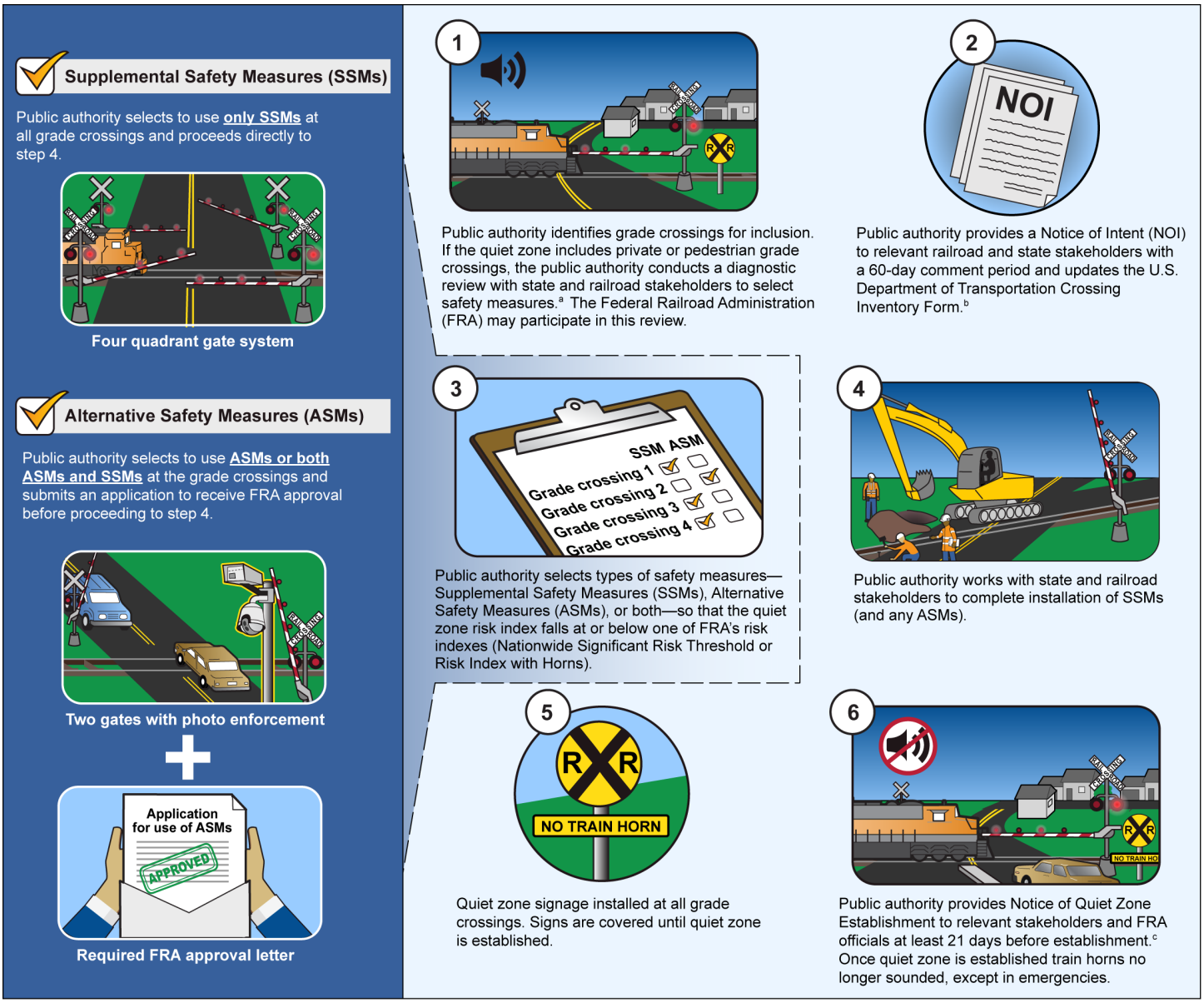
(ASM)—for grade crossings, measures that mitigate the increased risks of not sounding the train horn.[19] SSMs—such as eliminating a grade crossing, installing traffic channelization devices[20] extending 100 feet from the crossing gates, or installing four quadrant gates—are FRA pre-approved safety measures. On the other hand, ASMs—such as traffic channelization devices that are less than the required length to be an SSM—require individual review by the FRA. Public authorities must install safety measures at enough crossings within the proposed quiet zone so that the quiet zone's risk index is at or below one of FRA's two risk thresholds.[21]

[19]Under some circumstances public authorities can establish quiet zones without additional SSMs or ASMs, where adequate safety features are already in place or where the risk of accidents is below certain FRA risk thresholds.

[20]"Channelization device" means a traffic separation system made up of a raised longitudinal "channelizer," with vertical panels or tubular delineators that is placed between opposing highway lanes and is designed to alert or guide traffic around an obstacle or to direct traffic in a particular direction.

[21]FRA has two risk indexes, (1) the Risk Index with Horns and (2) the Nationwide Significant Risk Threshold. The Risk Index with Horns captures the average risk level if the train horn was routinely sounded at the grade crossings in the proposed quiet zone, and the Nationwide Significant Risk Threshold captures the average nationwide level of risk of highway-rail-grade crossings equipped with flashing lights and gates and at which locomotive horns are routinely sounded. The Nationwide Significant Risk Threshold is variable and subject to change over time. FRA annually calculates the Quiet Zone Risk Index for each quiet zone established in relationship to the Nationwide Significant Risk Threshold and compares it to the current Nationwide Significant Risk Threshold. This review is not conducted for quiet zones established by having an SSM at every public grade crossing or by reducing the Quiet Zone Risk Index to the Risk Index with Horns. Within six months of FRA's notification that the Quiet Zone Risk Index exceeds the Nationwide Significant Risk Threshold, the public authority must make a written commitment showing specific steps to lower the potential risk. A public authority then has 3 years from the date of FRA's notification to bring a quiet zone into compliance.

Figure 2: Process Public Authorities Follow to Establish Quiet Zones



Source: GAO analysis of FRA quiet zone process. | GAO-18-97

[a]Each pedestrian crossing or private crossing to an active commercial or industrial site must be reviewed by a diagnostic team and equipped or treated in accordance with its recommendations. The public authority must invite the state agency responsible for grade crossings' safety and all affected railroads to participate in the diagnostic review. FRA is not required to participate in diagnostic reviews.

[b]The Notice of Intent provides railroads and state agencies with an opportunity to provide comments and recommendations on the quiet zone. A complete and accurate U.S.

Department of Transportation Grade Crossing Inventory Form must be on file with FRA for all crossings within the quiet zone to reflect the current conditions at each crossing.

[c]A Notice of Quiet Zone Establishment must be issued to FRA, applicable railroads, and relevant state agencies indicating a quiet zone is being established at least 21 days prior to the establishment date.

Throughout the process public authorities may work with a number of stakeholders who have roles and responsibilities related to grade crossings. These include:

- **FRA:** In addition to issuing rules and regulations governing train horns and quiet zones, FRA has staff—in headquarters and in FRA's eight regional offices—that review public authority applications for use of ASMs, issue guidance on implementing federal regulations, answer questions from the public, and provide technical assistance related to the establishment of quiet zones. For example, FRA's 19 regional GCMs serve as subject matter experts on the train horn regulations and respond to questions from public authorities, while FRA program officials approve ASMs and conduct required annual reviews of quiet zones established relative to the Nationwide Significant Risk Threshold to ensure they equal or fall below this risk index.
- **Railroads:** Railroads work with public authorities to: (1) identify appropriate safety measures at grade crossings; (2) participate in diagnostic review meetings when the quiet zone includes public, private, or pedestrian grade crossings; (3) receive and comment on public authority's quiet zone notifications (e.g., the Notice of Intent and Notice of Quiet Zone Establishment); (4) install safety measures on railroad property; and (5) direct train crews not to sound horns in established quiet zones.
- **State departments of transportation and rail regulatory agencies:** These agencies receive and comment on Notices of Intent, public authority applications, and Notices of Quiet Zone Establishment; review, and in some cases approve grade crossing modifications; and participate in diagnostic reviews.[22]

[22]Most aspects of jurisdiction over grade crossings reside with the states. Within some states, responsibility is divided between several public agencies and the railroad. In other states, jurisdiction over grade crossings is assigned to a regulatory agency with various names such as the Public Utility Commission. These agencies are responsible for ensuring the safety of grade crossings within the states and, in some cases, approve any modifications to a grade crossing, such as adding SSMs. See U.S. Department of Transportation, FRA, *Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings*, Fifth Edition (October 2009).

