

# **Road Safety Audit for County Road X-37, from the Intersection of G-62 to the East Corporate Limits of Columbus City in Louisa County, Iowa**

**Final Report  
June 2009**

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<b>16. Abstract</b>  A road safety audit was conducted for a 7.75 mile section of County Road X-37 in Louisa County, Iowa. In 2006, the average annual daily traffic on this roadway was found to be 680 vehicles per day. Using crash data from 2001 to 2007, the Iowa Department of Transportation (Iowa DOT) has identified this roadway as being in the highest 5% of local rural roads in Iowa for single-vehicle run-off-road crashes.  Considering these safety data, the Louisa County Engineer requested that a road safety audit be conducted to identify areas of safety concerns and recommend low-cost mitigation to address those concerns. Staff and officials from the Iowa DOT, Governor's Traffic Safety Bureau, Federal Highway Administration, Institute for Transportation, and local law enforcement and transportation agencies met to review crash data and discuss potential safety improvements to this segment of X-37.  This report outlines the findings and recommendations of the road safety audit team to address the safety concerns on this X-37 corridor and explain several selected mitigation strategies.			
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# **ROAD SAFETY AUDIT FOR COUNTY ROAD X-37, FROM THE INTERSECTION OF G-62 TO THE EAST CORPORATE LIMITS OF COLUMBUS CITY IN LOUISA COUNTY, IOWA**

**Final Report  
June 2009**

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The author would like to thank the Louisa County Engineer and staff for requesting and participating in this road safety audit and the Iowa Department of Transportation for sponsorship of the effort. Input from the Louisa County Sheriff's Office was also valuable.

Participation and contribution by the members of the road safety audit team were invaluable in the successful completion of this activity. The audit team included

- Larry Roehl Louisa County Engineer
- Chief Deputy Adam Caudle Louisa County Sheriff's Office
- David Patterson Washington County Engineer
- Sgt. Jared Schneider Washington County Deputy
- Jerry Roche Federal Highway Administration, Iowa Division
- Kevin Korth Federal Highway Administration, Iowa Division
- Randy Hunefeld Governor's Traffic Safety Bureau
- LeRoy Bergmann Secondary Roads Engineer, Iowa Department of Transportation
- Bryan Bradley Iowa Department of Transportation, Office of Traffic and Safety
- Bob Sperry Safety Liaison, Institute for Transportation (InTrans)
- Tom McDonald Safety Circuit Rider, Institute for Transportation (InTrans)





Chief Deputy Caudle related that most signs on this section of County Road X-37 need to be upgraded. Raised pavement markings or similar devices would be very beneficial in providing needed guidance for drivers. Excess speed by many drivers is also a problem. Shoulders are narrow and ditches are quite deep along the route, making traffic stops very challenging. However, Louisa County law enforcement routinely patrols the route. Some large trees are located close to the roadway, and these can shade the pavement surface in the winter, delaying melting of snow and ice.

A total of five serious crashes were recorded on this section of X-37 during the 2004–2008 review period: one fatal crash and four major injury crashes. Many of the 25 listed crashes occurred during the morning and evening hours, indicating that commuters could be involved. A significant number of crashes occurred during nighttime hours. It was noted that many data on the crash reports was recorded as “unknown” or “not reported,” which makes analysis difficult. These missing data included categories such as light and road surface conditions, driver conditions, and contributing circumstances. Many of these crashes may have been animal related, since about half of the crashes indicated “animal” as the major cause. A complete discussion of the crash data is included later in this report.

County Engineer Roehl reported that some bicycle riders use this route on occasion.

## **FIELD REVIEWS**

### **Daylight Review**

A daylight review of Louisa County Road X-37 took place in the afternoon of May 12. The route was reviewed from the southerly terminus at the intersection of County Road G-62 northerly to Columbus City.

