

MEMORANDUM

To: Nathan Frohman, P.E., CFM
City Engineer
North Richland Hills

Date: February 7, 2024
Proj No.: R0039877.00

From: Jennifer L. Butcher, PE, PTOE, RSP1

Subject: Iron Horse Speed Study
North Richland Hills, TX

The services of Westwood Professional Services were retained by the City of North Richland Hills to conduct a Speed Study along Iron Horse Boulevard. The study was based upon 72-hour vehicle count with STATTRAK speed data at three locations along the corridor: north of the Sam's Club entrance, south of Boulder Drive, and north of Boulder Drive. The data was collected between Tuesday, October 17, 2023 to Thursday October 19, 2023, along with a site visit from Westwood staff on Tuesday, November 28, 2023 during the PM peak.

Figure 1. Speed Count Locations



Roadway Network

Iron Horse Boulevard is currently signed at 35 mph and is a four-lane roadway divided by a two-way left-turn (TWLT) median. There is on-street parking on both sides of the road at multiple locations throughout the corridor. Raised pavement markings (RPMs) are installed along the boulevard except for a 300-foot section north of Loop 820 where solid yellow and dashed white pavement marking is used. The existing pavement marking and RPMs are difficult to see or nonexistent in many places along the boulevard. The corridor is approximately 1.02 miles in length from the signalized interchange at Loop 820 to the signalized intersection at Rufe Snow Drive. It is being developed as a pedestrian friendly zone and the current land use around Iron Horse Boulevard is residential and commercial with the Iron Horse TEXRail Station on the west side of Iron Horse Boulevard.

Currently, two roads, Boulder Drive and Browning Drive, provide alternative access to Iron Horse Boulevard from Loop 820 and Rufe Snow Drive. Both roads intersect Iron Horse Boulevard, with Boulder Drive currently under construction for a new traffic signal and Browning Drive currently an operational signalized intersection. Although, Iron Horse Boulevard north of Browning is still under construction with all traffic utilizing the southbound side of the road. Construction is occurring on the northbound side of the road.

Data Analysis

The speed data, the average speed, 85th percentile speed, and ADT volume can be found in **Table 1**. More detailed data can be found in **Appendix A**. The 85th percentile speed ranges from 38 to 40 mph. Based on the speed data, the cars are driving slower on the north side of the corridor. This could be due to the density of development increasing further north.

Table 1. Speed Data

	Data Point 1	Data Point 2	Data Point 3
Average Speed (mph)	36	35	34
85 th Percentile Speed (mph)	40	39	38
ADT	4,633	2,862	3,084

Site Observations

Westwood performed a site visit during the PM peak on Tuesday, November 28, 2023, which included driving Iron Horse Boulevard and observing existing traffic. Along Iron Horse Boulevard, drivers were observed driving between 30 mph and 40 mph. Other than speed observations, some road factors were noted that should be considered for the speed limit.

North of Browning Drive is under construction, so all traffic is transitioned to the west side of the road. The signal at Browning Drive is operational. Iron Horse Boulevard, south of Browning Drive is not currently under construction. A vertical curve just south of Boulder Drive causes vehicles to pick up speed in the southbound direction. At the same location is a horizontal curve with on-street parking on the west side. Drivers leaving the townhome driveways already have limited sight distance with the on-street parking. If southbound vehicles travel faster than the posted speed limit, drivers traveling southbound may not see drivers leaving the driveways in a reasonable time. There are currently very few vehicles parked on-street, but as the townhomes reach more occupancy, the sight distance for the driveways will decrease with more on-street parking. Figure 2 shows two of the townhome driveways with the most limited sight distance.

Figure 2. Driveway Views



Sight Distance

The AASHTO Green Book was used to evaluate sight distance for the townhome driveways south of Boulder Drive with the greatest sight distance concerns. **Table 2** summarizes the minimum sight distance for 30–40 mph design speeds and a passenger car as the design vehicle.

