Office of Inspector General

Audit Report

Actions Taken in Advance of El Niño's Adverse Weather

Federal Railroad Administration

Report Number TR-1998-074
Date Issued: February 5, 1998

Memorandum

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

Subject: ACTION: Report on Actions Taken In Advance of El Niño's Adverse Weather, Federal Railroad Administration Report No. TR-1998-074

Date: February 5, 1998

Reply to Attn of: JA-1

From: Lawrence H. Weintrob
Assistant Inspector General for Auditing

To: Federal Railroad Administrator

This is our report on actions taken in advance of El Niño's adverse weather. The objectives of this audit were to identify actions taken by the Federal Railroad Administration (FRA) and railroads in anticipation of adverse weather resulting from El Niño and to ascertain whether additional preparedness actions were needed. The scope and methodology for this audit are in Attachment 1.

BACKGROUND

El Niño is a combination of unusual wind flows and sea currents that causes a warming of the Pacific Ocean leading to potentially severe weather such as torrential rain, high winds, and heavy snow. In 1982-83, the El Niño weather pattern caused extensive flooding and water damage throughout the west coast, the midwest, the south, and Hawaii. The National Oceanic and Atmospheric Administration and meteorologists predict that the El Niño of 1997-98 will be even more devastating, producing wet and turbulent weather in the south and heavy snow in the western mountains that could create extensive flooding in Spring 1998.

Severe weather conditions can seriously affect the safety of railroad operations. Railroad tracks, roadbeds, and bridges can be affected by torrential rains, high winds, and heavy snow accumulation. These conditions can result in washout and obstruction of tracks, erosion or removal of bridge foundations and trackbeds, and damage to track and structures from debris.

On August 9, 1997, an Amtrak train derailed near Kingman, Arizona. The derailment occurred on a collapsed railroad bridge that had been weakened by a flash flood (see photograph below).

FRA, responding to the incident, published Safety Advisory 97-1 in the Federal Register on September 2, 1997. The advisory outlined safety practices to "reduce the risk of casualties from train derailments caused by damage to track, roadbeds, and bridges resulting from uncontrolled flows of water and similar weather-related phenomena." The safety advisory recommended that affected railroads establish procedures to receive timely flash flood warnings from the National Weather Service or a competent commercial weather service; notify train crews to reduce train speeds, if necessary; compile information in advance of adverse weather about track areas and bridges susceptible to flooding; and train inspectors on the dangers of rapidly flowing water to track and railroad structures. The advisory also recommended that a bridge maintenance engineer be available to advise inspectors during adverse weather.

Between January 1982 and March 1996, FRA identified 26 derailments caused by washouts of bridges or bridge approaches, and 16 derailments caused by washouts or water damage to culverts or subgrade away from bridges. Although these derailments involved both large and small railroads, FRA Safety Advisory 97-1 was directed only at passenger railroads in commuter and intercity service and freight railroads operating trains in excess of 40 mph. According to FRA's Bridge Engineer, the scope of the safety advisory was limited based on the speed threshold for safe deceleration that becomes relevant at operating speeds exceeding 40 mph. The advisory did not apply to most small freight railroads which account for approximately one-third of the rail industry's mileage operated.

RESULTS

FRA did not issue specific guidance to its regional offices or railroads to prepare for El Niño. FRA's Safety Advisory 97-1 provided large railroads guidelines to address adverse weather conditions, such as El Niño. Many of the small railroads were not covered by the advisory.

Large Railroads Have Adequate Plans

We reviewed the recommendations contained in the safety advisory and the action plans submitted by six large railroads. We determined the safety advisory recommendations were technically sound and addressed aspects of railroad operations vulnerable to flash floods caused by adverse weather such as El Niño. We concluded five of the six respondents provided acceptable action plans corresponding to the recommendations contained in the safety advisory. The plans specified actions that had already been taken by the railroads and those that would be initiated according to the recommendations in the safety advisory. A listing of the recommendations contained in FRA Safety Advisory 97-1 and the railroads' responses are presented in Attachment 2. A matrix and examples of precautions taken by the large railroads we sampled are presented in Attachments 3 and 4.

