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Final Report for the Second Train Warning Sign Demonstration Project on the Los Angeles Metro Blue Line

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This demonstration project was carried out to investigate the use of a train activated warning sign as a means of reducing the added hazard for pedestrians of two trains in a highway railroad intersection (HRI) at the same time. The demonstration project was conducted at one of the Metro Blue Line's most hazardous HRIs, on the south sidewalk at the Vernon Avenue intersection with the Metro Blue Line and Union Pacific Railroad (UPRR) tracks. The sidewalk crosses two light rail transit (LRT) tracks and two UPRR freight tracks. From the analysis of before and after video data, the demonstration project found that the warning sign was effective in reducing risky behavior by pedestrians. Overall, the number of pedestrians crossing the LRT tracks at less than 15 seconds in front of an approaching LRT train was reduced by 14 percent after the warning sign was installed. The number of pedestrians crossing the tracks at six seconds or less before an LRT train entered the crossing was reduced by about 32 percent. The number of pedestrians crossing the tracks at four seconds or less in front of an approaching LRT train was reduced by 73 percent, an impressive decline in this type of especially risky behavior.

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LIST OF ACRONYMS

AC	Alternating Current
AMPG	Applied Management & Planning Group
Amps	Amperes
CCTV	Closed Circuit Television
CPUC	California Public Utilities Commission
DASH	Downtown Area Short Hop
EMC	Engineering Management Consultant
FTA	Federal Transit Administration
HRI	Highway Railroad Intersection
ITE	Institute of Transportation Engineers
LACMTA	Los Angeles County Metropolitan Transportation Authority
LADOT	Los Angeles Department of Transportation
LRT	Light Rail Transit
MBL	Metro Blue Line
NB	Northbound
PBF	PB Farradyne
SB	Southbound
TCRP	Transit Cooperative Research Program
TWC	Train-to-Wayside Communications
UPRR	Union Pacific Railroad
US	United States
VAC	Alternating Current Voltage
VCR	Video Cassette Recorder
XR	Crossing Relay

EXECUTIVE SUMMARY

The Metro Blue Line (MBL) is a 22-mile light rail transit system running between downtown Los Angeles and the City of Long Beach. MBL trains, running at speeds of up to 55 miles per hour, traverse 100 grade crossings. Many of the highway-railroad intersections (HRIs) are located at major streets carrying high traffic volumes. Following the startup of MBL operations in 1990, there were a large number of train/vehicle and train/pedestrian collisions at HRIs. As the result of a number of HRI safety improvement projects undertaken by the Los Angeles County Metropolitan Transportation Authority (LACMTA), the accident rate has been significantly lowered. However, there have been continuing problems with certain types of train/vehicle and train/pedestrian accidents at selected locations, one being train/pedestrian collisions at crossings situated adjacent to stations.

An important contributing factor for many train/vehicle and train/pedestrian collisions has been the presence of a second train, either a slower-moving freight train or a second light rail transit (LRT) train. Often, motorists and pedestrians may be acting in a manner they thought was safe, such as to avoid slow moving freight trains or crossing the tracks when there is an LRT train stopped at a nearby station, but their actions have resulted in collisions with second trains.

This demonstration project was carried out by the LACMTA, with funding support provided by the United States Department of Transportation (USDOT) Federal Transit Administration (FTA) under the Transit Cooperative Research Program (TCRP), to investigate the use of a train activated warning sign as a means of reducing the added hazard for pedestrians of two trains in a HRI at the same time. The Vernon Avenue HRI, shown in Figure 1, was selected as the location for this demonstration project.

Figure 1
VIEW OF INSTALLED SECOND TRAIN WARNING SIGN LOOKING WEST

The demonstration project has been conducted at one of the MBL's most hazardous HRIs, at Vernon Avenue in the City of Los Angeles. The project has been carried out on the south sidewalk at the Vernon Avenue intersection with the MBL and Union Pacific Railroad (UPRR) tracks. The sidewalk crosses two LRT tracks and two UPRR freight tracks. The entrance to the Vernon Avenue MBL station is located between the normally northbound and normally southbound LRT tracks. There have been 17 train/pedestrian collisions at the Vernon Avenue HRI since 1990. Five of the collisions have resulted in fatalities although one of the collisions was determined to be a suicide.

The effectiveness of the second train warning sign was evaluated using two approaches. First, before and after data regarding risky crossings by pedestrians was collected and analyzed. The data was collected by viewing video tapes recorded at the crossing where the video camera was activated only when there

were two trains at or in the vicinity of the crossing. Second, an intercept survey of pedestrians at the Vernon Avenue crossing was conducted to gauge pedestrian awareness of the second train warning sign and, more importantly, understanding of its warning message.

From the analysis of before and after data, the demonstration project found that the warning sign was effective in reducing risky behavior by pedestrians at the Vernon Avenue crossing. Overall, the number of pedestrians crossing the LRT tracks at less than 15 seconds in front of an approaching LRT train was reduced by 14 percent after the warning sign was installed.

The number of pedestrians crossing the tracks at six seconds or less before an LRT train entered the crossing was reduced from 59 to 40, a reduction of about 32 percent. The number of pedestrians crossing the tracks at four seconds or less in front of an approaching LRT train was reduced from 15 to four, a substantial 73 percent decline in this type of especially risky behavior. These reductions are the most significant findings from the demonstration project.

The intercept survey found that most pedestrians were aware of the second train warning sign and interpreted the sign as a warning sign, although only a few pedestrians interpreted the sign as meaning that there were two trains at the same time at or in the vicinity of the crossing.

Of the 556 pedestrians interviewed, more than three-quarters (77 percent) recalled having seen the warning sign. Only four percent of pedestrians directly related the sign to the presence of two trains although the overwhelming majority of respondents were aware that the sign indicated danger. A total of 92 percent of respondents interpreted the sign in such a way that would increase their safety near the tracks either by stopping, looking both ways, or otherwise taking precautions.

The majority of intercept survey respondents (93 percent) believe that the second train warning sign improves safety at the Vernon Avenue crossing to either a great extent (63 percent) or some extent (30 percent).

Based on the results of the demonstration project, the LACMTA will determine whether to implement the use of this warning sign at other crossings and will also evaluate other innovative approaches to increase the level of warning for pedestrians at HRIs.

CHAPTER 1

INTRODUCTION AND STATEMENT OF PROBLEM

The Metro Blue Line (MBL) is a 22-mile light rail transit system running between downtown Los Angeles and the City of Long Beach. MBL trains, running at speeds of up to 55 miles per hour, traverse 100 grade crossings. Many of the highway-rail intersections (HRIs) are located at major streets carrying high traffic volumes. Since the startup of MBL operations in 1990, there have been numerous train/vehicle and train/pedestrian collisions at HRIs but the accident rate has been significantly lowered as the result of a number of HRI safety improvement projects undertaken by the Los Angeles County Metropolitan Transportation Authority (LACMTA).

An important contributing factor for many train/vehicle and train/pedestrian collisions is the presence of a second train, either a slower-moving freight train or a second light rail transit (LRT) train. Often, motorists and pedestrians may be acting in a manner they thought was safe, such as to avoid slow moving freight trains or crossing the tracks when there is an LRT train stopped at a nearby station, but their actions have resulted in collisions with second trains.

At the Vernon Avenue HRI of the MBL and adjacent freight tracks, 17 train/pedestrian collisions resulting in five fatalities have occurred since the MBL commenced revenue operations in 1990. This makes it one of the most hazardous sites on the line. As a result of its accident history and because its configuration is similar in many respects to a number of other HRIs on the MBL, the Vernon Avenue HRI was selected as the location for a demonstration project.

The Vernon Avenue HRI includes two circumstances that result in the presence of two or more trains at the same time and that are considered to be especially hazardous. First, the Vernon Avenue MBL station is located immediately to the south of the HRI, between the normally northbound (NB) and normally southbound (SB) LRT tracks. For NB LRT trains, the train operator activates the flashing lights and automatic gates at the Vernon Avenue HRI from the train cab. Consequently, NB LRT trains may be observed at the station platform with and without the automatic gates activated. If the train operator has called the automatic gates down or if there is a second train in the vicinity, it will be observed that the automatic gates have been activated while the LRT train is berthed at the station platform. Pedestrians, seeing that the automatic gates have been activated, may believe that the automatic gates have been called down by the train operator when, in fact, there is a second train in the vicinity that has caused the activation of the automatic gates.

The second circumstance at the Vernon Avenue HRI that can result in the presence of two trains at the same time is the presence of one or more freight trains at the HRI or in the vicinity of the HRI at the same time as an LRT train. This case occurs at many MBL HRIs where the MBL operates on tracks that are parallel to the Union Pacific Railroad (UPRR) freight railroad tracks. This circumstance is also especially hazardous because pedestrians observing the activation of the automatic gates may only see the slow moving freight train approaching the HRI. In their haste to cross the tracks, they may fail to observe the LRT train approaching the HRI from the opposite direction at 55 miles per hour.

OBJECTIVE

The objective of this demonstration project was to identify and demonstrate an active warning sign that would increase the awareness of pedestrians at times when there are two trains at the same time at or in the vicinity of an HRI. The demonstration project has included the observation and measurement of pedestrian behavior before and after the installation of the active warning sign to determine the sign's effectiveness and potential for reducing collisions between trains and pedestrians at HRIs. The data collection and analysis was directed to test the LACMTA's hypothesis that the warning sign system would enhance pedestrian safety by reducing the incidence of risky behavior by pedestrians when crossing the

tracks when there were two trains at the same time at or in the immediate vicinity of the Vernon Avenue HRI.

DEFINITION OF THE PROBLEM

Often pedestrians may act in a manner that they think is safe, such as crossing the tracks when there is a LRT train stopped in a station or when an approaching LRT or UPRR train is observed at a considerable distance from the crossing. However, in each of these cases, pedestrians may not realize that there are two trains in the vicinity at the same time and that a second LRT train is approaching from the opposite direction.

The problem that the MBL demonstration project was designed to address concerns how to alert pedestrians and direct their attention to a second train that is approaching the grade crossing from the opposite direction. There have been 105 train/pedestrian accidents, resulting in 34 fatalities, at HRIs along the MBL since 1990.

DEMONSTRATION PROJECT SITE SELECTION

The demonstration project was conducted at the Vernon Avenue HRI in the City of Los Angeles, one of the MBL's most hazardous HRIs. The demonstration project was carried out on the south side sidewalk at the Vernon Avenue crossing of the MBL and adjacent freight railroad tracks owned and maintained by the UPRR. The sidewalk crosses two LRT tracks, one normally NB and one normally SB, and two UPRR freight tracks. The entrance to the Vernon Avenue station is located between the normally NB and normally SB LRT tracks.

Figure 2
VIEW OF VERNON AVENUE HIGHWAY-RAILROAD INTERSECTION

Pedestrian traffic is very high at the Vernon Avenue HRI, particularly during the morning and evening peak travel hours. There are four major pedestrian traffic generators in the immediate vicinity of the HRI:

- Vernon Avenue MBL station
- LACMTA bus stop in the northeast corner of the Long Beach Avenue East and Vernon Avenue intersection
- LACMTA bus stop in the southwest corner of the Long Beach Avenue West and Vernon Avenue intersection
- Small shopping center at the northeast corner of Long Beach Avenue East and Vernon Avenue.

There are much higher pedestrian volumes on the south side pedestrian crossing through the track area than for the crossing on the north side due, for the most part, to the location of the Vernon Avenue MBL station. Pedestrian counts, made by the LACMTA in March 1994, indicated that approximately 1,562 pedestrians, on the average, crossed the MBL tracks using the south side sidewalk each weekday.

Figure 3
VIEW OF VERNON AVENUE HIGHWAY-RAILROAD INTERSECTION

LACMTA passenger boarding and lighting data for the Vernon Avenue MBL station indicates that approximately 1,200 passengers board and alight from the MBL trains on an average weekday. There are approximately 220 LRT trains and 16 freight trains operated through the HRI on weekdays.

Table 1 provides a summary of the train-related collisions at the Vernon Avenue HRI, all of which have been train/pedestrian collisions. There have been 17 train/pedestrian collisions at the Vernon Avenue HRI from July 1990 through September30, 2001. Five of the collisions have resulted in fatalities although one of the fatalities was determined to be a suicide.

Table 1
SUMMARY OF COLLISIONS AT VERNON AVENUE HIGHWAY-RAILROAD INTERSECTION

Type of Accident	Date	Time	Reported Fatalities
Train/Pedestrian	11/07/90	0805P	1
Train/Pedestrian	03/15/92	0622A	0
Train/Pedestrian	05/11/92	1259P	0
Train/Pedestrian	10/09/92	0413P	0
Train/Pedestrian	04/12/93	0358P	0
Train/Pedestrian	08/15/93	0818P	1 (Suicide)
Train/Pedestrian	10/08/93	0331P	0
Train/Pedestrian	11/25/94	0551P	1
Train/Pedestrian	04/06/96	0758P	0
Train/Pedestrian	05/19/97	0440P	0
Train/Pedestrian	05/07/98	1030A	1
Train/Pedestrian	12/30/98	0545P	0
Train/Pedestrian	08/23/99	0729A	0
Train/Pedestrian	11/11/99	0305P	0
Train/Pedestrian	06/13/00	0722P	0
Train/Pedestrian	08/07/00	0157P	0
Train/Pedestrian	07/19/01	0510P	1

NOTE: The second train warning sign was installed on June 9, 2000.

CHAPTER 2

LACMTA PROPOSED SOLUTION METHODOLOGY

To meet the objective of this demonstration project, it was determined that the following tasks must be accomplished:

- Selecting sign size, message, and display type
- Sign selection pedestrian survey
- Sign and installation design
- Sign installation
- Before and after collection and analysis of pedestrian risky behavior data, as follows:
    1. Pre-installation data
    2. Post-installation data
    3. Pedestrian survey
    4. Analysis of sign effectiveness

SELECTING SIGN SIZE, MESSAGE, AND DISPLAY TYPE

A two-step procedure was used to select a second train warning sign to be demonstrated at the Vernon Avenue crossing. First, an expert panel of transportation safety specialists was convened to identify possible pedestrian-oriented second train warning signs and to identify 4-6 signs which could be used for further field testing. The expert panel selected four signs, two with a graphic message and two with a word only or text message. The second step of the two-step procedure to select a warning sign involved a pedestrian interview survey conducted at the Vernon Avenue HRI.