The PCC pavement overlay appeared in good to excellent condition, except near the southerly terminus, where some joint deterioration was evident. County Engineer Roehl advised that pavement markings, both centerline and edge line, are replaced on a two-year cycle. Condition of these lines appeared quite good during daylight conditions.

One bridge is located north of the 93rd Street intersection; the bridge has concrete handrails and older design approach guardrails.

A horizontal curve just north of the 105th Street intersection has a 40 mph advisory speed plaque mounted with the advance curve sign. Minimum size chevrons are in place along the curve but are widely spaced. Two other horizontal curves have similar chevrons in place; some are tipped and do not feature standard attachment brackets. Other curves on X-37 do not have chevrons or other special guidance devices in place. No double-arrow warning signs were observed at some T intersections. No Deer Crossing signs were in place. Signs throughout the section appear in good to satisfactory condition, although several supports are tipped and some signs appear to feature engineering grade sheeting.

A minimal amount of pavement edge drop-off was observed within the reviewed section. One utility pole down guy was observed within the clear zone, and an open drop inlet culvert was noticed in close proximity to the traveled way near the northerly terminus in Columbus City.

### **Nighttime Review**

A nighttime review was conducted on Louisa County X-37 during the evening of May 12 in light to moderate rainfall conditions.

Pavement markings were visible during the review, but much retro-reflective quality had been lost, possibly due to snow plow damage during winter maintenance activities.

In general, most signs appeared to exhibit good to adequate visibility, but many did not due to tipping of the sign supports and possible engineering grade sheeting. Straightening these posts to a vertical alignment and proper orientation might improve the conspicuity at night.

The existing chevrons along horizontal curves were not highly visible due to their relatively small size and minimal number, the tipping of the support, and lack of standard attachment brackets. Visibility along other selected curves could be enhanced with the addition of chevrons or single white reflector delineators.

### **WRAP-UP MEETING**

A wrap-up meeting for the Louisa and Washington County safety audits was conducted on the morning of May 13 in the Washington County Sheriff's Office. Participating in this meeting were David Patterson, Larry Roehl, Jared Schneider, Iowa State Patrol Sgt. Troy Bailey, Jerry Roche, Kevin Korth, Randy Hunefeld, LeRoy Bergmann, Bryan Bradley, Bob Sperry, and Tom McDonald.

Tom McDonald and other team members briefly reviewed notes and observations from the daylight and nighttime reviews of these routes. Some possible mitigation steps were discussed, and these are included below in this final report.

Sgt. Bailey and Sgt. Schneider indicated that increased law enforcement presence could be established to improve driver performance. Use of LIDAR detection equipment can make these efforts more efficient and effective.

More advisory speed signs with existing warning signs at curves should be considered, as should milled-in, all-weather pavement markings.

Iowa Traffic Safety Data Service (ITSDS) staff at InTrans provided crash data from 2002 through 2003 to supplement the data provided during the audits, and these additional data are discussed in this report.

Additionally, Iowa DOT District 5 Office staff conducted and provided traffic speed and volume studies for the reviewed section.

## **CRASH DATA**

Seven years of crash data for the years 2002–2008 were reviewed for the audited section of X-37. Copies of a crash location map that indicates severity and crash summary tables are included in Appendix A.

Forty-one total crashes were recorded during the seven-year review period, and 17 (41%) were animal related. Other major crash causes were ran-off-road (with 7 crashes) and too fast for conditions and swerving/evasive action (with 7 total crashes). Non-collision was listed as the predominant manner of collision in 36 of 41 crashes (88%), indicating a high number of single-vehicle crashes. Of the 41 total crashes, 10 occurred in 2007, with only 1 recorded in 2008.

