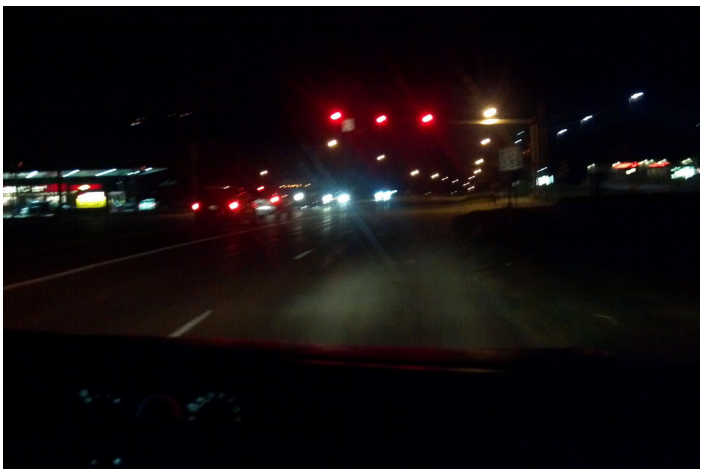
Road Safety Audit for IA 28 from the South Corporate Limits of Norwalk in Warren County through the IA 5 Interchange in Polk County, Iowa

Final Report
November 2012



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16. Abstract In response to local concerns, the Iowa Department of Transportation (DOT) requested a road safety audit (RSA) for the IA Highway 28 corridor through the City of Norwalk in Warren County, Iowa, from the south corporate limits of Norwalk through the IA 5 interchange in Polk County, Iowa. The audit included meeting with City staff to discuss concerns, review crash history and operational issues, observe the route under daylight and nighttime conditions, and analyze available data. This report outlines the findings and recommendations of the audit team for addressing the safety concerns and operational matters along this corridor.			
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Final Report
November 2012

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Participation in the audit by staff from the Federal Highway Administration, Iowa Governor's Traffic Safety Bureau, Iowa State Patrol, City of Norwalk, and Iowa DOT staff provided valuable input and advice, which contributed to the success of the audit.

These were the audit team members:

Jeremey Vortherms	Office of Traffic and Safety, Iowa DOT
Tim Simodynes	Office of Traffic and Safety, Iowa DOT
Jim Armstrong	District 5, Iowa DOT
James Phillips	District 5, Iowa DOT
Ken Morrow	District 5, Iowa DOT, Maintenance Manager
Todd Netley	District 5, Iowa DOT, Maintenance Supervisor, Martensdale Garage
Tim Hoskins	Public Works Director, City of Norwalk
Eddie Kuhl	Chief of Police, City of Norwalk
Jerry Roche	FHWA – Iowa Division
Randy Hunefeld	Iowa Governor's Traffic Safety Bureau
Bob Sperry	Institute for Transportation (InTrans)
Tom McDonald	Institute for Transportation

The Highway Safety Manual, (HSM) crash prediction analysis was completed by Mary Burroughs, engineer trainee at the FHWA – Iowa Division Office and the author is grateful for that enhancement of this report.

The Iowa Traffic Safety Data Service (ITSDS) at InTrans developed the crash data for this safety audit.

HISTORY

IA 28 was reconstructed through Norwalk, Iowa in 1985 with a four-lane portland cement concrete (PCC) pavement design. The far northerly section was reconstructed of PCC in 2002-3 as part of the IA 5 expressway construction. In addition, traffic signals have been installed at various times at selected intersections throughout the corridor and at least one access point was added (Turnberry Drive).

IA 28 is classified federally as a minor arterial in the rural area at the south end of the city and as a principal arterial in the urban section of Norwalk. For planning purposes, IA 28 through Norwalk is classified as an access route by the Iowa Department of Transportation (DOT). Figure 1 shows an overview of the reviewed section of IA 28 through Norwalk.

In response to local concerns, the Iowa DOT requested a road safety audit on this roadway segment. A thorough discussion of crash history is also included in this report.

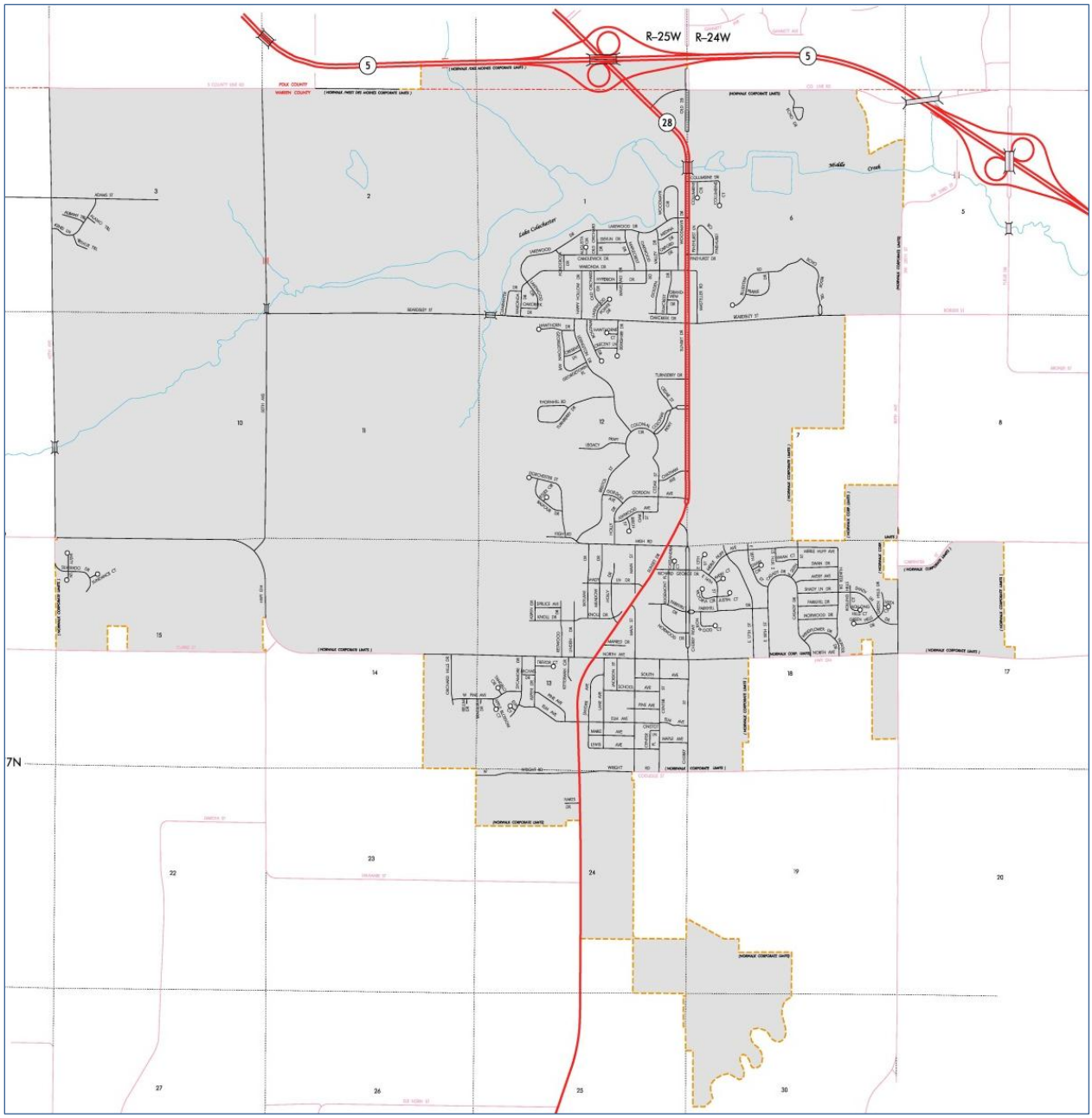


Figure 1. Overview map of IA 28 through Norwalk in Warren County through the IA 5 interchange in Polk County, Iowa

INITIAL MEETING

On October 24, 2011, a road safety audit (RSA) was commenced for IA 28 through the City of Norwalk (See Figure 1). Audit team members included Jerry Roche with the Federal Highway Administration (FHWA) – Iowa Division, Randy Hunefeld with the Iowa Governor's Traffic Safety Bureau (GTSB), Tim Simodynes with the Iowa DOT Office of Traffic and Safety, and Bob Sperry and Tom McDonald with the Institute for Transportation (InTrans) at Iowa State University.

The audit activities began with an initial meeting at the city facilities in Norwalk. The meeting participants were Tim Hoskins, Norwalk Public Works Director; Eddie Kuhl, Norwalk Police Chief; Jim Phillips, Iowa DOT District 5 Staff Engineer; Ken Morrow, District 5 Maintenance Manager; Todd Netley, Martensdale Garage Maintenance Supervisor; and the audit team members listed in the previous paragraph.

Following introductions, city staff members described local concerns, which had already been presented to the Iowa DOT and Tom McDonald, for traffic safety along the route. Following is a summary of comments made by Police Chief Kuhl:

> Just north of the Lakewood subdivision is a horizontal/vertical curve that has been the site of several cross-median crashes, one of which resulted in a fatality. The city has requested consideration of a median barrier in that area to prevent these occurrences.
>
> The posted speed limit through the audited section varies from 55 mph at the north end, to 45 mph through the Lakewood addition, then 55 mph to Chatham Avenue, then 45 mph for a short distance, before lowering to 35 mph through the remainder of the community. The City has requested an Iowa DOT speed study to review lowering the intermediate 55 mph zone to 45 mph as well as lowering the posted limit from 45 mph to 35 mph in other areas. The city based this request on a local speed study they conducted over a seven-day period, which indicated that approximately half of drivers were exceeding the posted speed limit.
>
> In addition there has been, and continues to be, considerable development in the area between Chatham Avenue and Beardsley Street, which has changed conditions substantially since the existing speed limits were established.
>
> There is a Norwalk city limit sign for southbound traffic under the IA 5 bridges. Chief Kuhl cited multiple examples when some Norwalk-bound drivers, confused by this sign location, are tempted to turn onto the eastbound IA 5 loop. It has been requested that the Iowa DOT relocate this sign farther south, beyond the eastbound off ramp from IA 5.
>
> Some operational problems have been experienced at the Beardsley Street intersection due to tight radii, as evidenced by off-tracking beyond the curb. The city requested that

the intersection, particularly the northwest quadrant, be examined for widening of this radius to facilitate south to west turning movements.

Prior to the audit, District 5 Traffic Technician Frank Redeker had examined the area and offered several suggestions for further review in improving safety. Following is a summary of those comments:

The advance pedestrian pavement markings at two crosswalks may not meet current Manual of Uniform Traffic Control Devices (MUTCD) guidelines and should be reviewed.

The roadway in the north end of the audit area features a raised concrete median with no delineation. It was suggested to consider painting the curb face through the curve area and perhaps also add delineators in the raised median to better guide traffic through the curve. Concern was also expressed for the deflection angle of a cable barrier if installed in this area.

It was suggested that the existing and future traffic signals be interconnected and synchronized to improve traffic flow through the city on IA 28, if this has not already been accomplished. Advance warning signs and beacons were also suggested for southbound traffic approaching the Beardsley Street intersection.

Finally, Redeker suggested that the current posted speed limits be verified with a speed study.

The audit team will review and comment on all of these requests and suggestions as part of the audit process.

Tim Hoskins advised that Iowa Signal (and Electric Company) from Clive currently maintains all traffic signals along the IA 28 route and McClure Engineering (Company) from Johnston performs most of the engineering tasks. Hoskins also indicated that some signals on IA 28 were interconnected, but he was not sure about any study to synchronize the signals for two-way progression. Hoskins also thought that the signals were semi-actuated for side-road traffic. Cycle length should also be checked to ascertain appropriateness for traffic demands at each intersection.

McClure Engineering had completed a traffic study for the corridor in 2008 and the recommendations from that report were reviewed and briefly discussed. This study was commissioned by the City of Norwalk to undertake a traffic analysis and signal warrant evaluation at several intersections considering planned development adjacent to IA 28 and the potential impact on traffic, with particular concern at Colonial Parkway and Chatham Avenue. Recommendations from this study included signalization at Colonial Parkway, which has since been accomplished, and consideration for traffic signals at Chatham Avenue.

Further study of signal warrants was also recommended at Wakonda Drive and Lakewood Drive. Interconnection and coordination of signals along the corridor was also recommended. It was opined that signal warrants may be met in the future at the County Line Road intersection, but the Wright Road intersection was recommended to remain with two-way stop control. The complete report of this study is available at the City of Norwalk and in the InTrans Office, if additional detailed review is desired.

