SYSTEM-WIDE IMPLEMENTATION OF RAIL RIGHT-OF-WAY INCURSION TREATMENTS

SUMMARY

The U.S. Department of Transportation (DOT) John A. Volpe National Transportation Systems Center (Volpe Center), under the direction of the DOT Federal Railroad Administration (FRA) Office of Research, Development and Technology (RD&T), conducted a study to evaluate the effectiveness of engineering treatments to deter vehicles from turning onto a rail right-of-way (ROW) at highway-rail grade crossings. The goal of the treatments is to reduce the number of vehicles that mistakenly enter a ROW, thus reducing the possibility of an incident with a train.

From 2016 through 2018, the Volpe Center partnered with SunRail to develop, install, and evaluate promising vehicle ROW incursion prevention engineering treatments [1]. Following this demonstration project, in early 2018 the Metropolitan Transportation Authority (MTA) Long Island Rail Road (LIRR) announced the *LIRR Forward* plan [2], which included the implementation of system-wide, high-visibility safety delineators and striping. A Google Maps before-and-after snapshot of one of these crossings is shown in Figure 1 (https://goo.gl/maps/SMdddn9PDgTFwq8R6). The top picture shows pre-installation conditions as of September 2017, and the bottom picture shows post-installation conditions as of July 2018. Note the addition of the white edge pavement markings and reflective markers through the crossing, and flexible delineators on both sides and in-between the tracks.

This system-wide initiative was an effort to decrease the number of vehicle ROW incursions, which delayed 417 trains on the LIRR system in 2017 [2]. Additionally, LIRR initiated a pilot project with Waze (a Google product) to include safety warnings to drivers using its app at 20 crossings [2].

Results indicated that those treatments had a significant positive effect on reducing ROW incursions by motor vehicles. The number of incidents involving trains striking vehicles on the tracks was reduced from two over the 1-year period before the treatments' implementation to zero over the 1-year period after implementation. Additionally, the number of reports of vehicles on tracks was reduced by over 85 percent during the evaluation period. Also, the number of trains delayed was reduced by 86 percent, and the total train delay time decreased by about 89 percent over the evaluation period.
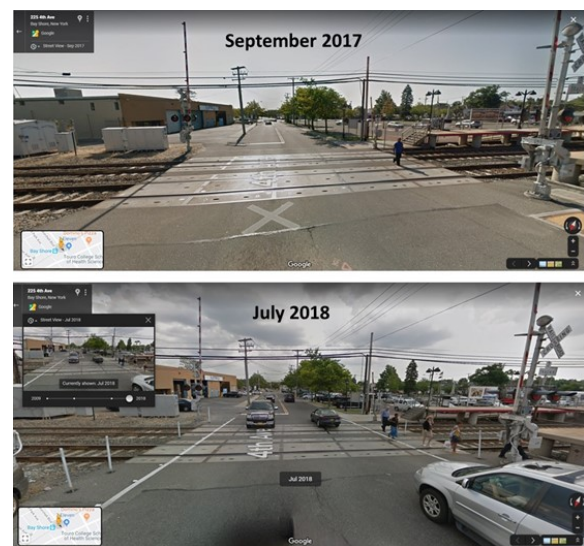
Figure 1. ROW Incursion Treatments Installed at the LIRR Crossing on 4th Ave in Bay Shore, NY (Crossing ID 338023U)

BACKGROUND

Vehicles turning onto a railroad ROW are a significant problem. There have been several recent high-profile incidents involving vehicles mistakenly turning into the railroad ROW at grade crossings. Following the February 14, 2015 incident in Oxnard, CA, in which a pickup pulling a trailer turned onto the ROW and was struck by a Metrolink train resulting in 27 injuries, 1 fatality and 3 overturned passenger cars [3], FRA RD&T initiated research on engineering solutions to this type of problem.

From 2016 through 2018, treatments were developed and evaluated at crossings in the City of Orlando, FL [1]. The treatments consisted of extending white edge and yellow centerline pavement markings through the crossing, adding reflective markers on the pavement markings through the crossing, and adding flexible delineators on both sides and in-between the tracks.

The study in Orlando successfully demonstrated the use of low-cost engineering treatments to reduce the frequency of ROW incursions by vehicles at grade crossings. Results indicated that those treatments had a positive effect on reducing ROW incursions by motor vehicles. Incursions decreased significantly at both crossings over the 2-year evaluation period.

OBJECTIVES

The main objective of this research was to study the effectiveness of a system-wide implementation of engineering treatments to prevent rail ROW incursions by vehicles, and to provide FRA and stakeholders with safety benefit information.