One fatal crash and four major injury crashes occurred during the review period. Of this number, only one major injury crash occurred on a weekend; all others were recorded during the work week. When all crashes are considered, a slightly higher number were recorded on weekends. Most crashes were reported during nighttime hours, and it did not appear that a high number of crashes occurred during normal commuting times; however, about 46% did take place between the hours of 8:00 p.m. and 3:00 a.m. Second- and third-shift commuters to the meat packing company in Columbus Junction may be involved in these crashes. The fatal crash and one major injury crash were recorded during nighttime hours. A total of 16 crashes occurred during the months of November through March (39%), which would be consistent when prorated for a five-month period (42%). No crashes were reported during February for the entire seven years; thus, it appears that winter weather conditions did not contribute to higher crash numbers for this route.

Road surface conditions were reported as dry for 14 of 41 crashes (34%); ice or slush were only noted for 5 crashes. Light conditions were noted as daylight for 9 crashes and dark for 8 incidents. Weather conditions were recorded as clear, partly cloudy, or cloudy for 18 of the 41 crashes (44%); conditions were noted as snowy, sleety, or freezing rain for 2 crashes.

Driver conditions were recorded as apparently normal for 34% of the crashes; “under the influence” was noted for 4 crashes out of a total of 41. Driver age for those involved in these crashes was well distributed: 6 of 43 drivers were in the 14–18 age bracket, 18 of 43 (42%) were in the 21–34 age bracket, and only 1 driver was over the age of 65. Drivers were closely split by gender. Improper action by drivers included 7 who lost control and 3 who were driving too fast for conditions.

A close review of the crash data for this route reveals a high number of unknown and/or not reported entries; unknown entries include 23 of 43 for driver condition (53%), 29 of 43 for driver contributing circumstances (67%), 21 of 41 for road surface and light conditions (51%), and 18 of 41 for weather conditions (44%). Many, but not all, of these missing data can be attributed to the high number of animal-related crashes: 17 of 41 (41%), where these data may be difficult to



obtain and are not deemed particularly worthwhile. For other crashes, however, investigating officers should make every effort to provide the most complete data possible when making reports of traffic crashes.

## **SPEED DATA**

On June 2–3, 2009, traffic data were sampled by Iowa DOT District 5 Traffic Technician Frank Redeker on County Road X-37. The study began at 11:00 a.m. on June 2 and concluded at 11:00 a.m. on June 3 at a location just northwest of the 218th Avenue intersection. Data were collected using two NuMetrics Traffic Analyzers on the roadway surface.

In the eastbound lane, the average speed for all vehicles was 52 mph, with approximately 9% exceeding the posted speed limit of 55 mph. The 85th percentile speed was 59.6 mph. A total of 415 vehicles were counted in this 24 hour period, 96% of which were passenger cars; the remainder were pickups, vans, buses, and trucks. Peak hourly volume was 39 total vehicles from 5:00 p.m. to 6:00 p.m., and low hourly volume was 0 vehicles from 1:00 a.m. to 2:00 a.m.

In the westbound lane, the average speed for all vehicles was 53 mph, with over 14% exceeding the posted speed of 55 mph. The 85th percentile speed was approximately 61 mph. A total of 415 vehicles were counted, with 96% being passenger cars; the remainder were pickups, vans, buses, and trucks. Peak hourly volume was 38 total vehicles from 7:00 a.m. to 8:00 a.m., and low hourly volume was 0 vehicles from 11:00 p.m. to midnight.

Weather conditions during data collection exhibited a temperature variation of 54°F to 89°F with a dry pavement surface.

Summaries of these data are included in Appendix B.

## **SUGGESTIONS AND RECOMMENDATIONS**

Considering observations made during field reviews, examination of available data, and comments from audit team members, the following suggestions are offered as mitigation strategies for improving traffic safety on the reviewed section of County Road X-37. The options are not listed in a priority order.

1. Update the chevrons along the three curves where the devices are currently installed, following suggested spacing in the proposed 2009 *Manual on Uniform Traffic Control Devices* and mounting with brackets recommended for proper visibility. Also, larger size devices and possibly fluorescent yellow micro-prismatic sheeting would be beneficial.
2. Replace any engineering grade sheeting traffic control devices with high-intensity or micro-prismatic sheeting. Re-align all tipped traffic control device supports and re-check for desired nighttime visibility.

