Evaluation of Mitigation for Safety Concerns on Low-Volume, Unpaved Rural Roads

Final Report
May 2013

MTC MIDWEST TRANSPORTATION CONSORTIUM

IOWA STATE UNIVERSITY
Institute for Transportation

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16. Abstract

The Institute for Transportation (InTrans) at Iowa State University completed work on an in-depth study of crash history on low-volume, rural roads in Iowa in December 2010. Results indicated that unpaved roads with traffic volumes greater than 100 vehicles per day (vpd) exhibit significantly higher crash frequencies, rates, and densities than any other class of low-volume road examined, paved or unpaved.

The total mileage for this class of roadway in Iowa is only about 4,400 miles, spread over 99 counties in the state, which is certainly a manageable number of miles for individual rural agencies.

The purpose of this study was to identify and examine several unpaved, local road segments with higher than average crash frequencies, select and undertake potentially-beneficial mitigation, and evaluate the results as time allowed. A variety of low-cost options were considered, including engineering improvements, enhanced efforts by law enforcement, and educational initiatives.

Using input, active support, and participation from local agencies and state and Federal safety advocates, the study afforded a unique opportunity to examine useful tools for local rural agencies to utilize in addressing safety on this particular type of roadway.

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EVALUATION OF MITIGATION FOR SAFETY CONCERNS ON LOW-VOLUME, UNPAVED RURAL ROADS

Final Report
May 2013

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In addition, the invaluable contributions of several county engineers and law enforcement agencies who assisted in the initial field reviews and cooperated with selected crash mitigation techniques must be recognized. Finally, Randy Hunefeld, Iowa's special Traffic Enforcement Program (sTEP) coordinator and multi-disciplinary safety team liaison for the Iowa Governor's Traffic Safety Bureau (GTSB) was instrumental in contacting local law enforcement departments and inviting participation in the project.

EXECUTIVE SUMMARY

The Institute for Transportation (InTrans) at Iowa State University initially completed work on an in-depth study of crash history on low-volume, rural roads in Iowa in December 2010. Results indicated that unpaved roads with traffic volumes greater than 100 vehicles per day (vpd) exhibit significantly higher crash frequencies, rates, and densities than any other class of low-volume road examined, paved or unpaved.

The total mileage for this class of roadway in Iowa is only about 4,400 miles, spread over 99 counties in the state, which is certainly a manageable number of miles for individual rural agencies.

Employing data from several counties in central Iowa, researchers identified and selected a sample of rural road segments that displayed higher average crash frequencies, rates, and densities than similar secondary unpaved roads in Iowa. These segments were then reviewed in depth in cooperation with local engineering and law enforcement officials to determine possible mitigation with potential to reduce crashes on those roadways, using a multidisciplinary approach for the suggested options and applications.

While the mitigation options selected did not offer completely desirable results, initial observations indicated optimistic opportunities for improving safety on this class of roadway. The strategies applied, conclusions drawn, and recommendations made are included in this report. With additional, broader-scoped study, more progress toward improving safety on these important rural roads will be achieved in the future.

INTRODUCTION

The Institute for Transportation (InTrans) at Iowa State University completed work on an in-depth study of crash history on low-volume, rural roads in Iowa in December 2010. Results of that research indicated that a certain class of rural roadway, specifically unpaved roads with traffic volumes greater than 100 vehicles per day (vpd), exhibit significantly higher crash frequencies, rates, and densities than any other class of low-volume road examined, paved or unpaved (Souleyrette et al. 2010).

The study examined crash history for the most recent seven years of data on a statewide rural secondary road system of approximately 80,000 miles and compared various crash data for several major groups based on traffic volume, and type of road surface, such as 0 to 100 vpd paved and unpaved, 101 to 400 vpd paved and unpaved, 401 to 1,000 vpd paved and unpaved, and 1,001 to 13,500 vpd paved and unpaved. For all classes reviewed, the highest crash frequencies, rates, and densities were found for unpaved, rural roads with traffic volumes between 101 and 400 vpd.

Figure 1 illustrates low-volume (< 400 vpd) road crash frequency, density, and rate by county for all crashes (top) and fatal and major injury crashes (bottom).

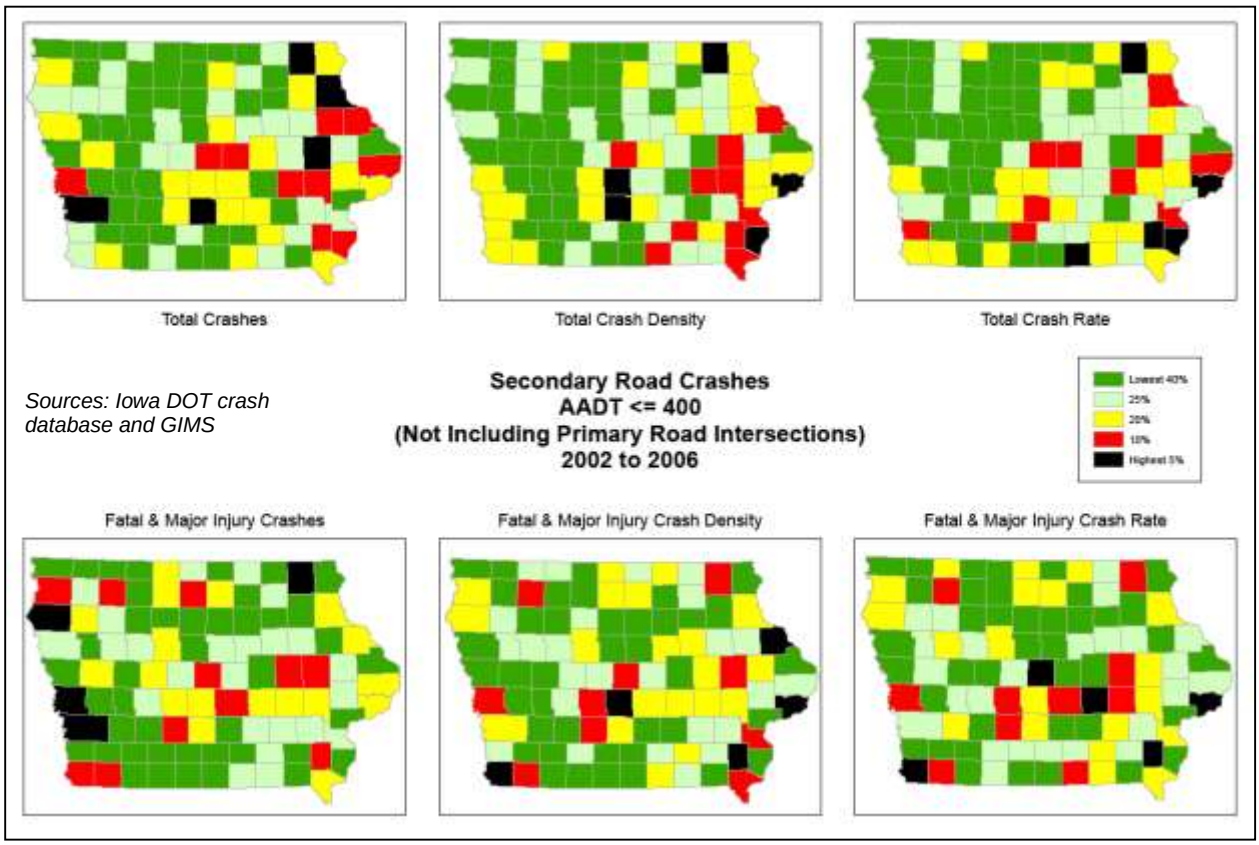

Figure 1. Crash frequency, density, and rate by county

Relative crash risk in each county is represented by a color. Black represents the highest 5 percent risk group, red the next 10 percent highest, yellow the next 20 percent, light green the next 25 percent, and dark green the lowest 40 percent.

Five years of crash data (2002 through 2006) are depicted. Crashes at intersections with primary roads and other secondary roads carrying higher (> 400 vpd) volumes were excluded.

While having higher crash rates, this class of secondary road, unpaved with traffic volumes exceeding 100 vpd, involves only about 4,400 total miles of roadway spread over Iowa's 99 counties (which is certainly a manageable number). Among the major contributing factors to crashes on these roads were higher speeds and younger driver involvement.

The final report included recommendations for crash mitigation, such as enhanced law enforcement, younger driver education, and several low-cost engineering improvements including upgraded signing, particularly at horizontal curves, and roadside delineation. The recommendations also included additional study of the possible effectiveness of reduced legal speed limits (currently 55 mph in Iowa for daylight hours and 50 mph at night) and development of a crash prediction model for this class of roadway.

The current study was undertaken to examine this identified class of rural roads more closely, apply selected crash mitigation, and, over time, evaluate the effectiveness of safety enhancements toward reducing crash frequencies and rates on these particular roadways. An examination of low-cost safety options could identify potentially-beneficial mitigation for common crashes experienced on this type of roadway and provide additional tools for local road officials to use to reduce crashes.

Objectives

The purpose of this study was to identify and examine several unpaved, local road segments with higher than average crash frequencies, select and undertake potentially-beneficial mitigation, and evaluate the results as time allowed. A variety of low-cost options were considered, including engineering improvements, enhanced efforts by law enforcement, and educational initiatives.

Project Description

InTrans researchers identified several low-volume, local, unpaved road segments in central Iowa (to reduce time and travel costs for the study) and contacted local agencies for interest in cooperating in this low-cost safety improvement effort. InTrans staff then worked with those local agencies to identify possible causations and to select possible crash-reducing, multidisciplinary mitigation strategies.

Engineering strategies included such low-cost improvements as signing upgrades and chevron and/or delineator installation.

County law enforcement agencies were also invited to participate, initially by attending meetings and field reviews to identify problems and later by applying increased patrols and enforcement efforts during time periods identified by the crash data and/or speed studies.

In some counties, local news media were advised of the program and meetings with school officials and driving instructors were sought where significant younger driver crash involvement had been determined. These efforts helped focus attention on safety improvements for these selected roadways while soliciting additional input, including perceived concerns with mitigation strategies, as well as multidisciplinary local involvement.

Project Tasks

The following tasks were undertaken as part of this investigation.

1. Literature Review

   An examination of existing literature as well as resources at the Federal Highway Administration (FHWA) and practices of other agencies in the selection and application of low-cost safety improvements on low-volume, rural roads was completed.

2. Invite Participation of an Advisory Group

   A group of experienced professionals from Federal, state, and local agencies were invited to provide advice and guidance throughout the project.

3. Select Candidate Road Segments

   Iowa's crash database was consulted to select higher crash frequency road segments on unpaved, rural roads in area local jurisdictions. County engineers in these jurisdictions were invited to participate in the project. Both higher and lower population counties were sought for participation.

4. Identify and Institute Potentially-Beneficial Mitigation

   On-site meetings were scheduled in participating counties with engineering and law enforcement staff. In some counties, local news media were advised of the program and meetings with school officials were sought where significant younger driver crash involvement had been determined.

5. Evaluate Effectiveness of Mitigation

   In as much as possible in the short timeframe available, the effectiveness of the selected safety improvements was evaluated. Given several years would be required to perform a statistically-valid crash analysis on low-volume roads, only preliminary conclusions were formulated.

6. An evaluation report that included a description of project activities, problems encountered and beneficial results of the process was prepared.

LITERATURE REVIEW

During the course of the Phase I portion of the previous project, related literature and studies were noted and some are also included here.

Many factors, including alcohol use, irregular terrain, increased speeds, and distances to medical care were noted by the Rural Transportation Initiative of the U.S. Department of Transportation (USDOT 2006) to more often result in fatalities on rural road crashes than in urban ones.

The following common safety problems for low-volume roads were identified in the *Guide to Safety Features for Local Roads and Streets* (FHWA and NHI 1992):

- Inadequate signing , markings, and delineation
- Inadequate sight distances at intersections
- Narrow lanes and inadequate shoulders (or no shoulder)
- Lack of clear roadside recovery area
- Frequent roadside obstacles
- Sharp horizontal and/or vertical curves
- Narrow bridges
- Limited right-of-way
- Inadequate passing, stopping, and horizontal sight distance

Vehicle speeds on low-volume roads cause special safety concerns, both in normal and poor weather conditions. Liu and Dissanayake (2007) collected speed data on gravel roads in Kansas and found that both the 85th percentile and mean speeds were reduced during poor weather, but by a very small amount. When speed limits were correlated with crash data, their premise that, by reducing speed, you could also decrease the severity of crashes was not able to be validated. A lack of posting and (expensive) enforcement was given as possible reasons for the lack of correlation between speed policy and safety performance.

Liu and Dissanayake, in a subsequent study (2008) developed logistic regression models to identify factors affecting the severity of injury crashes on gravel roads in Kansas. Their findings included typical causes for injuries in rural crashes: failure to use safety equipment, driver ejection, alcohol involvement, failure to yield right-of-way (ROW), inattentive driving, driving too fast for conditions or exceeding speed limit, older driver involvement, and ruts/potholes on surfaces. Any (and all) of these increased the chances of a crash being more severe. Another correlation that was found by the authors was between higher crash severity and crashes involving an overturned vehicle, head-on collisions, and collisions with fixed objects, all of which might have been anticipated.

Zegeer et al. (1994) computed a crash rate of 3.5 per million vehicle miles (MVM) on low-volume roads (< 2,000 vpd in their study) based on a sampling from seven states and noted that this was about 150 percent of the rate on all high-volume roads. Although the premise is the

same, in Iowa "low volume" is a much smaller range (< 400 vpd), which is a volume consistent with the 2003 *Manual on Uniform Traffic Control Devices* (MUTCD) definition.

In this study, Zegeer et al. (1994) found no significant difference between the crash rates on paved and unpaved roads with 250 vpd or less. Paved roads were found to be significantly safer than unpaved roads with vehicle counts above 250 vpd. In Iowa, that would be logical because paved roads would normally be regraded to a higher design standard before paving. However, the authors in this study recommended that unpaved, rural roads with traffic volumes higher than 250 vpd be paved, which is a recommendation that in not economically-feasible in Iowa.

Although based on a very small sample of road sections and crashes, Caldwell and Wilson (1997) compared the injury crash rates on unpaved county road sections in Albany County, Wyoming to injury crash rates on all roads in the state. Their findings revealed that risk of injury was five times higher on county roads than on all roads.