Tom McDonald then distributed and reviewed crash data for the past 10 years of record for the entire route and several selected individual intersections. Traffic signals have been installed at some intersections and the north section was reconstructed as part of the IA 5 relocation since IA 28 was originally rebuilt in 1985. However, some of the later improvements were made prior to the 10 year analysis period. Any exceptions will be addressed specifically.

The data for the overall corridor, which begins at the County Road (CR) G-24 intersection at the south end and extends northerly through the IA 5 interchange in Polk County, indicated a total of 319 crashes with 2 fatalities, 14 major injuries, 24 minor injuries, 57 possible injuries, and 222 resulting in property damage only (PDO). A total of 164 of these crashes occurred at 10 intersections. Outside of these 10 intersections, 155 crashes were recorded. A summary of the crash data is included later in this report and the complete data are contained in Appendix A.

The city advised that requests have been received to install traffic signals at the former County Line Road, now Echo Valley Drive, intersection, but it was concluded the location is too close to the IA 5 interchange ramps for safe and efficient operation.

Tim Hoskins indicated that southbound IA 28 traffic at the Wakonda Drive intersection does not present many gaps for entering traffic during busy times.

Randy Hunefeld asked if Police Chief Kuhl could estimate how many crashes might not be reported due to minimal property damage. Kuhl responded that he thinks the usual traffic speed on IA 28 should cause sufficient property damage that would require reporting for almost all such incidents. Kuhl further advised that Norwalk has a 13 officer staff and investigates all crashes except for those involving fatalities when assistance from the Iowa State Patrol is requested.

DAYLIGHT FIELD REVIEW

Following the initial office conference, a daylight field review was conducted with all meeting attendees participating. The field review began at the Wright Road intersection and proceeded northerly.

Traffic volume on IA 28 at Wright Road was about 5,200 vehicles per day (vpd), according to a 2008 Iowa DOT traffic estimate. Traffic on Wright Road varied from about 960 vpd on the west to 690 vpd on the east. The intersection is stop-sign controlled and few crashes had been recorded over the 10 year analysis period. However, Chief Kuhl indicated that additional development is anticipated west of IA 28 at this location.

The posted speed limit varies from 55 mph at the south corporate limit to 35 mph near North Avenue (CR G-14). The IA 28 roadway transitions from a two-lane to a five-lane design, with a continuous left turn lane in the middle prior to the North Avenue intersection.

North Avenue is controlled with traffic signals and the intersection is slightly-skewed to the right for northbound traffic (Figure D.1 in Appendix D). Left turns are controlled with a permissive left signal indication for both northbound and southbound traffic, but exclusive signal heads for left turns were not featured.

Traffic volume on IA 28 north of North Avenue increases to about 7,400 vpd with about 3,360 vpd on North Avenue west of the intersection and about 3,950 vpd estimated east of the intersection.

Continuing north, at the Main Street intersection, there was no left turn signal for northbound IA 28 traffic but a left turn signal head did exist for southbound vehicles (Figure D.2 in Appendix D). Traffic volumes on IA 28 continue to increase at this location with about 8,660 vpd south of the intersection and 11,000 vpd to the north. Main Street showed a volume of 2,570 vpd to the east and a commercial entrance on the west side had estimated traffic of 960 vpd.

The next major intersection is Cherry Parkway, controlled with traffic signals (Figure D.3 in Appendix D). There is a signalized pedestrian crossing at this location. No left turn signal exists for northbound traffic, but a five-section signal head allowing protected/permissive left turns is in place for southbound IA 28 traffic. Traffic volumes from the 2008 Iowa DOT estimates were 11,142 south of the intersection, increasing to 17,000 to the north. The side street on the west indicated about 1,100 vpd and Cherry Parkway to the east was estimated at more than 6,000 vpd in 2008. The posted speed limit increases to 45 mph just north of this intersection.

The Gordon Avenue intersection connecting from the west has only limited sight distance to the north due to the curvilinear alignment of IA 28, but few crashes have been recorded here. From this location northerly, roadway lighting exists for the southbound lanes only with no lights in place for the northbound lanes.

Chatham Avenue also intersects IA 28 from the west and is stop-sign controlled. Very few crashes were noted here over the analysis period. From this location northerly, the posted speed limit is 55 mph.

Newly-installed (late 2009) traffic signals exist at the Colonial Parkway intersection. Most of the nine crashes that have been recorded here occurred since 2007. Considerable development has occurred in recent years to the west of this intersection and major development is underway on the east side as well. Traffic volumes on IA 28 were estimated in 2008 as 16,600 vpd south of the intersection, increasing to 16,700 vpd to the north. Side road traffic from the west was 1,800 vpd, with no traffic shown on the east side until generated by the ongoing development. Left turn, protected-only signal heads and phasing were operating for northbound traffic only at this time on IA 28 (Figure D.4 in Appendix D).

Continuing north, the Beardsley Street intersection exhibited the highest concentration of crashes for the entire reviewed corridor (Figure D.5 in Appendix D). The existing traffic signals, which were installed permanently in 2004, feature a separate assembly for left turns from both directions, with permissive-only left turn phasing. This is the intersection where the city requested consideration for widening the existing corner radius for southbound right-turning traffic (Figure D.18 in Appendix D). The intersection marks the southern limits of the Lakewood subdivision. Traffic volumes indicated by the 2008 Iowa DOT count were 16,590 vpd to the south and 14,800 vpd north of the intersection. Side-road volumes were about 6,400 vpd on the west approach and 3,260 vpd on the east approach. It was also noted that the section of IA 28 south of Beardsley Street includes a conventional six-inch vertical face curb urban design despite the posted speed limit of 55 mph. Current design standards specify a sloped face curb for this speed.

Wakonda Drive and Lakewood Drive are the next two intersections to IA 28. Both intersections are controlled with Stop signs on the side roads with Lakewood Drive located at the northerly limits of the Lakewood subdivision. At Lakewood Drive, IA 28 traffic volumes were estimated at 14,074 vpd south of the intersection and 14,719 vpd to the north. Side-road traffic on the west approach was about 1,740 vpd, but only 40 vpd on the east approach.

At both intersections, but particularly at Wakonda Drive, the prominent crash type was failed to yield from a Stop sign. Masteller Road intersects IA 28 from the east opposite from Wakonda Drive, but only one crash appears to have occurred at this location during the review period. Additional review of the side-road traffic control may be warranted at both Wakonda Drive and Lakewood Drive to consider eventual signalization (Figures D.6 through D.10 and D.15 in Appendix D).

North from Lakewood Drive, IA 28 consists of a four-lane divided roadway with sloped curbs separated by a raised concrete median with access openings at quarter-mile intervals. The outside shoulders are constructed of granular material. This is the area where the City of Norwalk had requested a median barrier to dissuade cross-median crashes. The area is rural in nature with a long horizontal/vertical curve to the west approaching the IA 5 interchange in Polk County (Figure D.11 and D.12 in Appendix D).

The next intersection reviewed was the former County Line Road, now Echo Valley Drive, a T-configuration design approaching from the east with right- and left-turn storage lanes for side-road traffic. Traffic is controlled with a Stop sign, but no Stop Ahead warning sign was observed, even though the approach is curvilinear in alignment (Figure D.13 in Appendix D). Traffic volumes at this point on IA 28 were 14,000 vpd to the south and 13,810 vpd to the north per the 2008 Iowa DOT count. Side-road approach traffic was estimated at about 850 vpd.

The northerly city limits for Norwalk is the centerline of the IA 5 roadway and, therefore, the city limit sign for southbound traffic is located under the IA 5 bridges (Figure D.14 in Appendix D). A city request to relocate this sign due to poor visibility and confusion for southbound drivers will be reviewed by Iowa DOT District 5 staff.

The eastbound IA 5 off ramp (Figure D.21 through D.24 in Appendix D) has experienced more than 25 crashes during the analysis period; however, IA 5 did not exist for the full 10 year period. Therefore, the crash frequency over the full 10 year analysis period year is actually much higher. Analysis of crashes and suggestions for improvement are contained later in this report.

Chief Kuhl had previously recommended installation of automated enforcement cameras for speed control along the IA 28 corridor, but the city council declined to approve this enhancement.

Jim Phillips asked about the average crash rate throughout this corridor and that information is included later in this report.

NIGHTTIME FIELD REVIEW

Following dinner, a nighttime review (Figures D.19 and D.20 in Appendix D). was conducted by audit team members including city representatives and Iowa DOT staff. The review again commenced at the Wright Road intersection and proceeded northerly.

The pavement edge line was quite visible and possibly re-painted recently. However, the yellow centerline markings were not as bright. Several roadway signs also appeared to exhibit reduced visibility and should be reviewed for compliance with current MUTCD minimum retro-reflectivity requirements.

As noted in the daylight review, sections of IA 28 have roadway lights on the west (southbound) side only and the darker northbound roadway is quite noticeable at night. The same observation was made at several intersections, particularly at Colonial Parkway and Beardsley Street. No roadway lighting on either roadway exists from the Lakewood addition to the IA 5 interchange, which is fully lit.

Standard delineators are in place along the roadway north from the Lakewood Drive intersection for both directions of traffic flow; however, the spacing of these devices appears much wider than recommended by the 2009 MUTCD.

The Norwalk city limit sign also was not satisfactorily visible for southbound traffic due to the dark environment under the IA 5 bridges and small size of the sign.

The nighttime review concluded at approximately 7:30 p.m.

WRAP-UP MEETING

On October 26, 2011, a wrap-up meeting was conducted in the Norwalk city facilities for this RSA on IA 28 through the community. The wrap-up meeting participants were Tim Hoskins and Police Chief Eddie Kuhl from Norwalk, Randy Hunefeld from the Iowa GTSB, Tim Simodynes, Jim Phillips, Ken Morrow, and Todd Netley from the Iowa DOT, and Bob Sperry and Tom McDonald from InTrans.

Copies of notes from the initial meeting and field reviews were distributed and discussed. McDonald explained the notes and advised that the draft final report for this audit will be prepared and distributed to the group for review and comments in the near future. Appendix items for this report, including images taken along the route and copies of crash data and traffic volumes will not be distributed to save file size, but will be included with the final report after the draft is approved.

Earlier submitted city requests and suggestions were discussed including installation of a median barrier through the curve area north of the Lakewood Addition and reduced speed limits in selected areas of the reviewed section. Specific city requests are to lower the posted speed limit from 55 mph to 45 mph from the IA 5 interchange to Columbine Drive, lower the existing 45 mph to 35 mph to south of Beardsley Street, lower the existing 55 mph to 45 mph to Chatham Avenue, and lower the existing 45 mph to 35 mph south to Cherry Parkway.

It was noted that enforcement of a 45 mph speed in the rural area north of Lakewood might prove difficult. Chief Kuhl advised that routine speed enforcement is applied on IA 28 about twice a week. Hunefeld suggested that a focused enforcement effort on IA 28 be utilized occasionally as a team effort involving adjacent community police departments to raise speed restriction awareness and compliance by drivers.

Chief Kuhl also advised that speed enforcement camera use had been studied in February 2011 by Redflex Traffic Systems, Inc., a supplier of automated speed and traffic signal camera systems. A copy of that report was furnished to McDonald for further study.

Automated camera enforcement was considered at the Beardsley Street and IA 5 interchange areas as well as a mobile unit for use throughout town. A majority of Norwalk citizens had expressed approval for automated enforcement, but the effort was not supported by the City Council.

Informal speed assessments have also been conducted by the city and District 5 Traffic Technician Frank Redeker. It should be noted that a formal speed study in this corridor was conducted by the Iowa DOT in November of 2010, wherein it was recommended that the posted speed limit not be lowered based on the results of that study. A copy of that report is included in Appendix C.

The city had also requested that the Norwalk city limit sign be relocated south of the present location under the IA 5 interchange bridges. The preferred location for this Norwalk signing will be studied further by the Iowa DOT District 5 Office in consultation with the City of Norwalk.

Hunefeld suggested a warning sign be considered in advance of the signalized Beardsley Street intersection advising traffic to be prepared to stop when flashing. Similar signs have been deployed successfully in other areas of the state. The crash diagram for this intersection indicated some crashes could have had poor recognition of the signals as a contributing cause.

Suggestions made earlier by Redeker were also discussed, including compliance of pedestrian crossing pavement marking symbols with the MUTCD, interconnection of traffic signals, and additional delineation around the horizontal curve north of Lakewood. These issues were reviewed by the audit team.

Chief Kuhl advised that they have not experienced pedestrian-related crashes in recent history and have received recognition for that accomplishment.