3. Install double-arrow warning signs across from all T intersections and Deer Crossing warning signs where warranted. If a concentration of deer crashes is noted near a bridge, high fencing to direct deer to an under-road crossing location might be beneficial.
4. Consider additional mowing and vegetation removal where needed to improve visibility of deer in the right-of-way and to reduce shading of the roadway.
5. Be sure street name signs meet 2009 MUTCD recommendations for letter size, color, and placement for maximum visibility.
6. Contact utility companies to discuss removal or relocation of any down guys or utility poles from the clear zone wherever possible.
7. Add single white reflector delineators or chevrons along selected additional horizontal curves using recommended 2009 MUTCD spacing and mounting recommendations to improve guidance, especially during nighttime driving conditions.
8. Consider the use of milled-in, all-weather visibility pavement markings on the route, especially along horizontal curves and the sections where most non-animal crashes have been recorded.
9. Considering the data from the traffic speed sampling, discuss increased surveillance and patrol activities with the Iowa State Patrol and Louisa County Sheriff's Office. However, the narrow shoulders on this route may limit the locations where traffic stops can be made.

# APPENDIX A. CRASH DATA, 2002–2008

## X-37 Safety Audit, Louisa Co (2002-2008)

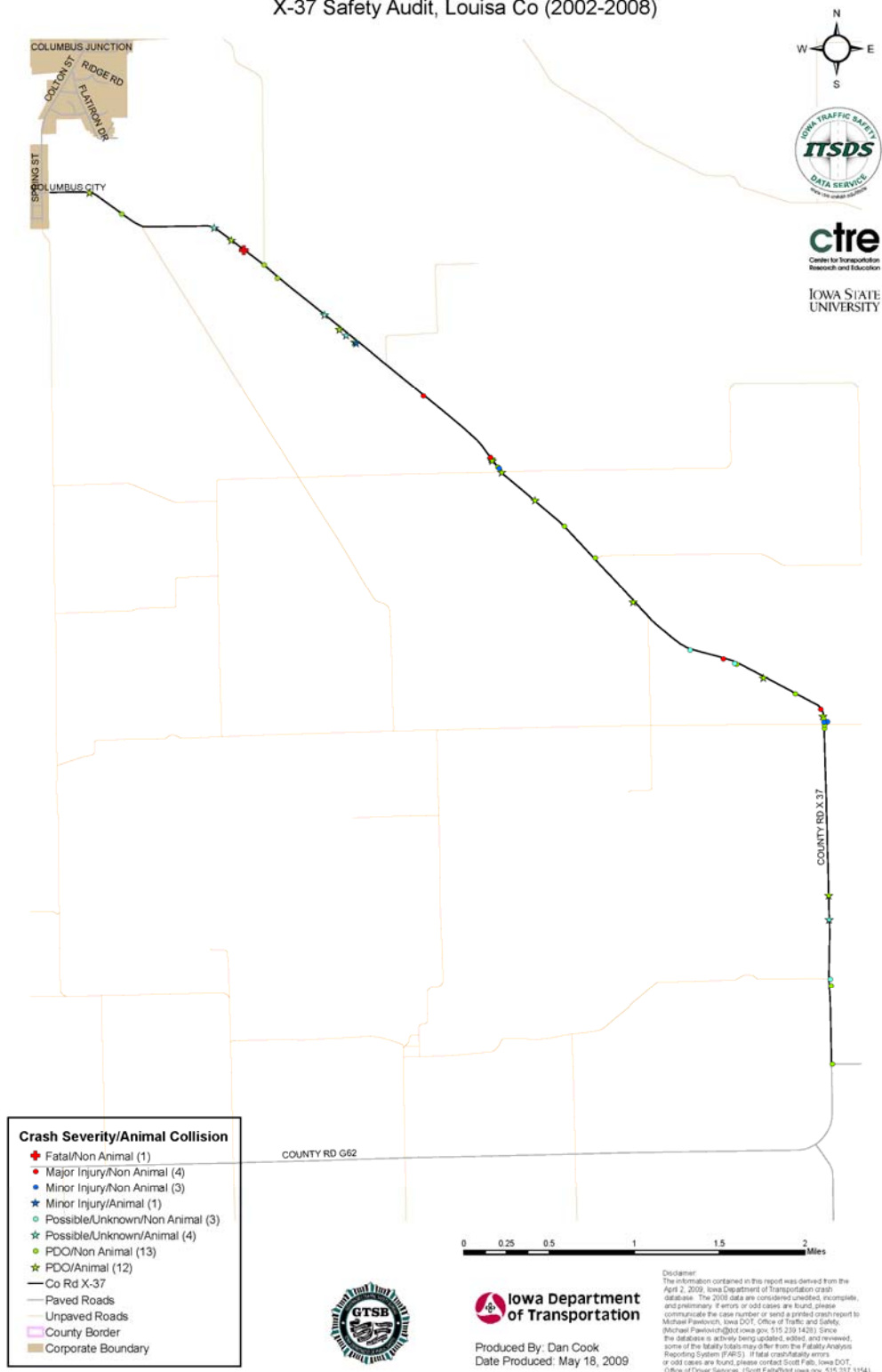


Figure A.1. All crashes from 2002 to 2008

The following disclaimer applies to Tables A.1. through A.13: The information contained in this report was derived from the April 2, 2009, Iowa Department of Transportation crash database. The 2008 data are considered unedited, incomplete, and preliminary. If errors or odd cases are found, please communicate the case number or send a printed crash report to Michael Pawlovich, Office of Traffic and