Selected Appendices for TCRP Report 137: Improving Pedestrian and Motorist Safety Along Light Rail Alignments

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APPENDIX B LITERATURE REVIEW – STATE OF THE KNOWLEDGE

This Literature Review presents the findings of a the project team's efforts to collect, review, and summarize published and unpublished information from United States and foreign LRT systems relevant to safety measures, devices, and practices on LRT alignments. The safety considerations include at-grade crossings, stations, and all aspects of safety that will enhance safety for pedestrians, cyclists, motor vehicles, and LRT passengers.

Wherever possible, the text describes the application of the treatment, practice or measures taken to improve safety, the quantified safety impacts in terms of changes to collisions, and any potential caveats that could affect the transferability of the results to other systems. Where quantified information is limited, anecdotal evidence of safety improvements and resulting changes to surrogate measures are also described in detail. The information collected here was carried forwarded into the applicable chapter of the report. Information about specific treatments was used, along with a number of other sources, to detail the Catalog of Treatments, shown in Chapter 5.

To obtain the information required for the literature review, the project team searched the following databases for relevant references:

- Personal and organization libraries of research team members;
- Institute of Transportation Engineers (ITE) digital library;
- Transportation Association of Canada (TAC) library catalogue;
- Transportation Research Information Services (TRIS);
- International Road Research Database (IRRD);
- Organization of Economic Cooperation and Development Library (OECD);
- Federal Transit Administration (FTA) publications;
- National Transit Database Safety and Security Reports;
- Historical National Transit Database (NTD);
- American Public Transportation Association publications (APTA); and
- The European Commission's Transport website (http://ec.europa.eu/transport/index_en.html).

In addition to searching these sources, the research team attempted to obtain unpublished documents through contacts at various North American LRT systems, the Federal Transit Administration (FTA), the TRB Committee on Light Rail Transit (AP075) and the APTA Rail Transit Standards Operating Practices Committee. Although some contacts provided reports, these reports were already reviewed during the initial literature review. As a result, no unpublished documents were added to the material.

This literature review represents a continuation of previous TCRP research that focused on LRT systems with light rail vehicles (LRVs) operating at speeds less than 55 km/h (35 mph), published as TCRP Report 17, and LRVs operating at speeds greater than 55 km/h (35 mph), published as TCRP Report 69. The system of classifying LRT alignments developed and used in those two previous studies is shown in **Table 1**.

The three basic alignment classes are as follows (1):

1. Type a. Exclusive alignments use full grade separation of both motor vehicle and pedestrian crossing facilities, thereby eliminating grade crossings and operating conflicts and maximizing safety and operating speeds;
2. Type b. Semi-exclusive alignments use limited grade crossings, thereby minimizing conflicts on those segments where conflicts cannot be eliminated entirely. Operating speeds on segments other than those where automatic crossing gates are installed are governed by vehicle speed limits on the streets or highways. On segments of this type of alignment where the right-of-way is fenced, operating speeds are maximized, but these higher speeds are typically maintained only for short distances, often on segments between grade crossings; and
3. Type c. Non-exclusive alignments allow for mixed flow operation with motor vehicles or pedestrians, resulting in higher levels of operating conflicts and lower-speed operations. These alignments are often found in downtown areas where there is a willingness to forgo operating speeds in order to access areas with high population density and many potential riders.

TCRP Report 69 provides more detailed descriptions of each sub category (2).

Table 1: LRT Alignment Classification

Class	Category	Description of Access Control
Exclusive	Type a	Fully grade separated or at-grade without crossings
Semi-exclusive	Type b.1	Separate right-of-way
	Type b.2	Shared right-of-way, protected by barrier curbs and fences (or other substantial barriers)
	Type b.3	Shared right-of-way, protected by barrier curbs
	Type b.4	Shared right-of-way, protected by mountable curbs, striping and/or lane designation
	Type b.5	LRT/pedestrian mall adjacent to parallel roadway
Non-exclusive	Type c.1	Mixed traffic operation
	Type c.2	Transit-only mall
	Type c.3	LRT/pedestrian mall

Source: TCRP Report 69 (2)

Korve et al. (1) provide a safety overview of the different LRT alignments. According to Korve et al. (1), exclusive (type a) or semi-exclusive rights-of-way on separate alignments (type b.1) should be encouraged because analysis based on 10 transit systems found that most collisions (92%) occur in shared rights-of-way under 35 mph even though these alignments accounted for the smallest percentage of the total system mileage (31%). This is because shared rights-of-way have the greatest potential for conflicts. Segregated rights-of-way maximize speed, capacity, and reliability while also minimizing interferences and conflicts with motor vehicles and pedestrians. Where physical or cost considerations require operation in shared rights-of-way, the amount of physical separation from motor vehicles and pedestrians should be maximized.

Based on these safety considerations, the following sequence for route alignment choices in order of desirability has been suggested (*1*):

- Exclusive alignment (type a)
- Separate right-of-way (type b.1)
- Median alignment protected by barrier curbs and/or fences (types b.2 and b.3)
- Median alignment protected by mountable curbs and striping (type b.4)
- Operation in reserved transit malls or pedestrian areas (types b.5, c.2, and c.3)
- Operation in mixed traffic (type c.1)

The sequence for route alignment choice provided above is based on safety considerations, however, there are other consideration in choosing light rail transit alignments. Type A alignments, where the LRT is completely separated from the road and pedestrian network allow LRVs to reach high speeds, but may be difficult to access from surrounding areas. These types of alignments are most often served by park-and-ride lots or by bus. Type B and type C alignments provide more direct access to a variety of land uses (3).

The literature review is divided into eight sections. **Section 1** describes the documented safety impact of changes made to general elements (such as operating speeds) related to LRT system design and operations. **Section 2** documents the safety impacts of commonly used treatments and practices. The first four sub-sections discuss passive treatments and the second four sub-sections discuss active treatments. The sub-sections include sections which give special attention to pedestrian issues. **Section 3** discusses education and enforcement efforts. **Section 4** discusses common practices being implemented by various transit agencies. **Section 5** outlines new technologies being put into practice by North American transit agencies operating LRT systems. **Section 6** summarizes the findings of safety studies related to stop and terminal design. **Section 7** summarizes accident data found in the references reviewed. **Section 8** draws attention to the gaps in knowledge revealed by the literature review.

1 - SAFETY IMPACT OF SYSTEM DESIGN AND OPERATIONS

TCRP Report 17 focused on LRT alignment types b.3 through b.5 and c.1 through c.3, where LRVs operate in streets with motor vehicles (and bicycles) or in malls with pedestrians at speeds less than or equal to 55 km/h (35 mph) *(1)*. The vast majority of the LRT systems provide a portion of their operation on-street in mixed traffic, shared rights-of-way (in which LRVs operate on, adjacent to, or across city streets at low to moderate speeds), and LRT/pedestrian malls. Most have some at-grade crossings even when operating on separate rights-of-way. An exception is Los Angeles Green Line that was open after the report was prepared.

The authors reviewed the results of a survey of 10 transit agencies and developed a list of common safety-related problems faced by LRT agencies. These problems dealt with LRT alignments where the transit vehicles operate at lower speeds and there is generally a higher level of interaction between the LRVs and pedestrians, cyclists and motorists. The authors also identified treatments, devices and practices that could potentially be applied to counter the safety problems, as shown in **Table 2**. The report did not provide information quantifying safety improvements following the implementation of the treatments.

Table 2: Proposed treatments to common safety-related problems along LRT alignments - Operating speeds < 55 km/h (35 mph)

	Problem	Possible Solution
1	Pedestrian Safety	
	Trespass on tracks	Install fence Install sidewalk, if none exists
	Jaywalk	Install fence/barrier between tracks, or to separate LRT r-o-w Provide outside landscaping, bollards, barriers
	Station and/or cross-street access	Define pedestrian pathways Provide adequate storage/queuing space Design station to preclude random crossings of tracks Install safety islands Install pedestrian automatic gates, bedstead barriers, and Z-crossings
2	Side-Running Alignment	Operate LRVs with headlights on and use audible devices Close driveways especially through land use changes Prohibit conflicting left or right turns by parallel traffic Provide separate turning lanes and phases for conflicting traffic Provide LRV-only signal phase Provide a comfort zone between dynamic envelope and curb Replace side-running with median operations
3	Vehicles Operating Parallel To LRT R-O-W Turning Left Across Tracks	
	Illegal left turns	Provide left-turn phase after through LRV phase

	Problem	Possible Solution
		Limit multiple LRV preemptions within same cycle Install active TRAIN APPROACHING signs
	Protected left-turn lanes with signal phases	Install active TRAIN APPROACHING sings Improve enforcement (e.g., photo enforcement)
4.	Traffic Control	
	Passive turn restriction sign violations	Install active signs Improve enforcement
	Active turn restriction sign violations	Provide distinctive LRT signals that are placed at separate locations
	Confusing traffic signal displays	Louver or optically program out conflicting signal indications Delineate dynamic envelope by contrasting pavement color and/or texture or paint
	Poor delineation of dynamic envelope	
5	Motor Vehicle On Tracks	Install NO VEHICLES ON TRACKS signs Pave tracks with different texture/paint Pave tracks at slightly different elevation (e.g., 4th above tracks)
6.	Crossing Safety (Right-Angle Accidents)	Increase all-red clearance intervals for cross-street traffic Modify or limit LRV preemption to maintain cross-street progression Provide photo enforcement
7.	Poor Intersection Geometry	Simplify roadway lane geometries Use traffic signals or other active controls to restrict motor vehicle movements while LRVs cross

Source: TCRP Report 17 (1)

TCRP Report 69 investigated the safety and operating experience of LRT systems with light rail vehicles (LRVs) operating on semiexclusive rights-of-way at speeds greater than 55 km/h (35 mph) (2). For the purposes of the present research and to maintain consistency with TCRP Reports 17 and 69, “higher speed LRT rights-of-way” are defined as those alignments on which light rail vehicles operate at speeds greater than 55 km/h (35 mph).(1,2) Because TCRP 69 was restricted to higher speed LRT rights-of-way, the large majority of the crossings and LRT alignments examined in TCRP 69 were equipped with flashing lights and automatic gates.

The TCRP 69 study was based on interviews with LRT agency officials, field observations, and analysis of accident records and accident rates on 11 LRT systems in the United States and Canada (2). The 11 LRT systems were located in Baltimore, Calgary (Canada), Dallas, Denver, Edmonton (Canada), Los Angeles, Portland, St. Louis, Sacramento, San Diego, and San Jose. A survey carried out as part of the study found a wide variation in operating practices, safety issues and concerns, accident experience, and innovative safety features among the LRT systems. This finding reflected the different situations and contexts at LRT crossings, and the varying warning systems and traffic control devices for LRT crossings found in the different systems and among different portions of the same system.

Korve et al. compared TCRP Reports 17 and 69 and concluded that higher speed LRT crossings (where LRVs operate at speeds greater than 55 km/h (35 mph)) experience fewer overall accidents than the types of LRT alignments addressed in TCRP Report 17. The improved accident experience at LRT crossings along Type b.1 and b.2 rights-of-way was primarily attributed to the reduced level of interaction between LRVs and motor vehicles, bicycles, and pedestrians compared with street or mall-type alignments (2).

Korve et al. identified a number of common safety-related problems faced by LRT agencies and cited several treatments, devices and practices to counter these problems. These are summarized in **Table 3**. The report provided no information with respect to quantifying safety improvements following the implementation of the treatments (2).

Table 3: Proposed treatments to common safety-related problems along LRT alignments - Operating speeds > 55 km/h (35mph)

	Issue	Possible Solution
1.	System Division	
	Vehicles driving around closed automatic gates	Install raised medians with barrier curbs Install channelized devices (traffic dots or flexible posts) Install longer automatic gate arms Photo-enhancement Four quadrant gates For parallel traffic, install protected signal indications or LRV-activated No Right/Left-turn signs (R3-1, 2) For parallel traffic, install turn automatic gates Install and monitor at a central control facility a Supervisory Control and Data Acquisition (SCADA) system
	LRV operator cannot visually confirm if gates are working	Install gate indication signals or in-cab wireless video link
	Slow trains share tracks/crossings with LRVs & near side LRT station stops	Constant Warning Time Use gate delay timers
	Motorists disregard for regulatory signs at LRT crossings and grade crossing warning devices	Avoid excessive use of signs Photo-enforcement
	Motor vehicles queue back across LRT tracks from a nearby intersection controlled by STOP signs (R1-1)	Allow free-flow (no – STOP sign) off the tracks or signalize intersection and interconnect with grade crossing
	Sight distance limitations at LRT crossings	Maximize sight distance by limiting potential obstructions to 1.1 m (3.5 ft.) in height within about

	Issue	Possible Solution
		30 to 60 m (100 to 200 ft.) of the LRT crossing (measured parallel to the tracks back from the crossing)
	Motor vehicles queues across LRT tracks from downstream obstruction	Install "Do Not Stop on Tracks" sign Install Keep Clear Zone Striping Install Queue Cutter Signal
	Automatic gate and traffic signal interconnect malfunctions	Install Plaque at crossing with 1-800 phone number and crossing name and/or identification number
2.	System Operations	
	Freight line converted to, or shared with, light rail transit	For new LRT systems, initially operate LRVs slower, then increase speed over time
	Accidents occur when second LRV approaches pedestrian crossing	When practical, first LRV slows/stops in pedestrian crossing, blocking pedestrian access until second, opposite direction LRV enters crossing
	Motorists disregard grade crossing warning devices	Adequately maintain LRT crossing hardware (e.g., routinely align flashing light signals) and reduce device "clutter"
3.	Traffic Signal Placement and Operation	
	Motorists confused about apparently conflicting flashing light signal and traffic signal indications	Use traffic signals on the near side of the LRT crossing (pre-signals) with programmable visibility or louvered traffic signal heads for far side intersection control Avoid using cantilevered flashing light signals with cantilevered traffic signals
	Track clearance phasing	Detect LRVs early to allow termination of conflicting movements (e.g., pedestrians)
	Excessive queuing near LRT crossings	Use queue prevention strategies, pre-signals
	Turning vehicles hesitate during track clearance interval	Provide protected signal phases for through and turning motor vehicles
	Vehicles queue back from closed gates into intersection	Control turning traffic towards the crossing
	LRT crosses two approaches to a signalized intersection (diagonal crossing)	Detect LRVs early enough to clear both roadway approaches and/or use pre-signals or queue cutter signals Delay the lowering of the gates which control vehicles departing the common intersections

	Issue	Possible Solution
	Motorist confused about gates starting to go up and then lowering for a second, opposite direction LRV	Detect LRVs early enough to avoid gate pumping (also allows for a nearby traffic signal controller to respond to a second LRV preemption) At near side station locations, keep gates raised, until LRV is ready to depart
	LRT versus emergency vehicle preemption	At higher speed LRT crossings (speeds greater than 55 km/h (35 mph), LRVs receive first priority and emergency vehicles second priority
	Turning motorists violate red protected left-turn indication due to excessive delay	Recover from preemption to phase that was preempted
	With leading left-turn phasing, motorists violate red protected left-turn arrow during preemption	Switch from leading left-turn phasing to lagging left-turn phasing
4.	Automatic Gate Placement	
	At angled crossings or for turning traffic, gates descent on top of or behind motor vehicles	Install gates parallel to LRT tracks Install advanced traffic signal to control turning traffic
5.	Pedestrian Control	
	Limited sight distance at pedestrian crossing	Install pedestrian automatic gates (with flashing light signals and bells (or alternative audible device)
	Pedestrians dart across LRT tracks without looking	Install warning signs Install swing gates

Source: TCRP Report 69 (2)

Some LRT systems include rail and road tunnels to avoid steep grades or to provide access to certain activity centers. The tunnel portals link the tunnel with the adjacent street environment and should be designed to minimize confusion among other road users. TCRP Report D-09 recommends that LRT alignments be more exclusive as they approach portals (4)

2 - COMMON PHYSICAL TREATMENTS AND CONTROL DEVICES

Common treatments and control devices for improving the safety of LRT systems can be grouped into two broad categories: passive treatments and active treatments. The passive treatments are discussed first: path delineation, signs, barriers, curbs and fencing, and passive treatments used to improve pedestrian safety. The active treatments are discussed next: gates and barrier devices, pre-signals/advance signals, LRT-activated warning signs, and active treatments used to improve pedestrian safety.

In practice, many treatments are applied in combination. The combinations may include both active and passive treatments. As a result of this, there is some overlap in the discussion.

Pedestrian issues are given special attention because interactions between pedestrians and LRVs are substantially different than those between motorists and LRVs. The purpose of pedestrian crossing devices is to make pedestrians aware of the presence of the LRV and/or to prevent pedestrians from crossing at inappropriate times. In general, however, motorists tend to be aware of their environment, while pedestrians, walking along on protected sidewalk areas, may not give traffic considerations their full attention (5). When crossing the travel path of motor vehicles or LRVs, pedestrians are expected to increase their level of attention to a level similar to that of motorists or LRV operators, but this increase in attention does not always occur.

Devices designed to warn pedestrians about the presence or approach of an LRV and to control pedestrian travel across LRT tracks can be grouped into three major categories (2):

- Delineation markings;
- Regulatory and warning devices (both passive and active); and
- Positive Control devices (LRV-activated vehicle and pedestrian gates).

Passive Treatments: Path Delineation

Path delineation can be accomplished with line striping, differential pavement color or texture, contrasting surface materials, and landscaping. Delineation can also be used to mark the edge of the dynamic envelope of the LRV, as described in Section 0 which discusses the use of delineation to improve pedestrian safety.

Passive Treatments: Signs

Signs commonly used at LRT crossings include fixed standard signs (such as stop signs, the railroad crossbuck or the LRV symbol).

Stop signs are commonly used as traffic control devices at intersections close to LRT crossings. In some situations, it may be necessary to replace stop signs at intersections adjacent to LRT crossings with traffic signals to prevent having vehicles stopped on the tracks. Depending on the distance between the intersection and the LRT crossing, and depending on traffic congestion and queues, it may be necessary to install a traffic signal at the intersection so that the signal can be preempted to clear motor vehicles off the tracks when an LRV approaches. Such a traffic signal may be necessary although not warranted by the Manual on Uniform Traffic Control Devices (MUTCD). In many cases, a traffic signal located near the grade crossing may also require the use of a pre-signal (2). The MUTCD stipulates that where a highway-rail grade crossing is located within 15 m (50 ft) (or within 23 m (75 ft) for a highway that is regularly used by multi-unit vehicles) of an intersection controlled by a traffic control signal, the use of pre-signals to control traffic approaching the grade crossing should be considered (6).

A study by Farran examined the impact of innovative pedestrian and motor vehicle traffic control designs and practices applied on the LRT Line recently (April 2004) opened in Barcelona, Spain (7). The study examined a combination of treatments used to prevent left turns. The treatments comprised two consecutive "No Left turn" signs placed on the left hand side of the road, a LRV symbol warning sign, and a supplementary plaque. The "No Left turn" sign located furthest from the crossing is mounted at the top of a white bollard at a height of approximately three feet, well within the motor vehicle driver's cone of vision. Both the sign and the bollard are made of flexible plastic material glued to the pavement. In addition, the left-turn prohibition becomes more evident to the driver and the width of the intersection is narrowed by installing green flexible retroreflective plastic bollards that are glued to the pavement. Finally, a straight arrow pavement marking is located on the travel lane to further emphasize the turn prohibition. Typical examples are shown in **Figure 1** and **Figure 2**.

Figure 1: Left-turn prohibition signs in Barcelona

Source: Farran (2006) (7)

Figure 2: Left-turn prohibitions at signalized intersections in Barcelona, Spain

Source: Farran (2006) (7)

Farran concluded that the combination of treatments for left-turns was “very effective” at most locations, but there were a few exceptions (7). LRVs in Barcelona usually operate within the normal traffic signal cycle and do not pre-empt the conflicting phase when approaching an intersection. Shortly after the start of operation of the LRT system, a handful of the intersections examined by Farran started to experience a high number of collisions between motor vehicles and LRVs. These collisions took place at locations where left turns were prohibited as a result of the implementation of the LRT. The collisions were attributed to motorists making illegal left turns across the LRT right-of-way as result of drivers’ inattention or willful violation of the “No Left turn” signs and their lack of awareness that a LRV was rapidly approaching the intersection. Approximately 20 LRV/motor vehicle collisions, resulting in eight injuries, occurred during the two months of testing.

The configuration of the crossings where collisions occurred, some of which were at roundabouts, made it difficult to apply some of the standard solutions already developed to address left-turn violations, such as installation of plastic bollards. As a result, the Barcelona LRT system increased the visible signage and implemented an automatic video enforcement system at the locations. The video cameras automatically record the events at the intersection when the LRV is traveling across the intersection or roundabout. The automatic video enforcement is prominently advertised, acting as a further deterrent for illegal turns. According to Farran, (7) incidents at these locations have been substantially reduced since implementation of these improvements and the video system, but no additional quantification of safety impacts were reported.

Passive Treatments: Barriers, Curbs and Fencing

Several passive treatments are available to channel traffic and keep traffic off LRT tracks: barriers, curbs, raised medians, flexible posts, fencing, etc.

Korve et al. recommend that raised medians with barrier (non-mountable) curbs be used on roadway approaches to LRT crossings where roadway geometry and widths allow (2). For LRT crossing locations where the roadway is not physically wide enough to construct a raised median with barrier curbs, other traffic channelization devices such as bollards, traffic dots (see **Figure 3**) and flexible posts (see **Figure 4**) should be considered.

Figure 3: Traffic dots in Dallas, Texas

Source: TCRP Report 69 (2)

Figure 4: Flexible posts in Harrisburg, North Carolina

Source: TCRP Report *69* (2)

The Denver Regional Transit District (RTD) installed raised medians with barrier curbs at two LRT crossings to deter motorists from crossing into the opposing lane of traffic to drive around the horizontal automatic gates. This particular treatment is shown in **Figure 5**.

Due to the presence of slower freight trains operating on adjacent tracks, motorists at the two Denver crossings had come to expect long delays between the start of the flashing light signals and the arrival of a freight train. As a result, a significant number of motorists were accustomed to driving around the lowered automatic gate arms. "High-Speed Train Approaching" warning signs with an LRV-activated flashing yellow beacon had little success in decreasing the rate of automatic gate violations. RTD then installed the raised medians with barrier curbs to deter motorists from driving around the automatic gates. According to RTD representatives, this has "reduced the rate of violations to almost zero" (2).

Figure 5: Raised medians with barrier curbs in Denver, Colorado

Source: TCRP Report 69 (2)

To deal with potential conflicts along semi exclusive LRT rights-of-way, the San Jose LRT system has taken the initiative of installing fencing all along the right-of-way between crossings. The San Jose LRT system installation is unique in that fencing is installed along the entire length of the right-of-way and near crossings, effectively enclosing the entire section of trackway except at LRV entrances and exits (2). Although a sealed corridor created by fencing minimizes potential conflicts, Korve et al. warn that fencing along the right-of-way may also limit sight distance if the fencing is taller than 1.1 m (3.5 ft) within 30–60 m (100–200 ft) of the LRT crossing (measured along the LRT alignment back from the LRT crossing) (2).

Many systems opt to improve safety by minimizing the number of conflict points, particularly for pedestrians. This can be achieved in a number of ways including the channelization of pedestrian traffic. Channelization of pedestrians can be accomplished using paving, delineation and barriers.

These three approaches provide increasing levels of control over pedestrian movements (2):

- Paving: A feature such as a sidewalk or path provides an area for pedestrians to use and can be expected to attract pedestrians and bikes;
- Delineation: Through the use of changes in pavement texture, materials, landscaping, or painted lines on a paved surface, the limits of the pedestrian pathway can be indicated so that pedestrians will stay within the allocated walking zone; and
- Barriers: A wide variety of barriers, such as fencing, railing, chains with bollards, or wire strung between posts, can be used to provide positive control over most pedestrian movements.

The most restrictive form of channelization is the barrier. Barrier channelization can be used to control pedestrian access to the LRT trackway, thereby focusing pedestrian movements at a designated LRT crossing location. Barrier channelization can also be used to increase pedestrian awareness of the LRT crossing.

Huddart and Thompson investigated design and safety issues on the Tuen Mun – Yuen Long LRT line in Hong Kong (8). In the central area of Yuen Long, a barrier was implemented alongside tracks running down the center of the right-of-way to channel and feed pedestrians toward a platform in the center alignment. Due to high pedestrian volumes to and from the platform, the barrier caused considerable pedestrian congestion. Steps were undertaken to improve this situation, but space restrictions inherent in the central roadway alignment limited the improvements that could be made without adding significant extra delay to the highway traffic. Huddart and Thompson acknowledged that this type of barrier alignment will likely limit platform widths and that a careful review of pedestrian movement and space available should be conducted. The review should include the disabled, prams and shopping carts (8).

For narrower road widths which can nevertheless accommodate LRT alignment in the center or at the pavement edge, Huddart and Thompson suggest that the best alignment from the perspective of passenger access is along the pavement edge. The authors acknowledge that this alignment will limit curbside activity such as traffic movement and parking. On even narrower roads, the authors suggest considering one-way traffic streams or creating traffic-free pedestrian zones (8).

Where LRT operates in areas with high pedestrian usage, Huddart and Thompson suggest that special treatments should be planned and operated. The standard practice is to fence the tracks so that pedestrians can cross only at defined crossing points, but this approach can conflict with unobstructed pedestrian movement. The authors suggest that a solution can be to limit LRT speeds to 15 km/h.

In high pedestrian environments, the authors also recommend that the track layout should be more generous so that pedestrians can avoid LRVs, particularly when two vehicles traveling in opposite directions are present simultaneously. Examples of areas with high pedestrian usage were not provided in that report

Passive Treatments: Pedestrians

Cairney and Diamantopoulou (9) report on the use of pavement markings to improve pedestrian safety. The sites selected were based on an analysis of pedestrian accidents involving motor vehicles and an examination of high accident locations. The treatments were "a painted strip that consisted of continuous lines defining the outside of the area, and broad diagonal stripes running across the area at regular intervals." This was applied in "the inner area" between tram tracks.

The painted strip was tested at two separate locations and was "intended to induce more orderly traffic flow and thus simplify the crossing task for the pedestrian, while also providing a refuge in the middle of the road." Video recording were used to collect "before," "during" and "after" data. The before measures were obtained some months before the devices were installed. The during observations at the painted strip were obtained approximately one week after and then three weeks after the installation. The after measurements were collected for a period of 6-months after the treatments had been installed.

The authors (9) analysis used the videotape to count pedestrians and vehicles. The analysis focused on counting or timing "more obvious aspects of behavior e.g. % of pedestrians running, % of vehicles encroaching on painted strip, time to cross the road, % of pedestrians stopping in the center, and amount of time spent stopped in area between tram tracks." The authors also conducted a detailed analysis of pedestrian vehicle conflicts at the two tram sites. They defined a pedestrian-first conflict as an event where a vehicle occupies the space previously occupied by a pedestrian within 3 seconds of the pedestrian leaving the space. Vehicle-first conflicts were defined as the opposite, but as the authors considered vehicle-first conflicts to be less critical for safety, they did not discuss them further in their paper.

The authors' analysis of the before, during and after led them to report that after the pavement markings were introduced at the two tram sites:

- There were significantly fewer pedestrians running across the road at both tram sites;
- There were slightly more time was spent in the area between the tram tracks in the middle of the road;
- There were significantly fewer close conflicts in 1998 (after) than in 1997 (before); and,
- Although no formal measurements were taken, the lateral position of the traffic was more uniform than it had been before the installation of the painted strip (e.g. straying outside of the designated lane was reduced).

Cairney and Diamantopoulou (9) state that the critical safety indicator for measuring critical behavior change "is likely to be the number and severity of pedestrian-first conflicts.

There was a reduction in the proportion of short conflict time, but this was not evident without detailed analysis" The authors also state that "an assessment of how well this type of treatment works relies on an integrated appreciation of how road user behavior has been influenced, focusing on the interaction between road users rather than isolated behavioral parameters. Indeed it would appear that traffic behavior has been more influenced by the painted strip than has pedestrian behavior."

Farran examined a system of pedestrian crossing warning devices in Barcelona. (7) This system includes a combination of delineation, LRT warning signs, pedestrian signals and audio devices to alert pedestrian about LRVs approaching the crossings from both sides.

The delineation uses arrow striping which incorporates the LRV symbol. The arrow striping and the signs are used to help pedestrians to look in the most appropriate direction before they walk onto the track area. The arrow is striped between the two rails for a given LRV direction and is located immediately upstream of the pedestrian pathway. A single arrow is used where LRVs typically operate in a single direction. Two arrows are used where LRVs typically operate two-way on a single track (**Figure 6** and **Figure 7**). These pavement markings are similar to ones used in Dusseldorf, Germany.

Figure 6: LRV directional striping (one-way track) in Barcelona, Spain

Source: Farran (2006) (7)

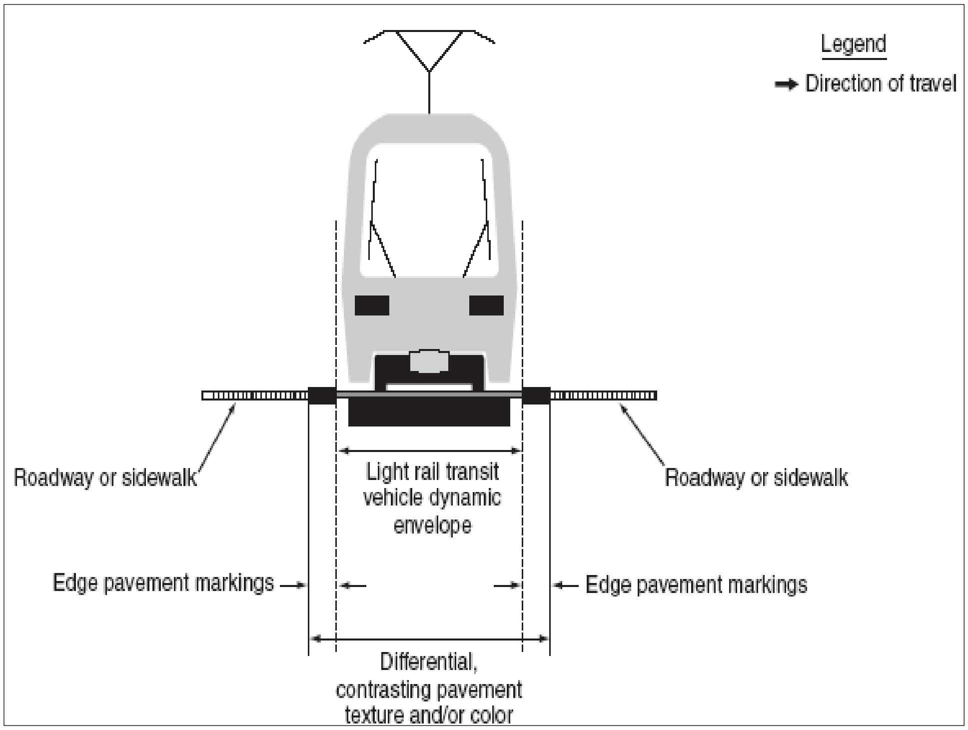
Figure 7: LRV directional striping (two-way track) in Barcelona, Spain

Source: Farran (2006) (7)

Delineation is also used in Barcelona to mark the edge of the dynamic envelope of the LRV.

When an LRV is stationary, the envelope exactly matches the LRV's outside dimensions. This space is generally referred to as the static envelope. When an LRV is moving along the track, not all of its motion is in a longitudinal direction. The LRV oscillates laterally and vertically and (in the event of a partial failure of the suspension devices) may lean to one side. These motions cause the car to impinge into space that is outside its static envelope. These secondary motions are taken into account in the determination of the outline of the maximum space that a moving car could reasonably occupy. That larger space is called the dynamic envelope (10) and is illustrated in **Figure 8**.

Figure 8: Dynamic envelope of LRVs



Source: MUTCD Chapter 10 (11)

In Barcelona, additional signs were added at some crossings that experienced higher than expected numbers of risky behavior incidents (pedestrian crossing against the red light) during the weeks of non-revenue testing and the initial operating period, but no quantified information were provided (7).

Pedestrian tactile warning strips can be installed to delineate the station platform and pedestrian crossings at station locations. The tactile warning strips may also be used at all pedestrian at-grade crossings of tracks where sidewalks exist and where pedestrian activity is present or anticipated.

The Americans with Disabilities Act (ADA) requires measures to increase awareness of areas that are potentially hazardous for the visually impaired. These measures include pedestrian tactile warning strips. If ADA compliant tactile warning strips are not used, a change in texture or color of the LRV right-of-way should be incorporated to delineate the safe zones for the pedestrian.

Tactile warning strips, striping and texture changes should be located completely outside of the dynamic envelope of the LRV (12). The marking of the dynamic envelope of LRVs and delineating safe zones has been improved by Tri-Met in Portland, Oregon. A visual and tactile warning is provided through the use of scored concrete (concrete that as been engraved, cut, or sawed) at all grade crossings. The warning is placed just beyond the dynamic envelope of the train and provides pedestrians with a tactile and visual cue regarding where it is safe to wait when a train is approaching the crossing. To further inform pedestrians of the safe waiting location, the tactile warning is supplemented by a red pedestrian stop bar imprinted with the text “Stop Here” in white (2).

Fixed barriers restrict the movements of pedestrian approaching a LRT crossing and lead pedestrians towards a designated crossing location. The barriers include various forms of fencing and railing. Fixed barriers are used to reinforce the message conveyed by passive pedestrian control devices such as delineation markings, and to increase awareness of the potential presence of an LRV at locations where a more strict control of pedestrian flows approaching a crossing may be necessary for safety considerations. Fixed barriers are also used to configure pedestrian-only crossings of LRT tracks. TCRP Project D-09 encourages fencing along the edges of the tracks wherever possible (13).

The most common types of fixed barrier are Z-crossings and bedstead barrier crossings. Z-crossings and bedstead barrier crossings are typically used in combination with other devices such as pedestrian signals or pedestrian automatic gates (5).

Calgary Transit has used both Z-crossings and bedstead barrier crossings. As shown in **Figure 9** and **Figure 10**, these pedestrian barriers are installed in a zigzag style pattern on sidewalks and at LRT stations. The configuration of the paths forces pedestrians to face the direction of a potentially approaching LRV. Z-crossings should be used only at pedestrian crossings with adequate sight distance (if pedestrians are turned to face approaching LRVs but cannot see them because of obstructions, the Z-crossing is useless). Z-crossings and bedstead crossings should not be used where LRVs operate in both directions on a single track, because pedestrians may be looking the wrong way in some instances. Although pedestrians may also look in the wrong direction during LRV reverse-running situations, reverse running should not negate the value of Z-crossings and bedstead barrier crossings as this type of operation is performed at lower speeds and is typically used only during maintenance or emergencies (2,14).

Figure 9: Example of Z-crossing (City of Lemon Grove, California)

Source: TCRP Report 69 (2)

Figure 10: Example of bedstead crossing (Calgary, Alberta)

Source: Siques (2002) (12)

Active Treatments: Gates and Barrier Devices

As a guideline, the MUTCD suggests that highway-light rail transit grade crossings along semiexclusive alignments should be equipped with automatic gates and flashing-light signals where light rail transit speeds exceed 55 km/h (35 mph). Four-quadrant gates may be used at locations where less restrictive measures such as automatic gates and channelization devices are not effective.

Where four-quadrant gates are used, the MUTCD stipulates that in the normal sequence of operation (unless constant warning time or other advanced system requires otherwise), the flashing-light signals and the lights on the gate arms (in their normal upright positions) shall be activated immediately upon detection of the approaching light rail transit vehicle. The gate arms are required to start their downward motion not less than 3 seconds after the flashing-light signals start to operate. The gate arms are required to reach their horizontal position at least 5 seconds before the arrival of the LRV. The activation of the exit gate arm (the gate on the far side of the crossing) and its downward motion are to be based on timing requirements established by an engineering study of the individual site. The MUTCD adds that gate arms are to remain in the down position as long as the LRV occupies the highway-light rail transit crossing. When the light rail transit vehicle clears the highway-light rail transit grade crossing, and if no other light rail transit vehicle is detected, the gate arms are then to ascend to their upright positions, and the flashing lights and the lights on the gate arms are to cease operation (11). Exit gate arms should be designed to be fail-safe in the up (vertical) position.

The Los Angeles County Metropolitan Transit Agency (LACMTA) tested four-quadrant gates for 6 months and found that the number of motorists driving around or under the lowered gates was reduced by 94 %. The effectiveness of this test location and the lessons learned prompted the LACMTA to recommend installing four-quadrant gates at various other locations along the agency's Metro Blue Line, with installations recommended to occur at a rate of two or three per year (2).

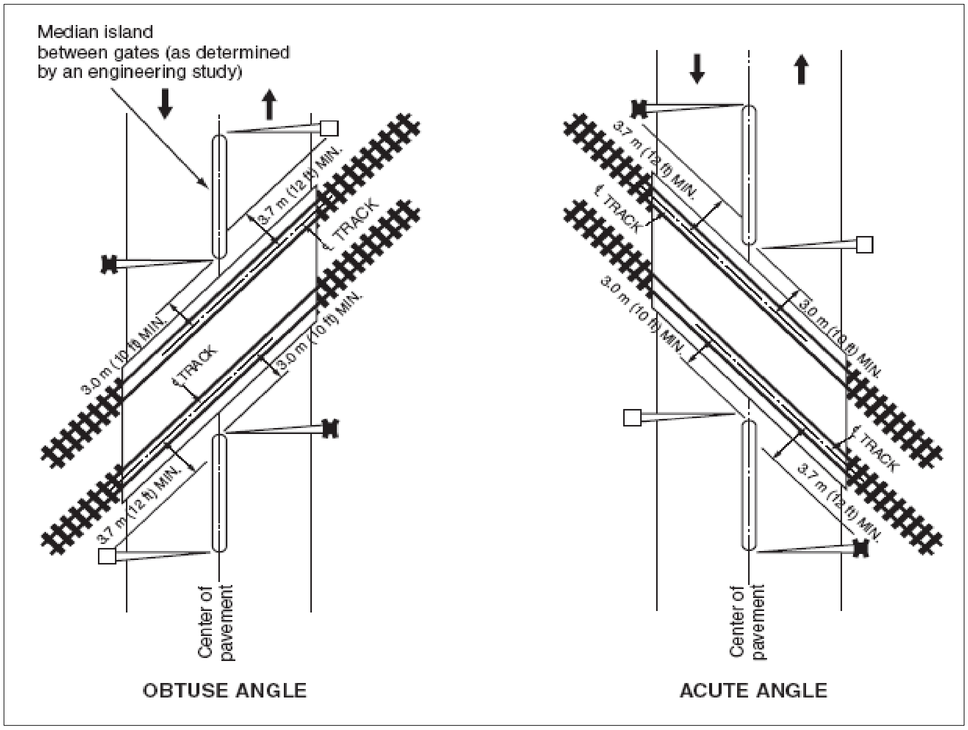
Several states have installed four-quadrant gates at demonstration sites along highway-light rail transit grade crossings. The North Carolina Department of Transportation, for example, installed four-quadrant gates at numerous highway-railroad grade crossings as part of the Sealed Corridor Program. Although the design and operation of the four-quadrant gates in North Carolina differ from those of Los Angeles, the results have been similar. The four-quadrant gates alone reduced violations by 86 % and, when combined with a median treatment, reduced violations by 94 % (2,15).

Placing the gates at right angles to the roadway works where there are no parallel streets and opposing directions of traffic are separated by a physical median.

When considering the application of gates at crossing locations, the position of the gates in relation to the LRT tracks and parallel roads should be carefully studied. At many crossing locations, the LRT right-of-way and tracks and a parallel road intersect another road at an oblique angle. If an automatic gate were to be placed perpendicular to the oblique crossing approach, as required in the MUTCD (**Figure 11**), there would be a free path for vehicles from the road parallel to the LRT tracks to turn into the path of an approaching LRV. To block the path from the parallel road and from the intersecting road, automatic gates are placed parallel to the LRT tracks, effectively blocking all paths crossing the LRT tracks, as shown in **Figure 12**.

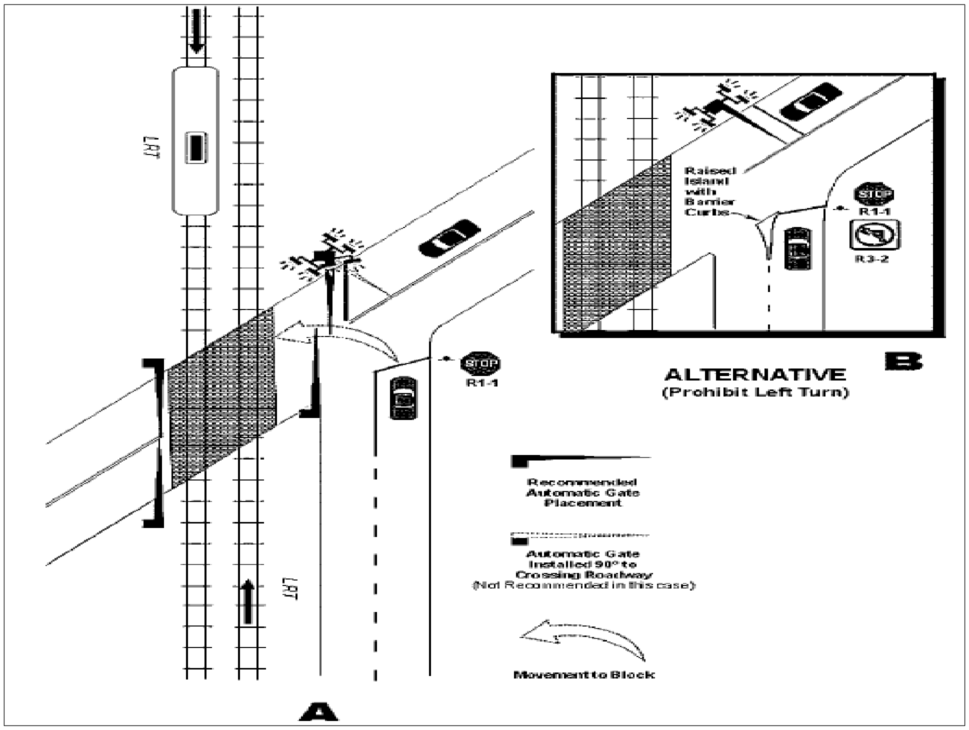
This way of orienting automatic gates has been used by several transit agencies, including Tri-Met in Portland and Calgary Transit in Alberta (**Figure 13**). No quantified evidence related to the safety impacts of realigning automatic gates has been found (2). As an alternative to installing left-turn gates parallel to the LRT alignment, left turns could be prohibited at all times by using No Left-turn signs and appropriate motor vehicle channelization (**Figure 12**).

Figure 11: Example location plans for four-quadrant gates



Source: MUTCD 2003 (6)

Figure 12: Automatic gate placement for turning traffic



Source: MUTCD 2003 (6)

Figure 13: Quasi four-quadrant gate system in Calgary, Alberta

Source: TCRP Report 69 (2)

In addition to conventional automatic gates, barrier devices have been tested by some transit agencies. Vehicle arresting barriers and safety barrier gates have been tested and used in the United States. The primary purpose of these devices is to prevent a collision between the vehicle and the train by stopping the vehicle before it enters the railway tracks (2).

The vehicle arresting barrier (VAB) is raised and lowered by a tower lifting mechanism. The VAB in the down position consists of flexible netting across the highway approaches. The netting is attached to an energy absorption system. When the netting is struck, the energy absorption system dissipates the vehicle's kinetic energy and allows it to come to a gradual stop. This device was tested at three locations in the intercity rail corridor between Chicago, Illinois and St. Louis, Missouri (16).

The safety barrier gate is a movable gate designed to close a roadway temporarily at a highway-rail crossing. A housing mechanism contains electro-mechanical components that lower and raise the gate arm. The gate arm itself consists of three steel cables, the top and bottom of which are enclosed aluminum tubes (**Figure 14**). When the gate is in the down position, the end of the gate fits into a locking assembly that is bolted to a concrete foundation. Safety barrier gate testing has demonstrated that the gate can safely stop a pickup truck traveling at 72 km/h (45 mph). Gates have been installed in Madison, Wisconsin (highway-rail grade crossing) and Santa Clara County, California (highway-light rail transit grade crossing) (16). No additional information of the effectiveness of these devices has been found, though the Santa Clara example was out of operation for several years and eventually dismantled in early 2008 due to maintenance problems as the gate was designed for building security and not frequent operation as required for the LRT. Santa Clara LRVs are now required to stop before crossing the roadway (based on communications with José Farrán, April 2008).

Figure 14: Safety barrier gate in San Jose, California

Source: TCRP Report 69 (2)

Active Treatments: Pre-signals/Advance Signals

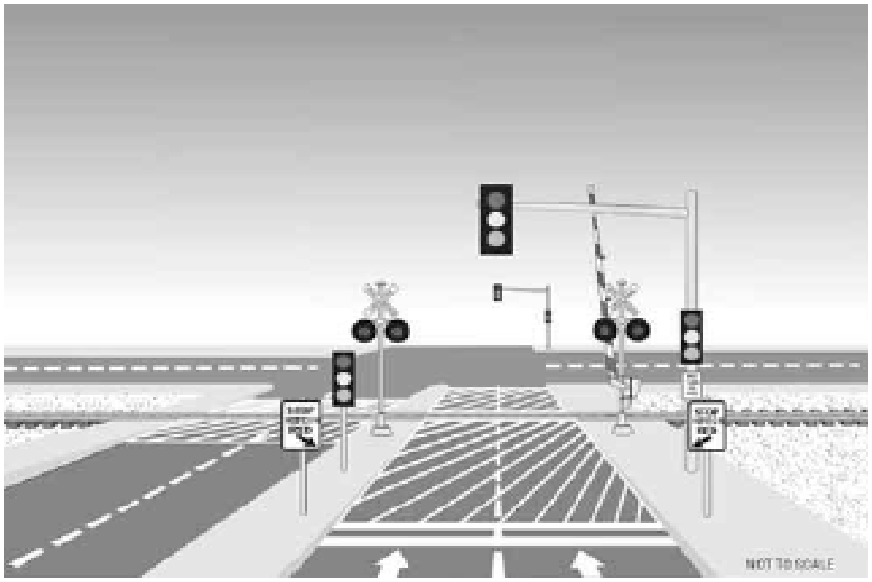
The purpose of pre-signals and advance signals is to reduce and ideally to eliminate the likelihood of vehicles stopping in the track area during the red phase of the traffic signal cycle (17).

Pre-signals are defined as traffic signals located upstream of a highway-rail grade crossing adjacent to a roadway-roadway intersection. The pre-signals are interconnected to the downstream traffic signal and to the rail signal controller. Pre-signals allow for an adequate lag time between the pre-signal and the downstream signal so that vehicles are outside of the clear storage distance and the intersection when the LRV arrives. Advance signals at highway-rail grade crossings adjacent to roadway-roadway intersections do not provide a lag between the advanced heads and the downstream heads (2).

As shown in **Figure 15**, pre-signals can be installed on the near side of the LRT crossing, upstream of the traffic signals that control the public street intersection. When an LRV approaches the crossing, the pre-signals turn red to stop motor vehicles on the near side of the LRT crossing. The pre-signals turn red before the traffic signals at the intersection (i.e., the downstream traffic signals), thereby clearing motor vehicles off the tracks and, at the same time, not allowing any more motor vehicles to move onto the tracks. The traffic signals located downstream at the intersection should use programmable visibility (commonly referred to as PV) traffic signal heads to minimize any possibility of confusion with the pre-signals. An added benefit of pre-signals is that they can be operated in conjunction with the intersection signals so that, on every signal cycle at the intersection, the pre-signals prevent queues from forming between the intersection stop bar and the LRT tracks, whether or not an LRV is approaching the crossing (2).

Using pre-signals can be an effective solution to improving safety at LRT crossings for motorists. Research suggests that motorists using crossings located in an area characterized by signalized intersections respond well to traffic signals. As most LRT systems are constructed in urban areas, traffic signals are familiar and generally more credible than flashing light signals (2).

Figure 15: Pre-signal locations at gated crossings



Source: TCRP Report 69 (2)

Korve et al. conducted field research on pre-signals at two highway-rail grade crossing sites in Illinois. They concluded that pre-signals are effective at significantly reducing the number of certain risky behaviors at highway-rail/LRT grade crossings adjacent to intersections (2).

The pre-signals at one crossing and Keep Clear Zone striping were installed in December 1999, and the after data was collected in March 2000. The four months from December 1999 to March 2000 allowed motorists to become accustomed to the pre-signal so that the novelty effect of a new traffic control device could be minimized. The pre-signals at a second crossing were installed in April 1999, and the after data collection was conducted in April 2000. Motorists using this pre-signal had 12 months to become accustomed to the pre-signal.

Data were collected manually while observing the two grade crossings. The observation periods covered 9 hours on each of 3 days during the before period and on each of 3 days during the after period. The data were verified by a review of videotaped observations that recorded the entire data collection period.

Over 350 observations were recorded each day for each of the two grade crossings. The database contained more than 2,500 observations during the before period and more than 1,800 observations during the after period. To determine whether the changes in observations of “risky behavior” in motorist behavior were statistically significant, the researchers used a t-test for two independent samples. The level of significance used was 0.05.

The field tests revealed that after the implementation of pre-signals (2):

- The number of vehicles in the clear storage distance at two study sites declined by a statistically significant average of 80 % and 93 % respectively;
- The number of vehicles in the minimum track clearance distance at one site declined by a statistically significant average of 91 % when the nighttime period was excluded. The number of vehicles in the minimum track clearance distance at the other site also declined, but the result was not statistically significant;
- The number of vehicles that conducted a prohibited right turn on red decreased by a statistically significant average of 82 %;
- The reduction in the number of vehicles that proceeded through the trackway as the gates began to ascend was not statistically significant; and,
- Fewer than 3 % (significance not specified) of the vehicles stopped at a red pre-signal proceeded through the signal into the clear storage distance or turned right on red.

Active Treatments: LRT-activated Warning Signs

This section discusses LRT-activated “Train Coming” and “Second Train Approaching” signs. These signs are a response to two important safety issues: motorists turning left in front of overtaking LRVs; and the problem of two trains being present simultaneously where there are double track operations.

Korve et al.’s research found that the single most frequent LRV-motor vehicle accident type involved motorists turning left in front of overtaking LRVs (i.e., LRVs traveling in the same direction as the motor vehicle) at signalized intersections. This type of accident accounted for 47% of all collisions (including those involving pedestrians) and almost two thirds of all motor vehicle-LRV accidents (18,1).

Most of these turning collisions at traffic signal-controlled intersections occurred due to one of the following three types of situation (7):

1. Motorists make illegal left turns across the LRT right-of-way immediately after termination of their green left-turn signal. These motorists know that it will still take a few seconds for the parallel traffic to enter the intersection from their stopped position, but they are unaware that an LRV is rapidly approaching the intersection, typically from behind;
2. Motorists violate the left-turn signal when leading left-turn indications to proceed are preempted (eliminated) by an approaching LRV. This illegal movement is not usually a conscious choice on the part of the motorist who has simply learned to expect the green turn indication before the through movement; and
3. Motorists waiting to turn left across the LRT tracks become impatient as a result of red time extensions resulting from multiple LRV preemptions. These motorists turn across the LRT right-of-way illegally in the belief that the signal is malfunctioning. This type of accident is most likely to occur when the traffic signal does not recover to the left-turn movement after the LRV has cleared the intersection.

To warn pedestrians and motorists that the arrival of an LRV is imminent, some transit agencies (in, for example, San Francisco, Portland and Dallas) use LRT-activated “Trains Coming” icons (15). No quantified information on the safety impacts of these engineering treatments has been found.

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 LRV. The distance between the two tracks should be considered.

When an LRT track and a freight railroad are less than 200 feet apart track centre to centre, as on a double track railroad, the Federal Railway Administration (FRA) defines these operations as “common corridors”. FRA regulations define adjacent tracks (shared ROW) as tracks that are 25 ft or less center to center. Shared corridors relate to freight tracks and transit tracks, such as LRT. They are defined as tracks that are separated by more than 25 ft, but less than 200 ft, center to center.

The FRA also defines “shared minor facilities.” These are (19):

- Highway-rail crossings where the transit line and general railroad system share crossing protection, for example the Los Angeles Blue Line
- Level crossings (diamonds) between transit tracks and general railroad system tracks
- Shared bridges

Studies have found that LRT systems with double track operations generally have more crossing accidents than those with single track operations. For example, a survey of eight LRT systems in the U.S. found that two of the systems with single track operations had experienced no accidents since initiation of their LRT services (20). At LRT crossings with dual tracks, motorists and pedestrians may act in a manner they believe to be safe, such as crossing the tracks when there is an LRT train stopped at a nearby station, or traversing the tracks ahead of slow moving freight trains when they do not have the right of way, but such behavior has resulted in collisions with second trains (21). It is unclear from existing research whether the greater frequency of accidents at crossings on LRT systems with double track operations is due to the nature of double track operations and a different level of exposure to the risk of collisions at crossings with dual tracks, or whether it is due to higher volumes of trains at these types of crossings.

Maryland’s Mass Transit Authority (MTA) conducted a research project through the Transit Cooperative Research Program (TCRP Project A-5a) to examine the use of a “Second Train Approaching” sign (2). The LRV-activated sign was designed to warn motorists that a second LRV is approaching. The LRV detection system includes a “Second Train Approaching” sign. In addition, the automatic gates and flashing light signals installed at crossings remain active after the first LRV passes, and the automatic gates are kept in the lowered (horizontal) position if two closely spaced LRVs approaching from opposite directions are detected.

Results from the evaluation indicated that the Second Train Approaching sign reduced the number of risky behavior incidents by motorists at the crossing. The number of motorists who began to cross the tracks between the departure of the first train and the arrival of the second train was reduced by 26 %. The number of motorists who began to move forward after the departure of the first train and before the arrival of the second train, while the gates remained in the horizontal position, was reduced by 86 %.

The effectiveness of the second train warning sign was also evaluated by the LACMTA in Los Angeles. The LACMTA investigated risky crossings by pedestrians using data collected before and after a second train warning sign was installed. The data were collected and analyzed by viewing video tapes recorded at the crossing. The video camera was activated only when there were two trains at or in the vicinity of the crossing.