Table 2. Driveway Sight Distance

Design Speed (V_{major})	Case B1 - Left Turn Minimum Sight Distance (ISD)
30 mph	353 ft
35 mph	412 ft
40 mph	470 ft
	Case B2 - Right Turn Minimum Sight Distance (ISD)
30 mph	287 ft
35 mph	334 ft
40 mph	382 ft

Appendix B shows the aerial views of two driveways with the left turn sight distance at each design speed. Based on these sight distance diagrams, these driveways will operate safer with a 30 MPH design speed and may need to change outbound vehicles to right only as on-street parking increases.

Crash Analysis and Crash Modification Factors

Five years of crash data was collected using TxDOT Crash Records Information System (CRIS). Over the five-year span, 23 total crashes occurred. Just one suspected serious injury was recorded at the

intersection of Browning Drive.

Crash Modification Factors (CMF) Clearinghouse, funded by the Federal Highway Administration (FHWA), was used to search for CMFs that apply to the study corridor. In **Table 3** below, the CMF most applicable is shown. More detailed information on the CMF chosen can be found in **Appendix C**.

Table 3. CMF Summary

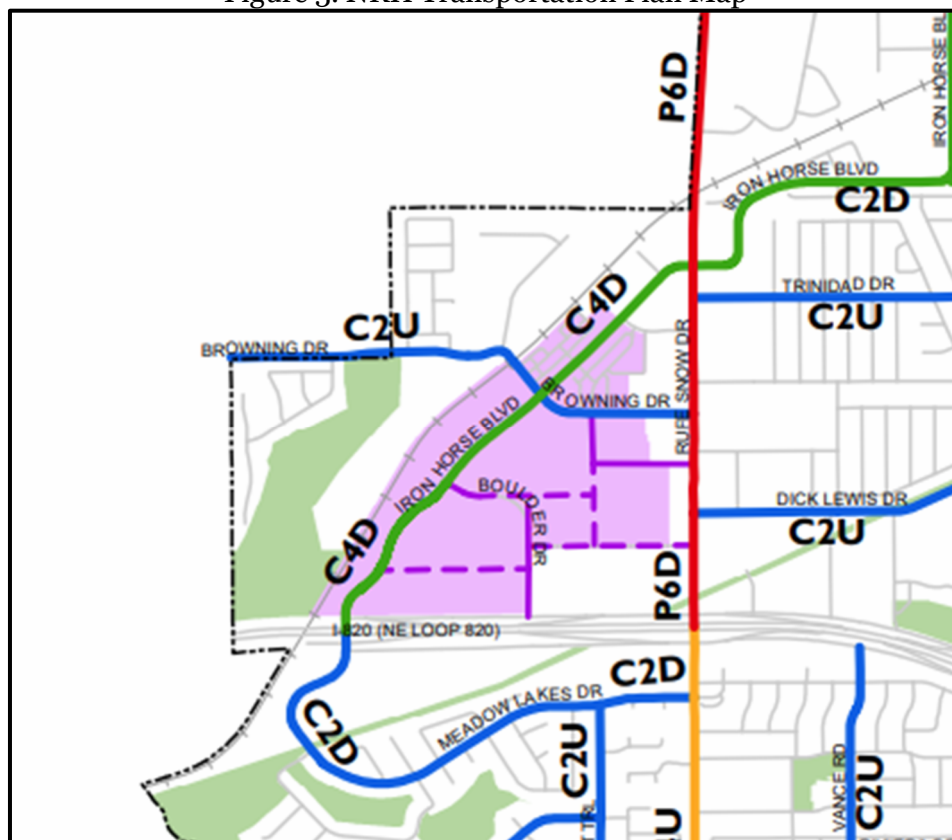
CMF Countermeasure	Factor
Lower Posted Speed Limit	0.740

The crash modification factor shown in Table 2 projects that lowering the speed of the roadway could decrease crashes by 26%. This crash modification factor was selected based on the roadway type, roadway speed, and traffic volumes.