Souleyrette et al. (2005) conducted a study to establish guidelines for removing unnecessary traffic control devices at low-volume, rural intersections. Many different opinions and practices were discovered in policies during the study's survey of county engineers in Iowa. The most common criteria in their procedures for establishing stop control at low-volume, rural intersections were sight distance and crash history.

The researchers also found that older drivers were underrepresented and younger drivers were overrepresented in intersection crashes for both stop-controlled and uncontrolled ultra-low-volume (< 150 daily entering vehicles/DEV) unpaved intersections. Broadside/right angle crashes were the most prominent multi-vehicle crash type, and the major contributing circumstance at these intersections was failure to yield the ROW. The crash report evidence indicated that drivers did not necessarily run the Stop sign, but instead misjudged available gaps and proceeded into the path of oncoming vehicles.

Another aspect of low-volume road safety problems have been recognized by driver education instructors. In a survey conducted in 2008 (Neenan 2008), instructors were asked about their observations, experience, and opinions on topics related to rural road driving. Although 98 percent indicated that their students had an opportunity to drive on rural roads during their behind-the-wheel training time, only 87 percent of the teachers spent one or more class periods teaching about the hazards of driving on rural roads.

The instructors' perceived risks to young drivers included speed, cell phone use, passengers (distractions), loose gravel surface, and impaired nighttime driving. Although some instructors indicated that there should be a requirement to drive on rural roads (especially unpaved) during the behind-the-wheel time, most also said that their cars were leased and, by contract, could not be driven on gravel roads.

Ksaibati and Evans (2008) assigned crashes to single-mile strips of roadway in Wyoming and then considered 10 potential procedures, which were very similar to the measures suggested by Russell et al. (1996), for identifying high risk locations (Table 1).

Table 1. Potential procedures for identifying high-risk locations (Ksaibati and Evans 2008)

10 Year Reviews Based on:	Or 3 Year Moving Averages of:
Total crash rate	Total crash rate
Total number of crashes	Total number of crashes
Fatal and injury crash rate	Fatal and injury crash rate
Total fatal and Injury crashes	Total fatal and Injury crashes
Total number of crashes/mile	Total number of crashes/mile
EPDO method*	

* Equivalent property damage only (EPDO) was not used because fatal crashes were too limited in number and using the EPDO method could skew the analysis

In the report, the researchers provided a sample table that shows the ranking of sections from Laramie County, Wyoming of the one-mile road segments that had crash frequencies of up to nine crashes per segment.

Specific mitigation strategies were suggested in a guide prepared by Russell et al. (1996) for personnel at local technical assistance program (LTAP) centers. In this report, researchers presented common solutions to specific safety problems and deficiencies, including design criteria, drainage features, and clear zone recommendations. Of great interest to many local agencies were the suggestions covering a sign inventory system, a maintenance work order/complaint system, and other guidance on low-cost safety improvements.

Literature was also reviewed in reference to the identification of high crash locations on local, rural roads. Russell et al. (1996) reported that one or more of the following measures can be applied to identify high-accident locations:

accident number	accident severity	accident rate
number rate	severity rate	number quality control
rate quality control		

The research pointed to the actual number of accidents as the basic measure and then, use of a weighted factor to that base for crashes in each severity level. The (weighted) result was an equivalent property damage only (EPDO) number, which can then be ranked with others. As an example of how the severity weighting would work, the researchers presented an example in which fatal and all injury crashes were considered equivalent to six PDO crashes.

In 2009, Ksaibati et al. published a report describing an extensive study of local road safety needs in Wyoming, both paved and unpaved. Using historical crash records and field evaluations in three Wyoming counties, low-cost safety improvements were identified and an attempt to produce a crash prediction model was made. Improvements suggested included signing and marking upgrades, addition of delineation, flattening of slopes, and extension of culverts.

In 1997, Caldwell and Wilson conducted research in an effort to develop a ranking and prioritization system for use for low-volume, unpaved, rural roads. The project methodology employed a modified Delphi procedure to obtain input from unpaved road experts and other professionals representing Federal and local agencies. Safety needs on the roads were determined by a review of not only crash data but also road user assessments. Their final program consisted of five steps:

1. System-wide prioritization of unpaved roads
2. Identification of safety improvements on individual road sections
3. Prioritization of safety improvements
4. Scheduling and implementing safety improvements
5. Program evaluation and update process

Although Caldwell and Wilson supported the program they had devised, they also realized that limitations with local funding and staff must be taken into account before developing a safety improvement program (SIP) for unpaved roads. Caldwell and Wilson recommended that changes in policies and practices might be essential before evaluating and prioritizing the safety needs of unpaved roads.

NCHRP Synthesis 321 also presented common types of crashes, possible contributing factors, and potential countermeasures and other mitigation strategies.

SELECTION AND PARTICIPATION OF AN ADVISORY GROUP

The advice and guidance offered by an experienced and knowledgeable group of professionals was crucial to the successful completion of this project:

- Nicole Fox, Iowa Department of Transportation (DOT), Local Systems
- Jim George, Dallas County Engineer
- Shauna Hallmark, InTrans
- Zach Hans, InTrans
- Randy Hunefeld, Iowa Governor's Traffic Safety Bureau
- Bob Kieffer, Boone County Engineer
- Tom McDonald, InTrans, Iowa LTAP
- Jerry Roche, FHWA - Iowa Division
- Bob Sperry, InTrans, Iowa LTAP
- Jeremey Vortherms, Iowa DOT, Traffic and Safety
- Randy Will, Webster County Engineer

In addition, the county engineers and law enforcement officers in the counties where study segments are located were also asked for and provided advice for addressing safety concerns on those roads.

SELECT CANDIDATE ROAD SEGMENTS

The initial selection of road segments to be studied began with an examination of crash maps, which were produced for nine central Iowa counties, showing visual symbols for the location and severity of crashes from 2001 through 2010 on local, unpaved roads with traffic volumes greater than 100 vpd. A sample of those maps is included in Appendix A.

Many of the counties chosen had crash rates or densities in the top 15 percent, as shown in Figure 1. Based on the information shown on the maps, researchers eliminated the roads in three of counties (Polk, Marion, and Webster) from further review because each exhibited far fewer crashes on this road type than the other area counties.

From the remaining six counties, 15 roadway segments were selected and complete crash information summaries were requested and received from Iowa Traffic Safety Data Services (ITSDS) at InTrans. These histories included the period 2001 through 2010 (preliminary data) and an example of that data is shown in Table 2.

In addition, a field review of these routes (taking notes, sign inventories, and photos) was conducted for each segment and crash rates, densities, and severities were calculated. Table 3 was created to summarize those details.

Table 2. Sample roadway and crash information (ITSDS)

Crash History - Candidate Secondary Unpaved Roadways (Min. 100 vpd), 2001-prelim.2010													
Section Number	County	Road Name	Limits	Section length (miles)	Weighted AADT (vpd)	Year	Fatal	Major Injury	Minor Injury	Possible/ Unknown Injury	Property Damage	Total	Crash Density (per mile per year)
1	Story	550TH AVE	130TH ST to 150TH ST	1.989	110	2001			1		1	2	0.90
						2002	1				1	2	
						2003					1	1	
						2004					1	1	
						2005		1			1	2	
						2006			1	1		2	
						2007			1		2	3	
						2008							
						2009			1		3	4	
						2010					1	1	
						Total	1	1	4	1	11	18	
2	Story	GRANT AVE	PRAIRIE VIEW DR to HARRISON DR	2.485	222	2001							1.01
						2002				1	2	3	
						2003			1		1	2	
						2004					1	1	
						2005		1		1	3	5	
						2006		1			2	3	
						2007			2			2	
						2008					5	5	
						2009			1		1	2	
						2010				2		2	
						Total		2	4	4	15	25	
3	Story	19TH ST	S G AVE to 270 TH ST	2.756	202	2001							0.51
						2002							
						2003					2	2	
						2004					1	1	
						2005					4	4	
						2006		1			1	2	
						2007				1	2	3	
						2008							
						2009			1			1	
						2010		1				1	
						Total		2	1	1	10	14	

Table 3. Study road segment crash densities, rates, and severities (2001 through 2010 data)

Summary of Low-Volume Road Segments 2001-2010 Data									
County	**Segment**	**Length**	**ADT**	***Crashes**	**PDOs**	**Density**	**Rate**	**Severity**	**$ Loss**
Story	550th Ave.	1.99	110	18	11	0.9	2253	22,148	200,337
"	Grant Ave.	2.45	222	29	17	1.02	1461	3,813	44,503
"	19th Street	2.76	202	14	10	0.51	688	4,143	21,014
Madison	Holliwell	1.68	260	11	9	0.65	690	885	5,792
Jasper	N. 39th Ave.	2.95	201	12	6	0.41	554	1,960	7,981
"	W. 4th St. S	1.44	206	15	7	1.11	1385	3,206	66,985
"	E. 5th St. S	1.43	280	14	5	0.63	958	3,568	34,930
Warren	150th Ave.	2.05	281	24	6	0.93	1141	3,030	35,456
"	118th Ave.	2.75	313	16	8	0.58	509	1,385	8,058
"	Nevada St.	3.27	246	7	2	0.21	238	2,191	4,691
Dallas	130th St.	2.79	173	15	9	0.39	851	26,069	140,054
"	Bittersweet	4.67	115	11	4	0.23	561	2,735	6,314
"	Old Portland	3.38	203	7	5	0.21	280	1,236	2,558
Marshall	Smith Ave.	3.5	171	16	10	0.46	732	1,538	7,029
"	Marsh Ave.	2.25	150	9	3	0.4	731	2,268	9,071

The crash rates (per hundred million vehicle miles of travel/HMVMT) and densities were reviewed by comparing them with the results of the 2010 study for the 101 to 400 vpd class, as well as the statewide average for rural secondary roads. All but two of the initially-selected review segments had a higher crash rate than the 2010 study average, but only two of the 15 had a higher crash density than that of the study average. All rates and densities of the final six selected segments were considerably higher than the statewide averages for rural, secondary roads (see Table 4).

Table 4. Comparative rates and densities

	Rate	**Density**
2010 research report for 101-400 vpd unpaved rural roads	318/HMVMT	1.0/mile/year
Iowa statewide averages for rural secondary roads	196/HMVMT	0.11/mile/year

Since the project's initiation, more current crash data has become available. Updated information is shown in Table 5 with 2002 through 2011 data, but all crash references in this report are from the 2001 through 2010 data in Table 3.

Table 5. Study road segment crash densities, rates, and severities (2002 through 2011 data)

Summary of Low-Volume Road Segments 2002-2011 Data									
County	**Segment**	**Length Miles**	**ADT**	***Crashes**	**PDOs**	**Density crashes/ mile/yr**	**Rate crashes/ HM VMT**	**Severity**	**$ Loss**
Story	**550th Ave.**	**1.99**	**110**	**17**	**11**	**0.85**	**2128**	**22,148**	**200,337**
"	**Grant Ave.**	**2.45**	**222**	**30**	**17**	**1.22**	**1511**	**3,206**	**38,708**
"	19th Street	2.45	202	14	10	0.57	**775**	4,143	21,014
Madison	Holliwell	1.68	260	11	9	0.65	**690**	885	5,792
Jasper	N. 39th Ave.	2.95	201	12	6	0.41	**554**	1,960	7,981
"	**W. 4th St. S**	**1.44**	**206**	**12**	**4**	**0.83**	**1108**	**1,757**	**14,680**
"	**E. 5th St. S**	**1.43**	**280**	**15**	**7**	**1.05**	**1026**	**3,199**	**33,559**
Warren	**150th Ave.**	**2.05**	**281**	**25**	**6**	**1.22**	**1189**	**3,101**	**37,796**
"	118th Ave.	2.75	313	16	8	0.58	**509**	1,385	8,058
"	Nevada St.	3.27	246	7	2	0.21	**238**	2,191	4,691
Dallas	**130th St.**	**2.79**	**173**	**15**	**9**	**0.54**	**851**	**26,069**	**140,054**
"	Bittersweet	4.76	115	11	4	0.23	**551**	2,735	6,314
"	Old Portland	3.38	203	7	5	0.21	**280**	1,236	2,558
Marshall	Smith Ave.	3.5	171	16	10	0.46	**732**	1,538	7,029
"	Marsh Ave.	2.25	150	9	3	0.40	**731**	2,268	9,071

*10 year total
** per HMVMT

Severity
RSI = [Ck*K + Ca* A + Cb* B + Cc*C + Cp* P] /(K + A + B + C + P)/Yrs
Where:
RSI = Relative Severity Index
C = Avg. Comprehensive Cost per Crash for a Severity Level K through P
K = Frequency of Fatal Crashes
A = Frequency of Major Injury Crashes
B = Frequency of Minor Injury Crashes
C – Frequency of Possible Injury Crashes
P = Frequency of Property Damage Only Crashes

Rate (per HMVMT) CR = N / [A x Y x 365 x L] x 100,000,000
Where:
CR = Crash rate
(crashes per HMVMT N = Crash frequency during the analysis period (Y)
A = Average Annual Daily Traffic (AADT)
Y = Analysis period, years
L = Segment length, miles

Density CD = N / [Y x L]
Where
CD = Crash density, crashes per mile (crashes/mile/year)
N = Frequency of crashes for the period
Y = Analysis period, years
L = Segment length, miles

To further refine the study group, county engineers from the six initial counties identified were contacted for insight regarding possible contributing factors to the higher crash frequencies and offered an opportunity to review the segments in a detailed field examination with the researchers. (Typical images from some of those segment reviews are included in Appendix B.) In addition, law enforcement was consulted often and provided input.

Many of these discussions proved valuable in a better understanding of some individual crashes. (In one instance, it was learned that the driver of a vehicle left home very angry and distraught, proceeded down a straight section of the road until leaving the roadway crossing a driveway and striking a parked vehicle in front of a house.)

With a detailed examination of the updated crash data and considering the input from county officials, the final selection of study segments was made resulting in six locations in four different counties. The counties and road segments that were chosen for complete analysis (and possible mitigation) are listed in Table 6 and shown in boldface in Table 5. Each is discussed individually in the next chapter.