Safety, (Michael.Pawlovich@dot.iowa.gov, 515.239.1428). Since the database is actively being reviewed and updated, some of the fatality totals may differ from the Fatality Analysis Reporting System (FARS). If fatal crash/fatality errors or odd cases are found, please contact Scott Falb, Office of Driver Services, (Scott.Falb@dot.iowa.gov, 515.237.3154).

**Table A.1. Crashes by major cause**

Year	Major Cause								Total	
	Animal	Ran Stop Sign	FTYROW: At Uncontrolled Intersection	Driving too Fast for Conditions	Swerving/Evasive Action	Ran off Road/Right	Ran off Road/Left	Lost Control		Unknown/Not Reported
2002	3		1	1		1			2	8
2003	2	1		1	1			1	2	8
2004	1				1	1			2	5
2005	4					2				6
2006	2			1						3
2007	4				2	2	1		1	10
2008	1									1
<b>Total</b>	<b>17</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>41</b>

**Table A.2. Crashes by manner of collision**

Year	Manner of Collision				Total
	Non-collision	Rear-end	Broadside	Unknown/Not Reported	
2002	8				8
2003	7		1		8
2004	5				5
2005	6				6
2006	2			1	3
2007	7	1		2	10
2008				1	1
<b>Total</b>	<b>35</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>41</b>

**Table A.3. Crashes by hour of day**

Year	Hour of Day																									Total	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Unkn		
2002		1			1							1		1		1					1	2					8
2003		1	1							1					2	1					1			1			8
2004			1								1			1					1		1						5
2005		1				1								1				1				2					6
2006						1	1					1															3
2007			2			1		2													2		1	2			10
2008																						1					1
<b>Total</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>1</b>		<b>41</b>	

**Table A.4. Crashes by day of week**

Year	Day of Week							Total
	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	
2002	2	1	1	2			2	8
2003	2	3					3	8
2004		1		3		1		5
2005				1	2	2	1	6
2006	2	1						3
2007	3	1	3		1	1	1	10
2008							1	1
<b>Total</b>	<b>9</b>	<b>7</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>41</b>