The expert panel included representatives from the City of Los Angeles Department of Transportation (LADOT), from the LACMTA Safety and Rail Operations Departments, and from the LACMTA's project consultant team, PB Farradyne (PBF), a Division of Parsons Brinckerhoff Quade & Douglas, Inc. and specialty subcontractors, Korve Engineering and Hoy Richards & Associates. The PBF consultant team was contracted for through the Engineering Management Consultant (EMC) joint venture, under its contract with the LACMTA.

The four signs selected by the expert panel were as follows:

Text Sign 1

The first text sign consisted of a static message, CAUTION SECOND TRAIN APPROACHING, activated when two trains were at or in the vicinity of the Vernon Avenue HRI. The sign is depicted in Figure 4 on the next page.

Figure 4
TEXT SIGN 1

Text Sign 2

The second text sign consisted of a static message, CAUTION ANOTHER TRAIN APPROACHING, activated when two trains were at or in the vicinity of the Vernon Avenue HRI. This wording was selected for further testing because of the possibility of up to four trains at the same time at the Vernon Avenue HRI. The second text sign is shown in Figure 5.

Figure 5
TEXT SIGN 2

Graphic Sign 1

The first graphic sign selected for further consideration by the expert panel consisted of an animation, incorporating motion by both two LRT vehicles and a pedestrian turning head. The LRT vehicles, one from the right and then one from the left, were displayed in continuous motion after the sign was activated. The pedestrian turning head was also displayed in continuous motion, looking to the right and then to the left.

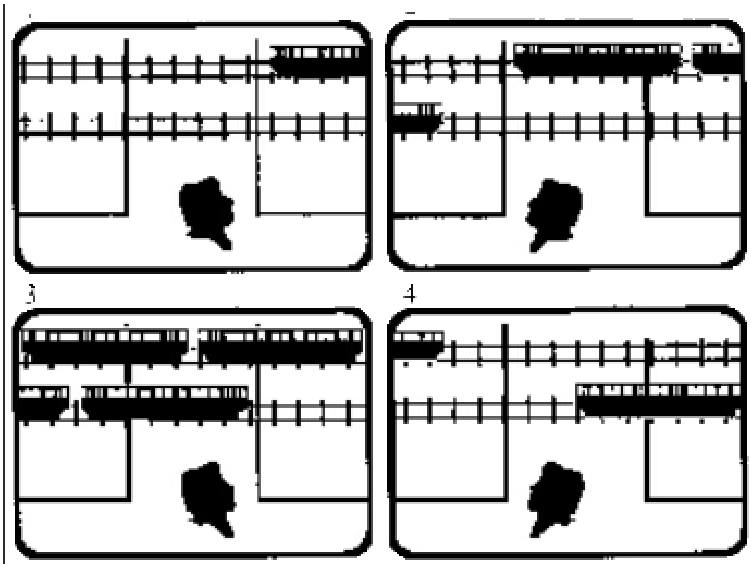


Figure 6
GRAPHIC SIGN 1

Graphic Sign 2

This sign showed a two-part display, with the sign alternating between the two displays when activated by the presence of two trains at the same time. The first display showed a LRT vehicle on the top track and located to the right hand side of the display, with an arrow pointing from a pedestrian standing in front of the two tracks towards the LRT vehicle. The second display showed a LRT vehicle on the lower track and located to the left hand side of the display, with an arrow pointing from a pedestrian standing in front of the two tracks towards the LRT vehicle.

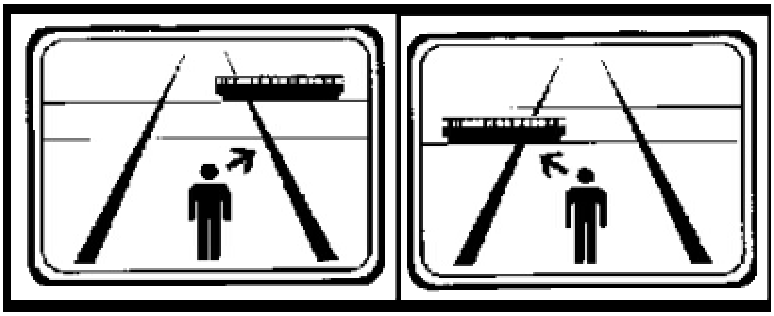


Figure 7
GRAPHIC SIGN 2

SIGN SELECTION PEDESTRIAN SURVEY

As already noted, the second step in selecting the sign for evaluation consisted of interviews with approximately 400 pedestrians at the Vernon Avenue HRI, regarding their understanding of and preference for one of the four second train warning signs identified by the expert panel. Applied Management & Planning Group (AMPG) conducted the interviews in May 1997 under a subcontract with EMC.

AMPG developed the intercept survey instrument, included in Attachment C at the end of this report. A total of 429 completed surveys were collected, of which 246 were conducted in Spanish and 183 were conducted in English. The fieldwork was performed between May 27 and 30, 1997, during morning and afternoon peak periods and mid-day hours.

The survey results indicated that the majority of the surveyed pedestrians were daily riders of the MBL. Also, most of the pedestrians interviewed were frequent users of the crossing. About one-half of the respondents crossed the tracks at Vernon Avenue two or more times a day (51 percent), followed by another one-quarter (24 percent) that crossed the tracks only one time per day.

The individuals interviewed also included a large number of bus riders. Seventy-two percent reported that they transferred to or from a bus at the intersection of Vernon Avenue and Long Beach Avenue.

Graphic Signs 1 and 2 were presented to the respondents before the Text Signs 1 and 2 to determine whether these signs reminded them to look both ways for more than one train. The Graphic Signs 1 and 2 were shown to survey participants in random order to eliminate the bias that could result from the order of presenting signs. For Graphic Sign 1, survey participants were shown the four-part display depicted in Figure 6 and the proposed animation of the two trains and pedestrian turning head was described. For Graphic Sign 2, survey participants were told that the sign consisted of two alternating displays. First, an arrow pointed right while a train was approaching from the right and second, an arrow pointed left at a train approaching from the left.

Without any prompting for Graphic Sign 1, approximately 27 percent of the respondents thought that it reminded them to look both ways, for one or more trains, before crossing the tracks. Two fifths (41 percent) of the respondents thought that the sign informed them that they should not cross the tracks because a train is coming. A significant number of the respondents (20 percent) didn't understand at all what message the sign was conveying to them.

When probed further by the surveyor, 89 percent said that Graphic Sign 1 reminded them to stop and look both ways before crossing the tracks, and another 89 percent reported that Graphic Sign 1 reminded them to stop and look for more than one train before crossing the tracks.

Without any prompting for Graphic Sign 2, about one-third (34 percent) of the survey respondents thought the sign indicated that they should look both ways, or look for one or more trains before crossing the tracks. Nearly half (48 percent) of the respondents reported that the sign reminded them to stop because a train is coming. Another one-third (32 percent) thought that they were supposed to look both ways for trains before crossing the tracks. Fourteen percent indicated that they did not understand at all what message was intended from the warning sign.

Again, when probed by the surveyor, the overwhelming majority (92 percent) of the survey respondents indicated that Graphic Sign 2 would remind them to stop and look both ways before crossing the tracks, while slightly fewer respondents (90 percent) indicated that the sign reminded them to stop and look for more than one train before crossing the tracks.

In addition to the two graphics signs, the two text signs were shown to the survey respondents. Respondents were asked to identify which sign would be the most effective in reminding them to stop and look for more than one train before entering the crossing. Overall, the respondents preferred graphic signs (58 percent) to text signs (38 percent). Additionally, Graphic Sign 2 (33 percent) was preferred by survey respondents over Graphic Sign 1 (25 percent).

The overwhelming majority of the survey respondents felt that the warning sign they preferred would improve safety at the Vernon Avenue crossing, either to a great extent (62 percent) or to some extent (32 percent).

Based on the pedestrian survey results, it was determined to proceed with the fabrication and installation of the preferred Graphic Sign 2 at the Vernon Avenue HRI for testing and evaluation.

SIGN AND INSTALLATION DESIGN

A Technical Specification for the Second Train Warning Sign was prepared by Korve Engineering under a subcontract with EMC. The Technical Specification is attached at the end of this report as Attachment A.

The warning sign was designed as two-sided, three feet by four feet in size, and using fiber optic bundles and quartz halogen lamps with yellow color filters to internally illuminate the sign images and left/right movement of the LRT vehicles and arrows. The sign background is black in color and not illuminated, resulting in a yellow warning message displayed against a black background.

It was required that the fiber optic bundles be arranged so that all adjacent light points are handled by different light sources. In the event of failure of one light source, the other light source continues to provide full power to the alternate light points in order to display degraded but discernible images.

The warning sign remains dark until it is energized by power applied through an external contact closure made when two trains are approaching the crossing at the same time. Once energized, the sign then alternately displays the left train/left arrow and the right train/right arrow in flashing mode at a user-specified frequency until the power is removed.

The warning sign is activated only when two or more trains are approaching the crossing, either two MBL trains, a MBL train and a freight train, or two MBL trains and a freight train. The presence of a northbound LRT train at the Vernon Avenue station is considered to be a train approaching the crossing, even if the train operator has not called the automatic gates down. Connections to the existing track circuit and train control circuits were designed to implement the logic required to identify two trains at the same time.

The presence of only two freight trains at the same time was not included in the warning sign control logic. The signal provided by the UPRR to the MBL train control system does not distinguish between one and two freight trains approaching the crossing. Since the system cannot determine when there are two freight trains at the crossing, this could not be included in the logic applied for the demonstration project.

Mounting brackets were designed so that the warning sign could be hung from a standard California Public Utilities Commission (CPUC) Number 8 flashing light assembly mast, with the sign oriented parallel to the tracks and facing pedestrians as they approached the track area. The mounting bracket configuration consisted of two 4-inch diameter horizontal mast arms, one along the upper edge of the warning sign and the other along the lower edge of the warning sign, together with a diagonal arm attached to the outer end of the upper horizontal mast arm. In order to support the increased sign loading, the foundation for the CPUC Number 8 flashing light assembly was set in concrete.

Table 2
TWO TRAIN COMBINATIONS ACTIVATING
SECOND TRAIN WARNING SIGN

SB LRT Occupying Track 2 Approach Circuit – Gates Called Down	NB LRT At Vernon Avenue Station – Gates Not Called Down (a)	NB LRT Occupying Track 1 Approach Circuit – Gates Called Down	UPRR Occupying First Track Approach Circuit – Gates Called Down	UPRR Occupying Second Track Approach Circuit – Gates Called Down
-	-			
-		-		
-			-	
-				-
-			-	-
	-		-	
	-			-
	-		-	-
		-	-	
		-		-
		-	-	-
-	-		-	
-	-			-
-		-	-	
-		-		-
-	-		-	-
-		-	-	

NOTES: (a) The Vernon Avenue Station is a “near side” station, meaning that there is a HRI immediately downstream of the station. At near side stations on the MBL, the automatic gates at the downstream HRI are activated by the train operator through the use of train-to-wayside (TWC) communications and not automatically activated when the LRT train is occupying an approach track circuit.

SIGN INSTALLATION

Installation of the warning sign was done under LACMTA Contract C0360, Metro Blue Line Grade Crossing Improvements. The warning sign was installed and made operational in June 2000.

Figure 8
VIEW OF INSTALLED SECOND TRAIN WARNING SIGN AND NORTHBOUND LRT TRAIN

Figure 9
VIEW OF INSTALLED SECOND TRAIN WARNING SIGN AND SOUTHBOUND LRT TRAIN

PEDESTRIAN BEFORE AND AFTER DATA COLLECTION

A video camera was installed in the southwest corner of Vernon Avenue and Long Beach Avenue West. The existing traffic signal pole at this location was replaced with a tall traffic signal pole that provides for mounting of the camera unit at the top of the pole. This location has provided a clear view of the track area for video observation and data collection.

Near the base of the traffic signal pole, a pedestal-type traffic cabinet was installed to house the camera control equipment as well as video cassette recording (VCR) equipment. Video data showing pedestrian behavior at the Vernon Avenue pedestrian crossing was recorded for analysis using the VCR equipment. Conductors were run to the traffic signal cabinet from the nearby train control and communications building to provide a contact closure for two trains at the same time.

Risky behavior data was recorded on VHS video cassettes. Since each cassette was limited to two hours of recording time, cassettes were typically replaced two times per week so that continuous or nearly continuous video data was captured for instances of two trains at the same time.

Subsequently, the collected video data was observed and analyzed by a traffic engineer, who was trained to understand the project. Training and consistency were two important factors in the data collection in order to derive meaningful and accurate results.

Figure 10
VIDEO CAMERA INSTALLED AT VERNON AVENUE

PUBLIC INFORMATION PROGRAM

As part of the demonstration project, a four-part public information program was developed and carried out by the LACMTA Public Affairs Department in conjunction with the installation and operation of the second train warning sign. The public information program consisted of the following four communication components.

- Distribution of Flyers. The flyer distribution consisted of a one-sheet bilingual announcement explaining to the public the project and expected time window for the installation and start of operation. The flyers included a photograph of the sign and an explanation regarding the purpose of the sign**.** Flyers were distributed within a 10-block area around the Vernon Avenue MBL station including distribution to local businesses and residents. “Take-One” cards containing similar information were placed on buses operating along LACMTA lines 56, 105, and 576 and on LADOT DASH buses that provide service to the Vernon Station. “Take One” cards were also placed on MBL trains.

- Signs. The posted signage consisted of poster-size bilingual announcements, with the same information contained in the flyers, placed in strategic locations at or in the immediate vicinity of the Vernon Avenue station.

- Media Event. The LACMTA Public Affairs Department worked with the LACMTA Media Relations Departments to conduct a major media event after the sign was operational. Local television, radio, and print media representatives attended the event where invited elected officials

addressed the media on the hazards of two trains at the same time and on the planned operation of the warning sign.

- Safety Education. The LACMTA Public Affairs Department has described the demonstration project and how the warning sign works at all community safety fairs, tours, and school train safety assemblies conducted in the neighborhoods surrounding Vernon Avenue station.

Note that the public information program was limited and was not designed as a "two trains at the same time" safety awareness program. The public information program was focused at the Vernon Avenue station area, as described above, and was not carried out elsewhere in the system. The effect of the public information program on pedestrian behavior during the demonstration program was not measured but, due to the focused nature of the program, it is believed by LACMTA safety engineers that any effect was minimal.