Small Railroads May Not Be Prepared

Although railroad officials at 23 of the 33 small railroads acknowledged their operations were vulnerable to El Niño, only 9 of the 23 railroads had taken precautionary action. Of the 14 railroads that did not take advance action, 13 railroads indicated they were not covered by FRA Safety Advisory 97-1 which applied to freight trains operating in excess of 40 mph or passenger trains in commuter or intercity service. The remaining railroad indicated it was not aware of the safety advisory.

We also found that 10 of the 14 railroads that did not take action either did not have written adverse weather procedures or had procedures that would not adequately prepare them for severe weather such as El Niño. For example, McCloud Railway in McCloud, California, responded that it would rebuild washed-out areas, reinstall damaged culverts, and enlarge existing culverts. However, these actions would only be taken to repair damage caused by adverse weather.

Furthermore, we found that 13 of the 14 railroads that did not take action owned or maintained tracks and bridges used to transport hazardous materials. Four of the 14 railroads owned or maintained tracks and bridges used to provide limited passenger service, such as weekend or summer excursion trains. In our opinion, these railroads, though operating at low speeds, should take precautionary measures,

similar to those identified in the safety advisory, to minimize the risk of accidents from damage to tracks, roadbeds, and bridges resulting from adverse weather.

Of the nine railroads that indicated they had taken action to prepare for El Niño, we met with officials at four of these railroads. We also performed physical observations at three of the four railroads to confirm precautions that had been taken. These actions included clearing debris from bridges and drainage areas, reinforcing track and bridge structures, and performing special inspections to identify vulnerable areas. A matrix and examples of precautions taken by the nine small railroads we sampled are presented in Attachments 5 and 6.

Conclusion

The variables involved in the cause of accidents resulting from adverse weather, equally apply to both large and small railroads. Since many of the small railroads carry hazardous materials as well as passengers, and operate in terrain subject to adverse weather conditions, the small railroads should be advised of the precautionary measures that should be taken to reduce their vulnerability.

RECOMMENDATION

We recommend the FRA Administrator distribute Safety Advisory 97-1 to all small railroads, thereby providing guidance on precautionary measures that can be taken to minimize the risk of accidents from damage to tracks, roadbeds, and bridges resulting from adverse weather.

MANAGEMENT RESPONSE

We discussed the results of our audit with staff from FRA's Office of the Associate Administrator for Safety on February 3, 1998. The Acting Associate Administrator for Safety concurred with the results of the audit and agreed to redistribute FRA Safety Advisory 97-1 to all small railroads.

ACTION REQUIRED

Please provide written comments on this final report within 15 days. We appreciate the courtesies and assistance extended to our staff during the audit. If you have any questions, or require additional information, please contact me at (202) 366-1992 or Patricia J. Thompson, Deputy Assistant Inspector General for Surface Transportation, at (202) 366-0687.

Attachment 1
(2 Pages)

SCOPE AND METHODOLOGY

Our audit universe consisted of 173 railroads which operate in 11 states (from California to the Carolinas) expected to be affected by El Niño. The universe was derived from the Association of American Railroads Economics and Finance Department's publication, Railroads and States. We judgmentally sampled 41 of these railroads which included 7 class I railroads, 1 regional railroad, 21 local railroads, and 12 switching/terminal railroads.

We interviewed officials at each selected railroad to confirm that the railroads operated in areas vulnerable to El Niño and to identify actions in advance of El Niño. Of the 31 railroads that acknowledged they operate in areas considered vulnerable to El Niño, we performed site visits to 10 railroads. We also performed physical observations of actions taken by 6 of the 10 railroads. Site visits were performed at the following railroad headquarters:

Railroad	Location
Acadiana Railway	Opelousas, Louisiana
Burlington Northern Santa Fe	Fort Worth, Texas
California Western Railroad	Fort Bragg, California
Columbus and Greenville Railroad	Columbus, Mississippi
CSX Transportation	Jacksonville, Florida
Florida East Coast Railway	St. Augustine, Florida
Illinois Central Railroad	Homewood, Illinois
Kansas City Southern	Kansas City, Missouri
Norfolk Southern Railroad	Atlanta, Georgia
San Joaquin Valley Railroad	Exeter, California

We also met with officials from FRA's Office of Safety and contacted FRA regional offices in Sacramento, California; Atlanta, Georgia; and Hurst, Texas. Moreover, we interviewed the National Oceanic and Atmospheric Administration's (NOAA) Director of International Development and the Program Coordinator for NOAA's Office of Global Programs. We also met with the Executive Vice President, Association of American Railroads, and the President, American Short Line Railroad Association.