Hunefeld also suggested that street name signs be mounted on the mast arms at signalized intersections.

The wrap-up meeting adjourned at 10:05 am.

SUPPLEMENTAL FIELD REVIEW

Following the wrap-up meeting, Tim Simodynes, Bob Sperry, and Tom McDonald conducted an additional field review to obtain images of roadway conditions and gather more data for IA 28 through the audited area.

Beginning again near the Wright Road intersection, the supplemental review commenced and proceeded northbound on IA 28 through Norwalk.

The rural two-lane section of IA 28 is posted at 55 mph approaching the city limits (approximately 7.5 milepost) and reduces to 45 mph from that point north. Nearing the North Avenue intersection, a traffic signal ahead symbol sign has been installed for northbound traffic and the regulatory speed is reduced to 35 mph.

The North Avenue intersection is preceded with a six-inch raised median on the south approach and features a left-turn storage bay for northbound traffic. A right turn lane also exists at this intersection for northbound vehicles. The IA 28 left turn signals provide only a permissive left display for north and southbound traffic.

Advance and actual fluorescent yellow-green (FYG) pedestrian crossing signs along with a painted pedestrian crossing are in place on the south side of the intersection. Painted advance pedestrian pavement marking symbols have been applied in all three northbound approach lanes, but do not appear to comply with 2009 MUTCD requirements in either design or size (Figure D.16 in Appendix D).

A painted island exists for southbound traffic approaching the North Avenue intersection.

Stop bars have been placed for side-road traffic at North Avenue, but not on IA 28. The location of these markings relative to the painted crosswalks should be reviewed for compliance with MUTCD recommendations.

From North Avenue to the north, IA 28 consists of a five-lane roadway with a continuous left turn lane in the middle.

The Main Street intersection features a three-lamp left turn signal for northbound IA 28 traffic with only permissive left signal phasing. The left turn signal for southbound traffic is a five-section head with both a permissive and protected phase capability, but the protected phase did not appear to be functioning at the time of review.

Painted pedestrian symbols have been placed on IA 28 approaching the intersection, again, not appearing to comply with 2009 MUTCD recommendations. An FYG pedestrian crossing sign had been installed on the south side of the intersection, but the painted crosswalk was on the

north side. The crossing sign location should be reviewed for compliance with MUTCD guidance.

The Shady Lane Drive intersection approaches from the west only and the Stop sign on Shady Lane Drive for IA 28 was leaning. Richard George Drive approaches IA 28 from the east and is controlled with Stop signs mounted on both sides of a short right turn leg with one sign appearing to be 36 inches in size and the other being smaller.

Many of the street name signs along IA 28 vary widely in size: some measured with an eight-inch letter height and others at only four inches, which is too small for speeds over 25 mph according to the 2009 MUTCD (Figure D.17 in Appendix D).

At the Cherry Parkway intersection, no individual left turn signal exists for northbound IA 28 traffic, but a five-section signal head controls left tuning southbound IA 28 traffic along with two three-section signal heads for through traffic.

A raised concrete median begins on IA 28 about 200 feet north of Cherry Parkway (near Chatham Avenue) along with a 55 mph speed limit.

At the Colonial Parkway intersection, a newer-design traffic signal has been installed along with left-turn bays for each direction of travel. The side street approaching from the east was not open to traffic at the time of the review and considerable land development was underway in that area. A three-section left turn signal head was in place for both north and southbound traffic, but the southbound signal was not activated given the eastbound side street was closed. The left turn signal phases consisted of a green arrow, yellow arrow, and red ball. Street name signs were in place on the signal mast arms. The northbound left turn vehicle detectors did not seem to be operating given the signals were cycling through all phases regardless of the presence of traffic.

At the Beardsley Street intersection, the traffic signals appeared to comply with 2009 MUTD requirements. Left turn bays and dedicated signals were in place with left turns controlled with five-section heads and protected/permissive left turn phases. Street name signs were installed on the signal mast arms. A raised concrete median had been installed on the west side-street approach to prevent left turn access to a convenience store on the southwest corner. The northwest radius appeared to be too restrictive for south to west turning traffic as numerous tire marks were visible on the roadway curbs, although no crashes could be verified as related to this tight radius.

Wakonda Drive approaches IA 28 from the west only and was controlled with a 30 inch Stop sign. One-way regulatory and divided roadway signs were also mounted on the Stop sign support. Roadway lighting at this location appeared to be adequate, but the Stop sign support was leaning from vertical. To improve visibility of the Stop sign, relocation of the sign closer to the curb might be desirable. The stop bar location appeared to be satisfactory.

Sight distance to the north from this intersection was hampered by a vertical curve on IA 28 and an intersection ahead warning sign might be considered in advance of the intersection for southbound traffic if measurements indicate a need.

Masteller Road intersects IA 28 from the east across from Wakonda Drive, but few crashes or operational problems were noted here. The pedestrian path on the west side that approaches from the south ended at this intersection.

Lakewood Drive also intersects IA 28 from the west and was controlled with a 30 inch Stop sign, again, leaning slightly. The plaques described at Wakonda Drive are also mounted with the Stop sign at this intersection. Visibility of IA 28 traffic from this intersection appeared adequate, but southbound vehicles approaching this intersection have a 55 mph speed limit and gaps between vehicles may be inadequate for entering vehicles during higher traffic volume periods, given numerous crashes involving southbound vehicles have been recorded. A gap study at this location should be considered.

Left turn bays were in place on IA 28 at both the Wakonda/Masteller and Lakewood intersections.

The Columbine Drive intersection approaching from the east is the last in the Lakewood Addition. Traffic was controlled with a Stop sign and visibility of oncoming IA 28 vehicles appeared adequate.

Just north from the Columbine Drive intersection, a 55 mph speed limit exists for IA 28 traffic. However, a horizontal curve warning sign with 45 mph advisory speed plaque had been installed for northbound vehicles. Bridges over a small stream on IA 28 are shielded with beam guardrail.

The IA 28 pavement features a six-inch mountable curb, which is an appropriate design for higher-speed traffic. The horizontal curve was marked with standard white delineators, but installed at approximate 300 foot intervals. A raised concrete median in this area was about nine feet wide, with six-inch mountable curbs and a six-foot wide concrete shoulder. Shoulders along the outside are granular. This section of IA 28 was relocated as part of the IA 5 construction in approximately 2002-2004.

A reduced speed sign is in place for southbound IA 28 traffic approaching the Lakewood Drive intersection. Relocating that sign and the 45 mph regulatory sign farther north may sufficiently slow IA 28 vehicles to permit entering IA 28 from this intersection more safely and should be considered pending results of a gap study mentioned earlier.

For southbound traffic through the IA 5 interchange, the posted speed was 55 mph. The Norwalk city limit sign is quite small and difficult to notice, even in daylight conditions. A larger and/or relocated sign should be considered in this area to avoid possible confusion for Norwalk-bound traffic that could be misdirected onto the eastbound IA 5 loop.

The eastbound off ramp from IA 5 has been the site of numerous crashes since opening to traffic, with the most frequent crash type being rear-end collisions at the Stop sign. A pavement widening to allow a southbound merge/acceleration lane on IA 28 could be considered in this location to allow vehicles to enter IA 28 more efficiently and safely.

ASSESSMENT OF CURRENT POSTED SPEEDS

At the request of the City of Norwalk, the Iowa DOT conducted a speed study on IA 28 in November 2010 using a laser speed detector. Speeds were sampled at seven locations throughout the corridor.

The 85th percentile speeds at all locations equaled or exceeded the posted speed limit, except for two sites, between Chatham Avenue and Beardsley Street, where the sampled speeds were somewhat lower than the posted 55 mph. In addition, the 50th percentile speed at the sample site 70 feet north of Chatham Avenue was found to be 47 mph and the 10 mph pace speed ranged from 43 through 52 mph. At 185 feet north of Colonial Parkway, the 50th percentile speed was also 47 mph and the 10 mph pace speed ranged from 42 through 51 mph.

Based on the speed study results, the Iowa DOT recommended additional enforcement to address excess speeding but no change in posted speed limits. Also note that an earlier speed study had been conducted in 2005 to verify the posted speeds that were established in 1985 following opening of IA 28 to traffic.

The complete 2010 speed study report is included in Appendix C.

CRASH DATA

The 2001 through 2010 data for the overall corridor from County Road (CR) G-24 through the IA 5 interchange indicated a total of 319 crashes with 2 fatalities, 14 major injuries, 24 minor injuries, 57 possible injuries, and 222 resulting in property damage only (PDO).

Crashes Recorded for the Entire Corridor

As is usual in urban locations, most crashes involved multiple vehicles and only about 30 percent were listed as non-collision or mostly single-vehicle crashes.

Calculating an accurate crash rate for this entire corridor is hampered somewhat by the widely varying traffic volumes; however, using an average volume of 12,068 vpd, a crash rate of approximately 190 crashes per hundred million vehicle miles of travel (HMVMT) was obtained for the 10 year analysis period. This rate is lower than the statewide average of 324 crashes/HMVMT for similar roadways in Iowa.

When calculated perhaps more accurately by segment, the rates were found to vary from a low of 80 crashes/HMVMT to a high of 370 crashes/HMVMT. Complete results of these calculations can be found at the end of Appendix A. The calculated crash density for the reviewed corridor was 8.94 crashes per year per mile compared to the latest nine-year statewide average for similar roadways of 6.84.

A total of 164 crashes occurred at 10 individual intersections. Outside of these 10 intersections, 155 crashes were recorded.

Note that the limits covered by the crash data extend entirely through the IA 5 interchange at the northern terminus, which is slightly north of the incorporated city limits of Norwalk. This section was included to address the high frequency of crashes recorded within the interchange under which IA 28 passes.

Crash Summary Outside of 10 Individual Intersections

Major causes for the crashes outside of the 10 intersections were animal collisions, failure to yield from a Stop sign, failure to yield while making a left turn, driving too fast for conditions, and following too close. The manners of these collisions included predominantly broadside and rear-end impacts, although non-collision (mostly single-vehicle) was the highest manner noted.

The most common time for these crashes was between 4:00 p.m. and 6:00 p.m. or commuter time after work. However, Fridays and Saturdays indicated the highest number of crashes, as did the months of November and December. Of these 155 crashes, 103 were recorded in daylight and 41 in hours of darkness.

Weather conditions were clear, partly cloudy, or cloudy for most crashes and only 13 occurred during snowfall. Roadway surface conditions were noted as dry for 105 of the 155 crashes, with 16 recorded when snow or ice was on the pavement, which would indicate good maintenance efforts by the Iowa DOT. Ken Morrow stated that IA 28 is classified as a level B for maintenance, which is only one level below the interstate system.

A total of 256 drivers were involved in these 155 crashes, and 199 of these were judged to be apparently normal by investigating officers. Drivers operating under the influence of alcohol or drugs were concluded for only 11 crashes. Teenage drivers were involved in only 31 crashes and drivers over the age of 65 in only 11, and both of these numbers are quite low representations compared to general demographics common for drivers.

Crash Summary for 10 Individual Intersections

Crash data were summarized for 10 intersections that were selected due to high crash concentrations. The crash data summaries, including a crash diagram, for all 10 intersections are included in Appendix A.

The remainder of this section highlights the specific findings for the following 5 (of the 10) intersections (in alphabetic order):

- Beardsley Street
- Cherry Parkway
- Eastbound IA 5 off ramp
- Lakewood Drive
- Wakonda Drive

The other five intersections did not display much higher crash frequency than one per year.

- The Beardsley Street intersection with IA 28 had 28 crashes recorded over the 10 year analysis period, 20 of which occurred following installation of traffic signals in approximately 2003. The most frequent crash type was failure to yield while making a left turn. Manner of collision showed angle oncoming left turn, broadside, and rear-end, which are all common signal-related crashes. More crashes occurred on Thursday than any other day of the week and in clear, daylight conditions with a dry pavement surface. Of the 57 drivers involved in these crashes, 52 were judged apparently normal by investigating officers and 17 were teenagers. The calculated crash rate for this intersection over the eight-year analysis period since the signals were installed was 0.33 crashes per million entering vehicles (MEV), which is below the statewide average of 0.9 crashes/MEV for similar intersections.

- The Cherry Parkway intersection recorded 16 crashes in the four years since the traffic signals were modified in 2006, but 26 in the total 10 year analysis period. The most frequent crash types were angle oncoming left turn and broadside, followed by rear-end. The most frequent time for crashes was between 4:00 p.m. and 8:00 p.m. with December being the

most common month for occurrence. Chief Kuhl stated that many southbound drivers use this intersection as a shortcut to the high school. It was noted that 5 of the 16 crashes were recorded in dark conditions, although roadway lights do exist at this location. Again, most crashes occurred during clear or cloudy conditions on dry pavement. The condition for 29 of 31 drivers was apparently normal and 10 of the drivers were teenagers. The calculated crash rate for this intersection was 0.62 crashes/MEV.