Transportation Master Plan

The *North Richland Hills Transportation Plan* shows Iron Horse Boulevard as a four-lane major collector that connects to two-lane minor collectors at both ends as seen in Figure 3. The purple shading represents a Transit Oriented Zone (TOD). In the future, it is expected for this area to become a high-pedestrian use area as pedestrians use the existing sidewalks along Iron Horse Boulevard to/from the Iron Horse TEXRail Station. Travel ways in TOD zones are expected to be low speed and low volume.

Figure 3. NRH Transportation Plan Map



Iron Horse Boulevard is classified as C4D. According to Figure 4 (a clip from Table D-1 in the City's Transportation Plan Vision 2030), C4D classified roadways can have a minimum design speed of 30 mph.

Figure 4. NRH Functional Classifications

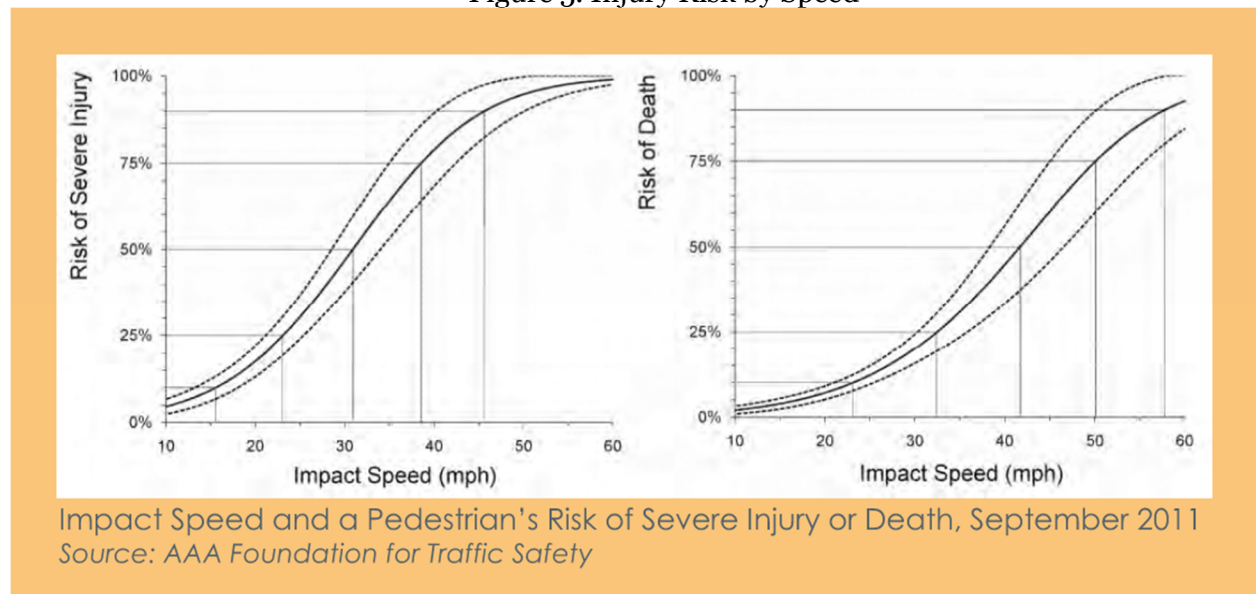
FUNCTIONAL CLASSIFICATION		NO. OF TRAVEL LANES	ROW WIDTH (FEET)	DESIGN SPEED (MPH)	MEDIAN TYPE	ON-STREET BIKE FACILITY MINIMUM STANDARD	PARKING PERMITTED	
ARTERIAL	MAJOR	P6D	6	VARIABLE	40-55	RAISED/TWLT*	PROTECTED	NO
	MINOR	M6D	6	110	40-45	RAISED/TWLT*	PROTECTED	NO
		M4D	4	80	35-45	RAISED/TWLT*	BUFFERED	NO
		M4U	4	70	35-45	NONE	BUFFERED	NO
	M2D	2	70	30-35	RAISED/TWLT*	BUFFERED	SOME	
COLLECTOR	MAJOR	C4D	4	68	30-35	RAISED/TWLT*	BUFFERED	SOME
		C4U	4	68	30-35	NONE	BUFFERED	SOME
		C2D	2	68	30-35	RAISED/TWLT*	SIGNED ROUTE	SOME
		C2U	2	68	30-35	NONE	SIGNED ROUTE	SOME
	MINOR	C2U	2	60	30-35	NONE	BICYCLE BOULEVARD	SOME
LOCAL	R2U	2	50	30	NONE	BICYCLE BOULEVARD	YES	