DEMONSTRATION PROJECT COSTS

Demonstration project costs are summarized in the following table.

Table 3
SUMMARY OF DEMONSTRATION PROJECT COSTS

Project Cost Item	Supplier	Approximate Cost
Second Train Warning Sign	National Sign	$15,000
Second Train Warning Sign Installation Including Track Circuit Modifications and CCTV Camera Equipment	LACMTA Contract C0360 Contractor (Mass Electric Corporation)	$80,000
Project Management and Engineering	PB Farradyne (*)	$ 35,000
Project Evaluation	PB Farradyne (*)	$ 70,000

NOTE: (*) Under work order from Engineering Management Consultant (EMC). Subconsultants included Korve Engineering, Hoy Richards & Associates, and Applied Management & Planning Group.

CHAPTER 3

ANALYSIS OF COLLECTED DATA

To view and record pedestrian behavior when two trains were at or in the vicinity of the Vernon Avenue HRI, a video camera was installed at a height of approximately 45 feet in the southwest corner of the Vernon Avenue and Long Beach Avenue West intersection. Video data was recorded and analyzed for the following time periods:

- Before warning sign installation and operation: March 24-June 9, 2000
- After warning sign installation and operation:
  a. June 9-10, 2000 (less than 24 hours not used for evaluation; sign switch failed)
  b. July 30- September 5, 2000 (MTA operators on strike until October 20, 2000)
  c. October 20-21, 2000 (less than 24 hours not used for evaluation; camera failed)
  d. May 20-June 18, 2001

For both before and after data collection, a total of 1,470 two-train events were observed (the same number for both the "pre-installation" and "post-installation" time periods). This number was established during the before data collection time period as the number of two-train events required to observe approximately 400 pedestrians crossing the tracks when there were two trains at the same time. The sample size was based on collecting as much data as possible for the available demonstration project budget. A total of 380 pedestrians were observed crossing the tracks during the before data collection time period, an average of one every 3.9 two-train events, and a total of 326 pedestrians were observed during the after data collection time period, an average of one every 4.5 two-train events.

On the average, there were about 25 two-train events per day at the Vernon Avenue crossing during both the before and after data collection periods.

Generally, there were significantly fewer pedestrians observed to be crossing the tracks when there were two trains at the same time than was expected when the demonstration project was started.

The following data was observed for each two-train event recorded during the data collection periods:

- Time of day
- Type of two-train event (e.g. NB LRT followed by SB LRT; UPRR followed by NB LRT)
- Number of seconds in front of an approaching LRT train that a pedestrian crosses the LRT tracks (only recorded for analysis if the number of seconds is less than 15 seconds)
- Direction that pedestrians are walking, eastbound or westbound

MEASURES OF EFFECTIVENESS

The recorded video data was analyzed to determine risky behavior by pedestrians, specifically risky behavior where pedestrians crossed the LRT tracks at less than 15 seconds in front of an approaching train when there were two trains at the same time. The number of risky crossings have been counted and recorded, including the number of seconds that the pedestrian crosses the track before the train arrives at the crossing. Only pedestrians crossing the tracks at less than 15 seconds in front of a train were counted. No data was collected for pedestrians crossing the tracks at 15 seconds or longer times in front of an approaching train. From this data, two measures were calculated as measures of risky behavior by pedestrians:

- Number of pedestrians crossing the tracks at less than 15 seconds in front of an approaching LRT train

- Number of pedestrians crossing the tracks at six seconds or less in front of an approaching LRT train.

These measures were determined on the basis of the experience and best judgment of the researchers. There is no generally accepted threshold or standard related to the number of seconds that constitutes risky behavior by pedestrians.

Arguably, the first measure is not a especially good indicator of risky behavior since 15 seconds is a relatively long advance warning time. However, it does indicate the number of pedestrians who disregard the flashing lights and bell warnings at the crossing. At the Vernon Avenue HRI, the flashing lights and bells are activated as soon as the XR relay drops, about 40 seconds in advance of SB LRT trains for trains running at their typical operating speeds, about 20-24 seconds in advance of NB LRT trains pulling out of the station, and about 35 seconds in advance of UPRR trains. The UPRR uses constant warning time equipment to activate the XR relay at the crossing. Typically, the train horns are sounded about 10 seconds before the train enters the crossing.

The threshold adopted for the second measure, six seconds, roughly corresponds with the time required for an LRT train to stop under emergency braking at the approach speeds of the SB LRT trains.

Comparisons were made for both measures and for the distribution of pedestrian crossing times before and after the installation of the warning sign. A significant difference between the before and after conditions according to the measures, particularly a reduction in the rate of pedestrians crossing at six seconds or less in front of an approaching train, will indicate the effectiveness of second train warning sign and success of the demonstration project.

No data on risky crossings by pedestrians was collected at other crossings during the before and after installation data collection periods.

Pedestrian awareness of the second train warning sign as well as opinions regarding the effectiveness of the second train warning sign were also measured by interview surveys with pedestrians at the Vernon Avenue station area. Positive responses from the interviewed pedestrians will indicate the effectiveness of second train warning sign and success of the demonstration project.

BEFORE INSTALLATION DATA ANALYSIS

The before installation data analysis was performed on 19 tapes and was completed on June 9, 2000 before the second train warning sign was installed. The second train warning sign was installed on the morning of June 9, 2000.

Table 4 shows the number of two train events recorded during different times of day for different combinations or variations of two trains at the same time. As already noted, a total of 1,470 two train events were observed in the before data collection time period. Figure 11 shows the same data presented in Table 4 but shows the data as a bar chart for each time period. Note that the incidence of two trains at the same time is highest during the peak periods, and somewhat higher during the AM peak period than during the PM peak period.

Table 4
TWO TRAIN EVENTS BY TYPE AND TIME OF DAY (N=1,470)

	Before 6:00am	6 - 9:30am	9:30 - 3pm	3 - 6:30pm	After 6:30pm	TOTAL
UPRR then NB LRT	17	56	115	68	59	315
UPRR then SB LRT	15	59	94	60	51	279
NB LRT then SB LRT	26	130	47	88	41	332
SB LRT then NB LRT	29	177	127	149	62	544
TOTAL	87	422	383	365	213	1,470

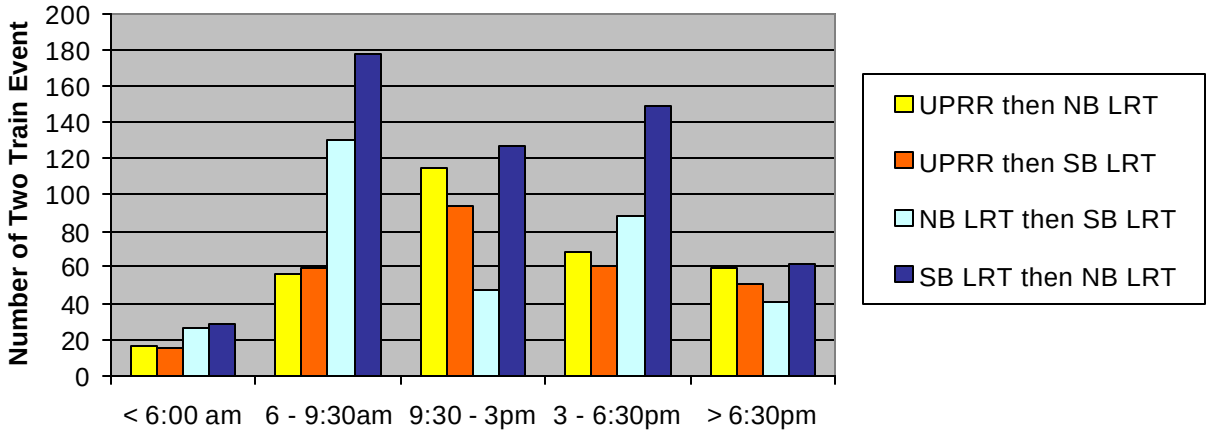


Figure 11
TWO TRAIN EVENTS BY TIME OF DAY
BEFORE INSTALLATION

A total of 380 pedestrians were observed crossing the LRT tracks at less than 15 seconds in front of an approaching LRT train. Table 5 summarizes the breakdown of pedestrian crossing times, less than 15 seconds, for each train direction. Figure 12 shows the same data in a graphic format.

Table 5
BREAKDOWN OF PEDESTRIAN RISKY CROSSING TIMES BY TRACK (N=380)

Number of Seconds	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Track 1 – Normally NB	0	3	0	5	10	7	3	25	4	14	13	11	6	8	109
Track 2 – Normally SB	0	0	3	4	14	13	15	10	16	37	29	53	32	45	271
TOTAL	0	3	3	9	24	20	18	35	20	51	42	64	38	53	380

The findings demonstrate that pedestrians, in some cases, cross the tracks without any attention to the second train. On 59 occasions, pedestrians were observed crossing the tracks at six seconds or less before an LRT train entered the crossing. On 15 occasions, pedestrians crossed the tracks at four seconds or less in front of an approaching train. On the other hand, a total of 248 of the pedestrians

observed crossing the LRT tracks were recorded at between 10 to 14 seconds prior to the train entering the crossing, illegal and unsafe behavior, but arguably not as risky as for the shorter crossing times.

There is a noticeable spike at eight seconds for NB risky crossings. One group of seven pedestrians crossing at the same time is included in this category.

About 71 percent of the risky pedestrian crossings were observed for the normally southbound track, track 2. It should be noted that the approach times on this approach to the crossing are in excess of 40 seconds as the result of a slow order, meaning that pedestrians have extended warning time to observe the approaching southbound trains before entering the track area.

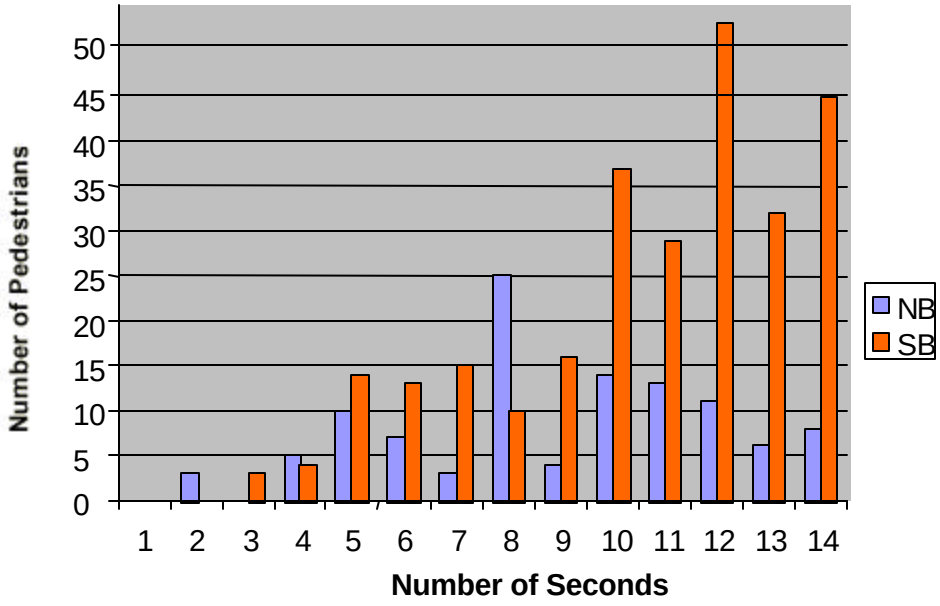


Figure 12
BREAKDOWN OF PEDESTRIAN RISKY CROSSING TIMES
BEFORE INSTALLATION

The number of pedestrians crossing the tracks at six seconds or less in front of an approaching LRT train was analyzed by type of two-train event. Table 6 summarizes the results of this analysis for the before installation time period. Risky crossings of this type by pedestrians occurred most frequently where the first train was a NB LRT and the second train was a SB LRT, confirming the combination believed by LACMTA safety engineers to be a particularly hazardous one.

Table 6
PEDESTRIANS CROSSING TRACKS AT SIX SECONDS OR LESS
BY TYPE OF TWO TRAIN EVENT (N=1,470)

Type of Two Train Event	Number of Events	Number of Pedestrian Crossings At Six Seconds Or Less	Pedestrian Crossings Per 100 Events
UPRR then NB LRT	315	6	1.9
UPRR then SB LRT	279	10	3.6
NB LRT then SB LRT	332	22	6.6
SB LRT then NB LRT	544	21	3.9
TOTAL	1,470	59	4.0

AFTER INSTALLATION DATA ANALYSIS

Analysis was performed for eight videotapes recorded from July 30 to September 5, 2000. In order to have the same number of two train events for comparison, additional video data was collected for the period of May 20 through June 18, 2001. Therefore, the total number of recorded two train events was 1,470 or the same number of recorded events as for the "before installation" time period.

Table 7
TWO TRAIN EVENTS BY TYPE AND TIME OF DAY
AFTER INSTALLATION (N=1,470)

	Before 6:00am	6 - 9:30am	9:30 - 3pm	3 - 6:30pm	After 6:30pm	TOTAL
UPRR then NB LRT	14	69	119	64	71	337
UPRR then SB LRT	11	67	112	65	80	335
NB LRT then SB LRT	12	159	31	111	35	348
SB LRT then NB LRT	27	153	71	117	82	450
TOTAL	64	448	333	357	268	1,470

Figure 13
TWO TRAIN EVENTS BY TYPE AND TIME OF DAY
AFTER INSTALLATION

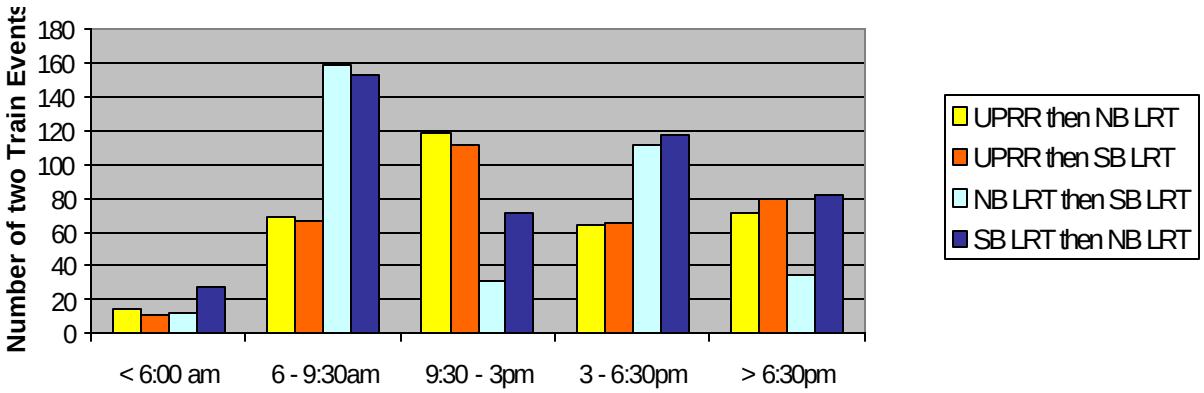


Table 7 shows the number of two train events recorded during different times of day for different combinations or variations of two trains at the same time. As already noted, a total of 1,470 two train events were observed in the after data collection time period. The same data is depicted graphically in Figure 13. The breakdown is remarkably the same as recorded for the before installation time period, with a lower number of two train events with a NB train in the station and a somewhat higher number of two train events involving UPRR freight trains during the mid-day hours.