The before video data (before warning sign installation and operation) were recorded from March 24 to June 9, 2000. The after video data (recorded when warning sign was in operation) were recorded at various times from June 10, 2000 to June 18, 2001. Difficulties arose with interruptions caused by a strike and equipment failure. The after periods analyzed were July 30 to September 5, 2000 and May 20 to June 18, 2001

On an average weekday, approximately 1,600 pedestrians traversed that crossing site, approximately 1,200 passengers boarded and alighted from the LRVs, and approximately 220 LRT trains and 16 freight trains used the rail right-of-way. Analysis of the before and after data showed that the warning sign was effective in reducing risky pedestrians behavior at the study site (21). The number of pedestrians crossing the LRT tracks at less than 15 seconds in front of an approaching LRT train was reduced by 14 % 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 %. The number of pedestrians crossing the tracks at four seconds or less in front of an approaching LRT train, an especially risky behavior, was reduced by about 73 % (21).

Active Treatments: Pedestrians

Although accidents between pedestrians and LRVs account for only 10 % of LRT-related accidents, they are the most severe, and account for at least 50 % of all fatalities resulting from LRT accidents (1).

Positive control devices are the most restrictive type of active (or passive) device that can be installed at a pedestrian crossing. There are two general types:

- Pedestrian automatic gates (LRV activates the gate); and
- Swing gates (pedestrian actuates the gate).

Both types provide a physical barrier between the LRT tracks and locations where pedestrians can safely queue.

Korve et al. recommend that pedestrian automatic gates (**Figure 16**) be installed at all pedestrian crossings (sidewalks or other designated pathways) where sight distance is limited and leads to situations where pedestrians are unable to see an approaching LRV until it is very close to the crossing, and/or LRV operators are unable to see pedestrians in the vicinity of the crossing until the LRV is very close. At crossings where such conditions exist, pedestrian automatic gates function to take away a pedestrian's decision about whether to cross the tracks or wait until the LRV passes (2). Depending on the type of pedestrians who typically use the crossing, a skirt may be added under the automatic gate arm to discourage pedestrians from walking or ducking under it. For example, pedestrian automatic gates with skirts are used at two Dallas LRT crossings situated near an elementary school.

To avoid compromising the safety of a pedestrian trapped between the tracks and the automatic gate as it lowers, some transit agencies (such as the LACMTA in Los Angeles) have installed pedestrian automatic gates set back from the track so that pedestrians have a refuge area between the track and gate where they can wait safely. The setback distance is wide enough to accommodate a wheelchair. An alternative solution, used by CalTrain, a commuter railroad in northern California, is a swing gate installed next to the pedestrian automatic gate. **Figure 17** shows a swing gate at a pedestrian only crossing at a station platform.

Figure 16: Pedestrian automatic gate

Source: TCRP Report 69 (2)

Figure 17: Pedestrian automatic gates and swing gates

Source: TCRP Report 69 (2)

To address pedestrian safety at higher speed LRT crossings, Calgary Transit installed various combinations of gates and barriers. At a number of stations, for example, Calgary Transit installed manually operated swing gates between the LRT tracks and the platform. The installations included active overhead railroad flashers (

Figure 18). The swing gates are similar to those installed by the LACMTA, by San Diego Trolley Inc., and by Metrolink in St. Louis, Missouri. The gates are intended to prevent pedestrians from crossing into the track area without pausing and checking. As pedestrians are required to actively open the gates, they are forced to be more alert to the risks associated with crossing the LRT tracks. The gates also provide a positive barrier between where it is safe and where it is dangerous to stand when an LRV is approaching (2). Transit officials in Calgary have, however, reported that pedestrian violations of the swing gates (opening the gates while the warning devices are flashing) have increased following the initial reductions in risky behavior that occurred immediately after the gates were installed (2).

Figure 18: Manual swing gates with overhead flashers in Calgary, Alberta

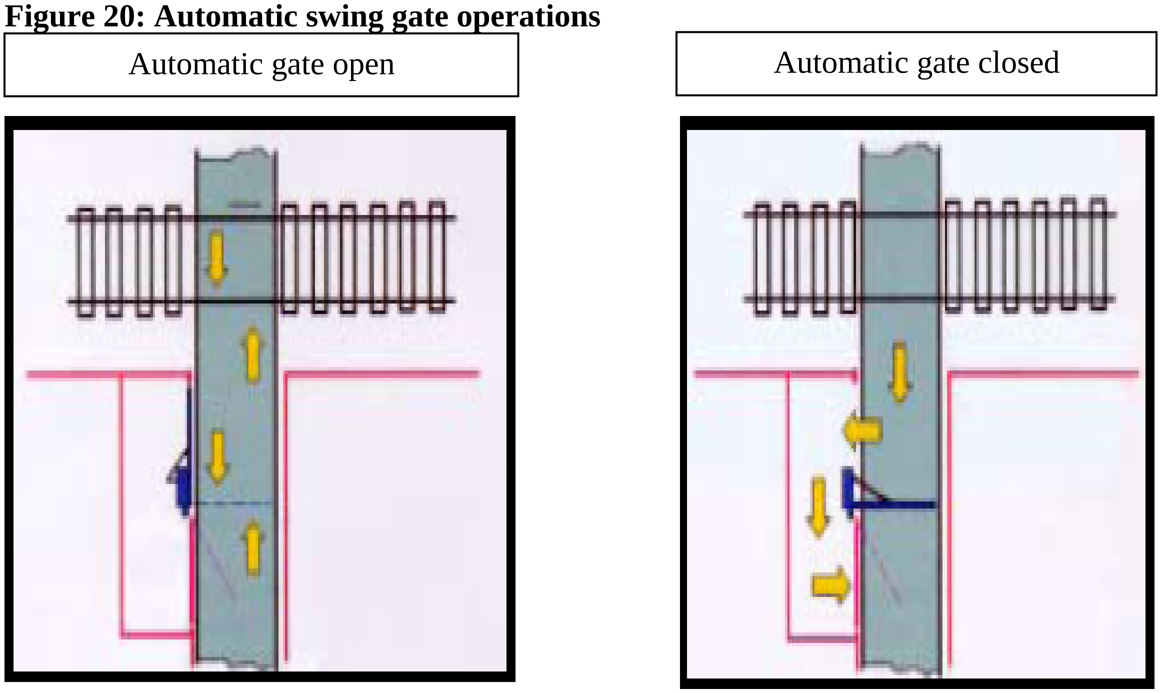
Source: TCRP Report 69 (2)

Some transit agencies use automatic swing gates as an alternative to manually operated swing gates. Automatic swing gates do not require action on the part of the pedestrian to enter the crossing. The gate is normally held open (under power) exposing a walkway across the tracks (**Figure 19** and **Figure 20**). When activated by a LRV approaching the grade crossing, the gate closes. As the gate closes, it exposes an emergency exit. After the LRV passes, the gate opens and access to the walkway across the tracks is permitted. As the gate opens, the emergency exit is closed. If there is a power failure, the swing gate will automatically close under spring tension. Used widely in Australia, automatic swing gates have been successful in fatality prevention and operational reliability (12). No additional quantified information was found.

Figure 19: Automatic swing gate in Melbourne, Australia

Source: Siques (2002*)* (12)

Figure 20: Automatic swing gate operations



Source: Siques (2002) (12)

Audible signals are another active measure for pedestrian safety. Audible signals can either be attached to other warning devices at the crossing or on-vehicle audible warnings can be used. TCRP Research Results Digest 84 summarizes the results of TCRP Project D-10 which describes the development and testing of two alternative audible warnings. The first was a conventional bell sound while the second was a “blended staircase” signal that combined the sounds of an approaching train and a conventional crossing bell. The sounds were process so that the pedestrian approaching the intersection hears a bell sound that rises in pitch and an approaching train that increases in loudness. The study did not produce conclusive evidence on the effectiveness of the signals. Extensive recommendations about the design and installation of audible signals can be found in TCRP Research Results Digest 84 (22).

3 - EDUCATION AND ENFORCEMENT AS TREATMENTS

Not all safety treatments are physical improvements to LRT facilities and crossing locations. Education and enforcement can also have positive safety impacts by reducing risky behavior. This section considers the impacts of education and enforcement measures on safety at LRT crossing locations.

A study by Savage (2005) investigated the impact of public education on rail-highway crossing safety. The study concentrated on the impact of Operation Lifesaver, a public education program initiated in Idaho in 1972 intended to educate drivers about safe practices at railway crossings (Operation Life Saver, http://www.oli.org/). Since 1972, Operation Lifesaver has expanded its scope and now addresses a wide variety of heavy and light rail safety concerns across much of North America. The study analyzed the impact of Operation Lifesaver on the number of incidents and fatalities at public railroad crossings involving a motor vehicle. Although this study did not address light rail crossing, the findings are important in understand the impact of public education on safety. Through regression analysis using a negative binomial model, the study found that Operation Lifesaver activity had a significant effect on the number of incidents. The authors found that, “increasing the amount of educational activity will reduce the number of collisions with a point elasticity of -0.11” (23). In an interview, Mr. Savage noted that he did not find a similar relationship for fatalities of pedestrians trespassing on heavy rail lines. He noted that this lack of relationship may be a function of the different socio-economic groups most at risk for collisions by trespassing on heavy rail lines compared to vehicle collisions. Education is only effective when the most at risk groups are also the groups targeted by education campaigns (Personal communication with Ian Savage, February 28, 2008).

Operation Lifesaver’s scope was extended in 2002 to include light rail facilities (Operation Lifesaver, Light Rail Materials Site, http://www.oli-lightrail.org/). The organization has developed adult’s and children’s programs in English and Spanish. Eighteen agencies have licensed the materials, which include posters, brochures, PowerPoint presentations, channel cards, and activity books among other information.

The materials promote safety around light rail vehicles, stressing the following key messages:

- Light rail is not light. Vehicles are 24 times heavier than a typical passenger car
- Be alert; look and listen for approaching trains. LRVs may travel fast, have frequent service, and are typically very quite
- LRVs may share the roadway with other users
- LRVs cannot swerve and may take a long distance to stop
- LRVs may be on the tracks day or night and may travel in either direction
- LRVs are wider than their tracks by more than three feet on each side. Not respecting the reserved space around the train can cause collisions – this message is repeated for vehicles and for pedestrians
- Respect crosswalks and warning signs
- The LRT right of way is not a safe place for pedestrians or vehicles. Do not play near the right of way, trespass, walk, or run on the tracks, or infringe on the space in a vehicle.

LACMTA has had significant success with its education and enforcement program. The program has reached over five million people and as a result of their efforts, LACMTA have seen a reduction in collisions (Personal communication with Barbara Burns, February 19, 2008).

Their education program has three prongs:

1. Site specific: Staff give presentations at schools, community centers, seniors' facilities, and other community facilities at specific sites. Photographs and examples from that site are used in the presentation. Enforcement through traffic citations is also increased at problem locations.
2. Tour program: This is a safety program targeted at schools. Staff come into a class, give a presentation and take the students for a tour on the LRT system
3. Mobile theatre: The mobile theatre includes a number of videos geared at two different age groups. Videos for the 10 and under age group are animated while videos for students 11 and up are live action and show actual accident scenes. The videos promote LRT safety and have been also been licensed to New Jersey Transit.

LACMTA also employs other creative campaigns, such as advertising at one grocery chain's checkout stand in stores near to a LRT line.

Their experience has shown that safety education should be ongoing. LACMTA completes one year of safety training in the communities surrounding a new line before any trains run on the track. After service has started, safety education should continue to be effective. The organization recommends that education efforts be repeated on a yearly basis.

4 - COMMON PRACTICES

This section discusses four common practices used to improve the safety of LRT systems, especially at highway- light rail grade crossings and stations. The practices are:

1. Crossing warning systems;
2. Safety training programs for LRV operators;
3. Introduction of LRVs passing through gated grade crossings in newly installed areas; and,
4. The use of sound as a warning.

Crossing Warning Systems

Crossing warning systems normally position the gate arm down whenever an LRV is within a certain distance of a crossing. Inductor loops detect the LRV. If an LRV is stopped in a station adjacent to the crossing, the gate arms normally stay down while the LRV is at the station loading and unloading passengers, even though the LRV is not moving toward the crossing. This may cause unnecessary delay on cross streets, confusion for motorists who wait at the crossing, especially if they cannot see the approaching LRV, and the possibility that motorists decide to disregard the automatic gates.

To resolve this problem, some transit agencies have adopted delayed automatic gate activation for near-side stations. For example, the Sacramento Regional Transit District installed delay timers to allow LRVs to dwell in the station on the near side of two LRT crossings without activating the crossing warning systems until the LRV is ready to depart (2). When the LRV detection system senses an LRV approaching the crossing, the flashing light signals and automatic gates activate only after a predetermined amount of time has passed. Using far-side stops and terminals will also eliminate unnecessary delays.

Safety Training Programs

Safety training programs for LRV operators are being implemented by several transit agencies to help LRV operators become more safety conscious. Metrolink in St. Louis, for example, has a LRV operator training program that emphasizes the use of LRV control and braking ability as a supplement to other warning systems already in place. Upon departing some station stops, Metrolink LRV operators dwell or travel slowly through the pedestrian crossing when a second, opposite-direction, arriving LRV is approaching. This blocks pedestrians from entering the crossing until the second, opposite direction LRV is fully within the crossing. The LRV functions as a crossing gate. This pedestrian blocking maneuver is also practiced in Calgary (2).

Introduction of LRVs at slower speeds

In areas where motorists and pedestrians are not familiar with LRT and LRV gated at-grade crossings, Korve et al.(2) recommended that when implementing a new LRT system or extending an existing system, careful consideration should be given to the impact of LRVs through gated grade crossings. The LRVs should first use the crossings at slow speed and should only later gradually increase their speed. This type of program is especially important for LRT corridors where slower freight trains have been operating (or continue to operate on adjacent tracks).

Users of the crossing may have grown accustomed to seeing only a few slow trains per day or week or, where the corridor has been abandoned, no trains at all. It is important to educate crossing users about the higher speed trains that will be using the crossing on a regular, frequent basis. The gradual speed increase of the trains should be coupled with a strong public outreach and education program that advises the public of the incremental LRV speed buildup over a 6-month period (2).

Use of Sound

The use of sound to warn motorists and pedestrians of an approaching LRV has been reconsidered by some transit agencies. Some agencies have changed their policies so that instead of sounding a bell at most intersections and a louder whistle at gated crossings over major intersections, LRV operators are now being instructed to sound the whistle at all intersections. The operators are instructed to use their train horns only in emergencies (24). The safety impacts of this new policy are unknown at this time.

5 - NEW TECHNOLOGIES

A variety of new technologies are available for application on LRT lines. For example, special crossing gate indication signals and wireless video links, inform LRV operators about the next crossing, and automated photo enforcement identifies motorists who disregard closed gates.

Denver, Colorado, has installed special crossing gate indication signals visible to approaching LRV operators. These signals indicate whether the automatic gates and flashing light signals at crossings are functioning as intended or whether there is a problem with the gates, such as the gate arm being broken off the mechanism (2). The crossing gate indication signals are especially useful at locations where LRVs approach a crossing from around a blind curve from which the LRV operator cannot see the automatic gates until the LRV is at the crossing. The indication signal needs to be located so the operator can stop the LRV short of the grade crossing under normal service braking.

Similar devices have been used in Sacramento, California where a special wayside signal (**Figure 21**) installed at two of the system’s crossings provides the LRV operator with one of two messages: the crossing warning systems (flashing light signals and automatic gates) have been activated; or the automatic gates are in the horizontal position.

An alternative to using gate indication signals in advance of crossings would be a wireless video link that connects surveillance cameras mounted at LRT crossings with approaching LRVs. LRV operators would then be able to see the next crossing ahead on a small video monitor well in advance of arriving at the crossing. This approach is not usually considered necessary for LRT operations because LRVs have relatively short stopping distances (compared with freight trains). Wireless video tests conducted by Amtrak suggest that images can be transmitted and received by approaching trains at distances greater than 6.5 km (4 mi) (2).

Track detection/signal control have been applied for many used to activate warnings at rail crossings, such as gate arms or flashing lights. These detectors can be integrated into the signal control system, including providing priority to LRVs or allowing for the inclusion of an LRT phase in the signal cycle (25).

No quantitative or qualitative information on the safety impacts of these devices has been found.

Figure 21: LRV operator gate indication signal in Sacramento, California

Source: TCRP Report 69 (2)

Photo enforcement is another new technology. In the early 1990s, to address the problem of motor vehicles driving around closed automatic gates, the LACMTA implemented the nation's first automated photo enforcement program at its higher speed LRT crossings. The system uses a camera mounted on top of a 4.6 m (15-ft) pole. Inductive loop detectors are used to detect the presence of a vehicle driving around the tip of a horizontal automatic gate arm. When a violator's motor vehicle crosses the detection loops while the flashing light signals and gates are in operation, a photograph is taken with data imprinted onto the photograph. Another photo, taken 1.2 s later, detects the location of the violating motor vehicle within the crossing. The license plate number and California Department of Motor Vehicles records are used to identify the owner of the violating motor vehicle and a citation in English and Spanish is sent to the owner. This program has had substantial effect. Crossing-gate violations have decreased by 92 % and the number of LRT-motor vehicle collisions has decreased by 70 % (2).

6 - STOP/TERMINAL DESIGN CONSIDERATIONS

Curbside stops are a well-known problem for LRT systems that operate in mixed traffic and on 2 by 2 lane undivided roads as in Toronto, Canada and Melbourne, Australia. At curbside stops, passengers wait at the curb, but need to cross traffic lanes without signal protection to reach the LRVs running on tracks in the center lanes (**Figure 26**). They sometimes wait on-street without protection from moving traffic. Similarly, when passengers alight, they often do so without protection from moving traffic. In addition to safety concerns, LRT systems of this type are not accessible to persons with disabilities because no platforms are provided. (Even with low floor light rail vehicles, the height from the curb of low floor vehicles is a minimum of 300mm.)

Curbside stops have been identified as a major passenger safety concern (26). They are thought to lead to 25 pedestrian road traffic accidents and a far higher number of near misses each year in Melbourne, Australia (26). A number of alternative designs have been adopted to replace curbside stops in Melbourne (**Figure 23**)..

The designs include:

- **Safety Zone Stops -** Safety Zone Stops are the most common adopted solution for tram stops in mixed traffic in Melbourne. A safety zone is a boarding area located in the center lanes of roads. The zone has railings to protect waiting passengers from the traffic flow. Traffic is not permitted on tracks at these stops and is required pass to the curbside of the stop. No platforms are provided. Some signalized pedestrian access is usually provided;
- **Super Stops** - Super Stops are high quality station style designs located in the center lanes of roads. The design includes platforms, shelters and real time passenger information. The road is narrowed to a single lane in each direction. Traffic is not permitted in the track area of the road and is required to pass the stop in the curbside lane. Pedestrian access is limited to few protected crossing points; and

- **Curb Access Stops -** Curb Access Stops are sidewalk “flareouts” or curb extensions where the road is narrowed to a single lane in each direction. A platform is constructed on the edge of the extended curb to aid tram access. Traffic can use the track area next to the stop, but must wait behind the tram as passengers board/alight. Curb Access Stops are cheaper than Super Stops, but limited in number because they have a significant impact on road space and capacity.

Figure 22: Examples of curbside light rail transit stops in Melbourne, Australia.

Source: Currie and Smith (2005) (26)

Figure 23. Alternative stop designs to curbside stops

Safety Zone Stop

Super Stop

Kerb Access Stop

Source: Currie and Smith (2005) (26)

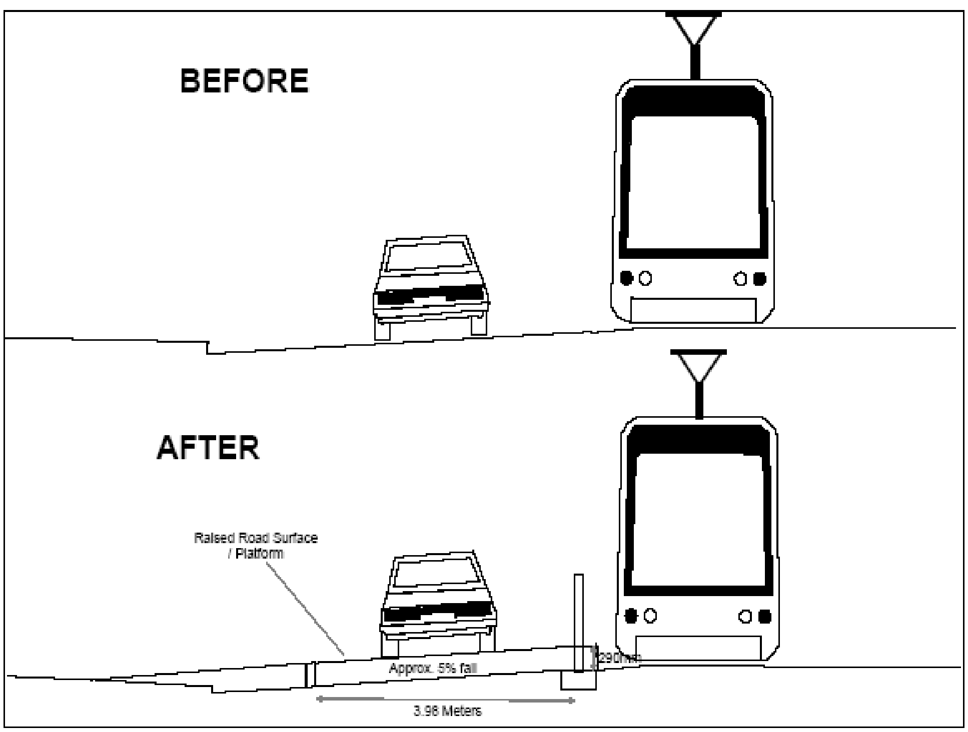
A new design called the “Easy Access Stop” was developed by the City of Port Phillip in association with VicRoads (Melbourne’s Road Management Authority) and Yarra Trams (the operator of Melbourne’s tram system) (**Figure 24** and **Figure 25**). The easy access stop was originally designed to improve passenger access to LRVs, to reduce vehicle speeds on the approach to and through the stop, and to improve patron safety while boarding and alighting a tram. No casualty or property damage accidents have been reported at or near the easy access stop since implementation. Concerns regarding the possibility of vehicles falling off the platform on to the tram tracks, or straddling the platform/tram track area have so far proved unfounded (26).

No quantified information on the safety impacts on these alternative designs was found. These alternative designs have not been evaluated in North America and may need to be studied to meet ADA requirements.

Figure 24: Easy access stop in Melbourne, Australia

Source: Currie and Smith (2005) (26)

Figure 25: Before and after schematic cross-section of the easy access stop



Source: Currie and Smith (2005) (26)

7 - ACCIDENT DATA AND SURROGATE MEASURES

Analysis of the frequency of accidents at higher speed LRT crossings reveals that LRT systems in North America are generally safe. Light rail accidents at any given crossing are rare events. When, however, collisions do occur at higher speed LRT crossings, the collisions are often severe (2).

Although, unlike motor vehicles, LRVs cannot swerve or stop quickly enough to avoid pedestrians who are errant or disobedient of traffic control devices, Korve et al. found that accidents between pedestrians and LRVs are the least common type of LRT-related accident. Accidents between pedestrians and LRVs accidents represent only about 10 % of the total, but these accidents are the most severe and account for at least 50 % of all fatalities resulting from LRT accidents (1). One main safety issue is that pedestrian accidents on approaches to center-of-street transit stops are recorded as vehicle-pedestrian accidents and not usually transit related.

Accident-Based Analysis

Korve et al. investigated accidents that occurred on 11 LRT systems (2). The annual number of accidents per LRT crossing for an LRT system in semiexclusive Type b.1 and b.2 rights-of-way ranged from 0.04 to a maximum of 0.38. The 24 highest accident locations along semiexclusive rights-of-way averaged less than one LRV accident per year. Although LRT crossings of semiexclusive Type b.1 and b.2 rights-of-way comprised 32 % of all LRT crossings examined, and the length of LRT trackway along semiexclusive Type b.1 and b.2 rights-of-way comprised 77 % of all LRT trackway, accidents at LRT crossings along these semiexclusive rights-of-way comprised only 13 % of all accidents recorded (27). The researchers concluded that "LRT crossings on semiexclusive rights-of-way are even safer than LRT crossings in shared rights-of-way with LRV speeds less than 55 km/h (35 mph)" (2). However, no consideration was given to the risk exposure of pedestrians and/or motorists through careful examination of pedestrian and vehicular (both LRV and motor vehicles) volumes. This point is further illustrated when the authors noted that collisions at higher speed LRT crossings tended to be more severe than at lower speed LRT crossings. For example, about 19 % of the total LRV-motor vehicle collisions at LRT crossings along rights-of-way where LRVs operate at speeds greater than 55 km/h (35 mph) resulted in fatalities compared with only 1 % at lower speed LRT crossings. For LRV-pedestrian collisions, 29 % of the higher speed collisions resulted in fatalities, compared with 18 % of the lower speed collisions.

Sabra et al. investigated the safety impacts of implementing combinations of MUTCD light rail traffic control devices at eight intersections in Baltimore, Maryland. They concluded that the combined engineering treatments were effective in reducing accidents (28). The improvements were implemented in two stages. Over a three-year period from 1999 to 2001, combinations of signals, signs, pavement markings and other forms of delineation were implemented. Follow-up improvements were added from 2002 to 2004. These improvements included the installation of turning prohibition signs, lane separation treatments, curb delineation and pedestrian fixed barriers at platform crossings (bedstead barriers).

The accident history at the eight study sites is summarized in **Table 4**. The table compares the number of property damage only (PDO), injury and fatal accidents for 1999 to 2001 with 2002 to 2004. PDO accidents dropped from 71 to 64 and injury accidents dropped from 55 to 34. There was one fatal accident in each three-year period. Additional analysis showed that the percentage of sideswipe was reduced from 33 % to 29 %, and that the percentage of left-turn accidents was reduced from 26 % to 24 %. Right-turn accidents increased from 5 % to 8 %. Given that the changes in risk exposure (changes in traffic, pedestrian and LRV volumes) were not described, and statistical testing was not undertaken, it is unclear whether these results are statistically significant.

Table 4: Accident history at LRT study sites in Baltimore, Maryland

	Year	PDO Accidents	Injury Accidents	Fatal Accidents	TOTAL
First stage of improvements	1999	25	23	1	49
	2000	27	17	0	44
	2001	19	15	0	34
	Total	**71**	**55**	**1**	**127**
Second stage of improvements	2002	20	14	1	35
	2003	29	13	0	42
	2004	15	7	0	22
	Total	**64**	**34**	**1**	**99**

Source: Modified from Sabra et. al (28).

Behavior-Based Evaluation

While the number of collisions has been a traditional safety indicator for LRT systems, TCRP Reports 17 and 69 showed that, because vehicle and pedestrian collisions at grade crossings are relatively infrequent, the number of collisions is often too small to be amenable to standard statistical testing (1,2). A survey of 11 LRT systems in North America showed that light rail accidents at any given location are very rare: 80 % of the 30 highest-accident locations averaged fewer than four accidents per year (1).

Given the infrequent and random nature of LRT-related collisions, an alternative approach to measurement is needed to evaluate the impact of traffic engineering treatments at grade crossings. In the absence of sufficient collision history, a potentially meaningful indicator of the effectiveness of engineering treatments is the use of a surrogate measure such as risky motorist behavior. Risky behavior incidents are those incidents where movements made by the motorist present a threat of collision with a train, but no actual collision occurs. Risky behavior incidents are indicators of a location’s collision potential.

Because such movements are more frequent than the number of collisions, they can be used as a surrogate safety indicator (2). Risky behavior can be categorized into three types: legal and dangerous behavior; illegal and dangerous behavior; and illegal yet perceived safe behavior (1).

Risky behavior of all three types can be evaluated by field investigators' observations, but it is usually evaluated through videotaping which is less obtrusive and allows for the replay of events. Both motor vehicle and pedestrian behavior can be observed through the installation of wide-angle-lens cameras at opposing angles, providing a wide field of view across the LRT alignment. Time-lapse videotaping may extend to periods of 48 hours or longer *(1)*.

8 - KNOWLEDGE GAPS IN SAFETY EFFECTS OF TREATMENTS

Most safety studies have examined treatments along LRT alignments using a simple before-and-after comparison of accidents, anecdotal evidence, accident surrogate measures such as violations, or some combination of the three approaches. The literature review did not find quantified evidence of the safety impacts of various devices and treatments established through contemporary statistical analyses. Although the effectiveness of treatments (such as LRV-activated signs) in reducing incidences of risky behavior on the part of motorists have been amply demonstrated (21,2), no studies to date are based on data that demonstrates the quantified reduction of collisions following the implementation of a given treatment.

The studies available are limited in their scope and do not examine the holistic safety impacts of the various treatments being studied. For example, devices such as pre-signals and advance signals have been widely implemented throughout North America. The focus of studies on pre-signals and advance signals, however, is on signal violations or the impact on LRV-motor vehicle accidents. No studies have examined the system-wide impacts of such treatments, for example, the possibility that the implementation of a new traffic signal at a location could result in an increase in accidents, such as rear end collisions, that just involve motor vehicles.

The lack of studies giving meaningful statistical results can be attributed mainly to the lack of crucial data such as sufficient accident data, vehicular, pedestrian, and LRV volume data and rail and highway inventory information containing dates on which treatments were implemented. In order to determine the feasibility of adopting an empirical Bayes analysis in parallel with a behavioral study to examine the safety impacts of select treatments along LRT alignments, it is essential to first determine the availability of the data needed to carry out this analysis.

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APPENDIX C1 TRANSIT AGENCIES AND CONTACT INFORMATION OF THE PERSONS WHO PARTICIPATED IN THE SURVEY

	Transit Agency	Contact Information
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	Transit Agency	Contact Information
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24.	UTA (Utah Transit Authority) Salt Lake City, UT	Ed Buchanan, Rail Safety Administrator

APPENDIX C2 TREATMENT USAGE AS REPORTED BY THE SURVEY PARTICIPANTS

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
Channelizations	MATA (Memphis Area Transit Authority) Memphis, TN RTD (Regional Transit District) Denver, CO Metro (Metropolitan Transit Authority of Harris County) Houston, TX Edmonton Transit System Edmonton, AB NJT-HBLR (New Jersey Transit Hudson-Bergen Light Rail) Jersey City, NJ	TTC Streetcars Toronto, ON BSDA (Bi-State Development Agency), Saint Louis, MO/IL LACMTA (Los Angeles County Metropolitan Transportation Authority) Los Angeles, CA SRTD (Sacramento Regional Transit District) Sacramento, CA MTA-MD (Maryland Transit Administration) Baltimore, MD ST (Sound Transit, Link) Tacoma, WA SDTI (San Diego Trolley Inc.) San Diego, CA North County Transit District Oceanside, CA SF Muni (San Francisco	SCVTA (Santa Clara Valley Transportation Authority) San Jose, CA UTA (Utah Transit Authority) Salt Lake City, UT MetroTransit Minneapolis, MN	20

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
		Municipal Railway) San Francisco, CA NJT-NCS (New Jersey Transit Newark City Subway) Newark, NJ SEPTA (Southeastern Pennsylvania Transportation Authority) Philadelphia, PA TriMet (Portland TriMet) Portland, OR		
Delineators	Not specifically asked on the survey- too generic. What kind of delineators, where placed, color, etc…			

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
CCTV/video recording	RTD (Regional Transit District) Denver, CO MetroTransit Minneapolis, MN	SCVTA (Santa Clara Valley Transportation Authority) San Jose, CA SRTD (Sacramento Regional Transit District) Sacramento, CA PAAC (Port Authority of Allegheny County) Pittsburgh, PA MTA-MD (Maryland Transit Administration) Baltimore, MD SDTI (San Diego Trolley Inc.) San Diego, CA SF Muni (San Francisco Municipal Railway) San Francisco, CA NJT-NCS (New Jersey Transit Newark City Subway) Newark, NJ TriMet (Portland TriMet) Portland, OR	BSDA (Bi-State Development Agency) Saint Louis, MO/IL LACMTA (Los Angeles County Metropolitan Transportation Authority) Los Angeles, CA Metro (Metropolitan Transit Authority of Harris County) Houston, TX Edmonton Transit System Edmonton, AB North County Transit District Oceanside, CA NJT-HBLR (New Jersey Transit Hudson-Bergen Light Rail) Jersey City, NJ	17
Pavement marking,	All participating agencies reported using this treatment except C-Train, Calgary, Alberta which did not respond to this question.			

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
texturing, and striping				
Z pedestrian crossings	BSDA (Bi-State Development Agency) Saint Louis, MO/IL RTD (Regional Transit District) Denver, CO SDTI (San Diego Trolley Inc.) San Diego, CA Metro (Metropolitan Transit Authority of Harris County) Houston, TX	SCVTA (Santa Clara Valley Transportation Authority) San Jose, CA SRTD (Sacramento Regional Transit District) Sacramento, CA C-Train Calgary, AB MetroTransit Minneapolis, MN SF Muni (San Francisco Municipal Railway) San Francisco, CA TriMet (Portland TriMet) Portland, OR		10

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
Blank-out turn prohibition signs	RTD (Regional Transit District) Denver, CO PAAC (Port Authority of Allegheny County) Pittsburgh, PA UTA (Utah Transit Authority) Salt Lake City, UT NJT-HBLR (New Jersey Transit Hudson-Bergen Light Rail) Jersey City, NJ	SCVTA (Santa Clara Valley Transportation Authority) San Jose, CA LACMTA (Los Angeles County Metropolitan Transportation Authority) Los Angeles, CA SRTD (Sacramento Regional Transit District) Sacramento, CA SDTI (San Diego Trolley Inc.) San Diego, CA Metro (Metropolitan Transit Authority of Harris County) Houston, TX MetroTransit Minneapolis, MN TriMet (Portland TriMet) Portland, OR	NJT (New Jersey Transit - River LINE) Camden, NJ	12
Pedestrian pull (swing) gates	RTD (Regional Transit District) Denver, CO SRTD (Sacramento Regional Transit District) Sacramento, CA	TTC Streetcars, Toronto, ON BSDA (Bi-State Development Agency) Saint Louis, MO/IL		15

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
	PAAC (Port Authority of Allegheny County), Pittsburgh, PA NJT (New Jersey Transit - River LINE), Camden, NJ NJT-HBLR (New Jersey Transit Hudson-Bergen Light Rail), Jersey City, NJ TriMet (Portland TriMet), Portland, OR	SCVTA (Santa Clara Valley Transportation Authority) San Jose, CA LACMTA (Los Angeles County Metropolitan Transportation Authority) Los Angeles, CA MTA-MD (Maryland Transit Administration) Baltimore, MD UTA (Utah Transit Authority) Salt Lake City, UT Metro (Metropolitan Transit Authority of Harris County) Houston, TX North County Transit District Oceanside, CA SF Muni (San Francisco Municipal Railway) San Francisco, CA		

Treatment	Used at only a few locations (less than 5)	Used at some locations	Used at nearly all locations	Total
Fencing	Fencing was explicitly surveyed. In the open ending questions the following agencies reported using fencing: MTA-MD (Maryland Transit Administration), Baltimore, MD MetroTransit, Minneapolis, MN SRTD (Sacramento Regional Transit District), Sacramento, CA			

APPENDIX C3 SURVEY RESPONSES

Twenty-four Light Rail Transit (LRT) systems participated in our on-line survey, and follow-up was carried out in the period of late 2006 to early 2007. The survey was designed to enquire about three types of data and their availability:

1. LRT-related accidents involving motorist and pedestrians
2. Traffic, pedestrian, and LRT volumes
3. Treatments.

APPENDIX C3 TABLE OF CONTENTS

BSDA (BI-STATE DEVELOPMENT AGENCY), SAINT LOUIS, MO/IL

Contact Information and History

Location	Saint Louis, MO/IL	
Website	www.metrostlouis.org	
System Name	BSDA (Bi-State Development Agency)	
Name	Sheila Hockel	Oscar Figueroa
Title	System Safety Auditor	
Address	707 No. 1st Street, St. Louis MO 63102	707 No. 1st Street, St. Louis MO 63102
Phone	314-982-1400 ex 1645	314-231-6840
email	shockel@metrostlouis.org	ofigueroa@metrostlouis.org
Contact provided by:	TCRP	TCRP
	TRA contact - will respond	
Contact Dates	TRA	
Actions Dec 5	TRA to call Dec 11 if no response, and enter actions	
Actions Dec 7		Left message for Oscar indicating that we are counting on his participation for the survey and that Sheila Hockel is also helping. Suggested that he coordinate with her to ensure all parts of survey are completed.
Actions Dec11	iTRANS follow up, Dec 13, left message	TRA call Dec 11
Actions Dec 14		
Actions Dec 15	Spoke to Sheila Hockel.	

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	1984 to present hard copy, 2000 to present electronically
Who can provide historical accident and incident data for your LRT system?	I can provide historical accident data

Traffic Volume

Location identifier	
Pedestrian volume	
Vehicle volume	
Vehicle turning movement volume	
Light Rail Vehicle volume	
Year of the volume count	
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	Unknown
How many years of vehicle volume (cars) data are recorded for your LRT system?	Maybe 2002 to present
Who can provide historical traffic volume data for your LRT system?	not sure, so contact me and I'll find out who

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	
Signal preemption (transfer of normal signal operations to special control mode)	Used at only a few locations (less than 5)	
Four-quadrant gates		
Four-quadrant flashing light signals		
Constant warning time systems (uniform warning regardless of LRT speed)	Used at nearly all locations	
Retroreflective advance warning signs		

Treatment	Usage	Installation/ Construction Date
Presignals/advanced signals (supplemental signals which control approaching traffic)		
Flashing light signals or beacons on the approach to LRT grade crossings		
Enhanced pavement markings on the approach to LRT-highway grade crossings		
Transverse rumble strips on the approach to railroad-highway grade crossings		
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at only a few locations (less than 5)	
Pavement marking, texturing, and striping		
Channelizations (including roadway medians)		
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at nearly all locations	
Education outreach programs to drivers and/or pedestrians	Not used	
Quick curbs (a median barrier device)	Not used	
Laser detection of vehicles, pedestrians, bicyclists	Not used	
CCTV/video recording	Not used	
Z pedestrian crossings	Used at some locations	
Collision warning systems	Not used	
Gate crossing indication signals	Used at nearly all locations	
Train control systems with warning of presence		
Limits on downtime of gates	Not used	
Pedestrian gates	Used at some locations	
Second-train signals	Not used	
Flashing signs	Used at only a few locations (less than 5)	
Blank-out turn prohibition signs	Not used	
Illumination of crossings	Used at nearly all locations	
Enforcement-photo-of gate and no-left-turn violations	Not used	
Crossing horns-automatic and LRV-operator-activated	Not used	

Treatment	Usage	Installation/ Construction Date
Enforcement (police enforcement)	Not used	
Pedestrian fence gates		
Vehicle fence gates		
Pedestrian signals	Used at nearly all locations	
GPS countdown pedestrian signals	Not used	

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes, please contact me for this report
Has your LRT agency ever conducted a formal safety evaluation?	
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	I'm not sure what you're asking for

Data Received

BSDA provided us with the following information:

- Accident investigation form

C-TRAIN, CALGARY, ALBERTA

Contact Information and History

Location	Calgary, AB	
Website		
System Name	C-Train	
Name	Tony Sharples	Tania Fraser
Title		
Address		
Phone	430-230-6683	430-537-3104
email	tsharples@calgary.ca	tfraser@calgary.ca
Contact provided by:	iTRANS	iTRANS
Contact Dates	Called on Nov 20, 2006 - Left Voice Mail - Retries: 22,23 Nov	Called on Nov, 20 - Waiting since deadline is in December - she will try to complete earlier
Actions Dec 5		
Actions Dec 7	Call on Dec 8, was out of office for the day.	Call on Dec 7 and 8. Retries on 11 and 12. Calls were made repeatedly.
Actions Dec11	Retries on 11 and 12. Calls were made repeatedly.	Retries on 11 and 12. Calls were made repeatedly.
Actions Dec 14		
Actions Dec 15	Talked with Tony Sharples (403-230-6683) and he wanted an e-mail about the project and our data needs. E-mail was sent. Tried calling to follow up, left voice mail. Asked him for accident forms and safety reports and video. He is currently seeking his manager’s permission to release data.	

Location	Calgary, AB	
Website		
System Name	C-Train	
Name	Dave Larose	Tim Ogle
Title		
Address		
Phone	430-537-3121	430-268-3793
Email	dlarose@calgary.ca	togle@calgary.ca
Contact provided by:	iTRANS	iTRANS
Contact Dates		
Actions Dec 5		
Actions Dec 7	The only information he supplied was his name, position and Name and that we would like to have the e-mail results	DECLINED
Actions Dec11	Retries on 11 and 12. Calls were made repeatedly.	
Actions Dec 14		
Actions Dec 15		
Accident		
Traffic Volume		
Treatment		

Location	Calgary, AB	
Website		
System Name	C-Train,	
Name	Anthony Lam	
Title		
Data		
Address		
Phone	430-268-6705	
email	anthony.w.law@calgary.ca	
Contact provided by:	iTRANS	
Contact Dates		
Actions Dec 5		
Actions Dec 7	Spoke to Anthony, said he cannot participate in survey because we are private consultant. Cannot give	

	such information to us. I informed in of all the various LRT system involved and the scope of the project where his data will not be singled but aggregated. He still will only supply his data or partake in survey if an official government agency requested it.	
Actions Dec11	Retries on 11 and 12. Calls were made repeatedly.	
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	
Who can provide historical accident and incident data for your LRT system?	

Traffic Volume

Location identifier	
Pedestrian volume	
Vehicle volume	
Vehicle turning movement volume	
Light Rail Vehicle volume	
Year of the volume count	
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	
Signal preemption (transfer of normal signal operations to special control mode)	Used at only a few locations (less than 5)	
Four-quadrant gates		
Four-quadrant flashing light signals		
Constant warning time systems (uniform warning regardless of LRT speed)	Used at nearly all locations	
Retroreflective advance warning signs		
Presignals/advanced signals (supplemental signals which control approaching traffic)		
Flashing light signals or beacons on the approach to LRT grade crossings		
Enhanced pavement markings on the approach to LRT-highway grade crossings		
Transverse rumble strips on the approach to railroad-highway grade crossings		
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at only a few locations (less than 5)	
Pavement marking, texturing, and striping		
Channelizations (including roadway medians)		
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at nearly all locations	
Education outreach programs to drivers and/or pedestrians		

Treatment	Usage
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Not used
Z pedestrian crossings	Used at some locations
Collision warning systems	Not used
Gate crossing indication signals	Used at nearly all locations
Train control systems with warning of presence	
Limits on downtime of gates	Not used

Pedestrian gates	Used at some locations
Second-train signals	Not used
Flashing signs	Used at only a few locations (less than 5)
Blank-out turn prohibition signs	Not used
Illumination of crossings	Used at nearly all locations
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Not used
Pedestrian fence gates	
Vehicle fence gates	
Pedestrian signals	
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Tony Sharples, tony.sharples@calgary.ca
Has your LRT agency ever conducted a formal safety evaluation?	Not sure what is meant by safety treatment.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	We have CCTV aimed at platforms, but some are angled such that we can see intersections. When we've had incidents involving the train, we do pull the video. I don't believe this information can be shared.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	Not available

Data Received

C-Train provided iTRANS with the following information:

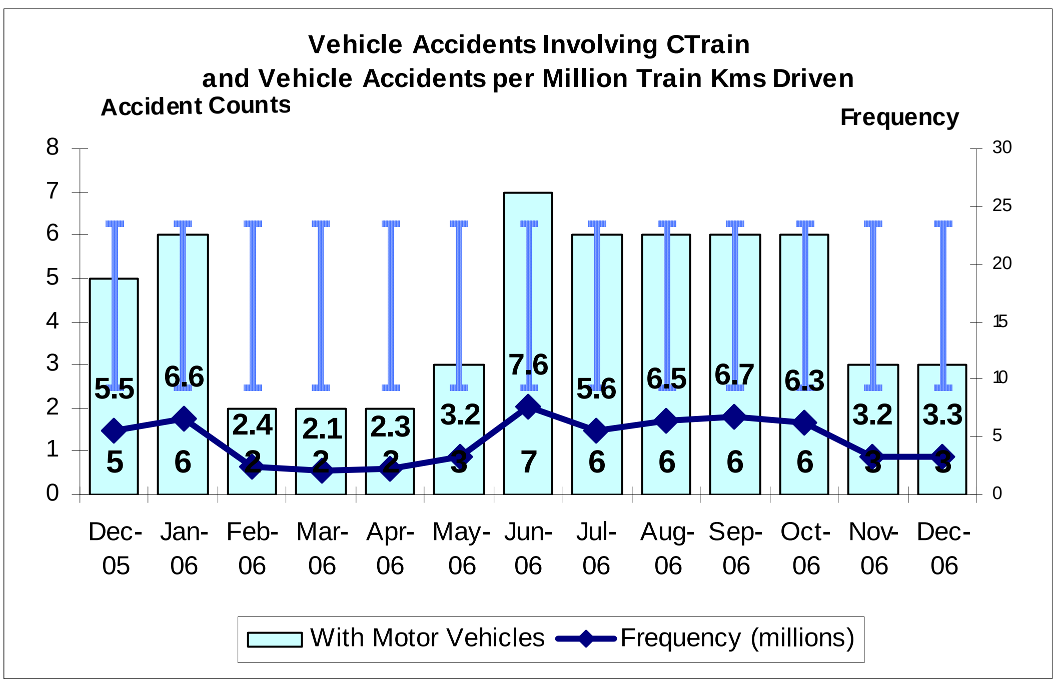
1. Monthly Vehicle Accident Statistics Month Ending Report for 2006 December
2. Injury Incident Analysis, 2006 January 1 to December 31
3. Accident Investigation form
4. Route maps

An excerpt of a chart, table and accompanying text directly from the CTrain section of the "Monthly Vehicle Accident Statistics Month Ending Report for 2006 December" (which also covers regular bus operations) is provided below. The report notes that the vertical 'I' bars in the chart represent "+/- 1 standard deviation from the average for the data that the bars correlate with". The comment on only 2 collisions being non-preventable was found to refer only to the 3 collisions in December 2006.

Vehicle Accidents – CTrain

There were three (3) vehicle accidents in 2006 December and three (3) in 2006 November. Only two (2) were non-preventable.

Collisions to date between CTrains and motor vehicles, pedestrians, and objects are all up over 2005 year to date.



Accident Frequencies – CTrain Vehicle Accidents

The frequency of CTrain accidents for 2006 December at 3.3 vehicle accidents per million train kilometres traveled is just slightly higher than 2006 November. The average number of CTrain-Vehicle accidents is 3.54 ± 2.03 overall and 3.83 ± 2.99 for December.

An excerpt from the "Injury Incident Analysis, 2006 January 1 to December 31" is included below. That document starts:

> *A review of all injury incidents within Calgary Transit was completed for occurrences during the period of 2006 January 1 to December 31. The purpose of this analysis was to determine which types of incidents were causing the most injuries to our employees and what actions we may wish to take in order to reduce the numbers. This report does compare the same period in 2005.*

Traffic Accident Involvement

	2005	2006
Lost Time Incidents	15	35
Medical Aid Incidents	5	3
First Aid	0	0
Untreated	9	8
Total	**29**	**46**

A number of our buses are involved in traffic accidents each year. In the majority of cases this involves a third party vehicle running into our buses while they are stopped at a bus stop or intersection. In a number of these instances the other driver is charged with the responsibility and Calgary Transit recovers the related costs. However, in a large number of cases our operator is injured and these injuries involve a number of days away from work as well as considerable pain and suffering by the operators.

Suggested Action

1. Operators have to be aware of the importance of keeping the taillights and brake lights clean in order for other vehicle operators to see that the bus is stopped. This should continue to be addressed in the initial training and during driver checks.
2. The majority of these accidents involve another vehicle running into the back of our buses while they are stopped. If it is possible, LED lights should be installed on as many buses as practicable as these are much brighter lights than the old bulb type lights and other drivers may more easily see that our bus is stopped.

EDMONTON TRANSIT SYSTEM, EDMONTON, ALBERTA

Contact Information and History

Location	Edmonton, AB	
Website		
System Name	Edmonton Transit System, ETS	
Name	Dave Geake	Mike Derbyshire
Title	Director of Light Rail Transit	The Director of Security
Address	D.L. MacDonald Division Mn Floor, 13310-50 A Street, Edmonton, AB T5V 1J2	Main Floor, Chancery Hall, #3 Sir Winston Churchill Square, Edmonton, AB T5J 2C3"
Phone	780-496-4496	780-496-5746
email	Dave.Geake@edmonton.ca	Mike.Derbyshire@edmonton.ca
Contact provided by:	iTRANS	iTRANS
Contact Dates	Called on Nov 20, 2006 - Left Voice Mail - Retries: 22,23 Nov	Called on Nov 20, 2006 - Left Message with Secretary - Retries: 22,23 Nov
Actions Dec 5		
Actions Dec 7		
Actions Dec11	Called on 11 and 12 repeatedly; no response.	Called on Dec 11, left message with Secretary- she would ask him to re-turn call. Call on Dec 12, no answer
Actions Dec 14		
Actions Dec 15		

Location	Edmonton, AB	
Website		
System Name	Edmonton Transit System, ETS	
Name	Wayne Mandryk	Larry McCormick
Title	The Manager of Transit Projects Office	Manager Traffic Operations
Address	7th Floor, Scotia Place, 10060 Jasper Avenue, Edmonton, AB T5J 3R8	15th Floor, Century Place – 9803-102 A Avenue, Edmonton, AB T5J 3A3
Phone	780-496-8118	780-496-2666
Email	Wayne.Mandryk@edmonton.ca	Larry.McCormick@Edmonton.ca
Contact provided by:	iTRANS	iTRANS
Contact Dates	Called on Nov 20, 2006 - Left Voice Mail - Retries: 22,23 Nov	Called on Nov 20, 2006 - Larry said he passed it on to other persons to address, recall on 24 Nov - left voice mail
Actions Dec 5		

Actions Dec 7	Called repeatedly on Dec 7 and 8. No response.	Called repeatedly on Dec 7 and 8. Left a voice mail on the 8th with his Secretary who said he was in a meeting. No word back from him as yet.
Actions Dec11	Talk to Wayne on Dec 11, said his staff is looking at it. They are working with the deadline of the Dec 29. Should get it out before that, if not only a few days late. Couldn't motivate.	
Actions Dec 14	Wayne Mandryk has handed the survey to Ben Woo (780-496-2667) to complete. Ben and Phil Therrien addressed the survey simultaneously. Phil informed me that the survey is completed and Ben should be sending it. Tried calling Ben but keep getting voice mail.	
Actions Dec 15		

Location	Edmonton, AB	
Website		
System Name	Edmonton Transit System, ETS	
Name	Kevin Wenzel	
Title		
Data		
Address		
Phone		
email	kevin.wenzel@edmonton.ca	
Contact provided by:	iTRANS	
Contact Dates	Called on Nov 20, 2006 - Larry informed that he didn't get survey - resent it, follow up call on 24 Nov - left voice mail	
Actions Dec 5		
Actions Dec 7	Called repeatedly on Dec 7 and 8. Left a voice mail on the 8th. No word back from him as yet	
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	1980 to present in hard copy and electronically
Who can provide historical accident and incident data for your LRT system?	Phil Therrien Supervisor of LRT Operations (780)496-4372 phil.therrien@edmonton.ca

Traffic Volume

Location identifier	Recorded electronically
Pedestrian volume	Recorded electronically
Vehicle volume	Recorded electronically
Vehicle turning movement volume	Recorded electronically
Light Rail Vehicle volume	Recorded electronically
Year of the volume count	Recorded electronically
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	1980 to present in hard copy and electronically
How many years of vehicle volume (cars) data are recorded for your LRT system?	1980 to present in hard copy and electronically
Who can provide historical traffic volume data for your LRT system?	Phil Therrien Supervisor of LRT Operations (780)496-4372 phil.therrien@edmonton.ca

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	Not recorded
Signal preemption (transfer of normal signal operations to special control mode)	Not used	Not recorded
Four-quadrant gates	Used at only a few locations (less than 5)	Recorded in hard copy
Four-quadrant flashing light signals	Used at only a few locations (less than 5)	Recorded in hard copy
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Not used	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Used at nearly all locations	Recorded in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at nearly all locations	Recorded in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at nearly all locations	Recorded in hard copy
Channelizations (including roadway medians)	Used at only a few locations (less than 5)	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at nearly all locations	Recorded in hard copy
Education outreach programs to drivers and/or pedestrians	Not used	

Treatment	Usage
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at nearly all locations
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Used at nearly all locations
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Used at only a few locations (less than 5)
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Not used
Illumination of crossings	Used at nearly all locations
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Not used
Vehicle fence gates	Not used
Pedestrian signals	Used at only a few locations (less than 5)
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	None
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Phil Therrien Supervisor of LRT Operations (780)496-4372 phil.therrien@edmonton.ca
Has your LRT agency ever conducted a formal safety evaluation?	No
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such	Yes, but it can not be shared with TCRP.

as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	Any public accessible information.
Who can provide safety devices/treatments data for your LRT system?	Phil Therrien Supervisor of LRT Operations (780)496-4372 phil.therrien@edmonton.ca

Data Received

ETS has provided the research team with the following information:

- Accident investigation form

KT (KENOSHA TRANSIT), KENOSHA, WI

Contact Information and History

Location	City of Kenosha	
Website		
System Name	KT (KENOSHA TRANSIT)	
Name	Len Brandrup	
Title	Director, Department of Transportation	
Address	3735 65th Street Kenosha, WI 53142	
Phone	262-653-4290	
email	transit@kenosha.org	
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	2000 to present in hard copy only
Who can provide historical accident and incident data for your LRT system?	Ron Iwen 1-262-653-4290 troni@kenosha.org

Traffic Volume

Location identifier	This field is not recorded
Pedestrian volume	This field is not recorded
Vehicle volume	This field is not recorded
Vehicle turning movement volume	This field is not recorded
Light Rail Vehicle volume	Recorded in hard copy
Year of the volume count	Recorded in hard copy
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	2000 to present in hard copy only
How many years of vehicle volume (cars) data are recorded for your LRT system?	None
Who can provide historical traffic volume data for your LRT system?	Only vehicle volume data is available from Ron Iwen, previously identified. Historical vehicle traffic volume data are not available.