Table D-1. Functional Classification Design Elements

*TWLT = Two-way Left Turn Lane

Referenced in the NRH Transportation Plan, Figure 5 displays the correlation between speed and risk of injury. At 30 mph, risk of severe injury is 50% and risk of death is 25%. As impact speeds increase from 30 mph to 40 mph, the risk of death for pedestrians doubles.

Figure 5. Injury Risk by Speed



Roadway Layout Considerations

The *TxDOT Roadway Design Manual* states that suburban four-lane roadways need a future ADT of at least 6,000. Current counts collected an ADT between 2,862 to 4,633. Based on traffic volumes, Iron Horse Boulevard would be sized correctly as a C2D roadway if counts do not exceed the 6,000 minimum ADT in the future.

Recommendations

According to the *Procedures for Establishing Speed Zones Manual* by TxDOT, the speed limit may be reduced by as much as 10 mph below the 85th percentile speed based on sound and generally accepted engineering judgement that includes consideration of the following factors:

- Narrow roadway pavement widths (20 feet or less, for example)
- Horizontal and vertical curves (possible limited sight distance)
- Hidden driveways and other developments (possible limited sight distance)
- High driveway density (the higher the number of driveways, the higher the potential for encountering entering and turning vehicles)
- Crash history along the location
- Rural, residential, or developed areas (higher potential for pedestrian and bicycle traffic)
- Lack of striped, improved shoulders (constricted lateral movement)

Despite an 85th percentile speed of closer to 40 MPH, Westwood recommends the speed limit along Iron Horse Boulevard to decrease to 30 mph. This corridor has vertical and horizontal curves that limit sight distance, a high driveway density, and is a developing active pedestrian zone. A posted speed of 30 mph improves pedestrian safety and is within the range of the design speeds for C4D classified roadways based on the City's Vision 2030.

Appendix A. Speed Data

For Project: Iron Horse Blvd L2 *North of Boulder*
 Project Notes: Iron Horse Blvd L2
 Location/Name: Incoming
 Report Generated: 10/30/2023 13:02
 Speed Intervals 1 MPH
 Time Intervals Instant
 Traffic Report From 10/17/2023 10:00:00 through 10/19/2023 10:00:00
 85th Percentile Speed 40 MPH
 85th Percentile Vehicles 7877
 Max Speed 64 MPH on 10/17/2023 21:44:09
 Total Vehicles 9267
 AADT: 4633

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	3089	3089
AM Peak 07:00	403	403
PM Peak 05:00	395	395

Speed

Speed Limit: 35
 85th Percentile Speed: 40
 50th Percentile Speed: 36
 10 MPH Pace Interval: 31.0 MPH to 41.0 MPH
 Average Speed: 36

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	1715	2609	936	N/A	N/A	N/A
% over limit	N/A	56.3	54.9	63.7	N/A	N/A	N/A
Avg Speeder	N/A	39.2	39.0	39.4	N/A	N/A	N/A
Avg Speed	N/A	35.9	35.8	36.7	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	38	0.4
VEH_MED	9229	99.6
VEH_LG	0	0
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

For Project: Iron Horse Blvd L2
 Project Notes: Iron Horse Blvd L2
 Location/Name: Outgoing
 Report Generated: 10/30/2023 13:05
 Speed Intervals 1 MPH
 Time Intervals Instant
 Traffic Report From 10/17/2023 10:00:00 through 10/19/2023 10:00:
 85th Percentile Speed 40 MPH
 85th Percentile Vehicles 7877
 Max Speed 64 MPH on 10/17/202 21:44:09
 Total Vehicles 9267
 AADT: 4633

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	3089	3089
AM Peak 07:00	403	403
PM Peak 05:00	395	395