A total of 326 pedestrians were observed crossing the LRT tracks at less than 15 seconds in front of an approaching LRT train after the warning sign was installed. This was a reduction of 14 percent in the total number of risky pedestrian crossings. Table 8 summarizes the breakdown of pedestrian crossing times, less than 15 seconds, for each train direction. Figure 14 shows the same data graphically.

Table 8
BREAKDOWN OF PEDESTRIAN RISKY CROSSING TIMES BY TRACK (N=326)

Number of Seconds	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Track 1 – Normally NB	0	2	0	1	10	8	17	10	16	23	13	1	5	2	108
Track 2 – Normally SB	0	0	1	0	6	12	15	19	20	40	31	26	19	29	218
TOTAL	0	2	1	1	16	20	32	29	36	63	44	27	24	31	326

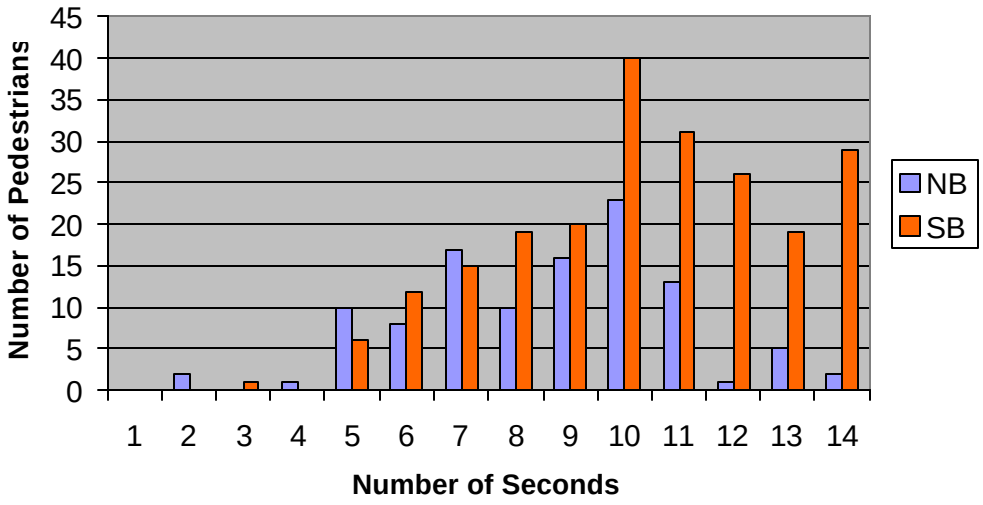


Figure 14
BREAKDOWN OF PEDESTRIAN RISKY CROSSING TIMES AFTER INSTALLATION

The number of pedestrians crossing the tracks at six seconds or less before an LRT train entered the crossing was reduced from 59 to 40, a reduction of about 32 percent. The number of pedestrians crossing the tracks at four seconds or less in front of an approaching train was reduced from 15 to four, a substantial 73 percent decline in this type of especially risky behavior. These reductions are the most significant findings from the demonstration project.

The number of pedestrians crossing between 10 seconds and 14 seconds in front of an approaching LRT train dropped from 248 to 189, a 24 percent change from the before installation data collection period.

Figure 15, on the following page, provides a comparison of the number of pedestrian risky crossings, made at less than 15 seconds in front of an approaching train, for the before installation and after installation time periods by the type of two train event. There is a noticeable reduction in the number of pedestrian risky crossings for instances where there are two LRT trains at the same time.

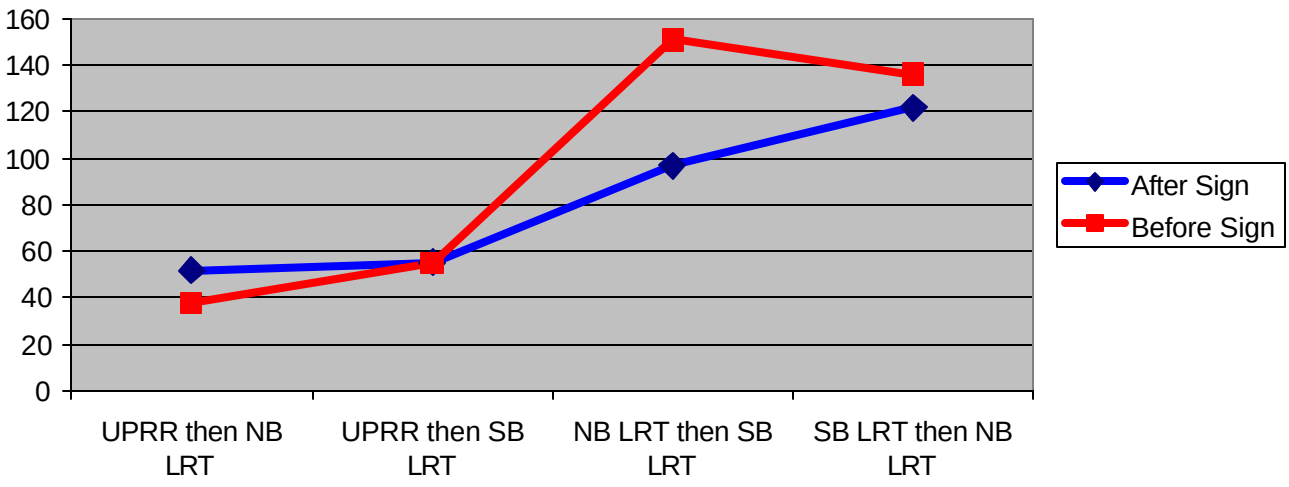


Figure 15
COMPARISON OF PEDESTRIAN RISKY CROSSINGS
BY TYPE OF TWO TRAIN EVENT

For the after installation time period, the number of pedestrians crossing the tracks at six seconds or less in front of an approaching LRT train was analyzed by type of two-train event as was done for the before installation time period. Table 9 summarizes the results of this analysis for the after installation time period including a comparison with the rate of pedestrian crossings at six seconds or less for the before installation time period. The comparative data shows that there was a reduction in risky crossings of this type by pedestrians for two train events involving two LRT trains. In particular, the comparative data shows that the number of risky crossings of the SB LRT track after a NB LRT had traversed the crossing was reduced by about 60 percent. Overall, the comparative data shows that the number of pedestrian crossings at six seconds or less was reduced for all types of two train events except for two train events involving a UPRR freight train and NB LRT train. There is no explanation from the data for this increase.

Table 9
PEDESTRIANS CROSSING TRACKS AT SIX SECONDS OR LESS
BY TYPE OF TWO TRAIN EVENT
AFTER INSTALLATION (N=1,470)

Type of Two Train Event	Number of Events	Number of Pedestrian Crossings At Six Seconds Or Less	After Installation Pedestrian Crossings Per 100 Events	Before Installation Pedestrian Crossings Per 100 Events
UPRR then NB LRT	337	11	3.3	1.9
UPRR then SB LRT	335	7	2.1	3.6
NB LRT then SB LRT	348	9	2.6	6.6
SB LRT then NB LRT	450	13	2.9	3.9
TOTAL	1,470	40	2.7	4.0

WARNING SIGN EFFECTIVENESS PEDESTRIAN SURVEY

In October 2000, AMPG conducted a followup survey to measure the effectiveness of the second train warning sign since its installation through interviews with pedestrians in the Vernon Avenue station area. Surveyors interviewed 556 pedestrians at both the Vernon Avenue Station platform where passengers were waiting for their train, and at the southwest corner of Vernon Avenue and Long Beach Avenue. The primary objectives of the follow-up survey were to:

- Gauge pedestrians' awareness of warning devices at the crossing;
- Measure pedestrians' awareness of the second train warning sign;
- Assess the extent to which pedestrians understand the warning sign; and
- Determine the extent to which pedestrians believe the warning sign improves safety at the Vernon Avenue crossing.

The survey instrument is included at the end of the report as Attachment D.

Awareness of Warning Devices

Survey respondents were asked to report which warning devices served as an indication that there was a train approaching the crossing. This question was asked in the 1997 survey and was repeated for the followup survey. For the followup survey, only those respondents who indicated that they recalled the second train warning sign were asked this question.

As shown in Table 10, the bell was the most frequently mentioned warning signal in both 1997 (71 percent) and in 2000 (85 percent). Awareness of all warning indicators increased since 1997, including the horn, flashing lights, the descending gate, and the traffic signal; however, this may be the result of slight differences between the 1997 and 2000 survey. A total of 18 percent of surveyed pedestrians reported that the second train warning sign provided an indication that there was a train approaching the crossing. Respondents were asked to identify all indicators of an approaching train so that multiple responses were allowed and the percentages listed exceed 100 percent.

Table 10
HOW RESPONDENTS KNOW A TRAIN IS COMING
COMPARISON BY YEAR (N=556 YEAR 2000; N=400 YEAR 1997)

	1997		2000	
Warning Signals	**Number***	**Percent**	**Number***	**Percent**
Bell	303	71	364	85
Train Horn	102	24	304	76
Flashing Lights	138	32	204	48
Gate descending	111	26	136	32
See Train	47	11	102	24
Second Train Warning Sign**	N/A	N/A	76	18
Traffic Signal	6	1	37	9
Refused	--	--	4	1

*Includes multiple responses.
**This category was not included in the 1997 survey.

Awareness of Second Train Warning Sign

Of the 556 pedestrians interviewed, three-quarters (77 percent) reported that they were aware of the second train warning sign. As expected, pedestrians who boarded MBL trains regularly at the Vernon Avenue station and those that crossed the tracks frequently were more likely than other pedestrians to be aware of the sign.

Just under half (49 percent) of the respondents who reported that they were aware of the sign, boarded at the Vernon Avenue station two or more times a day, compared to only one-fifth of those pedestrians that could not recall the sign (21 percent), as seen in Table 11. Three-quarters of pedestrians who recalled the warning sign boarded at Vernon Avenue at least once a day (75 percent).

Table 11
AWARENESS OF WARNING SIGN BY
FREQUENCY OF BOARDING MBL AT THE VERNON STATION (N=556)

	Aware		Not Aware	
Frequency of Boarding	**Number**	**Percent**	**Number**	**Percent**
Two or more times per day	211	49	27	21
One time per day	111	26	47	37
Two to three times a week	61	14	18	14
One time per week	25	6	10	8
Less than once a week	8	2	22	17
Not at all	12	3	4	3
Total	**428**	**100**	**128**	**100**

More than half of the pedestrians (60 percent) who were aware of the warning sign crossed the tracks two or more times a day. In contrast, only one-third (33 percent) of those pedestrians that did not recall the warning sign crossed the tracks as often. A total of 82 percent of pedestrians that could recall the warning sign crossed the tracks once a day or more.

Table 12
AWARENESS OF WARNING SIGN BY
FREQUENCY OF CROSSING TRACKS (N=550)

	Aware		Not Aware	
Frequency of Crossings	**Number**	**Percent**	**Number**	**Percent**
Two or more times per day	252	60	41	33
One time per day	93	22	33	26
Two to three times a week	50	12	20	16
One time per week	14	3	11	9
Less than once a week	16	4	20	16
Total	**425**	**101***	**125**	**100**

*Total does not add to 100 percent due to rounding error.

Interpretations and Reactions to the Second Train Warning Sign

Respondents were asked both open-ended and prompted questions regarding their interpretation of the second train warning sign. Pedestrians were first asked, "What does the sign tell you?" Although only four percent of pedestrians directly related the sign to the presence of two trains, the overwhelming majority of respondents were aware that the sign indicated danger. A total of 92 percent of respondents said that they interpreted the sign in such a way that would increase their safety near the tracks either by stopping, looking both ways, or otherwise taking precautions.

Surveyed individuals' reactions to the warning sign are summarized in Table 13. Just under half of the respondents (46 percent) thought the warning sign indicated that a train was coming or that they shouldn't cross the tracks. One out of five of the respondents (20 percent) reported that the warning sign reminded them to stop.

Table 13
RESPONDENTS' REACTIONS TO SECOND TRAIN WARNING SIGN (N=424)

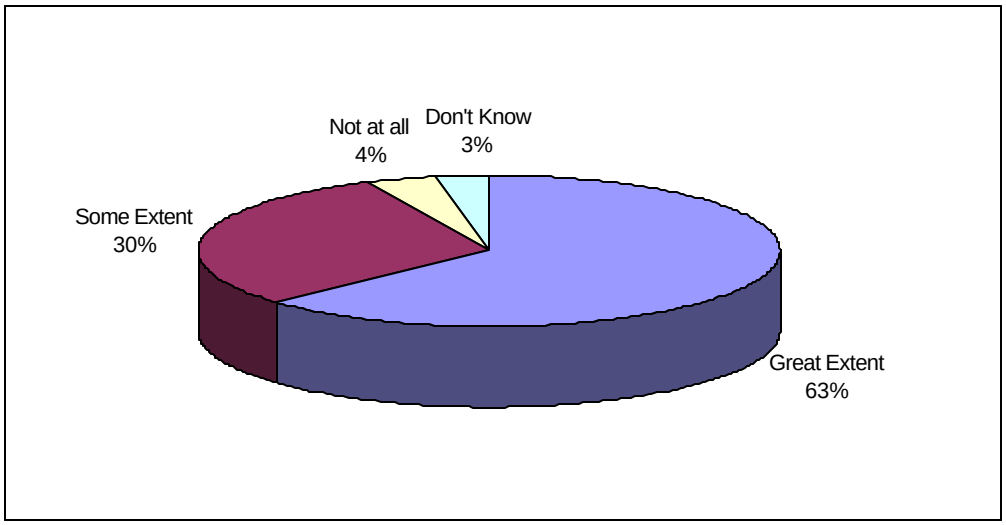
Reactions to Warning Sign	Number	Percent
Train Coming	105	25
Don't Cross the Tracks	89	21
Stop/Wait	84	20
Caution/Danger	77	18
More than One Train Coming	18	4
Look both ways	13	3
Slow Down	4	1
Other	20	5
Don't know	14	3
Total	**424**	**100**

The majority of the survey respondents felt that the warning sign improves safety at the Vernon Avenue crossing, either to great extent (63 percent) or some extent (30 percent) as depicted in Figure 16 on the next page. This finding is consistent with findings from 1997 in which 62 percent of respondents believed a second train warning sign would improve safety at the Vernon Avenue crossing to a great extent.