- **Private industry consultants:** In some cases, public authorities hire consultants to provide subject matter expertise on establishing quiet zones. Consultants may perform such tasks as determining the feasibility of a quiet zone; arranging diagnostic reviews; assessing quiet zone risks; and identifying appropriate safety measures.

According to FRA officials, federal funding is available to reduce the risks of accidents at grade crossings, but funding specific to quiet zones is limited and no dedicated source exists. The primary source of federal funding to improve grade crossings' safety is the Federal Highway Administration's (FHWA) Railway-Highway Crossings (Section 130) Program, which received a set-aside of $230 million for fiscal year 2017 from amounts authorized for the Highway Safety Improvement Program.[23] While the funds are not specific to quiet zones, Section 130 funds may be used to upgrade crossing infrastructure, an upgrade that may result in a public authority's being more easily able to establish a quiet zone. However, according to FRA program officials, the program is competitive and funding must be used for safety projects. They said projects are selected on a safety priority basis, and quiet zones are generally considered a quality of life issue, not a safety improvement. Hence, it is unlikely that many public authorities will obtain these funds to establish quiet zones. Further, the officials said that while other federal funding is available for which grade crossing improvements may be an eligible expense, none is dedicated to quiet zones.

According to FRA officials, limited federal funding is available because quiet zones are not a national issue. They produce highly localized quality-of-life benefits and little or no improvement in the level of safety at grade crossings, but rather the safety measures are installed to compensate for silencing the sound of a train horn at grade crossings.[24] As a result, public authorities seeking to establish quiet zones generally fund the installation of SSMs and ASMs. Given limited funding, public authorities determine whether the benefits of establishing a quiet zone outweigh the costs to establish them.

[23]23 U.S.C. § 130(e)(1)(A)(ii). Section 130 program funds are eligible for projects at all public grade crossings and apportioned to each state annually. Fifty percent of a state's apportionment is dedicated to the installation of protective devices at grade crossings, whereas the remainder of funds can be used for hazard elimination projects, including protective devices. Section 130 projects are funded at a 90 percent federal share, with the state or the roadway authority funding the remaining 10 percent.

[24]See Congressional Research Service, *The Federal Railroad Administration's Train Horn Rule* (June 3, 2013).

Benefits of Quiet Zones Have Not Been Quantified, and Costs Depend on Many Factors

While Benefits of Quiet Zones Have Not Been Quantified, Selected Stakeholders Highlighted Benefits for Communities

Benefits derived from establishing quiet zones and reducing noise from the train horn have not been quantified in research we reviewed or by the public authorities (i.e., communities) that we interviewed. Specifically, our review of literature did not identify any studies that had quantified the benefits resulting from public authorities establishing quiet zones at grade crossings where the horn was previously sounded. Further, FRA has not quantified benefits associated with quiet zones, but did note in its RFIA that quiet zones would likely result in localized quality-of-life benefits from silencing of the horn at locations where it had previously been sounded.[25] Finally, none of the public authorities we interviewed have conducted any analysis that has quantified benefits associated with quiet zones or were aware of any studies that quantified these benefits.

While the benefits of quiet zones have not been quantified, the majority of stakeholders whom we interviewed stated that quiet zones do provide benefits for communities. The most commonly cited benefit (35 of 40 stakeholders) was the reduction in noise due to the absence of routine sounding of the train horn. Stakeholders told us this noise reduction led to improvements in quality of life from, for example, the ability to sleep better at night, as well as a reduction in residents' noise complaints. To a lesser extent, stakeholders also cited economic development and safety as benefits for communities. Almost half of the stakeholders (19 of 40) we interviewed told us that areas with new quiet zones saw an increase in economic development from such things as new businesses or residential developments. Similarly, almost half of the stakeholders (17 of 40) said

[25]FRA's RFIA measured safety benefits resulting from eliminating whistle bans and requiring that trains horns be sounded at all grade crossings. The RFIA did not measure benefits that may result from establishment of a quiet zone to crossings for which train horns were previously sounded.

that quiet zones increased safety along rail lines, given the addition of new safety measures at the grade crossings.

While the benefits associated with quiet zones have not been measured, more generally, researchers have analyzed the effect of transportation noise on property values and health to understand the effects.[26]

- **Property values:** Our review identified two studies that analyzed the effect of freight train noise on property values in selected communities and found mixed results. In one study, the authors looked at the effect of a freight rail line on home prices and concluded that, while for smaller homes results suggest a negative and statistically significant effect on sale prices, results for medium and larger units were mixed.[27] In the second study, the author examined the effect of a railroad's decision to ignore whistle bans and found that proximity to rail lines and crossings had a negative and statistically significant effect on residential property values in some communities, with the effect varying depending on distance to the rail line.[28] The author concluded that the crossing effects were largely temporary, because over time, buyers less sensitive to noise would likely move into the area, reducing or eliminating any long-term effect of the railroad's decision. However, both of these studies have limitations, are based on data almost two decades old, and the results might not be representative of the economic effects associated with quiet zones.[29]

[26]Transportation noise is generally considered undesirable but there is no well-defined market price for establishing its value. As a result, researchers may rely on indirect methods, such as changes in property values, as a proxy to understand this value.

[27]See Robert A. Simons and Abdellaziz El Jaouhari, "The Effect of Freight Railroad Tracks and Train Activity on Residential Property Values," *The Appraisal Journal*, 72.3 (Summer 2004), 223. For this study, the authors used a model to estimate the effect of proximity to railroad tracks and crossings on the sale price of homes. The authors analyzed data from Cuyahoga County, Ohio. With respect to the effect of proximity to grade crossings, the study found mixed results, depending on size of the home and other factors.

[28]D. Clarke,"Externality Effects on Residential Property Values: The Example of Noise Disamenities," *Growth and Change*, 37, 3 (September 2006). The author used a model to estimate the effect of one railroads' (Conrail) decision to ignore whistle bans on residential property's real sales prices in three U.S. counties. Counties were selected based on availability of data that spanned the period of Conrail's decision to ignore whistle bans.

[29]These studies had two main limitations. First, the studies used a small population to conduct their research—one study used home sales data from one county and the other used data from three counties. Second, both studies were conducted some time ago, and relied on data from the late 1990's, making the results almost 20 years old.

- **Health effects:** In 2002, FRA summarized available academic literature on the undesirable effects of noise—primarily focusing on transportation noise associated with aircraft, highways, and railroads.[30] According to the research, transportation noise can cause undesirable psychological health effects, such as annoyance, and physiological health effects, such as hearing impairments and sleep disturbance on individuals.[31]

Costs to Establish Quiet Zones Depend on Many Factors

Total costs to establish quiet zones depend on many factors and vary widely.[32] Prior to issuing regulations, in the RFIA, FRA identified the types of costs associated with establishing quiet zones that can be incurred by public authorities, states, railroads, and FRA. These factors included such things as upgrading signals at grade crossings; purchasing, installing, and maintaining safety measures like flashing lights and gates; developing, reviewing, and evaluating quiet zones; and designing public education and awareness efforts. The actual cost that public authorities incur to establish quite zones will vary and depend on these and other factors. Both FRA program officials and FRA guidance has stated that, in general, the factors that affect the costs include such things as the number of grade crossings in a quiet zone, the geography of the area in which the quiet zone is established, and the types of safety measures a public authority decides to install. For example, some grade crossings may require upgrades to constant-warning-time devices or installation of complex and costly SSMs (e.g., four-quadrant gates), whereas other grade crossings may require fewer upgrades or less complex safety measures (e.g., traffic channelization devices). In 2013, FRA published guidance for public authorities in which it estimated that the capital costs public authorities may incur to establish quiet zones may range from about $30,000 to more than $1 million per grade crossing, depending on the types of safety improvements and existing infrastructure at grade

[30]U.S. Department of Transportation, John A. Volpe National Transportation Systems Center, *General Health Effects of Transportation Noise*, FRA/RDV-03/01 (Cambridge, MA: June 2002).

[31]The study did not isolate the effect of rail noise on individuals.

[32]Total costs refer to all direct (e.g., capital cost of safety measures) and indirect costs (e.g., administrative costs) associated with the establishment of the quiet zone.

crossings.[33] The RFIA stated that, because grade crossings may differ significantly, public authorities must analyze the characteristics of each and the safety measures needed to accurately estimate costs to establish quiet zones.