Speed

Speed Limit: 35
 85th Percentile Speed: 40
 50th Percentile Speed: 36
 10 MPH Pace Interval: 31.0 MPH to 41.0 MPH
 Average Speed: 36

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	1715	2609	936	N/A	N/A	N/A
% over limit	N/A	56.3	54.9	63.7	N/A	N/A	N/A
Avg Speeder	N/A	39.2	39.0	39.4	N/A	N/A	N/A
Avg Speed	N/A	35.9	35.8	36.7	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	38	0.4
VEH_MED	9229	99.6
VEH_LG	0	0
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

For Project: Iron Horse Blvd L3 - Sam's Entrance
 Project Notes: Iron Horse Blvd L3
 Location/Name: Incoming
 Report Generated: 10/30/2023 13:24
 Speed Intervals 1 MPH
 Time Intervals Instant
 Traffic Report From 10/17/2023 10:00:00 through 10/19/2023 10:00:00
 85th Percentile Speed 38 MPH
 85th Percentile Vehicles 5243
 Max Speed 60 MPH on 10/19/202 01:01:11
 Total Vehicles 6168
 AADT: 3084

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	2056	2056
AM Peak 11:00	187	187
PM Peak 05:00	347	347

Speed

Speed Limit: 35
 85th Percentile Speed: 38
 50th Percentile Speed: 34
 10 MPH Pace Interval: 29.0 MPH to 39.0 MPH
 Average Speed: 32.83

	Monday	Tuesday	Wednesda	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	784	1026	146	N/A	N/A	N/A
% over limit	N/A	30.8	32.4	32.2	N/A	N/A	N/A
Avg Speeder	N/A	38.3	38.5	39.0	N/A	N/A	N/A
Avg Speed	N/A	32.7	32.9	33.2	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	282	4.6
VEH_MED	5886	95.4
VEH_LG	0	0
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

For Project: Iron Horse Blvd L3
 Project Notes: Iron Horse Blvd L3
 Location/Name: Outgoing
 Report Generated: 10/30/2023 13:25
 Speed Intervals 1 MPH
 Time Intervals Instant
 Traffic Report From 10/17/2023 10:00:00 through 10/19/2023 10:00:00
 85th Percentile Speed 38 MPH
 85th Percentile Vehicles 5243
 Max Speed 60 MPH on 10/19/2023 01:01:11
 Total Vehicles 6168
 AADT: 3084

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	2056	2056
AM Peak 11:00	187	187
PM Peak 05:00	347	347

Speed

Speed Limit: 35
 85th Percentile Speed: 38
 50th Percentile Speed: 34
 10 MPH Pace Interval: 29.0 MPH to 39.0 MPH
 Average Speed: 32.83

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	784	1026	146	N/A	N/A	N/A
% over limit	N/A	30.8	32.4	32.2	N/A	N/A	N/A
Avg Speeder	N/A	38.3	38.5	39.0	N/A	N/A	N/A
Avg Speed	N/A	32.7	32.9	33.2	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	282	4.6
VEH_MED	5886	95.4
VEH_LG	0	0
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

For Project: Iron Horse Blvd L1 *South of Boulder*
 Project Notes: Iron Horse Blvd L1
 Location/Name: Outgoing
 Report Generated: 10/30/2023 10:53
 Speed Intervals: 1 MPH
 Time Intervals: Instant
 Traffic Report From: 10/17/2023 10:00:00 through 10/19/2023 10:00:00
 85th Percentile Speed: 39 MPH
 85th Percentile Vehicles: 4865
 Max Speed: 60 MPH on 10/19/202 03:52:18
 Total Vehicles: 5724
 AADT: 2862

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	1908	1908
AM Peak	11:00 181	181
PM Peak	04:00 347	347

Speed

Speed Limit: 35
 85th Percentile Speed: 39
 50th Percentile Speed: 35
 10 MPH Pace Interval: 30.0 MPH to 40.0 MPH
 Average Speed: 35.31