The Association of American Railroads categorizes railroads as class I, regional, local, and switching and terminal railroads. Class I railroads operate over at least 350 miles of track with operating revenue of at least $255 million; regional railroads operate over at least 350 miles of track or earn between $40 million and $255 million; and local railroads operate under 350 miles of track or have revenue below $40 million. According to the Association of American Railroads, class I railroads comprise 2 percent of U.S. railroads but account for 73 percent of the rail industry's mileage operated.

For the purpose of this report, we refer to class I and regional railroads as large railroads, and local and switching/terminal railroads as small railroads. For example, we refer to railroads like Burlington Northern Santa Fe in Fort Worth, Texas, as large railroads and railroads similar to McCloud Railway Company in McCloud, California as small railroads.

The audit was conducted from November 12, 1997 through January 13, 1998, in accordance with Government Auditing Standards as prescribed by the Comptroller General of the United States.

Attachment 2

FRA SAFETY ADVISORY RECOMMENDATIONS
RAILROAD RESPONSES

Safety Advisory Recommendations	Union Pacific	Burlington Northern Santa Fe	Norfolk Southern	CSX	Illinois Central	Kansas City Southern
1. Weather alerts received within 15 minutes of flash flood warning	X	X	X	X	X	X
2. Notify train crews; limit speed; and conduct special inspections	X	X	X	X	X	X
3. Identify vulnerable bridges carrying class 4 or higher track or passenger trains	X	X	X	X	X	X
4. Have info available for special inspections Mark bridges needing attention Use high water detectors or similar systems	X	X	X X	X	X X	X X X
5. Implement a training program for persons performing special inspections	X	X	X	X		X
6. Conduct annual refresher training		X	X	X		X
7. Have bridge maintenance or engineering employee readily available for special inspections		X	X	X		X
8. Brief all track & bridge inspectors on Safety Advisory 97-1	X	X	X	X	X	X
9. Conduct and provide results of more detailed bridge reviews to inspectors during CY 1998	X	X	X	X	X	X
10. Notify FRA of actions to enhance the safety of train operations in advent of a flood	X	X	X	X	X	X

X - Indicates Action Planned and/or Taken on Recommendation.

Attachment 3

PRECAUTIONS TAKEN BY LARGE RAILROADS

Precautions Taken	Burlington Northern Santa Fe	CSX	Illinois Central	Kansas City Southern	Norfolk Southern	Union Pacific	Florida East Coast
Bridge and Drainage Structures							
Cleared Areas of Debris	X	X		X			X
Ditching Efforts	X						
Reinforced Bridge and Drainage Structures	X			X			X
Track and Roadbed							
Cleared Areas of Debris	X	X					X
Reinforced Track & Roadbed	X			X			X
Repaired or Replaced Vulnerable Track							
Rockslide Prevention Efforts	X	X					
Constructed Rock Barrier			X				
Other							
Conducted Track Inspections	X	X			X		X
Developed Emergency Plans						X	
Emergency Supplies & Equipment						X	
Identified Vulnerable Areas	X	X	X			X	
Improved Weather Monitoring		X	X				
Placed Backup Generators	X						
Stockpiled Reinforcement Materials	X			X			X

X - Indicates Action Planned and/or Taken on Recommendation.

Attachment 4
(2 Pages)

EXAMPLES OF ACTIONS TAKEN BY LARGE RAILROADS

Burlington Northern Santa Fe (Fort Worth, Texas, class I) - The railroad's Vice President of Operations indicated that, in anticipation of the upcoming effects of El Niño, several activities had to be undertaken to prepare for the expected runoffs and flood potential. The railroad identified areas where its operations would be at risk should it encounter higher than normal flows of runoff and had begun cleaning slide fences which will mitigate potential problems by restoring a zone behind the fences to catch most of the smaller slides. The railroad also indicated it planned to place rip rap (broken rock or concrete) to a stretch of track that was vulnerable to washouts and scouring. Other actions included the inspection and shoring up of diversion dikes, reinforcing and filling in ditches, and placement of backup generators for signal systems at locations susceptible to power outages. Our physical site observations at this railroad confirmed that track, drainage ditches, and surrounding areas reviewed had been cleared of debris. We also observed that culverts were free from debris and were reinforced with rip rap.