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	Not recorded
Signal preemption (transfer of normal signal operations to special control mode)	Not used	Not recorded
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Used at nearly all locations	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	Not recorded
Transverse rumble strips on the approach to	Not used	Not recorded

railroad-highway grade crossings		
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at some locations	Not recorded
Channelizations (including roadway medians)	Not used	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	Not recorded
Education outreach programs to drivers and/or pedestrians	Not used	Not recorded

Treatment	Usage
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Not used
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Not used
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Not used
Vehicle fence gates	Not used
Pedestrian signals	Not used
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	We operate the system within the normal traffic control systems used throughout the City of Kenosha. They include stop signs, yield signs, regular traffic signals.
Does your LRT system produce a safety	We can outline what we have. Contact

report analyzing the causes and contributing factors of accidents and incidents?	Ron Iwen if information is needed.
Has your LRT agency ever conducted a formal safety evaluation?	See Ron Iwen for any safety reports prepared for the system.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	None available.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	None
Who can provide safety devices/treatments data for your LRT system?	

Data Received

None.

LACMTA (LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY), LOS ANGELES, CA

Contact Information and History

Location		
Website	www.mta.net	
System Name	LACMTA	
Name	Barbara Burns	Gerald Francis
Title		Chief Safety Officer
Address	1 Gateway Plaza, Los Angeles CA 90012	1 Gateway Plaza, Los Angeles CA 90012
Phone	(213) 922-5653	2130922-2006
email	burnsb@mta.net	francisg@metro.net
Contact provided by:	TCRP	TRA
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Location		
Website	www.mta.net	
System Name	LACMTA	
Name	Tracy Berg	Vijay Khawani
Title	Rail Safety Coordinator	Director of Corporate Bus and Rail Safety
Address	700 S. flower Street #2600 LA 90017	
Phone	(213) 452-0241	
email	Berget@scrra.net	
Contact provided by:	TCRP	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Not recorded
Number of years of accident and incident data recorded	June 1990 to present
Who can provide historical accident and incident data for your LRT system?	AUDREY CHIU (213) 922-4783 CHIUA@METRO.NET

Traffic Volume

Location identifier	Recorded electronically and in hard copy
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Not recorded
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	Not recorded
How many years of vehicle volume (cars) data are recorded for your LRT system?	Not recorded
Who can provide historical traffic volume data for your LRT system?	SEAN SKEHAN (213) 972-8428 SEAN.SKEHAN@LACITY.ORG Sean can provide this data for intersections in the City of Los Angeles. I do not have contacts for other cities.

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at some locations	Recorded in hard copy
Four-quadrant gates	Used at some locations	Recorded in hard copy
Four-quadrant flashing light signals	Used at some locations	Recorded in hard copy
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	
Retroreflective advance warning signs	Used at nearly all locations	Recorded in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at some locations	Recorded in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Used at only a few locations (less than 5)	Recorded in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at only a few locations (less than 5)	Recorded in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at only a few locations (less than 5)	Recorded in hard copy
Pavement marking, texturing, and striping	Used at nearly all locations	Recorded in hard copy
Channelizations (including roadway medians)	Used at some locations	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at some locations	Recorded in hard copy
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	Usage
Quick curbs (a median barrier device)	Used at only a few locations (less than 5)
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at nearly all locations
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Not used
Limits on downtime of gates	Used at some locations
Pedestrian gates	Used at some locations
Second-train signals	Used at only a few locations (less than 5)
Flashing signs	Used at some locations
Blank-out turn prohibition signs	Used at some locations
Illumination of crossings	Used at some locations
Enforcement-photo-of gate and no-left-turn violations	Used at some locations
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Used at nearly all locations
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Used at nearly all locations
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	Photo Enforcement Systems, Swing Gates, Pedestrian Gates Safety Education Videos, Public Service Announcements, Billboard Advertising,
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Audrey Chiu (213) 922-4783 Chiua@Metro.Net
Has your LRT agency ever conducted a formal safety evaluation?	Yes, There Was A Study Conducted On The Effectiveness Of The Second Train Coming Sign. It Is Available On TRB's Website.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such	No

as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	We Can Share Any Data That You Need, If Available
Who can provide safety devices/treatments data for your LRT system?	Abdul Zohbi (213) 922-2114 Zohbia@Metro.Net

Data Received

LACMTA has provided the research team with the following data:

1. Safety report "SUMMARY OF METRO BLUE LINE TRAIN/VEHICLE AND TRAIN/PEDESTRIAN ACCIDENTS (July 1990 – December 2006)
2. Accident Investigation form
3. Power point presentation "Rail Operations Safety"

In addition, detailed information about the signal priority system was obtained and fully documented in the interim report.

MATA (MEMPHIS AREA TRANSIT AUTHORITY)

Contact Information and History

Location	Memphis, TN	
Website	www.matatransit.com	
System Name	MATA (Memphis Area Transit Authority)	
Name	Tom Fox	
Title	President/General Manager	
Address	1370 Levee Road, Memphis TN 38101	
Phone	901-722-7111	
email	tfox@matatransit.com	
Contact provided by:		
Contact Dates	Left a message on Nov 21 asking for accident form	
Actions Dec 5	Talked to John Lancaster (901-722-0307) since his name was on the survey. He suggested I talked with Judd Killebrew (901-722-0303) or jkillebrew@matatransit.com). Called Judd, left voice mail. Re-tried several times. Talked with Judd, asked me to send William Hudson a letter about the project and our data request. Letter sent, talked with Judd who inform me that he will get back to me after talking with William.	
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	1999 to present
Who can provide historical accident and incident data for your LRT system?	Judd Killibrew Assistant Director of Safety Risk Management jkillibrew@matatransit.com

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Recorded in hard copy
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded in hard copy
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	Not recorded
How many years of vehicle volume (cars) data are recorded for your LRT system?	2000 to Present
Who can provide historical traffic volume data for your LRT system?	John Lancaster (901-722-0307)

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at only a few locations (less than 5)	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)		Not recorded
Signal preemption (transfer of normal signal operations to special control mode)	Not used	Not recorded
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Not used	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Used at only a few locations (less than 5)	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Not used	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at only a few locations (less than 5)	Not recorded
Channelizations (including roadway medians)	Used at only a few locations (less than 5)	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	Not recorded
Education outreach programs to drivers and/or pedestrians	Not used	

Treatment	Usage
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Not used
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Used at only a few locations (less than 5)
Blank-out turn prohibition signs	Not used
Illumination of crossings	Used at only a few locations (less than 5)
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Not used
Vehicle fence gates	Not used
Pedestrian signals	Used at only a few locations (less than 5)
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	None.
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Judd Killebrew Assistant Director of Safety & Risk Management jkillebrew@matatransit.com
Has your LRT agency ever conducted a formal safety evaluation?	No
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	No. However, this data is now available and it could be saved and reviewed since we have recently installed on-board cameras on our trolley fleet. Yes, this data could be shared with this TCRP project.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	Our state safety oversight agency, Tennessee Department of Transportation (TDOT) inspection reports and reviews could also be made available.
Who can provide safety devices/treatments data for your LRT system?	John C. Lancaster Senior Planner 901-722-0307 jclancaster@matatransit.com

Data Received

MATA has provided the research team with the following information:

- Accident Investigation form

METRO (METROPOLITAN TRANSIT AUTHORITY OF HARRIS COUNTY), HOUSTON, TX

Contact Information and History

Location		
Website	www.ridemetro.org	
System Name	Metro	
Name	James Gallagher	
Title		
Address	1900 Main Street, P.O. Box 61429, Houston, Texas 77208-1429	
Phone	713-739-4972	
email	jg27@ridemetro. org	
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded electronically and in hard copy
Number of years of accident and incident data recorded	2004 to present
Who can provide historical accident and incident data for your LRT system?	Reginald Mason Associate Vice President, System Safety (713) 739-4078 rm01@ridemetro.ord

Traffic Volume

Location identifier	Recorded electronically
Pedestrian volume	
Vehicle volume	
Vehicle turning movement volume	
Light Rail Vehicle volume	Recorded electronically
Year of the volume count	Recorded electronically
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	2004 to present
How many years of vehicle volume (cars) data are recorded for your LRT system?	none
Who can provide historical traffic volume data for your LRT system?	Not available

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Recorded in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at nearly all locations	Recorded in hard copy
Four-quadrant gates	Not used	
Four-quadrant flashing light signals	Not used	
Constant warning time systems (uniform warning regardless of LRT speed)	Used at some locations	Recorded in hard copy
Retroreflective advance warning signs	Used at some locations	Recorded in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at some locations	Recorded in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Used at some locations	Recorded in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	Recorded in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Used at some locations	Recorded in hard copy
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	

Pavement marking, texturing, and striping	Used at some locations	Recorded in hard copy
Channelizations (including roadway medians)	Used at only a few locations (less than 5)	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at some locations	Recorded in hard copy
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	**Usage**
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at nearly all locations
Z pedestrian crossings	Used at only a few locations (less than 5)
Collision warning systems	Not used
Gate crossing indication signals	Used at only a few locations (less than 5)
Train control systems with warning of presence	Used at some locations
Limits on downtime of gates	Used at some locations
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Used at some locations
Blank-out turn prohibition signs	Used at some locations
Illumination of crossings	Used at some locations
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Used at some locations
Enforcement (police enforcement)	Used at only a few locations (less than 5)
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Used at only a few locations (less than 5)
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	In-Pavement Lighting
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes
Has your LRT agency ever conducted a formal safety evaluation?	Texas Transportation Institute recommended several safety treatments for our light rail alignment. I can forward this study also.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	Yes, near-miss reports are kept and the data can be shared.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	None
Who can provide safety devices/treatments data for your LRT system?	Reginald Mason Associate Vice President, System Safety (713) 739-4078 rm01@ridemetro.ord

Data Received

None.

METROTRANSIT, MINNEAPOLIS, MN

Contact Information and History

Location	Minneapolis, MN	
Website	www.metrotransit.org	
System Name	MetroTransit	
Name	Michael J. Conlon	Kelci Stones
Title	Director of Rail and Bus Safety	Project manager, Marketing
Address	560 Sixth Avenue North, Minneapolis, Minnesota 55411-4398	560 6th Avenue N., Minneapolis MN 55411
Phone		
email	mike.conlon@metc.state.mn.us	Kelci.stones@metc.state.mn.us
Contact provided by:	TRA	TCRP
Contact Dates		Reviewed survey form but found to be empty. Left message for Kelci to ask to complete survey again and to call if had any questions.
Actions Dec 5		Spoke with Kelci Stones and was told that a more appropriate contact is Mike Conlon since Kelci is marketing person. No further action required for Kelci.
Actions Dec 7	Called and left message. Also indicated that we had received response from Kelci Stones but form was essentially empty.	
Actions Dec11	Exchanged correspondence with john MacQueen and later, Mike Conlon (the Director). System only operational since 2004 and general reluctance by Mike to commit time and resources to putting together the data for us. Decided not to pursue this system further because of lack of history of system.	
Actions Dec 14	System operates in Minneapolis and Bloomington (Cities)--traffic data would have to be obtained from them. No need to follow since	

	omitting this system by virtue of them having only data since 2004.	
Actions Dec 15		

Location	Minneapolis, MN	
Website		
System Name	MetroTransit	
Name	Erin Petersen	
Title		
Address	474 Concordia Avenue, St. Paul MN 55103	
Phone	651-228-7301	
email	petersen@mnsafetycouncil.org	
Contact provided by:	TCRP	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11	Left message asking about accident data related to LRT.	
Actions Dec 14	Called again but got machine. Left another message for Erin to call back.	
Actions Dec 15	Called again and left another voicemail message.	

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Not recorded
Number of years of accident and incident data recorded	June 2004 to present for specific accidents only-not compiled
Who can provide historical accident and incident data for your LRT system?	Michael Conlon Dir of Rail and Bus Safety 560 sixth avenue North Minneapolis MN 55411 mike.conlon@metc.state.mn.us

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded in hard copy
Year of the volume count	Recorded in hard copy
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	None
How many years of vehicle volume (cars) data are recorded for your LRT system?	None
Who can provide historical traffic volume data for your LRT system?	Blake Lynden

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at some locations	Recorded in hard copy
Four-quadrant gates	Not used	
Four-quadrant flashing light signals	Not used	
Constant warning time systems (uniform warning regardless of LRT speed)	Used at nearly all locations	
Retroreflective advance warning signs	Used at nearly all locations	Recorded in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at some locations	Recorded in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	
Enhanced pavement markings on the approach to LRT-highway grade crossings	Not used	Recorded in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at nearly all locations	Recorded in hard copy
Pavement marking, texturing, and striping	Used at nearly all	Recorded in hard

	locations	copy
Channelizations (including roadway medians)	Used at nearly all locations	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at some locations	Recorded in hard copy
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	Usage
Quick curbs (a median barrier device)	
Laser detection of vehicles, pedestrians, bicyclists	
CCTV/video recording	
Z pedestrian crossings	
Collision warning systems	
Gate crossing indication signals	
Train control systems with warning of presence	
Limits on downtime of gates	
Pedestrian gates	
Second-train signals	
Flashing signs	
Blank-out turn prohibition signs	
Illumination of crossings	
Enforcement-photo-of gate and no-left-turn violations	
Crossing horns-automatic and LRV-operator-activated	
Enforcement (police enforcement)	
Pedestrian fence gates	
Vehicle fence gates	
Pedestrian signals	
GPS countdown pedestrian signals	

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	illuminated no right turn indicators and LRT knockout lighted signs
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	No
Has your LRT agency ever conducted a	We are very busy analyzing and

formal safety evaluation?	mitigating hazards. We have done some work on intertrack fencing of split platform stations. We try to do things right from the first. That is, design out hazards as far as possible. Consequently our opportunities for improving outdated or old practices are limited. Pedestrians crossing mid-platform at the Government Center station led to a study of the scope of the problem (structured counts)before any treatments were made and then following any additional treatments (signage, platform and on-board announcements, etc.)
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	By procedure, we ask that all emergency braking events be reported to RCC. We don't generate a report that details these things for public consumption. Near misses as reported by Train operators are logged and investigated where possible.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	Individual accident reports are confidential and may not be shared, however each accident generates a report including contributing factors and hazard mitigation steps (where appropriate).
Who can provide safety devices/treatments data for your LRT system?	Not available.

Data Received

None.

MTA-MD (MARYLAND TRANSIT ADMINISTRATION), BALTIMORE, MD

Contact Information and History

Location	Baltimore, MD	
Website	www.mtamaryland.com	
System Name	Mass Transit Administration, Maryland DOT	
Name	Derrick Jones	Michale Bartholf
Title	Light Rail Coordinator	Deputy Director, Communications
Address	6 Paul Street	Baltimore MD 21202
Phone	410-454-7667	410-454-7667
email	DJones2@mtamaryland.com	MBartoff@mtamaryland.com
Contact provided by:		TRA
Contact Dates	Spoke with Admin Asst. Yvonne. Derrick Jones no longer works for MTA. New LRT coordinator is Mr. Fletcher Hamilton.	Spoke with Admin Asst. Yvonne. No such person works for MTA.
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Location	Baltimore, MD	
Website	www.mtamaryland.com	
System Name	Mass Transit Administration, Maryland DOT	
Name	Ronald A. Keele	Fletcher Hamilton
Title	Executive Director, Office of Safety and Risk Management	
Address	1515 Washington Blvd., Baltimore, MD 21230-1717	6 Paul Street, Baltimore MD 21202
Phone	410-454-7141	410-454-7616
email	Rkeele@mtamaryland.com	fhamilton@mtamaryland.com
Contact provided by:	TCRP	
Contact Dates		
Actions Dec 5		
Actions Dec 7		Called and left a voicemail message explaining about the project and the purpose of survey. Asked him to call back.

Actions Dec11		
Actions Dec 14	Called and left numerous voicemail messages for Ronald Keele, Executive Director to explain status of study and request for data. No responses to date.	
Actions Dec 15	Contacted Thomas Schoenborn and Thomas said he can provide LRT volume data. Called back on the 26 and 30th but he could not be reached.	Called and left messages for Vernon Hartsock on the 24th, 26th and 30th of Jan, 2007. No contact to date.

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	1985 to present in a computerized format
Who can provide historical accident and incident data for your LRT system?	Ronald A. Keele

Traffic Volume

Location identifier	Recorded electronically and in hard copy
Pedestrian volume	Recorded electronically and in hard copy
Vehicle volume	Recorded electronically and in hard copy
Vehicle turning movement volume	Recorded electronically and in hard copy
Light Rail Vehicle volume	Recorded electronically and in hard copy
Year of the volume count	Recorded electronically and in hard copy
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	1991 to present in hard copy and computerized format.
How many years of vehicle volume (cars) data are recorded for your LRT system?	1991 to present in hard copy and computerized format.
Who can provide historical traffic volume data for your LRT system?	Thomas Schoenborn 410-767-3734 tschoenborn@mtamaryland.com

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	Not recorded
Signal preemption (transfer of normal signal operations to special control mode)	Used at nearly all locations	Recorded in hard copy
Four-quadrant gates	Not Used	Recorded in hard copy
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Used at nearly all locations	Recorded in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at nearly all locations	Recorded in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Not used	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at some locations	Recorded in hard copy
Pavement marking, texturing, and striping	Used at nearly all locations	Recorded in hard copy
Channelizations (including roadway medians)	Used at some locations	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at nearly all locations	Recorded in hard copy
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	Usage
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at some locations
Z pedestrian crossings	Not used
Collision warning systems	Used at nearly all locations
Gate crossing indication signals	Used at nearly all locations
Train control systems with warning of presence	Used at nearly all locations

Limits on downtime of gates	Not used
Pedestrian gates	Used at some locations
Second-train signals	Used at some locations
Flashing signs	
Blank-out turn prohibition signs	
Illumination of crossings	
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Used at nearly all locations
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Used at nearly all locations
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	None
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes, available from Ronald A. Keele
Has your LRT agency ever conducted a formal safety evaluation?	Yes, A formal safety survey was conducted which included restriping/delineation of traffic pathways, increased safety signage, security fencing, pedestrian directional fencing, and placement of new bollards to prevent vehicle collisions. The results can be shared.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	"Suspicious" behavior of pedestrians is collected via on-board cameras. Due to the secure nature of the data collect, it cannot be shared.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	None
Who can provide safety devices/treatments data for your LRT system?	Vernon G. Hartsock 410-767-3323 vhartsock@mtamaryland.com

Data Received

None.

NJT (NEW JERSEY TRANSIT - RIVER LINE), CAMDEN, NJ

Contact Information and History

Location	Camden, NJ	
Website	www.riverline.com	
System Name	NJT (New Jersey Transit - River LINE)	
Name	Teresa Impasteto	
Title	Safety Manager	
Address	700 Beideron Avenue, Camden, NJ 08105	
Phone	856.580.5611	
email	theresa.impastato@us.transport.bombardier.com	
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5	Contacted Al Fazio, awaiting return call from Teresa	
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15	Talked with Theresa Impastato (856-580-5649). She could not e-mail any files because they were too large. Theresa will be mailing a hard copy and a CD of their recent safety reports. Also, she will send a copy of their accident investigation forms. Theresa will also send a sample of their CCTV recording at an intersection. The information was never received. Several voice mails were left for Theresa but she was not heard from again.	

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded electronically and in hard copy
Number of years of accident and incident data recorded	2004 to present
Who can provide historical accident and incident data for your LRT system?	Teresa Impasteto

Traffic Volume

Location identifier	Recorded electronically and in hard copy
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded electronically and in hard copy
Year of the volume count	Recorded electronically and in hard copy
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	2004 to present
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	Teresa Impasteto

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at nearly all locations	Recorded electronically and in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded electronically and in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at some locations	Recorded electronically and in hard copy
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Used at some locations	Recorded electronically and in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Used at some locations	Recorded electronically and in hard copy
Enhanced pavement markings on the	Used at nearly all	Recorded

approach to LRT-highway grade crossings	locations	electronically and in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at nearly all locations	Recorded electronically and in hard copy
Channelizations (including roadway medians)	Not used	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at only a few locations (less than 5)	Recorded electronically and in hard copy
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	**Usage**
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at nearly all locations
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Used at nearly all locations
Train control systems with warning of presence	Not used
Limits on downtime of gates	Used at nearly all locations
Pedestrian gates	Used at nearly all locations
Second-train signals	Not used
Flashing signs	Used at nearly all locations
Blank-out turn prohibition signs	Used at nearly all locations
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Used at nearly all locations
Crossing horns-automatic and LRV-operator-activated	Used at only a few locations (less than 5)
Enforcement (police enforcement)	Used at nearly all locations
Pedestrian fence gates	Used at only a few locations (less than 5)
Vehicle fence gates	Not used
Pedestrian signals	Used at only a few locations (less than 5)
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes
Has your LRT agency ever conducted a formal safety evaluation?	Yes. hazard analysis is always conducted and accident/ incident stats are analyzed on an annual basis
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	Yes. I have the data readily available.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	All incidents are available for the TCRP's review
Who can provide safety devices/treatments data for your LRT system?	Theresa Impastato- System Safety Supervisor

Data Received

None.

NJT-HBLR (NEW JERSEY TRANSIT HUDSON-BERGEN LIGHT RAIL)

Contact Information and History

Location	Jersey City, NJ	
Website	MyLightRail.com	
System Name	New Jersey Transit Hudson-Bergen Light Rail	
Name	Shashidhara Nagal	Charles Brody
Title	Manager, System Safety Programs	Engineer Special Projects Railroad Signals
Address	20 Craven Point Avenue, Jersey City, NJ 07305	
Phone	201-209-2549	201-209-3536
email	nagal.shashidhara@wgint.com	charles.brody@wgint.com
Contact provided by:	TRA	David Zahorsky President & General Manager Hudson Bergen Light Rail System
Contact Dates	Called by TRA during December	
Actions Dec 5	Left voice mail, tried calling several times, no response.	
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	2000 to present in hard copy
Who can provide historical accident and incident data for your LRT system?	Charles Brody

Traffic Volume

Location identifier	Recorded electronically and in hard copy
Pedestrian volume	None
Vehicle volume	
Vehicle turning movement volume	
Light Rail Vehicle volume	Recorded electronically and in hard copy
Year of the volume count	Recorded electronically and in hard copy
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	2000 to present electronically
How many years of vehicle volume (cars) data are recorded for your LRT system?	None
Who can provide historical traffic volume data for your LRT system?	Not available

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at nearly all locations	Recorded electronically and in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Used at nearly all locations	Recorded electronically and in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Not used	Not recorded
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Used at nearly all locations	Recorded electronically and in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	Recorded electronically and in hard copy
Enhanced pavement markings on the	Used at only a few	Recorded

approach to LRT-highway grade crossings	locations (less than 5)	electronically and in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at only a few locations (less than 5)	Recorded electronically and in hard copy
Pavement marking, texturing, and striping	Used at nearly all locations	Recorded electronically and in hard copy
Channelizations (including roadway medians)	Used at only a few locations (less than 5)	Recorded electronically and in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at only a few locations (less than 5)	Recorded electronically and in hard copy
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	**Usage**
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Used at only a few locations (less than 5)
Train control systems with warning of presence	Used at only a few locations (less than 5)
Limits on downtime of gates	Not used
Pedestrian gates	Used at only a few locations (less than 5)
Second-train signals	Used at only a few locations (less than 5)
Flashing signs	Used at only a few locations (less than 5)
Blank-out turn prohibition signs	Used at only a few locations (less than 5)
Illumination of crossings	Used at nearly all locations
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Used at nearly all locations
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Used at only a few locations (less than 5)
Vehicle fence gates	Not used
Pedestrian signals	Used at nearly all locations
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	At one location, camera detection of road vehicles on tracks when train is approaching will be installed during the next six months. On detection, bar signals will display "stop" to trains.
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes, contact Charles Brody for this report
Has your LRT agency ever conducted a formal safety evaluation?	1. LRT operator training - defensive operations 2. Safety treatments - gates that open to platforms.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	Yes, through CCTV's and train operator observations.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	

Data Received

None.

NJT-NCS (NEW JERSEY TRANSIT NEWARK CITY SUBWAY), NEWARK, NJ

Contact Information and History

Location	Newark, NJ	
Website	www.njtransit.com	
System Name	New Jersey Transit Newark City Subway	
Name	Barbara Lazzaro	Grace Introna
Title	Safety education program	Safety education program
Address	1 Penn Plaza, Newark NJ 07105; 800 Lemuel Avenue Camden, New Jersey 08105	1 Penn Plaza, Newark NJ 07105; 800 Lemuel Avenue Camden, New Jersey 08105
Phone	(856) 614-7010	973-491-7158
email	blazzaro@njtransit.com	gintrona@njtransit.com
Contact provided by:		
Contact Dates		
Actions Dec 5		
Actions Dec 7	Spoke with Barbara and she indicated that she would have to look at the survey again to see if she is appropriate person to complete it.	May not be appropriate person to complete survey since she is in corporate communications (based on voicemail message). Left a message for her to callback regarding the survey, also reiterated what the survey is for.
Actions Dec11	Called Barbara about getting Grace Introna's number but only got answering machine. Left a message requesting phone number.	
Actions Dec 14	Called and left Barbara voicemail message reminding her to complete survey and to call back if she had questions.	
Actions Dec 15		Left another voicemail message for Grace reminding her to complete the survey and to call back if she has questions. Also mentioned us getting Barbara Lazzaro to participate.

Location	Newark, NJ	
Website	www.njtransit.com	
System Name	New Jersey Transit Newark City Subway	
Name	Joyce C. Gallagher	
Title	Assistant General Manager	

Data		
Address		
Phone	973-566-6706	
email	jgallagher@njtransit.com	
Contact provided by:		
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	At least 1991 to present - hard copy and/or electronic
Who can provide historical accident and incident data for your LRT system?	

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Not recorded
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	New Jersey Department of Transportation 1035 Parkway Avenue Trenton, New Jersey 08625 City of Newark Traffic Engineer 255 Central Avenue Newark, New Jersey

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	
Signal preemption (transfer of normal signal operations to special control mode)	Not used	
Four-quadrant gates	Not used	
Four-quadrant flashing light signals	Not used	
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	
Retroreflective advance warning signs	Used at only a few locations (less than 5)	
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at only a few locations (less than 5)	
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	
Enhanced pavement markings on the approach to LRT-highway grade crossings	Not used	
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at some locations	
Pavement marking, texturing, and striping	Used at some locations	
Channelizations (including roadway medians)	Used at some locations	
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	
Treatment	**Usage**	
Quick curbs (a median barrier device)		
Laser detection of vehicles, pedestrians, bicyclists	Not used	
CCTV/video recording	Used at some locations	
Z pedestrian crossings	Not used	
Collision warning systems	Not used	
Gate crossing indication signals	Not used	
Train control systems with warning of presence	Not used	
Limits on downtime of gates	Not used	

Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Not used
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	
Enforcement (police enforcement)	
Pedestrian fence gates	Not used
Vehicle fence gates	Not used
Pedestrian signals	Used at nearly all locations
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes, contact Joyce C. Gallagher for the report
Has your LRT agency ever conducted a formal safety evaluation?	
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	

Data Received

None.

NORTH COUNTY TRANSIT DISTRICT, OCEANSIDE, CA

Contact Information and History

Location	Oceanside, CA	
Website	www.gonctd.com	
System Name	North County Transit District	
Name	Phyllis Hall	Walt Stringer
Title	Community Outreach Specialist	Light Rail Services Manager
Address	810 Mission Avenue. Oceanside, CA 92054	
Phone	(760) 967-2863	760-967-2818
email	phall@nctd.org	wstringer@nctd.org
Contact provided by:	TCRP	
Contact Dates		
Actions Dec 5		Hello – I am responding to the inquiry about TCRP A-30 which reached Phyllis Hall of NCTD. NCTD's new diesel light rail Sprinter system is still under construction and will not be operational for just over a year. You may be aware of San Diego Trolley LRT in our county, which has an extensive system, some of it dating back to 1981. I doubt we can be of much help for your survey at this phase of our project, but good luck with the project. Thanks – Walt Stringer, LRT Manager, NCTD.
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	
Date and time of the accident/incident	
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	
Accident diagrams	
Number of years of accident and incident data recorded	system opens in late 2007
Who can provide historical accident and incident data for your LRT system?	

Traffic Volume

Location identifier	
Pedestrian volume	
Vehicle volume	
Vehicle turning movement volume	
Light Rail Vehicle volume	
Year of the volume count	
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	
Signal preemption (transfer of normal signal operations to special control mode)	Not used	
Four-quadrant gates	Not used	
Four-quadrant flashing light signals	Not used	
Constant warning time systems (uniform warning regardless of LRT speed)	Used at nearly all locations	
Retroreflective advance warning signs	Used at some locations	
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at some locations	
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	
Pavement marking, texturing, and striping	Used at some locations	
Channelizations (including roadway medians)	Used at some locations	
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	Usage
Quick curbs (a median barrier device)	Not used
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at nearly all locations
Z pedestrian crossings	Not used
Collision warning systems	Not used

Gate crossing indication signals	Used at nearly all locations
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Not used
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Used at nearly all locations
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Used at some locations
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	using flagmen during system testing
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	
Has your LRT agency ever conducted a formal safety evaluation?	
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	

Data Received

None.

PAAC (PORT AUTHORITY OF ALLEGHENY COUNTY), PITTSBURGH, PA

Contact Information and History

Location	Pittsburgh, PA	
Website	www.portauthority.org	
System Name	PAAC (Port Authority of Allegheny)	
Name	Michael J. Zamiska	Kevin C. Jones
Title	Director, System Safety	Safety Specialist Light Rail
Address	345 Sixth Avenue, Third Floor, Pittsburgh, PA 15222-2527	
Phone	412-255-1383	(412) 851-4704
email	mzamiska@portauthority.org	kjones@portauthority.org
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	
Number of years of accident and incident data recorded	1998 to present
Who can provide historical accident and incident data for your LRT system?	Kevin C. Jones

Traffic Volume

Location identifier	Recorded in hard copy
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded

Light Rail Vehicle volume	Recorded in hard copy
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	1995 to present
How many years of vehicle volume (cars) data are recorded for your LRT system?	None
Who can provide historical traffic volume data for your LRT system?	Kevin C. Jones

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at only a few locations (less than 5)	Recorded in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	
Signal preemption (transfer of normal signal operations to special control mode)	Used at only a few locations (less than 5)	Recorded in hard copy
Four-quadrant gates	Not used	
Four-quadrant flashing light signals	Not used	
Constant warning time systems (uniform warning regardless of LRT speed)	Used at nearly all locations	Recorded in hard copy
Retroreflective advance warning signs	Used at nearly all locations	Recorded in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at only a few locations (less than 5)	Recorded in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Used at nearly all locations	Recorded in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	Recorded in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at some locations	Recorded in hard copy
Pavement marking, texturing, and striping	Used at some locations	
Channelizations (including roadway medians)	Not used	
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	

Education outreach programs to drivers and/or pedestrians	Not used	

Treatment	Usage
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at some locations
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Used at only a few locations (less than 5)
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at only a few locations (less than 5)
Vehicle fence gates	Not used
Pedestrian signals	Not used
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	Blank out (turn prohibition) signs
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	No
Has your LRT agency ever conducted a formal safety evaluation?	No
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	On-board cameras are not installed on any LRV's. Some stations have CCTV which may be aimed at times toward a crossing (vehicular or pedestrian) however that is not the original intent of the camera
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	Port Authority generates a monthly report that details all LRT incidents. These incidents include vehicle collisions, patrons injured onboard or boarding/alighting and derailments.
Who can provide safety devices/treatments data for your LRT system?	Kevin C. Jones

Data Received

None.

RTD (REGIONAL TRANSIT DISTRICT), DENVER, CO

Contact Information and History

Location	Denver, CO	
Website	www.rtd-denver.com	
System Name	RTD (Regional Transit District)	
Name	Lloyd Mack	David Genova
Title		
Address	1600 Blake Street. Denver CO 80202	1600 Blake Street. Denver CO 80202
Phone	303-628-9000 ; 303-299-3420	303-628-9000 ; 303-299-3420
email	lloyd.mack@rtd-denver.com	david.genova@rtd-denver.com
Contact provided by:	TCRP	TRA
Contact Dates	Lloyd has received the survey and will complete before the Dec 29 deadline. Will try for sooner but cannot promise because the system has just opened a new 20-mile corridor and they are busy with operational issues.	
Actions Dec 5		Called and left messages for David Genova on the 24th, 26th, 30th of Jan and 1st of Feb.
Actions Dec 7		Contacted Robert Rynerson at RTD to request for LRT volumes. Robert can send us schedules to calculate volumes. Follow phone call on Jan 30; Robert apologized said he can only send the second week of February because RTD is understaffed. No contacts for City and County of Denver so far--Robert said he can find out and provide us with contact.
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	1994 to present in hard copy
Who can provide historical accident and incident data for your LRT system?	Dave Genova Manager of Safety Dave.Genova@RTD-Denver.Com

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Not recorded
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	Could be calculated
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Recorded in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Not recorded
Signal preemption (transfer of normal signal operations to special control mode)	Not Used	Not recorded
Four-quadrant gates	Not Used	Not recorded
Four-quadrant flashing light signals	Used at some locations	Recorded in hard copy
Constant warning time systems (uniform warning regardless of LRT speed)	Used at only a few locations (less than 5)	Not recorded
Retroreflective advance warning signs	Used at nearly all locations	Recorded in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at only a few locations (less than 5)	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Used at only a few locations (less than 5)	Recorded in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at only a few locations (less than 5)	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not Used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at only a few locations (less than 5)	Not recorded
Pavement marking, texturing, and striping	Used at nearly all locations	Recorded in hard copy
Channelizations (including roadway medians)	Used at only a few locations (less than 5)	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at only a few locations (less than 5)	Recorded in hard copy
Education outreach programs to drivers and/or pedestrians	Used at only a few locations (less than 5)	

Treatment	Usage
Quick curbs (a median barrier device)	Not Used
Laser detection of vehicles, pedestrians, bicyclists	Not Used
CCTV/video recording	Used at only a few locations (less than 5)
Z pedestrian crossings	Used at only a few locations (less than 5)
Collision warning systems	Not Used
Gate crossing indication signals	Used at only a few locations (less than 5)
Train control systems with warning of presence	Not Used
Limits on downtime of gates	Used at only a few locations (less than 5)
Pedestrian gates	Not Used
Second-train signals	Not Used
Flashing signs	Used at only a few locations (less than 5)
Blank-out turn prohibition signs	Used at only a few locations (less than 5)
Illumination of crossings	Used at only a few locations (less than 5)
Enforcement-photo-of gate and no-left-turn violations	Not Used
Crossing horns-automatic and LRV-operator-activated	Not Used
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at only a few locations (less than 5)
Vehicle fence gates	Not Used
Pedestrian signals	Not Used
GPS countdown pedestrian signals	Not Used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	
Has your LRT agency ever conducted a formal safety evaluation?	Currently working on increasing active signage, but we are just beginning this project.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	No. On-board CCTV and station CCTV is used for accident investigation purposes.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	

Data Received

RTD has provided the research team with the following information:

1. Accident Investigation form

They have also verbally agreed that they have accident data but due to their other priority, they can't supply as per our request.

SCVTA (SANTA CLARA VALLEY TRANSPORTATION AUTHORITY), SAN JOSE, CA

Contact Information and History

Location	San Jose, CA	
Website	www.vta.org	
System Name	SCVTA (Santa Clara Valley Transportation Authority)	
Name	David Terrazas	Tony Hung
Title		
Address	3331 N. 15th Street, San Jose CA 95134	3331 N. 15th Street, San Jose CA 95134
Phone	408-321-7539	408-321-7539
email		
Contact provided by:	TRA	TCRP
Contact Dates		
Actions Dec 5		
Actions Dec 7	Casey Emoto was contacted to request for road and ped traffic volumes and he will be sending the data to us on the second week of February. Contacted Bill Capps to request LRT volumes. He will send us historical schedules that will enable us to calculate volumes (based on time headways).	
Actions Dec11	Kris suggested I contact George Ramos. Left messages for George on the 24th, 26th and 30th of Jan. No response thus far.	
Actions Dec 14		
Actions Dec 15		

Location	San Jose, CA	
Website	www.vta.org	
System Name	SCVTA (Santa Clara Valley Transportation Authority)	
Name	Garry Stanislaw	Mark P. Bugna
Title	Transportation Superintendent VTA Guadalupe Light Rail Division	Transit Systems Safety Supervisor Operations: Bus/Rail and Rail Safety
Data		
Address		

Phone	(408) 546-7601	408-321-5597
email	garry.stanislaw@vta.org	mark.bugna@vta.org
Contact provided by:	Transportation Superintendent Operations	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	1987 to present
Who can provide historical accident and incident data for your LRT system?	Christof Eichin (408) 321-7049 chris.eichin@vta.org, Kris Sabherwal, Light Rail Systems Engineer 408-546-7631 kris.sabherwal@vta.org

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Recorded in hard copy
Vehicle turning movement volume	Recorded in hard copy
Light Rail Vehicle volume	Recorded electronically and in hard copy
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	1986 to present
How many years of vehicle volume (cars) data are recorded for your LRT system?	unknown
Who can provide historical traffic volume data for your LRT system?	Bill Capps (408) 321-7059 bill.capps@vta.org, Kris Sabherwal, Light Rail Systems Engineer. 408-546-7631 Casey Emoto (408) 321-5564 casey.emoto@vta.org, Kris Sabherwal, Light Rail Systems Engineer. 408-546-7631

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at only a few locations (less than 5)	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Used at nearly all locations	Recorded electronically and in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at nearly all locations	Recorded electronically and in hard copy
Four-quadrant gates	Used at some locations	Recorded electronically and in hard copy
Four-quadrant flashing light signals	Used at some locations	Recorded electronically and in hard copy
Constant warning time systems (uniform warning regardless of LRT speed)	Used at nearly all locations	Not recorded
Retroreflective advance warning signs	Used at nearly all locations	Recorded electronically and in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at nearly all locations	Recorded electronically and in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Used at nearly all locations	Recorded electronically and in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at nearly all locations	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not Used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not Used	Not recorded
Pavement marking, texturing, and striping	Used at nearly all locations	Not recorded
Channelizations (including roadway medians)	Used at nearly all locations	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at nearly all locations	Recorded electronically and in hard copy
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	Usage
Quick curbs (a median barrier device)	Not Used
Laser detection of vehicles, pedestrians, bicyclists	Used at only a few locations (less than 5)
CCTV/video recording	Used at some locations
Z pedestrian crossings	Used at some locations
Collision warning systems	Not used
Gate crossing indication signals	Used at only a few locations (less than 5)
Train control systems with warning of presence	Used at some locations
Limits on downtime of gates	Used at some locations
Pedestrian gates	Used at some locations
Second-train signals	Not used
Flashing signs	Used at some locations
Blank-out turn prohibition signs	Used at some locations
Illumination of crossings	Used at some locations
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Used at some locations
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Used at some locations
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	Pedestrian gates on approach to a crossing. Yes, electronically and hard copy.
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Nanci Eksterowicz (408) 321-5593 nabci.eksterowicz@vta.org
Has your LRT agency ever conducted a formal safety evaluation?	No. Just qualitative evaluations.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	Near misses are collected manually when Operators notify OCC of an event.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	Christof Eichin (408) 321-7049 chris.eichin@vta.org

Data Received

SCVTA made the following data available to the research team:

1. Collision data was made available in PDF formats containing the fields:
a) Report number
b) Date/time
c) Location
d) Consist
e) Type
f) Code
g) Description
h) Condition
i) Injuries
2. Accident with autos since 1987 to 17th January, 2007
3. Accidents with pedestrians since 1987 to 3rd December, 2006
4. Accident with bike since 1987 to 12th October, 2003
5. Safety report (2001-2006 Annual Safety and Loss Control Reports)
6. Accident investigation form
7. Traffic Volume (PM Peak Volumes by intersection and by leg). Pedestrian and bike volume, 4 years of data were made available (2002, 2004, 2005 and 2006). For the auto volume, 6 years of data were made available (1997, 1998, 2000, 2001, 2002, and 2004).

From the FY 01 Annual Safety and Loss Control Report:

Guadalupe Division had a slight increase in accidents in 2001 with a slight decrease in frequency rate

In FY 2001, 39 rail accidents were reported, an 8% increase over FY 2000. Rail miles increased by 22%. The single most frequent cause, responsible for 13 accidents, was other vehicles turning left in front of the Light Rail Vehicle.

RAIL OPERATIONS-TRAFFIC ACCIDENTS TOP THREE CAUSES (FY 00-01)

Cause Code	Description	# Of Accidents	%
4	Straight ahead - other vehicle in same direction turns Left in front of LRV	13	33
2	Straight ahead - other vehicle from right	4	10

RAIL OPERATIONS -TRAFFIC ACCIDENTS TOP THREE CAUSES (FY 99-00)

Cause Code	Description	# Of Accidents	%
4	Straight ahead - other vehicle in same direction turns left in front of LRV	11	3
2	Straight ahead - other vehicle from right	5	1

1	Straight ahead - other vehicle from left	4	10	1	Straight ahead - other vehicle from left	3	1
	TOTAL	**21**	**53**		**TOTAL**	**19**	**5**

From the FY 02 Annual Safety and Loss Control Report:

In FY 2002, 21 rail accidents were reported, a 46% decrease from FY 2001. The single most frequent cause, responsible for 10 accidents, was due to other vehicles turning left in front of the Light Rail Vehicle (LRV).

Rail Traffic Accidents FY 01-02

DESCRIPTION	Accidents	%
Other vehicle turns left in front of LRV	10	5
Vehicle from the right strikes LRV	2	10
Vehicle turns right in front of the LRV	1	1

Rail Traffic Accidents FY 00-01

DESCRIPTION	Accidents	%
Other vehicle turns left in front of LRV	13	33
Vehicle from the right strikes LRV	4	10
Other vehicle from the left strikes the LRV while traveling straight ahead	4	10

From the FY 03 Annual Safety and Loss Control Report:

In FY 2003, 25 rail accidents were reported, a 19% increase from FY 2002. The single most frequent cause, responsible for 40% of the accidents, was due to other vehicles turning left in front of the Light Rail Vehicle (LRV).

Rail Traffic Accidents FY 2003

DESCRIPTION	Accidents	%
Vehicle turns left in front of LRV	10	40
Vehicle from the left strikes LRV	3	12
Collision with a stationary object	2	8

From the FY 04 Annual Safety and Loss Control Report:

In FY 2004, 15 rail accidents were reported, a 40% decrease from FY 2003. Total hub miles for FY 2004 decreased by 3% over FY 2003.

The single most frequent cause of accidents in FY 2004, responsible for 40% of the accidents, was due to other vehicles turning left in front of the Light Rail Vehicle (LRV).

DESCRIPTION	Accidents	%
Vehicle turns left in front of LRV	6	40
Collision with stationary object	2	13

From the FY 05 Annual Safety and Loss Control Report:

In FY 2005, 29 rail accidents were reported, verses 15 reported for FY 2004 a 93% increase. Total rail miles for FY 2005 were 2,660,821, an increase of 26% over FY 2004. The increase of rail miles and accidents is attributable to the opening of the Tasman East/Capitol extension in FY 2005.

The single most frequent cause of accidents in FY 2005, responsible for 35% of the accidents, was due to other vehicles turning left in front of the Light Rail Vehicle (LRV). There was no trend attributable to a particular Light Rail (LR) line. The accident frequency rate for the Rail Division was 1.1% for FY 2005, an increase of 0.4% from FY 2004.

DESCRIPTION	Accidents	%
Vehicle turns left in front of LRV	10	35
Collision with stationary object	4	14

From the FY 06 Annual Safety and Loss Control Report:

In FY 2006, 37 rail accidents were reported, verses 29 reported for FY 2005 a 28% increase. Total rail miles for FY 2006 were 3,082,416, an increase of 16% over FY 2005. The increase of rail miles and accidents is as a result of the opening of the Vasona extension.

The single most frequent cause of accidents in FY 2006, responsible for 30% of the accidents, was due to other vehicles turning left in front of the Light Rail Vehicle (LRV). There is no particular trend as there were no more than two-left turn accidents at any one particular intersection during FY 2006. The accident frequency rate for the Rail Division was slightly higher for FY 2006 than FY 2005.

Rail Traffic Accidents FY 2006

DESCRIPTION	Accidents	%
Vehicle turns left in front of LRV	11	30
Other vehicle turns right in front of LRV	6	16

SDTI (SAN DIEGO TROLLEY INC.), SAN DIEGO, CA

Contact Information and History

Location	San Diego, CA	
Website	www.sdcommute.org	
System Name	SDTI (San Diego Trolley Inc.)	
Name	Sheila Matias	James Dow
Title		
Address	1255 Imperial Avenue. Suite 1000. San Diego, CA 92101	1255 Imperial Avenue. Suite 1000. San Diego, CA 92101
Phone	619.557.4546	
email	Sheila.matias@sdmts.com	
Contact provided by:	TCRP	TRA
Contact Dates	Spoke with Sheila and she suggested that we contact Nancy Dock to complete survey as she does not have information about operations or safety; she only deals with marketing of services.	Left a message for James indicating that we had already contacted Nancy Dock to participate in survey and that we were counting on the participation of SDTI in landmark TCRP study. To call again Dec 11 if no response.
Actions Dec 5		
Actions Dec 7		
Actions Dec11	Spoken with Kris Sabherwal to get accident data and he has sent us PDF excerpts from accident database.	Called James again and left another message.
Actions Dec 14	Casey Emoto was contacted to request for road and ped. traffic volumes and he will be sending the data to us on the second week of February. Contacted Bill Capps to request LRT volumes. He will send us historical schedules that will enable us to calculate volumes (based on time headways).	Kris suggested I contact George Ramos. Left messages for George on the 24th, 26th and 30th of Jan. No response thus far.
Actions Dec 15		

Location	San Diego, CA	
Website	www.sdcommute.org	
System Name	SDTI (San Diego Trolley Inc.)	
Name	Nancy Dock	Peter Tereschuck
Title	System Safety Manager Operations	
Data		
Address	1255 Imperial Avenue. Suite 1000. San Diego, CA 92101	1255 Imperial Avenue. Suite 1000. San Diego, CA 92101
Phone	(619) 595-4946	
email	nancy.dock@sdmts.com	
Contact provided by:	iTRANS	iTRANS
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded electronically and in hard copy
Number of years of accident and incident data recorded	1981 to present
Who can provide historical accident and incident data for your LRT system?	Nancy Dock

Traffic Volume

Location identifier	Recorded electronically
Pedestrian volume	Recorded electronically and in hard copy
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded electronically and in hard copy
Year of the volume count	Recorded electronically
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	1983 to present
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	Walter Clack - Ops. Schedule Analyst walter.clack@sdmts.com (619) 595-4914

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at only a few locations (less than 5)	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at only a few locations (less than 5)	Recorded in hard copy
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Used at some locations	Recorded in hard copy
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Not used	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Used at nearly all locations	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at nearly all locations	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Used at only a few locations (less than 5)	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at nearly all locations	Not recorded
Channelizations (including roadway medians)	Used at some locations	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at nearly all locations	Not recorded
Education outreach programs to drivers and/or pedestrians	Used at some locations	Recorded in hard copy

Treatment	Usage
Quick curbs (a median barrier device)	Used at only a few locations (less than 5)
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at some locations
Z pedestrian crossings	Used at only a few locations (less than 5)
Collision warning systems	Not used

Gate crossing indication signals	Used at nearly all locations
Train control systems with warning of presence	Used at nearly all locations
Limits on downtime of gates	Used at some locations
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Used at some locations
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Used at nearly all locations
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Not used
Vehicle fence gates	Not used
Pedestrian signals	Used at only a few locations (less than 5)
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	Standard grade crossing warning equipment. Safety outreach to elementary schools located near the right of way and grade crossings. Defensive driving class for initial training of Train Operators and recent classes for T/O's. The course is tailored to address the hazards which are unique to our systems' characteristics. Accident Review Panel - A post accident panel chaired by the Safety Manager, which includes peers and investigating management personnel that review all accidents. The panel interviews the Train Operator involved and discusses the creation of the incident and concludes with a ruling. The experienced peer forum also offers guidance and assessment of defensive driving techniques.
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes
Has your LRT agency ever conducted a formal safety evaluation?	Consulting done to evaluate Homeland Security, internal enhancements.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	Emergency Brake Log OCC Yes, the data is available upon request.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	Coordination with the California DMV in expanding the California Driver's Handbook to include potential hazards of shared surface street and grade crossing operations with light rail vehicles.
Who can provide safety devices/treatments data for your LRT system?	Fred Byle - Superintendent of Wayside fred.byle@sdmts.com (619) 595-4937

Data Received

None.

SEPTA (SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY), PHILADELPHIA, PA

Contact Information and History

Location	Philadelphia, PA	
Website	www.septa.org	
System Name	SEPTA (Southeastern Pennsylvania Transportation Authority)	
Name	James Fox	Richard Lomas
Title	Director, System Safety	Safety Officer
Address	6th Floor. 1234 Market Street. Philadelphia, PA 19107	
Phone	(215) 580-7064	215-580-7903
email	jfox@septa.org	rlomas@septa.org
Contact provided by:	TRA	
Contact Dates	TRA left messages	
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	7 years hard copy
Who can provide historical accident and incident data for your LRT system?	Michael Wissman 215-580-7046

Traffic Volume

Location identifier	
Pedestrian volume	
Vehicle volume	
Vehicle turning movement volume	
Light Rail Vehicle volume	
Year of the volume count	
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	Ridership: Mike Seonia 215-580-7221 Vehicles: Bharat Gohel 215-580-3559

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at nearly all locations	
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	
Signal preemption (transfer of normal signal operations to special control mode)	Used at some locations	
Four-quadrant gates	Not used	
Four-quadrant flashing light signals	Used at some locations	
Constant warning time systems (uniform warning regardless of LRT speed)		
Retroreflective advance warning signs	Used at some locations	
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at nearly all locations	
Transverse rumble strips on the approach to	Not used	

railroad-highway grade crossings		
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	
Pavement marking, texturing, and striping	Used at nearly all locations	
Channelizations (including roadway medians)	Used at some locations	
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	Usage
Quick curbs (a median barrier device)	
Laser detection of vehicles, pedestrians, bicyclists	
CCTV/video recording	
Z pedestrian crossings	
Collision warning systems	
Gate crossing indication signals	
Train control systems with warning of presence	
Limits on downtime of gates	
Pedestrian gates	
Second-train signals	
Flashing signs	
Blank-out turn prohibition signs	
Illumination of crossings	
Enforcement-photo-of gate and no-left-turn violations	
Crossing horns-automatic and LRV-operator-activated	
Enforcement (police enforcement)	
Pedestrian fence gates	
Vehicle fence gates	
Pedestrian signals	
GPS countdown pedestrian signals	

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	Operation Life Saver
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Michael Wissman 215-580-7046
Has your LRT agency ever conducted a formal safety evaluation?	LRV (MSHL) Trolley Pedestrian Mirrors - Risk assessment and justification by System Safety department. System Safety Risk assessment on select track segment for signalization on MSHL. Director of System Safety James Fox 215-580-7064
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	Michael Monastero (Signals Engineering) 215-580-8232

Data Received

None.

SF MUNI (SAN FRANCISCO MUNICIPAL RAILWAY), SAN FRANCISCO, CA

Contact Information and History

Location	San Francisco, CA	
Website	www.sfmuni.com	
System Name	SF MUNI (San Francisco Municipal Railway)	
Name	Vahak Petrossian	Kenneth Anderson
Title	Manager, Transit and Crossing Branch California Public Utilities Commission	System Safety Inspector, Health and Safety
Address	505 Van Ness Ave., Suite 2B. San Francisco, CA 94102. ; 320 West 4th Street Suite 500 Los Angeles CA 90013	949 Presidio Ave., Room 219 San Francisco CA 94115
Phone	(415) 703-1094; (213) 576-7077	
email	vap@cpuc.ca.gov	
Contact provided by:	TCRP	TCRP
Contact Dates	Vahak stated that he will aim to complete survey by deadline. iTRANS suggested that he coordinate with Kenneth Anderson if further input is required on sections of survey related to accident data.	
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Location	San Francisco, CA	
Website	www.sfmuni.com	
System Name	SF MUNI (San Francisco Municipal Railway)	
Name	Michael Kirchanski	
Title	Health and Safety Manager Accident Investigation, System Safety Manager	
Address		
Phone	415-351-3452	
email	michael.kirchanski@sfmta.com	
Contact provided by:		
Contact Dates	Talked with Michael Kirchanski (415-351-3452) who informed iTRANS they do have several years of data in their mainframe database, but he can only say with certainty that the past 4 years are accurate. He promised to send us a sample of collision data and a data dictionary. Talked with Vince who informed iTRANS that he will be getting a sample data set to us. The sample was not received.	
Actions Dec 5	LRT Volume - Called Deborah Denison (415-701-4611) Traffic Volume - Bond Yee (415-701-4677) Left Voice Mail, didn't receive a call back.	
Actions Dec 7	Bon Yee (415)-701-4672). Called and left voice mail, no response as yet	
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	4 years in TransitSafe database, 20 years in previous mainframe computer application
Who can provide historical accident and incident data for your LRT system?	Michael Kirchanski

Traffic Volume

Location identifier	Recorded electronically
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Recorded electronically
Light Rail Vehicle volume	Not recorded
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	Yes - at least 4 years electronically, 20 years in hard copy
How many years of vehicle volume (cars) data are recorded for your LRT system?	None
Who can provide historical traffic volume data for your LRT system?	Deborah Denison Acting Director of IT 1 South Van Ness, 7th Floor San Francisco, CA 94102 415-701-4611 deborah.denison@sfmta.com

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Recorded in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)		Not recorded
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Not used	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at some locations	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	Recorded in hard copy
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at some locations	Recorded in hard copy
Channelizations (including roadway medians)	Used at some locations	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	Not recorded
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	**Usage**
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at some locations
Z pedestrian crossings	Used at some locations
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Used at some locations
Blank-out turn prohibition signs	Not used
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Used at some locations
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Used at some locations
Pedestrian signals	Used at some locations
GPS countdown pedestrian signals	Used at some locations

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	None
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes
Has your LRT agency ever conducted a formal safety evaluation?	Yes, Study on problems of historic street cars Study on redesigning 19th and Rossmoor grade crossing Between Car Barriers These are confidential reports, but I can discuss them with you.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such	No

as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	None
Who can provide safety devices/treatments data for your LRT system?	Bond Yee Executive Director, Department of Parking and Traffic 1 South Van Ness San Francisco, CA 94102 415-701-4677 bond.yee@sfma.com

Data Received

SF MUNI made the following data available to the research team:
1. Accident data
2. Safety report
3. Accident investigation form and

Accident Data:

A sample accident data set was given. The sample consisted of 37 accidents which has both a location and accident date variable.