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	941	1311	176	N/A	N/A	N/A
% over limit	N/A	39.9	44.1	44.6	N/A	N/A	N/A
Avg Speeder	N/A	38.4	38.5	39.4	N/A	N/A	N/A
Avg Speed	N/A	35.1	35.4	35.8	N/A	N/A	N/A

Class Counts

Number	%	
VEH_SM	1	0
VEH_MED	5723	100
VEH_LG	0	0
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

For Project: Iron Horse Blvd L1
 Project Notes: Iron Horse Blvd L1
 Location/Name: Incoming
 Report Generated: 10/30/2023 10:53
 Speed Intervals 1 MPH
 Time Intervals Instant
 Traffic Report From 10/17/2023 10:00:00 through 10/19/2023 10:00:00
 85th Percentile Speed 39 MPH
 85th Percentile Vehicles 4865
 Max Speed 60 MPH on 10/19/202 03:52:18
 Total Vehicles 5724
 AADT: 2862

Volumes - weekly counts

	<u>Time</u>	<u>5 Day</u>	<u>7 Day</u>
Average Daily		1908	1908
AM Peak	11:00	181	181
PM Peak	04:00	347	347

Speed

Speed Limit: 35
 85th Percentile Speed: 39
 50th Percentile Speed: 35
 10 MPH Pace Interval: 30.0 MPH to 40.0 MPH
 Average Speed: 35.31

	<u>Monday</u>	<u>Tuesday</u>	<u>Wednesda</u>	<u>Thursday</u>	<u>Friday</u>	<u>Saturday</u>	<u>Sunday</u>
Count over limit	N/A	941	1311	176	N/A	N/A	N/A
% over limit	N/A	39.9	44.1	44.6	N/A	N/A	N/A
Avg Speeder	N/A	38.4	38.5	39.4	N/A	N/A	N/A
Avg Speed	N/A	35.1	35.4	35.8	N/A	N/A	N/A

Class Counts

	<u>Number</u>	<u>%</u>
VEH_SM	1	0
VEH_MED	5723	100
VEH_LG	0	0
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

Appendix B. Left Turn Sight Distance

CASE B1 - LEFT TURN FROM MINOR ROAD



- 30 mph Sight Distance (353 ft)
- 35 mph Sight Distance (412 ft)
- 40 mph Sight Distance (470 ft)



Appendix C. Clearinghouse CMF Report

CMF / CRF Details

CMF ID: 8076

CMF Name: Lower posted speed limit from 50 kph to 40 kph

Description:

Prior Condition: Speed limit of 50 km/hr

Category: Speed management

Study ID: [Full Bayesian evaluation of the safety effects of reducing the posted speed limit in urban residential areas, Islam and El-Basyouny 2015](#)

Star Quality Rating

Star Quality Rating:	5 Stars
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Crash Modification Factor (CMF)

Value:	0.74
Adjusted Standard Error:	
Unadjusted Standard Error:	0.03

Crash Reduction Factor

Value:	26
Adjusted Standard Error:	
Unadjusted Standard Error:	3

Applicability	
Crash Type:	All
Crash Severity:	All
Roadway Types:	Major Collector
Minimum Number of Lanes:	2
Maximum Number of Lanes:	2
Number of Lanes Direction:	
Number of Lanes Comment:	
Road Division Type:	
Minimum Speed Limit:	40
Maximum Speed Limit:	50
Speed Unit:	km/h
Speed Limit Comment:	
Area Type:	Urban
Traffic Volume:	Minimum of 100 to Maximum of 11700 Annual Average Daily Traffic (AADT)
Average Traffic Volume:	
Time of Day:	
<i>If countermeasure is intersection-based.</i>	
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Average Major Road Volume:	
Average Minor Road Volume:	

Development Details	
Date Range of Data Used:	2006 to 2013
Municipality:	City of Edmonton
State:	notusa
Country:	Canada
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size (crashes):	107 crashes before, 85 crashes after
Sample Size (sites):	27 sites before, 27 sites after

Other Details	
Included in HSM:	No
Date Added to Clearinghouse:	Nov 10, 2016
Comments:	

This site is funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the University of North Carolina Highway Safety Research Center

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