AFTER INSTALLATION ACCIDENT EXPERIENCE

Prior to the installation of the second train warning sign, there were 14 train/pedestrian accidents at the Vernon Avenue crossing during a period of ten years. It is not known how many of these accidents occurred when there were two trains in the vicinity of the crossing at the same time. After the installation of the warning sign through September 30, 2001, three train/pedestrian accidents occurred at the crossing. None of these three accidents occurred when two trains were at or in the vicinity of the crossing at the same time.

Figure 16
EXTENT TO WHICH THE WARNING SIGN IMPROVES SAFETY AT THE VERNON AVENUE CROSSING BASED ON PEDESTRIAN SURVEY RESPONSES



SIGN MAINTENANCE EXPERIENCE

For the 73 weeks through January 10, 2002 while the sign has been operating, there has been one sign malfunction. A switch failed shortly after the sign was initially installed, causing the sign to go dark until the switch was replaced. The replacement was covered under the manufacturer's warranty.

CHAPTER 4

CONCLUSIONS

The goal of installing the second train warning sign was to identify an active warning sign and conduct an assessment of its' effectiveness in enhancing pedestrian safety at a busy highway-railroad intersection where there are frequently two trains at the same time at or in the vicinity of the intersection. The presence of two trains at the same time has been thought to be a potential contributing factor by LACMTA safety engineers for many train/vehicle and train/pedestrian collisions at MBL crossings. This demonstration project has been viewed as an important one by the LACMTA as it seeks to identify and implement warning devices and systems that will effectively mitigate the hazard created by the presence of two trains at the same time.

The effectiveness of the second train warning sign was evaluated using two approaches. First, before and after data regarding risky crossings by pedestrians was collected and analyzed. Second, an intercept survey of pedestrians at the Vernon Avenue crossing was conducted to gauge pedestrian awareness of the second train warning sign and, more importantly, understanding of its warning message.

From the analysis of before and after data, the demonstration project found that the warning sign was effective in reducing risky behavior by pedestrians at the Vernon Avenue crossing. Overall, the number of pedestrians crossing the LRT tracks at less than 15 seconds in front of an approaching LRT train was reduced by 14 percent after the warning sign was installed.

The number of pedestrians crossing the tracks at six seconds or less before an LRT train entered the crossing was reduced from 59 to 40, a reduction of about 32 percent. Most of the reduction in risky crossings of this type was observed for two-train events involving two LRT trains although some reduction was also noted for two-train events where one of trains was a UPRR freight train. The number of pedestrians crossing the tracks at four seconds or less in front of an approaching LRT train was reduced from 15 to four, a substantial 73 percent decline in this type of especially risky behavior. These reductions are the most significant findings from the demonstration project but neither finding can be shown to be statistically significant due to the small number of observations.

The intercept survey found that most pedestrians were aware of the second train warning sign and interpreted the sign as a warning sign, although only a few pedestrians interpreted the sign as meaning that there were two trains at the same time at or in the vicinity of the crossing. This is a significant finding that may question the value of graphics in conveying the desired message. LACMTA safety engineers believe that there is a learning curve associated with the recognition of any new warning sign or traffic control device and that this is the case with the graphic sign used for the demonstration project. The LACMTA has added the sign as an element of its on-going safety education program presentations for community groups and schools.

Of the 556 pedestrians interviewed, more than three-quarters (77 percent) recalled having seen the warning sign. Only four percent of pedestrians directly related the sign to the presence of two trains although the overwhelming majority of respondents were aware that the sign indicated danger. A total of 92 percent of respondents said they interpreted the sign in such a way that would increase their safety near the tracks either by stopping, looking both ways, or otherwise taking precautions.

The majority of intercept survey respondents (93 percent) believe that the second train warning sign improves safety at the Vernon Avenue crossing to either a great extent (63 percent) or some extent (30 percent).

Based on the results of the demonstration project, the LACMTA will determine whether to implement the use of this warning sign at other crossings and will also evaluate other innovative approaches to increase the level of warning for pedestrians at HRIs.

ATTACHMENT A

SECOND TRAIN WARNING SIGN TECHNICAL SPECIFICATION

Purpose

This specification describes requirements for a Second Train Warning light emitting fiber optic electric sign assembly for the Los Angeles Metro Blue Line. The general design of the warning sign shall be as shown in the attached drawings. The details of construction shown in the attached drawings are typical and may be modified subject to approval by the Los Angeles County Metropolitan Transportation Authority (LACMTA). Prior to actual construction of the sign assembly, the Contractor shall submit a complete set of detailed shop drawings and a full size mockup of the sign face to LACMTA for review and approval by the LACMTA.

Sign Description

The sign shall be two-sided. Each sign face shall display the images of two (2) approaching trains, a standing man, two (2) arrows pointing to the trains, and four straight lines depicting the crosswalk and the train tracks. The images shall be internally illuminated through the use of fiber optic bundles and quartz halogen lamps with yellow color filters. The sign background shall be black in color and not illuminated.

The sign shall remain dark until it is energized by power applied through an external contact closure made when there are two trains detected in the vicinity of the crossing at the same time. The power will be applied when two trains are approaching the crossing at the same time. Once energized, the sign shall then alternately display the left train/left arrow and the right train/right arrow in flashing mode (flash frequency and duration of alternate “on” displays to be adjustable) until the power is removed. The standing man and the track and crosswalk lines shall be displayed in steady mode at all times when the sign is energized. The flashing operation shall be controlled by an internal programmable repeat cycle timer.

The sign display shall be clearly visible with the sign images and left/right movements clearly legible at a distance of 60 feet or closer under all ambient light conditions. The unit shall be capable of continuous operation over a temperature range of -35F to +165F and in all weather conditions.

Enclosure and Visor

The overall dimensions of the sign enclosure shall be approximately 36 inches high, approximately 48 inch wide, and maximum 14 inches deep. Overall weight of the assembly, including the enclosure, the visors, mounting fixtures, and all components required for the operation of the sign shall not exceed 225 pounds. The sign housing shall be constructed of extruded aluminum alloy plate of sufficient strength and shall be designed and constructed to prevent deformation or failure when subject to 70 mph wind loads. The housing may be constructed of either single thickness plate or a combination of housing frame and housing plate. Irrespective of the design, overall material thickness of the housing shall be minimum of 0.125 inches. Corner reinforcing shall be used if necessary to maintain the integrity of the sign.

The sign face doors shall contain three over center snap (lockable) stainless steel link locks on the top and shall be connected to the housing on the bottom with a continuous full length (“piano”) stainless steel hinge. The sign face doors shall contain minimum 3/32 inch thick by 3/4 inch wide neoprene door gaskets to provide a weatherproof seal. A visor shall be installed over each sign face to enhance readability. All components shall be readily accessible for maintenance from the front or back of the sign without the use of tools. The entire sign face shall be protected by a 1/8 inch anti-glare polycarbonate lens mounted into the door frames.

Image Detail

The sign display of the images shall be as illustrated on the attached drawing. The train images, and the crosswalk and train track lines shall be formed by a solid array of 0.055 inch diameter fiber optic bundles. The arrows and the standing man images shall be outlined by 0.055 inch diameter fiber optic bundles. Pixel points shall not be farther than 7/16 inch apart (center to center, horizontally and vertically).

The color of the images shall be yellow and shall be provided by a tempered optically correct glass color filter in conformance with the Institute of Transportation Engineers (ITE) specification. It shall be possible to change the color in the field by replacement of the supplied color filters or to replace the color filter without the removal of the sign from mounting. The images shall be displayed in white if the color filter is removed.

Mounting

The warning sign is intended to be hung from a 4-inch diameter horizontal mast arm using two or more mast arm sign mounting fixtures, which shall be centrally located on the top of the housing. The warning sign shall also be affixed, along the bottom of the housing, to a second 4-inch diameter horizontal mast arm using two or more mounting fixtures. The mounting fixtures shall be of sufficient strength and shall be designed and constructed to prevent deformation or failure when the warning sign is subjected to 70 mph wind loads or when the lower cantilever mast is subjected to the dynamic loading of one 200-pound person swinging on the cantilever arm. The Contractor shall submit a detailed shop drawing for the proposed mounting fixtures and mounting fixture arrangement for LACMTA review and approval.

Fasteners

A continuous full length stainless steel (“piano”) hinge shall be attached along the bottom side of the housing and joined to the sign face door in such a manner as to maintain a rain tight and dust resistant seal.

Three “over center snap” (lockable) style latches shall be installed on the top side of the enclosure to hold the sign face door in the closed position and to maintain a rain tight and dust resistant seal.

Electrical Requirements

The number of transformers and quartz halogen lamps used as the light sources for the sign shall be adequate so that the sign display is clearly visible with the sign images and left/right movements clearly legible at a distance of 60 feet or closer under all ambient light conditions.

The transformers shall have a class A insulation and shall operate the lamps. The transformers shall be impregnated with a double coating of epoxy resin or lacquer so as to preclude the intrusion of moisture. The nominal primary input voltage shall be 120 volts AC, and the secondary output shall be 10.8 volts AC under load. Connections for primary wiring shall be made via a barrier terminal strip. All wiring shall be #18 gauge stranded wire with soldered connections. All conductors shall enter the enclosure through the side, and the point of entry for the conductors shall be sealed so that it is rainproof. The lamps shall be quartz halogen, employ an MR16 socket, and be rated at 50W at 12 volts AC with a life expectancy of 8,000 hours or greater.

Fiber Optic Bundles

The images shall be formed by an arrangement of fiber optic light emitting pixel points. The fiber optic bundle transmitting the light shall be manufactured only from high quality step index glass. Plastic fiber ***CAN NOT*** be used. The fiber optic bundles shall be ground smooth and optically polished at the input and output ends for maximum light transmission. At full intensity, the sign shall be visible anywhere within a 60 degree cone of vision centered about the optical axis.

The fiber optic bundles shall be mounted through the sign face from the inside.

Door panels and bundle termination holders shall be colored black to minimize reflectivity. The fiber optic bundles shall be arranged so that all adjacent light emitting pixels in the display of the images shall be fed from two distinct light sources. In the event of failure of one light source, the other shall continue to provide full power to the alternate light points thereby displaying discernible images.

Dimmer

The sign shall be equipped with photoelectric cell mounted on the enclosure to measure the exterior ambient light intensity. The photoelectric cell shall be adjustable for sensitivity. It shall also be adjustable by rotation to avoid direct light. The photoelectric cell shall operate automatically to brighten the intensity of the sign illumination as daylight occurs and diminish the nighttime illumination to one half of the daylight illumination as nighttime occurs.

Terminal Block

All wiring connections in the sign assembly shall terminate on a molded, phenolic, barrier type, terminal block. Power requirements shall be 120 VAC, 5 Amps maximum.

Drawings

The general design of the warning sign shall be as shown in the attached drawings. The details of construction shown in the attached drawings are typical and may be modified subject to approval by the LACMTA. In the event of any discrepancy between the drawings and this specification, the specification shall be considered as the governing document.

Acceptance Tests

The LACMTA shall conduct bench and field tests to verify that the warning sign has been constructed and performs as called for in this specification.

Warranty

The sign shall be unequivocally guaranteed for a period of one year from date that the sign meets all acceptance test requirements and is accepted by the LACMTA. In case of a failure during the warranty period, the manufacturer shall be fully responsible for all expenses involved, including shipping costs, for repair and/or replacement of the sign. Repair and/or replacement of the sign shall be done within 30 days from the date that the failure is reported to the manufacturer.

**<INSERT DESIGN DRAWINGS HERE
TO BE INCLUDED IN FINAL REPORT>**

ATTACHMENT B

BEFORE AND AFTER INSTALLATION PEDESTRIAN CROSSING DATA

TAPE 1

Tape Start: 3–24–00 Friday 12:28 pm
Tape End: 3–26–00 Sunday 1:41 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am				
6-9:30am	353, 357	329, 330, 354	331, 333, 334, 350, 352	332, 335, 351, 356, 361
9:30-3pm	307		308, 358, 360, 362, 364	338, 359, 363
3-6:30pm	314, 313, 315, 317, 318, 319, 320	309, 311, 312	321, 341, 343	339, 342, 344
>6:30pm	328, 349, 346	323	324, 348	325, 327, 345, 347
Pedestrians crossing the tracks less than 15 seconds prior to train coming	308 - 1@SB, 8 sec	312 - 1@NB, 13 sec	333 - 2@NB, 12 sec	325 - 1@SB, 14 sec 356 - 1@SB, 13 sec 359 - 1@SB, 9 sec

TAPE 2

Tape Start: 3–26–00 Sunday 3:07 pm
Tape End: 3–29–00 Wednesday 8:30 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	442	372		
6-9:30am	406, 377, 384, 402, 403, 405, 407, 408, 409, 414, 445, 448, 450	373, 374, 376, 379, 381, 383, 401, 404, 411, 444, 446, 447, 449, 451	400, 417, 419	361, 413, 415, 416, 418
9:30-3pm	420, 424	388	421, 422, 423	385, 386, 386, 387
3-6:30pm	365, 390, 430, 434, 433, 435	431, 436	391, 426, 428, 429	366, 389, 425, 427, 432
>6:30pm	369, 370	371, 395, 437, 441	367, 368, 392, 396, 398, 399	392, 393, 394, 397
Pedestrians crossing the tracks less than 15 seconds prior to train coming	380 - 1@SB, 10 sec 402 - 1@SB, 12 sec 405 - 2@SB, 11 sec 407 - 1@NB, 5 sec 445 - 1@SB, 14 sec 448 - 2@SB, 5 sec	371 - 1@SB, 14 sec 372 - 2@SB, 12 sec 373 - 3@SB, 13 sec 374 - 3@SB, 12 sec 376 - 3@NB, 11 sec 377 - 1@SB, 12 sec 401 - 1@SB, 13 sec 404 - 2@SB, 8 sec 436 - 1@SB, 8 sec 446 - 4@SB, 9 sec 449 - 1@SB, 9 sec		386 - 2@SB, 10 sec 418 - 2@SB, 12 sec