Table 6. Counties and road segments selected for complete analysis and possible mitigation

County	Road Segment(s)
Dallas	130th Street from US 169 west to Kimble Place (East corporate limits of Perry)
Jasper	W 4th Street S from S 44th Avenue W north to Newton South city limits E 5th Street S from S 44th Avenue E north to Newton South city limits
Story	530th (Grant) Avenue from Ames city limits (just north of Harrison Street) north to the South city limits of Gilbert 550th Ave from 150th Street north to 130th Street (CR E-18)
Warren	150th Avenue from IA 92 north to CR G-36

IDENTIFY POTENTIALLY-BENEFICIAL MITIGATION

Dallas County – 130th Street from US 169 West to Kimble Place (East Corporate Limits of Perry)

This 2.8 mile long segment of rock-surfaced road carries about 175 vpd and serves as a direct route for Perry High School students commuting from the northeast section of the school district to school, which is located just south of the west end of the segment. The route also serves other commuters from the same direction who work and/or shop at businesses located in the city.

A total of 15 crashes were recorded during the 10 year (2001 through 2010) study period, including one fatal, one major injury, and two minor injury crashes. Two crashes involved possible or unknown injuries and nine involved property damage only (PDO). More than half of the total crashes were recorded between 4 p.m. and 10 p.m. and nearly one quarter of the drivers involved in the crashes were of teen age.

Two of the 17 total drivers were recorded as impaired. Major causes of crashes included two run off the road (ROR) crashes and four additional incidents listed causes as follows: excessive speed, too fast for conditions, or operating in a reckless/aggressive manner. Three crashes involved animal impacts. The calculated crash rate and density for this segment were 851/HMVMT and 0.39/mile/year, respectively, both of which are above statewide averages for similar roads.

During an initial field review with the county engineer on June 30, 2011, it was noted that the road was about 30 ft wide and straight, giving a safe appearance. Although posted for a 45 mph speed limit, it was surmised that compliance may not be high among drivers. It was also noted that some brush was growing along the roadside, which, if removed, might reduce a possible hazard.

When potential traffic generators in the area were discussed, county officials advised that Perry High School is located near the west end of this segment.

Two of the three bridges along the route had no approach guardrails, but the county stated that some safety funding had been received to install guardrails for one of the bridges where a fatal crash had occurred and an application for additional funding to install guardrails at the remaining two structures had been submitted.

In a December 2011 review, it was noted that county crews had removed the brush in the ROW, not only eliminating potential fixed object hazards that had existed previously but also reducing potential large animal habitat in close proximity to the roadway (see examples in Figure 2).

Figure 2. Two different rural road views of vegetation in ROW (left) and removed (right)

To sample operating speeds, researchers conducted a speed evaluation on this road segment December 8 through December 12, 2011 using Numetric plates buried under the granular surface of the roadway, as shown in Figure 3.

Figure 3. Installation of buried Numetric plate

A summary of the data obtained is shown in Table 7.This information was provided to the county engineer and sheriff for information purposes and use in enforcement efforts, if desired.

Table 7. Speed study summary 12/8/2011 through 12/12/2011

Speeding Violations by Day 130th Street Dallas County					
	WB		EB		
	(>55)	(>65)	(>55)	(>65)	
Sunday	19	5	8	2	
Monday	8	3	7	3	AM Count Only
Thursday	9	6	11	3	PM Count Only
Friday	15	6	10	3	
Saturday	14	7	7	3	
Total	65	27	43	14	# of Violations
Count	301		239		Total Traffic Counted
% Violations	22%	9%	18%	6%	

In July 2012, the researchers and Hunefeld met with the Dallas County engineer and sheriff to discuss these findings, solicit additional information, and discuss potential mitigation strategies. The physical improvements to the roadway that had been made were reviewed by the engineer, Jim George, but the sheriff noted that their speed-monitoring trailer was no longer functioning. It was agreed that the lowered speed limit was not working well and the sheriff noted that in light of decreased manpower, further traffic control enhancements might not be practical.

Jasper County – West 4th Street South from South 44th Avenue West, North to the Newton Corporate Limits

This 1.44 mile long gravel-surfaced road segment carries average annual daily traffic (AADT) of 206 vpd and serves local traffic as well as providing a commuter route from Newton to a prison facility to the south.

A review of the crash data for the period 2001 through 2010 revealed a total of 15 crashes including one major injury, no minor injury, and three with possible injury. Seven crashes involved PDO. No crashes involving snow, slush, or ice were recorded, indicating adequate winter maintenance practices.

Major crash causes included two animal crashes, three ROR, and six crashes involving speed, swerving, overcorrecting, and losing control. Eleven of the crashes occurred either between 8:00 a.m. and 2:00 p.m. or between 8:00 p.m. and midnight. Five of 18 drivers involved in these crashes were aged 18 or under and two of the crashes involved alcohol. Nine of the 18 vehicles involved in crashes struck either a culvert or a ditch/embankment. The calculated crash rates and density for this segment were 1,385/HMVMT and 1.11 crashes/mile/year, both of which are above state averages for similar roads.

On June 23, 2011, the researchers, along with the county engineer, Russ Stutt, conducted a field review of this segment. A considerable amount of brushy vegetation, both in the roadside and around signs was noted but the engineer advised that it is the county's policy to not mow roadsides, except in a few cases of visibility restrictions.

The roadway width was measured to be about 27 ft and a bridge on this segment was restricted to a 20 ton load limit. The engineer mentioned that this route serves as a direct access to the prison for employees living in Newton.

On July 25, 2012, a meeting was conducted with several county officials, including the sheriff, Mike Balmer, the chief deputy, John Halferty, the county engineer, Stutt, assistant, Pam Olson, and Hunefeld from the Iowa GTSB. Following a cursory review of the project and objectives, several related issues were discussed.

The sheriff informed the researchers that the prison operates in three shifts (6:00 a.m. to 2:00 p.m., 2:00 p.m. to 10:00 p.m., and 10:00 p.m. to 6:00 a.m.). The officers also pointed out that a recycling company (Dodd's) is located near the south end of the segment and generates several truck trips per day. Many other travelers use the route as a connection from paved county road North 39th Avenue East to Newton.

Speed was suggested as a possible factor for some of the crashes on this school access road and it was suggested that a speed study be conducted after school starts in September 2012. Meetings with school administrators and driver education instructors were also mentioned as possibly beneficial. Neither law enforcement officer thought that lowering the speed limit on this road was practical.

Jasper County – East 5th Street South from South 44th Avenue East, North to Newton Corporate Limits

This road segment is granular-surfaced, 1.43 miles long, parallels W 4th Street S, and lies half mile east of that segment. The road carries AADT of 280 vpd, consisting of mostly local traffic, including younger drivers commuting to and from Newton High School that is located within the city north of this study segment.

A review of the 2001 through 2010 crash data for this segment indicated a total of 14 crashes, one of which was a major injury and two that were minor injury crashes. Six were listed as possible injury crashes and five had PDO. Most (13 or 14) of the crashes occurred during the week and nine of those crashes were recorded during commuter times (8:00 a.m. to 10:00 a.m. and 2:00 p.m. to 6:00 p.m.).

Of the 18 total drivers involved, 12 were of teen age. Alcohol was reported for two drivers.

Major crash causes listed four ROR and four that are often speed related, (swerving, over-correcting, and lost control), which might be attributable to inexperienced drivers. There were no animal crashes.

Three crashes occurred when the road surface was wet or snow covered, but most were recorded when the surface was reported as dry. Crash rate and density for this segment were calculated at

958/HMVMT and 0.63 crashes/mile/year, both of which are higher than the statewide average for similar roadways.

During a field review on June 23, 2011, the county engineer, Stutt, pointed out that a go-cart track is located near the north end of the segment and generates higher traffic demand on summer weekends. Parking for racing events is allowed on one side of the road for those events but this restriction can be difficult to enforce. However, Stutt was not aware of any serious traffic safety problems during racing events.

The road width was measured to be about 27 ft (which is a typical width). A sharp vertical curve was noted at the south end of this segment with a culvert and ravine near the bottom. The City of Newton sewage treatment plant is also located just north of the study segment, also generating some traffic.

During a subsequent meeting in July 2012 with the Jasper County sheriff and chief deputy, it was confirmed that the go-cart track scheduled events every weekend from May to October, but since restrictive parking signs had been installed and enforced, few problems with parking have been noted.

When asked about the school-related traffic, both engineering and law enforcement officials opined that crashes seem to increase when school is in session and consistent with the beginning and end of the school day, as well as when school events are scheduled. It was suggested that a speed study on this segment be performed after school started in the fall. However, it was not possible for a traffic speed evaluation to be conducted by the researchers.

Story County – 530th (Grant) Avenue from Ames City Limits (just North of Harrison Street) North to the South City Limits of Gilbert

This granular-surfaced road segment is about 2.5 miles long and carries an AADT of 222 vpd, consisting of mainly local traffic, but including a substantial volume of student drivers commuting to and from Gilbert High School. At the time of this evaluation, a new, larger school was being constructed that may result in a higher number of younger drivers.

A review of the 2001 through 2010 crash data for this segment revealed a total of 29 crashes including three major injury crashes, five minor injury crashes, and four possible/unknown injury crashes. Seventeen crashes resulted in PDO.

The major crash causes were ROR (four), swerving/evasive action (seven), over-correcting (two), and lost control (two), all of which can often be associated with younger, inexperienced drivers. In addition, six crashes recorded driving too fast for conditions or operating in a reckless manner as contributing causes. The most common fixed objects struck were a ditch or embankment.

Although most crashes involved only a single vehicle, five crashes were intersection-related including one ran Stop sign and three where failure to yield ROW was the major contributing cause. During the 10 year crash analysis period, one uncontrolled intersection where crashes had occurred was modified to a two-way stop by the county engineer in 2010 (180th Street and Grant Avenue).

The data indicated that 25 of 29 crashes occurred on weekdays with 18 of the 29 recorded during school commutation times, between 6:00 a.m. and 8:00 a.m. or between 2:00 p.m. and 6:00 p.m.

None of the reported crashes occurred during winter conditions of ice, snow, or slush and all occurred on a dry roadway surface.

Of the 40 drivers involved in the recorded crashes, 22 were of 19 years or younger (and 14 were age 16 or younger). Alcohol was a factor in only one crash. Calculated crash rate and density for this segment were 1,461/HMVMT and 1.02/mile/year, both of which exceed the statewide average for similar roads.

On June 23, 2011, researchers conducted a field examination of roadway conditions. It was found that the typical roadway width was about 29 to 30 ft and the southerly section of the study segment was in rolling terrain, with a few areas of limited roadway width and ROW. However, the southerly section up to West 190th Street or Moose Road had been proposed for annexation by the City of Ames, and planned development in that area may result in reconstruction and paving of the roadway. (Inclusion of the City of Ames in this evaluation will be considered.)

Very little loose rock was noted on the surface and visibility was very good at the time, but may worsen at intersections when the corn crop is taller.

During a meeting with the county engineer later that day, researchers were advised that high traffic volume on this road segment with accelerating/decelerating movements makes frequent maintenance necessary to address formation of wash-boarding on the surface. The county engineer also acknowledged the many young drivers traveling the road due to the proximity of the high school and observed that traffic volume may increase when the new school is completed.

On June 6, 2012, the research team and Hunefeld from the Iowa GTSB met with Story County law enforcement officers Captain Barry Thomas, Deputy Don Ellis, and the county engineer, Darren Moon, to discuss this road segment and a section of 550th Avenue, which is also involved in this study. It was learned that the proposed annexation north of the Ames city limits has been delayed temporarily for at least two years and, therefore, the entire segment will be analyzed in the current condition. Although paving of the northern section has been identified in the county's long-range (5 year) program, no funding has been or is available at this time.

Both law officers agreed that younger, inexperienced drivers were a probable safety concern. It was also noted that recent funding cutbacks in their department had eliminated the option of

adding enforcement hours for officers. Captain Thomas pointed out that continued population growth in the northern part of Ames and rural areas will probably continue to exacerbate the problem.

McDonald stated that some funding was available with this evaluation study to support extra enforcement as a mitigation strategy, and if the county was interested, details could be decided mutually to assure appropriate documentation was made of any enhanced efforts by Story County enforcement.

A meeting with Gilbert High School administrators and driver instructors was suggested as part of mitigation strategies. A presentation at a school assembly or during driver education classes will also be explored. In addition to crash data from Grant Avenue, an informative video is available as a training tool.

A supplemental meeting was conducted by the research team in December 2012 with local law enforcement with Commander Ellis and Lt. Jeff Dodds participating. In addition, Jerry Roche, FHWA safety engineer, and Hunefeld from the Iowa GTSB attended. The main goal of the meeting was to discuss details for additional enforcement as a crash mitigation tool.

Crash data as well as previous speed study results were reviewed, along with reporting forms that would be used for recording extra enforcement hours (see Appendix C). A process for negotiating a service agreement between the County and Iowa State University was addressed. In addition, a possible meeting with school officials, contacts through the officer assigned to the school, and media releases were encouraged and assistance was offered. Programs on safe driving had been presented at the school in the past.

The researchers conducted a traffic speed evaluation in December 2011 using Numetric plates placed beneath the granular surface in each direction of travel. Given that many vehicles traveling on low-volume, unpaved roads tend to favor the center of the roadway, the information obtained may not be statistically-accurate for a directional vehicle count, but the speeds recorded should be reliable.

Raw data collected data revealed a total of 553 vehicles (northbound/NB plus southbound/SB) traveling this segment during the recording period and that 62 of them (11 percent) were traveling at 60 mph or above, as tabulated in Table 8.