**Table A.5. Crashes by month**

Year	Month												Total
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
2002	2			2		1		1			1	1	8
2003	3			1	1			1		1	1		8
2004			1			2			1	1			5
2005				1	2		1	1			1		6
2006	1			1								1	3
2007	1						3	3		1	1	1	10
2008			1										1
<b>Total</b>	<b>7</b>		<b>2</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>6</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>41</b>

**Table A.6. Crashes by severity and day of week**

Crash Severity	Day of Week							Total
	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	
Fatal				1				1
Major Injury	1	1		1		1		4
Minor Injury	2	1	1					4
Possible/Unk			2	1			4	7
PDO	6	5	1	3	3	3	4	25
<b>Total</b>	<b>9</b>	<b>7</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>41</b>

**Table A.7. Crashes by severity and hour of day**

Crash Severity	Hour of Day																				Total
	1	2	4	5	6	7	9	10	11	13	14	15	17	18	19	20	21	22	23		
Fatal		1																			1
Major Injury	1					1			1	1											4
Minor Injury	1	1								1		1									4
Possible/Unknown				2						1	1					1	1		1		7
PDO	1	2	1	1	1	1	1	1	1		1	1	1	1	2	3	4	2			25
<b>Total</b>	<b>3</b>	<b>4</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>41</b>	

**Table A.8. Crashes by road surface condition**

Year	Road Surface Conditions						Total
	Dry	Wet	Ice	Slush	Unknown	Not Reported	
2002	2	1			3	2	8
2003	2	1	1		3	1	8
2004	2	1			2		5
2005	2				4		6
2006				1	2		3
2007	6		1		1	2	10
2008						1	1
<b>Total</b>	<b>14</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>15</b>	<b>6</b>	<b>41</b>

**Table A.9. Crashes by light condition**

Year	Light Conditions						Total
	Daylight	Dawn	Dark - roadway lighted	Dark - roadway not lighted	Unknown	Not Reported	
2002	2		1		4	1	8
2003	2		1	1	4		8
2004	1	1		1	2		5
2005	1			1	4		6
2006	1				2		3
2007	2			5	1	2	10
2008						1	1
<b>Total</b>	<b>9</b>	<b>1</b>	<b>2</b>	<b>8</b>	<b>17</b>	<b>4</b>	<b>41</b>

**Table A.10. Crashes by weather conditions**

Year	Weather Conditions									Total
	Clear	Partly Cloudy	Cloudy	Mist	Rain	Sleet/Hail/Freezing Rain	Snow	Not Reported	Unknown	
2002	4				1				3	8
2003	1	2		1		1		1	2	8
2004	2				1				2	5
2005		1	1						4	6
2006			1						2	3
2007	3	3					1	2	1	10
2008								1		1
<b>Total</b>	<b>10</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>14</b>	<b>41</b>

**Table A.11. Crashes by driver condition**

Year	Driver Condition						Total
	Apparently Normal	Asleep/ fainted/ fatigued	Under the Influence	Other	Unknown	Not Reported	
2002	2	1			3	2	8
2003	3		2		2	2	9
2004	2				3		5
2005				1	5		6
2006	1				2		3
2007	6		2		1	2	11
2008						1	1
<b>Total</b>	<b>14</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>16</b>	<b>7</b>	<b>43</b>