- The eastbound IA 5 off ramp intersection with IA 28 has been the site of 24 crashes since 2004 or more than three per year. Most of these crashes were rear-end collisions at the Stop sign, occurring most frequently between 4:00 p.m. and 6:00 p.m. The crashes were distributed uniformly throughout month of the year and no injury crashes were noted. Almost all crashes were recorded during clear, daylight, or partly cloudy conditions and on dry pavement. Of the 53 drivers involved in crashes, 50 were judged to be apparently normal. Only 4 drivers were teenagers and 2 were older than 65 years. The crash rate calculation for this intersection since it was fully opened in 2004 was 1.0 crashes/MEV.

- The non-signalized Lakewood Drive intersection had 15 crashes recorded over the 10 years, with failure to yield from a Stop sign and ran Stop sign the most noted causes and broadside the top manner of collision. The most frequent time of day for crashes were morning and evening commute times with Tuesday being the day of week for 5 of the 15 crashes. Injuries resulted in 8 of the crashes. More than a third of the crashes were recorded in dark conditions, perhaps indicating a deficiency in roadway lighting. Weather conditions were predominantly clear or partly cloudy and the pavement surface was primarily dry for most crashes. A total of 23 of 27 drivers were found to be apparently normal at the time of the crashes and only six of the drivers were teenagers. The calculated crash rate was 0.27 crashes/MEV at this location.

- The non-signalized Wakonda Drive intersection experienced 16 crashes over the full 10 year analysis period, 10 of which were failed to yield from a Stop sign. Consequently, the most common manners of collision were angle oncoming left turn and broadside. The collision diagram indicated that 9 of the 16 crashes occurred in the southwest quadrant of the intersection, with southbound drivers colliding with eastbound traffic, possibly indicating inadequate sight distance for entering vehicles. Most crashes at this intersection occurred during the middle of the week in clear or partly cloudy, daylight conditions and on dry pavement. A total of 30 drivers were involved in these crashes with 26 judged as apparently normal and 8 being teenagers. The calculated crash rate was 0.295 crashes/MEV.

HSM Crash Rate Comparison

The American Association of State Highway and Transportation Officials (ASSHTO) Highway Safety Manual (HSM), published in 2010, contains crash predictive models that can be used, given existing conditions and previously determined factors on a roadway, to compare observed crashes to those predicted by the model.

Crash data from IA 28 were compared using the HSM model and the results are included at the end of Appendix A (Table A.101).

Note that the segments on each end are modified somewhat from the lengths used in the general crash analysis of this report, but the data shown in the table are still accurate. It is interesting to also note that the actual crash frequencies recorded for IA 28 are similar to or higher than those predicted by the HSM model, regardless of whether or not intersection crashes are included with segment crashes.

CONCLUSIONS AND SUGGESTIONS FOR IMPROVEMENT

The IA 28 corridor through Norwalk appeared to be well maintained and several improvements, including signalization and addition of access points, have been made since the roadway was reconstructed in 1985. The area adjacent to IA 28 continues to develop, which will dictate additional roadway and traffic control upgrades in the future.

It may be beneficial to the community to consider making many of the suggested major improvements, especially those to signalization, at one time rather than piecemeal. Some of the suggestions below reflect that philosophy.

Although current crash history compares favorably with statewide averages for similar urban roadways, the suggested improvements listed below may contribute to improved safety and traffic flow through the IA 28 corridor. Some of these suggestions should be considered proactive in nature, intended to enhance safety before significant numbers of crashes occur.

Based on crash history, observations made during field reviews, input from city and Iowa DOT staff, consideration of on-going and probable future development, and advice from the audit team, the following suggestions are offered for consideration to improve safety and traffic operations. These suggestions are not listed in priority order.

Low-cost improvements, such as signing upgrades, could be accomplished initially with more-costly enhancements programmed later when funding is identified. The amount of safety and operational benefit has not been assessed and these assessments should be done as part of the development of detailed project plans.

- Upgrade all existing traffic signals to meet Part 4 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD) standards and guidelines, including but not limited to number of signal heads, separate signal heads for left turns, and use of arrows in lieu of circular indications for turns.

- Interconnect and synchronize signals for two-way progression of traffic, where and when it would be most beneficial, keeping in mind this action will improve the flow of traffic on IA 28, but that increased delays may occur on side-street approaches.

- Where failed to yield right of way (FTYROW) while making a left turn is a frequent crash occurrence, consider utilizing the flashing yellow arrow for the permissive/protected left turn or convert the left turn signal to a protected left only. Locations for consideration include Beardsley Street, Cherry Parkway, and North Avenue. Either of the suggested changes will likely improve safety for left-turning vehicles, but could result in less efficient overall traffic operations during peak periods.

- Review signal timing to assure compliance with recommendations that can be found in the Institute of Transportation Engineers (ITE) Traffic Control Devices Handbook and Manual of Traffic Signal Design.

- Install a longitudinal barrier in the median of the horizontal curve north of the Columbine Drive intersection to prevent cross-median crashes. Two types of longitudinal barrier may be considered: concrete barrier and high-tension cable. Consider extending the barrier through the median opening north of the bridge until development requires access at this location. A properly-designed cable rail might be preferred over beam or concrete rail to avoid potential snow drifting. As an interim step, apply yellow paint to the face of the raised median curb through the horizontal curve area and install delineators in the median.

- Review existing delineator locations around the horizontal curve and re-position to match spacing in the MUTCD Chapter 3F.

- Review existing pedestrian symbol markings and crosswalk markings in the northbound lanes south of North Avenue and at the Main Street intersection to ascertain reasonable compliance with the guidance in Sections 3B.19 and 3B.20 of the MUTCD.

- Examine the condition of street name signs throughout the corridor and replace as needed to assure uniformity of application and compliance with Section 2D.43 of the MUTCD. Install street name signs on mast arms at signalized intersections using minimum-sized lettering as shown in Table 2D-2 of the MUTCD.

- Perform nighttime inspection of all signs to ascertain adequate visibility and compliance with prescribed minimum retroreflectivity standards in the MUTCD.

- Examine available stopping sight distance and, if needed, install a Stop Ahead warning sign in advance of the Stop sign at the former County Line Road, now Echo Valley Drive, intersection.

- Realign sign supports to assure vertical installations, such as the Stop sign support at the Shady Lane Drive intersection.

- Working with the IA DOT, relocate the existing city limit sign from under the IA 5 bridges to a more visible location and consider increasing the sign size. This step should avoid confusion with the IA 5 entrance loop as the route into Norwalk.

- Review visibility from the Stop signs for entering traffic at the Wakonda Drive and Lakewood Drive intersections. Remove any obstructions that hamper visibility of southbound IA 28 traffic, if feasible. Relocate and mill-in stop bars as close as possible to the IA 28 curb line to allow stopped drivers improved vision of southbound vehicles. Realign the sign supports to assure vertical installation. Monitor traffic signal warrants for these two

intersections while being mindful that installation of signals often increases the frequency of crashes. Perform a gap study of southbound IA 28 traffic at the Lakewood Drive intersection and consider options to improve gaps if the study yields inadequate results.

- As development continues, consider installing uniform roadway lighting for both directions of travel from Cherry Parkway through the Columbine Drive intersection. Enhanced lighting would also possibly reduce the number of nighttime crashes in this area.

- Request the Iowa DOT initiate a new speed study to evaluate current conditions. In consideration of the development in progress and future plans, it may be appropriate to perform speed studies more frequently to monitor the changing traffic patterns along this route. Consider performing speed studies annually to set appropriate speed limits. As other methods of setting regulatory speeds are tested and accepted, the Iowa DOT should perhaps consider other options for selecting appropriate speeds throughout this segment. In addition, the City of Norwalk should consider increased enforcement presence to assure compliance with established speed limits in the corridor. Perhaps, speed feedback signs can help reinforce appropriate speeds on IA 28. If disregard for posted speed limits continues to pose a safety concern and conventional enforcement is not effective, automated enforcement should be reconsidered as a viable and proven speeding deterrent.

- Widen the radius at the northwest quadrant of the Beardsley Street intersection to address encroachment by turning traffic.

- To address the crash pattern that has developed at the IA 5 eastbound off ramp, consider milled-in pavement markings to designate the left and right turn lanes better at the Stop signs and/or consider construction of a southbound merge lane adjacent to IA 28, south of that location, to permit safer traffic entry to Norwalk and possibly reduce the frequency of rear-end collisions.

- Also, as part of considering these changes, schedule and conduct a public information meeting to present and discuss any plans for improving IA 28 in conjunction with this RSA. Discuss findings and recommendations separately with school officials, particularly with driver instructors.

APPENDIX A. CRASH DATA

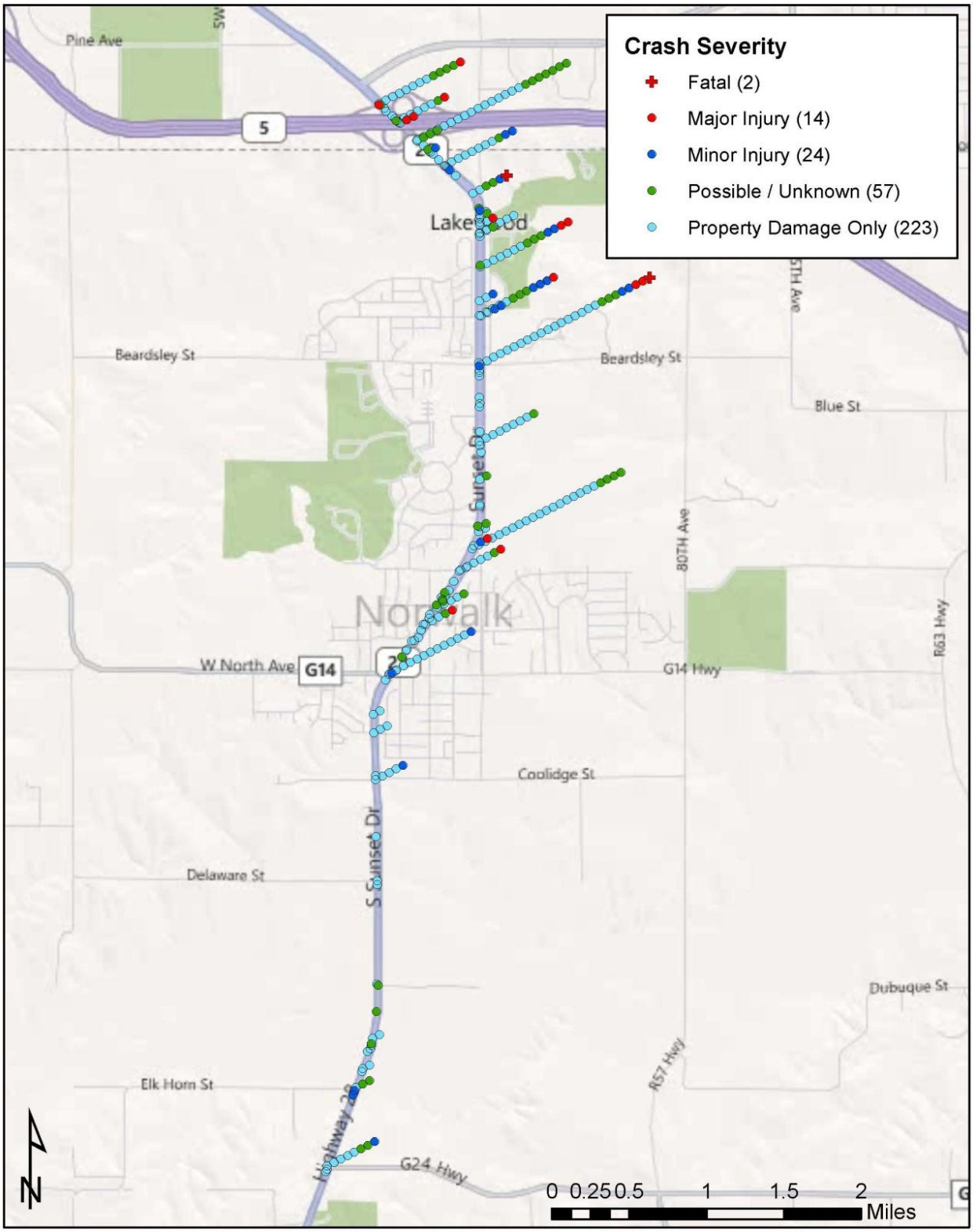


Figure A.1. 2001-2010 IA 28 Norwalk corridor crash map by severity

Crash Summaries for the Entire IA 28 Corridor through Norwalk

Table A.1. 2001-2010 Crashes by intersection and year

Intersection	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
IA 28/Beardsley St	6	2	3			5	4	3	3	2	**28**
IA 28/Sunset Dr & Cherry Pkwy	3			4	1	2	1	2	8	5	**26**
IA 28/Colonial Pkwy					1	1		2	3	2	**9**
IA 28/Columbine Dr	2		3			1	1		2	1	**10**
IA 28/Sunset Dr & Coolidge St & Wright Rd							2		1	2	**5**
IA 28/Lakewood Dr	2		1	3		2	5		2		**15**
IA 28/Sunset Dr & North Ave		2	1	2			3	2	3	3	**16**
IA 28/Echo Valley Dr		1	1	2	1	3		2		2	**12**
IA 28/Wakonda Dr & Masteller Rd	1	2	1	2	3		3		1	3	**16**
IA 28/IA 5 Ramp		2	1		2	8	2	6	1	5	**27**
Not at Intersection of Interest	15	12	13	12	15	27	14	13	13	21	**155**
Total	**29**	**21**	**24**	**25**	**23**	**49**	**35**	**30**	**37**	**46**	**319**