TAPE 3

Tape Start: 3–29–00 Wednesday 8:49 am
Tape End: 3–31–00 Friday 9:10 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am				
6-9:30am	453, 478, 488, 520, 521, 527, 481, 487, 490, 515, 525, 526, 534	452, 477, 489, 492, 516, 519, 528, 531, 532, 533	454, 479, 482, 484, 486, 518, 523, 524, 529	480, 483, 485. 497, 517, 522, 530
9:30-3pm	460, 496, 455, 461, 462	456	457	458, 459, 494
3-6:30pm	465, 470, 504, 467, 468, 472, 506, 510	464, 466, 473, 499, 502, 503, 507, 509	501, 508	463, 500, 505
>6:30pm	513, 514	475, 476, 511, 512	469	
Pedestrians crossing the tracks less than 15 seconds prior to train coming	520 - 1@SB, 14 sec 527 - 1@SB, 6 sec 468 - 1@NB, 6 sec	464 - 3@NB, 11 sec 466 - 3@NB, 5 sec 473 - 1@NB, 11 sec 475 - 2@SB, 10 sec 502 - 1@NB, 13 sec 503 - 2@SB, 12 sec 511 - 1@SB, 12 sec 512 - 2@NB, 11 sec 516 - 2@SB, 11 sec 532 - 1@SB, 13 sec	469 - 4@NB, 12 sec	485 - 4@SB, 14 sec 500 - 2@SB, 10 sec

TAPE 4

Tape Start: 3–31–00 Friday 9:10 am
Tape End: 4–3–00 Monday 8:45 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	559			
6-9:30am	563, 562	564,560		
9:30-3pm	535, 539	565	537	536, 538, 540
3-6:30pm	545, 547, 548, 550, 556	541, 542, 543, 544, 546	548, 551, 554	548, 552, 553
>6:30pm	558, 557			
Pedestrians crossing the tracks less than 15 seconds prior to train coming	560 - 4@SB, 14 sec 545 - 2@SB, 9 sec 547 - 3@NB, 4 sec 557 - 1@NB, 4 sec 562 - 2@NB, 11 sec	543 - 1@NB, 8 sec 544 - 1@SB, 6 sec 546 - 2@SB, 11 sec		

TAPE 5

Tape Start: 4–3–00 Monday 8:45 am
Tape End: 4–6–00 Thursday 2:30 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	668, 710, 669, 670, 671, 672, 674	673,709, 711, 712, 715	667, 713	666, 714
6-9:30am	644, 677, 678, 681, 722, 645, 675, 676, 717, 719, 724	641, 642, 643, 679, 680, 682, 683, 716, 718, 720, 721, 723, 726	727	725
9:30-3pm	650, 693, 728, 647	654, 684	649, 651, 653, 686, 689, 690	648, 652, 685, 687, 688, 691, 692, 729
3-6:30pm	656, 695, 705, 656, 659, 660, 661, 662, 702	655, 657, 658, 694, 696, 697, 703	698, 704	699, 700, 701, 704
>6:30pm			664, 665, 707, 708	663, 706, 707
Pedestrians crossing the tracks less than 15 seconds prior to train coming	695 - 1@SB, 7 sec 645 - 1@SB, 14 sec 659 - 1@SB, 13 sec 662 - 2@SB, 12 sec 674 - 2@SB, 12 sec 675 - 2@SB, 13 sec	643 - 1@SB, 12 sec 654 - 1@SB, 14 sec 657 - 1@NB, 8 sec 680 - 1@SB, 12 sec 694 - 2@SB, 10 sec 696 - 1@SB, 13 sec 707 - 3@NB, 2 sec 711 - 1@SB, 3 sec 716 - 1@SB, 13 sec 718 - 1@SB, 10 sec 720 - 1@SB, 6 sec 721 - 2@SB, 14 sec 723 - 5@SB, 5 sec		652 - 1@SB, 11 sec 687 - 1@SB, 6 sec

TAPE 6

Tape Start: 4–6–00 Thursday 2:30 pm
Tape End: 4–9–00 Sunday 3:15 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	756	753, 791, 806	752, 755, 812	754, 811
6-9:30am	761, 757, 758, 762, 763, 764, 765	759, 792, 794, 795	767, 813	766
9:30-3pm	731, 798,801, 814	730, 769, 804	732, 733, 771, 773, 774, 796, 799, 802	770, 800, 802
3-6:30pm	738, 776, 779, 783, 784, 815, 740, 781, 782, 803	734, 735, 736, 737, 741, 742, 775, 777, 778, 780	743, 806	743, 805, 806, 807, 808
>6:30pm	748, 749, 750, 786, 809, 810	744, 788	745, 787, 789, 790	746, 747, 751
Pedestrians crossing the tracks less than 15 seconds prior to train coming	730 - 2@SB, 3 sec 762 - 1@SB, 14 sec 764 - 1@NB, 4 sec 765 - 1@SB, 7 sec 803 - 1@NB, 10 sec 814 - 1@NB, 11 sec	742 - 1@SB, 13 sec 775 - 1@NB, 12 sec 788 - 1@SB, 10 sec 795 - 2@NB, 12 sec		743 - 2@SB, 8 sec 805 - 1@SB, 10 sec

TAPE 7

Tape Start: 4–9–00 Sunday 3:15 pm
Tape End: 4–14–00 Friday 6:50 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	826, 827	828, 906, 907, 951, 952, 953, 954	950	864, 955
6-9:30am	834, 911, 914, 919, 922, 961, 965, 829, 830, 833, 835, 865, 866, 871, 973, 912, 916, 917, 923, 927, 956, 957, 963	868, 869, 870, 872, 876, 877, 910, 913, 915, 925, 958, 964	831, 837, 838, 875, 918, 921, 924, 926, 959	832, 838, 874, 880, 960
9:30-3pm	840, 889, 891, 892, 893, 894, 897, 934,844, 849, 850, 896	846, 848, 928, 935	841, 843, 847, 886, 888, 895, 931, 932	839, 842, 845, 885, 887, 898, 929, 966, 967
3-6:30pm	855, 859, 900, 902, 904, 942, 945, 852, 860, 899, 938, 943, 944	816, 817, 818, 819, 853, 854, 856, 857, 858, 861, 941	821, 851, 898	819, 821, 898, 903
>6:30pm	823, 948, 946	822, 905	862	824, 863, 947, 949
Pedestrians crossing the tracks less than 15 seconds prior to train coming	826 - 1@SB, 10 sec 827 - 2@SB, 12 sec 835 - 1@SB, 10 sec 850 - 1@SB, 4 sec 860 - 1@SB, 11sec 865 - 1@SB, 9 sec 927 - 2@NB, 8 sec 956 - 1@SB, 11 sec 963 - 1@NB, 11 sec	817 - 1@SB, 7 sec 828 - 1@SB, 14 sec 854 - 1@SB, 5 sec 856 - 3@SB, 12 sec 869 - 1@SB, 9 sec 870 - 1@NB, 13 sec 907 - 1@SB, 11 sec 941 - 1@SB, 11 sec	843 - 3@NB, 12 sec 895 - 2@NB, 10 sec	955 - 1@SB, 11 sec 960 - 2@SB, 14 Sec

TAPE 9

Tape Start: 4–21–00 Friday 4:44 am
Tape End: 4–22–00 Saturday 5:45 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	171	133, 173		170, 172, 175
6-9:30am	139, 140, 146, 135, 143, 145	134, 136, 137, 141, 142, 144	174	176
9:30-3pm	148, 178, 181, 150, 151	155	154, 179, 180, 182, 184, 186, 187, 189	152, 154, 156, 183, 185, 188
3-6:30pm	162, 164, 194	157, 160, 161, 163	158, 165, 191, 193	159, 190, 191, 192
>6:30pm		169	167, 168	166
Pedestrians crossing the tracks less than 15 seconds prior to train coming	150 - 1@SB, 11 sec 151 - 2@SB, 14 sec 162 - 4@SB, 13 sec	134 - 2@SB, 14 sec 136 - 1@SB, 9 sec 157 - 4@SB, 12 sec 161 - 2@SB, 10 sec	184 - 1@NB, 13 sec 193 - 1@NB, 9 sec	183 - 2@SB, 10 sec

TAPE 10

Tape Start: 4–22–00 Saturday 5:45 pm
Tape End: 4–27–00 Thursday 5:55 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am		203, 227, 235	202, 205	204
6-9:30am	233, 230, 232, 237	208, 209, 234	231	206, 207, 229, 231, 236
9:30-3pm	242	213, 215, 238, 239	211, 212, 214, 217, 218, 241	210, 240
3-6:30pm	196, 245, 251, 219	246,248		
>6:30pm	201, 225		197, 199	198, 200, 224, 226
Pedestrians crossing the tracks less than 15 seconds prior to train coming	245 - 1@SB, 13 sec 251 - 1@SB, 10 sec 232 - 1@NB, 6 sec 242 - 1@NB, 8 sec	208 - 1@SB, 12 sec 234 - 1@SB, 13 sec 238 - 2@SB, 10 sec 239 - 1@SB, 10 sec 246 - 1@SB, 7 sec 248 - 2@SB, 13 sec	218 - 1@NB, 8 sec	231 - 1@SB, 13 sec 236 - 1@SB, 13 sec 240 - 1@SB, 7 sec

TAPE 11

Tape Start: 4–27–00 Thursday 5:55 pm
Tape End: 5–4–00 Thursday 9:20 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am				
6-9:30am	449	359, 400, 401, 448, 451	447	428, 429, 430
9:30-3pm	410, 412, 460, 458, 463, 466	402, 403, 456, 432, 434, 462, 465	411, 413, 435, 461	457, 464
3-6:30pm	390, 414, 416, 415, 416, 444, 470	468, 469	417, 443	385
>6:30pm	343, 392, 344, 419, 424, 425	348, 418, 393, 423		345
Pedestrians crossing the tracks less than 15 seconds prior to train coming	343 - 1@SB, 10sec 390 - 2@SB, 10sec 392 - 2@SB, 14sec 344 - 1@SB, 6sec 414 - 1@SB, 12sec 416 - 1@SB, 7sec 424 - 1@SB, 14sec 458 - 1@SB, 7sec	348 - 1@SB, 9sec 359 - 1@NB, 14sec 393 - 1@SB, 9sec 400 - 1@NB, 9sec 448 - 1@SB, 10sec		345 - 2@SB, 12sec 385 - 1@SB, 7sec

TAPE 12

Tape Start: 5–4–00 Thursday 9:20 am
Tape End: 5–11–00 Thursday 9:05 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am		507	538	
6-9:30am	508, 511, 512, 515, 510, 514, 541, 543	509, 513, 542, 559, 560	539, 540, 561	539, 540, 562
9:30-3pm	476, 483, 517, 548, 550, 567, 516, 523	481, 482, 546, 564, 565	473, 474, 475, 478, 480, 518, 520, 521, 545, 549, 566	472, 474, 519, 522, 544, 547
3-6:30pm	494, 495, 527, 529, 491, 524, 526, 552, 554	485, 488, 496, 497, 525, 531	486, 490, 492, 493, 528, 530, 553	487, 551
>6:30pm	499, 501, 506, 505, 537	502, 558	498, 500, 504, 534, 535, 556	503, 532, 536, 555, 557
Pedestrians crossing the tracks less than 15 seconds prior to train coming	494 - 1@SB, 10 sec 495 - 1@SB, 5 sec 524 - 1@NB, 10 sec 552 - 1@SB, 11 sec	481 - 2@SB, 11 sec 482 - 1@SB, 10 sec 488 - 1@SB, 12 sec 502 - 1@SB, 11 sec	549 - 2@NB, 10 sec	547 - 1@SB, 12 sec 555 - 3@SB, 12 sec 530 - 1@SB, 12 sec

TAPE 13

Tape Start: 5–11–00 Thursday 9:05 am
Tape End: 5–20–00 Saturday 10:50 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am		641, 720	643, 677	643
6-9:30am	697, 723, 726, 642, 648, 650, 652 698, 727, 728, 729	644, 647, 649, 651, 653, 679, 721, 722, 725, 734	645, 678, 680, 730, 732	646, 696, 731, 733
9:30-3pm	654, 661, 683, 701, 703, 616, 618, 700, 706, 735	681, 699	613, 615, 617, 656, 658, 684, 685, 702, 704, 707	614, 655, 659, 680, 705, 707
3-6:30pm	619, 623, 663, 622, 631, 632, 662, 666, 667, 668, 669, 689	620, 621, 630, 665, 670	624, 625, 627, 628, 664, 688, 708, 709, 711	626, 629, 710, 712
>6:30pm	638, 673, 675, 713, 718, 635, 674	634, 693, 695, 715, 716	639, 671, 672, 691, 692, 714, 717, 719	637, 690, 671, 694
Pedestrians crossing the tracks less than 15 seconds prior to train coming	623 - 1@SB, 6 sec 661 - 1@SB, 5 sec 701 - 6@SB, 14 sec 622 - 1@SB, 12 sec 631 - 2@NB, 7 sec 650 - 3@SB, 13 sec 668 - 7@NB, 8 sec 669 - 1@SB, 10 sec 700 - 1@SB, 14sec 728 - 1@SB, 13sec	620 - 1@SB, 9 sec 621 - 2@NB, 8 sec 647 - 1@NB, 5 sec 649 - 1@NB, 7 sec 665 - 1@SB, 14 sec	688 - 1@NB, 12 sec 709 - 1@NB, 5 sec	629 - 3@SB, 5 sec 686 - 1@SB, 11 sec 696 - 1@SB, 5 sec