**Table A.12. Crashes by driver age**

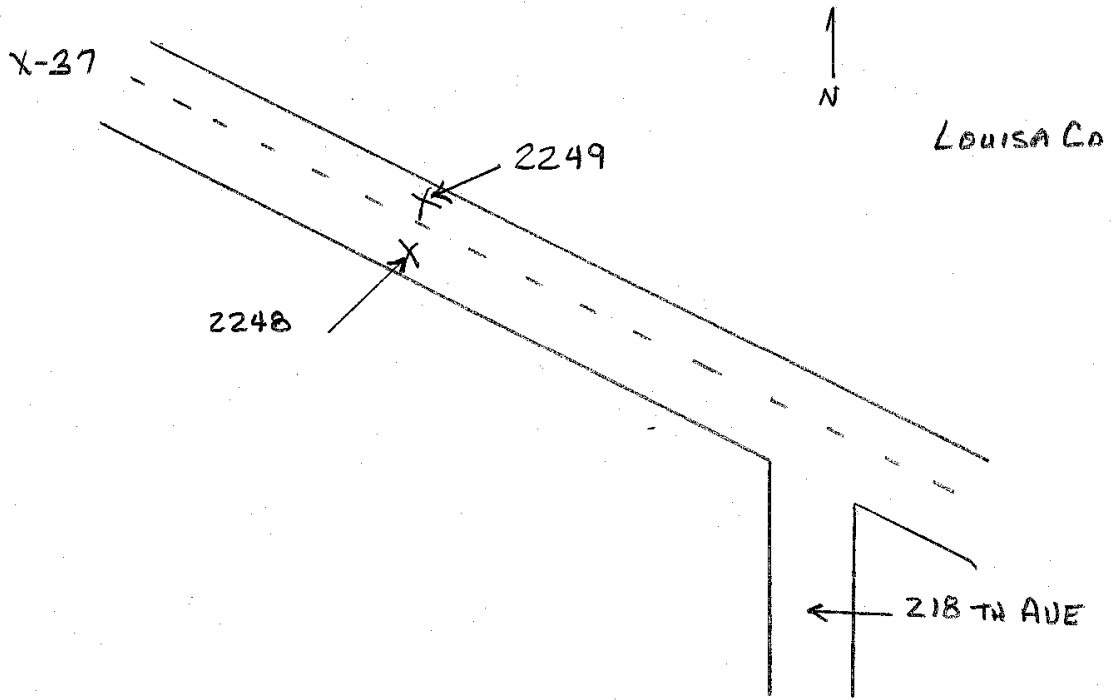
Year	Driver Age																Total
	14	16	17	18	19	20	21-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	70-74	
2002				1			1	3	1	2							8
2003				1	1		2	2			1		1	1			9
2004				1					1	1		1				1	5
2005			1			1			1		1	1			1		6
2006								1			1		1				3
2007	1	1					3	2	1		1	1	1				11
2008						1											1
<b>Total</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>6</b>	<b>8</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>43</b>

**Table A.13. Crashes by driver contributing circumstances**

Year	Driver Contributing Circumstances								Total
	Ran stop sign	Driving too fast for conditions	Lost control	Swerved to avoid	FTYROW: at uncontrolled intersection	Other: no improper action	Not reported	Unknown	
2002		1	1		1		2	3	8
2003	1	1	2			1	4		9
2004			2	1			2		5
2005			2				4		6
2006		1					2		3
2007							1	10	11
2008								1	1
<b>Total</b>	<b>1</b>	<b>3</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>15</b>	<b>14</b>	<b>43</b>



**APPENDIX B. SPEED STUDY RESULTS**



**Figure B.1. Placement of NuMetrics Traffic Analyzer plates**

**Nu-Metrics Traffic Analyzer Study  
Computer Generated Summary Report  
City: Columbus City  
Street: X-37**

A study of vehicle traffic was conducted with HI-STAR unit number 2248. The study was done in the EB-west of 218th lane at X-37 in Columbus City, Ia in Louisa county. The study began on Jun/02/2009 at 11:00:00 AM and concluded on Jun/03/2009 at 11:00:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 60 minute time periods. The total recorded volume showed 423 vehicles passed through the location with a peak volume of 39 on Jun/02/2009 at [17:00-18:00] and a minimum volume of 0 on Jun/03/2009 at [01:00-02:00]. The AADT count for this study was 423.