Table A.2. 2001-2010 Crashes by intersection and severity

Intersection	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
IA 28/Beardsley St	1	2	3	3	19	**28**
IA 28/Sunset Dr & Cherry Pkwy		1	1	4	20	**26**
IA 28/Colonial Pkwy				1	8	**9**
IA 28/Columbine Dr				1	9	**10**
IA 28/Sunset Dr & Coolidge St & Wright Rd			1		4	**5**
IA 28/Lakewood Dr		2	2	4	7	**15**
IA 28/Sunset Dr & North Ave			2		14	**16**
IA 28/Echo Valley Dr			2	1	9	**12**
IA 28/Wakonda Dr & Masteller Rd		1	5	3	7	**16**
IA 28/IA 5 Ramp				10	17	**27**
Not at Intersection of Interest	1	8	8	30	108	**155**
Total	**2**	**14**	**24**	**57**	**222**	**319**

Crash Summaries for Intersections of Interest

IA 5 Eastbound Off Ramp to IA 28

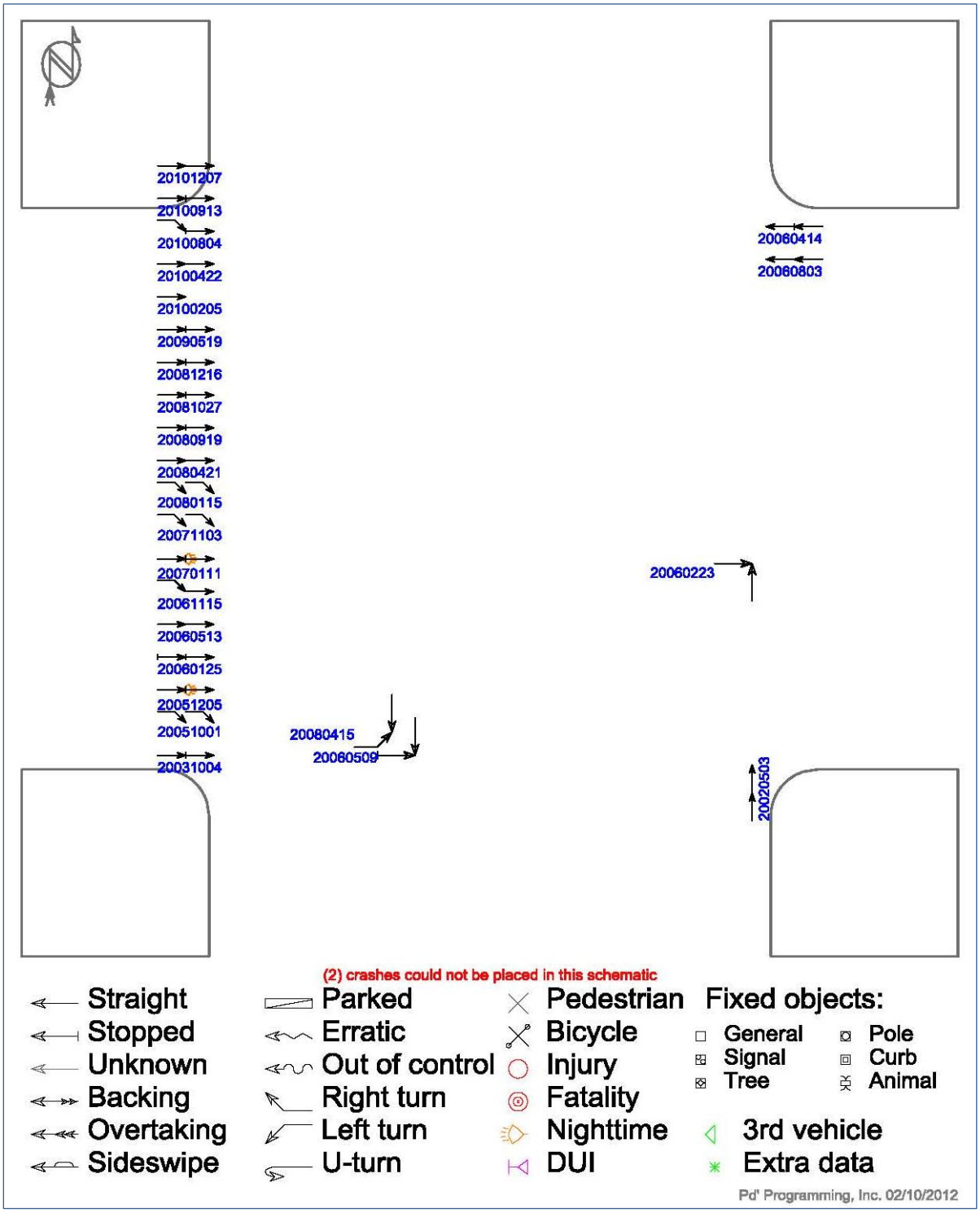


Figure A.2. 2001-2010 IA 5 eastbound off ramp and IA 28 intersection crash diagram

Table A.3. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions							1	1			**2**
Equipment failure						1					**1**
Followed too close			1		1	2		3		2	**9**
FTYROW: From Stop sign						1		2			**3**
FTYROW: Other						1					**1**
None indicated		1									**1**
Other: No improper action					1						**1**
Other: Other improper action		1				2	1		1	2	**7**
Swerving/Evasive Action										1	**1**
Unknown						1					**1**
Total	**0**	**2**	**1**	**0**	**2**	**8**	**2**	**6**	**1**	**5**	**27**

Table A.4. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Broadside						1		1			**2**
Non-collision						1				1	**2**
Rear-end		2	1		2	6	2	5	1	4	**23**
Total	**0**	**2**	**1**	**0**	**2**	**8**	**2**	**6**	**1**	**5**	**27**

Table A.5. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.								1		1	**2**
8:00 a.m. to 9:59 a.m.						2					**2**
10:00 a.m. to 11:59 a.m.										1	**1**
Noon to 1:59 p.m.					1	2					**3**
2:00 p.m. to 3:59 p.m.						1				1	**2**
4:00 p.m. to 5:59 p.m.		2	1		1	2	2	4	1	2	**15**
6:00 p.m. to 7:59 p.m.						1		1			**2**
Total	**0**	**2**	**1**	**0**	**2**	**8**	**2**	**6**	**1**	**5**	**27**

Table A.6. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Sunday											
Monday					1			2		1	4
Tuesday						1		3	1	1	6
Wednesday						2				1	3
Thursday						3	1			1	5
Friday		2				1		1		1	5
Saturday			1		1	1	1				4
Total	0	2	1	0	2	8	2	6	1	5	27

Table A.7. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January						1	1	1			3
February						1				1	2
April						2		2		1	5
May		1				2			1		4
August						1				1	2
September								1		1	2
October			1		1			1			3
November						1	1				2
December		1			1			1		1	4
Total	0	2	1	0	2	8	2	6	1	5	27

Table A.8. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by hour of day and severity

Hour of Day	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
6:00 a.m. to 7:59 a.m.				1	1	2
8:00 a.m. to 9:59 a.m.				1	1	2
10:00 a.m. to 11:59 a.m.					1	1
Noon to 1:59 p.m.				2	1	3
2:00 p.m. to 3:59 p.m.				1	1	2
4:00 p.m. to 5:59 p.m.				4	11	15
6:00 p.m. to 7:59 p.m.				1	1	2
Total	0	0	0	10	17	27

Table A.9. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by day of week and severity

Day of Week	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Sunday						
Monday				1	3	**4**
Tuesday				1	5	**6**
Wednesday				1	2	**3**
Thursday				3	2	**5**
Friday				1	4	**5**
Saturday				3	1	**4**
Total	**0**	**0**	**0**	**10**	**17**	**27**

Table A.10. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness		1			1						**2**
Daylight		1	1		1	8	1	5	1	4	**22**
Dusk Twilight (Civil)							1	1		1	**3**
Total	**0**	**2**	**1**	**0**	**2**	**8**	**2**	**6**	**1**	**5**	**27**

Table A.11. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear		1	1		1	5		2	1	2	**13**
Cloudy					1	2		1			**4**
Partly cloudy		1				1	1	2		2	**7**
Rain							1				**1**
Snow								1		1	**2**
Total	**0**	**2**	**1**	**0**	**2**	**8**	**2**	**6**	**1**	**5**	**27**

Table A.12. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry		2	1		1	8	1	3	1	4	**21**
Not Reported								1			**1**
Snow					1			1		1	**3**
Wet							1	1			**2**
Total	**0**	**2**	**1**	**0**	**2**	**8**	**2**	**6**	**1**	**5**	**27**

Table A.13. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions							1	1			**2**
Followed too close			1		1	2		3		2	**9**
FTYROW: From Stop sign						1		2			**3**
FTYROW: Other						1					**1**
Not Reported		2			1	1					**4**
Other: No improper action		1	1		2	8	2	6		4	**24**
Other: Other improper action		1				2	1		2	2	**8**
Swerved to avoid: vehicle-object-non-motorist-or animal in roadway										1	**1**
Unknown						1					**1**
Total	**0**	**4**	**2**	**0**	**4**	**16**	**4**	**12**	**2**	**9**	**53**

Table A.14. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal		3	2		4	15	4	11	2	9	**50**
Not Reported		1				1		1			**3**
Total	**0**	**4**	**2**	**0**	**4**	**16**	**4**	**12**	**2**	**9**	**53**

Table A.15. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
16						1					**1**
17						1					**1**
19		1			1						**2**
20						1					**1**
21-24		1			2		1	1		1	**6**
25-29						1		1		1	**3**
30-34						7	1	2		1	**11**
35-39						1	1		1		**3**
40-44		1	1			1	1	1		4	**9**
45-49		1			1	1		1		1	**5**
50-54								3			**3**
55-59						1		1			**2**
60-64								1	1	1	**3**
65-69			1			1					**2**
Unknown								1			**1**
Total	**0**	**4**	**2**	**0**	**4**	**16**	**4**	**12**	**2**	**9**	**53**

Table A.16. 2001-2010 IA 5 eastbound off ramp and IA 28 crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
16					1	**1**
17				1		**1**
19					2	**2**
20				1		**1**
21-24				5	1	**6**
25-29				1	2	**3**
30-34				1	10	**11**
35-39				1	2	**3**
40-44				4	5	**9**
45-49				2	3	**5**
50-54				2	1	**3**
55-59					2	**2**
60-64				1	2	**3**
65-69				1	1	**2**
Unknown					1	**1**
Total	**0**	**0**	**0**	**20**	**33**	**53**