METHODS

LIRR provided ROW incursion reports and train delay data over a 2-year timeframe from 2017 through 2019 to Volpe Center researchers. This data covered a set time before and after the treatments were installed. The research team then compared the incident data between the two periods, one before and one after the treatments' installation.

RESULTS

LIRR completed the installation of the white pavement markings, reflective markers, and delineators at all of their 296 grade crossings in the summer of 2018. An example of this treatment as installed at Pond Road in Ronkonkoma, NY (Crossing ID 338175R) is shown in Figure 2.

Figure 2. ROW Incursion Treatments Installed at the LIRR Crossing on Pond Road in Ronkonkoma, NY (Crossing ID 338175R)

Volpe researchers contacted LIRR to evaluate the safety impact of the implementation of the safety treatments in June 2019, 1 year after its system-wide installation was completed.

Data Collection and Analysis

The main data collection task consisted of collecting LIRR reports of incidents of vehicles on tracks. These were incidents of vehicles stuck on the tracks regardless of whether or not they were struck by a train. LIRR provided data on the number of incidents as well as the number of train delays due to vehicles on tracks from June 2017 through May 2019. Researchers also conducted an analysis of incident data involving trains striking vehicles on tracks reported to the FRA.

For this analysis, the research team defined the before-and-after study periods for comparison as follows:

- Pre-installation period: 06/01/2017–05/31/2018 (1 year)

- Post-installation period: 06/01/2018 – 05/31/2019 (1 year)

Note that not all crossings were treated at the same time; system-wide treatment installation was completed by the summer of 2018.

Crashes: There were a total of two incidents in the pre-installation period involving LIRR trains striking vehicles on a ROW. On March 23, 2018, a LIRR train struck a disabled and abandoned vehicle near the Willis Ave grade crossing in Mineola, NY. News reports noted that police indicated the driver was "using GPS that directed her over the tracks, and her car got stuck" [4]. On March 31, 2018, a LIRR train struck a vehicle just east of the Glen Street crossing in Glen Cove, NY. Both incidents occurred at nighttime with no reported injuries.

There were no train-involved incidents reported in the post-installation period (06/01/18-05/31/19).

Reports of Vehicles on Tracks: As shown in Table 1, a total of 21 events involving vehicles entering a ROW from a grade crossing location occurred in the 12-month pre-installation period from June 2017 through May 2018 (average of 1.75 per month). The number of events decreased to three in the post-installation period from June 2018 through May 2019 (average of 0.25 per month). The analysis reveals that the number of reports of vehicles on tracks was reduced by over 85 percent after the installation of the ROW improvements.

Note that two additional reports of vehicles on tracks were reported in the post-installation period, but the location of those incidents was at a crossing outside of the LIRR commuter rail network and therefore not included in the analyses.

Table 1. Number of Reports of Vehicles on Tracks Entering from a Grade Crossing

Period	Incidents	Average/month
Pre-Installation	21	1.75
Post-Installation	3	0.25

Train Delays: LIRR also captured train delays due to reports of vehicles on tracks. As shown in Table 2, the number of trains delayed was significantly reduced – from 401 in the pre-installation period to 57 in the post-installation period. This translates to about an 86 percent reduction in the number of trains delayed by reports of vehicles on tracks. The total train delay time was also reduced by about 89 percent between the two periods (155.1 hours in the pre-installation period compared to 17.2 hours in the post-installation period). Additionally, the average delay time got shorter, from about 23.2 minutes per delay in the pre-installation period to about 18.1 minutes per delay in the post-installation period (about a 22 percent reduction).

Table 2. Train Delays Due to Reports of Vehicles on Tracks

Period	Trains Delayed	Total Delays (hours)
Pre-Installation	401	155.1
Post-Installation	57	17.2

CONCLUSIONS

The system-wide implementation of ROW safety treatments by the LIRR at all of its 296 crossings resulted in an 85 percent reduction of vehicle ROW incursion events and an 86 percent reduction in the number of trains delayed by reports of vehicles on the tracks. Additionally, the total train delay time due to reports of vehicles on the tracks was reduced by about 89 percent. The number of incidents involving trains striking vehicles on the tracks was reduced from two over the 1-year period before the treatments' implementation to zero over the 1-year period after implementation.

FUTURE ACTION

The study successfully demonstrated the safety benefit of a system-wide implementation of low-

cost engineering treatments to lower the frequency of ROW incursions by vehicles at grade crossings. These findings should be widely disseminated to rail safety stakeholders. Furthermore, these types of safety treatments should be recommended and encouraged at crossing locations where vehicle incursions are known to be a significant issue.

REFERENCES

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