Public authorities we interviewed confirmed that the costs to establish quiet zones do vary and depend on many factors. All 13 public authorities we interviewed often said that in establishing quiet zones they incurred costs for identifying safety measures for grade crossings, purchasing and installing these safety measures, and maintaining quiet zones, among other things. According to the public authorities we spoke with in our review, the cost to establish quiet zones ranged from about $14,000 to several million dollars.[34] However, this range also reflects different levels of quiet zone activity; for example, one public authority established a quiet zone at a single grade crossing, while another established a quiet zone that encompassed 60 grade crossings.

In addition, railroads, states, and FRA may incur costs as part of establishing quiet zones. For example, officials from seven of the eight railroads we interviewed stated that they incur costs for such things as (1) participating in diagnostic reviews, (2) commenting on Notice of Intents and Notice of Quiet Zone Establishments; and (3) notifying and training crews not to sound horns in quiet zones. States may also incur costs. Two states included in our review—California and Colorado—have public utility commissions that told us they are required to review and approve any modifications to grade crossings in their states, including those associated with quiet zones. Finally, FRA incurs costs related to quiet zones. This cost includes reviewing quiet zone applications, participating in diagnostic reviews when invited, and the time GCMs or other FRA staff

[33]FRA, *Guide to the Quiet Zone Establishment Process: An Information Guide* (Washington, D.C.: September 2013). According to FRA program officials, these estimates are not an exact amount, but rather an "order of magnitude" cost estimate intended to give public authorities a rough sense of what quiet zones might cost per grade crossing. We did not validate these costs or the underlying methodology used to prepare these estimates.

[34]These cost estimates were provided by public authorities, and may not represent total costs to establish a quiet zone.

spends providing technical assistance to public authorities and others on establishing quiet zones.[35]

While public authorities are generally responsible for paying the costs to establish quiet zones, about half of the public authorities we interviewed (10 of 13) said they obtained funding from outside sources to help pay for the zones, for example:

- **Federal funds:** Six of the public authorities we interviewed reported receiving federal funds to help establish their quiet zones.[36] In particular, one public authority that we interviewed reported receiving a $3.3 million Transportation Investment Generating Economic Recovery grant to establish a quiet zone.[37] Alternatively, public authorities in the remaining five communities were eligible for grade crossing safety improvement efforts that were designated by the state through FHWA or other programs.[38]
- **State or railroad funds:** For three of the public authorities we interviewed, quiet zones were established in conjunction with larger state department of transportation highway or railroad projects and these entities paid a portion of the costs.
- **Grade crossing incentive funds:** Four of the public authorities we interviewed received grade-crossing incentive funds from railroads or state departments of transportation to close grade crossings that were part of a quiet zone.
- **Private funds:** In two communities, private investors provided financial assistance to public authorities for a quiet zone. For

[35]As discussed earlier, FRA is required to review applications when public authorities use ASMs or modified SSMs to establish quiet zones. According to FRA officials, about 10 percent of new quiet zones require applications for FRA review.

[36]While several of the public authorities in our nongeneralizable sample obtained federal funds to help pay for their quiet zones, this funding may not be typical of other public authorities that have, or wish to establish, quiet zones.

[37]Congress first authorized and appropriated funds for a national surface transportation infrastructure discretionary grant program in the American Recovery and Reinvestment Act of 2009 (Pub. L. No. 111-5, 123 Stat. 115, 203 (Feb. 17, 2009)). This program has become known as Transportation Investment Generating Economic Recovery.

[38]As stated earlier, FHWA Section 130 funds are not available to establish quiet zones. Rather, these funds are available to install protective devices at grade crossings that are designated high-risk for accidents.

example, a private developer paid for a quiet zone in order to facilitate the building of residential developments.

Selected Public Authorities and Other Stakeholders Reported Several Challenges in Establishing Quiet Zones and Suggested Potential Improvements

Public authorities and other stakeholders that we spoke with reported several types of challenges with establishing quiet zones. These stakeholders noted three primary challenges, which included the cost to establish quiet zones, obtaining stakeholder cooperation, and the process to establish quiet zones. As aforementioned, public authorities generally incur costs to establish quiet zones, so cost plays a major role in a public authority's decision of whether to pursue a quiet zone or not. The most commonly cited challenge was cost (29 of 40 stakeholders). In some cases, officials whom we interviewed reported that costs were the main reason that public authorities delayed or discontinued the process to establish a quiet zone.

In addition to cost, stakeholders cited two other primary challenges to establishing quiet zones—obtaining cooperation among quiet zone participants and the process for establishing quiet zones—and suggested a variety of improvements related to bolstering the process.

- **Cooperation among quiet zone participants (18 of 40):** Although stakeholders we spoke with cited a number of cooperation issues, including difficulties in getting private grade crossing owners to participate and lack of state cooperation, over half (10 of 18) cited cooperation between public authorities and railroads as a challenge. Such cooperation is important since both must typically work together to establish quiet zones. However, there are natural tensions between public authorities and railroads with respect to establishing quiet zones. As discussed earlier, stakeholders we spoke with supported quiet zones believing they not only maintain safety, but improve quality of life. On the other hand, all eight railroads told us that the train horn is the most effective safety measure.
- **The process for establishing quiet zones (16 of 40):** In general, the stakeholders we spoke with cited a variety of process related challenges, including that the train horn regulations are difficult to

understand, FRA waivers are difficult to obtain,[39] and that the quiet zone process could be better explained by FRA. In particular, over half of the stakeholders whom said that process was a challenge (10 of 16) explained that the quiet zone process was either difficult to understand or navigate or that the requirements to establish a quiet zone were confusing. For example, one public authority told us that rules for establishing a quiet zone can be difficult to interpret and that this difficulty could impact public authorities' establishment of quiet zones. Four of the 16 stakeholders also told us the process was time consuming and, in some instances, can take years to complete. FRA program officials said the turnaround time for FRA reviews depends on the quality of materials provided. They said it generally takes 90 to 120 days for FRA to complete its review, but it can take longer if there is missing information or other problems with a public authority's application, as is often the case.

Stakeholders we spoke to suggested three types of process-related improvements: administrative changes to improve the efficiency of the process, improvements to FRA's role in the quiet zone process, and improvements to FRA guidance that public authorities use to establish quiet zones.

Administrative improvements: Twenty-five of the 40 stakeholders that we interviewed identified one or more types of administrative process improvements to improve the efficiency of the process for establishing quiet zones or better facilitate their establishment. These suggested improvements included:

- *Making the quiet zone process more user-friendly (11 of 40 stakeholders that offered suggestions related to the quiet zone process)*: Stakeholders we interviewed identified various improvements that could streamline some administrative requirements of the quiet zone process. These steps include standardizing or automating the quiet zone process, developing sample Notices of Intent or Notices of Quiet Zone Establishment that public authorities could use to input information, and making quiet zone materials

[39]Waivers of compliance with a provision of the regulations may be granted when the FRA Associate Administrator for Railroad Safety finds that a waiver is in the public interest and consistent with the safety of highway and railroad users. In general, to obtain a waiver from train horn regulatory provisions, two parties file a petition, the railroad owning or controlling operations over the railroad tracks crossing the public-highway-rail-grade crossing and the public authority that has jurisdiction over the roadway crossing the railroad tracks. 49 C.F.R, § 222.15.

available electronically.[40] For example, GCMs in one FRA region told us that by standardizing the paperwork all regions would receive the same documents, a step that would make review easier. In addition, these officials said public authorities often forget to include key information in the Notice of Intent and with a standard form this may not occur.

- *Requiring diagnostic reviews for all quiet zones (7 of 40)*: As discussed earlier, when there are private grade crossings that allow public access to active commercial or industrial sites or pedestrian grade crossings in a quiet zone, a diagnostic review is required.[41] The regulations require public authorities to provide state agencies and affected railroads, among others, the opportunity to participate in diagnostic reviews. According to FRA program officials, FRA is not required to participate in diagnostic reviews. Diagnostic reviews evaluate conditions at proposed quiet-zone crossings and a diagnostic review team makes recommendations about measures that are needed to protect safety at these crossings. Seven stakeholders we interviewed suggested that diagnostic reviews should be required for all quiet zones, not just instances when there are private or pedestrian crossings. For example, one GCM told us conducting a review for all grade crossings provides a better idea of what safety measures are needed and is a prudent action to protect public safety.[42]

FRA's Role in the Process: About half of the stakeholders we spoke with (21 of 40) suggested improvements related to FRA and its role in the quiet zone process:

- *Increase FRA oversight and inspection of quiet zones (11 of 40)*: In general, these stakeholders believe FRA should be more involved with inspections and oversight of quiet zones, particularly between when a Notice of Quiet Zone Establishment is issued and when a quiet zone is established. Most of the railroad stakeholders we spoke with (6 of 8) believe there is a need for increased FRA involvement

[40]Federal train horn regulations require public authorities to prepare Notice of Intent and Notice of Quiet Zone Establishment documents.