Safety Report:

In addition to supplying detailed reports, SF MUNI supplied summarized major and minor accident reports from 2002 to 2006. These are the same reports they have submitted to National Transit Database (NTD). The detailed report consists of a full description of an accident where as the major and minor accident reports have summarized motor vehicle and pedestrian accidents.

SRTD (SACRAMENTO REGIONAL TRANSIT DISTRICT), SACRAMENTO, CA

Contact Information and History

Location	Sacramento, CA	
Website	www.sacrt.com	
System Name		
Name	Rufus Francis	
Title		
Address	PO Box 2110. Sacramento CA 85172. ; 1212 Skyline Drive, Yuba City CA 95991	
Phone	916-321-2814	
email	rfrancis@sacrt.com	
Contact provided by:	TCRP	
Contact Dates		
Actions Dec 5	Spoke with Rufus and he indicated that he will aim to complete survey by Dec 29 deadline.	
Actions Dec 7		
Actions Dec11		
Actions Dec 14	TRA: Asked staff in their firm to report about Sacramento.	
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	
Date and time of the accident/incident	
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	
Accident diagrams	
Number of years of accident and incident data recorded	
Who can provide historical accident and incident data for your LRT system?	

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Not recorded
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	0
How many years of vehicle volume (cars) data are recorded for your LRT system?	0
Who can provide historical traffic volume data for your LRT system?	Historical LRT traffic volume data are not available

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Recorded electronically and in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	Not recorded
Signal preemption (transfer of normal signal operations to special control mode)	Used at some locations	Recorded electronically and in hard copy
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Used at nearly all locations	Recorded electronically and in hard copy
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at only a few locations (less than 5)	Recorded electronically and in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Used at some locations	Recorded electronically and in hard copy

Enhanced pavement markings on the approach to LRT-highway grade crossings	Not used	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at some locations	Recorded electronically and in hard copy
Channelizations (including roadway medians)	Used at some locations	Recorded electronically and in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at some locations	Recorded electronically and in hard copy
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	**Usage**
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Used at some locations
Z pedestrian crossings	Used at some locations
Collision warning systems	Not used
Gate crossing indication signals	Used at some locations
Train control systems with warning of presence	Not used
Limits on downtime of gates	Not used
Pedestrian gates	Not used
Second-train signals	Not used
Flashing signs	Used at some locations
Blank-out turn prohibition signs	Used at some locations
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Used at some locations
Crossing horns-automatic and LRV-operator-activated	Used at some locations
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at only a few locations (less than 5)
Vehicle fence gates	Not used
Pedestrian signals	Used at only a few locations (less than 5)
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	directional fencing
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Yes, contact Rufus Francis
Has your LRT agency ever conducted a formal safety evaluation?	
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	Rufus Francis

Data Received

None.

ST (SOUND TRANSIT, LINK), TACOMA, WA

Contact Information and History

Location	Tacoma, WA	
Website	www.soundtransit.org	
System Name	ST (Sound Transit, Link)	
Name	Charles Joseph	Rob Huyck
Title	Division Manager, Operations & Maintenance.	Safety Manager
Address	Union Station, 401 South Jackson Street, Seattle, WA 98104	
Phone	206-398-5200	206-398-5331
email	josephc@soundtransit.org	huyckr@soundtransit.org
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5		
Actions Dec 7	Charles indicated that he had received the survey and will aim to complete by Dec 29.	
Actions Dec11		
Actions Dec 14	TRA: Left voice mail (again). They are under construction and may or may not have data to support our survey.	
Actions Dec 15	Called and left voice mail about the project and what data we need. Re-tried several times, no answer. Requested (via e-mail) a copy of their investigation form.	

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded in hard copy
Date and time of the accident/incident	Recorded in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	2003 to present in hard copy only
Who can provide historical accident and incident data for your LRT system?	Rob Huyck

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded electronically
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	2003 to present electronic files
How many years of vehicle volume (cars) data are recorded for your LRT system?	0
Who can provide historical traffic volume data for your LRT system?	Denise Ahuna 253-405-5950 ahunad@soundtransit.org

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Not used	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Used at nearly all locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Not used	Not recorded
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Not used	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at some locations	Recorded in hard copy
Flashing light signals or beacons on the approach to LRT grade crossings	Used at nearly all locations	Recorded in hard copy
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at some locations	Not recorded
Pavement marking, texturing, and striping	Used at some	Not recorded

	locations	
Channelizations (including roadway medians)	Used at some locations	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	Not recorded
Education outreach programs to drivers and/or pedestrians	Used at only a few locations (less than 5)	

Treatment	**Usage**
Quick curbs (a median barrier device)	
Laser detection of vehicles, pedestrians, bicyclists	
CCTV/video recording	
Z pedestrian crossings	
Collision warning systems	
Gate crossing indication signals	
Train control systems with warning of presence	
Limits on downtime of gates	
Pedestrian gates	
Second-train signals	
Flashing signs	
Blank-out turn prohibition signs	
Illumination of crossings	
Enforcement-photo-of gate and no-left-turn violations	
Crossing horns-automatic and LRV-operator-activated	
Enforcement (police enforcement)	
Pedestrian fence gates	
Vehicle fence gates	
Pedestrian signals	
GPS countdown pedestrian signals	

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	
Has your LRT agency ever conducted a formal safety evaluation?	
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	Rob Huyck

Data Received

None.

TRIMET (PORTLAND TRIMET), PORTLAND, OR

Contact Information and History

Location	Portland, OR	
Website	trimet.org	
System Name	TriMet (Portland TriMet)	
Name	Tommye Gilbreath	Tim Garling
Title	VP Communications, Safety Dept.	Acting Executive Director, Operations
Address	4012 SE 17th Avenue, Portland OR 97202	4012 SE 17th Avenue, Portland, Oregon 97202
Phone	503-962-2100	503-962-4955
email	gilbreathe@trimet.org	garlingt@trimet.org
Contact provided by:	TCRP	TRA
Contact Dates		Talked with Tommye Gilbreath (safety manager - 503-962-4982) who asked that we talk with Tina Lowe (Legal counsel 503-962-6487). Tina Lowe informed me that we need a public record request form submitted to her. Only then will she start the process of releasing any data. I haven't reached Tina Lowe back as yet. Sent Letter of Public Request to Tina Lowe, waiting for her response. Made calls and sent e-mails to follow up, Nothing as yet. Talked to Tina, her staff is in the process to review all the data we've requested.
Actions Dec 5		
Actions Dec 7	Called and left a message stating that TRA, our sub, has been in touch with Tim Garling. Requested that she coordinate with Tim to complete survey.	
Actions Dec11	Called and left another message reminding Tommye to complete survey. Also inquired about Kay Dannen's phone number.	
Actions Dec 14		
Actions Dec 15		Waiting lawyers response

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded electronically and in hard copy
Number of years of accident and incident data recorded	1986 to 1999 hard copy, 2000 to present electronic
Who can provide historical accident and incident data for your LRT system?	Shelly Lomax Acting Director, Safety and Security 503-962-4982

Traffic Volume

Location identifier	Recorded electronically
Pedestrian volume	
Vehicle volume	Recorded electronically
Vehicle turning movement volume	
Light Rail Vehicle volume	Recorded electronically
Year of the volume count	
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	1986 to 1999 hard copy, 2000 to present electronic
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	John Griffiths griffiths@trimet.org

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Recorded electronically
Signal priority (LRT automatically switch traffic signals in their favor)	Not used	Recorded electronically
Signal preemption (transfer of normal signal operations to special control mode)	Used at some locations	Recorded electronically
Four-quadrant gates	Not used	Recorded electronically
Four-quadrant flashing light signals	Not used	Recorded electronically
Constant warning time systems (uniform warning regardless of LRT speed)	Used at some locations	Recorded electronically
Retroreflective advance warning signs	Used at some locations	Recorded electronically
Presignals/advanced signals (supplemental signals which control approaching traffic)	Not used	Recorded electronically
Flashing light signals or beacons on the approach to LRT grade crossings	Used at some locations	Recorded electronically
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at some locations	Recorded electronically
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Recorded electronically
Second train warning (a sign at the crossing for motorists/pedestrians)	Used at some locations	Recorded electronically
Pavement marking, texturing, and striping	Used at some locations	Recorded electronically
Channelizations (including roadway medians)	Used at some locations	Recorded electronically
Audible crossings warning devices (including wayside horns and other synthesized tones)	Used at some locations	Recorded electronically
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	Usage
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Used at some locations
CCTV/video recording	Used at some locations
Z pedestrian crossings	Used at some locations
Collision warning systems	Used at some locations
Gate crossing indication signals	Used at some locations
Train control systems with warning of presence	Used at some locations
Limits on downtime of gates	Used at some locations
Pedestrian gates	Used at some locations
Second-train signals	Used at some locations
Flashing signs	Used at some locations
Blank-out turn prohibition signs	Used at some locations
Illumination of crossings	Used at some locations
Enforcement-photo-of gate and no-left-turn violations	Used at some locations
Crossing horns-automatic and LRV-operator-activated	Used at some locations
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Used at some locations
Pedestrian signals	Used at some locations
GPS countdown pedestrian signals	Used at some locations

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	Ped warning signals (visual and audible)
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	Shelly Lomax 503-962-4982
Has your LRT agency ever conducted a formal safety evaluation?	Yes, we have evaluated some pilot treatments such as ped gates.
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	We keep a data base from operator call-ins. This can be shared.
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	We can share incident reports.
Who can provide safety devices/treatments data for your LRT system?	Shelly Lomax lomaxs@trimet.ort 503-962-4982

Data Received

None.

TTC STREETCARS (TORONTO TRANSIT COMMISSION), TORONTO, ONTARIO

Contact Information and History

Location	Toronto, Ontario Canada	
Website	www.ttc.ca	
System Name	TTC (Toronto Transit Commission)	
Name	John O'Grady	Sandra Sutherland
Title	Chief Safety Officer	
Address		
Phone		
email		
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5	Talked to John on Dec 06 - acknowledge receipt of survey - will look at it--when ??	
Actions Dec 7		
Actions Dec11	Talked to John on Dec 11, he has delegated the survey to one of the analyst and promise to get it back to us by Christmas. Couldn't motivate him for an earlier date.	
Actions Dec 14		
Actions Dec 15		

Location	Toronto, Ontario Canada	
Website	www.ttc.ca	
System Name	TTC (Toronto Transit Commission)	
Name	Vince Cosentino	
Title	System Safety Analyst	
Address		
Phone	416-393-6559	
email	VINCE.COSENTINO@TTC.CA	
Contact provided by:		
Contact Dates	Called on Dec 7 and 8, left voice mail on the 8th. Need to follow up with more calls	
Actions Dec 5	Representative of Sandra returned	

	her call, Vince Cosentino. He said that the survey was given to him to gather full. He promised to make the deadline or just a few days over. Can't finish it earlier because of various departments he needs to get information from. He will now be the contact man for this survey should iTRANS need to follow up. Tel # 416-393-6559	
Actions Dec 7		
Actions Dec11		
Actions Dec 14	'Talked with Vince Cosentino from TTC (416-393-6559) who is currently putting together collision data from 1997 to 2006. He will also send a data dictionary. iTRANS also talked with Jim Smith from the City (416-392-5210) who needs an e-mail about the project and what data we need. Vince sent Collision data from 97-06, accident reporting form, data dictionary. Jim is waiting on us to get the LRT routes we're interested.	Jim Smith from the City (416-392-5210) who needs an e-mail about the project and what data we need. E-mail was sent to him. Jim e-mailed us back where he wanted to know which part of the TTC system we are interested in. He sent us an e-mail about the pricing index for the data. We informed him to wait since we need the treatment data from Maria.
Actions Dec 15		Maria Holmes at TTC (416-393-6127) requested an e-mail about treatments they've listed in the survey. E-mail was sent to her. No response back as yet. Talked with Maria, who informed me that she is working on it. She needs the Engineering Dept input.

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically and in hard copy
Date and time of the accident/incident	Recorded electronically and in hard copy
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically and in hard copy
Accident diagrams	Recorded in hard copy
Number of years of accident and incident data recorded	Electronic- 1991 to present; Hardcopy- 2004 to present
Who can provide historical accident and incident data for your LRT system?	Vince Cosentino

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded in hard copy
Year of the volume count	Recorded in hard copy
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	50+ years, since inception
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	Suggested contact: City of Toronto Transportation Services Division 416-392-9633

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at nearly all locations	Recorded in hard copy
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Recorded in hard copy
Signal preemption (transfer of normal signal operations to special control mode)	Used at nearly all locations	Recorded in hard copy
Four-quadrant gates	Used at only a few locations (less than 5)	Recorded in hard copy
Four-quadrant flashing light signals	Used at only a few locations (less than 5)	Recorded in hard copy
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Not used	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at nearly all locations	
Flashing light signals or beacons on the approach to LRT grade crossings	Not used	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Not used	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Not used	Not recorded
Channelizations (including roadway medians)	Used at some locations	Recorded in hard copy
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	Not recorded
Education outreach programs to drivers and/or pedestrians	Used at nearly all locations	

Treatment	Usage
Quick curbs (a median barrier device)	Used at some locations
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Not used
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Used at only a few locations (less than 5)
Limits on downtime of gates	Used at only a few locations (less than 5)
Pedestrian gates	Used at only a few locations (less than 5)
Second-train signals	Not used
Flashing signs	Not used
Blank-out turn prohibition signs	Not used
Illumination of crossings	Not used
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Not used
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Not used
GPS countdown pedestrian signals	

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	The Ttc And Toronto Police Services Participate Jointly In Awareness Campaigns To Educate Passengers And Motorists About Public Safety Issues Related To Ttc Streetcars. This Includes Educating Passengers About The Proper Way To Board And Exit Streetcars And Informing Motorists That They Are Required By Law To Stop Behind The Open Doors Of A Streetcar.
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	No
Has your LRT agency ever conducted a formal safety evaluation?	N/A
Does anyone collect observations of risky	N/A

behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	N/A
Who can provide safety devices/treatments data for your LRT system?	Not Available

Data Received

Accident data, a 2005 safety report, accident investigation form, and signal priority treatment information have been received.

Variables and description for TTC accident data

Variable	**Description**
INCIDENT DATE	Date of occurrence
OCCUR TYPE	Type of occurrence
RESP	Preventability codes
CLASS	Classification of the severity of occurrence
COST CTRE	Cost center code of the TTC operator involved
ROUTE NUMBER	Route number of TTC vehicle involved in occurrence
RUN	Run number of TTC vehicle involved in occurrence
TIME	Time of occurrence.
TTC DIRN	Direction of TTC vehicle involved in the occurrence
VEH NO	Vehicle number of TTC vehicles involved in the occurrence
O I	Was the TTC operator involved in the occurrence injured?
S A	Service activity code of TTC vehicle involved at time of occurrence
LOC1 TYPE	Type of location TTC vehicle involved was at
LOC2 TYPE	Type of location TTC vehicle involved was at
ON_STREET	Street name that the TTC vehicle involved was on
AT_STREET	Street name that the TTC vehicle involved was at or close to

Variables and description for TTC accident data

Variable	Description
PASS NUM	Number of Passenger on the TTC vehicle involved
PAS INJ	Number of passengers injured on the TTC vehicle involved
PAS DIE	Number of passengers died on the TTC vehicle involved
OTR INJ	Number of people injured on the other vehicle involved or pedestrian?/cyclist
OTR DIE	Number of people died on the other vehicle involved or pedestrian/cyclist
TYPE 1	Ground type of road/rail where TTC vehicle involved is on
TYPE 2	Whether the roadway was straight or curved
TYPE 3	Whether the roadway was on a upgrade or downgrade
R/R CAUSE	Did any of the ROAD_RAIL_TYPE_* contributed to the occurrence?
WEATHER COND	Weather condition code
WEATHER CAUSE	Did the weather condition contributed to the occurrence
RAIL COND	Rail condition code
RAIL CAUSE	Did the rail condition contributed to the occurrence?
LIGHT	Lightning of the sky at time of occurrence
TTC WARNING	The type of warning given by the TTC vehicle involved
OTHER WARNING	The type of warning given by the other vehicle involved
TTC LT ON	Was TTC vehicle's lights on or off?
OTHER LT ON	Was other vehicle's lights on or off?
STREET LT ON	Was the street lights on or off
LIGHT CAUSE	Was lighting a factor in contribution of occurrence?
SPEED CAUSE	Was speed a factor in contribution of occurrence?
CHARGES	Was anyone charged by the police?
WHO	Who was charged by the police?
COLLID WITH	The subject which TTC vehicle involved made contact with
OTHER 1	Location of the other vehicle to TTC vehicle involved

Variables and description for TTC accident data

Variable	Description
OTHER 2	Location of a 2nd other vehicle to TTC vehicle involved (if applicable)
AREA_1 TTC	The area of contact to TTC vehicle involved
AREA_2 TTC	The area of contact to TTC vehicle involved
AREA_3 TTC	The area of contact to TTC vehicle involved
AREA_1 OTHER	The area of contact to the other vehicle involved
AREA_2 OTHER	The area of contact to the other vehicle involved
AREA_3 OTHER	The area of contact to the other vehicle involved
EXT	The extent of damage to TTC vehicle involved
TTC ACTION	Driver/vehicle action of TTC vehicle involved
OTHER ACTION	Driver/vehicle action of other vehicle involved
PED HIT	How the pedestrian made contact with the TTC vehicle involved
WAS PED	TTC vehicle's action at time of contact with pedestrian.
HIT PED	Which area of TTC vehicle made contact with pedestrian?
HIT PED	Which area of TTC vehicle made contact with pedestrian?
HIT PED	Which area of TTC vehicle made contact with pedestrian?
PED WAS	The action of pedestrian at time of making contact with TTC vehicle
PED. X INTER	The type of signal when pedestrian was crossing intersection at time of incident
TTC SCHEDULE	Was the TTC operator involved on schedule at time of incident?
AHEAD BEHIND	Time in minutes the TTC operator was ahead or behind schedule
SCHED CAUSE	Was TTC operator's time on schedule a contributing factor in the incident?
HRS WORK	How many continuous hours did the TTC operator worked prior to occurrence?
TTC IMPAIR	Was there any indication that the TTC operator was impaired or fatigue?

Variables and description for TTC accident data

Variable	**Description**
OTHER IMPAIR	Was there any indication that the other party involved was impaired or fatigue?
VIOLATIONS	Was there any indication that the TTC operator and/or the motorist/other violated the law r a TTC rule or basic defensive driving principle?
SPEEDING	Was the TTC operator or motorist speeding?
LANE CHANGE	Did TTC operator or motorist change lanes improperly?
FOLLOW CLOSE	Was TTC operator or motorist following too closely?
TOO FAST	Was TTC operator or motorist too fast for the conditions?
DISOBEY SIGNS	Did TTC operator or motorist disobeyed traffic signs/signals?
IMPROPER PASS	Did TTC operator or motorist made an improper passing/
INATTENTIVE	Was TTC operator or motorist inattentive?
CLEARENCE	Did TTC operator or motorist failed to allow for proper clearance/tail swing?
IMPROPER TURN	Did the TTC operator or motorist made an improper turn?
FAIL TO YIELD	Did TTC operator or motorist failed to yield?
OTHER VIOLATE	Did TTC operator or motorist commit other violations?
VIOLATE CAUSE	If the violation was that of the TTC operator’s, did it cause the occurrence?
DEFENSE TECH	Was there any defensive driving technique that could have been used by the TTC operator that may have prevented the occurrence?
OTHER CAUSE	Were there any other factors not in TTC operator's control that contributed to the occurrence?
ACTION TAKEN	Action taken for this occurrence

UTA (UTAH TRANSIT AUTHORITY), SALT LAKE CITY

Location	Salt Lake City, UT	
Website		
System Name		
Name	Edwin Buchanan	
Title	TraxRail Safety Administrator	
Address	Trax Lovendahl Center, 613 West 6960 South, Midvale, Utah 84074	
Phone	801-352-6603	
email	ebuchanan@uta.cog.ut.us	
Contact provided by:	TRA	
Contact Dates		
Actions Dec 5		
Actions Dec 7		
Actions Dec11		
Actions Dec 14		
Actions Dec 15		

Accident and Incident Data Availability

Location identifier (where it happened)	Recorded electronically
Date and time of the accident/incident	Recorded electronically
Accident/incident type or who was involved (motor vehicle, pedestrian, bicyclist, etc.)	Recorded electronically
Accident diagrams	Not recorded
Number of years of accident and incident data recorded	Since 1999
Who can provide historical accident and incident data for your LRT system?	Edwin Buchanan

Traffic Volume

Location identifier	Not recorded
Pedestrian volume	Not recorded
Vehicle volume	Not recorded
Vehicle turning movement volume	Not recorded
Light Rail Vehicle volume	Recorded in hard copy
Year of the volume count	Not recorded
How many years of light rail vehicle volume (trains) data are recorded for your LRT system?	Since 1999
How many years of vehicle volume (cars) data are recorded for your LRT system?	
Who can provide historical traffic volume data for your LRT system?	

Traffic Control Devices, Safety Devices and Practices Data Availability

Treatment	Usage	Installation/ Construction Date
Stop and Yield signs	Used at some locations	Not recorded
Signal priority (LRT automatically switch traffic signals in their favor)	Used at some locations	Not recorded
Signal preemption (transfer of normal signal operations to special control mode)		Not recorded
Four-quadrant gates	Not used	Not recorded
Four-quadrant flashing light signals	Not used	Not recorded
Constant warning time systems (uniform warning regardless of LRT speed)	Not used	Not recorded
Retroreflective advance warning signs	Used at only a few locations (less than 5)	Not recorded
Presignals/advanced signals (supplemental signals which control approaching traffic)	Used at only a few locations (less than 5)	Not recorded
Flashing light signals or beacons on the approach to LRT grade crossings	Used at only a few locations (less than 5)	Not recorded
Enhanced pavement markings on the approach to LRT-highway grade crossings	Used at only a few locations (less than 5)	Not recorded
Transverse rumble strips on the approach to railroad-highway grade crossings	Not used	Not recorded
Second train warning (a sign at the crossing for motorists/pedestrians)	Not used	Not recorded
Pavement marking, texturing, and striping	Used at only a few locations (less than 5)	Not recorded
Channelizations (including roadway medians)	Used at nearly all locations	Not recorded
Audible crossings warning devices (including wayside horns and other synthesized tones)	Not used	Not recorded
Education outreach programs to drivers and/or pedestrians	Used at some locations	

Treatment	Usage
Quick curbs (a median barrier device)	Used at only a few locations (less than 5)
Laser detection of vehicles, pedestrians, bicyclists	Not used
CCTV/video recording	Not used
Z pedestrian crossings	Not used
Collision warning systems	Not used
Gate crossing indication signals	Not used
Train control systems with warning of presence	Not used
Limits on downtime of gates	Used at some locations
Pedestrian gates	Used at some locations
Second-train signals	Not used
Flashing signs	Used at only a few locations (less than 5)
Blank-out turn prohibition signs	Used at only a few locations (less than 5)
Illumination of crossings	Used at nearly all locations
Enforcement-photo-of gate and no-left-turn violations	Not used
Crossing horns-automatic and LRV-operator-activated	Not used
Enforcement (police enforcement)	Used at some locations
Pedestrian fence gates	Used at some locations
Vehicle fence gates	Not used
Pedestrian signals	Not used
GPS countdown pedestrian signals	Not used

Open-ended Question Answers

Which other technologies or treatments, educational outreach, or unique practices related to pedestrian and motorist safety have been or are currently being implemented by your LRT system?	
Does your LRT system produce a safety report analyzing the causes and contributing factors of accidents and incidents?	NTD Reports are made each month
Has your LRT agency ever conducted a formal safety evaluation?	No
Does anyone collect observations of risky behavior or near misses between LRV and motorists and pedestrians using means such as CCTV or on-board cameras?	No
Other data or reports from your LRT system regarding the assessment of pedestrian and motorist safety	
Who can provide safety devices/treatments data for your LRT system?	

Data Received

None.

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File: 2.9
Project # 7057

Memorandum

To: File
Cc:
From: Allison Clavelle
Date: May 27, 2008
Re: UTA Site Visit Summary

On May 20 and 21, 2008, Don Cleghorn, Maurice Masliah, and Allison Clavelle of iTRANS Consulting Ltd. conducted a site visit for TCRP Project A-30 to the Utah Transit Authority (UTA) in Salt Lake City, Utah. The two day visit included a one day tour of the LRT system, hosted by Ron Nickle, Rail Safety Administrator, UTA, and a three hour workshop with Ron and eight UTA staff members.

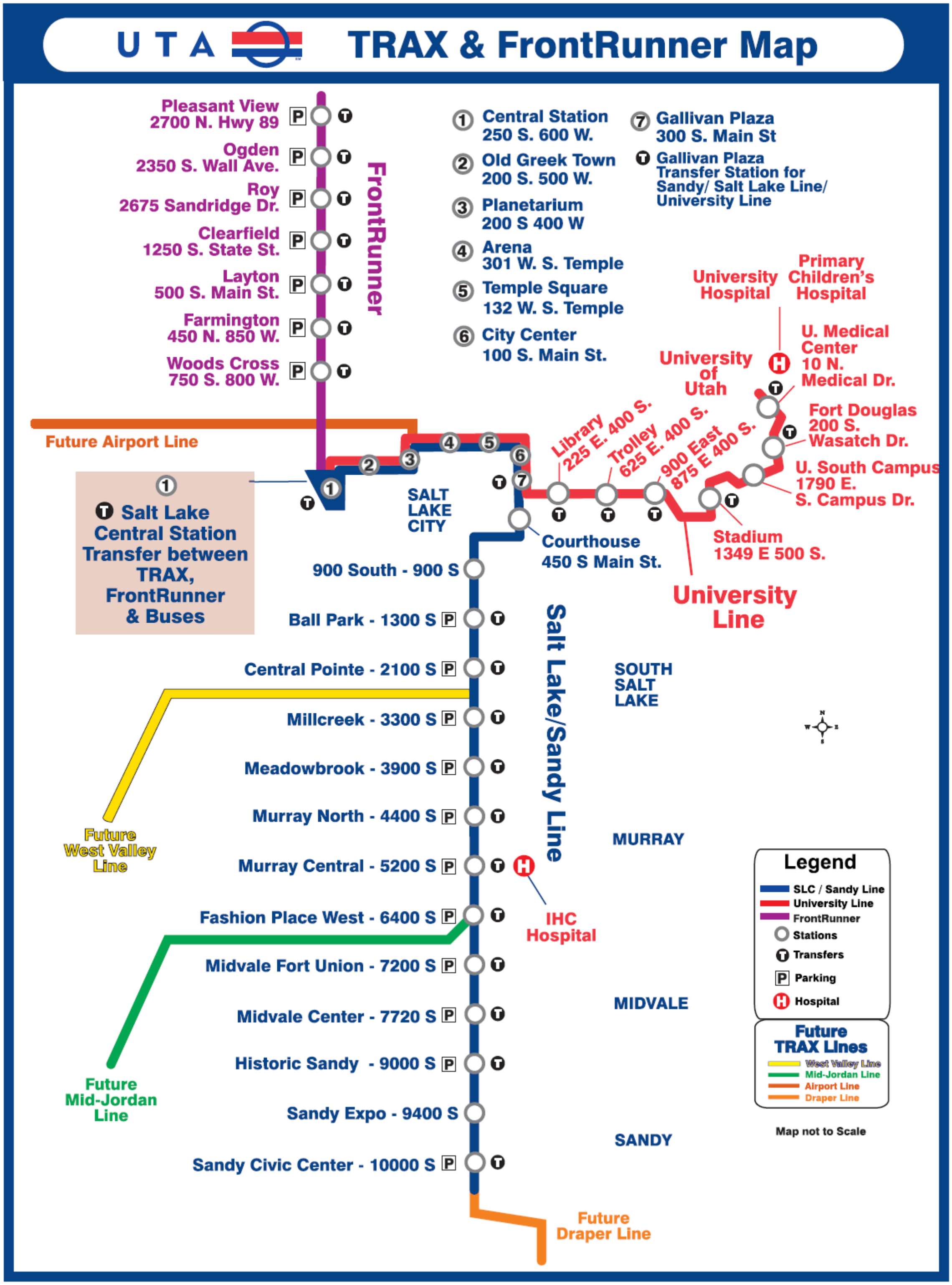
This memo is a summary of the findings of the site visit, including observations from locations and features of interest along the alignment in the field, the information gathered, and the issues raised in a workshop held with UTA staff.

1. SUMMARY OF VISIT

On the first day of the visit, Ron gave the iTRANS team a tour of the TRAX system. The system is made up of two light rail lines: the Salt Lake / Sandy Line, and the University Line. The Salt Lake / Sandy Line runs from the Central Station in Salt Lake City, E W through the downtown core, and turns N/S to terminate at the Sandy Civic Center. The southern portion of this line was the first LRT line to be built in Salt Lake City. The extension to the Salt Lake Central Station was opened in May 2008 to correspond with the opening of the FrontRunner, UTA's commuter rail service. The University Line, which was built after the original Salt Lake/Sandy line, runs E/W from Central Station, through downtown and the University, to University Hospital. **Exhibit 1** is the UTA rail map, including planned routes.

The system runs three types of trains on the two lines: Siemens 100, Siemens 160, and Bombardier UTDC. Operators change trains through their shifts.

Exhibit 1: UTA Rail Map



The southern portion of the Salt Lake / Sandy line is Automatic Block Signal (ABS) controlled, and shared with Union Pacific. The line is an exclusive ROW with at-grade crossings. Ron pointed out that the alignment has potential pedestrian crossing concerns, but there have been very few incidents. Trains approach the stations at 35 mph and accelerate quickly when leaving the stations. **Exhibit 2** shows a typical station on the southern portion of the line.

Exhibit 2: Example of Exclusive Alignment

Exhibit 3 is an example of an interesting, although originally unintentional, pedestrian safety measure at the final station on the Salt Lake / Sandy line. The train stops and waits while customers board. Then, the train pulls forward to the raised accessible platform. When the train is in its forward position, it acts as a pedestrian gate.

Exhibit 3: Station Crossing

The downtown area is a mostly semi-exclusive ROW. The LRT has a shared ROW separated by rumble strips or barrier curbs. Rumble strips are shown in **Exhibit 4,** and barrier curbs are shown in **Exhibit 5**. A short portion of the downtown line is mixed traffic operations. Trains operate at 25 mph. The downtown area also includes unsignalized midblock crossings.

A portion of the downtown alignment runs in front of a stadium where there are significant concerns with crowd control after games. UTA has addressed this concern by installing temporary barriers for special events. This arrangement is shown in **Exhibit 6**.

Exhibit 4: Semi-exclusive Alignment - Rumble Strip and Pavement Markings

Exhibit 5: Semi-exclusive Alignment, Barrier Curb

Exhibit 6: Temporary Barrier at Stadium

The University Line runs in a semi-exclusive median alignment with curbs separating the tracks from vehicles. Portions of this line reach speeds up to 40 mph. A few locations on the University Line have caused concern. Near the intersection of Wasatch and Medical, an intersection has experienced some collisions between the train and right turning vehicles. Throughout the University, jaywalking is a problem. The University Stadium is another location for concern, but there have been only a few incidents here. Like the downtown stadium location, the University Stadium station experiences a high volume of pedestrians after special events. UTA has staff on site after special events to direct the crowds. The University Line also includes a roundabout with four rail crossing gates. The roundabout crossing has experienced few problems. It is shown in **Exhibit 7**.
Exhibit 7

Exhibit 7: University Line Intersection Treatment at Roundabout

2. FINDINGS FROM WORKSHOP

On the second day of the visit, iTRANS met with a number of UTA representatives for a three hour workshop. In attendance were:

- Katy Seely and Mike Benvegnu of the Claims Unit
- Jason Petersen, Lieutenant of the UTA Transit Police
- Tim Rhoades, responsible for data collection and transfer
- Alan Miner, Manager of Rail Operations
- John Maxwell, responsible for training for the LRT and Freight line
- Jeff LaMora, Rail Service Project Administrator, UTA
- Damon Blythe, Rail Service and Operations Planner, UTA

After introductions by Ron, Maurice gave a 30 minute presentation on the purpose and results to date of TCRP project A-30. The team then initiated a discussion on the following four topics:

- Safety concerns and countermeasures
- MUTCD use and innovative treatments
- Data collection and dissemination procedures
- Safety audits

The results of the discussion are summarized in the following sections.

2.1 Safety Concerns

The most important safety concerns for UTA are:

- Jaywalking at mid-block crossings
- Bike couriers
- Pedestrians walking against signals
- Vehicles trapped inside gates
- Vehicles crossing tracks despite warning signals
- Vehicles crossing tracks despite gates
- Vehicles on tracks due to driver confusion
- Collisions from shared left-hand turn lanes
- Pinch points on platforms
- Left turn collisions
- System inconsistencies impacting driver and pedestrian expectations
- Right turn collisions
- Trespassing at stations after major events

Some of these safety concerns apply at specific locations (e.g. tight turn collisions at Wasatch Drive and South Medical Drive). Others concerns are more widespread, but most locations have had few or no incidents. UTA has installed a number of countermeasures, some at specific locations and some throughout whole portions of the line. Countermeasures are discussed in the next section.

2.2 Countermeasures

During the workshop, attendees discussed the following countermeasures:

- Pedestrian fencing – good treatment but hard to install in some locations. Must work with the local road authority. Concerns about pedestrians getting trapped.
- Need to restrict vehicles – pedestrian malls reduce pedestrian-vehicle and vehicle-train conflicts
- Visual barriers
- Education – television, radio, and print advertisements are more effective if they are more shocking.
- Education – "safety cow." UTA installs a plastic "safety cow" model on a pole to mark the site of a recent collision. The cow also has the effect of
- Jersey barriers – effective for vehicles and for jaywalking pedestrians
- Enforcement – ticket left turn violations and jaywalkers. Minimal impact when fines are low or unenforceable. UTA is interested in how other jurisdictions have enforced fines.
- Raised curbs – prevent vehicles from entering tracks. More effective than rumble strips, but may cause problems for emergency services
- Rumble strips – less effective at preventing vehicles on tracks than other barriers, but allows emergency services to cross.
- Concrete barricades to block left turns
- Consistency in the application of treatments – not a direct treatment, but it is important to create consistent driver and pedestrian expectations. Because UTA has constructed its system in stages with different levels of financing, there are inconstancies in the layouts, treatments, types of signs, etc.
- Delineators – can be effective, but get knocked down regularly
- Pavement markings
- Underground access to LRT platforms – concerns include ADA compliance and transients

Photo of the Safety Cow (source: http://slcrevisioned.blogspot.com/2007/01/safety-cow.html)

- Z-fencing for pedestrians – could be installed at more locations. May not prevent collisions if a pedestrian intends to jaywalk, but draws attention of pedestrian to oncoming trains
- Temporary barriers for crowd control – these work well, but are not a long term solution. UTA is interested in what other agencies do for high pedestrian volume locations.

2.3 MUTCD Chapter 10 and Innovative Treatments

UTA uses the train blank out sign from the MUTCD manual and generally follows the MUTCD, but has a few locations with different signage. For example, there is one grade crossing where one gate has a “Watch for Trains” sign on the counterweight for pedestrians. This was installed when the crossing was freight rail only. The gate and counterweight provide a barrier to pedestrians because the counterweight is over the sidewalk when the road gate is lowered.

The new systems are all designed to be compliant with Chapter 10, but there are some additional measures. Utah Department of Transportation (UDOT) has added “Left turn on green arrow only” on some catenary poles where the signs are appropriate, but could not be installed on the signal arms.

UTA installed a “Yield to Trains” sign for pedestrians at an unsignalized, mid-block crossing. UDOT and the City of Salt Lake asked UTA to take the sign down because the road authorities felt that the train should yield to pedestrians. The problem in this location is that because it is for trains difficult to see pedestrians. The trains now gong and sound their horns in the area.

Some downtown and university locations have texturized brick bordered by concrete to indicate pedestrian crossings. In the downtown, there are locations with poles in the center of crosswalk to delineate pedestrian space, but these locations can get congested in during peak times.

The painted signs shown in **Exhibit 8** are not standard MUTCD.

Exhibit 8: Look Both Ways Painted Sign

2.4 Data Collection

2.4.1 Incident/Accident Reporting, Storage, and Sharing

After a collision, the onsite supervisor files reports. The City Police and / or Transit Police may also file their own reports. No reporting is shared unless there is an injury or fatality.

UTA has developed a new reporting system. Handwritten reports took too long and could be hard to read and poorly entered into the system. The old reporting system was bus-oriented, but the new system is tailored to light rail. UTA wants primary and secondary causes, and recommended corrective action to be recorded in supervisor reports. The agency is also hoping to be able to integrate collision reporting with the claims system. UTA summarizes the data in Excel for the agency's own purposes, but send little data to the NTD as it is difficult to determine what qualifies as an NTD reportable incident:

- Quantifying damage is very difficult, and damage estimates are very rough. If the collision is the other party's fault (and it almost always is), UTA does not receive an outside damage estimate. These problems make it difficult to determine what is a reportable incident.
- There is also ambiguity on what constitutes an "at grade" crossing incident, especially for pedestrians. NTD has not provided satisfactory guidance about exactly what type of incidents to report.

UTA reports FTA reportable collisions to the SSO and to NTD, but never hears anything back which is frustrating to UTA staff. The SSO sends a yearly summary to FTA. The summary is prepared by UTA staff and approved by the SSO. The SSO's budget is based on the $30,000 UTA pays annually for oversight.

2.4.2 Proxy Measures

The workshop included discussion on how to identify and report locations with safety problems using proxy measures as an alternative or in addition to collision reports:

- Emergency braking records. UTA staff examine patterns in the emergency breaking records as a high frequency of emergency breaking might indicate a problem location. For example, a high frequency of emergency breaking was recently noted in one location. When staff investigated, they found that the pedestrian crossing lights were badly timed. After the lights were retimed, the number of emergency brake applications dropped significantly.
- UTA transit police keep citation records that may show high jaywalking and left turn-violation locations.
- Non-recoverable costs such as crossing gate replacements may show where there are potential issues. Broken crossing gates cost $1,000 each and do not qualify as reportable incidents to NTD. UTA typically loses one to two gates per week.

2.5 Safety Audits

UTA conducts safety reviews of locations where incidents have occurred. A multidisciplinary team goes to the site, notes possible hazards, and produces a comprehensive report. UTA does not have a formal safety audit checklist.

Jeff was unsure of how a safety audit form would look because such a wide variety of information may need to be collected for an LRT audit. He suggested organizing the checklist into categories for consideration rather than providing an extremely detailed list.

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File: 2.0
Project # 7057

Memorandum

To:	File
Cc:	
From:	Allison Clavelle
Date:	July 15, 2008
Re:	Metro Transit Site Visit Summary

On June 15 and 16, 2008, Don Cleghorn and Allison Clavelle of iTRANS Consulting Ltd. conducted a site visit for TCRP Project A-30 to Metro Transit in Minneapolis, Minnesota. The two day visit included a one day tour of the LRT system hosted by Gary Lane, a rail supervisor, and a three hour workshop with Metro Transit staff and consultants designing a new LRT line.

This memo is a summary of the findings of the site visit. The first section summarizes the visit in detail. The second section records the findings from the site visit, and includes answers to the specific questions the study team hoped to answer while on the visit.

1. SUMMARY OF VISIT

On the first day of the visit, Gary gave the iTRANS team a tour of the Hiawatha line. The Hiawatha line is currently the only LRT in the Minneapolis/St. Paul (Twin Cities) area. The line connects downtown Minneapolis to the Mall of America in Bloomington to the south via the Minneapolis-St. Paul Airport. The line was opened in 2004. **Exhibit 1** is the Metro Transit map of the Hiawatha line.

The Hiawatha line includes exclusive, semi-exclusive, and nonexclusive alignment types. Between the Mall of America and Humphrey Terminal Station, the alignment is mostly Type b.1 semi-exclusive with at grade intersections, with some sections of Type b.2 side or median running with barriers. Along these alignments, and other, similar alignments north of the Airport, Metro Transit experiences some problems with cars violating the gates. **Exhibit 2** shows a vehicle inside the gate at a grade crossing.

Metro Transit uses "lunar" lights at gate crossings to inform approaching LRT operators that a vehicle is interfering with the gates or that the gates have failed. An example of a "lunar" light is shown in **Exhibit 3**. These lights indicate gate status with the following signs:

- Flashing light indicate that the gate is down
- Solid light indicates that the gate is still in motion or that something is blocking the gate.

Exhibit 1: Map of Hiawatha Line

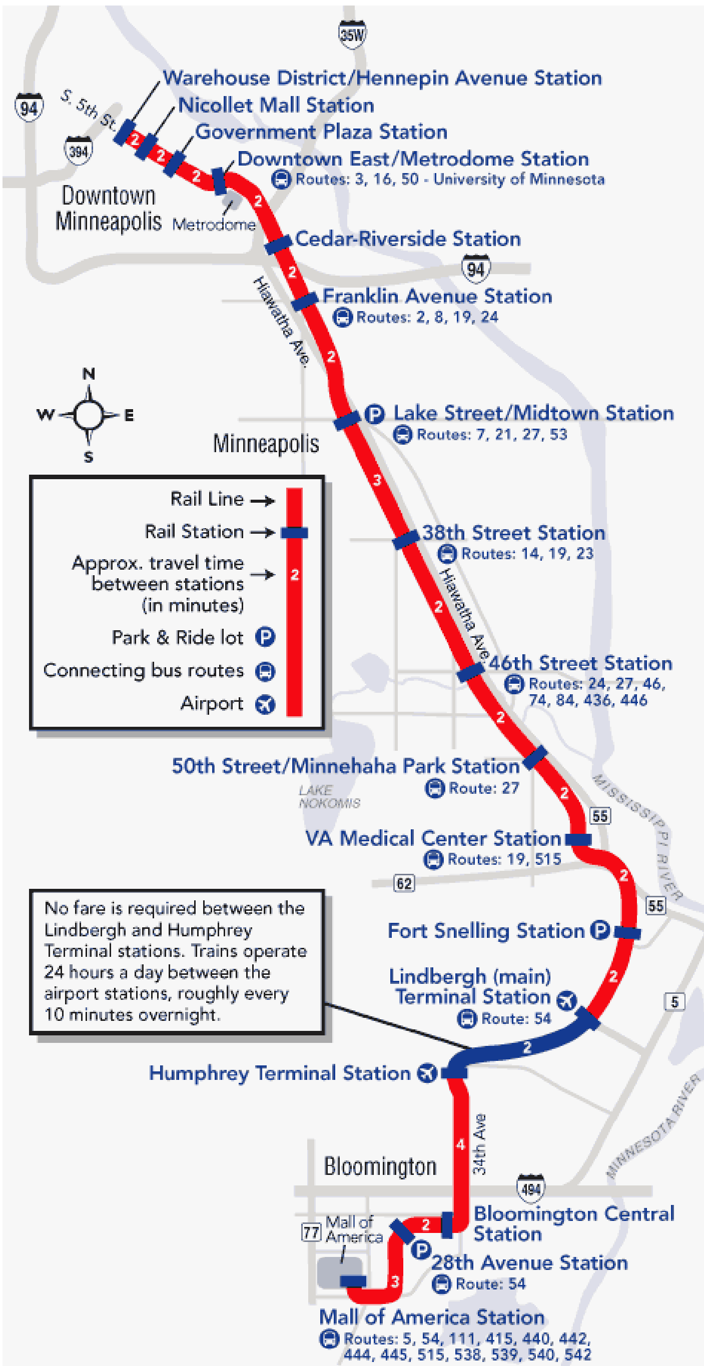

Exhibit 2: Vehicle Violating Gates

Exhibit 3: Lunar Light

From Humphrey Terminal Station to Lindbergh (main) Terminal Station, the line is Type a exclusive, and operates in a tunnel under the airport. The entrance to Humphrey Terminal Station was a problem area for Metro Transit when the entrance was constructed. The pedestrian parking lot access to the LRT was blocked from the site of the LRT operator by the elevator / stairs access to the second floor. As pedestrians crossing against the signal were not visible to operators, operators were forced to slow significantly approaching the station as a precaution. **Exhibit 4** shows the crossing. This access was closed after construction was complete, solving the problem. North of the airport, the line returns to semi-exclusive with at grade intersections.

Exhibit 4: Closed Crossing at Airport – LRVs arriving on the curve from the top of the photo could not easily see pedestrians in this crossing.

After Fort Snelling Station, the line changes to Type b.2 semi-exclusive side running with wide medians and curbs that separate the LRT from the roadway. At stations, the LRT area is fenced, restricting pedestrian movement. The most significant problems in these locations are vehicle / bicycle gate violations and pedestrians crossing against the signals. **Exhibit 5** and **Exhibit 6** show examples of the typical alignment in these areas.

Exhibit 5: Typical Type b.2 Semi-exclusive Alignment

Exhibit 6: Typical Type b.2 Station

One portion of the southern part of the line is Type b.4 semi-exclusive center running with mountable curbs and a single lane of road traffic on each side. U-turns are restricted in this area, but left turns are permitted. Operators proceed with caution through this area due to the frequent mid-block left turns by vehicles. The signs prohibiting U-turns were added on every catenary pole after opening. **Exhibit 7** shows trains passing on this portion of the alignment.

Exhibit 7: Trains Passing on Type b.4 Alignment

At the 38th Street Station, Metro Transit had experienced problems with the pedestrian access to the station. Pedestrians were exiting a bus at the bus stop and running to get the train on the platform. These pedestrians were in danger of being struck by a train on the other track. Metro Transit installed temporary barriers to force pedestrians to walk around to the platform access. These barriers were present at the time of the site visit and formed a partial Z-crossing, as shown in **Exhibit 8**. As operator feedback on the temporary barrier was positive, a permanent barrier was later installed. The permanent barrier is shown in **Exhibit 9.** The effectiveness of the barrier has not been determined.

Exhibit 8: Pedestrian Crossing (before) - Temporary Pedestrian Guidance

Exhibit 9: Pedestrian crossing (after) - Pedestrian guidance

Picture courtesy of Sheri Gingrech, Metro Transit

Near downtown, the alignment is Type b.1 semi-exclusive with some at-grade crossings and one pedestrian only crossing. This portion of the alignment runs parallel to a pedestrian and bicycle path. The path is separated from the alignment by fencing with small "No Trespassing" signs.

The downtown core is Type b.4 semi-exclusive centre running with mountable curbs. The downtown core alignment has experienced problems with pedestrians and vehicles on the tracks against the signals. Metro Transit also reported a number of sideswipe collisions in these locations. These collisions occur when a vehicle attempts to change lanes and collides with an LRV.

Exhibit 10 shows the terminal stop of the downtown alignment.

Exhibit 10: Downtown Alignment

The Hiawatha line has consistent signage and design throughout. All pedestrian crossings have the "Look" sign at pedestrian signals. An illuminated second train coming sign is provided, as shown in **Exhibit 9,** but the second train coming illumination is very difficult to see during daylight hours.

Metro Transit has recently begun upgrading tactile strips on the pedestrian pathway to warn pedestrians that they are entering an LRT area. An example of a strip is shown in **Exhibit 11**. **Exhibit 12** shows two additional types of pedestrian signage used by Metro Transit. The "Danger Moving Trains" sign is installed at pedestrian crossing locations. The small stop signs are a recent addition to encourage pedestrians and bicyclists to stop and look for an oncoming train. The effectiveness of the signs is not known.

Many of Metro Transit's stations include intertrack fencing to control pedestrian movements, but one key location in the downtown does not have intertrack fencing due to an on-going debate on urban design. This location experiences relatively high volumes of pedestrians crossing the track between the platforms. Intertrack fencing was discussed at the workshop, and the comments are presented in **Section 2** of this memo.

Exhibit 11: New Reflective, Tactile Strips

Exhibit 12: Pedestrian Signage

Metro Transit uses vehicle gates at most crossing locations. Blank out no left / right turn signs are installed at some problem intersections. Some of these signs were not standard MUTCD, as shown in **Exhibit 13**

Exhibit 13: Intersection with Blank Out No Right Turn Sign

Education plays a significant role in Metro Transit's safety program. Safety announcements are played over the speaker systems at stations, and include an announcement encouraging parents to hold their children's hands at and near the stations. Metro Transit also educates their operators to use the LRT horns to warn drivers and pedestrians of the approaching trains.

2. FINDINGS FROM WORKSHOP

On the second day of the visit, iTRANS met with a group of Metro staff and consultants involved in the design of the new LRT line. In attendance were:

- Michael Conlon, Director of Rail and Bus Safety, Metro Transit
- Sheri Gingrech, Deputy Chief Operations Officer, Hiawatha Line, Metro Transit
- Andy Lekazawich, Director of Rail Systems Maintenance from Pedspars
- David Schowalter, Urban designer, EDAW, Responsible for public space, improvements, pedestrian and bicycle access for Central Corridor LRT design
- Michael Guse, Rail Transportation Manager, Metro Transit
- AJ Olsen, Deputy Chief, Metro Transit Police
- Dave Learby, Risk Management
- Mike Hermann, Civil Task Manager, Central Corridor LRT, Metropolitan Council
- Mark Bishop, Senior Engineer responsible for Roadway Design, Central Corridor LRT, Metropolitan Council

After introductions by Mike Conlon, Don gave a presentation on the purpose and current results of TCRP Project A-30. Metro was very interested in what measures are being taken elsewhere, and were able to share some of the design considerations for their new LRT expansion project.

The iTRANS team then initiated a discussion on the following four topics:

- Safety concerns and countermeasures
- MUTCD use and innovative treatments
- Data collection and dissemination procedures
- Risk assessment (called safety audits in UTA visit)

The results of the discussion are summarized in the following sections.

2.1 Safety Concerns

The most important safety concerns for Metro Transit are:

- Pedestrian collisions at crossings
- Sideswipes and vehicles on the track in the downtown core
- Illegal turns across tracks
  - Light rail in the center alignment confuses drivers as drivers are not accustomed to checking left for trains
- Vehicles violating gates

2.2 Countermeasures

During the workshop, attendees discussed the following countermeasures:

- Pedestrian gates:
  - Metro Transit is considering pedestrian gates, but staff are unsure of how well the gates work. It is difficult to "seal" off intersections completely (pedestrians can walk into the street) and it is not known for sure whether it is feasible or advisable to try to "seal" off intersections completely:
    - Are gates useful?
    - Do gates need to be paired with four quadrant auto gates?
  - As Metro Transit is a new system, they do feel that they have had enough incidents to know where their priorities lie.
- The small stop signs shown in **Exhibit 12** are a recent addition in response to a fatality. It is too early to tell whether the signs are beneficial, and Metro Transit is not conducting any formal review.
- Sheri and Mike discussed plans to extend the fence at Metro Transit's highest incident location (the intersection south of the 46th Street Station, shown in **Exhibit 14)**. They are planning to make the sidewalk smaller and channel pedestrians. Sheri also discussed plans to channel pedestrians using a permanent barrier at the 36th Street Station (shown after completion in **Exhibit 9)**.

- Z gates – seem like a good idea, but Metro Transit struggles with implementing them because of space restrictions
- The "do not drive on tracks sign" is not always effective because people are not paying attention – too many signs.
- Second train sign – when the second train part is lit, it is hard to see in the sun. Metro Transit is considering alternative designs for better visibility.
- Pedestrian signal heads are so high that they are difficult to see. The height is specified by the MUTCD, but Metro Transit will be lowering the pedestrian heads, and the heads on the new alignment will also be lower than MUTCD specifications.
- Metro Transit has received good feedback about the effects of the blank out no turn signs.
- Choosing a way to separate the LRT dynamic envelope from driving lanes is difficult where space and grade are an issue. Metro Transit has found that 6 inch curbs can result in vehicles getting trapped on the alignment.

Exhibit 14: Pedestrian / Bicycle Problem Intersection – the Wide Area between the End of the Fence and the Road provides Little Control of Movements across the Tracks.

Metro Transit has attempted to control pedestrian crossings over the track between station platforms at their downtown and stadium stops using several techniques. The agency installed intertrack fencing at the stadium station, and illegal pedestrian crossings dropped significantly.

Mike Conlon conducted a risk analysis of several sets of measures. The measures were assessed by counting violations at the downtown station:

- Original design – tracks in the median with platforms on each side.
  - 226 weekday rush hour illegal pedestrian crossings.
- Fall 2005 – installed "Do not cross tracks" sign on platform sides.
  - 126 weekday rush hour illegal pedestrian crossings
- Spring 2006 – implemented a number of measures:
  - Public address on board arriving trains
  - Public address on platform every 10 min
  - Scrolling variable message sign on platform
  - Education through Hennepin County and Minneapolis newsletter safety articles
  - Metro Transit support with safety brochures at Bike to Work Day May 19th
  - 44 weekday rush hour illegal pedestrian crossings
- Summer 2006 – implemented further measures:
  - Widen crosswalks
  - Change pedestrian walk signal timing
  - Automatic digital announcements on trains and platforms
  - Fence design refinement
  - 42 weekday rush hour illegal pedestrian crossings
- Currently negotiating with other authorities for approval on the installation of intertrack fencing

2.3 MUTCD Chapter 10 and Innovative Treatments

The Hiawatha line and the new corridor were both designed using MUTCD guidelines, but Metro Transit also uses some non-standard signs.

- The designers and operations staff agreed that they find value in the MUTCD because it provides consistency. The problem is that MUTCD becomes cumbersome unless you can get someone to sort through how you introduce a sign. If you would like to use something for a different application, it is difficult to get official permission. The document provides good support for when it *agrees* with the application the designer wishes to use, but it can appear hypocritical to attempt to defend measures that are outside the MUTCD.
- MUTCD document is still evolving because LRT has not been around as long as heavy rail or road. Metro Transit attempts to design and implement treatments that are consistent with the spirit of the document.
- The application of the document requires a common sense approach.
- Metro Transit's small stop signs are not standard MUTCD, but have been installed at every sidewalk along the corridor.

2.4 Data Collection

Metro Transit felt that the current reporting process is sufficient, but that the resulting data are not accurate. FTA needs to ensure that the data collected are available and useful to the people who put time and energy into providing reports. It seems that the more the data system changes, the more cumbersome it gets. Currently, the Metro Transit Police conduct LRT investigations separately from the Risk Management and Rail and Bus Safety departments. If there was a standard FTA collision assessment database or format, they would use it – as long as it wasn't cumbersome.

Metro Transit uses a STARS database to record key fields. The database produces monthly bus operations reports.

2.5 Risk Assessment

Metro Transit is interested in the concept of a risk assessment checklist. The workshop participants had one suggestion on the sample provided for discussion: the line on violating user expectation was not clear and should be rewritten.