Table 8. Excess traffic speed results recorded December 8-12, 2011

Grant Avenue Speeding Violations (> 60 mph) recorded December 8-12, 2011 Suggested Enforcement Times											
2011/12/08 12:10:45.00	Thursday	Normal	61	MPH		2011/12/09 05:50:51.00	Friday	Normal	68	MPH	
2011/12/08 13:41:22.00	Thursday	Normal	61	MPH		2011/12/09 07:54:19.00	Friday	Normal	74	MPH	6-9 AM
2011/12/08 14:17:07.00	Thursday	Normal	68	MPH	SB	2011/12/09 07:54:42.00	Friday	Normal	67	MPH	
2011/12/08 14:32:15.00	Thursday	Exceeded Maximum Length	72	MPH		2011/12/09 08:23:00.00	Friday	Normal	68	MPH	
2011/12/08 15:03:40.00	Thursday	Normal	78	MPH		2011/12/09 08:24:26.00	Friday	Normal	66	MPH	
2011/12/08 15:19:11.00	Thursday	Normal	76	MPH		2011/12/09 09:21:37.00	Friday	Normal	63	MPH	
2011/12/08 15:39:29.00	Thursday	Normal	62	MPH	2-6 PM	2011/12/09 11:44:22.00	Friday	Normal	64	MPH	
2011/12/08 16:01:35.00	Thursday	Normal	73	MPH		2011/12/09 12:53:25.00	Friday	Normal	63	MPH	
2011/12/08 16:34:37.00	Thursday	Normal	60	MPH		2011/12/09 15:04:21.00	Friday	Normal	69	MPH	
2011/12/08 16:40:39.00	Thursday	Normal	66	MPH		2011/12/09 15:33:50.00	Friday	Normal	61	MPH	2-8 PM
2011/12/08 16:43:59.00	Thursday	Normal	63	MPH		2011/12/09 15:36:12.00	Friday	Normal	61	MPH	
2011/12/08 17:24:26.00	Thursday	Normal	61	MPH	SB	2011/12/09 18:16:36.00	Friday	Normal	61	MPH	
2011/12/08 17:38:06.00	Thursday	Normal	65	MPH		2011/12/09 19:36:50.00	Friday	Normal	75	MPH	
2011/12/10 00:03:58.00	Saturday	First Day of New Date	73	MPH		2011/12/11 10:16:36.00	Sunday	Normal	61	MPH	
2011/12/10 08:05:14.00	Saturday	Normal	60	MPH		2011/12/11 10:37:45.00	Sunday	Normal	63	MPH	
2011/12/10 08:11:29.00	Saturday	Normal	61	MPH	SB	2011/12/11 13:38:13.00	Sunday	Normal	73	MPH	
2011/12/10 08:42:45.00	Saturday	Normal	62	MPH	8-12 AM	2011/12/11 14:07:47.00	Sunday	Normal	61	MPH	
2011/12/10 09:03:18.00	Saturday	Normal	71	MPH	SB	2011/12/11 14:37:25.00	Sunday	Normal	69	MPH	
2011/12/10 10:57:39.00	Saturday	Normal	63	MPH		2011/12/11 15:06:43.00	Sunday	Normal	60	MPH	
2011/12/10 11:35:36.00	Saturday	Normal	63	MPH	SB	2011/12/11 16:04:46.00	Sunday	Normal	64	MPH	2-6 PM
2011/12/10 12:09:56.00	Saturday	Normal	66	MPH		2011/12/11 16:12:35.00	Sunday	Normal	62	MPH	
2011/12/10 14:01:48.00	Saturday	Normal	62	MPH		2011/12/11 16:32:22.00	Sunday	Normal	70	MPH	
2011/12/10 17:37:48.00	Saturday	Normal	66	MPH		2011/12/11 16:44:37.00	Sunday	Normal	64	MPH	
2011/12/10 18:37:52.00	Saturday	Normal	62	MPH		2011/12/11 18:34:40.00	Sunday	Normal	62	MPH	
2011/12/10 19:05:48.00	Saturday	Normal	68	MPH	2-10 PM	2011/12/11 10:41:28.00	Sunday	Normal	60	MPH	SB
2011/12/10 19:12:00.00	Saturday	Normal	62	MPH							
2011/12/10 19:58:47.00	Saturday	Normal	61	MPH							
2011/12/10 20:09:57.00	Saturday	Normal	61	MPH		2011/12/12 06:34:09.00	Monday	Normal	66	MPH	
2011/12/10 21:39:38.00	Saturday	Normal	74	MPH		2011/12/12 07:08:02.00	Monday	First Day of New Date	60	MPH	SB
2011/12/10 22:36:38.00	Saturday	Normal	62	MPH		2011/12/12 07:13:15.00	Monday	Normal	72	MPH	All 6-8 AM
2011/12/10 23:38:29.00	Saturday	Normal	61	MPH		2011/12/12 07:37:34.00	Monday	Normal	63	MPH	
2011/12/10 23:49:50.00	Saturday	Normal	68	MPH		2011/12/12 07:55:23.00	Monday	Normal	66	MPH	
Compiled from Raw Data with speeds >60 mph 12-12-12 - RBS											

As can be noted in Table 8, a substantial number of drivers exceeded the statutory 55 mph speed limit on this roadway segment during the evaluation period, which could be a contributing factor in the high crash frequency. Scheduling law enforcement patrols during the periods when higher speeds were noted may prove beneficial.

Story County – 550th Avenue from 150th Street North to 130th Street (CR E-18)

This granular road segment is approximately 2.0 miles long and carries an AADT of 110 vpd. Normal traffic consists of mostly local residents, but the destinations are not known with certainty, although commutation from Story City to Ames is a possibility. A Story County greenbelt area located south of the segment is another possible destination.

A review of 2001 through 2010 crash data indicated a total of 18 crashes including one fatal crash, one major injury crash, and four minor injury crashes. One was listed as a possible/unknown injury crash and 11 of the crashes involved PDO. Six of the 18 crashes occurred at intersections and notably 150th Street/County Road (CR) E-18.

Major crash causes included ran a Stop sign and failure to yield ROW from a Stop sign, driveway, or while making a left turn. Other crash causes noted were ROR, swerving/evasive action, and driving too fast for conditions. Driving too fast for conditions was cited in four of the crashes as the contributing cause.

More than half (10 of 18) of all crashes occurred between 2:00 p.m. and 10:00 p.m. Day of week for crashes was quite uniform, except for Sunday when no crashes were recorded.

A total of 26 drivers were involved in the 18 crashes with six aged 18 years or under. None of these crashes involved alcohol. Fixed objects struck included ditch/embankment (three) and bridge (one).

Only one crash was reported during winter weather where a snow-covered surface condition was noted. (Note: Story County officers observed that the fatal injury involved an elderly driver and it was unclear that the death was crash-related.)

Calculated crash rate and density were 2,253/HMVMT and 0.90 crashes/mile/year respectively, both of which are higher that statewide averages for similar roads.

On June 6, 2012, researchers and Hunefeld from the Iowa GTSB met with the county engineer, Moon, and Captain Thomas, and Commander Ellis of the Story County Sheriff's office. No additional opinions were offered about the origin/destination of traffic on this segment.

Extra enforcement was again suggested as a mitigation option, but the officers again responded that limited funding did not allow much opportunity for additional patrol efforts. Since parallel

US 69 was to be closed for reconstruction in 2012, enforcement priorities were shifted to official (and unofficial) detour routes that were being used by traffic.

On June 23, 2012, the researchers conducted a field exam of this segment where it was found that the typical roadway width was approximately 30 ft. A low vertical curve was located just north of the 150th Street intersection followed by a very flat and straight roadway profile to the 130th Street intersection. A narrow bridge between 150th and 140th Streets was marked with yellow and black hazard markers, but has no weight limit posted. These observations were discussed with the Story county engineer later that day.

During a meeting with the county engineer on December 12, 2012, he suggested that Cross Traffic Does Not Stop plaques be added to the Stop sign supports at 130th Street.

A speed evaluation was conducted by the research team at two separate times using buried Numetrics plates, first on October 7-10, 2011 (see Tables 9 and 10) and again on December 8-12, 2011 (summary not shown) to assess the traffic speeds on this segment. Neither study indicated any major speeding patterns. The days of week and time periods for higher speeds (> 60mph) on this section of 550th Street are shown in the tables.

Table 9. Story County 550th Avenue speed violations by day

Speeding Violations by Day 550th Avenue Story County (Noon 10/7/11-Noon 10/10/11)			
	NB	SB	
	(>60)	(>60)	
Sunday	2	4	
Monday	2	3	AM Count Only
Friday	6	4	PM Count Only
Saturday	10	6	
Total	20	17	# of Violations
Count	296	422	Total Traffic Counted
% Violations	6.70%	4.00%	

Table 10. Story County 550th Avenue speed violations by time of day

Time of Day for Speeding Violations (=> 60 mph) Noon 10/7/11-Noon 10/10/11									
6-8 AM	8-10 AM	10AM-12 PM	12-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10 PM-12 AM	Total
3	1	2	2	2	4	2	1		17
1	1	2	2	3	3	4	3	1	20
4	2	4	4	5	7	6	4	1	37

Warren County – 150th Avenue from IA 92 North to County Road G-36

This approximate 2 mile granular-surfaced road segment carries an AADT of 281 vpd and is located on the east edge of Indianola. In addition to local traffic, the segment also serves as an unofficial bypass of the community for commuters from IA 92 to US 69.

A review of 2001 through 2011 crash data indicated a total of 24 recorded crashes with no fatalities, one major injury crash, two with minor injuries, and 15 with possible injuries. Six crashes involved PDO.

Major crash causes included six ROR and five operating in a reckless manner. Two crashes involved animals. Intersection-related crashes included two running Stop sign and two failure to yield from a Stop sign or parked position.

Six crashes were reported involving either ice or snow on the road surface, but 10 occurred with dry surface conditions. Crashes were distributed fairly uniformly throughout the week, but somewhat higher on Mondays. Time of day for crashes was higher in the afternoon, with 14 of the 24 total being recorded between 2:00 p.m. and 8:00 p.m.

Driver age distribution was relatively uniform, including five teens and two of age 65 and older. It was also noted that 21 of the 36 total drivers involved in crashes were female. Only one alcohol/drug related crash was reported. For fixed objects struck in the crashes, two listed ditch/embankment, two posts and one pole.

Calculated crash rate and density for this segment were 1,141/HMVMT and 0.93/mile/year respectively, both of which exceed the statewide average for similar roads.

Researchers conducted an initial field review on June 30, 2011. Among the observations made were some loose rock along the edge of the roadway, typical road width of about 29 ft, and an unmarked curve near the Jewell Street intersection. Sight distance from this intersection appeared minimal to the south/right. Two utility poles were located very close to the road shoulder, well within the clear zone. A left turn warning sign was posted at the northern end, along with a double arrow sign to guide drivers around a curve to the CR G-36 intersection.

During a subsequent meeting with Warren County engineering staff, the researchers learned that many events are scheduled annually in an area adjacent to this roadway segment, such as the Hot Air Balloon Festival, a Laser Show, and political events. It was surmised that crash frequency may be impacted by the higher traffic volume generated by these summer and fall events, but when historic crashes were tabulated by month, a relatively normal distribution was found.

For example, each month showed at least one crash, except October and December, which listed the highest frequency with five crashes each. The summer months of June, July, and August showed only two crashes each, indicating that traffic management for these events has been handled very well.

During a July 31, 2012 meeting with Warren County Deputy Mike Morrison, Hunefeld from the Iowa GTSB, and the research team, Morrison suggested the limited available sight distance near Jewell Street, young drivers, speed, and the near proximity of some utility poles as the major contributors to the higher crash frequency on this road segment.

Morrison also recommended that this (and other similar segments surrounding the city should be paved because of the volume of traffic and types of drivers (commuters, non-local traffic) using these roads. Morrison also suggested that additional cable guardrail should be installed on curves and other potentially-hazardous locations.

When asked about new driver education that is provided by instructors or law enforcement for students by Indianola High School, the researchers learned that no unique training for driving on unpaved rural roads is offered. New driver training is provided by a consultant and only the state-required training is included, according to Deputy Morrison.

To assess common traffic speed on this segment, researchers conducted a speed evaluation from June 19 through June 25, 2012 using a post-mounted side radar unit. Sample results from this equipment is shown in Figures 4, 5a, and 5b. Except for apparent statistical outliers on June 19 (Tuesday) and June 24 (Sunday), no speeding events were recorded by the radar unit on any other day.

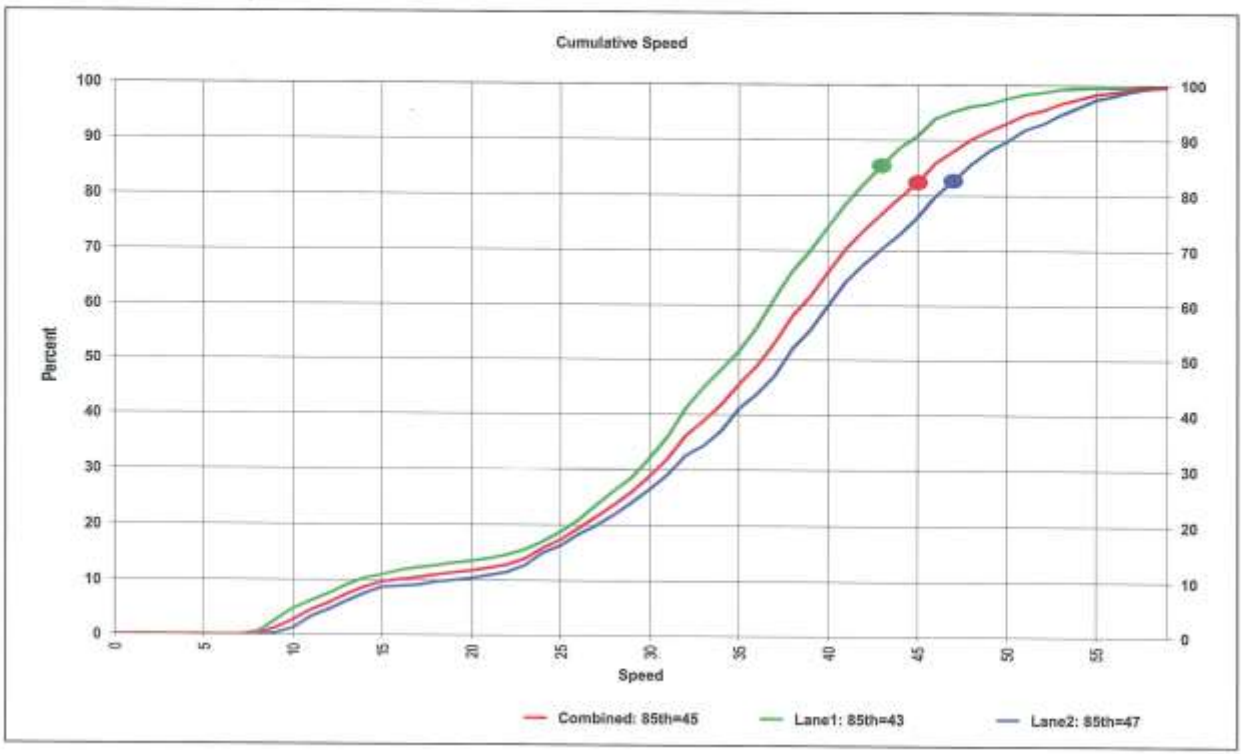

Figure 4. Warren County 150th Avenue 85th percentile speeds

Institute for Transportation
2711 South loop Drive
Ames, Iowa 50014
515-294-8103

Best Times for Enforcement

Location:
150th Avenue N of Jersey St.
GPS:
Not Available
Closest Cross Street:

Analysis Dates:
Tuesday, June 19, 2012
Monday, June 25, 2012

Equipment Used:

Installed By:

Requested By:

Sun	**Combined: Noon to 4 PM** **Lane1: Noon to 4 PM** **Lane2: 4 PM to 8 PM**
Mon	**Combined: 4 AM to 8 AM** **Lane2: 4 AM to 8 AM**
Tue	**Combined: 5 PM to 9 PM** **Lane1: 5 PM to 9 PM** **Lane2: 5 PM to 9 PM**
Wed	**Combined: 3 AM to 7 AM** **Lane2: 3 AM to 7 AM**
Thu	
Fri	
Sat	

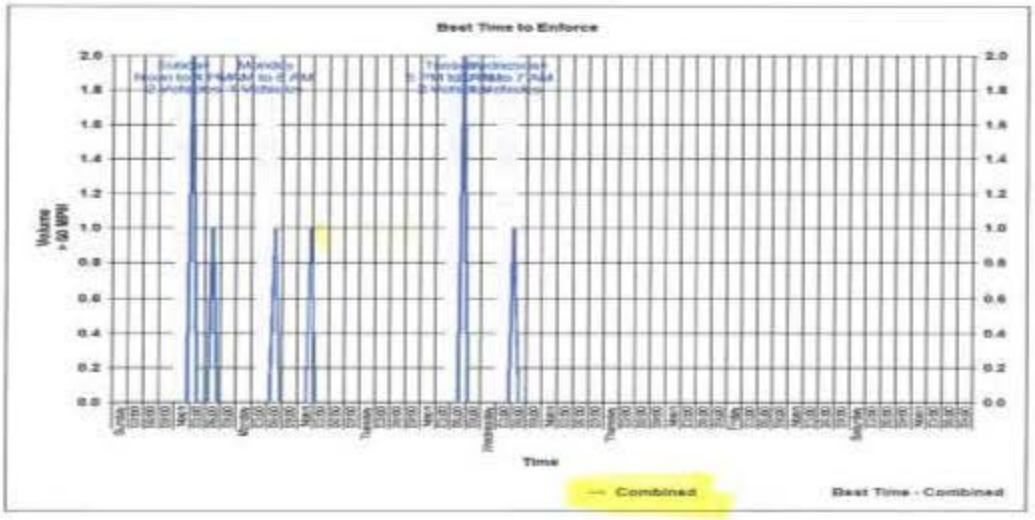

Figure 5a. Warren County 150th Avenue best enforcement times

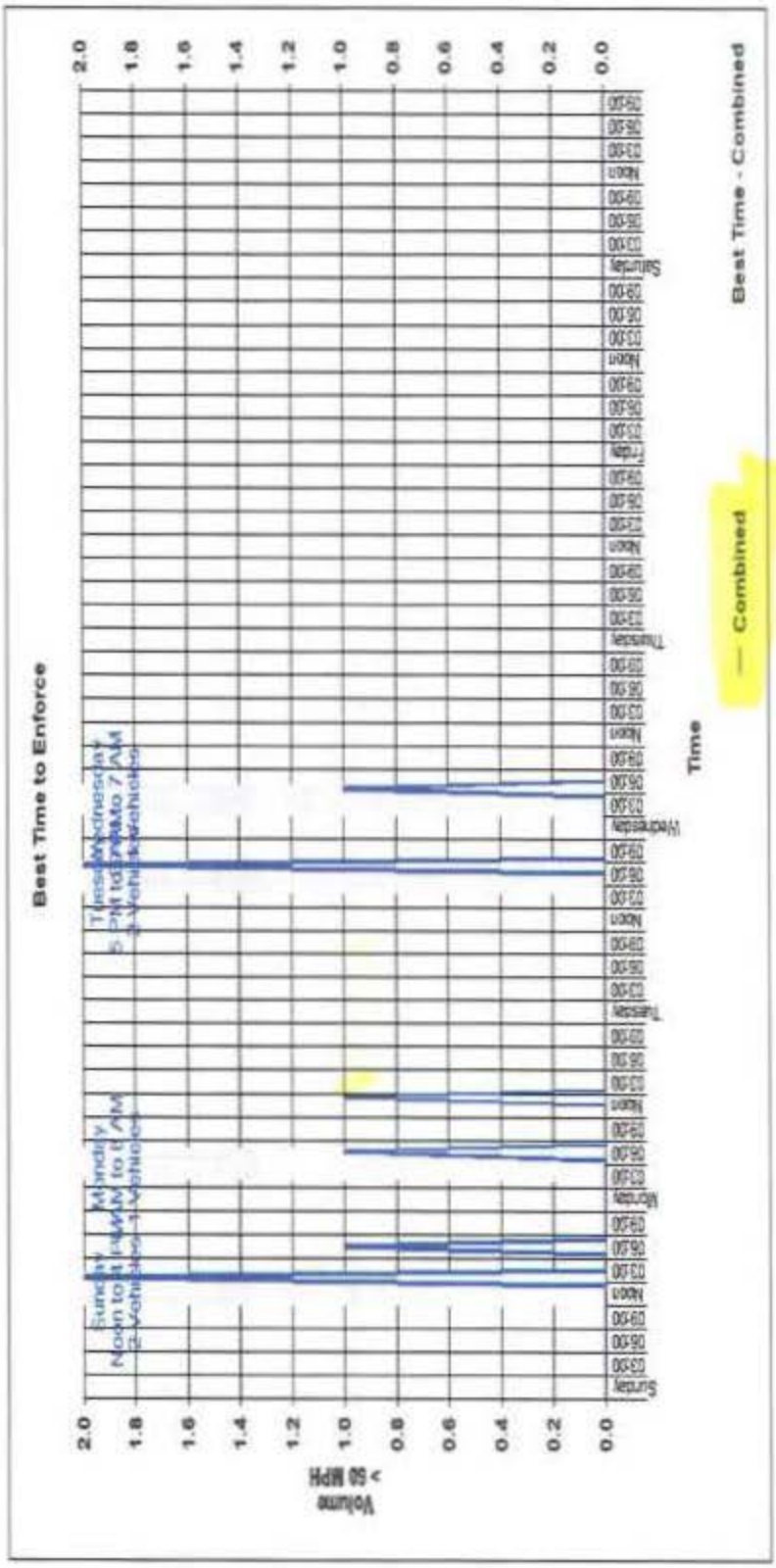

Figure 5b. Warren County 150th Avenue best enforcement times graph

IDENTIFY APPROPRIATE POTENTIAL MITIGATION STRATEGIES

From experience and review of successful and/or experimental safety mitigation strategies during the literature review, the following options were included in the toolbox of options for application by local agency consideration on the road segments studied:

- Clear excess vegetation from the ROW in locations where deer crossings are likely and mow along edge of roadway to improve roadside visibility of signage, as well as help keep animals further from the traveled way.

- Visit with utility companies about relocation of nearby poles to the ROW edge and possible addition of delineation to the close-proximity utility poles as an interim safety enhancement.

- Install highly-visible chevrons around curves.

- Schedule additional patrols or enforcement based on the most prominent time periods for crashes from the data. This would be appropriate if clusters of crashes exist on roads that were of adequate width to allow making stops for speeding, drug and alcohol use, or other violations affecting safety. Enforcement staffs would need to be able to absorb some of these activities, along with regular duties, to make this strategy effective, although enhanced enforcement as needed should also be considered.

- Install white delineators to provide a visual "edge" to the roadway to increase alignment recognition given that gravel roads have no "curb or painted edge line" to guide drivers. These delineators should be spaced longitudinally and offset using Part 3F of the MUTCD. Delineators are available in various sizes and sheeting types, from three or four in. diameter buttons to four or six x 12 in. rectangular delineators, so installations could be varied to test the effectiveness of the sizes.

- All existing signs along the studied segments should be replaced with new traffic control devices, using highly retroreflective sheeting. This will increase visibility and recognition greatly (and effectiveness) of the signs to provide the intended warnings.

- Review need for enhanced warning signs near special locations or structures (racetrack, narrow-width bridges, etc.).

- Monitor traffic speeds using a speed trailer or other collection device and provide data regarding the optimum timing for focused enforcement, if the results warrant.

- The regulatory speed limit could be lowered if appropriate and if other efforts above prove inadequate. However, signs alone will not slow the traffic and increased enforcement would be necessary to make this option effective.

- Meet with high school officials (principal and/or driver instructors, etc.) to discuss safety concerns on specific segments where younger drivers seem to have a high level of crash involvement. Local agency officials, including both engineering and law enforcement staff, should schedule these meetings and use crash data for the local school district. Crashes, including fatalities and all injuries, should be included to make the data as pertinent as possible for that specific area and the students involved.

- Communications by local agencies with local news media should include developing an informative article explaining a road segment's crash history along with county engineering and enforcement efforts to address those safety concerns with selected mitigation to improve safety.

COMPARISON OF TRAFFIC VOLUME TO CRASH FREQUENCY

It has commonly been concluded that the frequency of crashes on a given type of roadway can be more or less directly tied to the volume of traffic utilizing that roadway. To test that assumption on low-volume, unpaved, rural roads, several comparison models were constructed, including those shown in the graphs in Figures 6 and 7. However, no reliable direct association was apparent from the study sample.

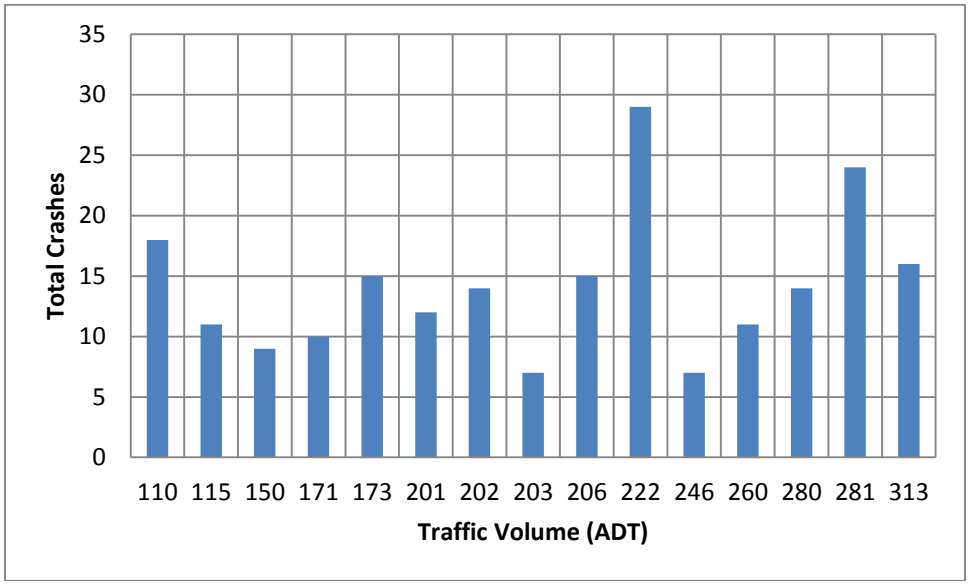

Figure 6. Histogram of crashes versus traffic volume 2001 through 2010

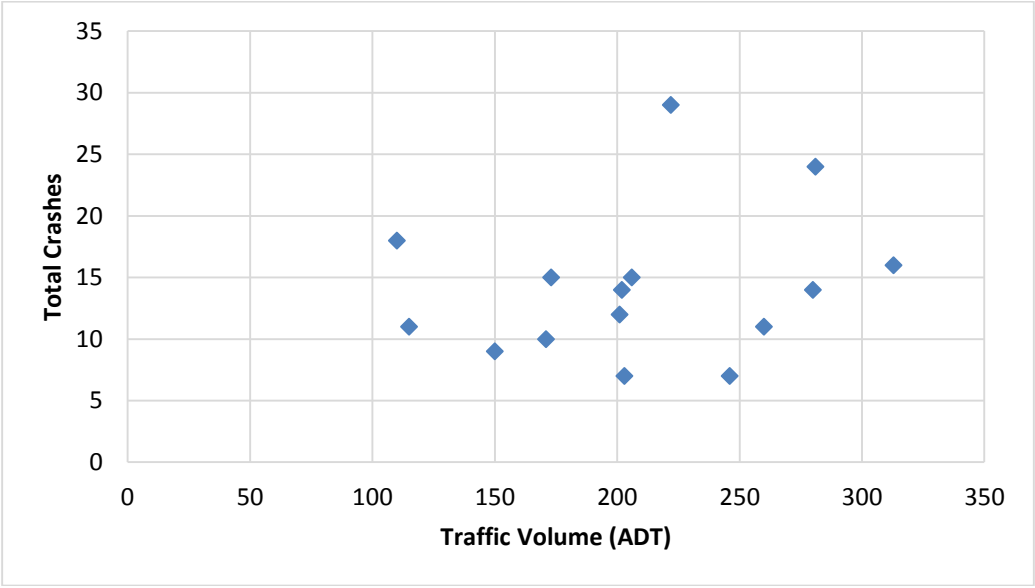

Figure 7. Scatter plot of crashes versus traffic volume 2001 through 2010

Perhaps the sample size was insufficient to demonstrate a relationship satisfactorily or possibly, that relationship does not hold true on these roadways, and other more-reliable crash contributors must be studied and identified to allow an accurate crash prediction model to be developed. Only additional, broader-scoped research will answer this question.

RECOMMEND AND IMPLEMENT APPROPRIATE STRATEGIES

Based on the field and crash data reviews at each of the sites, plus the extensive discussions with engineering and law enforcement officials in each jurisdiction, several mitigation strategies were chosen to recommend to each local agency for each of the segments reviewed. Those suggestions and agency responses to each are noted in Table 11.