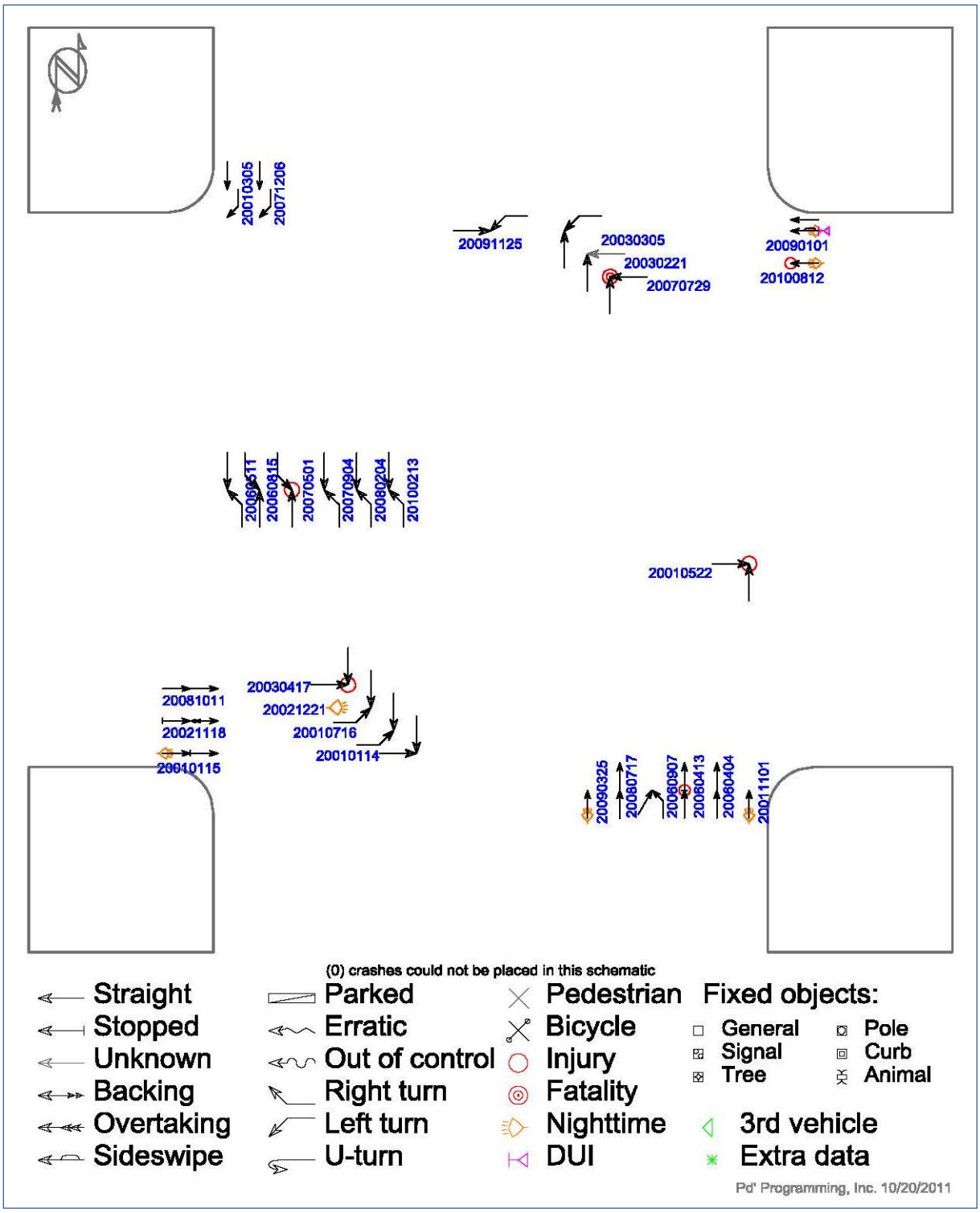


Figure A.3. 2001-2010 IA 28 and Beardsley Street crash diagram

Table A.17. 2001-2010 IA 28 and Beardsley Street crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Animal	1								1		2
Driving too fast for conditions	2										2
Exceeded authorized speed			1								1
Followed too close								1			1
FTYROW: From Stop sign	1	1	2								4
FTYROW: Making left turn	1					3	2	1		1	8
Inattentive/distracted by: Fallen object								1			1
Inattentive/distracted by: Use of phone or other device						1					1
Ran off road-right	1										1
Ran Traffic Signal									1		1
Swerving/Evasive Action							1				1
Traveling wrong way or on wrong side of road		1									1
Other: Other improper action						1					1
Other: No improper action							1			1	2
Unknown									1		1
Total	6	2	3	0	0	5	4	3	3	2	28

Table A.18. 2001-2010 IA 28 and Beardsley Street crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle-oncoming left turn	1		1			3	1	1		1	8
Broadside	2	1	1				2				6
Head-on									1		1
Rear-end	2	1				2	1	2			8
Sideswipe-same direction									1		1
Non-collision	1								1	1	3
Not Reported			1								1
Total	6	2	3	0	0	5	4	3	3	2	28

Table A.19. 2001-2010 IA 28 and Beardsley Street crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Midnight to 1:59 a.m.									1		1
2:00 a.m. to 3:59 a.m.									1		1
6:00 a.m. to 7:59 a.m.	1					1			1	1	4
8:00 a.m. to 9:59 a.m.	2	1	1			1					5
10:00 a.m. to 11:59 a.m.			1				1	2			4
Noon to 1:59 p.m.	1							1			2
2:00 p.m. to 3:59 p.m.						3	2				5
4:00 p.m. to 5:59 p.m.	1		1								2
6:00 p.m. to 7:59 p.m.	1						1				2
8:00 p.m. to 9:59 p.m.		1								1	2
Total	6	2	3	0	0	5	4	3	3	2	28

Table A.20. 2001-2010 IA 28 and Beardsley Street crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Sunday	1						1				2
Monday	3	1						1			5
Tuesday	1					2	2				5
Wednesday			1						2		3
Thursday	1		1			3	1	1	1	1	9
Friday			1								1
Saturday		1						1		1	3
Total	6	2	3	0	0	5	4	3	3	2	28

Table A.21. 2001-2010 IA 28 and Beardsley Street crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January	2								1		**3**
February			1					1		1	**3**
March	1		1						1		**3**
April			1			2					**3**
May	1					1	1				**3**
July	1						1	1			**3**
August						1				1	**2**
September						1	1				**2**
October								1			**1**
November	1	1							1		**3**
December		1					1				**2**
Total	**6**	**2**	**3**	**0**	**0**	**5**	**4**	**3**	**3**	**2**	**28**

Table A.22. 2001-2010 IA 28 and Beardsley Street crashes by hour of day and severity

Hour of Day	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Midnight to 1:59 a.m.					1	**1**
2:00 a.m. to 3:59 a.m.					1	**1**
6:00 a.m. to 7:59 a.m.				1	3	**4**
8:00 a.m. to 9:59 a.m.				1	4	**5**
10:00 a.m. to 11:59 a.m.					4	**4**
Noon to 1:59 p.m.					2	**2**
2:00 p.m. to 3:59 p.m.			2		3	**5**
4:00 p.m. to 5:59 p.m.		1	1			**2**
6:00 p.m. to 7:59 p.m.	1				1	**2**
8:00 p.m. to 9:59 p.m.		1		1		**2**
Total	**1**	**2**	**3**	**3**	**19**	**28**

Table A.23. 2001-2010 IA 28 and Beardsley Street crashes by day of week and severity

Day of Week	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Sunday	1				1	**2**
Monday					5	**5**
Tuesday			2	1	2	**5**
Wednesday					3	**3**
Thursday		2	1	1	5	**9**
Friday					1	**1**
Saturday				1	2	**3**
Total	**1**	**2**	**3**	**3**	**19**	**28**

Table A.24. 2001-2010 IA 28 and Beardsley Street crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness	1	1							2		**4**
Dawn Twilight (Civil)									1		**1**
Daylight	5	1	3			5	4	3		1	**22**
Dusk Twilight (Civil)										1	**1**
Total	**6**	**2**	**3**	**0**	**0**	**5**	**4**	**3**	**3**	**2**	**28**

Table A.25. 2001-2010 IA 28 and Beardsley Street crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear	1	1				4	3	1	1		**11**
Cloudy	1	1	1			1			1	1	**6**
Fog/smoke	1										**1**
Mist								1			**1**
Partly cloudy	3		2					1		1	**7**
Snow							1				**1**
Unknown									1		**1**
Total	**6**	**2**	**3**	**0**	**0**	**5**	**4**	**3**	**3**	**2**	**28**

Table A.26. 2001-2010 IA 28 and Beardsley Street crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry	4	2	2			5	3	2	2	2	**22**
Slush	1		1								**2**
Snow	1						1				**2**
Wet								1			**1**
Unknown									1		**1**
Total	**6**	**2**	**3**			**5**	**4**	**3**	**3**	**2**	**28**

Table A.27. 2001-2010 IA 28 and Beardsley Street crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions	2										**2**
Exceeded authorized speed			1								**1**
Followed too close								1			**1**
FTYROW: From Stop sign	1	1	2								**4**
FTYROW: Making left turn	1					3	1			1	**6**
Inattentive/distracted by: Fallen object								1			**1**
Inattentive/distracted by: Use of phone or other device						1					**1**
Made improper turn							1	1			**2**
Ran traffic signal									1		**1**
Swerved to avoid: vehicle-object-non-motorist-or animal in roadway							1				**1**
Traveling wrong way or on wrong side of road		1									**1**
Other: Other improper action						1					**1**
Other: No improper action	8	1	2			6	6	3	2	2	**30**
Unknown									2		**2**
Not Reported		1	1				1				**3**
Total	**12**	**4**	**6**	**0**	**0**	**11**	**10**	**6**	**5**	**3**	**57**

Table A.28. 2001-2010 IA 28 and Beardsley Street crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal	12	3	6			10	9	5	4	3	**52**
Under the influence of alcohol/drugs/medications									1		**1**
Other						1					**1**
Unknown		1					1	1			**3**
Total	**12**	**4**	**6**	**0**	**0**	**11**	**10**	**6**	**5**	**3**	**57**

Table A.29. 2001-2010 IA 28 and Beardsley Street crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
16	2	1	1			1		1	1	1	8
17	1					3	2				6
18		1							1		2
19			1								1
20	1										1
21-24	1					1	2		1		5
25-29	1	1	1			1	1	1		1	7
30-34	1										1
35-39	1					1	1				3
40-44							1	1			2
45-49	1					1		1	1	1	5
50-54	2	1	1				1	1			6
55-59			2					1	1		4
60-64						2					2
65-69	1					1					2
75-79							1				1
80-84							1				1
Total	12	4	6			11	10	6	5	3	57

Table A.30. 2001-2010 IA 28 and Beardsley Street crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
16		1	2		5	**8**
17	1		4		1	**6**
18				1	1	**2**
19					1	**1**
20					1	**1**
21-24					5	**5**
25-29			1	2	4	**7**
30-34					1	**1**
35-39				1	2	**3**
40-44			1		1	**2**
45-49					5	**5**
50-54	1	1			4	**6**
55-59		1			3	**4**
60-64				2		**2**
65-69					2	**2**
75-79			1			**1**
80-84					1	**1**
Total	**2**	**3**	**9**	**6**	**37**	**57**