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File: 2.0
Project # 7057

Memorandum

To:	File
Cc:	
From:	Allison Clavelle
Date:	July 15, 2008
Re:	New Jersey Transit Site Visit Summary

On June 17 and 18, 2008, Don Cleghorn and Allison Clavelle of iTRANS Consulting Ltd. and Herb Levinson conducted a site visit for TCRP Project A-30 to New Jersey Transit (NJT) in Jersey City, New Jersey. The two day visit included a one day tour of the LRT system hosted by Dave Morgan, NJT, and a three hour workshop with NJT staff and staff from their consultants, URS Washington.

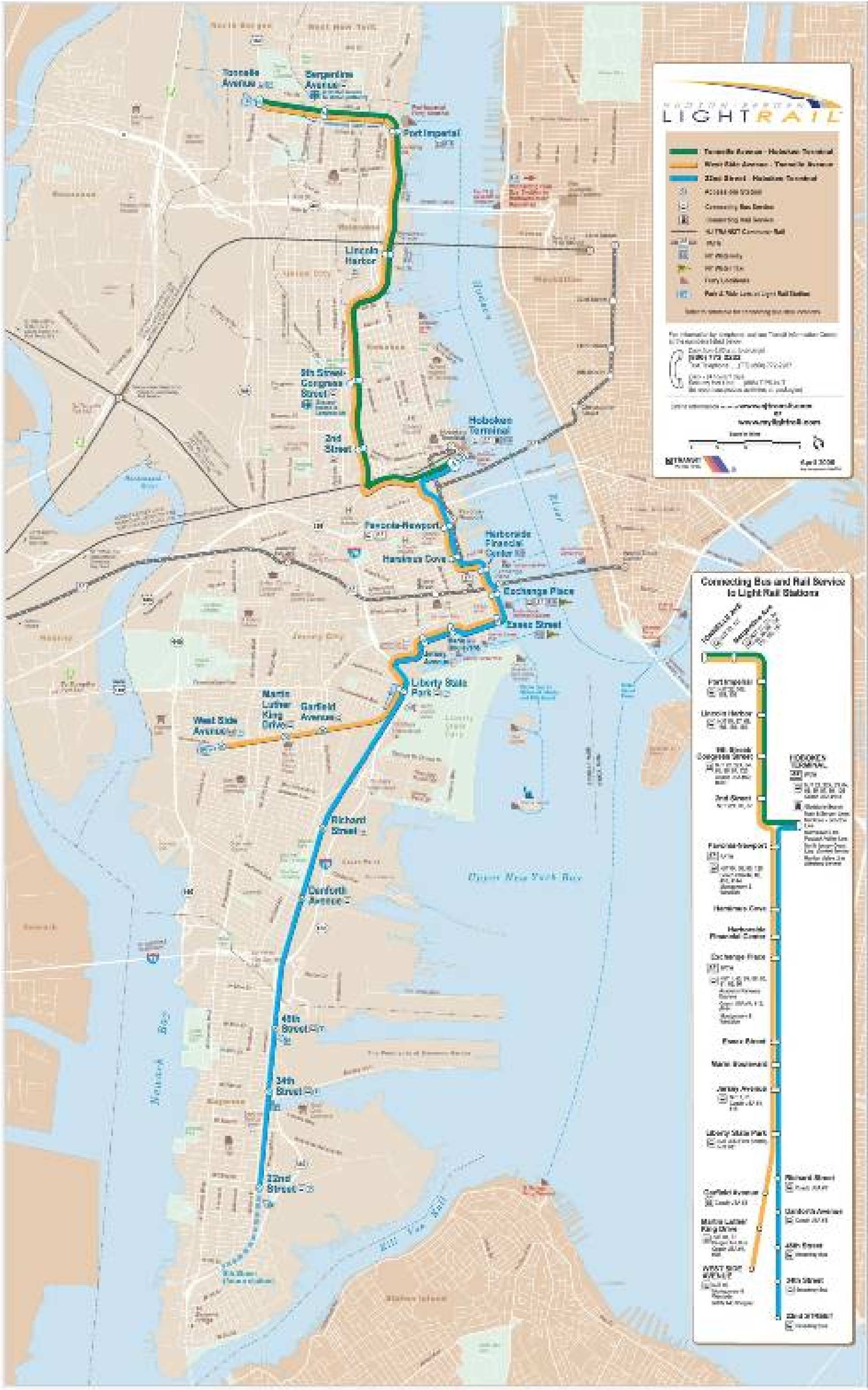
This memo is a summary of the findings of the site visit. The first section summarizes the visit in detail. The second section records the findings from the site visit, and includes answers to the specific questions the study team hoped to answer while on the visit.

1. SUMMARY OF VISIT

The first day of the visit, Dave gave the iTRANS team a tour of the Hudson-Bergen Light Rail (HBLR) line. The HBLR line is one of two light rail systems operated by NJT, and was opened in 2000. **Exhibit 1** shows the NJT map of the HBLR line. The line has three branches (Green, Yellow, and Blue):

- The Green branch connects Tonnelle Avenue in North Bergen to Hoboken Terminal via Weehaken. Hoboken. Hoboken Terminal is a significant transfer point for commuter rail and access to New York City.
- The Yellow branch connects Tonnelle Avenue to West Side Avenue in Jersey City. It follows the Green branch alignment until just before Hoboken Terminal where it splits to travel south through Jersey City. After Liberty State Park, the Yellow branch turns west into Jersey City.
- The Blue branch starts at Hoboken terminal and travels the same alignment as the Yellow branch until just after Liberty State Park. Then, the Blue branch continues south to Bayonne, terminating at 22nd Street.

Exhibit 1: Hudson-Bergen Light Rail Map



The HBLR line includes exclusive, semi-exclusive, and nonexclusive alignment types.

The northern portion of the alignment, from Tonnelle Avenue Station to the 2nd Street Station in Hoboken, is largely Type b.1 alignment with at grade crossings. **Exhibit 2** shows a typical cross section from this alignment type. Crossings are normally signal controlled with a limited number of gated crossings. In areas where there is significant pedestrian activity, the alignment is fenced or otherwise protected to control pedestrians.

Exhibit 2: Typical Type b.1 Alignment

NJT has installed blank out signs at a number of locations in response to LRT-vehicle collisions and close calls. **Exhibit 3** shows blank out no right turn signs operating at an at-grade crossing near Lincoln Harbour Station. The sign was installed to increase awareness of the presence of an LRV after an LRV and NJT bus collided at this location. There had also been a number of close calls.

Exhibit 3: Blank-out no right turn sign

The 9th Street-Congress Street Station was originally expected to be a moderate or low volume station. A short third track section was installed to facilitate passing for an express route. An elevator was installed to connect the track and community at the lower elevation to a community at the top of the adjacent hill. After the installation of the elevator, pedestrian traffic and ridership at the station increased significantly. Because the station was expecting low volume, NJT initially planned to have the express train skip the station using the center track of the short three-track section, and installed second train blank out signs to warn of the presence of the express train. Express train service has not, however, been implemented, The blank out signs are used in normal operating conditions, but the iTRANS team saw many pedestrians ignore the lights and cross when a train was approaching.

Exhibit 4 shows the second train coming operations. The picture on the left shows the cross buck lights flashing indicating the first train is approaching. The picture on the right shows the second train sign and cross buck lights, indicating that a second train is approaching.

The same station experienced a non-fatal pedestrian collision involving a small child. This location has also had a number of close calls. To address these issues, NJT installed a Z-crossing to force pedestrians to look in the direction of an oncoming train. The Z-crossing is shown in **Exhibit 5**. It forces pedestrians leaving an entrance to the track to turn 180 degrees before crossing the track. Pedestrians must turn to face oncoming trains. The measure has been effective according to anecdotal reports, but a pedestrian entrance planned for the other end of the platform will not have a Z-crossing, and will not force pedestrians to make the additional movement.

Exhibit 4 and **Exhibit 5** show a tactile pavement marking that NJT is installing at all stations on the HBLR line. The yellow tactile stripe, which reads, "WATCH FOR TRAINS," is being installed at all locations where pedestrians are near the dynamic envelope of the train.

Exhibit 4: Second Train Coming Blank Out Sign at Pedestrian Crossing (Left: Before First Train, Right: Between First and Second Trains)

Exhibit 5: Z-crossing

The Pavonia-Newport Station serves Harbor Center mall and is another location with high pedestrian volumes. This location also has a blank out second train coming sign. The sign has arrows that alternate when the train is approaching. The arrows do not indicate the direction from which the train is approaching. **Exhibit 6** shows the operation of the second train coming sign at this location.

Exhibit 6: Second Train Warning Blank Out Sign

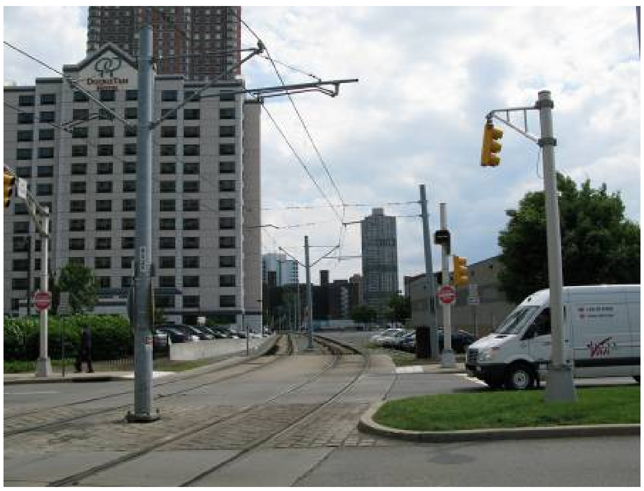
The Pavonia-Newport station also has a blank out no right turn side to prevent vehicles from turning right across the tracks when a train is approaching. This sign is shown in **Exhibit 7**.

Exhibit 7: Blank Out No Right Turn Sign (Left: Intersection, Right: Detail)

Between Pavonia-Newport Station and Harsimus Cove Station, there is an at-grade crossing that has experienced some problems. The crossing is controlled by traffic signals, but motorists often fail to stop behind the stop bar when the light is red. This puts them in danger of being within the dynamic envelope of the train. NJT has installed a number of warning signs. Train operators move through this area with the brake already engaged in case a vehicle is on the tracks.

Exhibit 8 shows the intersection. The top photo shows a vehicle over the stop bar and in the crossing, but a safe distance from the train. The photo on the bottom shows the signage leading up to the crossing. The crossing is at the signals at the end of the median.

Exhibit 8: Problem Crossing (Left: Vehicle over Stop Bar, Right: Signage approaching Intersection)



Approaching the financial district from the north, the alignment enters the street. Most of the alignment at this point is Type b.3, median running with curbs and textured concrete to differentiate the LRT space from the vehicle and pedestrian space. One small section has one LRT track as Type b.3 and a second track as Type c.1. The Type c.1 track is shared by vehicles and the LRT. A blank out sign warns vehicles when an LRV approaching from behind on the track ("trolley" is displayed on the sign). **Exhibit 9** shows this unusual alignment type where the LRT operates two-way and street traffic operates one-way.

Exhibit 9: Type c.1/b.3 Alignment (Right: Trolley Warning Blank Out Sign on Shared Type c.1 Lane)

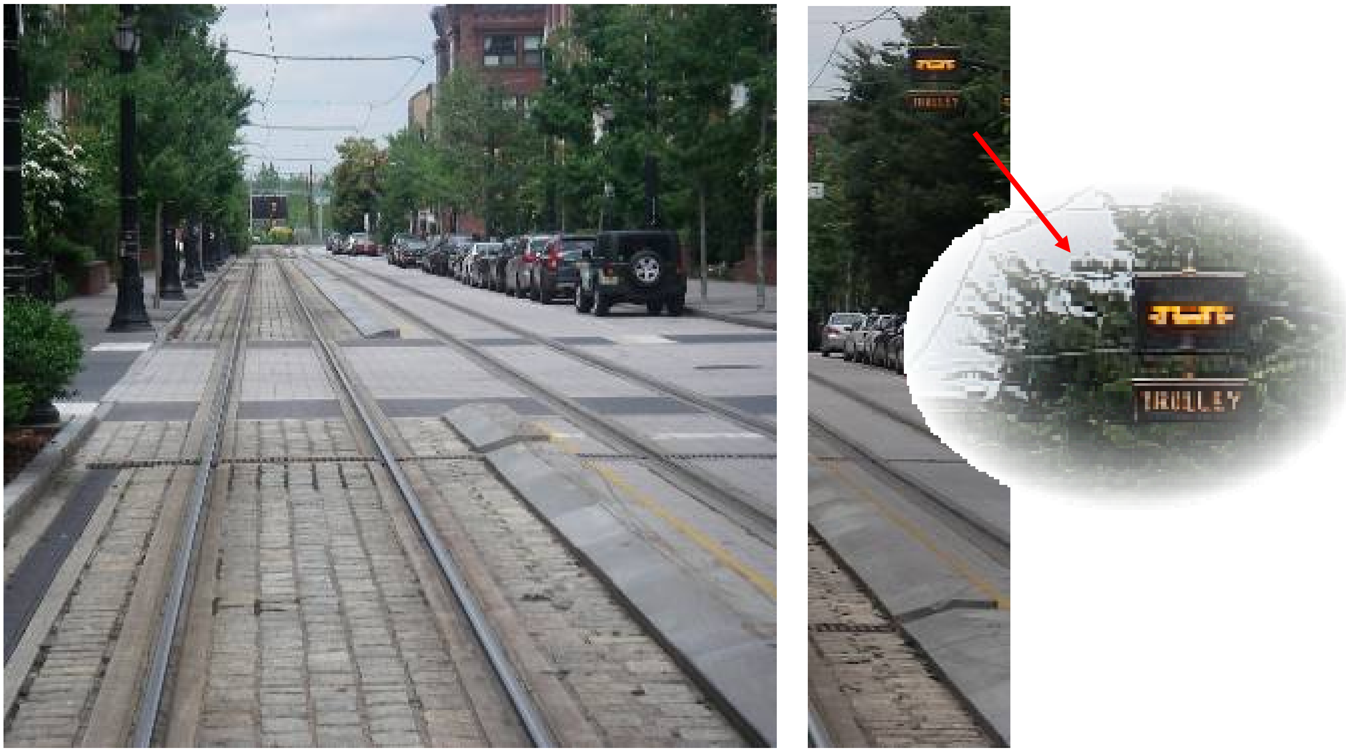


Exhibit 10 shows the transition from this short stretch of shared alignment to an unusual alignment which is possibly Type c.3, but which is not so much a pedestrian mall as a segregated LRT running down the center of the alignment with sidewalks on each side. No vehicles are permitted in this section. The LRT-only lanes are clearly designated by the pavement type. The paving stone type treatment has the added bonus of being tactile so drivers and pedestrians feel the difference in the pavement if they stray onto the LRT-only alignment.

Exhibit 10: Type c.1/b.3 to Type c.3 Transition

In the financial district, the alignment varies considerably as the tracks shift alignment within the street. LRT lanes are designated by textured concrete throughout the financial district. Most of the LRT alignment is protected by small curbs, but there are sections with no curbs. **Exhibit 11** shows a section of the track where the alignment crosses lanes. The section is near the financial district.

Exhibit 11: Transition alignment

The Harborside Financial Center Station is extremely busy. Pedestrians cross the tracks to access the station, and also to cross the street. The LRT alignment is protected with significant landscaping and fencing to deter pedestrians from making illegal crossings. Midblock crossings are permitted at one central location. This location is at one side of the station and is consistent with pedestrian desire lines between the buildings, reducing the temptation to cross the LRT track at another location. The station also has pedestrian signal heads, but very few pedestrians were obeying the signals during the site visit. The station platform is very wide and provides refuge for pedestrians between the two tracks.

Exhibit 12 and **Exhibit 13** show the Harborside Financial Center Station. **Exhibit 14** shows typical drainage installation along the textured concrete in this portion of the alignment.

Exhibit 12: Pedestrian Fencing and Landscaping

Exhibit 13: Pedestrian Crossing of Type b.2 Median Running Alignment

Exhibit 14: Type b.3 Alignment with Textured Surface and Drainage

NJT was also able to provide an example of vehicle and pedestrian gates in operation together. Dave Morgan commented that adding pedestrian gates to the installation of vehicle gates is only nominally more expensive than vehicle gates alone. **Exhibit 15** and **Exhibit 16** show the vehicle and pedestrian gates in various stages of operation.

Exhibit 15: Pedestrian and Vehicle Gates (Left: Gates Up, Right: Pedestrian Gate Detail)

Exhibit 16: Pedestrian and Vehicle Gates - Gates Down

2. FINDINGS FROM WORKSHOP

On the second day of the visit, iTRANS met with a group of staff from NJT and URS Washington Division (URS), the contractor that designed and now operates the HBLR. In attendance were:

- Dave Morgan, AGM, Light Rail Operations, NJT
- Phillip Maccioli, GM, URS
- Harry A. McCall, Superintendent, Operations, URS
- Steven Magiotta, Manager, LRT Operations and Maintenance, NJT
- A number of others who were present intermittently

After introductions by Dave, Don gave a presentation on the purpose and current results of TCRP project A-30. NJT provided a number of interesting observations. Both NJT and URS (the contractor that designed and runs HBLR) have staff with extensive heavy rail experience. This background provided a different perspective than that from the other visits carried out in this project.

The iTRANS team then initiated a discussion on the following four topics:

- Safety concerns and countermeasures
- MUTCD use and innovative treatments
- Data collection and dissemination procedures
- Risk assessment (called safety audits in NJT visit)

The results of the discussion are summarized in the following sections.

2.1 Safety Concerns

The most important safety concerns for NJT are:

- Pedestrian crashes are the most serious concern because of the high likelihood of a fatality. Most pedestrian crashes result from the pedestrian not paying attention.
- Pedestrians look at the train they want to catch and do not see a second train.
- Center platforms in off-street alignments pose less of a problem as pedestrians need only cross one track.
- Pedestrians blocking tracks and roadway, especially during the peak hours
- Vehicles making prohibited right turns on red and running into an LRV. NJT has installed bright signage which seems to help. Blank out signs are considered more effective than static signs. At some locations, gates would be the best option, but there are too many trains (gates would be going up and down all the time).
- Vehicle queuing over crossing in rush hour. The road network's lack of capacity creates problems for LRT operation. Some LRT crossings are close to several traffic signals, and as the road network is congested, queues are fairly common.
- Motorists have less respect for LRVs than for heavy rail.

2.2 Countermeasures

During the workshop, attendees discussed the following countermeasures:

- Attendees reported that four quadrant gates are hard to maintain and operate. The gates need to be tested, are difficult to time, and expensive. There are also potential problems with people getting caught between the gates.
- Gates are not practical at many locations due to the high frequency of trains.
- Blank out signs are more effective than static signs.
- NJT has installed some blank out second train signs at a few stations, but pedestrians don't necessarily pay attention. At the 9th Street Station, the second train sign was installed because an express train was planned to pass that stop. The express LRT route was never implemented because the stop ended up having significant ridership, but the sign was not removed.
- None of the blank out second train coming signs indicate the direction from which the train is approaching, despite the availability of alternating arrows in the active signs.
- Second train signs are thought to have the greatest benefit for first time users of the system. The benefits dissipate over time for regular users as regular users begin to ignore all warning signs and sounds.
- Operator training is a significant countermeasure. Operators need to be informed of problem areas and given speed restrictions at problem locations. Hands on training is especially important as it allows operators to learn the idiosyncrasies of the route. NJT has new operators ride with seasoned

operators for one week after their four week training period. Operator training is essential where an agency cannot install the optimum treatment because of some sort of limitation (e.g. trains too frequent for gates).

- Operators can approach problem locations with brakes already engaged. This shortens reaction and actual stopping time.
- Fencing is effective, but there is no place to put fencing on street running alignments.
- NJT is retrofitting stations with consistent yellow striping around the LRT's dynamic envelope.
- Operators sound the LRV horns at problem locations. This can result in noise complaints if the crossing is near a residential area, but the practice is defensible if the location poses a risk.
- Pedestrian heads could be lower to attract attention, but this can create a hazard because of clearance. Low pedestrian heads could be a good option as that is where people are looking. It is also possible to make the signs dynamic so they display the track the train is using.
- Too many warning systems can be a nuisance and people start to ignore the warnings if there are too many. Application of treatments must be site specific. The "rules" state that the signs have to be on for a 15 second clearance. This is the minimum time. It is preferable to give more time, but in locations where there is a train every 3 minutes, giving more time would result in almost constant warning. People become accustomed to the noise and don't hear it any more. Warning bells are more of a training aid, but they too eventually lose their effectiveness.
- The more specific a treatment is, the better it is – especially for warning bells and lights. It is important to give people enough time to cross, and it is also important to provide real information that is useful to the pedestrian.
- Z-crossings force pedestrians to look at the train. This only works under normal LRT operating conditions (not reverse running).
- National consistency is important so that drivers and pedestrians have the same expectations no matter where they are in the country.
- Bollards blocking lanes where cars should not be are very effective.
- Diagram signs are also effective, especially when paired with bollards and no entry signs.
- Jersey barriers with chevrons are effective.
- Lots of systems make their own signs because there is no guidance from FTA. There is a lack of national consistency.

2.3 MUTCD Chapter 10 and Innovative Treatments

The NJT group felt strongly that MUTCD Chapter 10 should be combined with Chapter 8 and that heavy and light rail lines should be treated with the same measures. This would avoid sending a mixed message to the public, and would add to consistency.

2.4 Data Collection

The workshop attendees had a number of comments concerning data collection:

- Some important information on LRT is missing from national databases, e.g. crossing geometry information.
- There are many un-reportable collisions and no real motivation to report.
- There is no way to cross reference collisions with treatments or the type of crossing or site where the collision occurred. Dave suggested having a database of LRT crossings similar to the FRA's crossing database to cross-reference collisions.
- The collision reporting form for FTA should be similar to the one that FRA uses.
- There is a lack of consistency across FTA. The configurations of the SSOs are inconsistent. Many systems are not doing audits or physical inspections.

2.5 Risk Assessment

The local staff offered the following comments on risk assessment:

- NJT does a multidisciplinary hazard analysis.
- After an incident, the agency does an investigation. The investigation results in a report that lists the root cause and recommends remedial measures. This report is filed with the SSO.
- NJT uses the system safety approach to risk assessment:
  - The system safety and configuration management process
  - Before NJT builds and operates the system, they ensure that the design is safe, they ensure that the system is built to the design, and that ensure that the system operates to the design standard.
  - If a change is proposed, NJT does an operation hazard analysis. They list possible mitigations for hazards that the change in operation will cause. That process should be completed for any change.
  - The process is described in Standard 882D (Military Standard)
  - During design and construction, there should be a certification checklist.
  - This is all part of the New Jersey SSO program, but details will vary from state to state depending on how states legislate their SSOs
  - The process needs to start at the design stage – the design team should "design out" the hazards. Peer reviews of designs are also important.

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File: 2.0
Project # 7057

Memorandum

To:	File
Cc:	
From:	Allison Clavelle
Date:	August 15, 2008
Re:	California Site Visit Summary SF Muni and SCVTA

On July 23 to 25, 2008, Don Cleghorn and Allison Clavelle of iTRANS Consulting Ltd. conducted a three-day site visit for TCRP Project A-30 to two Light Rail Transit agencies in California: the San Francisco Municipal Railway (SF Muni) on July 23 and July 24, and the Santa Clara Valley Transportation Authority (SCVTA) on July 25.

The two day visit of SF Muni included a day and a half self-guided tour of the LRT system, and a series of short meetings with SF Muni staff. The SCVTA visit included a one day guided tour of the LRT system, hosted by a rail and bus supervisor. TCRP Project A-30 panelist José Farrán of Adavant Consulting accompanied Don and Allison on the SCVTA visit, and provided many interesting insights on the SCVTA and SF Muni systems.

This memo is a summary of the findings of the site visit. The first section summarizes the SF self-guided tour, and provides information about the outcome of meetings with SF Muni staff. The second section summarizes observations from the SCVTA visit.

1. SAN FRANCISCO SITE VISIT

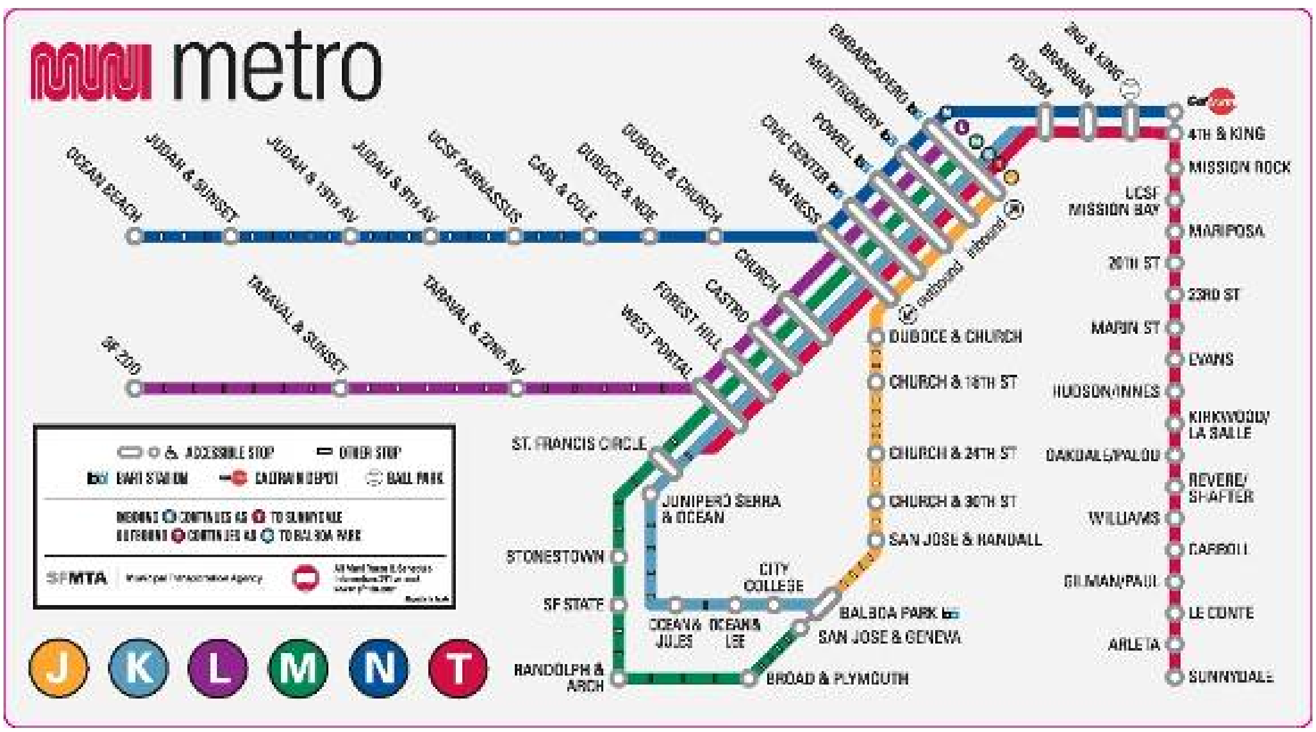
Originally, the plan for the SF Muni visit followed the same format as the other site visits, but on arriving in San Francisco, the study team learned that the agency had not been able to arrange for a formal workshop. The study team also learned that all site supervisors and members of the Safety and Training department had high work loads on the days of visit and were unable to accompany the team on a site visit. The team was, however, able to meet with three key members of the SF Muni Safety and Training department to discuss light rail safety and data collection and storage. SF Muni staff recommended various locations, and the team completed a self-guided tour of the system, visiting different alignment types and locations.

1.1 Site Visit

San Francisco has an extensive passenger rail transportation system that has been in operation and that has been improved over a period of 60 years. Because of the extensive history and extensive range of operations, San Francisco offers a wide variety of alignments and treatment types. Cable Car operations were not considered during the visit as these operations are outside of the scope of TCRP Project A-30. San Francisco LRT and historic streetcar operations were both reviewed, but the focus on the historic streetcar line was limited to locations where it transitioned to or mimicked more typical LRT operations. Early in the visit, the study team noted that the division between streetcar and LRT is often not clear, as all the vehicles are capable of operating on all tracks, and the alignment shifts between street-running, semi-exclusive, and exclusive on many of the lines.

Exhibit 1 is a map of the SF Muni rail network. The historic streetcar, called the J line, runs on top of Market Street in mixed traffic. The other lines are LRT running in semi-exclusive, non-exclusive, and exclusive alignments. The diagonal portion of the K, L, M, N, and T lines, extending from Embarcadero to West Portal, is a tunneled exclusive alignment, running under Market Street.

Exhibit 1: SF Muni Map

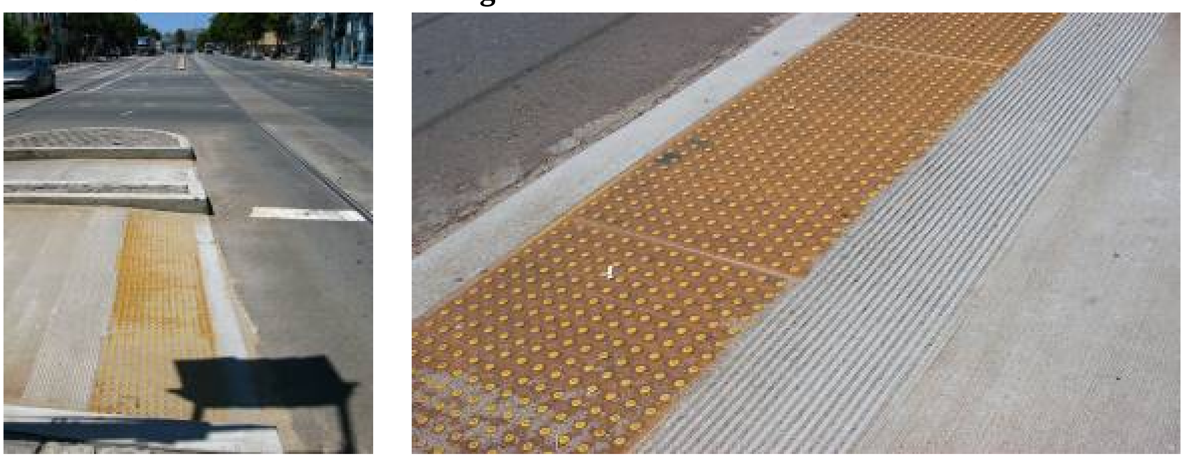


As shown in **Exhibit 1**, the SF Muni system is extensive. The study team concentrated on the most portions of the alignment that were most relevant to TCRP Project A-30.

The T-line, Muni's newest extension, is largely median running semi-exclusive with some pockets of non-exclusive. The M line provides service to SF State University, and also has a semi-exclusive median running alignment. The L line is one of the older portions of the system, surfacing at West Portal and running west to SF Zoo. The N line is a combination of alignments, running in mixed traffic through much of the alignment. In some cases, the line has a dedicated street with sidewalks.

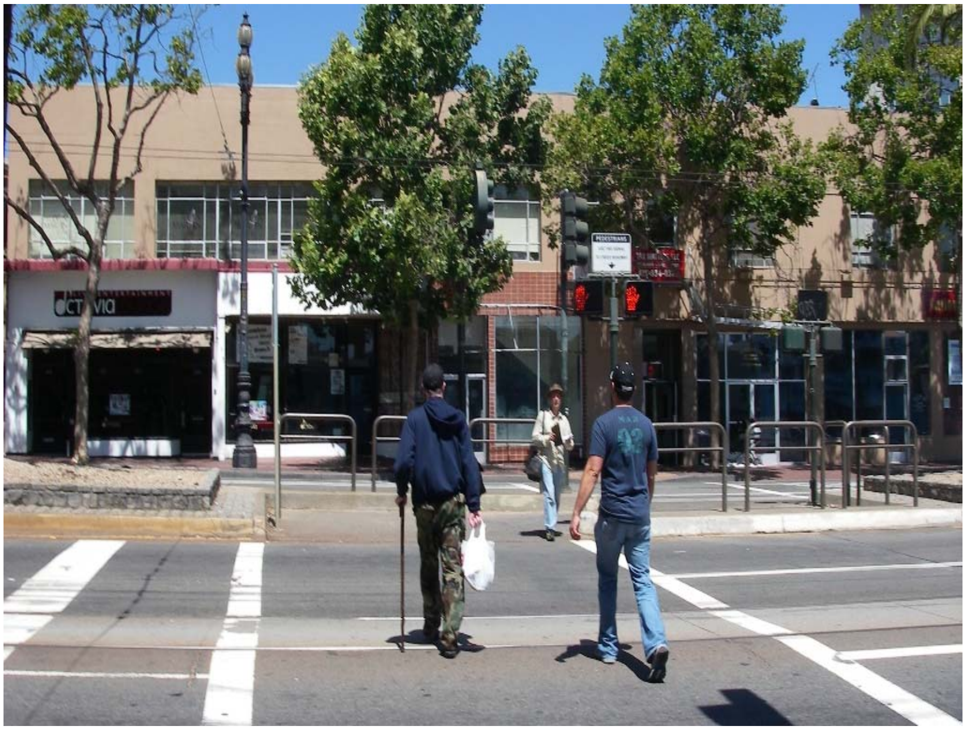
The streetcar portion of the alignment (the J line) has some interesting pavement markings that were not seen in any other city on the site visits. As streetcars are normally treated like buses, and have slower speeds and more frequent stops than typical LRT operations, the LRT applicability of treatments used for streetcar alignments is limited, but some specific markings and tactile treatments are worth noting. **Exhibit 2** shows the median treatment on a portion of the streetcar alignment. This treatment was also seen at pedestrian crossings on the LRT lines, on station platforms, and at crosswalks at a number of locations throughout San Francisco. The yellow tactile strip is not exclusive to the LRT/streetcar dynamic envelope; it seems to be used as a warning for all types of crossings and danger zones.

Exhibit 2: Median on Streetcar Alignment



The streetcar is a Type c.1 alignment and runs in the normal traffic lanes. Vehicles must cross over the tracks to turn left. Passengers board from the median or platforms on each side of the road. Crossings have two pedestrian signals on each side of the road, as shown in **Exhibit 3.**

Exhibit 3: Mid-block Crossing on Streetcar Line



In many locations along the streetcar line, passenger vehicles cross over the streetcar alignment. In some cases, the cross-over lanes are limited to buses and taxis, but in other locations they are general purpose lanes. Painted arrows, lane markings, and text indicate the land that vehicles should use. **Exhibit 4** shows a location where the streetcar track transitions from general purpose to streetcar, bus, and taxi only. At some locations along the streetcar alignment, pole mounted delineators are also used to separate traffic lanes from shared streetcar/traffic or streetcar/bus/taxi lanes. These types of delineators are shown in **Exhibit 5**. **Exhibit 5** also shows possible maintenance issues with pole mounted delineators as drivers clearly do not always stay within their lane.

Exhibit 4: Pavement Markings on Streetcar Alignment

Exhibit 5: Pole Mounted Delineators on Streetcar Alignment

Exhibit 6 shows an intersection alignment that is used in several places throughout the streetcar system. The streetcar is running in a Type c.1 alignment with shared lanes. Tracks are separated by a wide median with a pedestrian refuge. Vehicles may be operating in the same lane as the streetcar tracks, or to the right of this lane. To turn left, drivers must make a normal lane change, crossing over and to the left of one set of tracks. This is the same maneuver that is made on a roadway without a streetcar, and drivers should be accustomed to shoulder checking left in order to enter the left lane. After crossing into the turn lane, the drivers are out of the streetcar lane. Drivers then make a normal turning maneuver over the opposing tracks and lanes. This separates the two track crossings and simplifies the maneuver, making it very similar to an ordinary left turn that is not over streetcar tracks.

Exhibit 6: Left Turn over Tracks, from between Streetcar Tracks

On the streetcar alignment, the effectiveness of most of the safety treatments depends on LRT and vehicle operator training, and responsiveness to pavement markings and road signs. There is often nothing separating the streetcars from normal traffic operations. **Exhibit 7** is an example of a location where right turning vehicles must cross the streetcar alignment. Drivers must stay out of the tracks as the train approaches. The traffic signals are pre-timed with a separate phase for the streetcar.

Exhibit 8 shows the streetcar turning across the vehicle lanes. This intersection is also controlled by pre-timed signals, with the streetcar having its own phase.

Exhibit 7: Vehicle Lane Crossing Streetcar Alignment

Exhibit 8: Streetcar Alignment turning across Vehicle Lanes, showing Textured Pavement following the Track to Delineate the Dynamic Envelope, and KEEP CLEAR Painted on the Lane

Three of the LRT lines leave the exclusive tunnel alignment at West Portal. The semi-exclusive and non-exclusive portions of these alignments begin their southern alignments at this point. At West Portal, pedestrians, vehicles, and LRT all interface at the opening of a tunnel, with the tunnel forming a fourth leg to the T-intersection of three streets. The street traffic is controlled only by stop signs, but activity seems to be fairly slow and careful, and does not appear as chaotic as might be imagined.

There have been some instances where drivers have entered the tunnel, occasionally traveling a significant distance underground. Leaving the tunnel, the LRT trains operate like streetcars in a Type c.1 alignment. The intersection provides transit signals to coordinate LRV movements for the three directions (tunnel and two of the street legs), and Muni staff are usually present to direct traffic when necessary in peak periods. (Dedicated parking for Muni vehicles is marked to the right at the tunnel entrance.) **Exhibit 9** and **Exhibit 10** show the configuration of the West Portal entrance.

Exhibit 9: West Portal

Exhibit 10: West Portal

On some sections of the LRT alignment, San Francisco has used special texturized pavement to indicate lanes that are reserved for LRT. Two examples of this pavement are shown in **Exhibit 11**. Both alignment sections are Type b.2 with wide medians and curbs separating the LRT tracks from other vehicle lanes.

Exhibit 11: Pavement Texturing Between Tracks

San Francisco, like the other sites visited, experiences some problems with crowds around the stadium stops before and after games. The tracks around the stadium are largely Type b.2 semi-exclusive with either permanent or temporary fencing. **Exhibit 12** shows the type of permanent fencing that separates pedestrians and vehicles from the tracks around the stadium.

The project team had the chance to see the crowd control measures implemented by SF Muni before a game. These measures are shown in **Exhibit 13**. SF Muni staff block the tracks as the train passes. Staff allow the crowds to cross when it is safe, with the use of fabric caution tape devices of the type often seen in bank queues. SF Muni staff also installed additional temporary steel barriers in locations where the permanent barriers did not provide adequate coverage.

Exhibit 12: Fencing at Stadium

Exhibit 13: Crowd control around Stadium

Exhibit 14: Intersection on Semi-Exclusive Alignment

SF Muni uses blank-out train signs along the alignment, both for pedestrians and for vehicles. For vehicles, the signs reinforce the stop lights or red arrows. SF Muni staff informed the study team that the signs for pedestrians are intended to act as second train coming signs, but said that the signs' operation was inconsistent and unpredictable.

Exhibit 15 shows two vehicle-oriented train coming signs, installed on mast arms next to standard vehicle signals. **Exhibit 16** shows pedestrian Train Coming signs. All but one of the pedestrian blank-out Second Train Coming signs observed were white. The exception was white on a red background (partially failed) as shown. The signs were lit in conjunction with the "Do not cross" pedestrian signal on some, but not all, signal cycles.

Exhibit 15: Train Coming Sign

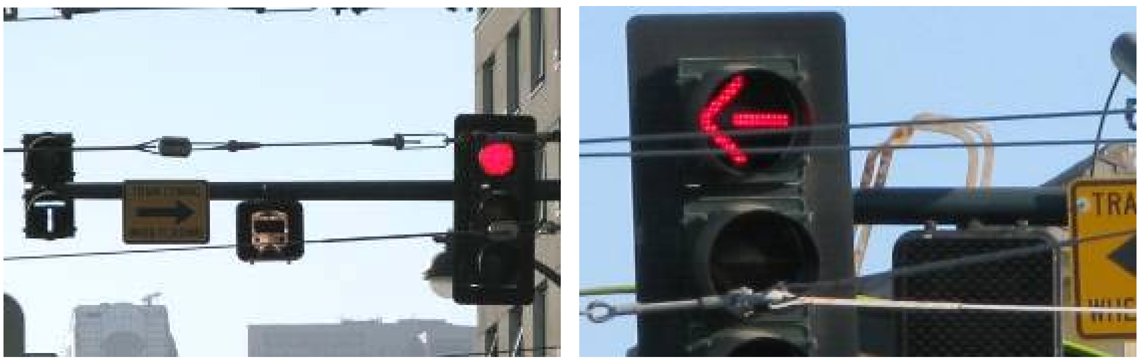


Exhibit 16: Second Train Coming Signs

Because the Muni system has been built over a number of years, it includes a number of different signal types, placements and signing strategies. Red and white transit signals, shown as "T"s, are used at many locations through San Francisco. The red signals inform operators that it is not safe to proceed, while the white signals inform operators that it is safe to proceed. Crosses ("X") were also observed in some locations, and white bars were observed in others. **Exhibit 17** shows the range of signal types observed in San Francisco.

A Muni staff member noted that SF Muni has been installing train signals for over 60 years, and many of the signals have not been upgraded. The California MUTCD indicates that white bar signals, without triangles, should be used for LRT signals.

Exhibit 17: LRT Signal types

The T line is largely Type b.2 semi-exclusive with some portions of Type c.2 shared alignments. Throughout the T line, small white bumpers have been installed as a tactile warning to drivers that they are driving on the LRT tracks. These bumpers, the “T” signals, and the curb separation from vehicle lanes are shown in the two photos in **Exhibit 18**. Muni staff reported that the bumpers seem to be effective. The bumpers give a clear visual and tactile warning, but there are some maintenance concerns because they are easily destroyed.

Exhibit 18: T-Signals on Type b.2 Semi-Exclusive Alignment

SF Muni uses a second type of bumpers beside stations on Type c.1 portions of the alignment.

These bumps, shown in **Exhibit 19**, are yellow, and they are smaller and rounder than the white bumpers shown in **Exhibit 18**. The yellow bumpers seemed to be restricted to the pavement directly beside station access points.

Exhibit 19: Yellow Warning "Bumps"

At some points along the T line, the alignment transitions to type c.1, and the LRT operates in shared lanes. **Exhibit 20** shows this type of alignment, and shows that the intersection's alignment and signage are very similar to those of a typical intersection. In the picture on the left, turns are restricted for vehicles approaching the camera. The photo on the right shows the turn restriction signage. Vehicles approaching the camera in the picture on the right have a left turn arrangement that is similar to that of portions of the streetcar line described earlier. The series of photos in **Exhibit 21** shows the signage and process for these left turns over the track.

In the first photo of **Exhibit 21**, a vehicle is in the left turn lane, waiting to turn left. This vehicle has already lane changed off of the tracks and is shown left of the LRT tracks. To make a left turn, only the opposing train and vehicles are conflicting. The second photo shows an LRV about to proceed through the intersection in the lane to the right of the turning car.

Exhibit 20: Type c.1 Alignment on T line

Exhibit 21: Left Turns on Type c.1 Alignment

As shown in **Exhibit 22**, the intersection is also equipped with a blank-out train sign. The sign shown is lit, but no train can be seen, and left turns are permitted. The sign may indicate that a train is approaching from behind. For this type of alignment, it may be more beneficial to use the blank-out sign to indicate when a train is approaching in the opposing traffic lanes, and when left turns are prohibited.

Exhibit 22: Left Turn with Blank-out Sign

Like the streetcar alignment, the T-line has tactile yellow striping between pedestrian refuge areas and the tracks. This is shown in **Exhibit 23. Exhibit 23** also shows a "Wait here for Pedestrian Signal" sign that is used throughout the T-line. These waiting areas also feature pedestrian push buttons.

Exhibit 23: Pedestrian Crossing Treatment

As discussed, San Francisco has a mix of signal types. The city also has a mix of signage. Some of the signage is standard to the California version of the MUTCD, and some signage is non-standard. **Exhibit 24** shows a standard “Do Not Drive on Tracks” sign combined with a non-standard variation of the Do Not Drive on Tracks sign. **Exhibit 24** also shows an installation of brick paving in the LRT/streetcar only lane.

Exhibit 24: Do Not Drive on Tracks with Non-standard Lower Sign

The M line, which runs south to SF State, is median running Type b.2 semi exclusive. A sample of the alignment is shown in **Exhibit 25**. The line runs down the median of a busy arterial roadway and is separated from the vehicle lanes by curbs. Some of the alignment also has intertrack fencing. In this area, the roadway and LRT line divide the University campus from a residential area, and there may be students who attempt to cross the tracks. The study team noted that in one location, the intertrack fencing was discontinuous to allow for the tracks to cross (in order to allow reverse running). This location, shown in **Exhibit 26**, is unfortunately also aligned with a stairway accessing the residential community on the other side of the roadway. The study team speculated that there may be more pedestrian crossings in this location because of the alignment of the stairway and the break in the fencing.

Exhibit 25: M line - Median Running Type b.2 Semi-exclusive

Exhibit 26: Break in Intertrack Fencing Opposite Community Access

1.2 Agency Meetings

The study team met with three members of the SF Muni Safety and Training department. Michael Kirchanski of SF Muni provided a brief history of the system and outlined some of the problem locations. Because the size of the system, San Francisco has many different types of alignments, ranging from the exclusive 'subway' (for LRVs) line to streetcars. Many of the problem locations listed are at the interface between different modes and different alignment types. These areas seem to create confusion for drivers.

Marie-Ellen O'Brien provided information about data collection for Transit Safe. The operator's report is made immediately after the accident. The accident is then entered into the system. All collisions are entered into SF Muni's 'Transit Safe' data management system by one of three trained staff. The system can be queried by vehicle type, time of day, type of collision, or any other field within Transit Safe. As collision records are tied to Human Resources (drivers), one problem with the system is that collisions become difficult to track after the driver leaves the organization.

In some cases, the City and SF Muni receive a claim that does not have a matching incident report. These incidents are investigated by the City attorney, and are entered into Transit Safe by SF Muni staff as "blind claims." A committee meets bi-weekly to review these claims, to determine whether the claims are likely to be legitimate, and to decide whether the operator should have known of the incident. These "blind claims" are entered into the system and become part of the collision record.

SF Muni also tracks customer complaints. SF Muni staff pointed out that customer complaints can be an excellent source of safety information. If a driver has an incident, SF Muni checks customer complaints to see whether there was a history. This information is not currently used to its fullest potential.

Incidents must be classified carefully because Muni has three different reporting standards: internal reporting; California Public Utilities Commission (CPUC) (the California SSO) reporting; and National Transit Database (NTD) reportable collisions. Transit Safe allows SF Muni staff to check and separate different types of reportable incidents. SF Muni has safety analysts who fill out a form that generates the NTD report. The agency has also hired retired police to train six street inspectors to give more detail in their collision reporting. The reports and the safety analysts' reports identify causes that are used to develop corrective action plans. SF Muni tracks corrective actions to ensure that they are put into place. CPUC also requires that corrective actions be recommended and implemented.

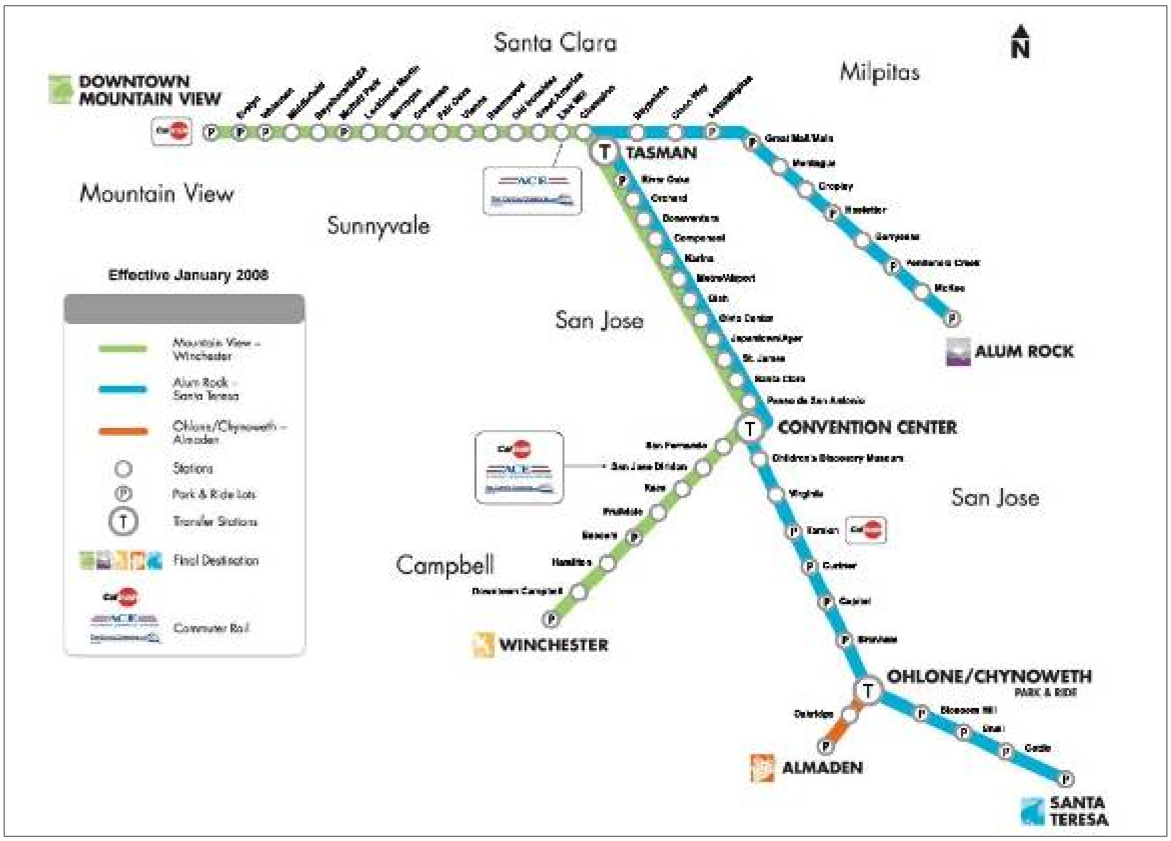
SF Muni has a large number of collisions each year. Their total number of reportable collisions has increased significantly since the change in NTD reporting rules that made all collisions at grade crossings reportable. Because a high proportion of the Muni system is Type c, a large number of collisions can be considered to be at grade crossings, and are therefore reportable. More SF Muni collisions take place on the streetcar (F line) than any other line, but few of these collisions are reportable.

2. SANTA CLARA COUNTY SITE VISIT

Panelist José Farrán contacted Brandi Childress of Santa Clara Valley Transportation Authority (SCVTA) to request permission for the team to visit the LRT system in Santa Clara County. Ms. Childress arranged to have transportation supervisor Paul Loose accompany the iTRANS team and Mr. Farrán on the visit. Mr. Loose provided key insights on the safety and operations of the system.

SCVTA's light rail system has two lines and serves seven municipalities in Santa Clara County. The original system was opened in 1987, and the newest section was added in 2005. The system is shown in
Exhibit 27.

Exhibit 27: Santa Clara Valley Transportation Authority (SCVTA) Light Rail Map



One of SCVTA's most complex pedestrian crossing environments is at the Downtown Mountain View terminus station where SCVTA's Mountain View-Winchester, CalTrain, and a number of bus routes operate. Riders accessing the LRT line must first cross the commuter rail tracks. The commuter rail track crossing is controlled by a pedestrian gate/swing gate combination, as shown in **Exhibit 28.**

Exhibit 28: Combination Pedestrian Gates and Swing Gates

Access across the LRT tracks is controlled by swing gates which are designed to make pedestrians pause and open the gates before walking across the tracks. The gates are intended to increase the level of pedestrian attention. The gates at the Mountain View station, shown in **Exhibit 29**, were no longer operating as originally intended. The springs have aged, and the gates do not automatically close. Other safety treatments at the Mountain View crossing include a "Look Both Ways" sign with static second train symbol, and standard flashing light signals on both sides of the tracks. There is also a non-standard "Railroad Crossing" warning sign mounted to the flashing light pole.

Exhibit 29: Pedestrian Swing Gates

At the station, the study team noticed that pedestrians transferring from CalTrain to the LRT were moving directly from the commuter rail platform to the crossing without passing the gate. This is shown in **Exhibit 30**. This pedestrian behavior is an example of pedestrians taking the easiest path, despite warnings or increased risk.

Exhibit 30: Contradictory Messages for Pedestrians – A Ramp is Provided for the Route that People Should Not Use

SCVTA had a test site for the installation of a high speed vehicle gate designed to stop vehicles moving at high speeds. The gate installation site is shown in **Exhibit 31.** The gate arms have been removed, and a new, traditional two quadrant gate has been installed. The gate arms were removed because they were difficult to maintain as they were not designed to be raised and lowered as frequently as necessary for LRT operations.

Exhibit 31: Replacement Gate at High Speed Crossing

Because of the geometry of this location, it would be very easy for pedestrians to enter the LRT alignment. The alignment is marked with non- standard warning signs for pedestrians. The signs are printed in three languages. An example is shown in **Exhibit 32**.

Exhibit 32: No Trespassing Sign

SCVTA also has an at-grade crossing with two quadrant vehicle gates and pedestrian gates. The crossing is near the San Jose Didiron Station in downtown San Jose. As the crossing is close to HP Pavilion, a local stadium, it is subject to crowds of pedestrians after games. The arrangement of the gates is shown in the series of photos in **Exhibit 33**.

Exhibit 33: Two Quadrant Vehicle Gate with Pedestrian Gates

The San Jose Didiron Station includes a busy pedestrian crossing. The station has a medium density residential development directly adjacent to the station with pedestrian crossings to access the LRT platform, the CalTrain station, and SCVTA buses. The crossings are carefully channelized with pedestrian fencing, landscaping, and intertrack fencing guiding pedestrians. The crossings also include pedestrian swing gates. The station is shown in **Exhibit 34** and **Exhibit 35**.

Exhibit 34: Didiron Station with Pedestrian Fencing, Landscaping, and Intertrack Fencing

Exhibit 35: Pedestrian Crossing Measures at Didiron Station

The Convention Center Station in Downtown San Jose also has an interesting pedestrian environment. The station is located mid-block between several important cultural venues. Pedestrian half signals stop traffic to allow pedestrians to cross to the station and to walk between venues, as shown in **Exhibit 36**. These signals are not always used. **Exhibit 37** shows a worn path through the landscaping in another location. The tracks are enclosed in level concrete, making the tracks on each side of the landscaping appear like a sidewalk rather than an LRT alignment from the viewpoint of pedestrians on the other side of the street. This may encourage pedestrians to walk along the tracks.