Table 11. Proposed and implemented strategies

Potential Mitigation Strategies												
County	**Dallas**		**Jasper**		**Jasper**		**Story**		**Story**		**Warren**	
Route	**130th Street**		**W 4th Street S**		**E 5th Street S**		**530th Avenue**		**550th Avenue**		**150th Avenue**	
Mitigation Strategy	**Pro-posed**	**Em-ployed**	**Pro-posed**	**Em-ployed**	**Pro-posed**	**Em-ployed**	**Pro-posed**	**Em-ployed**	**Pro-posed**	**Em-ployed**	**Pro-posed**	**Em-ployed**
Highly Reflective Signs	X	X	X	X	X	X	X	X	X	X	X	X
Remove Vegetation	X		X								X	
Reduce Speed Limit			X		X		X				X	
Add Delineators	X	X	X		X		X		X		X	X
Review Crash Clusters							X					
TCD - Flags, Chevron & Cross Traffic					X				X	X	X	X
Additional Enforcement	X	X	X		X		X	X	X	X	X	
News Media Blitz			X				X		X		X	
Meet with School Officials	X		X		X		X	X	X	X	X	

PERCEIVED CONCERNS WITH MITIGATION STRATEGIES

The local agencies were eager to utilize some of the mitigation techniques proposed that would improve the safety and minimize future crashes on the studied road segments. All chose to take part in the installation of new, highly-reflective signage, furnished as a part of this project, and all agreed to trim or remove vegetation from the roadsides.

Some counties dealt with the roadside vegetation after the initial discussion (when that mitigation strategy was suggested) and other agencies planned to accomplish that with heavier equipment while performing ditch work this summer.

Other suggestions, such as reviewing clusters of crashes and consideration of additional traffic-control devices, chevrons, and special intersection signs, were well received and implemented. However, some of the agencies were hesitant to adopt some of the suggestions and offered reasons for declining or thoughts about why they did not wish to participate.

One county (Dallas) had posted a reduced speed limit (45 mph) on the study segment previously. Most counties did not wish to establish lower speed limits because of questionable effectiveness and need for continued enforcement, for which most local law enforcement departments do not have staff or funding to provide. Based on the speed data obtained on 130th Street in Dallas County, it did not appear that the posting of reduced regulatory speed signs had worked unless focused enforcement is applied as well.

Two counties agreed to install delineators along the study segments for better delineation of the alignment, but expressed concerns with these installations. Potential maintenance difficulties were anticipated with the delineator supports for both routine mowing practices and snow plowing and winging during the winter months, so this strategy was not implemented in the other two counties.

Enhanced law enforcement was another strategy that was suggested to local agencies to address perceived unsafe behavior by some drivers. A Warren County deputy sheriff advised researchers that extra enforcement had been applied to the study segment in that county, but with little, if any, positive impact on driver behavior.

In addition, most local sheriff's offices have insufficient staff and funds to monitor or schedule patrols on low-volume, unpaved roads. However, funding was budgeted with this research effort to provide support for some additional enforcement and the Story County Sheriff's Office agreed to contract with Iowa State University to provide these services.

An initial examination of the additional Story County patrol reports seemed to indicate positive results on the 530th (Grant) Avenue segment as the number of observed violations and citations from one month to the next decreased, although those numbers increased again toward the beginning of the next month. (A copy of the results received at InTrans to date are included in Appendix C.) In any event, this law enforcement effort should be viewed as positive given that

officer presence increases driver awareness and the need to operate their vehicles more responsibly.

The Dallas County Sheriff advised researchers that deputies had and continued to apply extra patrols on the 130th Street segment in that county, but without significant results. No reports of improper behavior by drivers were observed. One deputy reported having traveled the route intermittently for four consecutive days and didn't observe a single violation. The sheriff also offered to continue the patrolling efforts if needed or requested by researchers.

Many counties have a good relationship with area news media, so it was concluded that obtaining publicity for safety concerns on these low-volume, unpaved roads, along with efforts to mitigate those concerns, should be possible. However, most local law enforcement or engineering staff may not possess sufficient writing skills to prepare effective articles or press releases.

Services from both the Iowa Local Technical Assistance Program (LTAP) Safety Circuit Rider and Safety Liaison were offered to assist with this, if and when there was a desire to apply this option. Again, the Story County Sheriff's Office did prepare and request publication of a news article describing the project efforts on the two road segments in that county. A copy of that news release is also included in Appendix C.

Many high schools in Iowa now utilize private driver education instructors using a curriculum prescribed by the State, so including additional material and training for safe vehicle operation on unpaved roads could be quite challenging. Of the four counties involved in this study, Story County did agree to meet with high school officials at Gilbert High School to discuss safety concerns involving younger drivers who use the Grant Avenue study segment as a commuter route to and from school.

On May 8, 2013, a meeting was conducted at the high school with the principal, Layne Billings, the transportation director, Bruce Betts, the driver educator, Kevin Litchfield, Deputy Lt. Dodds, the Story County engineer, Moon, Hunefeld from the Iowa GTSB, and McDonald from InTrans.

Crash data, including the school district-wide information, as well as segment-specific information, were shared with the officials and a discussion about the research study was undertaken. The reaction and input from officials was very positive and the meeting was judged to be very worthwhile. Complete notes and summary data from this meeting are included in Appendix C.

EVALUATE EFFECTIVENESS OF MITIGATION/PREPARE EVALUATION REPORT

The application of suggested crash mitigation on all study segments including signing updates and enhanced delineation was not accomplished until May 2013 and effectiveness of these efforts could not be evaluated. However, the short-term impact of the enhanced enforcement efforts in Story County and meeting with Gilbert High School officials did bring increased attention and focus to those two study segments for a period of time.

An assessment of beneficial, longer-term, safety impacts could be not completed. A re-analysis of the segments should be undertaken in 3 to 5 years to allow an initial conclusion regarding crash reduction and improved driver behavior to be made.

CONCLUSIONS

In consideration of the data gathered, input from the technical advisory committee (TAC), meetings with local agencies, and field observations, the following conclusions can be drawn.

Commonly-held assumptions regarding major crash contributors did not appear to be completely valid for the segments studied. For example, many of the high-crash study segments exhibited greater roadway widths than other similar roads; granular surfaces were uniform, well-maintained, and without excessive loose aggregate; and segments had very little horizontal curvature and were flat or slightly rolling in vertical alignment.

In addition, as shown in the discussion of comparison between traffic volume and crash frequency in the report, little correlation was shown here either. Other possible crash contributors need to be identified in additional studies.

Most drivers on these roads were presumed to be local, so familiarity with the terrain and roadway features may negate the potential safety impacts of road design deficiencies, such as narrow width, topography, and unpaved surface characteristics.

When located near high schools, younger driver involvement in crashes appeared higher. A revision in younger driver education programs would undoubtedly benefit by including instruction and practice driving on unpaved, rural road surfaces in the curriculum.

From experience in polling drivers, it could be concluded that many are not aware of the statutory speed limit for unpaved roads in Iowa (55 mph daytime and 50 mph nighttime). Posting of these regulations in key locations may yield positive results in raising driver awareness for proper vehicle operation.

Some segments indicated speed as a probable crash contributor. Although not evident uniformly among all study segments, a reduced regulatory speed limit might prove beneficial in modifying driver behavior, if supported by adequate signage and enforcement.

The project did afford an opportunity to implement a variety of low-cost, multidisciplinary mitigation to address safety on lower-volume, unpaved roads.

The relatively small sample of study sites from a concentrated area in Iowa may have contributed to potentially misleading results. An expanded evaluation that would examine a wider scope of rural areas across the entire state may yield different findings.

A longer evaluation period would be needed to more completely and fully assess the potential beneficial impacts on crash reductions that the selected mitigations might have.

Local law enforcement agencies would need additional funding support to apply enhanced enforcement on these low-volume, unpaved roadways.

Public education through local news media and presentations at high schools and service clubs describing crash history and safety concerns on low-volume, unpaved, rural roads should also prove worthwhile.

Due to the existence of extensive crash and roadway databases, Iowa is in a unique position to study potential safety concerns on low-volume, unpaved, rural roads and to develop useful mitigation.

RECOMMENDATIONS

Considering the relatively low mileage (averaging fewer than 45 miles per county statewide) of unpaved rural roads with traffic volumes exceeding 100 vpd, local agency engineers should consider identifying these segments and examining crash data for application of low-cost improvements where it is concluded to be potentially beneficial. InTrans staff would be available to assist in those efforts.

To supplement the methods employed with this project, future research should consider and evaluate other methods of data collection and crash mitigation.

Given that a high percentage of serious-result crashes are recorded on two-lane, rural roads, and many of those are on unpaved roads, additional research should be undertaken to consider a statewide examination of this road type and more in-depth analysis of the contribution of younger drivers and speed to higher crash frequencies.

One aspect for additional research might include intermittent posting of statutory regulatory speed limits, day and night, on unpaved roads, along with an assessment of benefits as ascertained by speed studies.

Origin of drivers involved in crashes may prove beneficial in determining safety mitigation steps. An additional study could also include a crash reduction analysis of the mitigation applied under this and previous research projects.

A broader-scoped study may permit the development of a crash prediction model for this class of rural roadway, which would be quite valuable for local agencies.