[41]49 C.F.R. §§ 222.25(b)(1), 222.27(b).

[42]According to FRA officials, a change to the train horn regulations would be necessary to require diagnostic reviews at all grade crossings. In addition, they said FRA has historically recommended that public grade crossings have a diagnostic review, even though it is not required.

with quiet zones' oversight. Among the railroad concerns were that without additional FRA oversight, quiet zones may not achieve compliance with the train horn regulations, and that public authorities may not actually install the safety measures identified in the Notice of Quiet Zone Establishment. A GCM in one FRA region told us that officials discovered noncompliant safety measures and missing signs after quiet zones had been established in this region, and that safety measures that were supposed to be installed were not. We discuss quiet zone oversight issues later in this report.

- *Expedite FRA's review of quiet zone applications (10 of 40*): As discussed earlier, FRA plays a role in the quiet zone process, in part, by reviewing quiet zone applications when ASMs are used. The 10 stakeholders felt that FRA should expedite its review process. For example, a GCM in one FRA region suggested FRA shorten the review time by developing a list of frequently used ASMs and their safety effectiveness ratings and posting them online, a process that would save FRA time when reviewing ASMs.

Guidance about the process: Finally, stakeholders we spoke with suggested guidance on the quiet zone process could be improved (17 of 40).

- In particular, 13 of the 17 stakeholders whom offered suggestions about guidance said that FRA's quiet zone guidance should be clearer or that training about the quiet zone process is needed. As previously discussed, some stakeholders told us the quiet zone process is difficult to understand or navigate, or that FRA could better explain the process. In particular, two public authorities suggested some form of step-by-step guide is needed to better describe the process, and GCMs in three FRA regions also suggested classes or other types of education were needed to better help public authorities understand the quiet zone process. According to FRA program officials, FRA's quiet zone guidance consists of its user guide and a document on how to create a quiet zone.[43] The train horn regulations also specifies how public authorities are to establish quiet zones and includes steps to follow under the public authority designation or public authority application processes.

Moving forward, FRA is in the process of conducting a retrospective regulatory review and deciding what, if any, changes may be needed. In March 2016, FRA issued a Notice of Safety Inquiry, which, according to

[43]FRA, *How to Create a Quiet Zone* (posted online September 27, 2012).

FRA, is a retrospective review of the train horn regulations. The Notice of Safety Inquiry solicited comments about many aspects of the train horn regulations, including whether FRA can decrease the barriers public authorities encounter when establishing a quiet zone. Among other things, the inquiry seeks comments about whether there should be an online process for submitting notices and other required quiet zone paperwork, whether diagnostic reviews should be required for all quiet zones, and if the regulations should be amended to include common ASMs in the list of approved SSMs. The Inquiry is also looking at other aspects of the quiet zone process and guidance. As of July 2017, FRA was still in the process of reviewing comments received in response to the notice. FRA program officials did not indicate what, if any, changes may result from this inquiry, but said any changes that are made would be handled through a rulemaking. However, FRA program officials noted that a rulemaking would not be necessary for the agency to provide public authorities with additional tools to aid in the development of a quiet zone, such as guidance.

FRA Has Conducted Analyses of Safety in Quiet Zones and Is Formalizing Quiet Zone Inspections, but Limitations Exist

FRA's Analyses Generally Indicate That Grade Crossings in Quiet Zones Are As Safe As The Same Grade Crossings When the Train Horn Was Sounded, but Methodology Has Limitations

One way FRA evaluates the effectiveness of its train horn regulations is through conducting analyses of data on the safety of grade crossings in quiet zones. Those analyses show that grade crossings in quiet zones are generally as safe as the same grade crossings when the train horn was sounded. Specifically, FRA conducted analyses in 2011 and 2013 to assess whether there was a statistically significant difference in the number of accidents before and after implementation of quiet zones.[44] The results showed that there was generally no statistically significant difference in the number of accidents that occurred before and after quiet zones were established. To conduct the analyses, FRA grouped quiet zones by the number of years of available data since establishment of the quiet zone, using an equal number of months before and after

[44]FRA, Office of Railroad Safety Grade Crossing Division, *2011 Analysis of the Safety Impact of Quiet Zones at Highway-Rail Grade Crossings* (Washington, D.C.: July 2011) and FRA, Office of Railroad Safety Grade Crossing Division, *2013 Analysis of the Safety Impact of Quiet Zones at Highway-Rail Grade Crossings* (Washington, D.C.: February 2014).

establishment.[45] FRA's analyses in 2011 and 2013 included 359 and 203 quiet zones, respectively.[46]

While FRA's analyses of quiet zones generally showed that grade crossings in quiet zones were as safe as the same grade crossings when the train horn was sounded, in 2013 FRA identified one exception that FRA program officials reported resolving in a subsequent analysis. Specifically, while FRA's 2011 analysis did not show any differences in safety after establishment of the quiet zones, in 2013 FRA concluded that for quiet zones established from May 2010 through April 2011, there was a statistically significant increase in the number of accidents that occurred after the establishment of the quiet zones. Specifically, FRA found that accidents doubled from 11 accidents before establishment of the quiet zones to 22 accidents following the establishment of the quiet zone. After that finding, FRA program officials conducted a preliminary analysis for 2017 and reported that the results did not show a statistically significant increase in accidents for any period of quiet zones, including those established from 2010 through 2011.[47] In addition to looking at quiet zones by establishment year, FRA's 2013 analysis also grouped quiet zones by how they were established, such as with safety measures at all crossings or against FRA's risk indexes. Results from this analysis did not

[45]For example, in 2013 FRA grouped quiet zones by the number of years of available incident data before and after establishment, using a paired t-test to compare the mean number of incidents for a time interval of 1, 2, 3, 4, 5, 6, or 7 year(s) before the quiet zone was established to the mean number of incidents during an equal time interval after establishment.

[46]In 2011, FRA had data on 434 quiet zones; however, 75 were dropped because they did not have a Notice of Quiet Zone Establishment date or because one year of observable data were not available. In 2013, FRA had data on 575 quiet zones; however, 373 quiet zones were dropped because they were in the Chicago region and exempted, they had inconsistent data, they did not have proper Notice of Quiet Zone Establishment information, or because one year of observable data were not available. In its 2011 analysis, FRA noted that it had a number of data quality issues. As a result, FRA program officials told us they implemented additional safeguards in 2013 and reduced the number of observations dropped due to errors to less than one percent.

[47]FRA's analyses grouped quiet zones by year of establishment. However, because these analyses were conducted in different months of the year, the analyses did not compare the exact same grouping of quiet zones for each year. For example, for the 2007-2008 time period, FRA's 2011 analysis included quiet zones established from February 2007 through January 2008, whereas the 2013 analysis included quiet zones established from May 2007 through April 2008.

show an increase in accidents by any establishment method analyzed.[48] As a result, FRA program officials told us that they believe the result in 2013 for quiet zones established from 2010 through 2011 was likely an anomaly and that those quiet zones are as safe as other crossings.

Before-and-after analysis is a methodologically acceptable practice, but the reliability of the results decrease over time because unlike other types of analyses, they do not control for factors that may change over time. In particular, FRA's analyses assume that the number of accidents experienced before the quiet zone is established is a good estimate of the number of accidents that would be expected in the future had the quiet zone not been established. However, FRA's before-and-after analyses have limitations because, unlike other methodologies, they do not take into account changes to characteristics of grade crossings over time. For example, a multivariate method can control for changes to characteristics at grade crossings that may impact safety. These characteristics can include changes to train or vehicle traffic, train or vehicle speeds, time of day when train activity occurs, number of highway lanes, the number of tracks in use, or other changes to surrounding roads or infrastructure at a crossing. For example, if train or vehicle traffic increased over time, it is possible that the number of incidents would increase, while the risk of an accident would stay the same. Specifically, closing a grade crossing near a quiet zone or increases in traffic from new businesses around a quiet zone could increase traffic after the establishment of a quiet zone; however, these changes would not be factored into FRA's current methodology for conducting safety analyses. This inherent limitation is exacerbated over time, because the assumption that there would be no changes to relevant characteristics of the grade crossings is less likely to be the case as more time passes.[49]

FRA also conducts annual reviews of selected quiet zones to ensure their safety, and FRA program officials told us that this review further validates its before-and-after analyses. As mentioned previously, FRA conducts

[48]FRA grouped each quiet zone into one of 19 quiet zone establishment methods. Since before-and-after analyses require a minimum amount of data for robust results, FRA only analyzed groups that had at least 15 accident data points. As a result, FRA analyzed 6 of the 19 groups and found that none of these groups had a statistically significant decrease in safety,

[49]Since FRA divides the total number of accidents in each group of quiet zones by the number of quiet zones in that group, another limitation of FRA's analyses is that they may mask changes in the number of incidents at any particular quiet zone.

annual reviews of quiet zones established against the Nationwide Significant Risk Threshold because the measure is variable and subject to change over time.[50] According to FRA program officials, about 11 percent of all quiet zones are established against the Nationwide Significant Risk Threshold and are thus included in this annual review. To ensure that established quiet zones fall at or below the Nationwide Significant Risk Threshold, FRA is required to recalculate this measure on an annual basis and notify a public authority if the Quiet Zone Risk Index no longer falls at or below the threshold.[51] By doing so, FRA program officials told us that they are further validating that the grade crossings in quiet zones are as safe as other grade crossings. While this annual review may provide FRA with additional support that grade crossings in quiet zones are as safe as others, it does not address the underlying limitations of a before-and-after analysis.