Exhibit 36: Pedestrian Half Signal at Conference Center Station

Exhibit 37: Tracks in Level Concrete Pad and Informal Path through Landscaping

Through a portion of downtown San Jose, the two tracks of the LRT line run on opposite sides of a block as a Type c.3 alignment in a pedestrian mall. Operators run at low speeds through this area and use their horns and bells to warn pedestrians to clear the track. **Exhibit 38** shows the LRT operating in this alignment type. This area is particularly difficult because of large pedestrian volumes generated by the nearby university campus and local entertainment establishments.

Exhibit 38: Type c.3 Alignment with Pedestrian Mall

Most of the remainder of the SCVTA LRT is median running Type b.3 semi-exclusive with barrier curbs. A sample of this alignment type is shown in **Exhibit 39**. At grade intersections throughout this part of the system are signal controlled with priority for LRT in some locations. Many intersections have blank-out train signs as shown in **Exhibit 40**. The team also noted the presence of the "Trolley" symbol sign. This sign is not in the MUTCD, but was also noted on other site visits. This sign is shown in **Exhibit 41**. **Exhibit 42** shows an unusual non-MUTCD sign at an intersection along the SCVTA alignment.

Exhibit 39: Type b.3 Alignment with Barrier Curbs

Exhibit 40: Median Running Type b.3 Alignment at Crossing

Exhibit 41: Trolley Crossing Sign

Exhibit 42: "Trolley Xing" Sign

SCVTA uses Train Coming and turn prohibition blank-out signs at various locations throughout the system. These signs are posted to increase driver and pedestrian awareness of risk, and to warn against making an illegal movement in the presence of a train. **Exhibit 43** shows a no right turn blank-out sign, and **Exhibit 44** shows a train blank-out sign.

Exhibit 43: No Right Turn Blank-out Sign

Exhibit 44: Train Blank-out Sign

Exhibit 45 shows SCVTA's variation of the standard MUTCD three-lens LRT signal with flashing triangle. The top "STOP" bar is red instead of the standard white. The other signals in **Exhibit 45** are a flashing white triangle to indicate "PREPARE TO STOP" and vertical or 45 degree bar to indicate "GO".

Exhibit 45: SCVTA LRT Signals

Exhibit 46 and **Exhibit 47** provide an example of how the LRT signals, blank-out sign, and vehicle signals operate in conjunction. The photos were taken at the intersection of San Carlos and 2nd Street at the exit from the divided portion of the alignment. The train is turning right into the median of San Carlos from its side running alignment on 2nd Street.

Exhibit 46: Vehicle and LRT signals – Train at Crossing

Exhibit 47: Vehicle and LRT signals (Right: Train leaving, Left: No train)

Appendix E

Review of the Accident Data Collection Process

This Appendix to Chapter 7 describes in detail the existing methods of collecting accident information along LRT alignment.

Data Collection at the Scene of an LRT Accident

This section describes LRT collision reporting, including the process of data collection at the scene of an LRT accident. The discussion is based on the forms collected from LRT agencies participating in the LRT agency survey carried out for this project and interviews from the site visits.

The Purpose of Accident Reporting **s**ection outlines the various purposes of accident reporting and how each one influences the type of information and the way in which it is collected. The Accident Report Format section examines common formats for reporting accident data, and their strengths and weaknesses. The Existing Accident Reporting at LRT Agencies section examines existing accident reporting at LRT Agencies, including the categories and format of the data collected. The Existing Standards of Accident Reporting section examines existing standards of accident reporting.

Purpose of Accident Reporting

Accident reports are a fundamental source of the information required for the assessment of safety treatments in use. However, the categories of information collected are not consistent nationwide, and the relevance of different data types to safety analysis varies. The primary factor influencing the categories of information collected by each transit agency is the purpose of the data collection, though the practicality of collection is also an important component of the design of reporting forms. In addition to safety analysis, accident data are used by transit agencies for diverse purposes such as loss prevention, crime reporting, and meeting the reporting requirements of the SSO and NTD.

The decision to include or omit different categories of data in accident reports is dependant on the intended use of the data. Loss prevention focuses on collecting information used for the determination of cost responsibility for an incident, such as details identifying all persons and vehicles involved and their conditions. Crime reporting focuses on documenting evidence relevant to a criminal investigation, such as descriptions of the accused, the alleged crime, etc. Report forms that seek to fulfill NTD reporting requirements will include information such as precise estimates of damage, the total number of injuries/fatalities, number of persons transported to hospital, etc.

In contrast, the critical information required for safety analysis is the set of circumstances resulting in a collision and a description of the effects. This would include details on the geometry of the collision site; types, features and pre-crash behaviors of the vehicles and/or persons involved; all traffic control and safety devices involved; other environmental features like lighting or weather; and details on the impacts and resulting damages to persons and property. In addition, to estimate collision rates, some measures of the exposure to conflicts are needed, for example the number of vehicles crossing at a level crossing, the number of passengers boarding/alighting at a platform/station, or the number of pedestrians crossing the tracks per unit of time. Information related to assigning legal responsibility or precise dollar estimates of damage are not necessarily relevant for this purpose.

An additional factor in the successful collection of collision data is the completion of provided forms. It is critical to establish the importance of reporting relevant safety information during the reporting stage, in the appropriate form and level of detail, so that all necessary information is gathered soon after the crash occurs. It was often observed in the review of data in Chapter 3 that the level of detail concerning the crash location and safety devices varied from record to record. If this information is not collected regularly at each incident then it cannot be incorporated into the electronic databases for later use in safety analysis.

Accident Report Format

In addition to ensuring that the requisite data is collected, the implications of the format of the accident report data must be considered. Although some methods of data recording may facilitate the process of collecting accident data during the investigation, the format of the data may not be optimal for transfer to an electronic database or for subsequent analysis. In addition, some data reporting formats are more likely to ensure that all of the relevant information is recorded, as the investigator may not be aware of every potential use of the data being collected.

This section reviews some of the common formats observed in accident reporting forms to record data: checkboxes, alphanumeric codes, text fields, and diagrams. The use of attachments and electronic forms in accident reporting will also be examined.

Checkboxes

The use of lists of checkboxes in accident reporting has numerous advantages from the perspective of both the accident investigator and the data analyst. Checkboxes can ensure that only relevant data are collected during the investigation by constraining user responses to those that are useful in subsequent analysis, and they can help to ensure that no relevant information is overlooked during the investigation. The use of checkboxes facilitates the transfer of data into an electronic database because the user does not have to search for the relevant information in a large block of text. It also enforces standard terminology for the feature or condition being reported, and as long as the terms are clear, the checkboxes almost eliminate misclassification in later analysis. A list of checkboxes may, however, constrain the user if the actual conditions of the collision cannot be adequately described by the available options. To avoid this, a list of checkboxes can be supplemented with text fields so the user can report unusual conditions. It is also not feasible to use checkboxes to report all types of data, such as location, contact information, etc. In general, the following conditions tend to favor the use of checkboxes: where the data category is vague or could be easily misinterpreted; where the data category has a limited number of possible/useful responses; and where the data category is of high importance to analysis and will be transferred into an electronic database.

Alphanumeric Codes

Some accident data are commonly recorded using alphanumeric codes. The primary advantages of alphanumeric codes are consolidation of data and ease of transfer into electronic databases. The *Data Element Dictionary for Traffic Record Systems* (ANSI D20), which is discussed in the Existing Standards of Accident Reporting section of this report, has created a standardized method of coding most data obtained from accident reports using alphanumeric codes.

An example of the use of alphanumeric coding in accident reporting is the LACMTA Supervisory Employees' Accident/Incident Investigation Form, which uses a ten digit code to classify each individual involved in an incident. The code provides comprehensive information for each individual, including gender, ethnicity, location at time of incident, whether or not they claimed injury, whether or not they received medical treatment, their disposition at the time of the incident, etc. This code can then be stored in an electronic database with minimal data entry/storage required. The code facilitates statistical analysis of incidents regarding the characteristics of the individuals involved.

The primary drawback of alphanumeric codes is that the data may be difficult to report and decipher if one is unfamiliar with the code. As mentioned in Chapter 3, the LACMTA accident database made extensive use of alphanumeric codes to concisely record important details. The LACMTA report form helps address this by including a legend outlining the code for the investigator to reference when completing the form, but without this legend the data are essentially useless. For a national database the coding systems would need to be standardized, so the use of standardized codes such as those proposed in ANSI D20 could help eliminate this drawback.

Text Fields

The use of text fields is required in all of the accident reporting forms examined for this project because it is not feasible to record many types of data using checkboxes, alphanumeric codes, and diagrams. In hardcopy accident report forms, text fields are the only feasible method of recording information categories such as the location of the incident, contact information of persons/emergency personnel involved, date and time of incident, etc. Text fields are also advantageous for reporting unusual conditions or circumstances that may not otherwise be accounted for in the use of more constrained reporting methods. Finally, statements obtained from/by the investigator can be used for quality control purposes, enabling the analyst to verify information contained in other sections of the accident report. The project team found this especially useful when examining the NTD database, as outlined in Chapter 3.

The disadvantages of text fields include non-uniformity of responses, reporting of unnecessary information, and the omission of critical information. These errors can create difficulties both when the data are entered into an electronic database and during any subsequent analysis of the data. In many cases it is advantageous to replace text fields with checkboxes or alphanumeric codes to create uniformity of responses and to facilitate data entry into electronic databases and analysis of the data. For data categories that are especially important for analysis, it may well be worthwhile to give up the potential flexibility and specificity of text fields to get at least some solid data through more constrained means.

A combination of text and checkbox/codes clearly provides the best result by allowing for cross-checking of results, but users in the field may feel this redundancy is not worthwhile, and the quality of data collection may suffer as a result.

Collision Diagrams

Collision diagrams are an extremely efficient means of communicating certain types of information regarding incidents because the information they contain may require long and detailed text or an inordinate number of checkboxes to convey. They are extremely useful for recording position and location information such as the alignment of vehicles at impact, the point and type of impact, the areas of damage on a vehicle, the location of impacts and damage on the vehicle or person, the location in the city, and the location in the intersection. Collision diagram templates can be prepared electronically for common street and LRT alignments and incorporated into accident report forms.

The goal of collision diagrams is to show the details of *where* the collision occurred. The safety analyst then uses this information to deduce *why* the collision occurred.

The primary drawback of diagrams is their lack of transferability to electronic databases.

Although it can certainly be useful to retain hardcopies or scanned copies of accident report diagrams for reference on a case by case basis, unless the information is categorized and transferred into a data format that can be stored in an electronic database, the data cannot be used in the statistical analysis of large sets of collisions.

Electronic versus Hardcopy Forms

The use of electronic forms in accident reporting is a relatively recent development with many inherent advantages. Of the twelve North American transit agencies examined in the Existing Accident Reporting at LRT Agencies section, Utah TRAX used electronic accident reporting forms. SF MUNI has a limited number of key staff members that process operator incident reports, supervisor reports, incident investigations, and related reporting and compile all data into the final electronic database. This process allows the safety staff to control the quality of data in the database. Electronic forms allow the investigator to use now-common word processing tools such as pull-down menus, expandable text fields, and electronic formatting to enhance the functionality and appearance of the form and improve the transferability to a database. It is worth noting that simply having electronic reports in a database does not ensure they are searchable; the Florida SSO reported that their reports are stored electronically in a database, but data within the reports themselves are not searchable.

The function of pull-down menus is essentially identical to that of checkboxes, with one notable exception. Instead of requiring that the form visibly display each available alternative answer for each question, which can result in a large and cumbersome form, the use of pull-down menus provides the same functionality while requiring a small fraction of the physical space. This advantage is also true for text fields, which can expand to the precise size of the text as entered by the user. Thus the size of the form is optimized for each individual report. In addition, the use of typed text, formatting tools, and spell-checking available in word processing software results in a report that is consistently legible, and subsequent searching for keywords is less likely to be thwarted by misspelled words.

Another key advantage of electronic forms is the ability to store accident reports in a searchable electronic format, as opposed to unsearchable scans of hardcopies, allowing users and analysts to quickly access the information contained in them. Electronic forms also reduce the number of data entry errors by avoiding retyping of information and through the use of automatic spell-check, etc. The transfer of accident report data from the electronic form into the database can be automated so that data on a collision can be made available in at least preliminary form virtually as soon as the report is written. A well-designed database could include tracking information to record the author, subsequent reviewers and approvals or other comments, and dates and times of key milestones such as the report submission, supervisory review, transmission to the SSO, etc.

For electronic forms to be the primary source of accident data, it is desirable that investigators have a laptop while on scene. The report could be entered later from field notes, but the immediacy of the information is lost and cues in the report form cannot lead the investigator to additional data collection once they have left the scene. The investigator could also complete a hardcopy form on the scene, but then the electronic form is just a data entry tool and many of the benefits are lost. In addition, if the accident form includes diagrams, these will have to be completed separately.

Existing Accident Reporting at LRT Agencies

To determine the current state of accident reporting at LRT agencies, the research team reviewed the accident reporting forms currently in use by 11 LRT agencies in the United States and Canada. The accident report forms are located at the end of this Appendix. The results of this review are presented in Chapter 7.

The accident investigation forms reviewed were:

- "CTrain Occurrence Report/Employee Incident/Investigation Report"– Calgary Transit in Calgary, Alberta, Canada
- "ETS LRT Inspector Accident/Incident Report" – City of Edmonton, Alberta, Canada
- "Mata Field Supervisor's Accident Report" – Memphis Area Transit Authority in Memphis, Tennessee
- "Metro Supervisory Employees' Accident/Incident Investigation Form" – Los Angeles County metropolitan Transportation Authority in Los Angeles, California
- "MetroLink Field Investigation Report" – St. Louis Metropolitan Region's Public Transportation System in St. Louis, Missouri
- "Tri-Met Operations Accident/Incident Report" – Tri-County Metropolitan Transportation District of Oregon in Portland, Oregon
- "Southeastern Pennsylvania Transportation Authority Operator's Accident Incident/Supervisor's Accident Incident/Public & Operation Safety Division Incident Report" – Southeastern Pennsylvania Transportation Authority in Philadelphia, Pennsylvania
- "RTD Rail Operations Supervisor's Accident Report"– Regional Transportation District (RTD) in Denver, Colorado
- "VTA Supervisor's Occurrence Report (Light Rail)" – Santa Clara Valley Transportation Authority in San Jose, California
- "TRAX Supervisor's Accident/Incident Report Form" – Utah Transit Authority in Salt Lake City, Utah
- "Safety Form/Supervisor Form/Employee Form" – San Francisco Municipal Transportation Agency
- "TTC Accident Investigation Report" – Toronto Transit Commission in Toronto, Ontario, Canada

Incident versus Accident Report Forms

The purpose and intended use of the accident form is the primary determinant of the categories of information included. In general, the title of the form provides some insight into its intended purpose. Many of the forms classified as “Accident Report” or “Accident Investigation Report” contained only information exclusively pertaining to the collision of a transit vehicle with either another vehicle, pedestrian, or fixed object. In contrast, some of the forms examined classified as “Accident/Incident” reports had a much broader scope, including data fields relevant to criminal activity on transit property, passenger illness, etc. From the perspective of safety analysis, these types of incidents should be completely separate from collision reports. As indicated in Chapter 3, failure to do so often leads to incorrect reporting of incidents, resulting in the need to undertake significant data cleaning before databases can be used for analysis.

Existing Standards of Accident Reporting

The desire to promote uniformity and comparability of accident data across agencies and levels of government has led to the publication of a number of accident reporting guidelines. One such publication is the American National Standard Manual on Classification of Motor Vehicle Traffic Accidents (ANSI D16). The ANSI D16 is divided into two sections. The first section provides standardized definitions for many of the terms used in accident reporting, including examples of specific items that are included and/or excluded in the definition. The second section provides a classification system that is recommended for use in accident reporting. When quantitative values are used in classification (e.g., classification by weight), the ANSI D16 specifies the categories and a range of values for each category.

The purpose of the ANSI D16 manual is to facilitate a common language of accident reporting between agencies, but some issues are not clear. Although the category “railway accident” is included in the manual, the manual is not designed to provide details about railway accidents. A railway accident is defined as a collision between a “road vehicle in transit and a rail vehicle,” where a road vehicle is “any land vehicle other than a railway vehicle”(*1*). Hence even if light rail were considered a “rail vehicle” (LRT systems that are not connected to the general railroad system are not in the jurisdiction of the FRA so this definition is unclear), a light rail accident with a pedestrian would be excluded from this category. In addition, no distinction is made between light rail and heavy rail vehicles, and no classification system by size, weight, or operation is included for rail vehicles. However, the information included in the manual could serve as a basis for accident reporting, with suitable expansion for light rail applications.

The *Data Element Dictionary for Traffic Record Systems* (ANSI D20), published by the American Association of Motor Vehicle Administrators, provides “a common set of coding instructions for data elements related to highway safety, driver licensing, and vehicle registration” (*2*). For each data element, the ANSI D20 gives the definition, source of the definition, source of the (data) element, the length and type of code (i.e., 2 digit numeric), synonyms, and suggested classifications and their associated code value. For example, for the data element “direction of travel before accident,” a code of 1 represents northbound, 2 southbound, etc. Standardized alphanumeric codes could be of great use in accident reporting, especially in electronic databases. Unfortunately, the focus on non-railroad vehicles in the manual precludes its use in light rail accident reporting without the inclusion of data specific to this mode.

The MMUCC Guideline is based on ANSI D16 and ANSI D20. The purpose of the MMUCC is “to provide a dataset for describing crashes of motor vehicles in transport on a roadway that will generate the information necessary to improve highway safety within each state and nationally” (*3*). The MMUCC advocates the voluntary implementation of a minimum core set of data elements to be used in accident reporting. The third edition of the MMUCC was released in 2008.

The MMUCC includes 107 data elements that represent a core set of data elements. Data elements were incorporated into the guideline if they were believed necessary for the purpose of highway decision making and if they were believed comprehensive in their inclusion of all aspects of the issue/problem being described. Each data element incorporated into the guideline includes a definition, a list of attributes (or descriptions), and a rationale for inclusion in accident reporting. The MMUCC does not suggest a particular format or coding system for the data. However, the list of attributes provided for some of the data elements could be useful when developing accident report formats including checkboxes, pull-down menus, and alphanumeric codes.

Although the above publications are valuable references for use in accident reporting, they are focused exclusively on reporting collisions in the highway environment where motor vehicles are the primary vehicle involved. As such, collisions involving rail vehicles are assumed to occur at rail crossings, and specific details regarding the rail vehicle/mode are often overlooked. Since collisions involving light rail vehicles typically occur along the roadway at a rail crossing, there is significant overlap with the information contained in these manuals and the information required for LRT accident reporting. Thus, although these manuals may serve as a useful starting point in the standardization of LRT accident reporting, additional information is required to fully capture the details required in LRT accident reporting.

SSO Agency Data

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) added Section 28 to the Federal Transit Act (FTA). Section 28 of the FTA required the FTA to issue rule 49 CFR Part 659, creating SSO agencies responsible for rail transit safety and security (*4*). These agencies are mandated by the FTA through rule 49 CFR Part 659 to oversee the safety and security of rail transit agencies, review and submit incident data to the FTA, review annual reports, and review safety and security plans. The SSO is directed to investigate incidents that result in a certain damage or severity and develop a corrective action plan, if warranted. All rail transit agencies that receive federal funding are subject to review by an SSO. The SSOs submit annual reports to the FTA electronically that include information about incidents, corrective action plans, and oversight activities. The 2005 revisions to 49 CFR Part 659 require that the SSOs also report on hazard management.

SSOs fill multiple roles. They collect data to forward to the FTA, but their larger role is to oversee accident investigation and to undertake corrective action, while local LRT agencies are more concerned with data collection directly. All SSO agencies interviewed for this study expressed interest in a consistent standard for accident data collection.

All SSOs follow the same basic reporting process following an incident. Transit agencies are required to notify their SSO of an incident over a certain severity threshold within two hours of the incident occurring. The SSO then proceeds with a more formal safety review. The SSO may conduct an investigation directly, or the transit agency may conduct the investigation and then report to the SSO. If warranted, the SSO formulates a corrective action plan. The SSO submits all data to the FTA in an annual report.

Beyond the basic, mandated format outlined above, there are some significant differences in how the data are collected and processed by SSOs across the country. Some SSOs receive hard copies or scanned copies of incidents and annual reports filed by the transit agencies. Other SSOs, such as the Florida SSO, have an advanced document management system that allows reports to be submitted, reviewed, and accepted or declined electronically. Florida’s electronic system allows users to communicate quickly and efficiently, and allows the SSO administrator to track the approval process.

Florida’s system also allows for simple electronic transmittal of all safety documents to the FTA by providing the FTA with direct access to the Florida system. This capability simplifies the submission process and reduces the likelihood of transcription errors. Some agencies store the information from incident reports in searchable databases, but the type of information included in the database ranges from agency to agency, and no agency reported being satisfied with their search capability.

SSOs that have successful data collection programs, with relatively few disagreements with the transit agency/agencies, seem to rely on solid relationships and good communication between the SSO and the transit agencies. Many SSOs who report successful relationships hold regular meetings with the transit agencies and work together to develop corrective action plans. Many SSOs also report that the same agency safety staff have been acting in the same capacity for a long period of time and know how to fill out and submit forms. SSO staff return the forms for clarification or missing data should the need arise.

The data collection and processing practices for most SSOs and LRT agencies appear to have some internal redundancies. The LRT agency usually reports information on one form and submits the information to the SSO and also provides text and photo reports that detail incident investigations and corrective action plans. The SSO then re-enters the data into a format appropriate for submitting to the FTA. Standardized reporting and database software that allows for the easy transfer of data would provide an opportunity to improve efficiency. Florida's document management and submission system provides an example of a file management system allowing for the efficient movement of the text and photo based reporting. For data and research purposes, systems that improve the entering, storage, and transfer of individual data fields would be much more useful.

It is important to note that the function of SSOs is not to collect collision data. SSOs are federally mandated organizations that oversee the safety practices of federally funded light rail agencies. The intention of incident and collision reporting to the SSO is to ensure that the SSO is *aware* of possible safety problems and to involve the SSO in the process of analyzing the cause of the collision and designing and applying corrective actions. The SSO program mandates that agencies have safety and security plans in place. The program is also intended to ensure that a set safety process is followed when new LRT lines are designed or when changes are made to older lines. Different SSOs meet these goals at different levels of involvement and complexity.

The SSO annual reporting form addresses the following subjects:

- Contact information for the SSO and agencies
- Dates and approvals for the annual review of the agency's system safety and security plans, and incident investigations
- Compliance to internal safety review processes
- Compliance to three-year safety review requirements
- List of hazards with their probable causes, corrective action, and CAP status
- Accident reporting:
  - Accident type [collision (non-crossing); collision at crossing; derailments; fire; and other]
  - Crossing type (at-grade, mixed and cross traffic; at-grade, cross traffic only)
  - Crossing level of protection (active, passive, street running protected, street running unprotected)
  - Investigator name and contact information
  - SSO approval confirmation
  - Primary and secondary causes
  - If a corrective action plan has been developed
- List of correction action plans, action taken, approvals, individual responsible, and status.

In addition to submitting the annual report, LRT agencies are expected to submit individual text-based incident and corrective action reports to the SSO for each incident. The SSO then submits these to FTA. Florida's system of document management is especially useful in this case because all documentation, related approvals, and requests for further information or detail are linked and available to FTA electronically. It does not, however, auto-generate forms or allow incident data to be searched by a given parameter. SF Muni's system allows staff to generate data-field based reports of only incidents that are reportable to the CPUC/SSO. It does not, however, manage electronic documents and text- and data-based investigations and reports.

FTA/NTD Data

Transit agencies are required to report all safety and security incidents to the NTD using two forms. The first form is the Safety and Security Monthly Summary Form (S&S-50), which is a monthly summary of the number of safety and security events that resulted in an arrest/citation, but did not meet the criteria of a "reportable incident" (formerly "major incident" prior to 2008). These incidents include fare evasion, trespassing, vandalism, nonviolent civil disturbance, non-aggravated assault, robbery, larceny, burglary, motor vehicle theft, fires, and other safety occurrences not otherwise classified (*5*). It is possible that an accident involving an LRT vehicle that resulted in an arrest/citation but did not meet the reporting requirements of a reportable incident would be included in this report. However, the format of this form is based on the Federal Bureau of Investigation Uniform Crime Reporting Program, which is intended primarily for reporting a summary of criminal activity. As such, it does not provide detailed information regarding incidents, and so is not useful for the purpose of LRT safety analysis.

The second form is the Reportable Incident Report Form (S&S-40). Transit agencies are required to submit reportable incident data using the S&S-40 form. The form must be submitted within 30 days of the incident occurrence. The information reported on the Reportable Incident Report Form is sufficiently detailed to require access to the information collected at the time and location of the incident. One form must be completed and submitted to the NTD for each reportable incident, regardless of the number of individual criteria met. For example, an accident resulting in the derailment and of a LRT vehicle, fire, evacuation and injuries/fatalities would be reported on only one form.

All reports required for submission to the NTD are submitted electronically via the Internet reporting system. The format of the online Reportable Incident Report Form (S&S-40) is designed to be clear and user-friendly, guiding the user through a linear progression of reporting screens that require the user to enter only the information relevant to the specific incident being reported. The determination of what information is relevant to the specific incident is based on the input provided by the user. For example, the first screen provides the user with a list of incident classifications (i.e., collision, derailment, fire, Act of God, etc.) and requires the user to select all of the classifications that apply to the incident being reported. The user also indicates the transit mode and reporting period on this first screen. The second screen requires the user to provide information used to determine the severity of the incident, such as number of fatalities, number of injuries, extent of property damage (>$25,000), whether an evacuation for life safety reasons was required, and whether a transit vehicle was involved in the incident. Based on the information provided on these two screens, the Internet reporting system determines what screens to guide the user through in order to obtain all of the information relevant to the incident being reported.

The Internet reporting system format makes use of tools such as checkboxes and pull-down menus that guide and standardize user inputs and reduce input errors. This standardization of responses facilitates the analysis of data. However, as discussed in Chapter 3, despite the advantages offered by the NTD Internet reporting system, there are still some problems with the quality of data contained in the NTD. The project team needed to conduct significant data cleaning before the NTD data was suitable for use in analysis due to poor data entry.

The FTA produces an annual edition of the NTD *Safety and Security Reporting Manual* which provides detailed instructions on how to use the Internet reporting system. The NTD *Safety and Security Reporting Manual* also provides descriptions of NTD reporting requirements and definition of terms. This publication is an invaluable resource to all individuals either reporting to or obtaining information from the NTD. The NTD also publishes the *Safety & Security Newsletter*, a periodical containing articles that provide summary statistics from data collected, provide additional rationale and guidance for data collection, and answer frequently asked questions.

References

1. American National Standard. *Manual on Classification of Motor Vehicle Traffic Accidents*, 7th ed. ANSI D16 1-2007. National Safety Council, 2007.

2. American Association of Motor Vehicle Administrators. *Data Element Dictionary for Traffic Record Systems*. ANSI D20-2003, 2003.

3, http://www.mmucc.us. Accessed August 28, 2008.

4. http://transitsafety.volpe.dot.gov/Safety/sso/archive/regulation.asp. Accessed March 28, 2007.

5. National Transit Database. *2008 Safety and Security Reporting Manual*. Federal Transit Administration. http://www.ntdprogram.gov/ntdprogram/reference.htm.

Calgary Transit – Incident Report Form

THE CITY OF CALGARY TRANSIT

This Report Filed By:
- ☐ Operator
- ☐ Maintenance
- ☐ Supervisor

REFERENCE NO.
CPS CASE NO.

OCCURRENCE REPORT

TS 2105 (R2006-06)

OFFICE USE ONLY

SERIAL NO. | LICENCE NO. | MAKE | YEAR

THIS REPORT IS CONFIDENTIAL AND IS FOR THE USE OF THE CITY SOLICITOR TO SECURE HIS ADVICE CONCERNING ANTICIPATED LITIGATION AGAINST THE CITY OF CALGARY AND/OR ITS EMPLOYEES FOLLOWING AN ACCIDENT.

The personal information on this form is collected under the authority of Section 32(c) of the Freedom of Information and Protection of Privacy Act. The information will be used for the sole purpose of investigation of this particular incident. If you require further information, please contact Risk Management and Claims at 268-5443.

☐ COLLISION ☐ PASSENGER INJURY ☐ PEDESTRIAN INJURY | OTHER | INVESTIGATED BY ☐ CITY POLICE ☐ TRANSIT SAFETY ☐ SUPERVISOR | REPORTED YYYY MM DD | OCCURRED YYYY MM DD

OPERATOR'S SURNAME | INITIALS | ADDRESS

BADGE NO. | PAYROLL NO. | RESIDENCE PHONE NO. | BIRTH DATE YYYY MM DD | YEARS OF DRIVING | DRIVER'S LICENSE NO. | CLASS

C.T. VEHICLE

ROUTE NO. | KEY NO. | BUS NO./OR | CAR NUMBERS COMMAND | MIDDLE | REAR | EXACT TIME HRS. | APPROX. NO. OF PASS.

☐ STATIONARY ☐ MOVING | DISTANCE FROM OBJ WHEN FIRST SEEN | OUR VEHICLE DIRECTION OF TRAVEL | SPEED km/h | SPEED AT IMPACT km/h | OTHER VEHICLE DIRECTION OF TRAVEL | SPEED km/h

LOCATION OF ACCIDENT | SIGNAL NO.

WEATHER

☐ CLEAR ☐ CLOUDY ☐ FOG ☐ LIGHT RAIN ☐ HEAVY RAIN ☐ LIGHT SNOW ☐ HEAVY SNOW ☐ FREEZING SLEET ☐ THAWING SLEET

LIGHT CONDITIONS ☐ DAYLIGHT ☐ DUSK ☐ DAWN ☐ DARK ☐ GLARE ☐ NO GLARE ☐ VISOR UP ☐ VISOR DOWN

RAIL AND OR ROAD SURFACE CONDITION ☐ DRY ☐ WET ☐ MUDDY ☐ SNOWY ☐ ICE ☐ FROST ☐ LEAVES ☐ GREASY

LIGHTS OUR VEHICLE ☐ HEAD ☐ SIGNAL | OTHER VEHICLE ☐ HEAD ☐ SIGNAL

WARNING GIVEN ☐ HORN/BELL SOUNDED ☐ MECHANICAL SIGNAL ☐ FLAGGING ☐ STOPLIGHTS

PERSONAL INJURY

☐ PASSENGER INJURY ☐ PEDESTRIAN INJURY

NAME	ADDRESS	PHONE NO.

PASSENGER INJURY ☐ AT DOORS ☐ ON BOARD | STEP CONDITION ☐ GOOD ☐ DEFECTIVE ☐ DRY ☐ WET ☐ ICE ☐ SLUSH ☐ SNOW | FOOTWEAR - DESCRIBE

PEDESTRIAN INJURY ☐ WALKING ☐ RUNNING ☐ STANDING | FROM ☐ CROSSWALK ☐ RIGHT ☐ LEFT ☐ OBSTRUCTED VIEW

OTHER VEHICLE

OTHER DRIVER | ADDRESS | PHONE NO.

OWNER'S NAME | ADDRESS | PHONE NO.

INSURING COMPANY | AGENT | POLICY NO. | EXPIRY DATE YYYY MM DD

YEAR | MAKE | BODY STYLE | COLOUR | LICENSE NO. | V.I.N. NO.

DAMAGE

PROPERTY DAMAGE

DESCRIBE PROPERTY

LOCATION OR ADDRESS OF PROPERTY | DESCRIBE DAMAGE TO PROPERTY

OWNER'S NAME | RES. PHONE NO. | BUS. PHONE NO.

OWNER'S ADDRESS | ESTIMATED REPAIR COST

WITNESSES

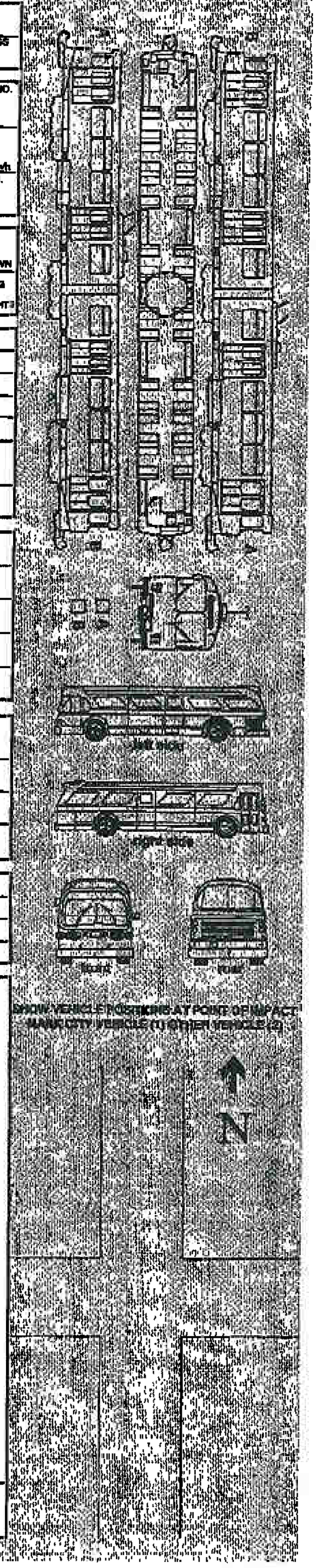
NAME	ADDRESS	PHONE NO.

GIVE FULL AND DETAILED STATEMENT - DEAL WITH FACTS ONLY

SIGNATURE

ATTACH ADDITIONAL SHEETS IF NECESSARY

CAREFULLY CIRCLE THE EXACT LOCATION OF DAMAGE TO THE C.T. VEHICLE



DISTRIBUTION: WHITE - SAFETY SECTION / CLAIMS CANARY - SAFETY SECTION

THE CITY OF CALGARY

EMPLOYEE INCIDENT / INVESTIGATION REPORT

X 75 (R2005-08)

FOR OFFICE USE ONLY

13a. Incident Number	13b. Claim Number
13c. Related Incident Number	
13d. WCB Claim Number	
13e. WCB Report Date YYYY MM DD	13f. Return To Work Date YYYY MM DD

EMPLOYEE:

- **PLEASE PRINT ALL INFORMATION ON THE FRONT PAGE.**
- **IMMEDIATELY FORWARD TO YOUR SUPERVISOR FOR ROUTING/INVESTIGATION.**

1. Incident Type

☐ **Near Miss - Complete Sections 2c - 5 Only** ☐ Untreated ☐ Exposure ☐ Injury (includes First Aid)

2a. Employee (Payroll) ID | **2b.** Last Name | First Name | Middle Initial

2c. Business Unit | Division | Section

2d. Occupation at the Time of the Incident

3a. Incident Date YYYY MM DD | **3b.** Incident Time : ☐ AM ☐ PM | **3c.** Is This an Aggravation or Recurrence of a Previous Injury? ☐ Yes - Date: ☐ No

3d. Date Incident Was Reported YYYY MM DD | **3e.** Time Incident Was Reported : ☐ AM ☐ PM | **3f.** Incident Reported To

Name of Immediate Supervisor (if different from answer to question 3f - the person that you reported this incident to)

4. What Were You Doing? How Did the Incident Happen? (attach diagram or photos, if necessary)

☐ Additional documentation is attached

5a. Did This Incident Occur on City Premises? ☐ Yes ☐ No | **5b.** Address or Location Where Incident Occurred

6. Names of Witnesses To This Incident

Witness 1: Phone ☐ Employee ☐ Non-Employee | Witness 2: Phone ☐ Employee ☐ Non-Employee

7. Did You Receive First Aid Treatment at the Site? ☐ Yes ☐ No | **8.** Did You Go to an Occupational Injury Service (OIS)? ☐ Yes - specify where:________ ☐ No

9. Did You Use an Ambulance for Transport? ☐ Yes ☐ No | **10.** Was Medical, Psychological, Physiotherapy, Dental, Chiropractic or Other Treatment Received? ☐ Yes ☐ No

11a. Scheduled Hours of Work FROM: : ☐AM ☐PM TO: : ☐AM ☐PM | Time On Shift hrs. | **11b.** Will You Be Off Work Longer Than the Remainder of the Shift? ☐ Yes ☐ No | **11c.** Date of First Full Regular Shift Missed YYYY MM DD

IF MORE THAN ONE BODY PART OR INJURY TYPE, INDICATE 1, 2, 3 IN ORDER OF SEVERITY

12a. BODY PART AFFECTED (Select / Circle Left or Right)

HEAD
- C ☐ Ear L / R
- F ☐ Face excludes eye
- LL ☐ Head
- I ☐ Jaw
- D ☐ Mouth / teeth
- H ☐ Nose
- A ☐ Scalp
- G ☐ Skull

EYE
- B ☐ Eye L / R

NECK
- E ☐ Neck including throat

SHOULDERS AND ARMS
- K ☐ Arm, upper L / R
- L ☐ Elbow L / R
- M ☐ Forearm L / R
- J ☐ Shoulder L / R

TRUNK
- T ☐ Abdomen (stomach) L / R
- MM ☐ Back, lower L / R
- Q ☐ Back, upper L / R
- R ☐ Buttocks L / R
- S ☐ Chest L / R
- U ☐ Groin

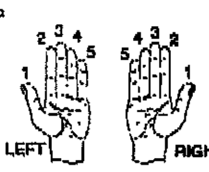
HIPS AND LEGS
- V ☐ Hip L / R
- Y ☐ Knee L / R
- X ☐ Leg L / R
- Z ☐ Shin L / R
- W ☐ Thigh L / R

BODY SYSTEM
- JJ ☐ Circulatory
- HH ☐ Digestive tract
- NN ☐ Psychological
- DD ☐ Respiratory
- EE ☐ Skin

MISCELLANEOUS
- GG ☐ None
- FF ☐ Other - list: ____________

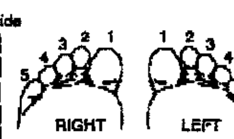
HANDS AND FINGERS
- O ☐ Hand L / R
- N ☐ Wrist L / R
- P ☐ Fingers / Thumb

Left Side ☐1 ☐2 ☐3 ☐4 ☐5 — Right Side 1☐ 2☐ 3☐ 4☐ 5☐



FEET AND TOES
- AA ☐ Ankle L / R
- BB ☐ Feet L / R
- CC ☐ Toes L / R

Right Side 1☐ 2☐ 3☐ 4☐ 5☐ — Left Side ☐1 ☐2 ☐3 ☐4 ☐5



12b. NATURE OF INJURY

- A ☐ Amputation (severing of bone)
- M ☐ Asphyxia and other threats to breathing and/or aggravation to respiratory system
- 003 ☐ Bites
- D ☐ Bruise (closed wound)
- B ☐ Chemical burn or corrosion
- C ☐ Concussion - cranial injury
- V ☐ Dislocation
- 002 ☐ Drowning
- 004 ☐ Electrical injury
- 008 ☐ Fatality
- H ☐ Fracture and/or crushing injury
- P ☐ Hearing loss (including traumatic and progressive)
- 007 ☐ Injury of unspecified nature
- 001 ☐ Injury to internal organ
- 005 ☐ Multiple injuries or more than one nature
- W ☐ Not yet diagnosed
- U ☐ Non-personal (personal glasses, etc.)
- E ☐ Open wound (including cuts and punctures)
- S ☐ Poisoning or toxic effect (excluding bites, inhalation)
- 009 ☐ Psychological, post traumatic stress & anxiety disorders, etc.
- 006 ☐ Skin - other (rash, etc.)
- J ☐ Sprain, strain, or tears
- O ☐ Thermal injury (frostbite, heat)
- Y ☐ Vision

The information you are providing to The City of Calgary is collected under the authority of the Freedom of Information and Protection of Privacy Act, Section 33(c) and the Occupational Health and Safety Act, Sections 18 & 19 and the Workers' Compensation Act, Sections 32 & 33. The information will be used for the purpose of administrating The City of Calgary's incident reporting, investigation and recording program. If you require further information regarding the collection or use of this information, please contact The City of Calgary, Human Resources HSW FOIP Administrator at (403) 268-6710.

Employee Signature | Date YYYY MM DD | or | Form Completed By | Date YYYY MM DD

SUPERVISOR / INVESTIGATOR TO COMPLETE NEXT PAGE

X 75 (R2005-08) B

THIS SIDE TO BE COMPLETED BY SUPERVISOR / INVESTIGATOR AND FORWARDED PER PROCEDURE.
(For a Near Miss, start at 14c Contributing Action and work down.)

14a. SOURCE OF INCIDENT

ENVIRONMENTAL CONDITIONS
010 ☐ Confined space
E ☐ Explosions (explosives, boilers, etc.)
013 ☐ Exposure to traumatic experience (violence, etc.)
T ☐ Fire, flame, smoke (not tobacco) or other heat sources
014 ☐ Human - acts of violence
016 ☐ Human - physical / training
015 ☐ Hyperbaric - high pressure (underwater, etc.)
009 ☐ Indoor environmental factors - not identified (temperature, lighting, etc.)
U ☐ Weather (ice, rain, heat, etc.)
012 ☐ Workplace organizational factors (procedures, scheduling, etc.)
011 ☐ Workplace psycho-social factors (conflict, harassment, etc.)

BUILDING OR WORKING AREA
B ☐ Buildings, structures, stairs
001 ☐ Equipment layout (ergonomic - industrial)
023 ☐ Equipment layout (ergonomic - office)
F ☐ Furniture and fixtures
W ☐ Ladders or other climbing apparatus
O ☐ Working / walking surface

MATERIAL HANDLING EQUIPMENT
I ☐ Hoisting apparatus and conveyors
002 ☐ Material handling mobile equipment (earthmoving, forklift, etc.)

OBJECTS, ANIMATE
Q ☐ Animals (includes insects, birds and reptiles)
008 ☐ Bacteria, virus (not human) (sewage, etc.)
006 ☐ Communicable disease (Hep B, TB, etc.) & body fluid (including blood) level I & II
007 ☐ Communicable disease (Hep B, TB, etc.) & body fluid (including blood) level III
S ☐ Drugs, medicines, alcohol
X ☐ Plants, minerals, vegetables

OBJECTS, INANIMATE
A ☐ Boxes, barrels, containers
K ☐ Materials (metal, wood, glass, etc.)
005 ☐ Medical and specialized equipment
004 ☐ Needle

CHEMICAL, PLASTICS, ETC.
C ☐ Chemicals, corrosive or toxic

DUST, MIST, VAPOUR
003 ☐ Dust, mist, vapours, fibres

MACHINE OR TOOL
D ☐ Energized electrical equipment
G ☐ Industrial hand tools, non-powered
H ☐ Industrial hand tools, powered
017 ☐ Input devices (computer keyboard)
J ☐ Machines (mechanical tools, production machines)
L ☐ Mechanical power transmission
M ☐ Pumps and prime movers
P ☐ Pressure equipment - air & fluid

PERSONAL PROTECTIVE EQUIPMENT
018 ☐ PPE (including clothing, equipment, etc.)

VEHICLE
020 ☐ Vehicle - City bus
019 ☐ Vehicle - City car
022 ☐ Vehicle - City LRT
021 ☐ Vehicle - City other
N ☐ Vehicle - non-City (private, contractor)

UNCLASSIFIED OR UNKNOWN
Z ☐ Unknown or no source of injury

14b. ACCIDENT TYPE

BODY STRESSING
004 ☐ Body position / posture
007 ☐ Contact pressure
005 ☐ High force / heavy load
I ☐ Repetitive movement (repeat action)
006 ☐ Vibration

CAUGHT OR STRUCK
B ☐ Caught in, on, under or between
L ☐ Struck against
M ☐ Struck by

CONTACT
002 ☐ Contact / exposure to biological factors (body fluid, bacteria, plant, etc.)
D ☐ Contact / exposure to chemical / particulate
C ☐ Contact / exposure to electrical or radiation
003 ☐ Contact / exposure to sound & pressure
E ☐ Contact / exposure to thermal extremes
009 ☐ Contact with person
K ☐ Rubbed or abraded by or against

PUNCTURE
001 ☐ Punctured, stung, bitten

FALL, TRIPS AND SLIPS
F ☐ Fall from elevated position
G ☐ Fall on same level
Q ☐ Slipped or tripped

MENTAL STRESS
008 ☐ Exposure to mental stress factors

OTHER
R ☐ Unknown or no accident type

14c. CONTRIBUTING ACTION

J ☐ Footings and surroundings
F ☐ Handling, storage and loading of materials or equipment
M ☐ Horseplay
D ☐ Improper use of equipment
O ☐ Inadequate communication
H ☐ Isolation / lockout / deactivation not used
K ☐ Making safety devices inoperative
R ☐ No contributing action
S ☐ Other: ____________
A ☐ Not secured adequately
B ☐ Operating at unsafe speed
L ☐ Operating without authority
I ☐ Personal protective equipment not used
P ☐ Physical lifting and handling
E ☐ Placement of hands, feet or body
C ☐ Using unsafe equipment
N ☐ Vehicle or equipment operation
Q ☐ Work under the influence of drugs / alcohol
G ☐ Working on moving or dangerous equipment

14d. CONTRIBUTING CONDITIONS / MATERIALS

F ☐ Assignment of personnel
M ☐ Congested or restricted access
B ☐ Defective tools / equipment / material
H ☐ Environmental hazard (ventilation, light, space, etc.)
P ☐ Exposure - temperature extremes
I ☐ Hazard of outdoor working conditions
E ☐ Hazardous method or procedure
D ☐ Improper piled / placed, insecure
K ☐ Inadequate maintenance
N ☐ Inadequate signage and/or markings
L ☐ Inadequate / improper protective equipment
A ☐ Inadequately guarded
Q ☐ No contributing conditions involved
O ☐ Noise exposure
R ☐ Other: ____________
J ☐ Poor housekeeping
G ☐ Unsafe clothing
C ☐ Unsafe design / construction / assembly

14e. ORGANIZATIONAL FACTORS

H ☐ Scheduling
B ☐ Engineering
C ☐ Maintenance
D ☐ Purchasing
A ☐ Supervision
E ☐ Tools / equipment
I ☐ Training / capability
F ☐ Work standards
J ☐ No organizational factors

15. Is There Any Additional Information to Section 4 (on reverse)? Explain the Underlying Causes of the Incident (Inadequate work standards, etc.)

____

____

____

____

____

☐ Additional documentation is attached

16. RECOMMENDED ACTIONS	ASSIGNED TO	TARGET COMPLETION DATE YYYY MM DD

Supervisor / Investigator's Name	Employee ID	Signature	Date YYYY MM DD

REVIEW

Comments

Name & Signature	Employee ID	Position	Date YYYY MM DD

Comments

Name & Signature	Employee ID	Position	Date YYYY MM DD

Comments

Name & Signature	Employee ID	Position	Date YYYY MM DD

☐ COPY / FEEDBACK PROVIDED TO EMPLOYEE	By (Supervisor)	Date YYYY MM DD

Denver – Accident Report Form

RTD Rail Operations Supervisor's Accident Report

Supervisor: ______ Employee #: ______ Date: ______
Operator: ______ Employee #: ______ Time: ______ ☐ AM ☐ PM
Bus Number: ______ Other RTD vehicle #2: ______ Time Notified: ______ ☐ AM ☐ PM
Route: ______ Block: ______ Run Number: ______ Arrival Time: ______ ☐ AM ☐ PM
Photos Taken? How Many? AIT on Scene? Time Cleared: ______ ☐ AM ☐ PM

☐ RTD Bus ☐ Other ☐ Bus Operator ☐ LRV Operator ☐ Mechanic ☐ Service Person ☐ Other

Exact Location: On ______ ☐ At ☐ Near ☐ Far Side ☐ Nearside ______
City: ______ County: ______
Did police investigate? ______ Officer's Name: ______
Agency/Badge # ______ Citation Issued? ______ Citation Number: ______
To Whom? Type of violation:

RTD Vehicle (#1)

How far from curb? Front Wheel: ______ Rear Wheel: ______ Distance traveled after collision: ______
Point of contact ______
Extent of damage ______
Previous damage: ______

Other RTD Vehicle (#2)

Division:

Driver Name & ID#: ______ Bus: ______ Rt: ______ Blk: ______ Run: ______
☐ RTD Bus ☐ Other ☐ Bus Operator ☐ LRV Operator ☐ Mechanic ☐ Service Person ☐ Other
How far from curb? Front Wheel ______ Rear Wheel ______ Distance traveled after collision: ______
Point of contact: ______
Extent of damage: ______
Previous damage: ______

Other Vehicle (Vehicle #2)

Number of Passenger: ______ Was vehicle Towed? ☐ Yes ☐ No
How far from curb? Front Wheel: ______ Rear Wheel: ______ Distance traveled after collision: ______
Point of contact: ______
Extent of damage: ______
Previous damage: ______
Driver's Name: ______ Address: ______
City: ______ State: ______ Zip: ______ Vehicle Plate: ______ State: ______
Driver's Lic.# ______ State ______ Exp. Date: ______ DOB ______ Age: ______
Sex: ______ Home Phone: ______ Work Phone: ______ Cell Phone: ______
Vehicle Make: ______ Model: ______ Year: ______ Color: ______
Vehicle Owner's Name: ______
Address: ______ City: ______ State: ______ Zip: ______
Insurance Company: ______ Policy # ______
Agent Name: ______ Expiration Date: ______
Owner of other damaged property: ______
Address: ______ City: ______ State: ______ Zip: ______

Other Vehicle (Vehicle #3) *If Applicable* ☐ check this box if 4th vehicle involved – See Supplemental Page

Number of Passenger: ________ Was vehicle Towed? ☐ Yes ☐ No
How far from curb? Front Wheel: __________ Rear Wheel: __________ Distance traveled after collision: __________
Point of contact: ____________________
Extent of damage: ____________________
Previous damage: ____________________
Driver's Name: ____________________ Address: ____________________
City: ____________________ State: ______ Zip: __________ Vehicle Plate: __________ State: ______
Driver's Lic. # __________ State ______ Exp. Date: __________ DOB __________ Age: ______
Sex: __________ Home Phone: __________ Work Phone: __________ Cell Phone: __________
Vehicle Make: __________ Model: __________ Year: __________ Color: __________
Vehicle Owner's Name: ____________________
Address: ____________________ City: __________ State: ______ Zip: ______
Insurance Company: ____________________ Policy # ____________________
Agent Name: ____________________ Expiration Date: ____________________

Witness Information

Witness 1) Name: __________ Address: ____________________
City: __________ State: ______ Zip: __________ Phone: __________

Witness 2) Name: __________ Address: ____________________
City: __________ State: ______ Zip: __________ Phone: __________

Witness 3) Name: __________ Address: ____________________
City: State: Zip: Phone:

Injuries ☐ check this box if 3rd injury involved – See Supplemental Page

Injured 1) Name: __________ Address: ____________________
City: __________ State: ______ Zip: __________ Phone: __________
☐ RTD Employee/Operator ☐ Driver ☐ Passenger ☐ Pedestrian ☐ LRV Passenger
Which Vehicle? __________ DOB: __________ Sex: ____ LRV Passenger Proof of Fare? ______ (Y/N)
Transported? ________ Where? ____________________
Emergency/Fire Dept/Ambulance: ____________________
Nature of Injury: ____________________

Injured 2) Name: __________ Address: ____________________
City: __________ State: ______ Zip: __________ Phone: __________
☐ RTD Employee/Operator ☐ Driver ☐ Passenger ☐ Pedestrian ☐ LRV Passenger
Which Vehicle? __________ DOB: __________ Sex: ____ LRV Passenger Proof of Fare? ______ (Y/N)
Transported? ________ Where? ____________________
Emergency/Fire Dept/Ambulance: ____________________
Nature of Injury: ____________________

Describe Accident in Detail:	Accident Classification
	A
	B
	C
	D
	E
	Vehicle # 1
	G
	H
	J
	K
	L
	Vehicle # 2
	G
	H
	J
	K
	L
	Vehicle # 3
	G
	H
	J
	K
	L

Supplemental Page (for additional Vehicles and Injuries, use when necessary)

Other Vehicle (Vehicle #4) *If Applicable*

Number of Passenger: ________ Was vehicle Towed? ☐ Yes ☐ No

How far from curb? Front Wheel: ________ Rear Wheel: ________ Distance traveled after collision: ________

Point of contact: ________

Extent of damage: ________

Previous damage: ________

Driver's Name: ________ Address: ________

City: ________ State: ________ Zip: ________ Vehicle Plate: ________ State: ________

Driver's Lic. # ________ State ________ Exp. Date: ________ DOB ________ Age: ________

Sex: ________ Home Phone: ________ Work Phone: ________ Cell Phone: ________

Vehicle Make: ________ Model: ________ Year: ________ Color: ________

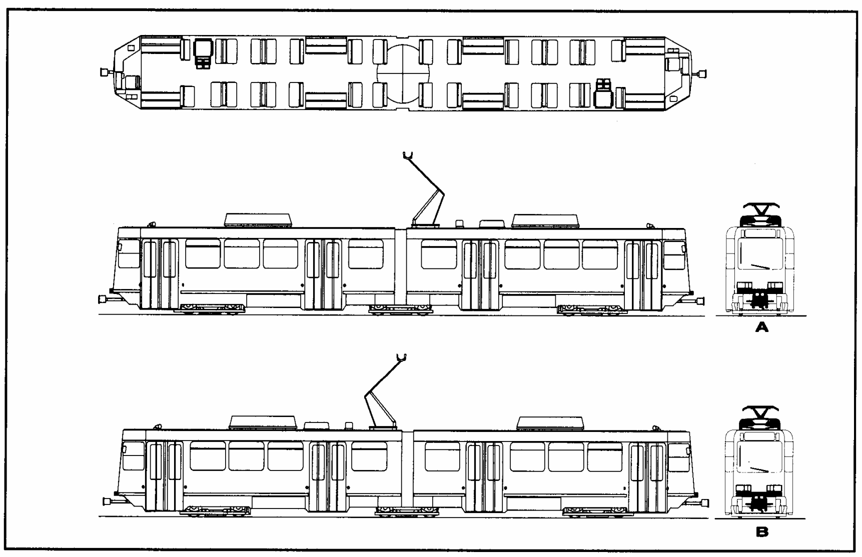
Vehicle Owner's Name: ________

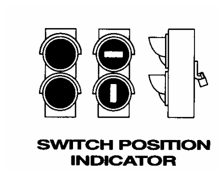
Address: ________ City: ________ State: ________ Zip: ________

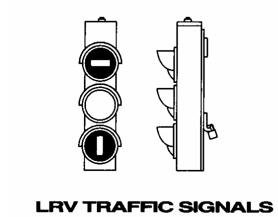
Insurance Company: ________ Policy # ________

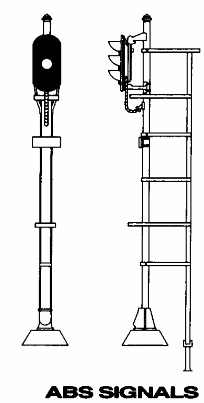
Agent Name: ________ Expiration Date: ________

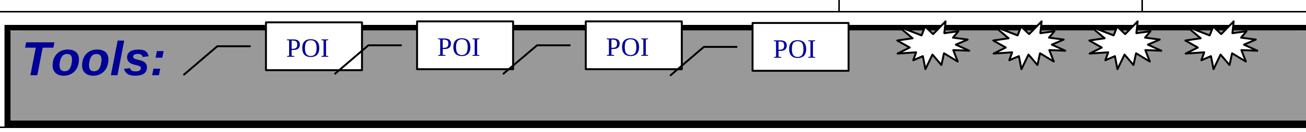
For Light Rail Use Only	LRV #		LRV Active Cab:		(A/B)			
Number of LRV in train consist =		All LRV #'s in train consist:						











Not Applicable N/A

Edmonton Transit System – Accident Report Form

ETS Edmonton Transit System
Owned and Operated by the City of Edmonton

LRT INSPECTOR ACCIDENT / INCIDENT REPORT

Legal Dept.: _____
Transit File No.: _____-_____

LRT Event No.: _____ | POSSE File No.: TS_____-_____ | CACTIS Issue No.: _____

☐ Collision ☐ Passenger Injury ☐ Pedestrian Injury ☐ Incident ☐ Near Miss

LOCATION: Do not use abbreviation.
Direction: ____ Grade: __
Year: ____ Month: _____ Day: __ Time of Accident/Incident: _____ Hours
Vehicle Unit No: N [ ] [ ] [ ] [ ] S Run: _____
Employee Name: _____ Badge: _____ Payroll: _____
Driver's License No:_____ Expires: _____
Employee Injured: __ Ambulance: __ Employee statement: _____
Inspector: _____ Date of Report: _____ Pictures: __ How many pictures: 0 ADPRO CD Included: __
Time Inspector Called: _____ Hours Time Inspector Arrived: _____ Hours
Time Vehicle Cleared: _____ Hours Peer Support Offered: N/A

Location Type: Other
Please specify if "Other": _____

Service: _____
Please specify if "Tail Track" or "Other": _____

EDMONTON TRANSIT VEHICLE INFORMATION
Estimated speed of vehicle prior to accident _____ Kmh
Horn Signal Given (if any): _____
Space available prior to accident: _____
Stopping Distance: _____
Measured Track Brake Marks of Vehicle: _____
No. of Passengers: _____

CONDITION OF VEHICLE
Brakes: _____
W/S Wipers: _____
Doors: _____
Others: _____

CONDITION OF STATION (Use this for station incident)
Steps/Escalator: N/A
Platform: N/A
Other: _____

POLICE INFORMATION
Police Constable No.: _____
Police File No.: _____
Police Arrive Time: _____
Summons to Whom: _____
HTA/MVA: _____

SIGNALS
N/A

SWITCHES
___

RAIL SURFACE
N/A
Please specify if "Other": _____

RAIL CONDITIONS
N/A
Please specify "rule in Effect" or "Other": _____

WEATHER
N/A

LIGHT
N/A
Please specify if "Other": _____

ACTION OF VEHICLE
___
Please specify if "Other": _____

DAMAGE TO EDMONTON TRANSIT VEHICLE
None visible
Please specify if "Other": _____

DESCRIPTION / INVESTIGATION (Attach Additional Forms if Required):
This part of the form will not expand therefore use the continuation form if you need more space.