CSX Transportation (Jacksonville, Florida, class I) - The railroad's Chief of Track Maintenance told us that the railroad routinely handles the impact of adverse weather conditions in Florida, such as hurricanes, and believed these procedures would be sufficient for El Niño. The railroad, however, has taken precautions in other states where it expects to experience the impact of El Niño. We reviewed the railroad's plan which included inspecting ditches to determine those susceptible to flash flooding in the railroad's "El Niño Focus Routes." The plan also identified high tonnage routes, hazardous material routes, and high speed routes as most vulnerable.

Illinois Central Railroad (Homewood, Illinois, class I) - The railroad's Vice President of Maintenance provided copies of the railroad's adverse weather procedures which included flood procedures. We reviewed the railroad's inspection procedures which require culverts be kept free of obstructions to guard against washouts and damage to roadbeds. The railroad also provided a listing of bridges vulnerable to damage from flash floods. In some areas where flash floods may occur, the railroad installed high water indicators.

Kansas City Southern Railroad (Kansas City, Missouri, class 1) - The railroad's Vice President and Chief Engineer stated the railroad would be able to handle the impact of El Niño based on existing adverse weather procedures. The railroad uses a radar system in its dispatcher's office to monitor the railroad's operations. The railroad also has installed high water indicators at numerous locations where previous washouts occurred. The railroad inspects bridges and maintains 10 to 12 railcars with reinforcement materials for potential washout areas. The railroad also ensures that culverts, streams, and riverbeds are free of debris that could create problems at bridges and tracks.

Attachment 5

PRECAUTIONS TAKEN BY SMALL RAILROADS

Precautions Taken	Acadiana	Arizona & California	Columbus & Greenville	Georgia SW DIV, SC Central	Magma Arizona	Carolina Southern	Pecos Valley Southern	California Western	San Joaquin Valley
Bridge and Drainage Structures									
Cleared Areas of Debris	X		X					X	X
Deepen Channels Under Bridge		X							
Ditching Efforts			X					X	
Reinforced Bridge and Drainage Structures		X	X		X				
Track and Roadbed									
Cleared Areas of Debris	X		X	X			X		X
Raise & Tamp Tracks	X								
Reinforced Track & Roadbed		X	X		X	X		X	
Repaired or Replaced Vulnerable Track	X	X							
Other									
Stockpiled Reinforcement Materials					X				
Identified Vulnerable Areas	X		X		X				
Conducted Track Inspections	X	X	X				X		X
Improved Weather Monitoring		X							

X - Indicates Action Planned and/or Taken on Recommendation.

Attachment 6

EXAMPLES OF ACTIONS TAKEN BY SMALL RAILROADS

San Joaquin Valley Railroad (Exeter, California, switching/terminal) - We met with the railroad's Roadmaster to discuss whether any special precautions were taken for El Niño. According to the railroad, no special preparations had been taken for El Niño beyond what is normally done to prepare for the rainy season. These preparations include cleaning culverts and bridges, and clearing tracks, culverts, bridges, and areas adjacent to the tracks of vegetation that could clog up these areas and result in washed out track. The railroad indicated it inspects the tracks weekly, and more frequently in the event of particularly adverse weather conditions. During our physical site observations at this railroad we observed eight bridges and culverts. Although it rained throughout the previous night and during the entire observation, none of the areas we reviewed were clogged by vegetation or contained water. In addition, no areas within 5 feet of the railroad tracks had weed growth.

Acadiana Railway (Opelousas, Louisiana, local) - The company's President and General Manager both indicated that no special actions had been taken. The railroad has routine adverse weather procedures that include daily inspections of track, bridges, and culverts. Our physical observation included 16 miles of track that had been cleared of debris.

Columbus and Greenville Railroad (Columbus, Mississippi, local) - The Superintendent stated precautions taken for El Niño included installing broken rock and concrete at previously washed out locations, reinforcing bridges, and cutting ditches to provide proper drainage. We confirmed actions taken during our observation of track and bridges that had been restored after previous washouts. At one location, we observed that a bridge structure had been reinforced with steel.