TAPE 14

Tape Start: 5–20–00 Saturday 10:50 am
Tape End: 5–5–00 Thursday 8:45 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	757, 758, 862		823	823
6-9:30am	777, 790, 835, 866, 868, 786, 792, 826, 827, 837, 838, 867, 870, 872	778, 779, 785, 791, 834, 836, 864, 865, 869, 871	759, 782, 784, 829, 830, 832, 874	760, 781, 783, 793, 829, 832, 863, 873, 874
9:30-3pm	748, 762, 763, 770, 771, 799, 801, 846, 746, 747, 773, 795, 878	839, 844, 847, 879	764, 765, 766, 768, 769, 772, 802, 804, 806, 841, 842, 843, 877	745, 761, 767, 796, 798, 800, 803, 806, 840, 845, 876
3-6:30pm	808, 811, 812, 813, 848, 849, 853	774, 809, 850, 852, 854, 881, 882	749, 750, 814, 851, 884	807, 810, 851, 883, 884
>6:30pm	816, 822, 755, 858	756, 860	753, 754, 775, 780, 818, 820, 824, 856, 859	753, 815, 817, 819, 821, 825, 855, 859, 861
Pedestrians crossing the tracks less than 15 seconds prior to train coming	811 - 1@SB, 8 sec 816 - 1@SB, 7 sec 795 - 2@NB, 14 sec 838 - 1@SB, 12 sec 853 - 1@SB, 8 sec 867 - 5@NB, 14 sec	774 - 2@NB, 8 sec 809 - 2@SB, 7sec 839 - 1@SB, 6 sec 854 - 1@SB, 11 sec 881 - 2@NB, 10 sec	775 - 2@SB, 10 sec	761 - 1@SB, 6 sec 803 - 1@SB, 12 sec 817 - 1@SB, 12 sec 825 - 1@SB, 11 sec 784 - 1@NB, 9 sec

TAPE 15

Tape Start: 5–25–00 Thursday 8:45 am
Tape End: 5–30–00 Tuesday 9:30 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	905, 906			986, 6
6-9:30am	911, 914, 989, 15, 907, 969, 7	909, 910, 967, 968, 987, 8, 11, 12, 13, 14	988, 10	908, 912, 9, 10
9:30-3pm	891, 895, 916, 921, 923, 925, 928, 946, 952, 955, 887, 915, 942, 945, 971, 974	917, 941, 992, 993	889, 890, 893, 894, 919, 920, 922, 924, 926, 927, 929, 947, 949, 951, 953, 970, 972, 975, 991	888, 918, 922, 930, 943, 944, 948, 950, 954, 973, 976, 990
3-6:30pm	899, 900, 933, 957, 997, 898, 931, 979, 994, 995	897, 932, 934	896, 956, 958, 960, 978, 982, 999	959, 977, 980, 981, 996, 998
>6:30pm	935, 2, 5, 0	936, 939, 985, 1, 3	937, 938, 962, 963, 965, 983, 4	901, 964
Pedestrians crossing the tracks less than 15 seconds prior to train coming	895 - 1@SB, 12 sec 955 - 3@SB, 12 sec 997 - 1@SB, 14 sec 942 - 1@SB, 6 sec 995 - 1@SB, 8 sec	932 - 1@SB, 11 sec 936 - 1@SB, 11 sec 993 - 3@NB, 8 sec	926 - 1@NB, 6 sec 960 - 2@NB, 10 sec 983 - 3@NB, 8 sec	950 - 3@SB, 14sec 959 - 2@SB, 11 sec 973 - 1@SB, 12 sec 10 - 1@SB, 10 sec 896 - 1@SB, 7 sec

TAPE 16

Tape Start: 5–30–00 Tuesday 9:30 am
Tape End: 6–2–00 Friday 9:30 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	42, 93, 88, 117, 118	89, 90	41	41
6-9:30am	44, 46, 53, 54, 125, 126, 49, 51, 52, 127	43, 48, 50, 94, 119, 120, 122, 123, 124, 128	45, 91, 95, 130	91, 129
9:30-3pm	59, 60, 67, 69, 72, 102, 104, 105, 55, 64, 65, 73, 101, 131	17, 56	16, 57, 61, 66, 68, 70, 103	62, 71
3-6:30pm	76, 78, 81, 110, 79, 90, 109, 111, 112, 114	77, 107	74, 106	75, 108, 113
>6:30pm	40, 82, 86	85	83	39, 87
Pedestrians crossing the tracks less than 15 seconds prior to train coming	86 - 1@SB, 10 sec 109 - 1@SB, 13sec	56 - 1@NB, 6sec 89 - 1@SB, 6sec 107 - 1@SB, 7 sec	66 - 1@NB, 8 sec 74 - 2@NB, 6 sec	41 - 1@SB, 14 sec 71 - 1@SB, 9sec 75 - 3@SB, 6 sec

TAPE 17

Tape Start: 6–2–00 Friday 7:00 pm
Tape End: 6–8–00 Thursday 12:45 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	207, 208, 252, 287, 186, 288	209	187	
6-9:30am	159, 215, 216, 221, 224, 226, 253, 254, 257, 261, 290, 211, 217, 218, 225, 255, 258, 262	188, 210, 214, 223, 256, 259, 260, 289, 291, 292	212, 213, 219	160, 212, 220, 222
9:30-3pm	161, 166, 229, 265, 163, 170, 269, 270	162, 164, 190, 192, 263	191, 195, 197, 227	165, 171, 189, 191, 193, 194, 196, 198, 228, 266, 267, 268
3-6:30pm	246, 248, 281, 203, 204, 240, 245, 273, 276, 277, 279	180, 235, 238, 239, 241, 274, 275, 278	173, 175, 177, 179, 199, 202, 236, 237, 242, 247, 271, 280	172, 174, 176, 201, 205, 237, 243, 244
>6:30pm	154, 251, 282, 283	155, 156, 157, 206, 249, 250, 286	153, 158, 185	158, 184, 284, 285
Pedestrians crossing the tracks less than 15 seconds prior to train coming	154 - 1@SB, 11 sec 163 - 1@NB, 12 sec 170 - 1@NB, 12 sec 240 - 1@SB, 13 sec 245 - 2@SB, 4sec 283 - 2@SB, 12sec	155 - 1@SB, 9 sec 156 - 1@NB, 10 sec 164 - 1@SB, 14 sec 210 - 1@SB, 8 sec 214 - 1@SB, 4 sec 249 - 2@SB, 11 sec 260 - 1@SB, 13sec 289 - 1@SB, 10sec 291 - 1@SB, 12 sec 292 - 2@SB, 12 sec	213 - 1@NB, 9 sec 236 - 2@NB, 6 sec 247 - 1@NB, 10 sec	189 - 1@SB, 10sec 212 - 1@SB, 6sec 244 - 1@SB, 14sec

TAPE 18

Tape Start: 6–8–00 Thursday 12:45 pm
Tape End: 6-12-00 Monday 8:45 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	319			
6-9:30am	324	320, 321, 323, 327		
9:30-3pm		295, 299	297	296, 298
3-6:30pm	300, 303, 306, 307	301, 304, 305	308	
>6:30pm	310, 311, 312	318	315, 316, 317	314
Pedestrians crossing the tracks less than 15 seconds prior to train coming	311 - 1@NS, 8 sec	299 - 1@SB, 12 sec 305 - 2@NB, 13 sec 327 - 1@SB, 7 sec		

TAPE 22

Tape Start: 7–30–00 Sunday 7:24 pm
Tape End: 8–3–00 Friday 5:50 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	963	869, 925	926	926
6-9:30am	832, 840, 842, 881, 887, 888, 931, 932, 936	838, 839, 843, 878, 883, 884, 885, 886, 889, 928, 929, 933, 934, 937	836, 870, 872, 873, 875, 876, 877, 927	837, 871, 874, 876
9:30-3pm	844, 896	890	846, 891, 893, 898, 9000, 904, 905, 938, 940, 941	845, 847, 892, 897, 899, 901, 902, 903, 939
3-6:30pm	855, 906, 911, 912, 944, 947, 948	856, 907, 909, 910, 943, 945, 946, 949	859, 857, 942, 952	858, 857, 913, 942
>6:30pm	830, 861, 862, 863, 924	829, 860, 865, 866, 954	824, 828, 914, 917, 918, 955, 958, 959	864, 915, 916, 919, 920, 921, 923, 956, 957, 960
Pedestrians crossing the tracks less than 15 seconds prior to train coming	832 - 1@SB, 12 sec 911 - 1@SB, 10 sec	885 - 1@SB, 11 sec 886 - 1@SB, 6 sec 925 - 1@SB, 14 sec 943 - 1@SB, 13 sec 954 - 1@SB, 10 sec		837 - 1@SB, 12 sec 874 - 1@SB, 11 sec 902 - 1@SB, 8 sec 919 - 1@SB, 5 sec

TAPE 23

Tape Start: 8–7–00 Monday 5:45 pm
Tape End: 8–11–00 Friday 8:30 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	13, 52	974, 51	91, 92, 93	90, 92
6-9:30am	977, 978, 979, 14, 20, 24, 53, 58	975, 980, 16, 18, 19, 21, 22, 25, 55, 59, 60		15
9:30-3pm		68	66, 67	67
3-6:30pm	75, 77, 80, 83	74	78, 82	78, 79, 81
>6:30pm		965, 984	966, 970, 972, 8, 11, 88	964, 969, 971, 973, 8, 9, 11
Pedestrians crossing the tracks less than 15 seconds prior to train coming	977 - 1@SB, 6 sec 20 - 1@SB, 9 sec 77 - 1@NB, 4 sec	975 - 1@NB, 5 sec 18 - 3@NB, 6 sec 21 - 1@NB, 10 sec		

TAPE 24

Tape Start: 8–11–00 Friday 8:30 am
Tape End: 8–15–00 Tuesday 5:30 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	194			
6-9:30am	106, 142, 195, 197, 199, 202, 205	143, 144, 171, 196	169, 2000, 201, 203	170, 200, 203
9:30-3pm	113, 120, 151		116, 119, 150, 154, 160, 178, 180, 181	115, 118, 152, 155, 159, 179
3-6:30pm	127, 129	128, 130, 133, 186, 187	123, 125	123, 124, 126, 183, 184
>6:30pm	167	141, 192	137, 138, 139, 105, 166, 168, 191	136, 164, 190, 191, 193
Pedestrians crossing the tracks less than 15 seconds prior to train coming	151 - 1@SB, 13 sec	187 - 1@NB, 8 sec 135 - 1@SB, 12 sec		155 - 1@SB, 6 sec 184 - 2@SB, 9 sec

TAPE 25

Tape Start: 8–15–00 Tuesday 5:30 pm
Tape End: 8–21–00 Monday 12:30 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am		264, 317		
6-9:30am	278, 319, 365, 366, 370, 372, 373, 377	277, 279, 280, 281, 361, 362, 367, 369, 374	265, 267, 268, 270, 271, 273, 274, 375	266, 269, 272, 274, 376, 383
9:30-3pm	332, 333, 334, 378, 384	339, 340, 382	292, 294, 295, 298, 299, 300, 326, 327, 336, 338, 380	287, 291, 293, 296, 297, 300, 301, 326, 327, 328, 379, 381, 383
3-6:30pm	251, 305, 345, 348, 350, 352	252, 253, 306, 308, 309, 342, 344, 346, 351	303, 349	302, 304, 349
>6:30pm		260, 261, 314	262, 263, 310, 315, 353, 357, 358, 360	310, 316, 354, 356, 359
Pedestrians crossing the tracks less than 15 seconds prior to train coming	251 - 1@SB, 10 sec 305 - 1@SB, 7 sec 366 - 1@SB, 5 sec	361 - 1@SB, 10 sec		266 - 2@SB, 14 sec 269 - 1@SB, 13 esc 272 - 1@SB, 11 sec 274 - 2@SB, 11 sec 276 - 1@SB, 7 sec 301 - 2@SB, 6 sec

TAPE 26

Tape Start: 8–21–00 Monday 12:30 pm
Tape End: 8–25–00 Friday 1:20 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	432,500			
6-9:30am	410, 411, 433, 449, 453, 454, 458, 502, 455, 457, 501, 507	405, 406, 407, 409, 444, 448, 451, 452, 456, 504, 505, 506, 508	412, 445, 446, 503	404, 412, 445, 447
9:30-3pm	416, 466, 509, 513, 414, 467	387, 389, 510	388, 418, 460, 462, 464, 465, 512	413, 417, 419, 459, 461, 463, 511
3-6:30pm	391, 396, 479, 519, 392, 393, 394, 421, 422, 481, 484, 487, 522, 523	390, 395, 424, 425, 480, 482, 483, 486, 488, 489, 514, 515, 524, 525, 526, 531	397, 423, 468, 470, 474, 475, 477, 478, 516, 520, 527, 528, 529, 530	398, 471, 473, 476, 478, 517, 518, 521
>6:30pm	400, 426, 436, 439, 440, 441, 494, 430, 431, 491	399, 428, 429, 432	401, 403, 427, 432, 433, 437, 438, 490, 492, 495, 533	401, 427, 434, 435, 493, 496, 498
Pedestrians crossing the tracks less than 15 seconds prior to train coming	414 - 1@SB, 14 sec	395 - 1@SB, 14 sec 406 - 1@SB, 8 sec 424 - 1@SB, 10 sec 451 - 3@SB, 12 sec 480 - 10@NB. 10 sec 504 - 1@SB, 9 sec 505 - 1@SB, 9 sec 532 - 1@SB, 9 sec		445 - 1@SB, 14 sec 473 - 1@SB, 6 sec 478 - 2@SB, 10 sec 518 - 2@SB, 8 sec

TAPE 27

Tape Start: 8–25–00 Friday 1:20 pm
Tape End: 8–29–00 Tuesday 8:45 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am				
6-9:30am	558, 592, 600, 569, 590, 594, 596, 597, 598, 599	570, 588, 589, 591, 595, 601	556, 568, 571, 593, 602	557, 567, 603
9:30-3pm	608, 559, 560	607, 609	573, 575, 577, 606	572, 574, 575, 576, 604, 605
3-6:30pm	542, 561, 562, 583, 610, 616, 618, 539, 540, 544, 545, 612, 614, 617	541, 543, 578, 611, 613, 615	537, 580, 582	535, 538, 579, 581
>6:30pm	547, 550, 554, 565, 566, 623, 625, 631, 632, 552, 555, 584, 624, 626, 628, 629, 630, 636	627, 633, 634, 635, 637, 638	548, 549, 563, 564, 585, 620, 622	551, 553, 585, 586, 587, 619, 621
Pedestrians crossing the tracks less than 15 seconds prior to train coming	542 - 2@SB, 14 sec 616 - 1@SB, 12 sec 544 - 7@SB, 10 sec 552 - 1@SB, 10 sec	543 - 1@SB, 10 sec 588 - 1@SB, 11 sec 591 - 2@SB, 10 sec 611 - 1@SB, 12 sec 637 - 1@SB, 11 sec 638 - 1@SB, 9 sec		604 - 1@SB, 12 sec