OTHER PARTY INFORMATION | AMBULANCE
Driver: _____ Address: _____ Phone: _____ Injured: __ ☐
Passenger: _____ Address: _____ Phone: _____ Injured: __ ☐
Pedestrian: _____ Address: _____ Phone: _____ Injured: __ ☐
Other: _____ Address: _____ Phone: _____ Injured: __ ☐

Driver's License No.: _____ Expiry Year: ____ License Plate No.: _____ No. of Passenger: _____
Make of Vehicle: _____ Model: _____ Color: _____ Year: ____ VIN: _____
Registered Owner: _____ Address: _____
Name of Insurance Company: _____ Agent: _____
Policy No.: _____ Valid from _____ to _____

VEHICLE TYPE
___
Please specify if "Other": _____

CONTACT LOCATION
None Found
Please specify if "Other": _____

Action THIS vehicle (___) (see ACTION OF VEHICLE codes)
Damage to THIS vehicle: _____
Tow truck required: __
Previous damage: __ _____

Ambulance required: __
Description of injury: _____

PEDESTRIAN: _____ Please specify if "Other": _____
Footwear/Clothing (Describe): _____

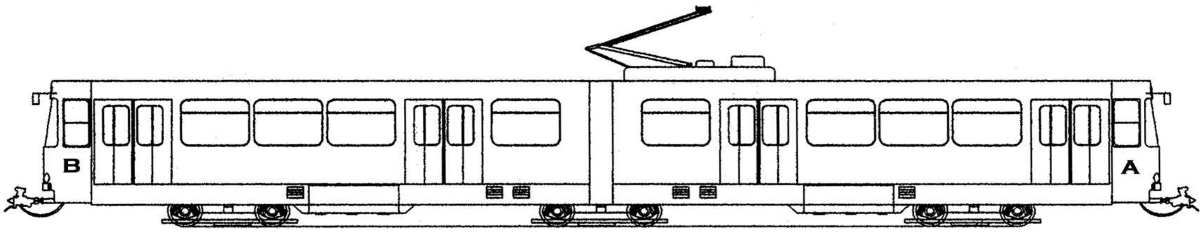
WITNESSES
Name: _____ Address: _____ Phone: _____
Name: _____ Address: _____ Phone: _____
Name: _____ Address: _____ Phone: _____
Name: _____ Address: _____ Phone: _____

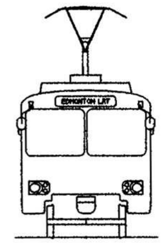
Completed by: _____ (Badge Number) Date: _____

This information is being collected under the authority of Section 33(c) of the Freedom of Information and Protection of Privacy Act and will be used for Risk Management and Claims purposes. If you have any questions about the collection or use of this information please call the Section Head, Litigation and Claims, City of Edmonton Law Branch, at 496-7216.
This report is made exclusively for the use of the city solicitor for his/her information and advice thereon in the event action is brought.

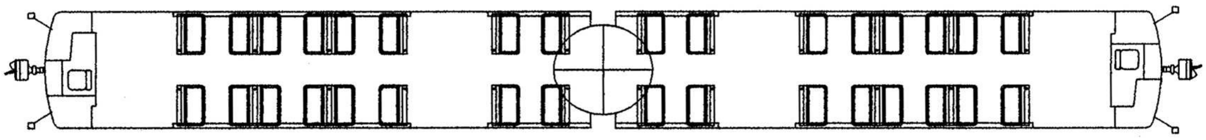
Version KH08

Transit File No.: _____-_____





At Point Of Contact Mark "X"



Measurements

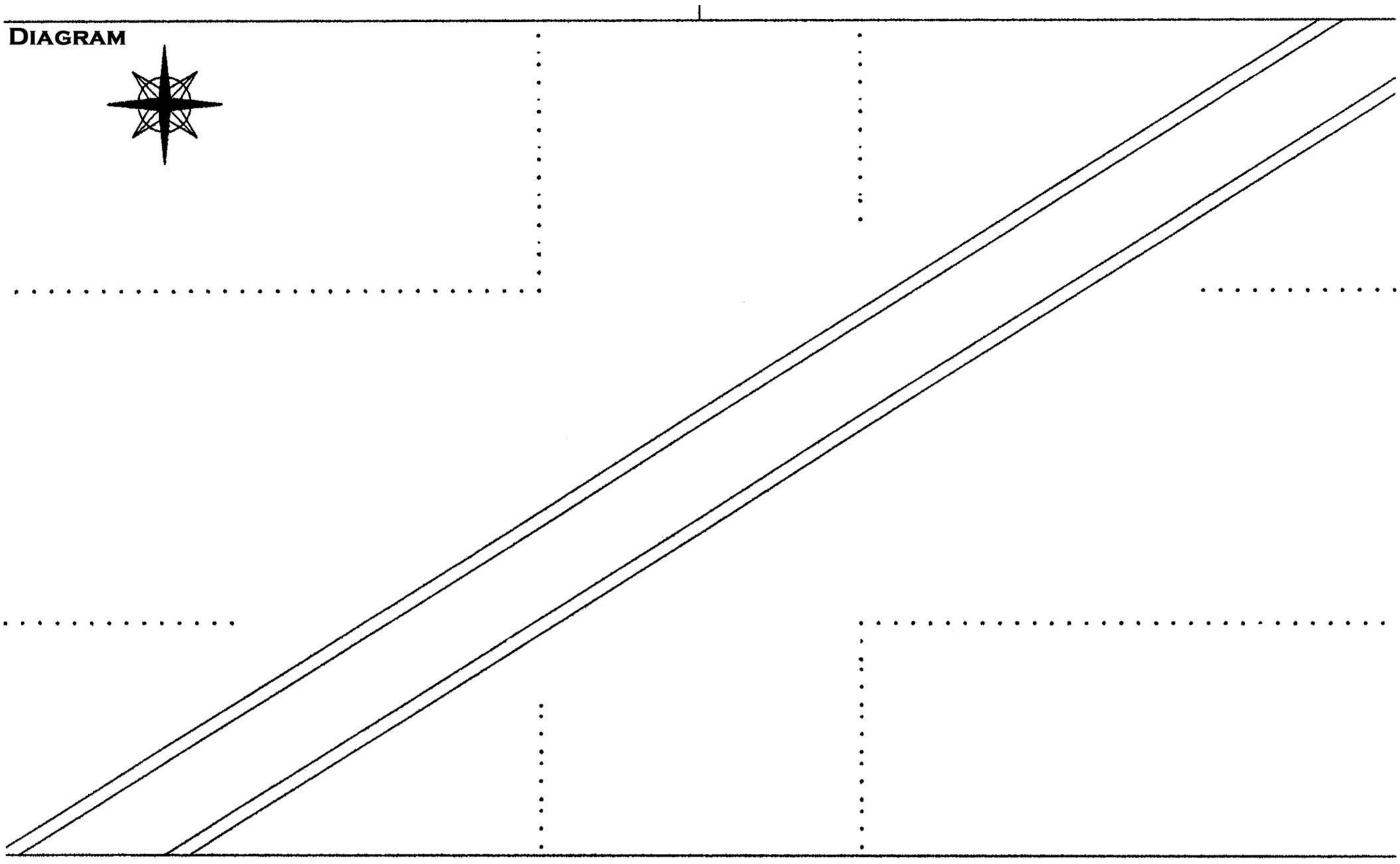
Point of Impact

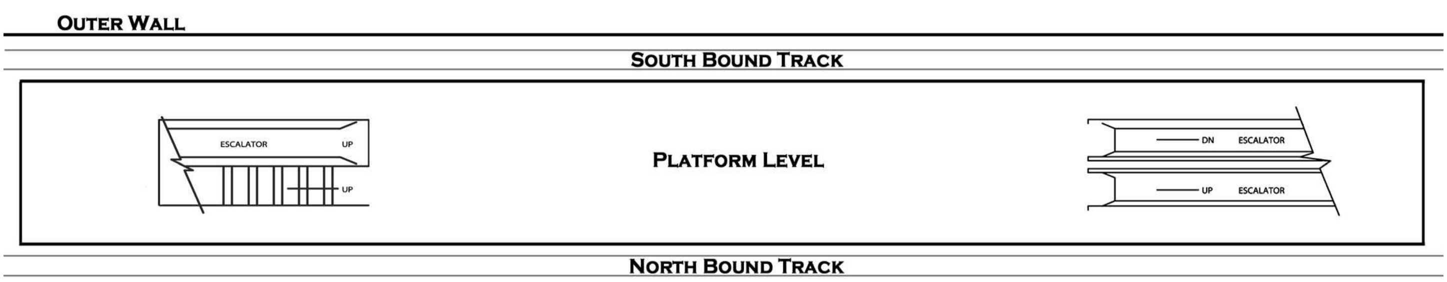
Transit Vehicle #1

Point of Rest

Vehicle #2

Diagram





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Version KH08

LACMTA – Accident Report Form

Metro

RAIL TRANS 172A
FRONT SIDE
REV 4/99

LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY
SUPERVISORY EMPLOYEES' ACCIDENT/INCIDENT INVESTIGATION FORM

DATE OF ACCIDENT/INCIDENT:	DAY	TIME OF ACCIDENT/INCIDENT: HRS.	TIME CALL RECIEVED: 00:00 HRS.
10-58 yes/no	TIME ARR. SCENE: 00:00 HRS.	Weather/Underground Condition:	

SEVERITY CODE
☐ HUMAN FATALITY
☐ PERSONAL INJURY
☐ PROPERTY DAMGE

ACCIDENT/INCIDENT CATEGORY:

H ☐ HEAD-ON	Q ☐ SIDE	G ☐ GUNSHOT	A ☐ ALLEGED
N ☐ REAR-END	R ☐ DERAILMENT	J ☐ ASSAULT	Z ☐ HAZMAT
B ☐ BROKEN TRAIN	F ☐ FIRE/SMOKE	D ☐ DISTURBANCE	E ☐ EXPLOSION
T ☐ OBSTRUCTION	I ☐ INHALATION	L ☐ ILLNESS	P ☐ PEDESTRIAN
K ☐ RAKING	M ☐ MISSILE	Y ☐ ROBBERY	S ☐ PASSENGER
O ☐ OTHER ________			

ACCIDENT/INCIDENT LOCATION

TRACK LOCATION
☐ MAINLINE
☐ SHOP
☐ YARD
☐ OTHER ________

NEAREST MILE POST ________ **BRANCH** ________ **TRACK** ________

NEAREST STATION
GRAND STATION

DIRECTION
☐ N ☐ S
☐ E ☐ W
☐ NORMAL
☐ REVERSE

ACCIDENT/INCIDENT LOCATION
A ☐ AT B ☐ BETWEEN
PICO STATION
GRAND STATION

TRAIN POSITION AT STATION
☐ N ☐ S
☐ MIDDLE
☐ E ☐ W

PLATFORM LOCATION
☐ N ☐ S ☐ E ☐ W ☐ MIDDLE ☐ AUX. CORRIDOR
☐ AR ☐ AL ☐ BR ☐ BL ☐ TRK ☐ TRK2

STAIR LOCATION
☐ TOP ☐ MIDDLE ☐ BOTTOM
☐ N ☐ S ☐ E ☐ W

ESCALATOR NUMBER: ________ ☐ TOP ☐ MIDDLE ☐ BOTTOM
ELEVATOR NUMBER: ________ ☐ TOP ☐ MIDDLE ☐ BOTTOM

MEZZANINE LOCATION:

TRAIN INFORMATION

OPERATORS NAME			BADGE	CERT. EXP. DATE	DATE EMP.
DIVISION	LINE NO	RUN NO.	LEAD CAB	TRAIN /	CONSIST

CONDITION OF CAB CONTROLS:
☐ ATO ☐ REV. JOG ☐ NOT KEYED ON
☐ MTO ☐ RMO ☐ EMO ☐ ATP BYPASS
☐ WASH/COUPLE ☐ STOP/PROCEED
☐ STREET RUN ☐ CAB SIG
EMERGENCY BRAKE: ☐ ON ☐ OFF

SWITCHES (CAB)
BYPASSES
CUTOUT:

POINT OF IMPACT:

POINT OF REST:

NO. PASS:	NO. INJURED:	NO. FATALITIES:

DAMAGE

OTHER VEHICLE OR PARTY

REG. OWNER			CITY	PH. NO
ADDRESS			MAKE	YR./MOD.
DRIVER			CITY	PH. NO
ADDRESS			LIC NO.	STATE
EXP. DATE	INS. CO	NO. PASS.	NO. INJURE	NO. FATAL

DAMAGE:

INCIDENT PHOTOGRAPH INFORMATION

TIME: 00:00	PHOTOGRAPHER ID:	NUMBER OF PHOTOS:

PAGE: 1

RAIL TRANS 172A
REVERSE SIDE
REV 4/99

ASSISTANCE RENDERED TO THE INCIDENT

CHECK ALL BOXES THAT APPLY:

☐ MTA MEDIA RELATIONS ______	☐ LAW ENFM ______	☐ R/COMM ______	☐ FAC. MAINT ______
☐ FIRE ______	☐ SAFETY DEPT ______	☐ SIG. ______	☐ GEN SERV ______
☐ TRACTION POWER ______	☐ TRK. ______	☐ OTHER ______	

INCIDENT COMMANDER:		FIRE DEPT.
OFFICER'S NAME	BADGE	ENG# R.A.# AMBULANCE#
POLICE REPORT N		

OFFICER'S STATMENT:

STATEMENT(s) [Operator/Other Driver(s)/Witness]

OPERATOR:

OTHER DRIVER(S):

WITNESS(ES):

RAIL TRANS 172A
FRONT SIDE -SUPLEMENT
REV 4/99

PERSONS INVOLVED

SEX: (1)
F-FEMALE
M-MALE

DIABLED: (2)
W-WHL.CHR.
B-BLIND
O-OTHER

ETHNICITY: (3)
B-BLACK
W-WHITE
A-ASIAN
H-HISPANIC
O-OTHER

STATUS: (4)
V1-MTA
V2-SECOND PARTY
V3-THIRD PARTY
P1-PATRON
P2-PEDESTRIAN
O - OTHER

INJURIES: (5)
C-CLAIMED
F-FATALITY
N-NONE

LOCATION: (6)
A-END
I-AISLE
D-BY-DOOR
S-ESCALATOR
L-ELEVATOR
P-PLATFORM
W-R.O.W
G-GRADE CROSSING
T-TUNNEL
Y-YARD
M-MEZZANINE

EMPLOYEE: (7)
O-OPERATOR
E-OTHER EMPLOYEE

OFFENDER/VICTIM: (8)
O-OFFENDER
V-VICTIM

MEDICAL TREATMENT: (9)
F-FIRST AID
M-MED. TREATMENT AT SCENE
T-TRANSPORTED

PERSONS DISPOSITION: (10)
S-STANDING
B-BOARDING
A-ALIGHTING
F-FALLING
L-LAYING
O-OTHER
T-SITTING
W-WALKING
R-RUNNING
P-PUSHED
RT-CAME FROM RT.
LT-CAME FROM LT.
H-HIT BY MTA VEHICLE
FE-FELL OFF PLATFORM
WT-WALKED INTO THE SIDE OF THE TRAIN

	NAME	ADDRESS	CITY	PH. NUMBER	1	2	3	4	5	6	7	8	9	10
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														

RAIL TRANS 172A
REVERSE SIDE -SUPLEMENT
REV 4/99

NARRATIVE (DESCRIBE INCIDENT IN DETAIL)

NAME (PRINT):

SIGNATURE: BADGE S#:

Memphis Area Transit Authority – Accident Report Form

FIELD SUPERVISOR'S ACCIDENT REPORT

MATA INFORMATION

Date:________________ Time:____________ Line:______ Blk#:______ Bdg#:_______ Vehicle #:__________
Location:____ Weather Conditions :___________________________
Name of Driver:______________________________ Bus MataPlus Trolley Other Seat Belt Worn: Y N N/A
Direction of Company Vehicle:__________ Location of Company Vehicle:______________________________
Damage to Company Vehicle Circle One and Describe: Light Medium Heavy ______________________
____
Number of Passengers in Company Vehicle:_____ Number of Passengers Injured:_____ (List Names on Back)
Operator's Statement:____
____
____
____
____
____

OTHER VEHICLE INFORMATION

Name of Driver of Other Vehicle:____
Address:____City:_______________ State:_____ Zip:______
Home Phone:______________ Work Phone:_____________ Place of Employment:_________________________
Driver's License Number:_____________________ State:__________ Expiration Date:___________________
Describe Other Vehicle:____________________________ Lic. Plate #:__________ State:____ Exp.Date:_____
Direction of Other Vehicle:__________ Location of Other Vehicle:___________________________________
Damage to Other Vehicle Circle One and Describe: Light Medium Heavy ________________________
____
Number of Passengers in Other Vehicle (Do Not Include Driver):_____ Number Injured in Other Vehicle:____

Owner of Other Vehicle if Different Than Driver:____
Address:____City:______________ State:_____ Zip:________
Home Phone:_____________ Work Phone:___________ Place of Employment:_______________________

Vehicle Insurance: Name of Insurance Company:____
Address of Insurance Company:_________________________ City:______________ State:____ Zip:________
Phone:______________ Agent's Name:________________________ Policy #:_____________________________

Driver's Statement:____
____
____
____
____
____

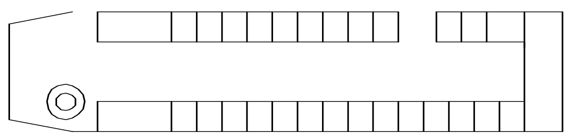
Police Information:____
Fire Department Information:____
Ambulance Information:____

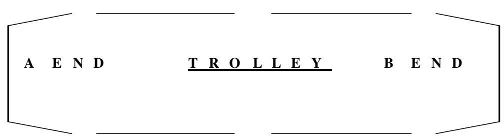
Supervisor's Comments:____
____
____
____
____
____

NAMES OF INJURED

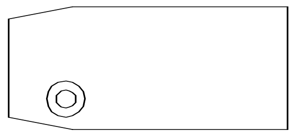
1. Name:______________________________ Address:____
   City:____________________ State:_____ Zip:_____ Phone:___________ Mata Vehicle/Other Vehicle
2. Name:______________________________ Address:____
   City:____________________ State:_____ Zip:_____ Phone:___________ Mata Vehicle/Other Vehicle
3. Name:______________________________ Address:____
   City:____________________ State:_____ Zip:_____ Phone:___________ Mata Vehicle/Other Vehicle
4. Name:______________________________ Address:____
   City:____________________ State:_____ Zip:_____ Phone:___________ Mata Vehicle/Other Vehicle
5. Name:______________________________ Address:____
   City:____________________ State:_____ Zip:_____ Phone:___________ Mata Vehicle/Other Vehicle

Company Vehicle
Circle Point of Initial Impact
Shade Damaged Areas





Other Vehicle
Circle Point of Initial Impact
Shade Damaged Areas



Who Received Ticket? Circle One: Operator Other Driver Both Neither

Completed By:____ Date:__________________________

Portland Tri-Met – Accident Report Form (Long)

TRI MET Operations Accident / Incident Report

Employee: ______________________________ Badge Number: _______ ACID Number:_________

Employee Information

☐ **SOP Violation** #

☐ **Rule Violation** #

Fit for Duty ☐ Yes ☐ No (Document Operator statement and re-instruction)

Incident Type:

☐ Accident	☐ Property Damage	☐ Witness
☐ Injury / Illness	☐ Auto in ROW	☐ Portland Streetcar
☐ Security	☐ ROW Trespasser	☐ Fit for Duty
☐ Defect	☐ Certification Trip	☐ Abandonment
☐ Rule Violation	☐ Slip, Trip, Fall	

Incident Date	Day	Time ☐ AM ☐ PM	Train #	Run #	# of Pass.	Vehicle #	# Courtesy Cards

Name | Badge No. | Home Phone | Position: ☐ Operator ☐ Supervisor ☐ Inspector ☐ Lead ☐ Other

Sex ☐ M ☐ F | Age | Years of Service | Start of Shift ☐ AM ☐ PM | Driver's Lic No./State/Exp Date

Home Address, City, State, Zip

Briefly describe damage to the TM vehicle | Damage over $400? ☐ Yes ☐ No

Were you injured? ☐ No ☐ Yes *If Yes, fill out Report of Occupational Injury/Illness*

Location

I was proceeding ☐ E ☐ W ☐ N ☐ S ☐ INB ☐ OUTB at ____________________________

At _________MPH. The other vehicle was traveling _______________ at _________MPH.
Warning given was ☐ Horn ☐ Bell ☐ None. Warning by other vehicle was ☐ Horn ☐ None.
Traffic / Train Control was ☐ Pre-empt ☐ Wayside Signal (☐ Working ☐ Not Working)

Aspect of signal_________________ ☐ Crossing Gate (☐ Up ☐ Down)
☐ Traffic lights (☐ Working ☐ Not Working) ☐ Flagging ☐ None

Investigated By:

☐ Tri-Met ________________

☐ Police / Sheriff __________

☐ Other __________________

☐ None

Photos Taken ☐ Yes ☐ No

Conditions

Weather	Light Conditions	Rail Condition	Road Surface	Running Lights Our Vehicle	Running Lights Other Vehicle	Cab Visor	Annunciator Lamps Lit?
☐ Clear	☐ Daylight	☐ Dry	☐ Dry	Marker	☐ Lit	☐ Up	☐ No
☐ Cloudy	☐ Dawn	☐ Wet	☐ Wet	☐ Lit	☐ Unlit	☐ Down	☐ Yes
☐ Raining	☐ Dark	☐ Muddy	☐ Frost/Ice	☐ Unlit		Mushroom	Bypass Switches Activated?
☐ Snowing	☐ Dusk	☐ Frost/Ice	☐ Snow	Headlight		☐ Up	☐ No
☐ Foggy	☐ Glare	☐ Snow	☐ Other	☐ Lit		☐ Down	☐ Yes
☐ Frost/Ice		☐ Other		☐ Unlit		Drum Handle ________	
						Reverser ________	

Other Vehicle Involved — Vehicle #2

Driver's Name | Driver's License Number/State/Expiration Date

Sex ☐ M ☐ F | D. O. B. | Insurance Company | Policy Number | Work Phone

Address, City, State, Zip | Home Phone

Plate Number | State | Make | Model / Type | Year | Color

Describe damage | Over $400 ☐ Yes ☐ No | # Pass.

Registered Owner's Name | Work Phone

Address, City, State, Zip | Home Phone

TRI MET Operations Accident / Incident Report

Employee: ____________________________ Badge Number: _______ ACID Number:_________

Passenger Accident (If Applicable)

Passenger Action
- ☐ Intending
- ☐ Boarding
- ☐ Deboarding
- ☐ Departing
- ☐ Standing
- ☐ Moving
- ☐ Sitting
- ☐ Mobility Aid
- ☐ Other __________

Passenger Location
- ☐ On Train
- ☐ At Door

Car# _____________

Door# _____________
- ☐ Front
- ☐ Middle
- ☐ Rear
- ☐ Platform
- ☐ Other ____________________

Incident Type
- ☐ Fall on board
- ☐ Bump on board
- ☐ Hit by door
- ☐ Fall / Stairwell
- ☐ Fall away from train
- ☐ Other _________________________

Other Passenger Factors
- ☐ Wearing glasses
- ☐ Carrying objects
- ☐ Able bodied/stable
- ☐ Unstable
- ☐ Using cane
- ☐ Crutches / Walker
- ☐ Impairment (describe) _______________________
- ☐ Wheelchair
- ☐ Motorized wheelchair
- ☐ Scooter

Floor / Step Condition
- ☐ Dry
- ☐ Wet
- ☐ Debris / Litter
- ☐ Snow / Ice
- ☐ Unknown

Pedestrian Accident (If Applicable)

Movement/ Action
- ☐ Walking in street / ROW
- ☐ Running in street / ROW
- ☐ Standing in street / ROW
- ☐ Ascending / Descending Stairs
- ☐ Riding Bicycle
- ☐ Working in street / ROW
- ☐ Playing in street / ROW
- ☐ Unknown
- ☐ Other _________________________

Direction Headed
- ☐ North
- ☐ South
- ☐ East
- ☐ West
- ☐ Unknown
- ☐ Other _________________________

Further Description
- ☐ At Intersection
- ☐ In crosswalk
- ☐ Not in crosswalk
- ☐ With signal
- ☐ Against signal
- ☐ No signal
- ☐ Not at Intersection
- ☐ Crossing diagonally
- ☐ Crossing in front of train
- ☐ Crossing from behind vehicle
- ☐ Getting in/out of other vehicle
- ☐ From between parked vehicles
- ☐ Other ______________________

Persons Injured / Involved

☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ___________	Name	Address, City, State, Zip				
	Describe Injury	Sex ☐ M ☐ F	D. O. B.	Work Phone	Home Phone	
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ___________	Name	Address, City, State, Zip				
	Describe Injury	Sex ☐ M ☐ F	D. O. B.	Work Phone	Home Phone	
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ___________	Name	Address, City, State, Zip				
	Describe Injury	Sex ☐ M ☐ F	D. O. B.	Work Phone	Home Phone	
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ___________	Name	Address, City, State, Zip				
	Describe Injury	Sex ☐ M ☐ F	D. O. B.	Work Phone	Home Phone	
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ___________	Name	Address, City, State, Zip				
	Describe Injury	Sex ☐ M ☐ F	D. O. B.	Work Phone	Home Phone	

TRI MET Operations Accident / Incident Report

Employee: ___________________________ Badge Number: _______ ACID Number:_________

Witnesses

Type	Name / City, State, Zip	Address / Home Phone	Work Phone
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ____________	Name	Address	
	City, State, Zip	Home Phone	Work Phone
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ____________	Name	Address	
	City, State, Zip	Home Phone	Work Phone
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ____________	Name	Address	
	City, State, Zip	Home Phone	Work Phone
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ____________	Name	Address	
	City, State, Zip	Home Phone	Work Phone
☐ Passenger in Vehicle # _____ ☐ Pedestrian ☐ Other ____________	Name	Address	
	City, State, Zip	Home Phone	Work Phone

Other Vehicle Involved (Vehicle #3 If Applicable)

Driver's Name				Driver's License Number/State/Expiration Date	
Sex ☐ M ☐ F	D. O. B	Insurance Company	Policy Number	Work Phone	
Address, City, State, Zip				Home Phone	
Plate Number	State	Make	Model / Type	Year	Color
Describe damage				Over $400 ☐ Yes ☐ No	# Pass.
Registered Owner's Name				Work Phone	
Address, City, State, Zip				Home Phone	

Other Property Damage

Other Property Damage (Describe)

TRIMET Operations Accident / Incident Report

Employee: ____________________________ Badge Number: _______ ACID Number:_________

Theft / Assault /Arrest

Name of Suspect(s) (If Known) ____

Age _______ Height ________ Weight _______ Hair Color ________ Hair Length _______ Eye Color _________

Clothing or other characteristics ____

Suspect Description
- ☐ Individual
- ☐ Group (Count) _______
- ☐ Male
- ☐ Female
- ☐ Adult
- ☐ Youth
- ☐ White
- ☐ Black
- ☐ Hispanic
- ☐ Asian
- ☐ Native American
- ☐ Unknown
- ☐ Other ____________________

Weapons
- ☐ None
- ☐ Handgun
- ☐ Shotgun / Rifle
- ☐ Assault Weapon
- ☐ Knife
- ☐ Hands / Feet
- ☐ Club / Baton
- ☐ Unknown
- ☐ Other ____________________

Type of Incident

- ☐ **Theft**
- ☐ Operator's Property
- ☐ Passenger Property
- ☐ Other ____________________

- ☐ **Assault**
- ☐ Operator
- ☐ Passenger
- ☐ Other ____________________

- ☐ **Vandalism**
- ☐ Seats
- ☐ Windows
- ☐ Doors
- ☐ Train interior
- ☐ Train exterior
- ☐ Platform
- ☐ Other ____________________

Action taken against suspect
- ☐ Arrested
- ☐ Cited
- ☐ Ejected
- ☐ Unknown
- ☐ None
- ☐ Other ____________________

Narrative

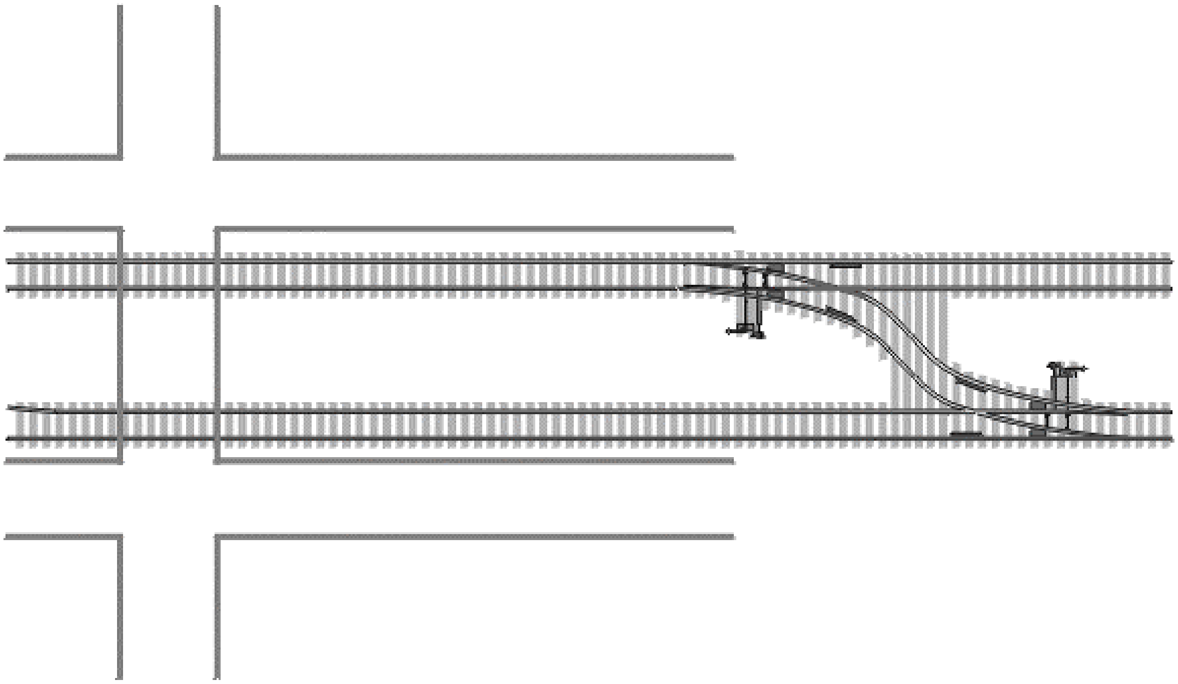
Describe what happened. (Include details of any special circumstances or conditions, such as curves, grades, obstruction to view, and what you did)

TRIMET Operations Accident / Incident Report

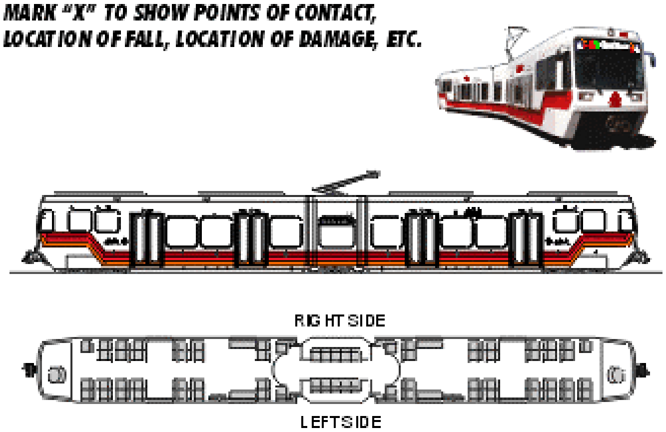
Employee: ____________________________ Badge Number: _______ ACID Number:_________

INDICATE NORTH BY ARROW

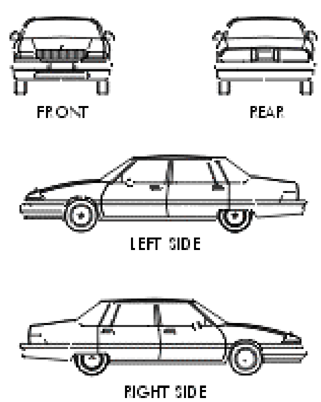
DIAGRAM - DRAW ACCIDENT SCENE AS CLOSE TO DETAIL AS POSSIBLE SHOWING MEASUREMENTS, PATH OF VEHICLES, ETC.



MARK "X" TO SHOW POINTS OF CONTACT, LOCATION OF FALL, LOCATION OF DAMAGE, ETC.



PLACE AN "X" ON EXACT POINT OF IMPACT



Submitted By ______________________________ Date of Report _____________
Signature

Portland Tri-Met – Accident Report Form (Short)

TRIMET Operations Accident / Incident Report (Short Form)

Employee________________________________ Badge Number __________ ACID Number _______________

Employee Information

☐ **SOP Violation** # ☐ **Rule Violation** #	**Fit for Duty** ☐ Yes ☐ No (Document Operator statement and re-instruction)	**Incident Type:** ☐ Accident ☐ Injury / Illness ☐ Security ☐ Defect ☐ Rule Violation ☐ Property Damage ☐ Auto in ROW ☐ ROW Trespasser ☐ Certification Trip ☐ Slip, Trip, Fall ☐ Witness ☐ Portland Streetcar ☐ Fit for Duty ☐ Abandonment

Incident Date	**Day**	**Time** ☐ AM ☐ PM	**Train No.**	**Run No.**	**# of Pass.**	**Vehicle #**	**# Courtesy Cards**

Name	**Badge No.**	**Home Phone**	**Position** ☐ Operator ☐ Supervisor ☐ Inspector ☐ Lead ☐ Other
Home Address, City, State, Zip			

Sex ☐ M ☐ F	**Age**	**Years of Service**	**Start of Shift** ☐ AM ☐ PM	**Driver's Lic No./State/Exp Date**

Briefly describe damage to the TM vehicle	**Damage Over $400?** ☐ Yes ☐ No

Were you injured? ☐ No ☐ Yes *If Yes, fill out Report of Occupational Injury/Illness*

Describe what happened, actions taken, or other applicable information.

Submitted by ____Badge # ___________ Date___________

Signature

Saint Louis – Accident Report Form

FINAL INVESTIGATION REPORT 20070113MLIN1015

Incident:	Train 135 Passed Signal EP14 on Red Aspect
Incident Level & Hazard Rating:	Level 2, Hazard Rating II Unacceptable
Date at Time of Incident:	January, 1004 HRS
Location of Incident:	Mile Post 18.5,Track 2
Weather/Road Conditions:	30 degrees F, Overcast, Wet, Visibility good
Facility Name:	Metro Link Alignment
Life Threatening Injuries:	None
Lost Production:	Unknown

Incident Description:

Notification & Incident Response:

Initiating Event and Preliminary Cause: .

Additional Investigation:

Root Cause:

Corrective Action:

Manager's Response:

Prepared By:
Reviewed By:

Distributed:

Santa Clara Valley TA – Accident Report Form

SUPERVISOR'S OCCURRENCE REPORT
LIGHT RAIL

PAGE OF

Santa Clara Valley Transportation Authority

DISTRICT VEHICLE

RAIL CERTIFICATION DATE:

OCCURRED DATE:	REPORTED DATE:	ACCIDENT REPORT NO.

NAME OF OPERATOR:	BADGE #:	DRIVERS LICENSE #:

LRV'S	LEAD	2ND	3RD	RUN #	TRAIN #	DIRECTION OF TRAVEL

EXACT LOCATION:	CITY:

- ☐ COLLISION
- ☐ PASSENGER INJURY
- ☐ PEDESTRIAN INJURY

POST ACCIDENT DETERMINATION

	YES	NO
POST ACCIDENT QUESTIONNAIRE	☐	☐
DOT ACCIDENT	☐	☐
NON-DOT ACCIDENT	☐	☐

PERSONS INJURED OR PROPERTY INVOLVED:

INDICATE EACH SQUARE WITH Y-YES OR N-NO

	NAME	ADDRESS	CITY	ZIP CODE	AMBULANCE REQUESTED	CLAIMED INJURIES	APPARENT INJURY	PASSENGER	PEDESTRIAN	OTHER VEHICLE	APPROXIMATE AGE
1.											
2.											
3.											

PASSENGER FALL
- ☐ AT DOORS
- ☐ ON BOARD

STEP CONDITION
- ☐ GOOD
- ☐ DEFECTIVE

PLATFORM/STATION CONDITION
- ☐ DRY ☐ ICY
- ☐ WET ☐ OTHER

PEDESTRIAN INJURY
- ☐ WALKING ☐ RUNNING ☐ STANDING

FROM
- ☐ CROSSWALK ☐ RIGHT ☐ LEFT ☐ OBSTRUCTED VIEW

WEATHER CONDITIONS
- ☐ CLEAR ☐ CLOUDY ☐ FOG
- ☐ LIGHT RAIN ☐ HEAVY RAIN

LIGHT CONDITIONS
- ☐ DAYLIGHT ☐ DAWN ☐ GLARE
- ☐ DUSK ☐ DARK ☐ BRIGHT SUN

RAIL/ROAD CONDITIONS
- ☐ DRY ☐ MUDDY ☐ FROST
- ☐ WET ☐ GREASY ☐ LEAVES

RUNNING LIGHTS
- LRV ☐ ON ☐ OFF
- OTHER VEHICLE ☐ ON ☐ OFF

WARNING GIVEN
- ☐ HORN/BELL ☐ MECH. SIGNAL
- ☐ FLAGGING ☐ STOP LIGHT

OTHER VEHICLE

DRIVER'S NAME	ADDRESS	CITY	STATE	ZIP
OWNER'S NAME	ADDRESS	CITY	STATE	ZIP

DRIVER'S LICENSE	STATE	INSURANCE COMPANY NAME AND ADDRESS

VEHICLE	YEAR	MODEL	VEHICLE LICENSE #	STATE	YEAR

DIRECTION OF TRAVEL	SPEED LIMIT MPH	ON/CROSS STREET

EST. SPEED BEFORE COLLISION MPH	DISTANCE TRAVELLED AFTER POI	VEHICLE DAMAGE ☐ MINIMAL ☐ MODERATE ☐ MAJOR

SUPERVISOR	RADIO CALL #	TIME ARRIVED ON SCENE	REVIEWED BY

CAR #	CAMERA	PHOTO FRAMES	

INVESTIGATING OFFICER	BADGE #	CITY	CASE #

SUPERVISOR'S OCCURRENCE REPORT

SUPPLEMENTAL REPORT

SANTA CLARA Valley Transportation Authority

DATE: PAGE OF

DISTRICT VEHICLE							
OCCURRED DATE:			REPORTED DATE:				ACCIDENT REPORT NO.
NAME OF OPERATOR:						BADGE #:	DRIVERS LICENSE #:
LRV'S	LEAD	2ND	3RD	RUN #	TRAIN #	DIRECTION OF TRAVEL	
EXACT LOCATION:							CITY:

SEPTA – Operator Accident Report

Southeastern Pennsylvania Transportation Authority

OPERATOR'S ACCIDENT INCIDENT REPORT

INCIDENT # ____/____/____ ____ ____ ____ (mm / dd / yy)

DAY ☐ SUN ☐ MON ☐ TUES ☐ WED ☐ THU ☐ FRI ☐ SAT DATE ____/____/____ TIME ____:____ ☐ AM ☐ PM

WEATHER ☐ CLEAR ☐ CLOUDY ☐ FOGGY ☐ RAINING ☐ SLEETING ☐ SNOWING

VISIBILITY ☐ DAWN ☐ DAY ☐ DUSK ☐ DARK

CONDITION OF HIGHWAY OR TRACK ☐ DRY ☐ ICY ☐ SNOW ☐ UNDER REPAIR ☐ WET

VIDEO ☐ YES ☐ NO

SEPTA VEHICLE

PASSENGERS ____

DISTRICT ☐ ALL ☐ CAL ☐ COM ☐ ELM ☐ FKD ☐ FRO ☐ GTN ☐ LIB ☐ LUZ ☐ SOU ☐ VIC ☐ OTHER ____

MODE ☐ BUS ☐ LRV ☐ TRACKLESS ☐ TRUCK ☐ SUPV'S CAR ☐ OTHER ____

VEHICLE # ____ ROUTE ____ BLOCK ____ DIRECTION ☐ NORTH ☐ SOUTH ☐ EAST ☐ WEST

ACCIDENT ON ____ STREET ☐ AT ☐ BTWN ____

DESCRIBE DAMAGE TO VEHICLE ____

TYPE OF ACCIDENT OR INCIDENT ☐ COLLISION WITH OPPOSING VEHICLE ☐ PEDESTRIAN ☐ PASSENGER ☐ MISCELLANEOUS

DESCRIBE THE ACCIDENT OR INCIDENT IN DETAIL ____

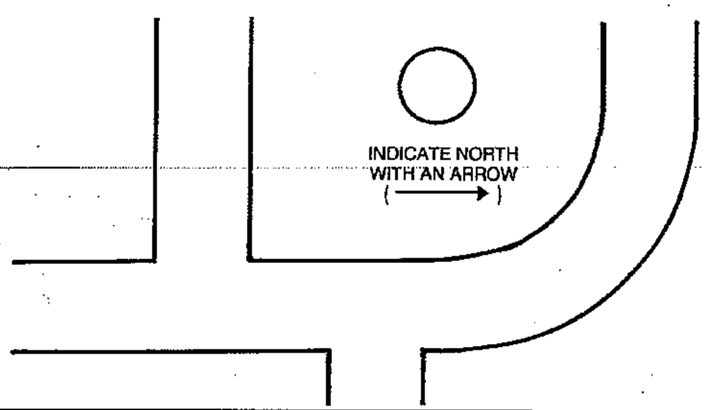
EMPLOYEE NAME (print) ____ ACCOUNT # ____ YRS SERVICE ____

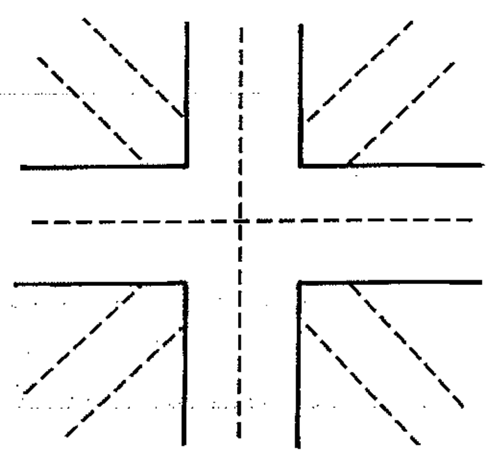
EMPLOYEE'S SIGNATURE ____ LICENSE # ____ DATE OF REPORT ____

TRAFFIC DIAGRAM: IMPORTANT - DRAW COMPLETE DIAGRAM OF WHERE AND HOW ACCIDENT HAPPENED USING SYMBOLS BELOW SHOWING STREET NAMES AND INDICATING DIRECTION OF TRAVEL BY LINE OF ARROWS OF VEHICLES INVOLVED

POINTS OF CONTACT (SHOW BY (✓) MARK) ON SYMBOLS — ILLUSTRATION — CO. VEH. — OTHER VEHICLE — PEDESTRIAN

REPORT CHECKED AT DEPOT BY:





CLAIM				CLASS	
CODE	YEAR	NUMBER	COLL.	ACC.	VEH.

FORM 5039

OPPOSING VEHICLE # _____ of _____

OCCUPANTS _____

VEHICLE MAKE __________ MODEL __________ COLOR __________ YEAR __________

LICENSE PLATE STATE _____ LICENSE # __________ DIRECTION OF VEHICLE ☐ NORTH ☐ SOUTH ☐ EAST ☐ WEST

OWNER __________ ADDRESS __________ PHONE __________

OPERATOR __________ ADDRESS __________ PHONE __________

OPERATOR'S LICENSE # __________ INSURED ☐ YES ☐ NO INSURANCE CO. __________

POLICY # __________ DESCRIBE DAMAGE TO VEHICLE __________

VEHICLE TOWED ☐ YES ☐ NO HEAD LIGHTS ☐ ON ☐ OFF TAIL LIGHTS ☐ ON ☐ OFF HORN SOUNDED ☐ YES ☐ NO

DID OPERATOR MENTION DEFECTS OR CAUSE OF ACCIDENT ☐ YES (explain) ☐ NO __________

COLLISION WITH COMPANY VEHICLE ☐ YES ☐ NO ROUTE _____ BLOCK _____ VEHICLE # _____

PEDESTRIAN ACCIDENT

PEDESTRIAN WAS ☐ RUNNING ☐ STANDING ☐ WALKING ☐ OTHER __________

LOCATION ☐ CROSS WALK ☐ BTWN PARKED VEHICLES ☐ LOADING ZONE ☐ SIDEWALK ☐ OTHER __________

DIRECTION PEDESTRIAN WAS FACING OR LOOKING ☐ NORTH ☐ SOUTH ☐ EAST ☐ WEST

PASSENGER ACCIDENT

TYPE OF ACCIDENT ☐ FALL ☐ STRUCK BY DOORS ☐ OTHER __________

PASSENGER WAS ☐ ALIGHTING ☐ FINISHED ALIGHTING ☐ APPROACHING TO BOARD ☐ BOARDING ☐ ON-BOARD STANDING ☐ ON-BOARD SITTING

LOCATION ☐ AISLE ☐ CENTER DOORS ☐ CENTER STEPS ☐ FRONT DOORS ☐ FRONT STEPS ☐ SEAT

MOTION OF SEPTA VEHICLE ☐ RUNNING STRAIGHT ☐ STANDING ☐ STARTING ☐ STOPPING ☐ TURNING

IF OUTSIDE, DISTANCE OF PASSENGER FROM VEHICLE _____ feet DISTANCE OF DOOR INVOLVED FROM CURB _____ inches

MISCELLANEOUS INCIDENT

PERSON WAS A ☐ PASSENGER ☐ PEDESTRIAN ☐ OTHER __________

LOCATION ☐ ON COMPANY VEHICLE ☐ SIDEWALK ☐ STATION/STOP ☐ STREET ☐ OTHER __________

ON THE SCENE

POLICE AT SCENE ☐ YES ☐ NO RESCUE AT SCENE ☐ YES ☐ NO SUPERVISOR AT SCENE ☐ YES ☐ NO

POLICE CAR # _____ POLICE NAME __________ BADGE # _____ POLICE NAME __________ BADGE# _____

RESCUE # _____ # CLAIM INJURIES _____ # OF WITNESSES _____ INCIDENT CARD SERIAL # _____

INJURED PERSONS

(please circle one)

NAME / ADDRESS	DOB / SSN	INJURY / HOSPITAL	WAS IN WHICH VEHICLE/LOCATION	REMOVED BY / REMOVED HOW
			SEPTA Opposing	Police# _____ Rescue# _____
			Walk on Pedestrian	Walked Carried Refused
			SEPTA Opposing	Police# _____ Rescue# _____
			Walk on Pedestrian	Walked Carried Refused
			SEPTA Opposing	Police# _____ Rescue# _____
			Walk on Pedestrian	Walked Carried Refused

SEPTA – Supervisor Accident Report

05/07/2008 WED 9:10 FAX 002/003

Southeastern Pennsylvania Transportation Authority

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

INCIDENT # ____/____/____ ____________ (mm / dd / yy)

TYPE OF ACCIDENT ☐ COLLISION WITH OPPOSING VEHICLE ☐ PASSENGER ☐ PEDESTRIAN ☐ OTHER DATE ____/____/____

DAY ☐ SUN ☐ MON ☐ TUE ☐ WED ☐ THU ☐ FRI ☐ SAT TIME ______:______ ☐ AM ☐ PM LOCATION ____________________

SEPTA VEHICLE

\# PASSENGERS ______

DISTRICT ☐ ALL ☐ CAL ☐ COM ☐ ELM ☐ FKD ☐ FRO ☐ GTN ☐ LIB ☐ LUZ ☐ SOU ☐ VIC ☐ OTHER ______

MODE ☐ BUS ☐ LRV ☐ TRACKLESS ☐ OTHER ____________ VEHICLE # ____________

ROUTE ____________ BLOCK ____________ DIRECTION ☐ NORTH ☐ SOUTH ☐ EAST ☐ WEST

OPERATOR ____________________ ACCOUNT # ____________ YRS OF SERVICE ______

OPERATOR'S STATEMENT ____

____

____

____

____

DESCRIBE DAMAGE TO VEHICLE ____________________ ☐ MINOR ☐ MAJOR

OPPOSING VEHICLE # ____ of ____

\# OCCUPANTS ______

VEHICLE MAKE ____________ MODEL ____________ COLOR ____________ YEAR ______

LICENSE PLATE STATE ______ LICENSE # ____________ DIRECTION OF VEHICLE ☐ NORTH ☐ SOUTH ☐ EAST ☐ WEST

OWNER ____________ ADDRESS ____________________ PHONE ____________

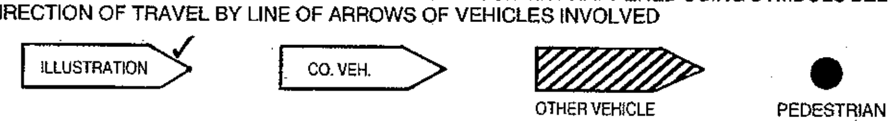
OPERATOR ____________ ADDRESS ____________________ PHONE ____________

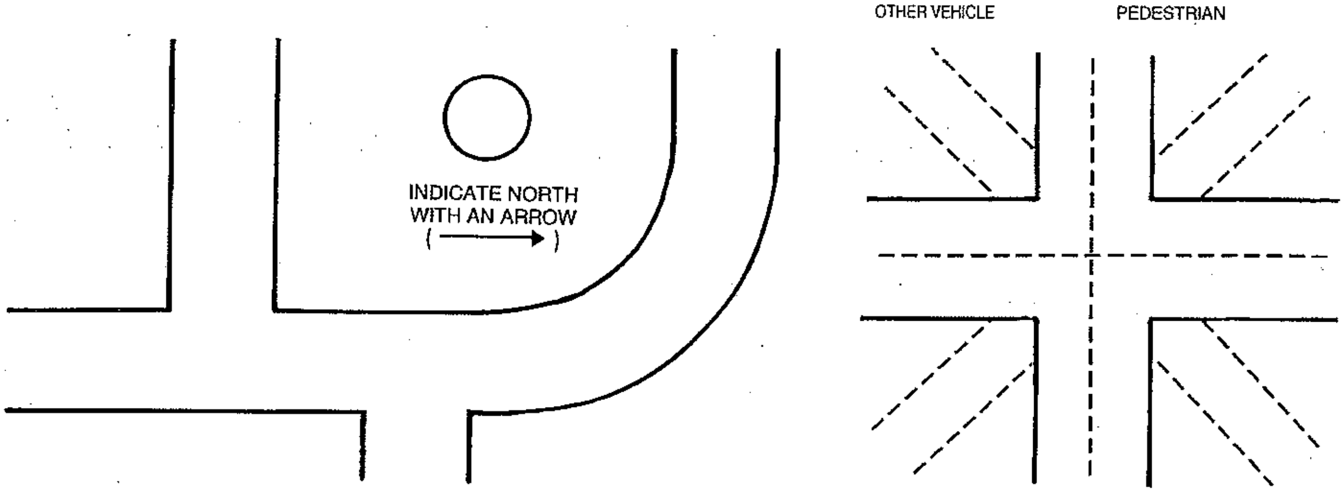
OPERATOR'S LICENSE # ____________ INS. CO. ____________ POLICY # ____________

DESCRIBE DAMAGE TO VEHICLE ____________________ VEHICLE TOWED ☐ YES ☐ NO

TRAFFIC DIAGRAM: IMPORTANT - DRAW COMPLETE DIAGRAM OF WHERE AND HOW ACCIDENT HAPPENED USING SYMBOLS BELOW SHOWING STREET NAMES AND INDICATING DIRECTION OF TRAVEL BY LINE OF ARROWS OF VEHICLES INVOLVED

POINTS OF CONTACT (SHOW BY (✓) MARK) ON SYMBOLS





FORM 6193A

ON THE SCENE

POLICE CAR # ________ POLICE NAME ________________________ BADGE # ________ POLICE NAME ________________________ BADGE # ________

RESCUE # ________ # CLAIM INJURIES ________ # WITNESSES ________ INCIDENT CARD SERIAL # ____________ VIDEO ☐ YES ☐ NO

INJURED PERSONS

(please circle one)

NAME / ADDRESS	DOB / SSN	INJURY / HOSPITAL	WAS IN WHICH VEHICLE/LOCATION	REMOVED BY / REMOVED HOW
			SEPTA Opposing	Police#_____ Rescue#_____
			Walk on Pedestrian	Walked Carried Refused
			SEPTA Opposing	Police#_____ Rescue#_____
			Walk on Pedestrian	Walked Carried Refused
			SEPTA Opposing	Police#_____ Rescue#_____
			Walk on Pedestrian	Walked Carried Refused
			SEPTA Opposing	Police#_____ Rescue#_____
			Walk on Pedestrian	Walked Carried Refused
			SEPTA Opposing	Police#_____ Rescue#_____
			Walk on Pedestrian	Walked Carried Refused

CONDITIONS AND TRAFFIC CONTROLS

(check appropriate boxes)

WEATHER
☐ CLEAR ☐ CLOUDY ☐ FOGGY ☐ RAINING ☐ SLEETING ☐ SNOWING

VISIBILITY
☐ DAWN ☐ DAY ☐ DUSK ☐ DARK

CONDITION OF HIGHWAY OR TRACK
☐ DRY ☐ GREASY ☐ ICY ☐ SNOW ☐ UNDER REPAIR ☐ WET

SIGNALS AND SIGNS
☐ NONE ☐ TRAFFIC LIGHT ☐ 2WAY STOP ☐ 4WAY STOP ☐ YIELD ☐ PEDESTRIAN ☐ SEPTA SIGNAL # ________

VISIBLE ☐ YES ☐ NO WORKING ☐ YES ☐ NO COMMENTS ________________________________

GRADE CROSSING
☐ NONE ☐ FLASHING LIGHTS ☐ GATES ☐ CROSS BUCKS ☐ HIGHWAY PRE-EMPT ☐ ADVANCE WARNING ☐ TRAFFIC LIMIT LINES

VISIBLE ☐ YES ☐ NO WORKING ☐ YES ☐ NO COMMENTS ________________________________

TRAFFIC LINES
☐ NONE ☐ LANE MARKERS ☐ BROKEN PASSING ☐ SOLID NO PASSING ☐ SHOULDER MARKERS ☐ MEDIAN ☐ GUARD RAIL

SUPERVISOR'S COMMENTS and measurements if appropriate ________________________________

____

____

____

____

____

SUPERVISOR'S NAME (print) ________ ACCOUNT # ________ SUPERVISOR'S SIGNATURE ________ DATE OF REPORT ________

SEPTA – System Safety Incident Report

Southeastern Pennsylvania Transportation Authority
PUBLIC & OPERATIONAL SAFETY DIVISION
System Safety Department
INCIDENT REPORT

Safety Officer On Call:____________________ **Time of Arrival:**______________

Day: ______________________________ **Date:**__________________________

Control Center Incident Number:_____________

Time Called/Beeped by Control Center: ___________________ **A.M. P.M.**

Director/Controller: ____

Time of Incidence Occurrence:____________________ **A.M. P.M.**

Type of Incidence:____

Route #:____________________ **Block #** ____________________ **Vehicle #** ________

RR Line:_________ **Run Assignment #** _________ **Car #** _________ **Train #** _________

Location:____

Direction of Travel:____

Vehicle(s)# Involved:____

Employee(s) Involved:____

____

Estimated Damage to Equipment and/or Structure $:____________________________

Number of Injuries:_______ **Fatalities?** ☐ **Yes** ☐ **No** **How Many?** _________

Hospital(s):____

Fire/Rescue(s) Responding:____

Police Department(s) Responding:____

SEPTA Body Fluids Test Conducted? ☐ **Yes** ☐ **No**

Federal Toxicological Test Conducted? ☐ **Yes** ☐ **No**

Environmental Conditions:

Visibility: **Dawn** ☐ **Day** ☐ **Dusk** ☐ **Dark** ☐ **In Tunnel:** ☐ **Yes** ☐ **No** ☐

Weather: **Clear** ☐ **Cloudy** ☐ **Rain** ☐ **Fog** ☐ **Sleet** ☐ **Snow** ☐

Other SEPTA Personnel at Scene:

____

____

____

____

____

____

____

____

____

ACC 101-2/99
Revised December 20, 2005

Witness(es):

Name: ______________________________
Address: ______________________________
____
Phone #: ______________________________

Name: ______________________________
Address: ______________________________
____
Phone #: ______________________________

Name: ______________________________
Address: ______________________________
____
Phone #: ______________________________

Name: ______________________________
Address: ______________________________
____
Phone #: ______________________________

Injured Party(ies)

Name: ______________________________
Address: ______________________________
____
Status/Injury: ______________________________

Age: ____________________
d.o.b.: ____________________
Phone #: ____________________
Sex: ____________________

Name: ______________________________
Address: ______________________________
____
Status/Injury: ______________________________

Age: ____________________
d.o.b.: ____________________
Phone #: ____________________
Sex: ____________________

Narrative of Occurrence Based Upon Available Information:

Notification must be made in accordance with checklist.