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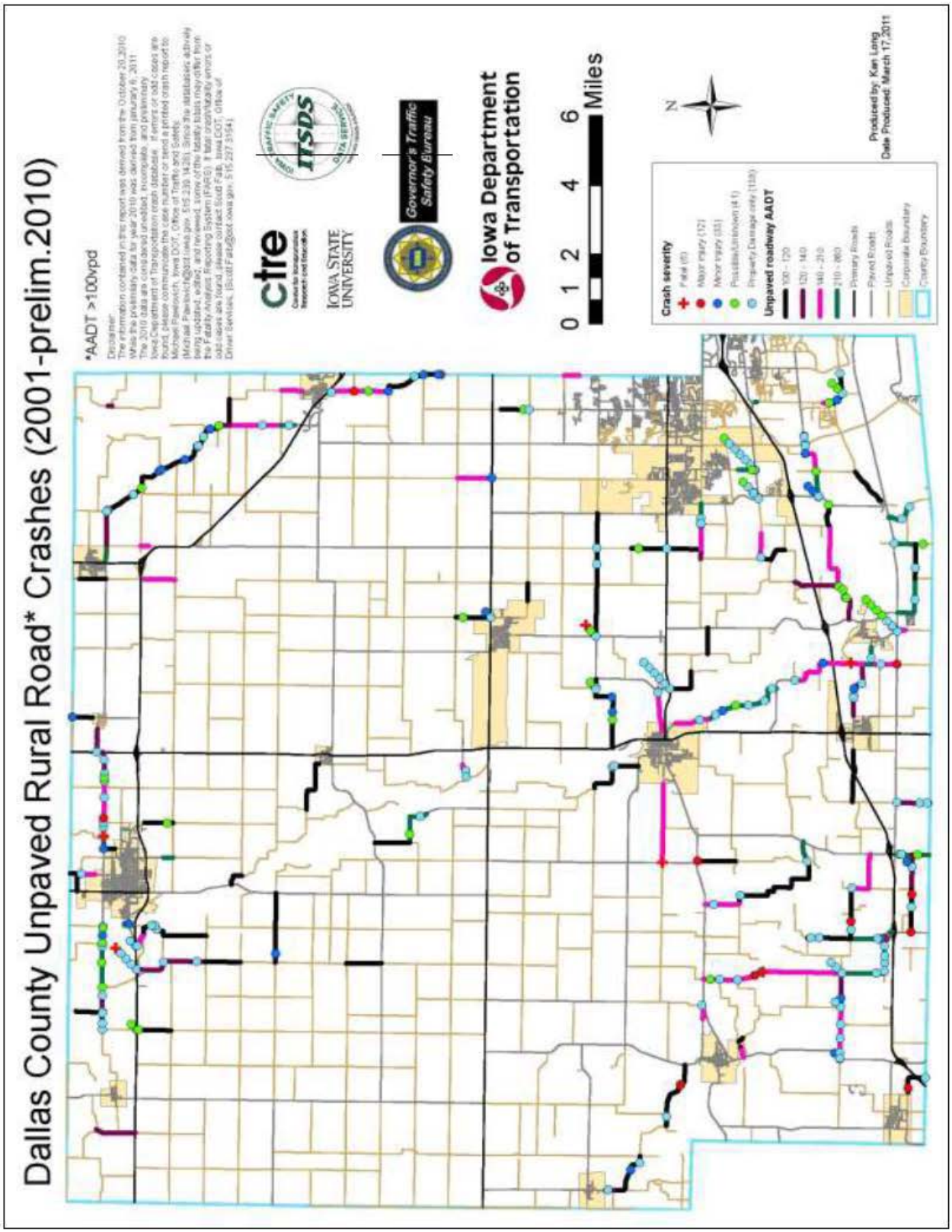
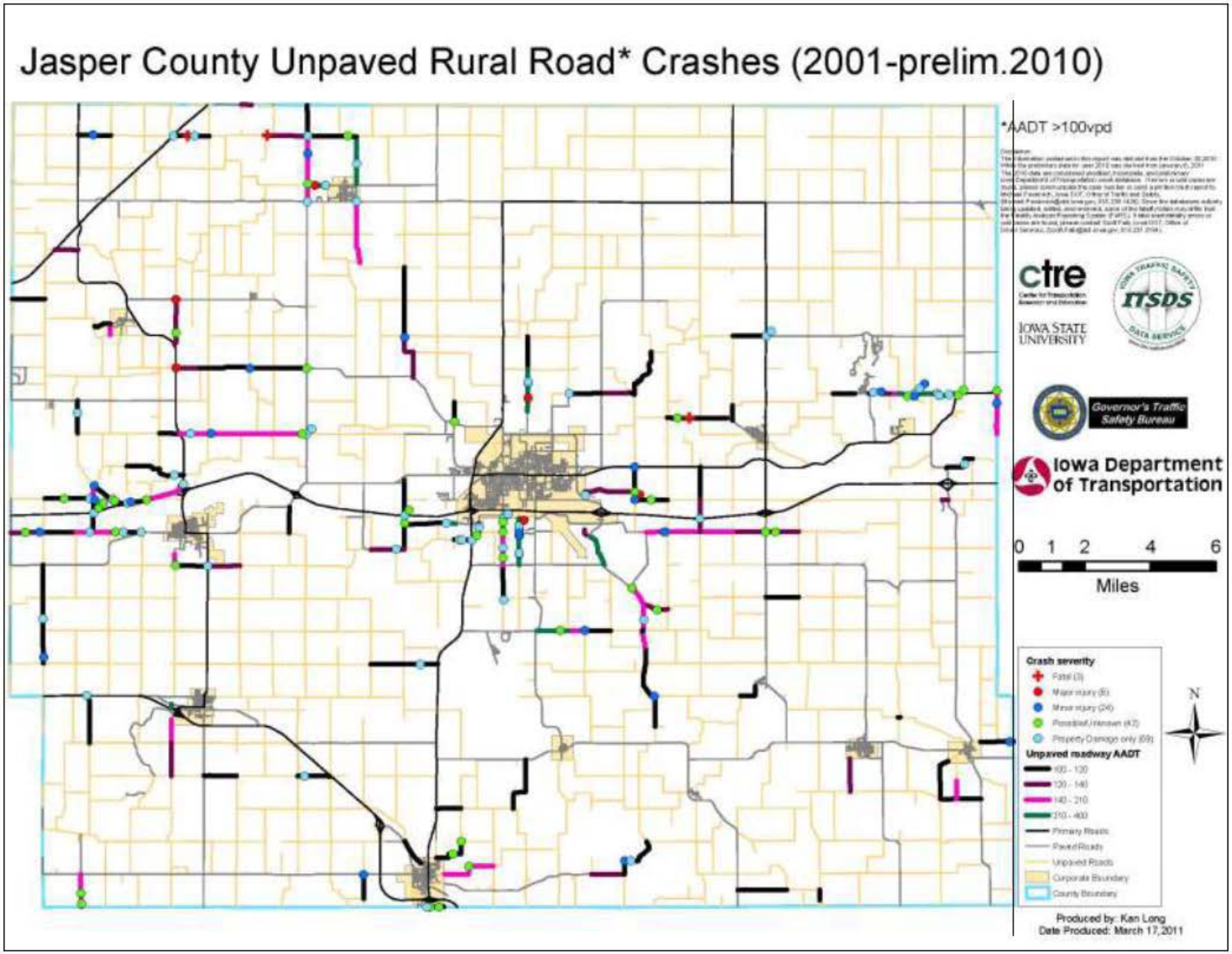
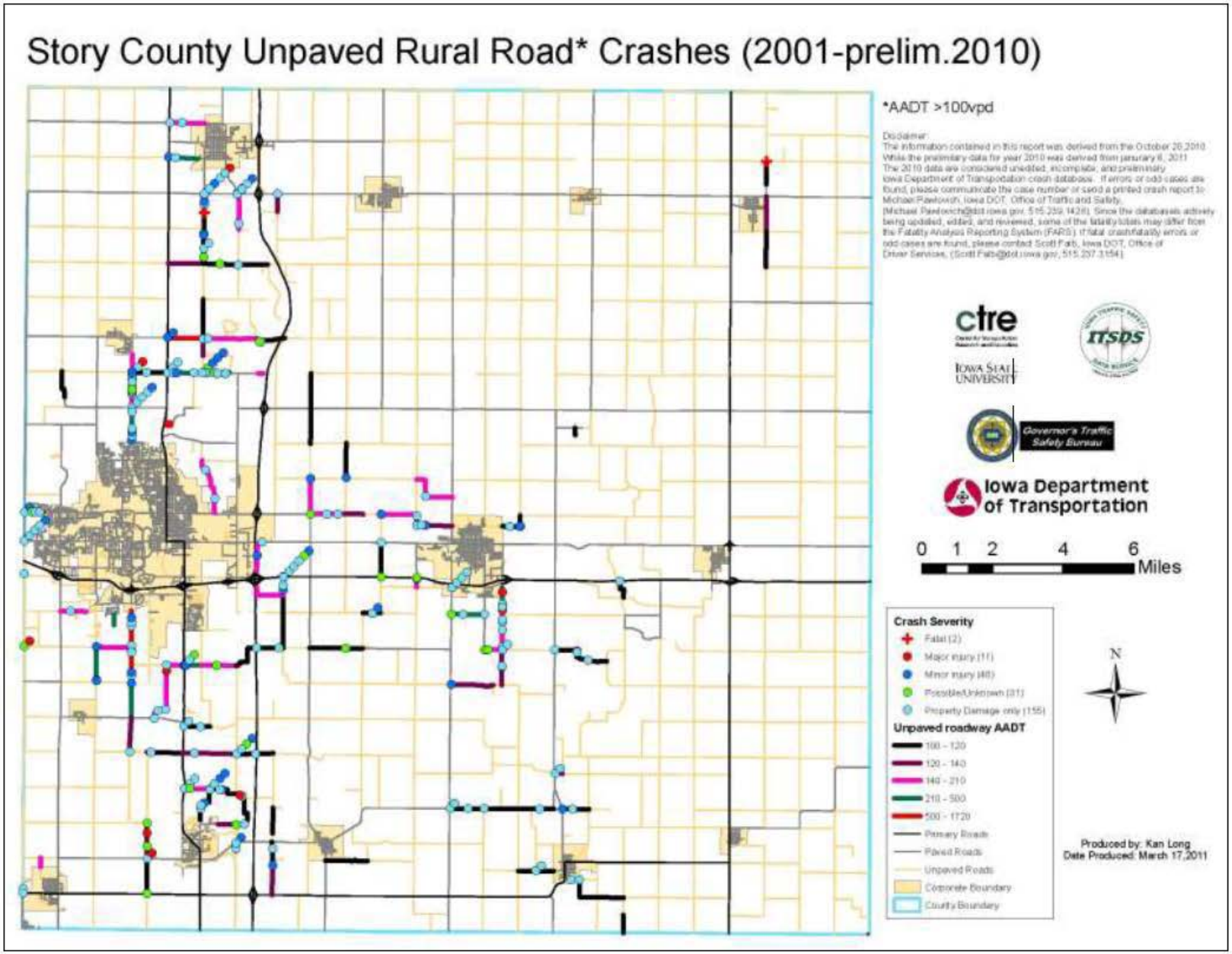
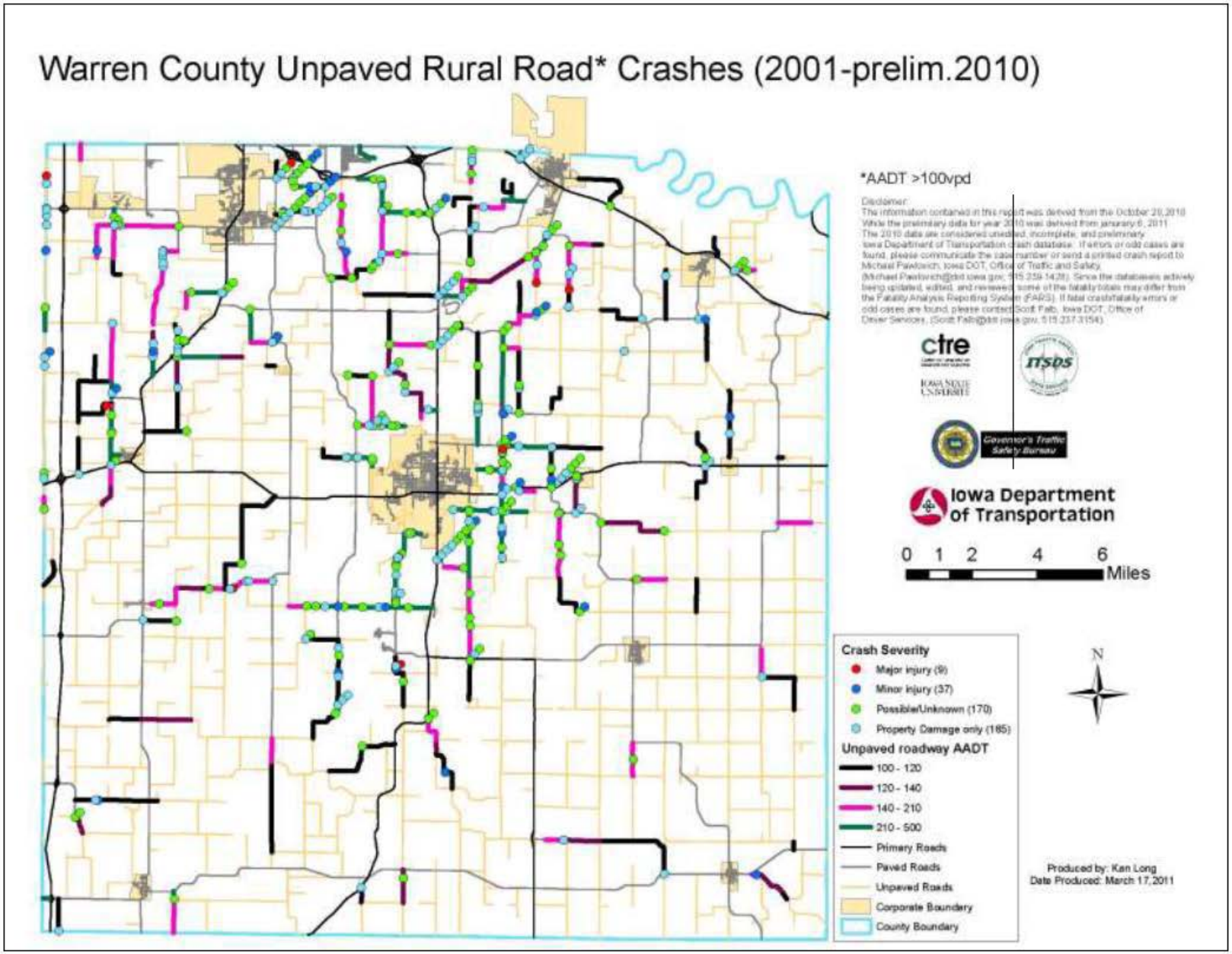
APPENDIX A. CRASH MAPS




Jasper County Unpaved Rural Road* Crashes (2001-prelim.2010)
*AADT >100vpd
ctre
Center for Transportation Research and Education
IOWA STATE UNIVERSITY
ITSDS
IOWA TRAFFIC SAFETY DATA SERVICES
Governor's Traffic Safety Bureau
Iowa Department of Transportation
0 1 2 4 6
Miles
Crash severity
Fatal (3)
Major injury (8)
Minor injury (24)
Possible/Unknown (42)
Property Damage only (69)
Unpaved roadway AADT
100 - 120
120 - 140
140 - 210
210 - 400
Primary Roads
Paved Roads
Unpaved Roads
Corporate Boundary
County Boundary
N
Produced by: Kan Long
Date Produced: March 17, 2011


Story County Unpaved Rural Road* Crashes (2001-prelim.2010)
*AADT >100vpd
Disclaimer:
The information contained in this report was derived from the October 20,2010 While the preliminary data for year 2010 was derived from January 6, 2011 The 2010 data are considered unedited, incomplete, and preliminary Iowa Department of Transportation crash database. If errors or odd cases are found, please communicate the case number or send a printed crash report to Michael Pawlovich, Iowa DOT, Office of Traffic and Safety, (Michael.Pawlovich@dot.iowa.gov, 515.239.1428). Since the databases actively being updated, edited, and reviewed, 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, Iowa DOT, Office of Driver Services, (Scott.Falb@dot.iowa.gov, 515.237.3154).
ctre
Iowa State University
ITSDS
Governor's Traffic Safety Bureau
Iowa Department of Transportation
0 1 2 4 6 Miles
Crash Severity
Fatal (2)
Major injury (11)
Minor injury (48)
Possible/Unknown (31)
Property Damage only (155)
Unpaved roadway AADT
100 - 120
120 - 140
140 - 210
210 - 500
500 - 1720
Primary Roads
Paved Roads
Unpaved Roads
Corporate Boundary
County Boundary
N
Produced by: Kan Long
Date Produced: March 17,2011


Warren County Unpaved Rural Road* Crashes (2001-prelim.2010)
*AADT >100vpd
Disclaimer:
The information contained in this report was derived from the October 20, 2010
While the preliminary data for year 2010 was derived from January 6, 2011
The 2010 data are considered unedited, incomplete, and preliminary.
Iowa Department of Transportation crash database. If errors or odd cases are
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(Michael.Pawlovich@dot.iowa.gov; 515.239.1428). Since the databases actively
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ctre
IOWA STATE UNIVERSITY
ITSDS
Governor's Traffic Safety Bureau
Iowa Department of Transportation
0 1 2 4 6
Miles
Crash Severity
Major injury (9)
Minor injury (37)
Possible/Unknown (170)
Property Damage only (185)
Unpaved roadway AADT
100 - 120
120 - 140
140 - 210
210 - 500
Primary Roads
Paved Roads
Unpaved Roads
Corporate Boundary
County Boundary
N
Produced by: Ken Long
Date Produced: March 17, 2011

APPENDIX B. SITE PHOTOS

Dallas County – 130th Street from US 169 West to Kimble Place (East Corporate Limits of Perry)

Dallas County – 130th Street from US 169 West to Kimble Place (East Corporate Limits of Perry)

Jasper County – West 4th Street South from South 44th Avenue West, North to the Newton Corporate Limits

Jasper County – East 5th Street South from South 44th Avenue East, North to Newton Corporate Limits

Jasper County – East 5th Street South from South 44th Avenue East, North to Newton Corporate Limits

Story County – 530th (Grant) Avenue from Ames City Limits (just North of Harrison Street) North to the South City Limits of Gilbert

Story County – 530th (Grant) Avenue from Ames City Limits (just North of Harrison Street) North to the South City Limits of Gilbert

Story County – 550th Avenue from 150th Street North to 130th Street (CR E-18)

Story County – 550th Avenue from 150th Street North to 130th Street (CR E-18)

Warren County – 150th Avenue from IA 92 North to County Road G-36

Warren County – 150th Avenue from IA 92 North to County Road G-36

APPENDIX C. MITIGATION STRATEGIES

Delineator Options for County Engineers
(Following guidelines in MUTCD, Chapter 3F)

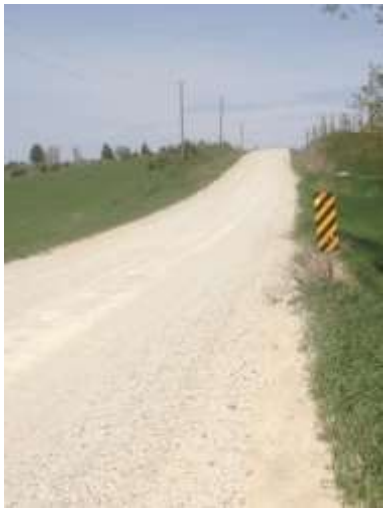
1. Suggested installation guides for posts:
    a. 300 ft spacing, along both sides
        i. Try some segments with closer spacing, say 200 ft
        ii. Consider 200 ft spacing at any crash clusters
    b. Offset maximum 8 ft from traveled way
        i. Try some closer, say 2 to 3 ft minimum, some 4 to 5 ft, but consistent in a segment
        ii. Stay outside mow line if desired but no more than 8 ft
    c. White color on right for approaching traffic
        i. One or more segment(s) with white color on left side as well?
    d. If selected spacing results in a delineator location within an entrance or side road, relocate the device approximately one quarter the normal spacing distance to one side or the other
2. Three sizes of delineators were offered for possible usage in this project: round 4 in. "button type," 4 x 12 in. rectangles with square corners, and 6 x 12 in. rectangles with rounded corners

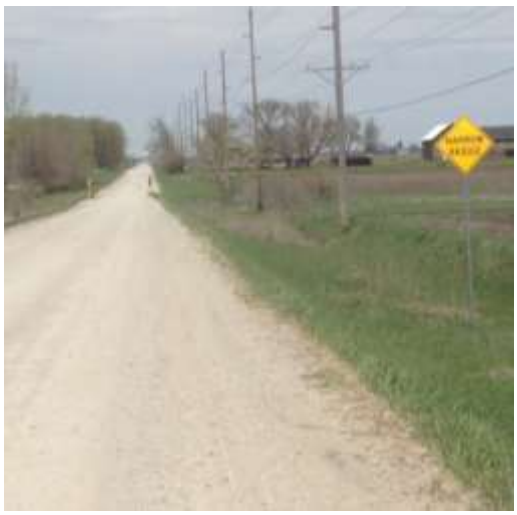
Images of Dallas County Delineators Installed to Date

Roadway Sign Options for County Engineers

New, highly-reflective signage was provided to all four counties for the study segments.