TAPE 28

Tape Start: 8–29–00 Tuesday 8:50 am
Tape End: 9–5–00 Tuesday 9:20 am

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am				
6-9:30am	678, 683, 684, 757, 681, 688, 689, 690, 692, 716, 717, 730, 754, 755	679, 680, 682, 685, 691, 694, 715, 720, 721, 722, 723, 724, 725, 726, 728, 729, 752, 753, 756	688, 693, 718, 719	686, 687, 693, 718, 719
9:30-3pm	738, 640, 731, 736, 758	642, 644, 656, 695, 759	645, 647, 649, 696, 697, 699, 733, 735, 737, 760	643, 646, 648, 650, 652, 698, 732, 734, 761, 762, 763
3-6:30pm	670, 664, 701, 739, 740, 741, 742	659, 660, 662, 663, 665, 666, 667, 669, 700	653, 655, 657, 658, 668, 744, 746	654, 658, 745
>6:30pm	673, 676, 703, 704, 711, 713, 675, 714, 750, 751	702, 747, 748	672, 706, 708, 709	671, 674, 707, 710, 749
Pedestrians crossing the tracks less than 15 seconds prior to train coming	757 - 2@SB, 8 sec 692 - 1@SB, 6 sec 716 - 3@NB, 11 sec	644 - 2@NB, 10 sec 656 - 1@NB, 9 sec 702 - 1@SB, 12 sec 715 - 2@SB, 11 sec 748 - 1@SB, 8 sec 752 - 1@SB, 14 sec 753 - 2@SB, 10 sec	746 - 2@SB, 11 sec	648 - 1@SB, 10 sec 671 - 1@SB, 14 sec 719 - 1@SB, 9 sec

TAPE 34

Tape Start: 5-20-01 Sunday
Tape End: 5-23-01 Wednesday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	283, 329, 234, 281	318,382		280
6-9:30am	238, 240, 283,285, 288, 336, 338,340, 344, 345, 235,243,244,245,291, 341,342	236,237,239, 241,242, 246,284,286,287,290, 292, 293, 295,335,337,339,314,343	230,232,233,234,	247, 331
9:30-3pm	250, 255, 298, 251		227, 248, 249, 252, 253, 254, 258, 308, 309, 301, 303, 305,307, 308,309	226,228,256, 257296, 297, 300, 302, 304,306
3-6:30pm	267, 231,261, 264, 267, 314, 318, 230, 263, 265, 275, 317	229, 259, 262, 266, 313, 315, 316,373,374,319	271, 232,260,311,312,320	269,270, 272,310
>6:30pm	234, 278, 279, 321,327	233	225	322,323
Pedestrians crossing the tracks less than 15 seconds prior to train coming	283-3 @ SB, 12 sec 288-1 @ SB, 7sec 288-2 @ SB, 10sec 298-2 @ SB, 10 sec 243-2 @ NB, 8 sec 251-2 @ NB, 7sec 317-1 @ SB, 11sec 251-2 @ NB, 7 sec 327-1@ SB, 13 sec	328-1 @ SB, 13 sec 328-1 @SB, 7 sec 335-2 @ SB, 14 sec 337-1 @ SB, 9sec 239-1 @ SB, 12 sec 274-1 @SB, 11 sec 290-1 @ SB, 11 sec 314-1 @ SB, 13 sec 314-1@SB 15 sec 315-2 @ SB, 11 sec 339-2 @ SB, 6 sec 343-1 @ SB, 11 sec	234-1 @ NB, 9 sec	226-1@ SB, 7 sec 228-1@SB, 10 sec 269-1 @ SB, 8 sec 300-2@ SB, 8 sec 302-3 @ SB 14sec

TAPE 35

Start: 5-23-01 Wed 8:30 am
End: 5-24-01 Thursday 12:40 pm

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	370		368	
6-9:30am	373, 349, 371, 372	348, 379	360, 377, 380, 383	374, 375, 376, 378, 381, 382, 384, 385
9:30-3pm	353,355	356		351,354
3-6:30pm		357, 358, 359, 360, 362		
>6:30pm	363, 364		366	365, 367, 369
Pedestrians crossing the tracks less than 15 seconds prior to train coming	370-1 @ SB, 7 sec 370-1 @ SB, 14 sec	359-1 @ SB, 14 sec		374-1@ SB, 1 sec

TAPE 36

Tape Start: 5-24-01 Thursday
Tape End: 5-28-00 Monday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am			475	409
6-9:30am	426, 419, 420, 422, 449, 461	410, 412, 423, 424, 462	451, 452	411, 450
9:30-3pm	463, 479	477, 476	388, 389, 391, 393, 434, 454, 464, 466	388, 390, 392, 453, 465,
3-6:30pm	395, 401, 403, 439, 458, 396, 397, 437, 443	398, 399, 400, 435, 436, 438, 440, 441, 442, 471	394, 355, 356, 357	458, 467, 468, 470, 456
>6:30pm	447, 404, 446			444, 459
Pedestrians crossing the tracks less than 15 seconds prior to train coming	403-1@ SB, 11 sec 403-1@ SB, 12 sec 463-1 @ SB, 11 sec 419 -1 @ SB, 8 sec 437-1 @ NB, 13 sec 472- 3 @ NB, 7 sec	398-2 @ SB, 13 sec 436-1 @ SB, 15 sec 477-1 @ SB, 6 sec 477-1 @ SB, 11 sec	394-3 @ NB, 8 sec 455-2 @ NB, 2 sec 456-1 @ NB, 13 sec	388-2 @ SB, 9 sec 394-2 @ SB, 7 sec 455-2@ SB, 8 sec 411-1 @ SB, 3 sec 411-1 @ SB, 15 sec

TAPE 37

Tape Start: 5-28-01 Monday
Tape End: 5-31-01 Thursday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	541, 502, 493, 503, 585	504	586	
6-9:30am	510, 588, 545, 547, 590, 592, 507, 508, 514, 543, 546, 548, 556, 552, 553, 557, 593, 594, 596	505, 506, 509, 511, 512, 544, 549, 550, 551, 551, 558, 559, 589, 595	513, 542, 555, 591	554
9:30-3pm	568, 572, 573, 515	518, 571	481, 582, 584, 516, 517, 519, 560, 563, 566, 567	480, 482, 483, 562, 564, 565, 569, 570
3-6:30pm	488, 525, 528, 574, 578, 485, 521, 524, 526, 531, 577	489, 527, 529, 534, 575, 576	487, 530, 532, 579	486, 522, 530, 533
>6:30pm	536, 490, 497, 498, 501, 535, 537, 580, 581	491, 500	494, 496, 499, 538	492, 495, 538, 540, 582, 585
Pedestrians crossing the tracks less than 15 seconds prior to train coming	488-1 @SB, 13 sec 536-1 @SB, 13 sec 545-1 @ SB, 13 sec 590-3 @ SB, 11 sec 590-2 @ SB, 8 sec 592-1 @ SB- 13 sec 524-2 @ SB, 10 sec 524- 2 @ SB, 12 sec 531- 1 @ NB, 9 sec 594-1 @ SB, 15 sec 596 -1 @ NB, 5 sec 496-1 @ NB, 7 sec	571-3 @ NB, 15 sec 589-1 @ NB, 7 sec		

TAPE 38

Start: 5-31-01 Thursday
End: 6-4-01 Monday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	628, 627			
6-9:30am	634, 638, 630, 665, 701, 597,598, 629, 631, 636, 637, 698, 713, 715, 720, 721	632, 633, 635, 639, 664, 666, 714, 716, 719	600, 697, 699, 716, 722	590,600, 602, 640, 668, 696, 700, 717, 723, 724
9:30-3pm	683, 702, 708, 682, 709, 710	741	603,604,606,608,610, 670, 671, 674, 676, 678, 680, 705, 706	605, 607, 609, 611, 672, 673, 675, 677, 679, 681, 704
3-6:30pm	620, 625, 626, 617, 624, 647, 649	616, 618, 619, 621, 622, 643, 648, 650, 651, 652, 687	613, 615, 623, 644, 654, 655, 684	614, 645, 653, 654, 685, 686, 688, 689, 690
>6:30pm	660, 656, 657, 692		659, 662, 663, 691, 711, 712	658, 661
Pedestrians crossing the tracks less than 15 seconds prior to train coming	665- 1 @ SB, 10 sec 683-5 @ SB, 11 sec	632-1 @ SB, 11 sec 639-1 @ SB, 13 sec 643-1 @ NB, 8 sec 648-1 @ NB, 13 sec 718-1 @ SB, 14 sec	606-2 @ NB, 11 sec 654-8 @ NB, 5 sec 654-6 @ NB, 7 sec 697-1 @ NB, 14 sec 697-1 @ NB, 10 sec	645-1 @ SB, 8 sec 653-1 @ SB, 7 sec 608-1 @ SB, 10 sec 686-2 @ SB, 14 sec 717-1 @ SB, 9 sec 724-1 @ SB, 13 sec

TAPE 39

Start: 06-04-01 Monday
End: 06-07-01 Thursday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am		758	835	891, 834, 837
6-9:30am	761, 795,840, 727, 762, 769, 796, 841	759, 760, 763, 765, 767, 770, 792, 793, 797, 797, 799, 838, 839, 842, 843, 844	764, 794, 800, 802	726, 798, 801
9:30-3pm	742, 818, 738, 730, 743, 804, 805, 811, 819	728, 773,812, 817	729, 733, 735, 739, 772, 775, 778, 814, 815	731, 734, 736, 737, 774, 777, 778, 803, 807, 808, 813, 816
3-6:30pm	809, 822, 748, 755, 782, 783, 786, 821	744, 746, 753, 754, 756, 779, 780, 781, 823	749, 750, 752, 784, 810	749, 751, 782, 785, 787
>6:30pm	824, 826	789, 825	790, 831	788, 827, 829, 830, 832
Pedestrians crossing the tracks less than 15 seconds prior to train coming	738-1 @ SB, 10 sec 761-2 @SB, 5 sec 761-3 @SB, 8 sec 761-5 @SB, 10 sec 727-1 @ SB, 14 sec 755-1 @ SB, 10 sec 755-1 @ SB, 13 sec 762-1 @ SB, 14 sec 782-3 @ NB, 6 sec 805-1 @ SB, 12 sec 819-1 @ SB, 7 sec	754-3 @ SB, 12 sec 760-1 @ SB, 10 sec 760-1 @ SB, 11 sec 780-1 @ SB, 6 sec 823-1 @ NB, 7 sec 843-1 @ SB, 9 sec 843-1 @ SB, 11 sec	737-3 @ NB, 11 sec 815-1 @ NB, 12 sec	735-1 @ SB, 14 sec 751-1 @ SB, 12 sec 778-2 @ SB, 14 sec 803-1 @ SB, 13 sec 803-1 @ SB, 5 sec

TAPE 40

Start: 06-11-01 Monday
End: 06-15-01 Thursday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	68, 991, 27, 69	28	70, 22	992, 71
6-9:30am	33, 36, 993,994, 995, 997, 972, 996, 998, 1, 34, 35, 38	971, 973, 974, 999, 1000, 29, 30, 31, 32, 39, 77, 78, 79, 80		40
9:30-3pm	5, 4, 46	7, 39	975, 3, 6, 8, 9	976, 4, 47
3-6:30pm	60, 51, 61	10, 12, 13	11, 14	986, 14, 15
>6:30pm	987, 17, 62, 63	18, 64	21, 22	986, 988, 989, 19, 20, 65, 66, 67
Pedestrians crossing the tracks less than 15 seconds prior to train coming	60-1 @ SB, 11 sec 996-1 @ SB, 9 sec 17-1 @ SB, 7 sec 17-1 @ SB, 9 sec 27-1 @ SB, 10 sec 69-1 @ SB, 12 sec	971-1 @ SB, 14 sec 10-1 @ SB, 14 sec 12-1 @ SB, 13 sec 18-1 @ NB, 8 sec 80-2 @ NB, 11 sec 80-1 @ NB, 10 sec		

TAPE 41

Start: 06-14-01 Thursday
End: 06-18-01 Monday

Time Slots	SB LRT Then NB LRT	NB LRT Then SB LRT	UPRR and NB LRT	UPRR and SB LRT
<6:00 am	162	205	163, 187, 206, 208	207
6-9:30am	82, 86, 118, 119, 130, 190, 83, 114, 120, 131	85, 115, 122, 126, 191	116, 117, 121, 122, 124, 125, 128, 129, 132	87, 123, 127, 129, 133, 189
9:30-3pm	171, 97, 98	168, 169, 195	88, 92, 96,139, 143, 144, 145, 146, 170, 174, 175, 177, 192, 194	90, 91,94, 95, 172, 173, 176, 193, 196
3-6:30pm	101, 152, 99, 100, 105, 106, 148, 151,153, 179	102, 104, 149, 150	197, 200	147, 178, 181, 198, 199
>6:30pm	154, 108, 100, 201	160, 202, 204	110, 111,112, 156, 184, 186	107, 155, 161, 183, 185, 203
Pedestrians crossing the tracks less than 15 seconds prior to train coming	154-1 @ SB, 11 SEC 152-2 @ SB, 14 SEC 100-2 @ NB,9 SEC 105-2 @ NB, 6 SEC 106-1 @ SB, 11 SEC 106-1 @ NB, 7 SEC 114-1 @NB, 10 SEC 131- 1 @ SB, 9 SEC 153-1 @ NB, 14 SEC 153-2 @ NB, 11 SEC 153-1 @ NB, 10 SEC	169-4 @ SB, 9 SEC 169-1 @ SB, 12 SEC 202-2 @ SB, 12 SEC 150-1 @ SB, 10 SEC 150-1 @ SB, 12 SEC	92-1@ NB, 8 SEC 96-10 @ NB, 9 SEC 117-1 @ NB, 9 SEC 200-2 @ SB, 7 SEC 200-6 @ NB, 10 SEC	107-1 @ SB, 5 SEC 181-1 @ SB, 12 SEC 183-1 @ SB, 7 SEC

ATTACHMENT C

BEFORE INSTALLATION INTERCEPT SURVEY QUESTIONNAIRE

ATTACHMENT D

AFTER INSTALLATION INTERCEPT SURVEY QUESTIONNAIRE