Notification Checklist

FRA-NTSB Notification Required ☐ **Yes** ☐ **No**
(1-800-424-0201 {24 hours per day})
Date: ________ **Time:** ________ **Contact Person:** ________
Report Number: ________

****
FTA Notification Required ☐ **Yes** ☐ **No**
(1-215-656-7100 / fax 7260 {24 hours per day})
Date: ________ **Time:** ________ **Contact Person:** ________

****
PRTSRP Notification Required ☐ **Yes** ☐ **No**
(1-800-914-6987) Dave Barber, pager; 717-787-1207 (leave message if page not answered)
Fax – 717-772-2985
Date: ________ **Time:** ________ **Contact Person:** ________

Complete and Attach *"Incident Report Supplement" – PRTSRP Notifications"*

****
Pennsylvania State Police Notification Required ☐ **Yes** ☐ **No**
(1-215-560-6200 or 7099 (direct) / fax 6228 {business hrs} Trooper Mark Michaels / pager 1-610-639-7999 {after hours})
Date: ________ **Time:** ________ **Contact Person:** ________

****
PUC Notification Required ☐ **Yes** ☐ **No**
Harrisburg (Don Wilson): 1-717-772-2254, fax 3114 (business hours) / 1-717-432-0661 (after hours)
Date: ________ **Time:** ________ **Contact Person:** ________
And...
Philadelphia (Sant Harrison): 1-215-952-1190, 91, 92, 93 / fax 1199 (business hours only)
Date: ________ **Time:** ________ **Contact Person:** ________

****
Included With This Report Are:
Operator Report ☐ **Supervisor Report** ☐ **Interviews** ☐ **Photographs** ☐ **Vehicle Inspection** ☐
Event Recorder Log ☐ **CD-ROM** ☐ **Field Notes** ☐ **Sketch** ☐ **Chain of Custody** ☐
Evidence ☐ **Control Center Report** ☐ **Police Report** ☐ **D&A Form** ☐
Radio / Telephone Tapes ☐ **Infrastructure Inspection** ☐
Other ☐ ________

Signature: ________ **Date:** ________

Page 3 of 4

Incident Report Supplement
PRTSRP Notifications

Incident Date ______________ **Incident Location** __________________________

This Incident Report Supplement addresses the documentation requirements promulgated by Federal Transit Administration and PRTSRP Program requirements pursuant to Title 49 CFR 659.35(d) regarding the content of investigation final reports.

Item 1 – Incident Classification

☐ PRTSRP requires System Safety detailed investigation / report – Stop. (*Attach copy of PRTSRP letter*)

☐ PRTSRP **does not require** System Safety detailed investigation / report – ***Complete Items 2 & 3 Below***

Item 2 – Probable Cause & Contributing Factors

Probable Cause	***Contributing Factors***
☐ Human Factor (SEPTA Employee) ☐ Rules Infraction ☐ Hours of Service ☐ Toxicological	☐ Human Factor (SEPTA Employee) ☐ Rules Infraction ☐ Hours of Service ☐ Toxicological
______ (Specify)	
☐ Human Factor (Other Actors)	☐ Human Factor (Other Actors)
______ (Specify)	
☐ Vehicle Condition (SEPTA)	☐ Vehicle Condition (SEPTA)
______ (Specify)	
☐ Vehicle Condition (Other)	☐ Vehicle Condition (Other)
______ (Specify)	
☐ Infrastructure / Facility Condition (SEPTA)	☐ Infra / Fac Condition (SEPTA)
______ (Specify)	
☐ Roadway Condition	☐ Roadway Condition
______ (Specify)	
☐ Weather / Environmental Condition	☐ Weather / Environmental Condition
______ (Specify)	
☐ Other ______________________	☐ Other ____________________

Item 3 – Recommendations

☐ No Recommendations Issued

☐ Recommendations – Forward Corrective Action Plan (CAP) upon completion / generation.

Information included herein represents a good-faith determination based on contemporaneous and readily available data at the time of supplement preparation. Classifications included herein do not supersede nor preclude modal supervision from making determination of preventability and/or disciplinary action.

SF Muni Accident Report Forms

Confidential to the City Attorney

Supervisor Form

Incident Number: FY09-00296

[redacted]

Basic Information
Incident Details
Primary Agency Vehicle Involved
Other Vehicle Involved
Agency Passenger(s) Involved
Pedestrians Involved
Witness Information
Injury Section
Drug & Alcohol Questions
Responders
Supervisor Analysis
Close Section

Basic Information	
Preparer's ID*	
Preparer's Name	[redacted]
Preparer's Title	
Involved Employee ID	MO04120882
Employee Name	Mary O'Brien
Employee Title	Principal Admin Analyst
Date of Incident	7/24/2008 (MM/DD/YYYY)
Mode	Bus
Incident Type	Collision
Number of Other Employees Involved	0
Was a Vehicle Involved?	Yes
Was an Injury Involved?	Yes

Return to top

Incident Details	
Time of Incident* OSHA 301	
Can Time Be Determined?*	

OSHA 301	
Division	Presidio
Department	
Location On	[redacted]
Location At	[redacted]
Fixed Location	[redacted]
City	San Francisco [redacted]
State	CALIFORNIA
Description of Location	
Weather	
Lighting	
Description of Environmental Conditions	
Description of Incident*	
Return to top	
Primary Agency Vehicle Involved	
Vehicle Number 1	[redacted]
Line Number	[redacted]
Run Number	
Driver Employee ID*	
Name of Driver	[redacted]
Number of Passengers	
Names of Passengers	
Collision Type	
Collision Description	
Collision With	
Return to top	
Other Vehicle Involved	

How many other vehicle(s) were involved in the incident?	0
Return to top	
Agency Passenger(s) Involved	
How Many Passengers were Involved?	0
Return to top	
Pedestrians Involved	
How Many Pedestrians were Involved?	
Return to top	
Witness Information	
Number of Witness(es)	
Return to top	
Injury Section	
Was a Non-Employee Injured?*	
Was the Involved Employee Injured?*	
Number of Fatalities	
Number of Injuries	
Number of Injuries - Refused Aid	
Number of Injuries - First Aid	
Number of Injuries - Beyond First Aid	
Return to top	
Drug & Alcohol Questions	
(3) If the accident involved a road service vehicle was there disabling damage to any vehicle(i.e. was any vehicle towed away)?	
(5) Can the driver's performance be completely discounted as a contributing factor to the accident?	
(5) Is drug and alcohol testing required?	
(5) Please explain if the driver's performance can be completely discounted as a contributing factor yet no drug or alcohol testing is required.	
(6) Could any other safety sensitive employee have contributed to the accident?	
(7) Was testing performed within two hours of the	

accident?	
(7) If no please, state an explanation.	
(7) Was testing performed within eight hours of the accident?	
(8) If no please state an explanation.	
(1) Did this accident involve a fatality?	
(2) Was there any injury for which the individual received immediate medial treatment away from the scene?	
(4) If the accident involved a rail vehicle or trolleybus (LRV, PCC, streetcar, trolleybus, or Cable Car), did the rail vehicle or trolleybus have to be removed from service?	
Return to top	
Responders	
Did the police respond to the Incident?	
Name of Police Agency	
Police Investigator Name	
Police Case Number	
Did an ambulance/EMT respond to the Incident?	
Name of Ambulance/EMT Agency	
Ambulance/EMT Unit Number	
Return to top	
Supervisor Analysis	
Did the invloved employee work the previous shift?	
Analysis of the Incident*	
Other Parties' Version of the Incident	

Additional Remarks	
Employee Training History (last two years)	CPR, First Aid Training and/or AED-7571, CPR and F/A 4-28-2005-7527
Retraining Required?	
Recommended Retraining	
Property Damage?	
Estimated Property Damage*	$
Report Closed	
Return to top	
Close Section	
Employee ID*	
Name	[redacted]
Title	
Corrective Action	
Supporting Documentation	
E-mail Notification	
Return to top	
* = Required	

[redacted]

Confidential to the City Attorney

Safety Form

Incident Number: FY09-00296

[redacted] [redacted] [redacted]

Basic Information
Incident Details
Environmental Conditions of Incident
Primary Agency Vehicle
Other Vehicle Involved
Pedestrians & Passengers Involved
Type of Incident Analysis
Safety Analysis
Incident Consequences

Basic Information	
Preparer's ID*	
Name	[redacted] [redacted]
Title	
Phone* NTD Major	
Email* NTD Major	
Date Last Edited* NTD Major	(MM/DD/YYYY)
Primary Involved Employee ID	MO04120882
Involved Employee Name	Mary O'Brien
Involved Employee Title	Principal Admin Analyst
Number of Other Employees Involved	0
Other Involved Employee(s)	
Date of Incident	7/24/2008 (MM/DD/YYYY)
Mode	Bus
Incident Type	Collision
Was a Vehicle Involved?	Yes

Was an Injury Involved?	Yes
Return to top	
Incident Details	
Time of Incident* NTD Major, CPUC Form T	
NTD Mode* NTD Major	Bus
Service Type* NTD Major	
Division	Presidio
Department	
Location On	[redacted]
Location At	[redacted]
Fixed Location	[redacted]
City	San Francisco [redacted]
State	CALIFORNIA
Description of Location CPUC Form T	
Station, Route or Street Name Associated with Incident* NTD Major	
Longitude NTD Major	
Latitude NTD Major	
Time Zone* NTD Major	Pacific
Standard/DST* NTD Major	
Description of the Incident* CPUC Form T	
Return to top	
Environmental Conditions of Incident	
Weather* NTD Major	
Traffic*	
Lighting*	

NTD Major	
Type of Right of Way/Roadway*	
Right of Way/Roadway Configuration* NTD Major	
Right of Way/Roadway Conditions* NTD Major	
Intersection Controls* NTD Major	
Intersection Controls Details*	
Actions/Existing Conditions* NTD Major	
Actions/Existing Conditions Description* NTD Major	
Other Condition Comments NTD Major	
Return to top	
Primary Agency Vehicle	
Vehicle Number 1	[redacted] [redacted]
Line Number	[redacted] [redacted]
Run Number	
Vehicle Type* NTD Major	
Vehicle Action* NTD Major	
Vehicle Description* NTD Major	
Vehicle Make	
Vehicle Model	
Vehicle Year	
Return to top	

Confidential to the City Attorney

Collision Subform - Safety

Incident Number: FY09-00296

[redacted] [redacted]

Manner of Collision* NTD Major, CPUC T						
Collision Type* NTD Major						
Collision Location* NTD Major						
Collision Description* NTD Major						
Estimated Property Damage* NTD Major, CPUC T	$ 0					
	Transit Passengers	Transit Facility Occupants	Transit Employees	Other Workers	Trespassers	Others
Refused Aid* NTD Major	0	0	0	0	0	0
Fatalities* NTD Major, CPUC T	0	0	0	0	0	0
Injuries (Treated at the scene and released)* NTD Major	0	0	0	0	0	0
Injuries (Transported to Hospital)* NTD Major	0	0	0	0	0	0
Injuries (Admitted to Hospital)* NTD Major, CPUC T	0	0	0	0	0	0
* = Required						

[redacted] [redacted]

Other Vehicle Involved

How many other vehicle(s) were involved in the incident?	0
Describe Actions of Other Vehicles* NTD Major	

Return to top

Pedestrians & Passengers Involved

How Many Pedestrians were Involved?	0
Describe Actions of Other Individuals* NTD Major	
Describe Actions of Other Passengers* NTD Major	

Return to top

Type of Incident Analysis

NTD Primary Event* NTD Major	
NTD Secondary Event NTD Major	☐ Evacuation ☐ Fire ☐ Vehicle Leaving Roadway
Safety Incident Category	
Sub Forms	

Return to top

Safety Analysis

Analysis of the Incident*	
Claim Number	
Investigation Start Date	(MM/DD/YYYY)
Investigation End Date	(MM/DD/YYYY)
Parties Interviewed	

Results	
Cause	
Investigation Status	
Report Closed	
Total Property Damage* CPUC Form T	$ 0
Return to top	

Incident Consequences

	Transit Passengers	Transit Facility Occupants	Transit Employees	Other Workers	Trespassers	Others
Refused Aid	0	0	0	0	0	0
Fatalities	0	0	0	0	0	0
Injuries (Treated at the scene and released)	0	0	0	0	0	0
Injuries (Transported to Hospital)	0	0	0	0	0	0
Injuries (Admitted to Hospital)	0	0	0	0	0	0
Corrective Action						
Supporting Documentation						
E-mail Notification						

Return to top

* = Required

[redacted] [redacted] [redacted]

Confidential to the City Attorney

Employee Form

Incident Number: FY09-00296

[redacted] [redacted] [redacted] [redacted]

Basic Information
Incident Details
Primary Agency Vehicle Involved
Other Vehicle Involved
Agency Passenger(s) Involved
Pedestrians Involved
Witness Information
Injury Section
Close Section

Basic Information	
Involved Employee ID	MO04120882
Employee Name	Mary O'Brien
Employee Title	Principal Admin Analyst
Date of Incident	7/24/2008 (MM/DD/YYYY)
Mode	Bus
Incident Type	Collision
Number of Other Employees Involved	0
Was a Vehicle Involved?	Yes
Was an Injury Involved?	Yes
Return to top	
Incident Details	
Time of Incident	
Can Time Be Determined?	
Division	Presidio
Department	
Location On	[redacted] [redacted]
Location At	[redacted] [redacted]
Fixed Location	[redacted] [redacted]
City	San Francisco [redacted] [redacted]

State	CALIFORNIA
Description of Location	
Weather	
Lighting	
Description of Environmental Conditions	
Description of Incident*	
Blind Claim ?	
Under Investigation	
Collision with	
CAO Claim #	
CAO Investigator	
Amount Paid	$
Date Paid	(MM/DD/YYYY)
Operator Report filed	
Claimant's Name	
Claim Status	
Date Claim filed	(MM/DD/YYYY)
Date referred to Operations	(MM/DD/YYYY)
Blind Claim Meeting Notes	
ARS Code	

Return to top

Primary Agency Vehicle Involved

Vehicle Number 1	[redacted]
Line Number	[redacted]
Run Number	
Vehicle Action	
Vehicle Description	

Property Damage	
Driver Employee ID*	
Employee Name	[redacted] [redacted]
Defect Card Completed ?	
Type of Vehicle Involved	
Collision Type	
MTA Damage	
Return to top	
Other Vehicle Involved	
How many other vehicle(s) were involved in the incident?	
Return to top	
Agency Passenger(s) Involved	
How Many Passengers were Involved in the Incident?	
Return to top	
Pedestrians Involved	
How Many Pedestrians were Involved?	
Return to top	
Witness Information	
Number of Witnesses	
Return to top	
Injury Section	
Was a Non-Employee Injured?*	
Were you Injured?*	
Return to top	
Close Section	
Preparer's Section	
Employee ID	
Name	[redacted] [redacted]
Title	
Phone Number	
Reviewer's Section	
Employee ID	
Name	[redacted] [redacted]

Title	
Comments	
Closer's Section	
Employee ID*	
Name	[redacted]
Titie	
Corrective Action	
Supporting Documentation	
E-mail Notification	
Return to top	
* = Required	

[redacted]

Confidential to the City Attorney

New Incident Form

[redacted]

Involved Employee ID*	MO04120882
Employee Name	Mary O'Brien [redacted]
Employee Title	Principal Admin Analyst
Number of Other Involved Employees*	0
Date of Incident*	7/24/2008 (MM/DD/YYYY)
Mode*	Bus
Incident Type*	Collision
Division*	Presidio
Was a Vehicle Involved?*	Yes
Was an Injury Involved?*	Yes
Select Additional Incident Forms (Supervisor Form Always Generated)	☑ Employee Form ☑ Safety Form ☐ Security Form
* = Required	

[redacted]

Toronto Transit Commission – Accident Report Form

Side 1

Form ... Toronto Transit Commission

Occurrence Report

This report is made for the exclusive use of the Solicitor to the Commission for information and advice in case action is brought.

Office Use
Serial No.
Office Report No.
Division / Empl. No.

This report is being submitted for the following occurrence:

- 1 ☐ Collision with vehicle
- 2 ☐ Collision with fixed object
- 3 ☐ Collision with cyclist
- 4 ☐ Collision with TTC vehicle
- 5 ☐ Collision with pedestrian
- 6 ☐ Collision with other
- 7 ☐ Switch incident
- 8 ☐ Derailment
- 9 ☐ Dewirement
- 10 ☐ Witness
- 11 ☐ Fare dispute
- 12 ☐ Fire on vehicle
- 13 ☐ Assault
- 14 ☐ On board
- 15 ☐ Other

Operator's Full Name (please print)	Empl. No.	Telephone No.

Address	Postal Code	Date Report Handed In — Year / Month / Day	Time ☐ am ☐ pm

Route No./Name	Location (provide full name of street) on: ... at:	Switch No.

Run No.	Vehicle No.	Day (circle) S M T W T F S	Date of Occurrence — Year / Month / Day	Time ☐ am ☐ pm	No. of Injured	No. of Passengers

Other Vehicle/Object

Driver	Address	Postal Code	Telephone No.
Owner	Address	Postal Code	Telephone No.
Licence Plate No.	Insurance Co. and Policy No.		Expiry Date
Vehicle Year and Make	No. of Occupants	Extent of Damage	

Others Involved

☐ Customer ☐ Motorist/Passenger ☐ Pedestrian ☐ Cyclist	☐ Male ☐ Female	Name	Age/DOB
Address	Postal Code	Telephone No.	
Injuries	Type of Footwear	Mobility Aid	
☐ Customer ☐ Motorist/Passenger ☐ Pedestrian ☐ Cyclist	☐ Male ☐ Female	Name	Age/DOB
Address	Postal Code	Telephone No.	
Injuries	Type of Footwear	Mobility Aid	

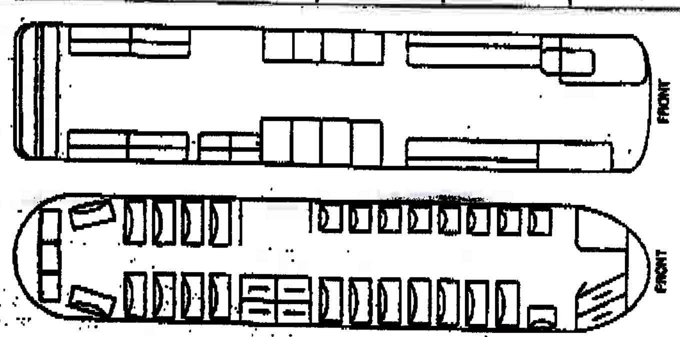
If person fell near step, complete this block describing conditions of ☐ Dry ☐ Wet ☐ Snow/slush ☐ In good order ☐ Defective

Witnesses

Name	☐ On street ☐ On board ☐ Motorist	☐ Male ☐ Female	Telephone No.
Address			Postal Code
Name	☐ On street ☐ On board ☐ Motorist	☐ Male ☐ Female	Telephone No.
Address			Postal Code

If additional list of passengers, witnesses, injured and/or vehicles refer to attached sheet. Number of sheets attached ▶

Front End	Head On	Side Swipe	Side Swipe	Overtaking	Right Turn	Right Turn	Left Turn	Left Turn	Left Turn	Intersection 90°	Fixed Object
→ →	→ ←	→ →	→ ←	→ →	→ ↓	→ ↓	→ ↑	→ ↑ ←	→ ↑	→ ↓	→ ■



Mark where "on board" injury(s) occurred with an "X"

Your Diagram: Show the position of the vehicles at time of impact.

N
W E
S

Identify arrow representing your vehicle with letter "A". Other vehicle(s) with numbers. Identify pedestrians with "O".

Conditions

- 1 ☐ Clear
- 2 ☐ Overcast
- 3 ☐ Fog
- 4 ☐ Rain
- 8 ☐ Freezing Rain
- 5 ☐ Flurries
- 7 ☐ Snow

- 1 ☐ Dry
- 19 ☐ Wet
- 20 ☐ Snow covered
- 8 ☐ Ice
- 9 ☐ Oil/Grease
- 24 ☐ Leaves

- 1 ☐ Good
- 2 ☐ Fair
- 3 ☐ Poor
- 4 ☐ Debris
- 5 ☐ Ice
- 6 ☐ Leaves

TTC
- 1 ☐ Unnecessary
- 2 ☐ Necessary not given
- 3 ☐ Horn/Gong
- 4 ☐ Hand Signal
- 5 ☐ No Time
- 6 ☐ Other

Vehicle
- 1 ☐ Unnecessary
- 2 ☐ Necessary not given
- 3 ☐ Horn/Gong
- 4 ☐ Hand Signal
- 5 ☐ No Time
- 6 ☐ Other

Switch Type
- E ☐ Electric No. ______
- M ☐ Manual

Switch Condition
- 1 ☐ Not Functioning
- 2 ☐ Functioning
- 3 ☐ Plugged
- 4 ☐ Debris

Lighting
- 1 ☐ Daylight
- 3 ☐ Dark
- 2 ☐ Dusk
- 4 ☐ Dawn

Road/Rail Type (check all applicable)
- G ☐ Gravel/other
- A ☐ Asphalt/concrete
- S ☐ Straight
- C ☐ Curve
- U ☐ Upgrade
- D ☐ Downgrade
- C ☐ Construction

Lights
- TTC: Y ☐ On N ☐ Off
- Vehicle: Y ☐ On N ☐ Off
- Street: Y ☐ On N ☐ Off

Speed (prior to impact)
- TTC ______ kmph
- Vehicle ______ kmph

Distance TTC vehicle went after impact ______ metres

Equipment used (e.g. seatbelt, fire extinguisher, CIS)

Onboard Injuries

(for multiple on board provide information on Injury Supplementary List)

Passenger
- 1 ☐ Fell/tripped
- 2 ☐ Caught in door
- 3 ☐ Dragged: Distance ______ metres
- 4 ☐ Other
- 5 ☐ Passenger hit by other vehicle

Location
- 1 ☐ Front doors
- 2 ☐ Rear doors
- 3 ☐ Centre doors
- 4 ☐ In aisle
- 5 ☐ Perimeter seats
- 6 ☐ Transverse seats
- 7 ☐ Steps

Passenger Action
- 21 ☐ Alighting
- 22 ☐ Boarding
- 23 ☐ Arising/sitting
- 24 ☐ Seated
- 25 ☐ Standing
- 26 ☐ Moving
- 27 ☐ Paying Fare
- U ☐ Using mobility aid
- C ☐ Carrying parcels

If Involving a Wheelchair/Scooter Incident
- 1 ☐ On board (strapped in)
- 2 ☐ On board no straps on
- 3 ☐ On ramp/lift
- 4 ☐ Off vehicle
- 1 ☐ Operator assisted
- 2 ☐ Attendant assisted
- 3 ☐ On own

At Time TTC Vehicle
- 1 ☐ Starting
- 2 ☐ Sudden Start
- 3 ☐ Slowing
- 4 ☐ Sudden Stop
- 5 ☐ Stopped
- 15 ☐ Turning
- 4 ☐ Changing Lanes
- 14 ☐ Swerving
- 1 ☐ Going Straight
- 13 ☐ Backing
- 5 ☐ Entering bay/platform
- 6 ☐ Exiting bay/platform
- 16 ☐ In bay/at stop

Emergency Response

TTC Supervisor	Police Attended ☐ Yes ☐ No	Police Badge No.	Police Division	Fire Dept. ☐ Yes ☐ No	Pumper No.
Division	Medical Attention ☐ Yes ☐ No	MTA No.	Hospital		

Police Charges: Y ☐ Yes N ☐ No P ☐ Pending

Who: M ☐ Motorist T ☐ Operator O ☐ Other

Charges:

Details of Occurrence

Operator's Signature

...formation is collected under the authority of the City of Toronto Act, 1997 (No. 2), S.O. 1997, Chapter 25, Part IV, Section 3... injury/witness data and initiate processes related to collision/occurrence investigations. Questions about this collection... Claims Section, Toronto Transit Commission, 1900 Yonge St. Toronto, Ontario, M4S 1Z2 416-393-3873...

☐ Claims ☐ Safety ☐ Security ☐ Marketing ☐ Divisional File ☐ Employee Record

Surface Supervisory Occurrence Report 185L

This report is made for the exclusive use of the Solicitor to the Commission for information and advice in case action is brought.

This report is being submitted for the following occurrence:
1 ☐ Collision with vehicle 2 ☐ Collision with fixed object 3 ☐ Collision with cyclist 4 ☐ Collision with TTC vehicle 5 ☐ Collision with pedestrian 6 ☐ Collision with other 7 ☐ Switch incident 8 ☐ Derailment 9 ☐ Dewirement 10 ☐ Witness 11 ☐ Fare dispute 12 ☐ Fire on vehicle 13 ☐ Assault 14 ☐ On board 15 ☐ Other

Classification 1 ☐ Minor 2 ☐ Moderate 3 ☐ Major 4 ☐ Severe

Route No. | Run No. | Direction | Vehicle No.

Was Operator Injured? Y ☐ Yes N ☐ No

Service Activity: 1 ☐ In Service 2 ☐ first trip 3 ☐ last trip 4 ☐ Changeoff 5 ☐ Garage Routing 6 ☐ Non-Revenue Vehicle

Location Type (check all appropriate boxes): 1 ☐ At intersection 2 ☐ Mid block 3 ☐ Loop 4 ☐ Garage 5 ☐ Near side stop 6 ☐ Far side stop 7 ☐ Entering Bay/stop 8 ☐ Exiting Bay/stop 9 ☐ In Bay/at stop 10 ☐ Terminal 11 ☐ At island 12 ☐ Curb

Location (provide full name of street)
on: at: Switch No.

Day | Month | Year | Day (circle) S M T W T F S | Time of Incident ☐ am ☐ pm | Time at Scene ☐ am ☐ pm | No. of Injured | No. of Injured to Hospital | No. of Passengers

Division | Operator No. | Operator Name

Emergency Response

Police Badge No. | Division | MTA Unit No. | Fire Stn. | Fire Officer in Charge | How Equipment Cleared? ☐ Operated Private ☐ Returned to Service ☐ Changeoff ☐ Towed/coupled

TTC Emergency Truck | Charges Y ☐ Yes N ☐ No P ☐ Pending | Who M ☐ Motorist 7 ☐ Operator O ☐ Other | Charges

TTC/Other in Attendance

Name	Empl. No.	Department

Other Vehicle / Object

Driver | Driver's Licence No. | Telephone No.
Address | Postal Code
Owner | Telephone No.
Address | Postal Code
Licence Plate No. | Insurance Co. and Policy No. | Expiry Date
Vehicle Year and Make | No. of Occupants | Extent of Damage
Motorist Injured? ☐ Yes ☐ No | Extent of Injury: | Transported to:

Others Involved

Check One: ☐ Passenger ☐ Pedestrian ☐ Other | ☐ Male ☐ Female | Name | Age/DOB
Address | Postal Code | Telephone No.
Injuries | Type of Footwear | Mobility Aid

Check One: ☐ Passenger ☐ Pedestrian ☐ Other | ☐ Male ☐ Female | Name | Age/DOB
Address | Postal Code | Telephone No.
Injuries | Type of Footwear | Mobility Aid

If person fell near step, complete this block describing conditions of ☐ Dry ☐ Wet ☐ Snow/slush ☐ In good order ☐ Defective

Witnesses

Name | ☐ On street ☐ On board ☐ Motorist | ☐ Male ☐ Female | Telephone No.
Address | Postal Code
Name | ☐ On street ☐ On board ☐ Motorist | ☐ Male ☐ Female | Telephone No.
Address | Postal Code

If additional list of passengers, witnesses, injured and/or vehicles refer to attached sheet. Number of sheets attached ▶

Conditions

Road/Rail Type (check all applicable): G ☐ Gravel/Other A ☐ Asphalt/Concrete S ☐ Straight C ☐ Curve U ☐ Upgrade D ☐ Downgrade C ☐ Construction
Contribute to occurrence Y ☐ Yes N ☐ No U ☐ Unknown

Weather: 1 ☐ Clear 2 ☐ Overcast 3 ☐ Fog 4 ☐ Rain 8 ☐ Freezing Rain 6 ☐ Flurries 7 ☐ Snow
Contribute to occurrence Y ☐ Yes N ☐ No U ☐ Unknown

Road Conditions: 1 ☐ Dry 19 ☐ Wet 20 ☐ Snow covered 9 ☐ Oil/Grease 8 ☐ Ice 24 ☐ Leaves
Contribute to occurrence Y ☐ Yes N ☐ No U ☐ Unknown

Rail Conditions: 1 ☐ Good 2 ☐ Fair 3 ☐ Poor 4 ☐ Debris 5 ☐ Ice 6 ☐ Leaves
Contribute to occurrence Y ☐ Yes N ☐ No U ☐ Unknown

Lighting: 1 ☐ Daylight 3 ☐ Dark 2 ☐ Dusk 4 ☐ Dawn; Street lights Y ☐ On N ☐ Off
Contribute to occurrence

Switch Type: E ☐ Electric No. ______ M ☐ Manual

Switch Condition: 1 ☐ Not Functioning 2 ☐ Functioning 3 ☐ Plugged 4 ☐ Debris
Contribute to occurrence

Speed: TTC kmph | Vehicle kmph

Skid/sand marks: TTC m | Vehicle m

Contribute to occurrence

Vehicle / Traffic Collision

2 ☐ Vehicle
3 ☐ Bicycle
4 ☐ Animal
5 ☐ Fixed object: ______
6 ☐ Moving object: ______

Location of other Vehicle to TTC

	Other (1)	Other (2)
Approach opposite direction	1 ☐	1 ☐
Approach from angle	2 ☐	2 ☐
Ahead	3 ☐	3 ☐
Behind	4 ☐	4 ☐
Overtaking / passing	5 ☐	5 ☐
Being over taken / passed	6 ☐	6 ☐
Stationary	7 ☐	7 ☐

	TTC	Other (1)	Other (2)
Front	F ☐	F ☐	F ☐
Rear	R ☐	R ☐	R ☐
Open	O ☐	O ☐	O ☐
Closed	C ☐	C ☐	C ☐
Corner	1 ☐	1 ☐	1 ☐
Wheels	2 ☐	2 ☐	2 ☐
Doors	3 ☐	3 ☐	3 ☐
Underbody	4 ☐	4 ☐	4 ☐
Between wheels	5 ☐	5 ☐	5 ☐
Centre doors	6 ☐	6 ☐	6 ☐
Roof	7 ☐	7 ☐	7 ☐

Extent of TTC Vehicle Damage
0 ☐ None 1 ☐ Minor 3 ☐ Moderate 5 ☐ Extensive

	TTC	Other (1)	Other (2)
Going straight ahead	1 ☐	1 ☐	1 ☐
Turning left	2 ☐	2 ☐	2 ☐
Turning right	3 ☐	3 ☐	3 ☐
Changing lanes	4 ☐	4 ☐	4 ☐
Entering bay / loop / station	5 ☐	5 ☐	5 ☐
Exiting bay / loop / station	6 ☐	6 ☐	6 ☐
Stopped traffic / pedestrians	7 ☐	7 ☐	7 ☐
Stopped traffic control	8 ☐	8 ☐	8 ☐
Stopped for passengers	9 ☐	9 ☐	9 ☐
Slowing	10 ☐	10 ☐	10 ☐
Parked	11 ☐	11 ☐	11 ☐
Involved in collision	12 ☐	12 ☐	12 ☐
Reversing	13 ☐	13 ☐	13 ☐

Onboard Injuries

(for multiple on board provide information on Injury Supplementary List)

Passenger
1 ☐ Fell/tripped
2 ☐ Caught in door
3 ☐ Dragged: Distance ______ metres
4 ☐ Other
5 ☐ Passenger hit by other vehicle

Passenger Action
21 ☐ Alighting
22 ☐ Boarding
23 ☐ Arising / sitting
24 ☐ Seated
25 ☐ Standing
26 ☐ Moving
27 ☐ Paying Fare
U ☐ Using mobility aid
C ☐ Carrying parcels

At Time TTC Vehicle
1 ☐ Starting
2 ☐ Sudden Start
3 ☐ Slowing
4 ☐ Sudden Stop
5 ☐ Stopped
15 ☐ Turning
4 ☐ Changing Lanes
14 ☐ Swerving
1 ☐ Going Straight
13 ☐ Backing
5 ☐ Entering bay / platform
6 ☐ Exiting bay / platform
16 ☐ In bay / at stop

Location
1 ☐ Front doors
2 ☐ Rear doors
3 ☐ Centre doors
4 ☐ In aisle
5 ☐ Perimeter seats
6 ☐ Transverse seats
7 ☐ Steps

If involving a Wheelchair/Scooter Incident
1 ☐ On board (strapped in)
2 ☐ On board no straps on
3 ☐ On ramp / lift
4 ☐ Off vehicle
1 ☐ Operator assisted
2 ☐ Attendant assisted
3 ☐ On own

Collision with Pedestrian

Pedestrian was heading: ______ (direction) on ______ (name of street) Or was crossing ______ (name of street)

Pedestrian Contacted
1 ☐ By TTC
2 ☐ Walked into side of TTC
3 ☐ Unknown

TTC was
2 ☐ Turning left
3 ☐ Turning right
1 ☐ Straight
13 ☐ Reversing
11 ☐ Stationary

Area of Contact
F ☐ Front
R ☐ Rear
O ☐ Open
C ☐ Closed
1 ☐ Corner
2 ☐ Wheels
3 ☐ Doors
4 ☐ Underbody
5 ☐ Between wheels

Pedestrian was
31 ☐ Walking in street
32 ☐ Crossing mid block
33 ☐ Working / playing in
34 ☐ In crosswalk
35 ☐ At bay / stop crossing
36 ☐ On sidewalk
37 ☐ On curb
38 ☐ Crossing intersection

Pedestrian Crossing Intersection
1 ☐ With signal
2 ☐ Against signal
3 ☐ No signal
4 ☐ Diagonally
5 ☐ Unknown

Assault

Assault On
☐ Operator
☐ Passenger
☐ Other TTC

Weapons Present
☐ Yes
☐ No
☐ Used

Involved
☐ Physical altercation
☐ Verbal abuse
☐ Spat on
☐ Swarmed

Reason
☐ Fare dispute
☐ Service dispute
☐ Intoxication
☐ Mentally challenged
☐ Unknown

Location
☐ On Vehicle
☐ At Stop
☐ At Station
☐ Other: ______

Derailment / Switch

Derailed
N ☐ Front trucks
N ☐ Rear trucks
N ☐ Centre trucks

Derailed at/on
1 ☐ Yard
2 ☐ Switch
3 ☐ Special track work
4 ☐ Curve
5 ☐ Turn

Reason
1 ☐ Switch not functioning
2 ☐ NA switch not functioning
3 ☐ Debris
4 ☐ Defective rail
5 ☐ Collision
6 ☐ Other

Switch Incident
1 ☐ Switch open
2 ☐ Split switch
3 ☐ Contacted
4 ☐ Switch closed

Distance Derailed ______ meters

Details of Occurrence

Details: ______

Diagram

- Indicate North -

(show all traffic control points, TTC vehicle A other vehicles #, clearly indicate streets and direction)

Diagram not to scale

Supervisor's Name	Empl. No.	Personal information is collected under the authority of the City of Toronto Act, 1997 (No. 2), S.O. 1997, Chapter 26, Part IV, Section 30, and will be used to capture injury/witness data and initiate processes related to collision/occurrence investigations. Questions about this collection should be directed to the Claims Section, Toronto Transit Commission, 1900 Yonge St. Toronto, Ont., M4S 1Z2 (416) 393-3879.
Supervisor's Signature	Division	

Distribution: Copy to: ☐ *Claims* ☐ *Safety* ☐ *Security* ☐ *Marketing* ☐ *Divisional File* ☐ *Employee Records* ☐ *Employee*

Form 561/May 2002
Toronto Transit Commission

Side 1

Assessment and Summary Disposition Report

Operator	Empl. No.	Date of Occurrence	Report No.

Supervisor's Assessment of Causes

1. At the time of the collision the Operator was O ☐ On schedule A ☐ Ahead of schedule B ☐ Behind schedule Ahead/behind: ______ mins.
   Did the above contribute to the occurrence? Y ☐ Yes N ☐ No 0 ☐ Unknown
2. Operator: Continuous hours worked prior to occurrence ______
3. Was there any indication that the occurrence was result of being impaired or fatigued? ☐ Yes ☐ No
   If Yes, Operator: I ☐ Impaired F ☐ Fatigue Motorist/other: I ☐ Impaired F ☐ Fatigue
   Confirmed by ☐ Operator ☐ Motorist ☐ Witness ☐ Police ☐ Another TTC Supervisor ☐ Observation
4. Was there any indication that the Operator and/or motorist/other violated the law or a TTC rule or a basic defensive driving principle?
   Y ☐ Yes N ☐ No

   (If TTC Operator, check "T" series boxes; if motorist/pedestrian, check "O" series boxes.)

   T ☐ O ☐ Speeding
   T ☐ O ☐ Too fast for conditions
   T ☐ O ☐ Inattentive
   T ☐ O ☐ Improper turn
   T ☐ O ☐ Improper lane change
   T ☐ O ☐ Disobeying traffic signs/signals
   T ☐ O ☐ Failure to allow for proper clearance/tail swing
   T ☐ O ☐ Failure to yield
   T ☐ O ☐ Following too closely
   T ☐ O ☐ Improper passing
   T ☐ O ☐ Failure to check switch
   T ☐ O ☐ Other: ______

   Confirmed by ☐ Operator ☐ Motorist ☐ Witness ☐ Police ☐ Another TTC Supervisor ☐ Observation
   If the violation was that of the Operator's, did it cause the occurrence? Y ☐ Yes N ☐ No
5. Was there any defensive driving technique that could have been used by the Operator that may have prevented the occurrence?
   Y ☐ Yes N ☐ No
6. Were there any other factors not in Operator's control that contributed to the occurrence?
   ☐ Yes ☐ No
7. In your professional judgement was this occurrence 1 ☐ Preventable (Primary) 2 ☐ Preventable (Secondary) N ☐ Not preventable
   ☐ Unknown/Alleged (Explain below)

Comments: (provide comments on any "Yes" responses and on your decision regarding preventability)

Supervisor's Signature	Empl. No.	Division	Date

Summary Disposition

	Empl. No.	Date of Occurrence	Report No.

…ummary Disposition has been completed following review of all related reports and interview of the …ator of the TTC vehicle involved in the occurrence as applicable.

…ccurrence Preventability

… The determination of preventability is based on the ability of the Operator of the TTC vehicle to do everything reasonable to prevent this occurrence. The occurrence is classified as follows:

☐ Preventable (Primary) 2 ☐ Preventable (Secondary) N ☐ Not Preventable ☐ Unknown/Alleged (Explain below)

… Non-Classified Report

☐ Assault ☐ Fare Dispute ☐ Witness ☐ Other

…rior Occurrences (in the past 24 months)

☐ Not Applicable

…. No. of collisions — Preventable (Primary) ____ Preventable (Secondary) ____ Not Preventable ____

2b. No. of "on boards" — Preventable (Primary) ____ Preventable (Secondary) ____ Not Preventable ____

2c. No. of Switch Violations — Preventable (Primary) ____ Preventable (Secondary) ____ Not Preventable ____

2d. Action taken (indicate if any action has been taken more than once. eg. ☒ Counselled (2x)

☐ Not Applicable

☐ Interviewed ☐ Counselled ☐ Supervisor Follow Up

☐ Recertification ☐ On Notice ☐ ADD ☐ Relieved of Duty

… Action taken this occurrence:

☐ Not Applicable

1 ☐ Interviewed 3 ☐ Counselled 6 ☐ Supervisor Follow Up

2 ☐ Recertification 4 ☐ On Notice 7 ☐ ADD 8 ☐ Relieved of Duty

4. Comments: ____________________

Position	Signature	Date
☐ Superintendent ☐ Assistant Superintendent		

…istribution:

Copy to - ☐ Safety ☐ Divisional File ☐ Employee Records ☐ …

TOTAL P.07

Utah TRAX – Electronic Accident Report Form

This document must be filled in completely then "save as" a document named in the following format: **"Year/Month/Day/Operator number.doc" on the J: drive – Oprations – Accidents - Date folder (create a new folder and name it YYYY MM DD).** For example, an accident occurring on March 13, 2004 involving operator 1094 would have a file name: **"2004 03 13 1094.doc" (yyyy mm dd oooo.doc). Once saved, the document should be emailed to UTA Office of General Claims- Operator Supervisor- Rail Safety Administrator**

10/27/2008	**TRAX Supervisor's Accident/Incident Report Form**	1:48:32 PM

Date of Accident:	Monday	Time:	Photos taken: Yes	# of discs:	Damage Estimate: No

Supervisor name:	Asst. Supervisor name:
Location of Accident:	City:

UTA Information

Operator name:		Employee #:	SS#: On File
UTA Vehicle #:	Train #:	Block #:	Division: TRAX OPS

Police Investigation - ☐ Check if not applicable

Did Police investigate: No	Police Department:	Officer name:
Case #:	Citation issued: N/A	If yes, to whom:
What was citation for:		

Other Vehicle Information (Vehicle #2) - ☐ Check if not applicable

Driver name:		H Phone:	W Phone:		
Address:		City:	State:	Zip:	
DL#:	DL State:	Sex: Male	Date of Birth:		
Year:	Make:	Model:	Color:	Plate #:	State:
Owner name:		H Phone:	W Phone:		
Address:		City:	State:	Zip:	
Insurance Co:		Policy number:			
Agent:		Phone:			

Damaged Property - ☐ Check if not applicable

Owner name:	H Phone:	W Phone:	
Address:	City:	State:	Zip:
Describe property:			
Extent of damage:			
Vehicle Towed: N/A			

Number of Injuries: ☐ (if more than 1 use addendum 1)

Injured #1

Name:	H Phone:	W Phone:	
Address:	City:	State:	Zip:
Injured person was: (check one)	☐ Driver (veh #)	☐ Passenger (veh #)	☐ Pedestrian
Sex: Male	DOB:	Transported: Yes	If yes, where:
Nature of the injury:			

Witnesses - ☐ Check if not applicable

Witness name:	H Phone:	W Phone:	
Address:	City:	State:	Zip:
Witness name:	H Phone:	W Phone:	
Address:	City:	State:	Zip:

First Report of Injury- ☐ Check if not applicable

Supervisor:	**Date & Time**

Drug Testing - ☐ Check if not applicable

Drug test ordered: No	Type of test: N/A	Date ordered:	Time ordered:
Alcohol test done within 2 hours after accident? N/A	If no, why not:		

Description of Accident/Incident (all items **must** be completed)

Estimated Train speed:	Posted Speed:	
Weather Conditions: clear	Road Surface Conditions: dry	Track Conditions: dry
Light Conditions: daylight		
Train was: stopped	Vehicle #2 was: N/A	Vehicle #3 was: N/A
Traffic Controls: none	Last TRAX signal: Green - if stop indication was bypass authorized: Yes	Street Running Signal: N/A

Supervisors findings:
Probable Cause:
Contributory Causes:
Corrective Action Suggestions:

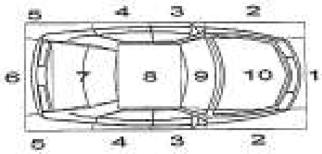
11/20/2006
ISO WH

Accident Classifications - ☐ Check if not applicable

Property Damage

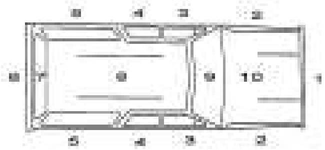
Enter the vehicle number in each applicable zone of damage using the zone key for the type of vehicle.

Passenger Vehicle



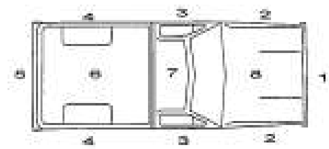
1	2	3	4	5	6	7	8	9	10
Bumper, Headlights, Grill	Fender, Wheel	Door, Glass, Pillar	Door, Glass, Pillar	Quarter Panel, Wheel	Bumper, Tail lights, Rear panel	Trunk, Floor Pan, Rear Glass	Roof	Windshield	Hood
15	6	11	11	12	13	15	6	8	3

Sport Utility Vehicle



1	2	3	4	5	6	7	8	9	10
Bumper, Headlights, Grill	Fender, Wheel	Door, Glass, Pillar	Door, Glass, Pillar	Quarter Panel, Wheel	Bumper, Tail lights, Rear panel	Trunk, Floor Pan, Rear Glass	Roof	Windshield	Hood
20	5	14	14	16	6	10	8	2	5

Pickup Truck



1	2	3	4	5	6	7	8
Bumper, Headlights, Grill	Fender, Wheel	Door, Glass, Pillars	Bedside, Wheel, Front Panel	Bumper, Tail lights, Rear panel	Inner Bed	Roof, Rear glass, Back panel	Hood, Cowl
19	9	20	12	11	8	12	9

Personal Injury

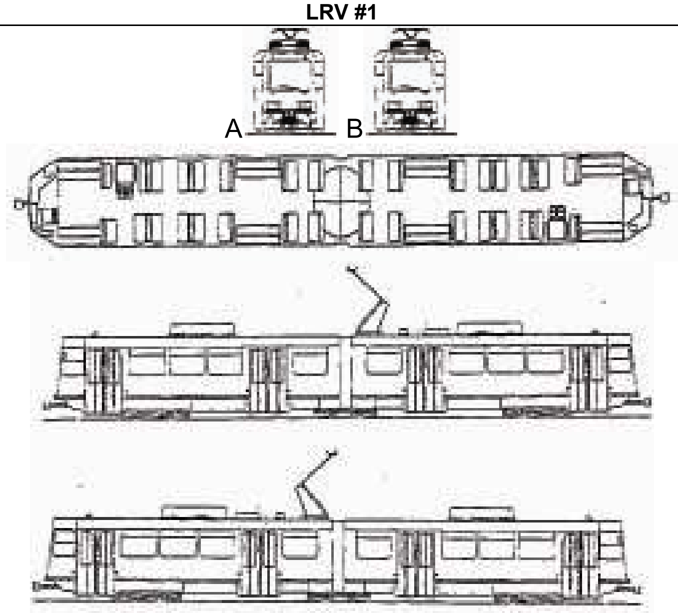
Put in the number of persons injured under each classification	Vehicle #1	Vehicle #2	Vehicle #3	Vehicle #4	Vehicle #5
Class A: Bruising, Abrasions, Minor to Moderate Bleeding, Sprains and Strains:					
Class B: Unconsciousness, Fractures, Severe Bleeding:					
Class C: Death, Paralysis, Dismemberment:					
Totals:					

LRV Damage - ☐ Check if not applicable

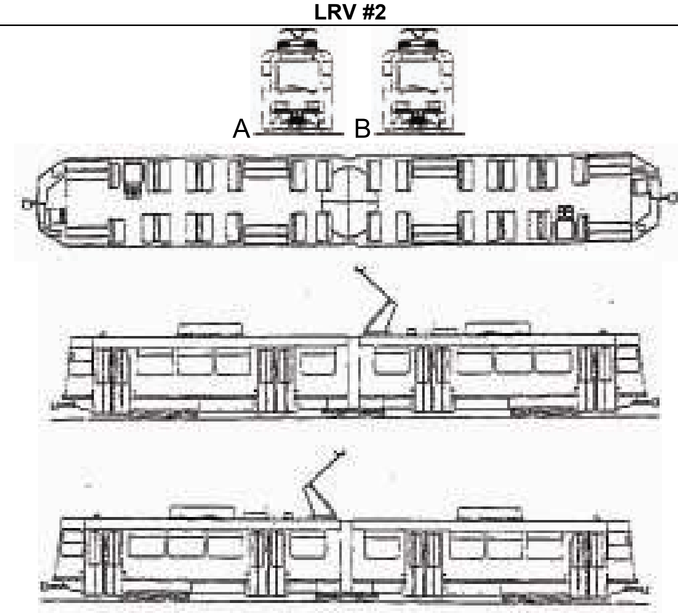
Describe LRV Damage.

Indicate damage to LRV's below

LRV #1



LRV #2



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Insert Accident/Incident Diagram

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