IA 28 and Cherry Parkway

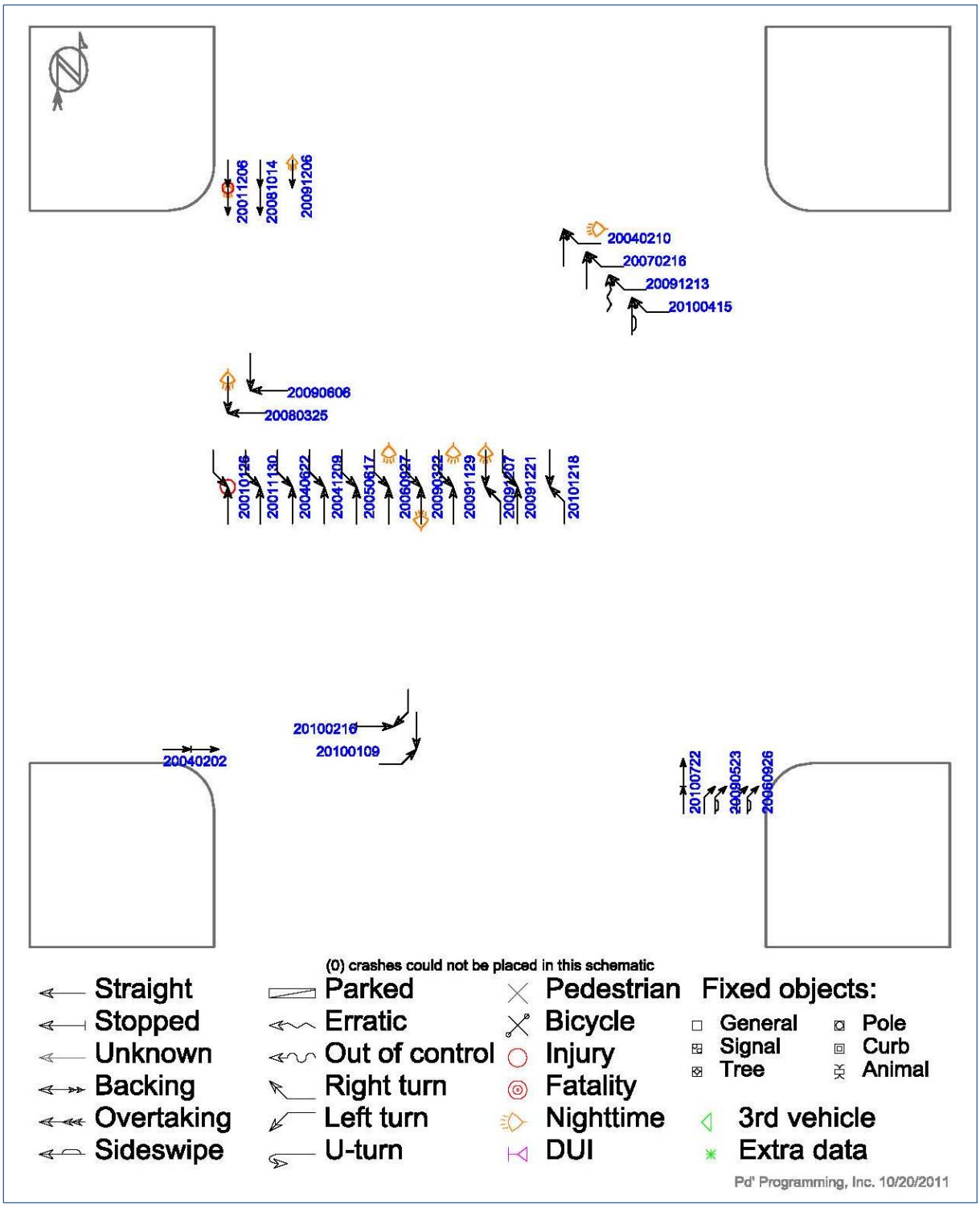


Figure A.4. 2001-2010 IA 28 and Cherry Parkway crash diagram

Table A.31. 2001-2010 IA 28 and Cherry Parkway crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions				1						1	**2**
FTYROW: Making left turn	1				1	1			3	1	**7**
FTYROW: Making right turn on red signal				1			1			1	**3**
FTYROW: Other	1										**1**
Inattentive/distracted by: Fatigued/asleep										1	**1**
Ran Traffic Signal								1	1	1	**3**
Swerving/Evasive Action								1	1		**2**
Other: Other improper action	1								3		**4**
Other: No improper action						1					**1**
Unknown				2							**2**
Total	**3**	**0**	**0**	**4**	**1**	**2**	**1**	**2**	**8**	**5**	**26**

Table A.32. 2001-2010 IA 28 and Cherry Parkway crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle-oncoming left turn	2			2	1	1			4	1	**11**
Broadside				1				1	2	2	**6**
Rear-end	1			1			1	1		1	**5**
Sideswipe-same direction						1			1	1	**3**
Non-collision									1		**1**
Total	**3**	**0**	**0**	**4**	**1**	**2**	**1**	**2**	**8**	**5**	**26**

Table A.33. 2001-2010 IA 28 and Cherry Parkway crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.	2								1		**3**
8:00 a.m. to 9:59 a.m.					1	1		1			**3**
10:00 a.m. to 11:59 a.m.									1		**1**
Noon to 1:59 p.m.									2	1	**3**
2:00 p.m. to 3:59 p.m.				1							**1**
4:00 p.m. to 5:59 p.m.	1			1			1			3	**6**
6:00 p.m. to 7:59 p.m.				2		1			2	1	**6**
8:00 p.m. to 9:59 p.m.								1	2		**3**
Total	**3**	**0**	**0**	**4**	**1**	**2**	**1**	**2**	**8**	**5**	**26**

Table A.34. 2001-2010 IA 28 and Cherry Parkway crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Sunday									4		4
Monday				1					2		3
Tuesday				2		1		2		1	6
Wednesday						1					1
Thursday	1			1						2	4
Friday	2				1		1				4
Saturday									2	2	4
Total	3	0	0	4	1	2	1	2	8	5	26

Table A.35. 2001-2010 IA 28 and Cherry Parkway crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January	1									1	2
February				2			1			1	4
March								1	1		2
April										1	1
May									1		1
June				1	1				1		3
July										1	1
September						2					2
October								1			1
November	1								1		2
December	1			1					4	1	7
Total	3	0	0	4	1	2	1	2	8	5	26

Table A.36. 2001-2010 IA 28 and Cherry Parkway crashes by hour of day and severity

Hour of Day	Crash Severity				
	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
6:00 a.m. to 7:59 a.m.	1			2	**3**
8:00 a.m. to 9:59 a.m.			1	2	**3**
10:00 a.m. to 11:59 a.m.				1	**1**
Noon to 1:59 p.m.				3	**3**
2:00 p.m. to 3:59 p.m.			1		**1**
4:00 p.m. to 5:59 p.m.		1		5	**6**
6:00 p.m. to 7:59 p.m.			1	5	**6**
8:00 p.m. to 9:59 p.m.			1	2	**3**
Total	**1**	**1**	**4**	**20**	**26**

Table A.37. 2001-2010 IA 28 and Cherry Parkway crashes by day of week and severity

Day of Week	Crash Severity				
	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Sunday				4	**4**
Monday			1	2	**3**
Tuesday			2	4	**6**
Wednesday			1		**1**
Thursday		1		3	**4**
Friday	1			3	**4**
Saturday				4	**4**
Total	**1**	**1**	**4**	**20**	**26**

Table A.38. 2001-2010 IA 28 and Cherry Parkway crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness	2			1		1		1	3	1	**9**
Dawn Twilight (Civil)									1		**1**
Daylight	1			3	1	1	1	1	4	4	**16**
Total	**3**	**0**	**0**	**4**	**1**	**2**	**1**	**2**	**8**	**5**	**26**

Table A.39. 2001-2010 IA 28 and Cherry Parkway crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Blowing sand/soil/dirt/snow									1		1
Clear	1			1	1	1		2	2	3	11
Cloudy									2		2
Fog/smoke	1										1
Mist				1							1
Partly cloudy				1		1			2	1	5
Rain										1	1
Sleet/hail/freezing rain									1		1
Snow	1			1			1				3
Total	3	0	0	4	1	2	1	2	8	5	26

Table A.40. 2001-2010 IA 28 and Cherry Parkway crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry	2			2	1	2		2	4	3	16
Ice									1		1
Slush							1				1
Snow	1			1					1	1	4
Wet				1					2	1	4
Total	3	0	0	4	1	2	1	2	8	5	26

Table A.41. 2001-2010 IA 28 and Cherry Parkway crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions				1						1	2
FTYROW: Making left turn	1				1	1			3	1	7
FTYROW: Making right turn on red signal				1			1			1	3
FTYROW: Other	1										1
Inattentive/distracted by: Fatigued/asleep	1									1	2
Lost Control									1		1
Ran traffic signal								1	1	1	3
Swerved to avoid: vehicle-object-non-motorist-or animal in roadway								1			1
Other: Other improper action	2								3	1	6
Other: No improper action	1			2	1	4		2	6	4	20
Unknown				4			1		1		6
Total	6	0	0	8	2	5	2	4	15	10	52

Table A.42. 2001-2010 IA 28 and Cherry Parkway crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal	6			8	2	5	2	4	15	8	**50**
Illness										1	**1**
Physical impairment										1	**1**
Total	**6**	**0**	**0**	**8**	**2**	**5**	**2**	**4**	**15**	**10**	**52**

Table A.43. 2001-2010 IA 28 and Cherry Parkway crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
14						2					**2**
16	1			2					1	1	**5**
17				1					4	1	**6**
18									1		**1**
19									2		**2**
21-24					1		1		1		**3**
25-29				1		1			1	1	**4**
30-34				1	1			2		1	**5**
35-39						1	1	2		1	**5**
40-44	3			1		1					**5**
45-49	1								1		**2**
50-54				1						1	**2**
55-59									2	2	**4**
60-64				1					1	1	**3**
65-69										1	**1**
70-74	1										**1**
75-79									1		**1**
Total	**6**	**0**	**0**	**8**	**2**	**5**	**2**	**4**	**15**	**10**	**52**

Table A.44. 2001-2010 IA 28 and Cherry Parkway crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
14				2		2
16				1	4	5
17					6	6
18					1	1
19					2	2
21-24					3	3
25-29					4	4
30-34				2	3	5
35-39				3	2	5
40-44		1	1		3	5
45-49		1			1	2
50-54					2	2
55-59					4	4
60-64				1	2	3
65-69					1	1
70-74			1			1
75-79					1	1
Total	0	2	2	9	39	52

IA 28 and Colonial Parkway

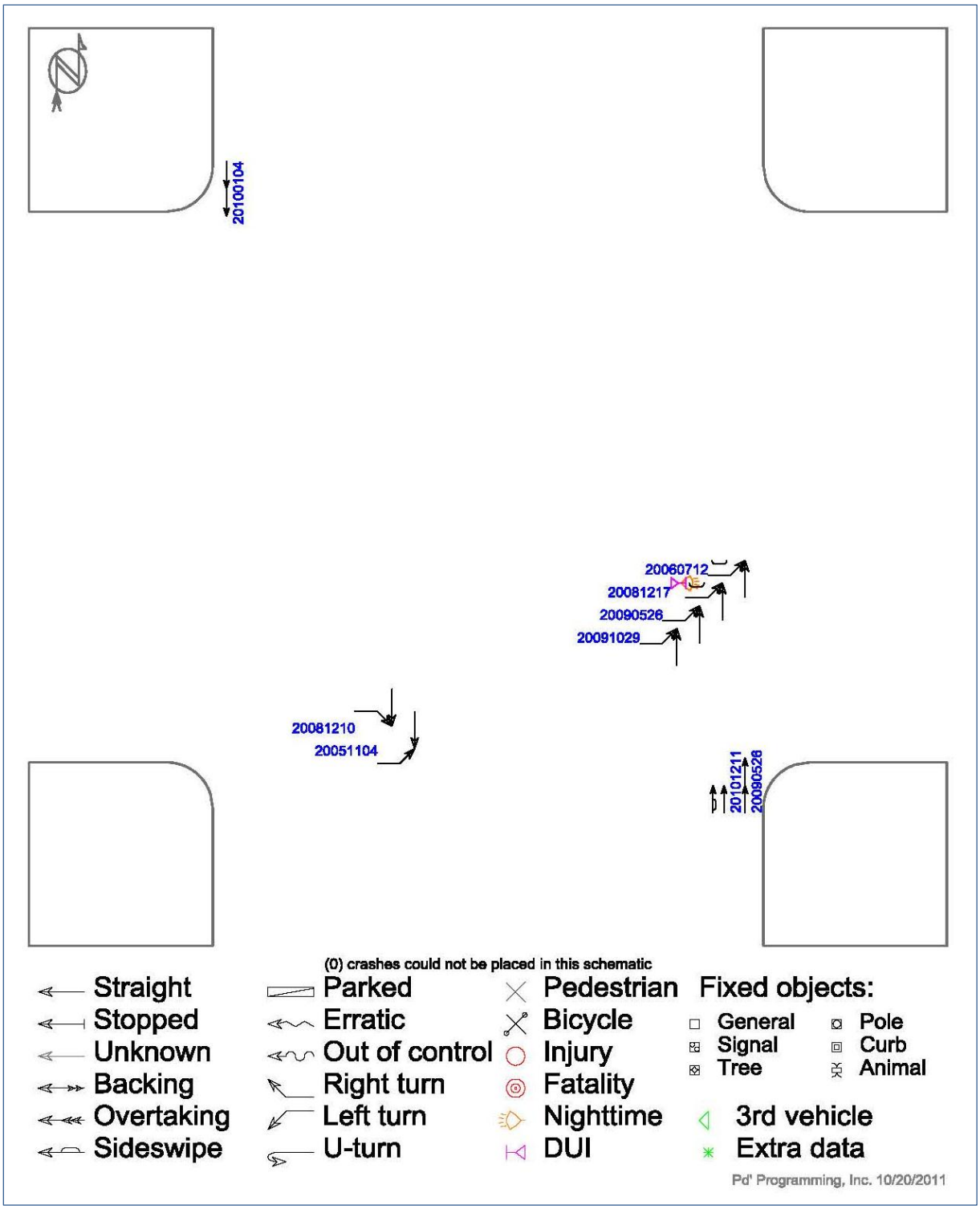


Figure A.5. 2001-2010 IA 28 and Colonial Parkway crash diagram

Table A.45. 2001-2010 IA 28 and Colonial Parkway crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions								1			1
Followed too close									1	1	2
FTYROW: From parked position									1		1
FTYROW: From Stop sign						1		1			2
FTYROW: Making left turn									1		1
FTYROW: Other					1					1	2
Total	0	0	0	0	1	1	0	2	3	2	9