**SPEED**

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 51 - 56 MPH range or lower. The average speed for all classified vehicles was 52 MPH with 9.16% vehicles exceeding the posted speed of 55 MPH. The HI-STAR found 9.16 percent of the total vehicles were traveling in excess of 55 MPH. The mode speed for this traffic study was 51MPH and the 85th percentile was 59.61 MPH.

< to 10	11 to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55	56 to 60	61 to 65	66 to 70	71 to 75	76 to >					
0	0	0	0	1	12	27	38	86	123	90	30	5	2	1					

CHART 1

**CLASSIFICATION**

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin. Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 398 which represents 96 percent of the total classified vehicles. The number of Vans & Pickups in the study was 10 which represents 2 percent of the total classified vehicles. The number of Busses & Trucks in the study was 0 which represents 0 percent of the total classified vehicles. The number of Tractor Trailers in the study was 7 which represents 2 percent of the total classified vehicles.

< to 16	17 to 23	24 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to >												
296	102	10	0	3	0	4	0												

CHART 2

**HEADWAY**

During the peak traffic period, on Jun/02/2009 at [17:00-18:00] the average headway between vehicles was 90 seconds. During the slowest traffic period, on Jun/03/2009 at [01:00-02:00] the average headway between vehicles was 3600 seconds.

**WEATHER**

The roadway surface temperature over the period of the study varied between 54.00 and 89.00 degrees F. The HI-STAR determined that the roadway surface was Dry 100.00% of the time.

**Nu-Metrics Traffic Analyzer Study  
Computer Generated Summary Report  
City: Columbus City  
Street: X-37**

A study of vehicle traffic was conducted with HI-STAR unit number 2249. The study was done in the WB west of 218th lane at X-37 in Columbus City, Ia in Louisa county. The study began on Jun/02/2009 at 11:00:00 AM and concluded on Jun/03/2009 at 11:00:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 60 minute time periods. The total recorded volume showed 416 vehicles passed through the location with a peak volume of 38 on Jun/03/2009 at [07:00-08:00] and a minimum volume of 0 on Jun/02/2009 at [23:00-00:00]. The AADT count for this study was 416.

**SPEED**

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 51 - 56 MPH range or lower. The average speed for all classified vehicles was 53 MPH with 14.46% vehicles exceeding the posted speed of 55 MPH. The HI-STAR found 14.46 percent of the total vehicles were traveling in excess of 55 MPH. The mode speed for this traffic study was 51MPH and the 85th percentile was 60.81 MPH.

< to 10	11 to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55	56 to 60	61 to 65	66 to 70	71 to 75	76 to >					
0	2	0	1	2	6	12	35	93	120	78	46	12	1	0					

CHART 1

**CLASSIFICATION**

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin. Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 393 which represents 96 percent of the total classified vehicles. The number of Vans & Pickups in the study was 8 which represents 2 percent of the total classified vehicles. The number of Busses & Trucks in the study was 2 which represents 0 percent of the total classified vehicles. The number of Tractor Trailers in the study was 5 which represents 1 percent of the total classified vehicles.

< to 16	17 to 23	24 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to >												
320	73	8	2	2	2	1	0												

CHART 2

**HEADWAY**

During the peak traffic period, on Jun/03/2009 at [07:00-08:00] the average headway between vehicles was 92.308 seconds. During the slowest traffic period, on Jun/02/2009 at [23:00-00:00] the average headway between vehicles was 3600 seconds.

**WEATHER**

The roadway surface temperature over the period of the study varied between 54.00 and 89.00 degrees F. The HI-STAR determined that the roadway surface was Dry 100.00% of the time.

**APPENDIX C. IMAGES FROM FIELD REVIEWS**



**Figure C.1. Horizontal curve just north of 105th Street**



**Figure C.2. Existing chevrons in horizontal curve**



**Figure C.3. Combination horizontal and vertical curvature**



**Figure C.4. Existing curve warning sign and pavement markings**



**Figure C.5. Side road intersection**





**Figure C.6. Entering Columbus City westbound**