While the reliability of a before-and-after analysis may decrease over time, FRA has no plans to revise its methodology. In fact, as mentioned previously, FRA program officials told us that preliminary results for their 2017 safety study mirror results from 2011, showing that there was no statistically significant difference in accidents before and after the establishment of quiet zones. According to FRA program officials, the agency is not required to conduct this analysis, but moving forward, program officials plan to conduct the same analysis on a biennial basis to internally validate that grade crossings in quiet zones are as safe as others.

By continuing to rely on the current methodology, FRA's future analyses may continue to provide the agency with information that does not account for changes in characteristics of grade crossings over time. The *Standards for Internal Control in the Federal Government* states that management should use quality information to make informed decisions. This requirement can be satisfied by, for example, obtaining relevant data from reliable sources, obtaining that information on a timely basis, and processing that data into quality information that accurately represents

[50]According to FRA program officials, reviews for quiet zones established with safety measures at all crossings or established against the Risk Index with Horns are not required because these measures are intended to fully compensate for the lack of the train horn.

[51]As part of this process public authorities are required to update information on the quiet zone about every three years. These updates will incorporate any changes in risk level due to vehicle or train traffic, among other things.

what it purports to represent. Furthermore, a previous FRA study that the agency relied on in developing the final rule has reported that changes in grade crossings' characteristics can affect the results of analyses used to predict accidents at grade crossings.[52] As a result, FRA's Rail-Highway Crossing Resource Allocation Procedures recommended that analyses used to predict accidents at grade crossings only include accident data for the most recent 5 years because older accident history information may be misleading due to changes that occur in grade crossings' characteristics over time.[53] While FRA's recommendation was not developed to analyze the safety of grade crossings in quiet zones, the agency's recommendation that accident data older than 5 years may be misleading because of changes that occur to grade crossings' characteristics over time is relevant to those analyses. Nevertheless, FRA program officials told us that they have no plans to revise the methodology because it effectively compares the safety of grade crossings in quiet zones to other grade crossings. By continuing to use the same methodology, the agency may be missing an opportunity to fully understand the safety of grade crossings in quiet zones.

FRA Has Taken Steps to Formalize Quiet Zone Inspections, but Lacks Formal Guidance

In addition to conducting studies, FRA also oversees quiet zones by inspecting them to ensure their safety and compliance with train horn regulations. According to FRA program officials, FRA is not required to inspect quiet zones; rather, public authorities, in conjunction with the railroads, are responsible for maintaining quiet zones and ensuring

[52]FRA, *North Carolina "Sealed Corridor" Phase I U.S. DOT Assessment Report: Report to Congress*, (Washington, D.C.: August 2001).

[53]FRA documentation states the most accurate predictions, in theory, will result from the use of all the available accident history, assuming crossing characteristics remained constant. However, the extent of improvement is minimal if data for more than 5 years are used. It is therefore recommended that only data for the most recent 5 years of accident history be used. This ensures good performance from both the accident prediction formula and use of the most relevant data. Accident history information more than 5 years old may be misleading because of changes that occur to crossing characteristics over time. If it is known that a significant change has occurred to a crossing during the most recent 5 years, such as a warning device upgrade, only the accident data since the change should be used. See FRA, *Rail-Highway Crossing Resource Allocation Procedure User's Guide*, Third Edition, DOT / FRA/ OS -87/ 10 (Washington, D.C.: August 1987).

compliance with train horn regulations.[54] Until recently, FRA has utilized its GCMs to, among other things, informally inspect quiet zones and work with public authorities to resolve issues affecting the safety of quiet zones—issues such as foliage covering signage, maintenance issues with safety devices, or outdated pavement markings.[55] In fact, GCMs in all eight regions told us that they informally inspect quiet zones.[56] According to FRA program officials, the agency has recently identified the need for "more eyes on the ground" to more systematically address maintenance issues within quiet zones and to ensure compliance with train horn regulations.[57] As a result, FRA is transitioning its informal inspection program for quiet zones to a more formal inspection process.

As part of this transition, FRA has taken steps to hire and train new inspection staff. In May 2017, FRA program officials told us that they were in the process of hiring Grade Crossing Inspectors (Inspectors), who would be responsible for conducting quiet zones inspections. In particular, Inspectors would be responsible for, among other things, ensuring compliance with (1) the train horn regulations, (2) emergency notification requirements at grade crossings, and (3) requirements to submit grade crossing inventory forms. Subsequently, FRA program officials told us in

[54]While the train horn regulations do not require physical inspections of quiet zones by FRA, public authorities, or railroads, FRA program officials told us that the regulations do provide FRA with the authority to conduct inspections of quiet zones and, if warranted, terminate a quiet zone or fine a public authority or railroad for violations. In addition, FRA program officials told us public authorities must certify that the Notice of Quiet Zone Establishment is accurate and provide periodic updates that contain written affirmations that safety measures within the quiet zone continue to comply with governing regulations.

[55]As mentioned previously, as of August 2017, FRA officials told us that they employed 19 GCMs across eight regions that are responsible for, among other things, serving as subject matter experts on FRA regulations governing the use of train horns and quiet zones and coordinating regional assistance to public authorities interested in establishing quiet zones.

[56]We found, however, that how and when GCMs conducted these informal inspections varied significantly. For example, GCMs in one region told us they informally inspect quiet zones primarily when problems arise, whereas GCMs in another region told us they informally inspect all quiet zones in their region every three years using a checklist they developed.[57]As of August 2017, FRA had not terminated any quiet zones because of violations or fined any entities for quiet zone violations.

[57]As of August 2017, FRA had not terminated any quiet zones because of violations or fined any entities for quiet zone violations.

August 2017 that they planned to hire 24 new Inspectors.[58] As of August 2017, FRA had also developed the Inspector training curriculum, and began training three Inspectors. FRA program officials expressed uncertainty over when the remaining 21 Inspectors will be hired because of uncertainty regarding FRA's hiring and training priorities, among other things. In September 2017, FRA program officials told us that one of the newly hired Inspectors had completed the training and had begun inspecting quiet zones.

While FRA has started conducting formal quiet-zone inspections, we found that FRA has not developed guidance on how the inspections should be conducted, including guidance on how frequently these inspections should be conducted and what should be examined. As a result, such guidance is not included as part of the training curriculum developed for Inspectors. According to FRA program officials, this guidance has not been developed because program officials are still finalizing the inspection program. Although no guidance has been developed, FRA program officials told us that they are considering inspecting all new quiet zones between when the public authority submits a Notice of Quiet Zone Establishment and when the quiet zone is established. Additionally, FRA program officials told us that existing quiet zones would be inspected based on mission requirements, risk, and the availability of resources, but ideally every 3 years. With respect to how the quiet zones are to be inspected, FRA program officials said they plan to develop guidance for Inspectors that is akin to the other FRA safety disciplines.[59] FRA program officials told us that they are working toward establishing an Audit Division, which would be responsible for developing this guidance. However, as of August 2017, FRA program officials had not provided a timeline for when this division or guidance would be completed.

[58]Over this same time period, FRA officials told us that they will be simultaneously phasing out GCMs through attrition and retirement. In addition to hiring Inspectors, FRA also plans to hire Grade Crossing Specialists who will also have a role with inspecting quiet zones. However, as of August 2017, FRA program officials told us they were in the process of developing the Grade Crossing Specialist's position description and were unsure when these individuals will be hired.

