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Research at a Glance

Technical Brief

BUREAU OF RESEARCH

NJ Transit Grade Crossing Safety

Grade crossings pose one of the most significant safety challenges for railroads and transit agencies across the United States (U.S.) and grade crossing related accidents encompassed 34% of railroad incidents occurring in the past ten years. The elimination of grade crossings to reduce risk can improve public safety, decrease financial burdens, and improve service to the public.

Research Problem Statement

To improve grade crossing safety in New Jersey, this research provided the New Jersey Transit (NJT) with a list of 20 crossings for closure from an NJT supplied list of 100 crossings. This methodology can be reapplied to larger lists of crossings to prioritize crossings for closure in the future. The results of this research will support NJT and NJDOT in the efficient spending of limited funds to maximize the benefit for the communities of New Jersey.

Research Objectives

The objective of this research was to narrow the NJT provided list of 100 grade crossings to 20 through a developed selection method that can be utilized on a larger inventory in the future. This methodology was used to prioritize the provided grade crossings for closure by formulating a ranking model with selection criteria and evaluation factors, such as traffic and train volumes, speed, community impacts, and warning devices.

Principal Investigator

Dr. Xiang Liu is an associate professor in the Department of Civil and Environmental Engineering and an affiliated member of CAIT at Rutgers, The State University of New Jersey. Dr. Liu has over 12 years of research experience in rail and transit engineering, safety, technology, operations, developing AI, automation, and risk analysis methods.

Dr. Mohammad Jalayer is an associate professor in the Department of Civil and Environmental Engineering and an affiliated member of CREATEs at Rowan University. Dr. Jalayer's primary research interests include traffic operations and evaluation, highway safety and crash modeling, big data analytics, and Intelligent Transportation System (ITS).

Asim Zaman P.E. is a Project Engineer at Rutgers, The State University of New Jersey at CAIT. He has expertise in rail engineering, safety, and data analysis. He received his M.S. in Railroad Engineering from Rutgers University.

Methodology

Twenty different data fields were collected and generated to prioritize the selected list of 100 crossings for closure. These data fields included: crash history; average annual daily traffic; roadway speed; roadway lanes; length of the crossing's street; weekday train traffic; train speed category; number of tracks; access to train platforms; intersection angle; distance to alternate crossings; distance to emergency and municipal buildings; whether emergency and municipal buildings are on the same street; and date of last or future planned signal and surface upgrades.

Following the data collection, the crossings were ranked based on an analytical hierarchical process (AHP). First, crossings that could not be closed were filtered out. These include County or State routes and crossings with no alternate paths, as determined through GIS analysis of alternate routing.

The remaining crossings were ranked by an AHP. Each variable was given a direction and a weight which was used to calculate each crossing's total score. The variable direction describes whether a higher or lower variable value indicates that the crossing should be closed. The weight indicates a variable's relative importance in deciding which crossings should be prioritized for closure.

Finally, adjacent crossings identified for closure were removed from the prioritization list in sequence. An adjacent crossing is defined as a grade crossing that is next along tracks without any other crossings or bridges/tunnels in between. When calculating alternate routes, adjacent crossings are often expected to bear the additional traffic generated by closing the crossing in question.

Results

According to the proposed methodology, the 20 crossings recommended for closure are listed below. The crossings are located in Monmouth County (60%), Bergen County (25%), and Essex County (25%).

Rank	Crossing ID	Line Name	Roadway Name	Town
1	263229H	Montclair Line	Walnut St	Montclair
2	263025W	Pascack Valley Line	Orchard St	Hillsdale
3	263418E	Bergen County Line	Hobart Place	Garfield
4	856967N	North Jersey Coast Line	Church St	Spring Lake
5	263046P	Pascack Valley Line	Euclid Ave	Hackensack
6	856936P	North Jersey Coast Line	Fifth Ave	Asbury Park
7	856934B	North Jersey Coast Line	Sixth Ave	Asbury Park
8	856962E	North Jersey Coast Line	Thirteenth Ave	Belmar
9	856956B	North Jersey Coast Line	Evergreen Ave	Bradley Beach
10	856941L	North Jersey Coast Line	First Ave	Asbury Park
11	266882G	Montclair Line	Jerome Place	Montclair
12	856969C	North Jersey Coast Line	St. Clair Ave	Spring Lake
13	263029Y	Pascack Valley Line	Irvington St	Westwood
14	856897B	North Jersey Coast Line	Chestnut St	Red Bank
15	263028S	Pascack Valley Line	Industrial Rd	Westwood
16	856964T	North Jersey Coast Line	Seventeenth Ave	Belmar
17	263227U	Montclair Line	Claremont Ave	Montclair
18	856923N	North Jersey Coast Line	Roosevelt Ave	Deal
19	856975F	North Jersey Coast Line	Shore Rd	Spring Lake
20	856957H	North Jersey Coast Line	Seventh Ave	Belmar

Research Project Manager

Stefanie Potapa
NJ State Contract Manager,
Research Bureau, New Jersey
Department of Transportation
Trenton, New Jersey

U.S. Department of Transportation
Federal Highway Administration

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