Images of Story County Roadway Signs and Object Markers Installed to Date



Enhanced Law Enforcement Mitigation Aids

Tasks

- Deputies are to provide additional monitoring and enforcement activities in the designated areas of a selected road segment for a specified (multi) week period
- At ~ two days a week for two hours per day (1 hour in the a.m. and 1 hour in the p.m.).
- A report form itemizing the Officer involved, date, hours present, and the number of vehicles encountered, stopped, and/or cited during each period shall be provided with each monthly billing.
- Bills and reports shall be submitted within 10 days following the month of occurrence and sent to agencies responsible party.
- The agreed upon cost is $XX per hour, with a maximum cost of $YY.

Enhanced Law Enforcement Activities Report Form

			Documentation of Enhanced Law Enforcement Activities						
			LVSR II Project Dec 2012 - May 2013			Agency-_____	Road Segment _____		
	Time Spent			Straight	Overtime	Stationary (S)	Number Vehicles	Improper	Citations
Date	Start	Stop	Officer Name	Time Hrs	Time Hrs	Mobile (M)	Encountered	Actions Noted	Issued
						Rates	Amount for Billing		
			Total Straight Hours						
			Total Overtime Hours						
						Total this period =			
Send Bill to Tom McDonald, InTrans, 2711 South Loop Drive, Ames, IA 50010									

Enhanced Law Enforcement Activities Press Release

In December 2010, Iowa State University released a study titled *Safety Analysis of Low Volume Rural Roads in Iowa.* Several conclusions in that report emphasized the much higher crash rates and densities for many types of the crash events taking place on unpaved rural roads with traffic counts between 100 and 400 vehicles per day.

Using the information gleaned from that investigation and report, a follow-up study began in the fall of 2011 to review some typical area roads that fall in that category. Field reviews of several road segments in Story and nearby counties were conducted, possible crash causes were noted and suggestions were made for physical improvements to delineate the roadside, if appropriate. A second phase of this study was conducted to attempt to find other mitigation strategies that could possibly be used to reduce the high crash rates.

Six short road segments in four central Iowa counties were originally identified as study sites and, after conducting field reviews and speed studies, and also holding discussions with local engineering and law enforcement officials, several strategies have been offered for utilization.

All existing signs along the routes might be replaced with ones of higher reflective value, new delineation of roadway alignment may be added with white markers, and additional enforcement efforts along these routes may be employed for a period of time. Hopefully, this will slow traffic and also help to identify typical driver traits and actions that might account for the higher crash numbers that have been recorded. The County Sheriff's Office will be begin conducting that additional enforcement on *date* and it will be continued for approximately *time period*.

An analysis of before and after crash data is planned, but only after the improvements and enforcement have been in place for two to three years. The original safety analysis report may be viewed on the Institute for Transportation website at
http://www.intrans.iastate.edu/reports/souleyrette_low_vol_report_w_cvr.pdf

For questions regarding the most recent study by Iowa State, contact Tom McDonald or Bob Sperry at the Institute for Transportation: 515-294-8103.

Enhanced Law Enforcement Results for from Story County Sheriff's Office to Date

530th (Grant) Avenue							
	Time Spent		Time	Stationary (S)	Vehicles	Improper	Citations
Date	Start	Stop	(hrs)	Mobile (M)	Encountered	Actions Noted	Issued
3/15/2013	7 am	9 am	2	S	13	2	0
3/18/2013	7 am	9 am	2	S + M	4	2	1
3/24/2013	3 pm	5 pm	2	S	16	1	0
4/6/2013	1 pm	3 pm	2	S + M	22	0	0
4/12/2013	3 pm	5 pm	2	S	35	0	0
4/14/2013	1 pm	3 pm	2	S + M	18	0	0
4/25/2013	3 pm	5 pm	2	S	67	0	0
4/29/2013	7 am	9 am	2	S + M	13	2	0
5/10/2013	3 pm	5 pm	2	S	19	2	2
5/12/2013	1:30 pm	3:30 pm	2	S + M	13	0	0

550th Avenue							
	Time Spent		Time	Stationary (S)	Vehicles	Improper	Citations
Date	Start	Stop	(hrs)	Mobile (M)	Encountered	Actions Noted	Issued
3/16/2013	3 pm	5 pm	2	S + M	6	2	0
3/21/2013	3 pm	5 pm	2	S	22	0	0
3/29/2013	3 pm	5 pm	2	S	14	0	0
4/4/2013	3 pm	5 pm	2	S	12	0	0
4/8/2013	7 am	9 am	2	S + M	15	2	1
4/20/2013	7 am	9 am	2	S	5	0	0
4/26/2013	1 pm	3 pm	2	S	3	0	0
4/28/2013	3 pm	5 pm	2	S	11	0	0
5/8/2013	7 am	9 am	2	S + M	8	0	0

Work with School Officials

Notes from Informational Meeting with Gilbert High School Officials

On May 8, 2013, a meeting was conducted at the Gilbert High School to discuss this research project and particularly safety concerns that had been noted on the Grant Avenue road segment in Story County. Participating in the meeting were the principal, Layne Billings, the transportation director, Bruce Betts, driver educator, Kevin Litchfield, Story County engineer, Darren Moon, Story County deputy, Lt. Jeff Dodds, Randy Hunefeld from the Iowa Governor's Traffic Safety Bureau, and Tom McDonald from the Institute for Transportation (InTrans).

Following self-introductions, McDonald discussed the unpaved rural roads research project that included this Grant Avenue road section and distributed crash data to illustrate the high frequency of crashes recorded over the 10 year review period from 2001 through 2010. The majority of crashes involved teenaged drivers and possible students at Gilbert High School who were commuting from home in Ames to the school.

Billings asked how this percentage of teen drivers compared to other similar roads in the state. McDonald replied that he did not have that information, but of the six segments included in the study, only Grant Avenue exhibited this level of teen driver involvement.

Moon stated that more recent crash history showed only one crash had occurred on this section of Grant Avenue in 2012 and two in 2011, both below the 2.9 crashes per year average over the 10 year study period, so perhaps a downward trend is beginning.

It was indicated by school officials that some parents are advising their children to avoid this road when commuting, although the length to school is shorter than any alternates from Ames to Gilbert. Litchfield stated that students are given experience with driving on unpaved roads as part of the practice driving curriculum.

It was noted that 15 of the 29 crashes recorded during the 10 year study period indicated that speed may have contributed to those incidents. InTrans conducted a short-term speed assessment using Numetrics plates in December 2012 and found numerous vehicles to be exceeding the statutory 55 mph speed limit. Billings was provided with a copy of that data taken from the project report.

As part of the mitigation employed to address safety concerns on Grant Avenue, the Story County Sheriff's Office has been applying added enforcement efforts during high potential crash times over the past two months and some positive impacts from this effort seems apparent. Lt. Dodds indicated that these occasional patrols will be continued in the future as officer availability and funding priorities allow.

Billings advised that he planned to provide the crash and speed data furnished with this meeting to staff responsible for new driver instruction at the school to raise awareness of the necessity of driving responsibly, particularly on unpaved roads.

Gilbert School District Crash Data 2001 through 2010 (based on 2010-2011 district boundaries)

	Crashes							Injuries					
Year	Total	Fatal	Major	Minor	Possible/ Unknown	Property Damage Only	Property Damage	Total	Fatalities	Major	Minor	Possible	Unknown
2001	58	0	2	14	4	38	$229,669	39	0	2	26	11	0
2002	58	0	3	5	9	41	$276,526	28	0	3	7	13	5
2003	61	0	1	9	6	45	$253,665	21	0	1	13	3	4
2004	77	1	1	9	11	55	$355,985	34	1	1	12	20	1
2005	75	0	2	5	13	55	$343,374	27	0	2	12	11	2
2006	72	0	3	4	11	54	$362,282	26	0	4	9	12	1
2007	61	0	0	10	6	45	$342,591	16	0	0	10	6	0
2008	80	0	2	6	10	62	$357,520	24	0	2	10	11	1
2009	71	0	0	8	2	61	$342,850	13	0	0	10	3	0
2010	57	0	1	6	9	41	$333,200	24	0	1	11	10	2
Totals	670	1	15	76	81	497	$3,197,662	252	1	16	120	100	16

	Alcohol/Drug-Related		Alcohol-Related		Motorcycle-Related		Bicycle-Related		School Bus-Related		Normal Bus-Related		Pedestrian-Related	
Year	Fatalities	Injuries	Fatalities	Injuries	Fatalities	Injuries	Fatalities	Injuries	Fatalities	Injuries	Fatalities	Injuries	Fatalities	Injuries
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	1	0	0	0	2	0	0	0	0	0	1	0	1
2003	0	4	0	2	0	0	0	0	0	0	0	0	0	0
2004	0	3	0	3	0	2	0	0	0	0	0	0	0	0
2005	0	1	0	1	0	2	0	1	0	0	0	0	0	0
2006	0	1	0	0	0	1	0	1	0	0	0	0	0	1
2007	0	1	0	1	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	2	0	2	0	0	0	0	0	0	0	0	0	0
2010	0	3	0	3	0	0	0	0	0	0	0	0	0	0
Totals	0	16	0	12	0	7	0	2	0	0	0	1	0	2

	Crashes by Month											
Year	January	February	March	April	May	June	July	August	September	October	November	December
2001	5	4	7	8	2	3	6	2	2	4	5	10
2002	7	9	4	2	8	2	4	1	3	6	5	7
2003	3	8	4	2	4	5	2	5	6	8	2	12
2004	6	3	5	8	5	8	6	0	9	7	8	12
2005	7	8	5	7	6	9	2	2	7	7	3	12
2006	9	5	9	4	3	4	7	3	3	11	9	5
2007	5	6	2	1	2	6	4	4	5	7	8	11
2008	11	14	1	5	4	5	2	2	7	4	9	16
2009	6	6	4	4	3	6	6	8	4	11	10	3
2010	10	2	6	2	8	3	1	9	2	1	8	5
Totals	69	65	47	43	45	51	40	36	48	66	67	93

	Crashes during Two-Hour Time Ranges/by Time of Day											
Year	Midnight to 1:59 AM	2:00 AM to 3:59 AM	4:00 AM to 5:59 AM	6:00 AM to 7:59 AM	8:00 AM to 9:59 AM	10:00 AM to 11:59 AM	Noon to 1:59 PM	2:00 PM to 3:59 PM	4:00 PM to 5:59 PM	6:00 PM to 7:59 PM	8:00 PM to 9:59 PM	10:00 PM to 11:59 PM
2001	3	0	1	12	3	2	2	4	13	8	5	5
2002	1	3	1	6	0	2	6	7	13	12	3	4
2003	1	4	2	7	3	3	6	8	10	6	8	3
2004	2	2	1	8	4	2	8	10	15	11	10	4
2005	1	3	3	7	4	3	7	11	11	14	7	4
2006	5	2	2	4	2	5	5	16	15	10	4	2
2007	1	3	1	7	5	3	7	7	15	2	8	2
2008	3	2	0	16	12	6	7	3	14	8	4	5
2009	3	1	2	6	8	4	4	6	12	9	11	5
2010	2	3	3	7	5	6	5	5	9	5	5	2
Totals	22	23	16	80	46	36	57	77	127	85	65	36

Crash History for 530th (Grant) Avenue from NCL of Ames to SCL of Gilbert 2001 through 2010

2.45 miles, 10 year period

29 total crashes, 21 injuries, no fatalities including
1 animal
1 ran Stop sign
3 FTYROR (from Stop sign and from uncontrolled intersection)
15 speed related
4 ROR

No adverse surface conditions reported

40 total drivers including
22 teenaged (55%)
1 +65
1 impaired driver

Objects struck include
12 ditch/embankment

Major hours of day for crashes
5 from 6:00 a.m. to 8:00 a.m. (17%)
18 from 2 p.m. to 8:00 p.m. (62%)

Educational Materials and Websites for Younger Drivers

http://www.iowadot.gov/mvd/ods/RuralRoadCrashes.html

http://www.iowadot.gov/mvd/ods/coach.pdf

http://www.iowadot.gov/mvd/ods/iadrivertest.html (There's an app for driving test studies)

http://www.iowadot.gov/mvd/ods/default.htm (Click on the Safety and Education link)

http://www.minnesotasafetycouncil.org

http://www.minnesotasafetycouncil.org/traffic/GetThere.pdf

http://www.statefarm.com/mobile/driverfeedback/driverfeedback.asp (There's an app that measures your acceleration, braking, and cornering)