[59]FRA has developed a manual for each of its other five disciplines. For example, FRA's manual for the operating practices discipline includes: pertinent laws and regulations, inspector best practices, field-reporting procedures and forms, and illustrative examples of non-compliance issues.

The absence of guidance on inspections is inconsistent with internal control standards. Specifically, the *Standards for Internal Control in the Federal Government* states that management should implement control activities through its policies that document each unit's responsibility, or further delineates day-to-day procedures.[60] These procedures may also include the timing of when a control activity occurs and state that management should communicate these policies to its staff. Without this type of guidance, FRA cannot have reasonable assurance that inspections are being conducted consistently across FRA's eight regions and as FRA intends.

Conclusions

Grade crossing collisions are one of the leading causes of fatalities in the railroad industry, and ensuring safety in these areas, including those within quiet zones, is a vital part of FRA's mission. While public authorities are primarily responsible for safety in quiet zones, FRA can help ensure that grade crossings in quiet zones are as safe as others. However, the methodology FRA uses to assess the safety of quiet zones has limitations because it does not account for changes to grade crossings' characteristics over time. By continuing to rely on this methodology, FRA may be missing an opportunity to ensure that established quiet zones are providing the same level of safety as when train horns were sounded.

In addition to its safety studies, FRA is also taking steps to formalize its process for conducting physical inspections of quiet zones. While FRA has started hiring and training a few Inspectors, it lacks guidance on how and when quiet zone inspections are to be performed. Without this guidance, FRA cannot ensure that quiet zones will be inspected consistently across FRA's eight regions.

Recommendations for Executive Action

We are making the following two recommendations to FRA:

The Administrator of FRA should revise the methodology for the analysis of safety in quiet zones to take into account relevant changes over time—including changes in train and automotive traffic, or in the physical characteristics of the grade crossing. (Recommendation 1)

[60] GAO-14-704G.

The Administrator of FRA should develop guidance for Inspectors on the nature and frequency of quiet zone inspections. (Recommendation 2)

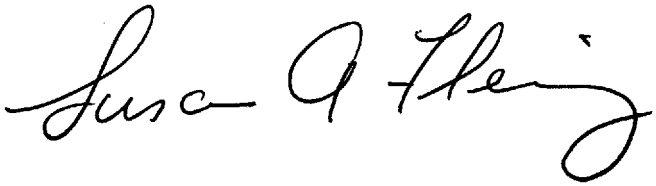
Agency Comments and Our Evaluation

We provided a draft of this report to the Department of Transportation for review and comment. The department provided a written response (see app. II), as well as technical comments that we incorporated as appropriate. The department concurred with the second recommendation regarding developing guidance for quiet zone inspectors and partially concurred with the first recommendation regarding revising the methodology for analyzing the safety of quiet zones. The department said it would consider our recommendation to revise its methodology as it explores options for updating its methodology.

We are encouraged that FRA is willing to consider revising its methodology for analyzing the safety of grade crossings in quiet zones. However, we continue to believe that our recommendation is valid and that to fully understand quiet zone safety FRA needs to revise its methodology to account for relevant characteristics of quiet—zone grade crossings. As we state in the report, the reliability of FRA's current methodology will likely decrease over time because it does not control for relevant changes to grade crossings in quiet zones including changes to vehicle or train traffic or speeds. These and other factors are critical determinants of grade-crossing safety. Further, developing a methodology that incorporates characteristics that affect safety at grade crossings in quiet zones may also provide FRA insight into the safety of grade crossings more generally. Since grade-crossing accidents are a major source of fatalities and, according to the department, are expected to increase as train- and highway-traffic increases, it will become increasingly important to have reliable information about grade-crossing safety, both in quiet zones and across grade crossings more generally.

We will send copies of this report to appropriate congressional committees, the Secretary of Transportation, and the Administrator of the Federal Railroad Administration. In addition, we will make copies available to others upon request, and the report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or flemings@gao.gov. Contact points for our Office of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.



Susan A. Fleming
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

The Fixing America's Surface Transportation Act included provisions for GAO to review the effectiveness of the Federal Railroad Administration's (FRA) final rule governing the use of train horns at highway-rail grade crossings.[1] The objectives of this report were to determine: (1) what is known about the benefits and costs of quiet zones,[2] (2) what challenges, if any, public authorities and others encounter in establishing quiet zones, and (3) how, if at all, FRA is evaluating the effectiveness of federal train horn regulations.[3] The scope of this report was limited to new quiet zones—that is, quiet zones that were established since FRA published the final rule in August 2006. Federal regulations govern the use of train horns at public-highway-rail-grade crossings (grade crossings) and provide public authorities[4]—typically a city, town, or county—with the opportunity to create quiet zones where train horns are not sounded. We focused on new quiet zones to better understand the benefits, costs, challenges, and safety impacts associated with the regulations.

To obtain information about quiet zones, we reviewed FRA's data on quiet zones established from 2005 through 2017. To assess the reliability of these data, we examined FRA's reports, analyzed the data to identify any outliers, and interviewed FRA officials about how the data were collected and used. We determined that the data were sufficiently reliable for our purposes.

For each of our objectives, we reviewed pertinent law and FRA regulations and documents; interviewed FRA program officials in

[1]Pub. L. 114-94 § 11403(a) (2015).

[2]A "quiet zone" is a section of rail line that is at least one-half mile in length that contains one or more consecutive public grade crossings at which train horns are not routinely sounded when approaching the grade crossings. Public grade crossings are locations where a public highway, road, or street crosses one or more railroad tracks at-grade.

[3]The final rule was codified in parts 222 and 229 of Title 49, Code of Federal Regulations. An interim final rule was issued in December 2003. The final rule was initially issued in April 2005; however, after petitions for reconsideration were received, a revised final rule was issued in August 2006. 71 Fed. Reg. 47614 (Aug. 17, 2006). The train horn regulations also included provisions for pre-rule quiet zones—these are grade crossings at which state statutes or local ordinances restrict the routine sounding of train horns or at which locomotive horns did not sound due to formal or informal agreements between the public authority and the railroad(s) prior to the final rule. The train horn regulations excludes about 390 crossings in the Chicago Region (called the "Chicago Region Exemption"), which were governed by the Illinois Commerce Commission.

[4]Public authorities are the entity responsible for traffic control or law enforcement at-grade crossings.

headquarters; and conducted in-depth interviews with a nongeneralizable sample of 40 stakeholders. This sample included stakeholders from 8 freight railroads, 5 private industry consulting firms with experience helping public authorities establish quiet zones, 6 state agencies, 13 public authorities within these six states, and FRA Grade Crossing Managers (GCMs) in each of FRA's 8 regions. The railroads selected included all seven class I railroads, plus the Florida East Coast Railway.[5] The latter was selected due to its previous experience with whistle bans, and it was located in a state where we conducted interviews. The private industry consultants were selected based on several factors, including (1) experience with assisting public authorities in establishing quiet zones, (2) recommendations from FRA and other stakeholders we interviewed, and (3) geographic dispersion.

We selected six states as part of a nongeneralizable sample for interviews. These states included California, Colorado, Florida, Illinois, Maryland, and Texas. The states were selected based on a variety of factors, including the number of new quiet zones and the number of grade crossings in new quiet zones. Five of the six states accounted for about 48 percent of new quiet zones (California, Colorado, Florida, Illinois, and Texas). We also conducted interviews in Maryland before we conducted other interviews to test our interview protocol. Maryland was selected for this purpose to, among other things, minimize resources. Within these states, we conducted interviews with 13 judgmentally selected public authorities (see table 1). The public authorities were also selected based on factors such as the number of new quiet zones and recommendations from FRA and other stakeholders we interviewed.

[5]The freight railroad industry is divided into three classes based on annual operating revenues, as determined by the Surface Transportation Board. For 2016, this revenue threshold was at least $447.6 million for class I railroads, at least $35.8 million for class II railroads, and less than $35.8 million for class III railroads.

Table 1: States and Public Authorities Included in GAO's Review

State	Public authority
California	Richmond
	Rocklin
Colorado	Commerce City
	Denver (Regional Transportation District)
	Fort Collins
	Windsor
Florida	Baldwin
	Broward County
Illinois	Galesburg
	Oak Lawn
Maryland	Montgomery County
Texas	Aledo
	Fort Worth

Source: GAO. | GAO-18-97

For all our objectives we also conducted a literature review of pertinent studies in scholarly/peer-reviewed journals, conference papers, non-profit or think tank publications, and trade publications or industry articles to identify research on quiet zones. We restricted our review to results published between January 1, 1996, and October 17, 2016, and our search yielded 99 results. Of these 99 results, we reviewed each abstract or full article if available, to determine whether it was relevant to any of our objectives. Our analysis identified 10 results pertaining to safety, 11 results related to benefits and costs, and 1 result related to challenges.[6] With respect to the articles related to costs and benefits, we also looked at citations within the studies we reviewed to identity whether any of these were relevant to our objective on costs and benefits of quiet zones. Using this approach we identified one additional study.[7] Each abstract was reviewed by two analysts to determine whether it seemed relevant. Where disagreement existed with respect to whether the abstract was relevant, we included the abstract in our request for the complete study. We then developed criteria/requirements for each objective and reviewed

[6]As of February 2017, the result related to challenges could not be obtained through a U.S. library lender.

[7]See D. Clark, "Externality Effects on Residential Property Values: The Example of Noise Disamenities," *Growth and Change*, Vol. 37, No. 3 (September 2006). This paper was cited in FRA's RFIA.

each study against our criteria/requirements. Namely, we were only interested in studies that quantified the benefits or costs of quiet zones or that used data or analytics to measure safety at grade crossings in quiet zones or compared safety at-grade crossings in quiet zones to grade crossings where train horns sound. Further, each study was reviewed by an analyst and a statistician or economist to determine its relevance.[8]

With respect to our objective on the effectiveness of the train horn regulations, we determined that none of the studies met our underlying criteria. Specifically, none of the studies measured the safety at grade crossings in quiet zones or compared the results to grade crossings where the train horn sounded. Conversely, with respect to our objective on the costs and benefits of quiet zones, we determined that six studies were relevant.[9] To assess the reliability and methodological soundness of the studies we determined were relevant, we compared the studies with general guidelines based on standards for assessing research and analysis from the literature, past GAO reports on evaluating research programs, and our internal expertise in research design. These guidelines include, for example, examining a study based on: (1) the extent to which it was well designed and the methodology supports the objectives; (2) whether the assumptions were reasonable and explicitly stated; (3) whether the study used the best available data; and (4) whether the conclusions and recommendations were balanced and supported by data analysis.

To determine what is known about the benefits and costs of quiet zones, we reviewed the literature search discussed above and analyzed any studies obtained using the methodology described above. We also reviewed FRA's Regulatory Evaluation and Regulatory Flexibility Assessment for Use of Locomotive Horns at Highway-Rail Grade

[8]Studies related to the safety of quiet zones were reviewed by an analyst and statistician, whereas studies on the costs and benefits of quiet zones were reviewed by an analyst and economist.

[9]One of these results, U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division, *General Health Effects of Transportation Noise,* DTS-34-RR297-LR2, FRA/RDV-03/01 (Cambridge, MA, June 2002), was not a study but rather a summary of academic literature on the effects of transportation noise. As a result, we did not critique this study, but rather summarized the high level findings. Two of the studies we identified related to costs and benefits could not be secured through a U.S. library lender. Finally, one of the studies we reviewed did not meet our standards for data reliability, so we eliminated it from our analysis.

Crossings Final Rule (RFIA).[10] The RFIA was issued before the final rule and analyzed the potential economic effects of requiring the train horn to be sounded at all public grade crossings, of eliminating whistle bans, and of providing conditions under which the train horn can be silenced at-grade crossings. To review the RFIA, we compared it to selected principles from Office of Management and Budget's (OMB) guidance for developing regulatory analyses.[11] These principles included whether the analysis considered alternatives; whether the analysis estimated the incremental effect of the rule compared to a business-as-usual baseline; and whether the analysis analyzed uncertainty. In evaluating the RFIA, an analyst and economist independently reviewed the analyses and subsequently came to consensus about each element's adherence to OBM guidance. We also reviewed FRA's September 2013 user guide for quiet zones.[12] This guide provides a high-level overview of the quiet zone process, including an estimated cost range to establish quiet zones. We discussed the cost range with FRA, including the source of the information and its reliability. Since FRA program officials told us it was an "order of magnitude" estimate and not meant to represent actual costs to establish quiet zones, we did not determine the reliability of the information. As a result, the cost range information is used for illustrative purposes only, and we included a disclaimer about its reliability. Finally, we interviewed FRA GCMs in all eight of FRA's regional offices, states, public authorities, railroads, and private industry consultants about the benefits and costs of establishing quiet zones. Some of these stakeholders provided information about costs to establish quiet zones, but this was anecdotal, and we did not attempt to verify its completeness or accuracy.

To determine the challenges encountered by public authorities and other stakeholders in establishing quiet zones and improvements stakeholders suggested to the quiet zone process, we interviewed FRA GCMs, states,

[10]FRA, *Regulatory Evaluation and Regulatory Flexibility Assessment for Use of Locomotive Horns at Highway-Rail Grade Crossings Final Rule (49 C.F.R. Parts 222 and 229)* (Washington D.C.: July 21, 2003).

[11]Office of Management and Budget: *Circular A-4, Regulatory Analysis* (Washington, D.C.: Sept. 17, 2003); and Office of Management and Budget, *Circular No. A-94 Revised, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (Washington, D.C.: Oct. 29, 1992).

[12]FRA, *Guide to the Quiet Zone Establishment Process: An Information Guide*, Federal Railroad Administration, Highway-Rail Crossing and Trespasser Programs Division (Washington, D.C.: September 2013).

public authorities, railroads, and private industry consultants. We asked these stakeholders to identify the primary challenges in establishing quiet zones and for suggested improvements to the quiet zone process. We then analyzed the information obtained to identify common themes of challenges or suggested improvements. Based on this analysis, an initial list of categories for each challenge and improvement was then developed along with their definitions. The definitions identified specific types of comments to be included in each challenge or improvement category. After reviewing the initial list for overlaps and duplication, as well as to keep the list manageable, a final consolidated list was developed that consisted of eight types of challenges and seven types of improvements (see table 2). Using this list, an analyst then reviewed each interview and judgmentally assigned the information into one of the categories. A second analyst then independently reviewed these assignments using the consolidated list of categories and definitions. Any differences were then reconciled by the two analysts.[13]

[13]Most stakeholders identified more than one challenge or improvement during an interview, and these were reflected in each of the appropriate categories.

Table 2: Categories of Quiet Zone Challenges and Categories of Improvements Suggested by Stakeholders and Definitions

Category of challenge/improvement	Definition
Challenges	
Funding/cost	Items related to funding or cost of quiet zones or the process of establishing quiet zones.
Stakeholder cooperation	Items related to stakeholders, including mentions of coordination, cooperation, participation, delays, and similar items.
Process related	Items related to the quiet zone process from the initial identification of grade crossings for quiet zones to when a quiet zone is established.
FRA related	Items specifically related to FRA and FRA's role in the quiet zone process.
Guidance or assistance	Items that are related to guidance available, or could be made available, and technical assistance available, or could be made available, to stakeholders in the quiet zone process.
Safety/risk	Items related to safety of quiet zones, or risks associated with quiet zones. This includes mentions of liability or risk issues, liability insurance, reliability of safety devices, uniqueness or special characteristics of crossings, and similar items.
Other	Catch-all category that includes items not related to other challenges.
No challenge	Includes stakeholders that said establishing a quiet zone was not a challenge, or that did not mention any challenges.
Improvements	
Funding/cost	Items related to funding quiet zones or reducing or controlling costs of quiet zones or the process of establishing quiet zones.
Process related	Items related to the change or improvement of the process for establishing quiet zones. Includes such things as requiring diagnostic reviews and extending Notice of Quiet Zone Establishment period beyond 21 days.
FRA related	Items related to changes or improvements that FRA can make related to the process of establishing quiet zones or overseeing/monitoring quiet zones. Includes such things as expediting FRA reviews and requiring FRA oversight or inspections of quiet zones
Guidance or assistance	Changes or improvements that relate to guidance or assistance related to the quiet zone process.
Safety/risk	Items related to the safety or risk of quiet zones. Includes such things as considering pedestrians and pedestrian safety and requiring SSMs at all grade crossings.
Other	Catch-all category that includes items not related to other categories.
No improvements	Includes organizations that said no improvements are needed or who offered no improvements.

Source: GAO. | GAO-18-97

To further enhance our understanding of quiet zone challenges and improvements, we reviewed guidance issued by FRA about quiet zones and the train horn rule. This included FRA's *How to Create a Quiet Zone* document (posted to the FRA website in September 2012) and FRA's

user guide about quiet zones published in September 2013.[14] Additionally, we reviewed FRA's regulations governing train horns and quiet zones. We also interviewed FRA program officials about the quiet zone process, application processing, various aspects of the train horn rule, and obtained information from FRA about quiet zone guidance.

To determine how FRA is evaluating the effectiveness of the federal train horn regulations, we reviewed FRA's analysis of the safety of quiet zones at highway-rail-grade crossings completed in 2011 and 2013, which compared the safety of grade crossings in quiet zones to the safety of grade crossings where the train horn is sounded. We also discussed with FRA program officials the methodologies used to prepare these studies, and concerns with the data, conclusions, and plans to conduct future analyses. To assess the reliability and methodological soundness of the studies, we used the same approach as above. Both analyses were reviewed by a statistician and economist to corroborate the review. In addition to developing criteria for reviewing the analyses, we also reviewed guidance by FRA and others regarding analyzing incident data at grade crossings and about the limitations of a paired t-test—FRA's methodology for comparing the grade crossings.[15]

To assess the extent to which FRA's methodology generally reflects internal control principles, we reviewed it against practices for presenting accurate information and communicating with internal and external stakeholders outlined in the *Standards for Internal Control in the Federal Government.*[16] We also conducted data reliability assessments with respect to the underlying data FRA used in its analyses. FRA's analyses used data that originated from two distinct FRA databases: ccmMercury (CCM) and the Safety Data Analysis website. CCM is a correspondence management system which includes all data on quiet zones—such as the establishment date and grade crossings included, among others. This information is contained in the Notice of Quiet Zone Establishment that the public authority establishing the quiet zone is required to provide to

[14]FRA, *How to Create a Quiet Zone* (posted online September 27, 2012), and *Guide to the Establishment of Quiet Zones: An Information Guide* (Washington, D.C.: September 2013).

[15]A paired t-test is a statistical method used to compare two population means where observations in one population can be paired with observations in the other population.

[16]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014).

FRA. Alternatively, the Safety Data Analysis website contains two datasets: the Grade Crossing Inventory System (GCIS) and the Railroad Accident/Incident Reporting System (RAIRS). The GCIS contains information on every crossing in the nation and was used to identify the characteristics of the individual crossings within the quiet zone, whereas the RAIRS contains details about each crossing collision incident that has occurred. To assess the reliability of the data used in our review, we examined FRA reports, reviewed prior GAO data reliability material, and interviewed FRA stakeholders about how the data were collected, stored, and used. We determined that the data were sufficiently reliable for the purposes of our objectives.

Finally, to understand how FRA conducts oversight of quiet zones, we interviewed FRA program officials about oversight of quiet zones, guidance to staff and public authorities, and any planned changes for how the agency conducts oversight of quiet zones. We also interviewed GCMs in each of FRA's eight regions to understand how they carry out oversight of quiet zones and to learn about the extent to which differences exist across regions. We also reviewed prior GAO reports that summarized FRA's oversight approach to the rail industry, including its more traditional inspection disciplines. We also asked stakeholders included in our sample of FRA GCMs, states, public authorities, railroads, and private industry consultants about the challenges of establishing quiet zones and potential improvements to the quiet zone process. We then assessed FRA's oversight approach using the *Standards for Internal Control in the Federal Government.*

We conducted this performance audit from July 2016 to October 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Comments from the Department of Transportation

U.S. Department of Transportation
Office of the Secretary of Transportation

Assistant Secretary for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

Susan A. Fleming
Director, Physical Infrastructure Issues
U.S. Government Accountability Office (GAO)
441 G Street NW
Washington, DC 20548

OCT 16 2017

Dear Ms. Fleming:

Highway-rail grade crossing and trespass incidents account for almost all rail-related deaths. The number of grade crossing deaths has averaged over 256 and the number of trespass deaths has averaged over 439 every year since 2008. Compared to the first three quarters of Fiscal Year (FY) 2016, the grade crossing incidents rate increased by 5 percent during the first three quarters of FY 2017. The number of highway-rail grade crossing incidents will likely grow with future train and highway traffic increases.

The Federal Railroad Administration (FRA) works with state and local governments, railroads, and safety organizations to reduce the number of highway-rail grade crossing collisions and resulting casualties. The National Highway Traffic Safety Administration and FRA launched a $7 million media buy in January 2017 for "Stop! Trains Can't" public service announcements. An additional $6 million is available for FY 2018. The campaign targets young males (the demographic with the most crossing incidents) in states with the most dangerous crossings and states where 75 percent of crossing accidents occur.

In addition, FRA's Grade Crossing Safety Task Force is focusing on validating crossing latitude and longitude data, collaborating with mapping and navigation technology providers to expand use of crossing data, examining human behavior predictive modeling, supporting enhanced law enforcement and first responder strategies, strengthening State crossing safety action plans, and working with the Federal Highway Administration to update the Railroad-Highway Crossing Handbook. FRA also created the grade crossing inspector discipline for which we are currently hiring and training several new employees.

To maintain the level of grade crossing safety comparable to use of train horns, FRA works with public authorities when a community chooses to establish a quiet zone. Since 2005, communities have established 570 new quiet zones under FRA regulations. FRA's 2014 study of quiet zones demonstrates that safety has not been compromised.

However, the GAO made two recommendations to FRA:

1. The Administrator of FRA should revise the methodology for the analysis of safety in quiet zones to take into account relevant changes over time – including changes in train and automotive traffic, or the physical characteristics of the crossing.
2. The Administrator of FRA should develop guidance for inspectors on the nature and frequency of quiet zone inspections.

Upon review of GAO's draft report, FRA concurs with the first recommendation to the extent that it will consider GAO's recommendation as it explores a range of options for updating its methodology for analyzing the safety of quiet zones. FRA also concurs with the second recommendation to develop guidance for inspectors on the nature and frequency of quiet zone inspections. We will provide a detailed response to both recommendations within 60 days of the final report's issuance.

We appreciate the opportunity to respond to the GAO draft report. Please contact Madeline M. Chulumovich, Director, Audit Relations and Program Improvement, at (202) 366-6512 with any questions.

Sincerely,

Keith Washington
Deputy Assistant Secretary for Administration

Appendix III: List of Organizations Contacted by GAO

Table 3: List of Organizations Contacted by GAO

Name of organization	Type of organization
Federal government	
FRA Headquarters	Federal government
FRA Region 1	Federal government
FRA Region 2	Federal government
FRA Region 3	Federal government
FRA Region 4	Federal government
FRA Region 5	Federal government
FRA Region 6	Federal government
FRA Region 7	Federal government
FRA Region 8	Federal government
The Volpe National Transportation Systems Center	Federal government
FHWA headquarters	Federal government
State agencies	
California Public Utilities Commission	State agency
Colorado Public Utilities Commission	State agency
Illinois Commerce Commission	State agency
Illinois Department of Transportation	State agency
Maryland State Highway Administration	State agency
Texas Department of Transportation	State agency
Local organizations	
Broward County Metropolitan Planning Organization, Florida	Local government
City of Richmond, California	Local government
City of Rocklin, California	Local government
City of Commerce City, Colorado	Local government
City of Fort Collins, Colorado	Local government
City of Windsor, Colorado	Local government
Denver Regional Transportation District, Colorado	Local government
City of Baldwin, Florida	Local government
City of Galesburg, Illinois	Local government
City of Oak Lawn, Illinois	Local government
Montgomery County Department of Transportation, Maryland	Local government
City of Aledo, Texas	Local government
City of Fort Worth, Texas	Local government
Railroads	
BNSF	Railroad

Canadian National Railway	Railroad
Canadian Pacific Railroad	Railroad
CSX, Inc.	Railroad
Florida East Coast Railway	Railroad
Kansas City Southern, Inc.	Railroad
Norfolk Southern Railroad	Railroad
Union Pacific Railroad	Railroad
Private industry consultants	
CTC, Inc.	Consulting firm
Felsburg Holt & Ullevig	Consulting firm
Quiet Zone Technologies, Inc.	Consulting firm
Robinson Engineering	Consulting firm
SRF Consulting, Inc.	Consulting firm
Associations	
American Short Line and Regional Railroad Association	Trade association
Association of American Railroads	Trade association
National Railroad Construction and Maintenance Association	Trade association
Others	
David E Clark (Marquette University)	Academic

Source: GAO. | GAO-18-97

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Susan A. Fleming, (202) 512-2834, flemings@gao.gov

Staff Acknowledgments

In addition to the contact named above, Susan Zimmerman (Assistant Director), Krister Friday, Sarah Gilliland, Timothy Guinane, Richard Jorgenson, SaraAnn Moessbauer, Malika Rice, Amy Rosewarne, Melissa Swearingen, Larry Thomas, and Crystal Wesco made significant contributions to this report.

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