Table A.46. 2001-2010 IA 28 and Colonial Parkway crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle-oncoming left turn									2		2
Broadside					1			1			2
Rear-end									1	1	2
Sideswipe-same direction						1		1		1	3
Total	0	0	0	0	1	1	0	2	3	2	9

Table A.47. 2001-2010 IA 28 and Colonial Parkway crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.					1			1			2
10:00 a.m. to 11:59 a.m.										1	1
2:00 p.m. to 3:59 p.m.									3	1	4
4:00 p.m. to 5:59 p.m.						1					1
6:00 p.m. to 7:59 p.m.								1			1
Total	0	0	0	0	1	1	0	2	3	2	9

Table A.48. 2001-2010 IA 28 and Colonial Parkway crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Monday										1	**1**
Tuesday									2		**2**
Wednesday						1		2			**3**
Thursday									1		**1**
Friday					1						**1**
Saturday										1	**1**
Total	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**2**	**3**	**2**	**9**

Table A.49. 2001-2010 IA 28 and Colonial Parkway crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January										1	**1**
May									2		**2**
July						1					**1**
October									1		**1**
November					1						**1**
December								2		1	**3**
Total	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**2**	**3**	**2**	**9**

Table A.50. 2001-2010 IA 28 and Colonial Parkway crashes by hour of day and severity

Hour of Day	Crash Severity		
	Possible/ Unknown	Property Damage Only	Total
6:00 a.m. to 7:59 a.m.		2	**2**
10:00 a.m. to 11:59 a.m.		1	**1**
2:00 p.m. to 3:59 p.m.	1	3	**4**
4:00 p.m. to 5:59 p.m.		1	**1**
6:00 p.m. to 7:59 p.m.		1	**1**
Total	**1**	**8**	**9**

Table A.51. 2001-2010 IA 28 and Colonial Parkway crashes by day of week and severity

Day of Week	Crash Severity		
	Possible/ Unknown	Property Damage Only	Total
Monday		1	1
Tuesday	1	1	2
Wednesday		3	3
Thursday		1	1
Friday		1	1
Saturday		1	1
Total	1	8	9

Table A.52. 2001-2010 IA 28 and Colonial Parkway crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness								1			1
Daylight					1	1		1	3	2	8
Total	0	0	0	0	1	1	0	2	3	2	9

Table A.53. 2001-2010 IA 28 and Colonial Parkway crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear					1	1		2		1	5
Rain									3		3
Snow										1	1
Total	0	0	0	0	1	1	0	2	3	2	9

Table A.54. 2001-2010 IA 28 and Colonial Parkway crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry					1	1		1		1	4
Ice								1		1	2
Wet									3		3
Total	0	0	0	0	1	1	0	2	3	2	9

Table A.55. 2001-2010 IA 28 and Colonial Parkway crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions								1		1	**2**
Followed too close									1	1	**2**
FTYROW: From parked position									1		**1**
FTYROW: From Stop sign						1		1			**2**
FTYROW: Making left turn									1		**1**
FTYROW: Other					1						**1**
Other: No improper action					1			2	4	3	**10**
Unknown						1					**1**
Total	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**4**	**7**	**5**	**20**

Table A.56. 2001-2010 IA 28 and Colonial Parkway crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal					2	1		3	7	5	**18**
Under the influence of alcohol/drugs/medications								1			**1**
Other						1					**1**
Total	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**4**	**7**	**5**	**20**

Table A.57. 2001-2010 IA 28 and Colonial Parkway crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
16								1	1		**2**
17									2	1	**3**
18								1			**1**
20										1	**1**
21-24						1			1	1	**3**
25-29					2				1		**3**
35-39										1	**1**
40-44								1			**1**
50-54									1		**1**
60-64								1	1	1	**3**
70-74						1					**1**
Total	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**4**	**7**	**5**	**20**

Table A.58. 2001-2010 IA 28 and Colonial Parkway crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
16					2	**2**
17				1	2	**3**
18					1	**1**
20					1	**1**
21-24					3	**3**
25-29					3	**3**
35-39					1	**1**
40-44					1	**1**
50-54				1		**1**
60-64				1	2	**3**
70-74					1	**1**
Total	**0**	**0**	**0**	**3**	**17**	**20**

IA 28 and Columbine Drive

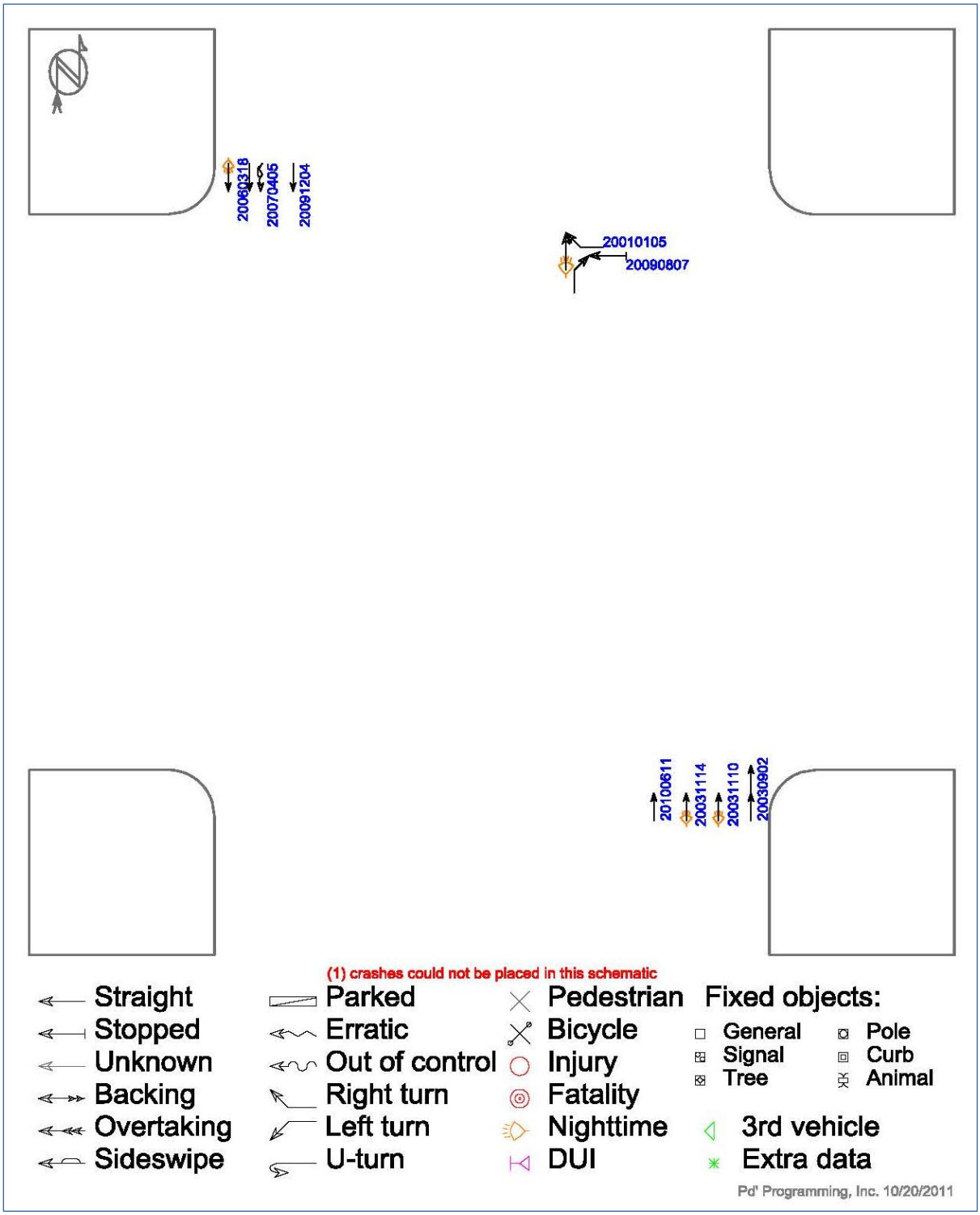


Figure A.6. 2001-2010 IA 28 and Columbine Drive crash diagram

Table A.59. 2001-2010 IA 28 and Columbine Drive crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Animal			2			1			1		4
Lost Control										1	1
Made improper turn									1		1
Ran Stop Sign	1										1
Other: Other improper action	1		1				1				3
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.60. 2001-2010 IA 28 and Columbine Drive crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Broadside	1								1		2
Rear-end			1								1
Sideswipe-same direction							1				1
Non-collision	1		2			1			1	1	6
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.61. 2001-2010 IA 28 and Columbine Drive crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.	1		2						2		5
4:00 p.m. to 5:59 p.m.			1								1
6:00 p.m. to 7:59 p.m.	1						1			1	3
8:00 p.m. to 9:59 p.m.						1					1
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.62. 2001-2010 IA 28 and Columbine Drive crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Monday			1								1
Tuesday	1		1								2
Thursday							1				1
Friday	1		1						2	1	5
Saturday						1					1
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.63. 2001-2010 IA 28 and Columbine Drive crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January	1										1
February	1										1
March						1					1
April							1				1
June										1	1
August									1		1
September			1								1
November			2								2
December									1		1
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.64. 2001-2010 IA 28 and Columbine Drive crashes by hour of day and severity

Hour of Day	Crash Severity		
	Possible/ Unknown	Property Damage Only	Total
6:00 a.m. to 7:59 a.m.	1	4	5
4:00 p.m. to 5:59 p.m.		1	1
6:00 p.m. to 7:59 p.m.		3	3
8:00 p.m. to 9:59 p.m.		1	1
Total	1	9	10

Table A.65. 2001-2010 IA 28 and Columbine Drive crashes by day of week and severity

Day of Week	Crash Severity		
	Possible/ Unknown	Possible/ Unknown	Possible/ Unknown
Monday		1	1
Tuesday	1	1	2
Thursday		1	1
Friday		5	5
Saturday		1	1
Total	1	9	10

Table A.66. 2001-2010 IA 28 and Columbine Drive crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness	1		1			1					3
Dawn Twilight (Civil)			1						1		2
Daylight	1		1				1		1	1	5
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.67. 2001-2010 IA 28 and Columbine Drive crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear	1					1	1				3
Cloudy									1	1	2
Mist	1										1
Partly cloudy			1								1
Rain			1						1		2
Not Reported			1								1
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.68. 2001-2010 IA 28 and Columbine Drive crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry	1		1			1	1		1	1	6
Ice	1										1
Wet			1						1		2
Not Reported			1								1
Total	2	0	3	0	0	1	1	0	2	1	10

Table A.69. 2001-2010 IA 28 and Columbine Drive crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Lost Control										1	1
Made improper turn									1		1
Ran Stop sign	1										1
Swerved to avoid: vehicle-object-non-motorist-or animal in roadway			1								1
Other: Other improper action	1		2				1				4
Other: No improper action			3			1	1		2		7
Unknown	1										1
Total	3	0	6	0	0	1	2	0	3	1	16

Table A.70. 2001-2010 IA 28 and Columbine Drive crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal	2		6			1	2		3	1	**15**
Not Reported	1										**1**
Total	**3**	**0**	**6**	**0**	**0**	**1**	**2**	**0**	**3**	**1**	**16**

Table A.71. 2001-2010 IA 28 and Columbine Drive crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
15							1		1		**2**
16	1										**1**
17	1									1	**2**
30-34	1		1								**2**
35-39			1								**1**
40-44			2			1	1				**4**
45-49			2								**2**
60-64									1		**1**
70-74									1		**1**
Total	**3**	**0**	**6**	**0**	**0**	**1**	**2**	**0**	**3**	**1**	**16**

Table A.72. 2001-2010 IA 28 and Columbine Drive crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
15					2	**2**
16					1	**1**
17					2	**2**
30-34				1	1	**2**
35-39				1		**1**
40-44				2	2	**4**
45-49					2	**2**
60-64					1	**1**
70-74					1	**1**
Total	**0**	**0**	**0**	**4**	**12**	**16**

IA 28 and Coolidge Street

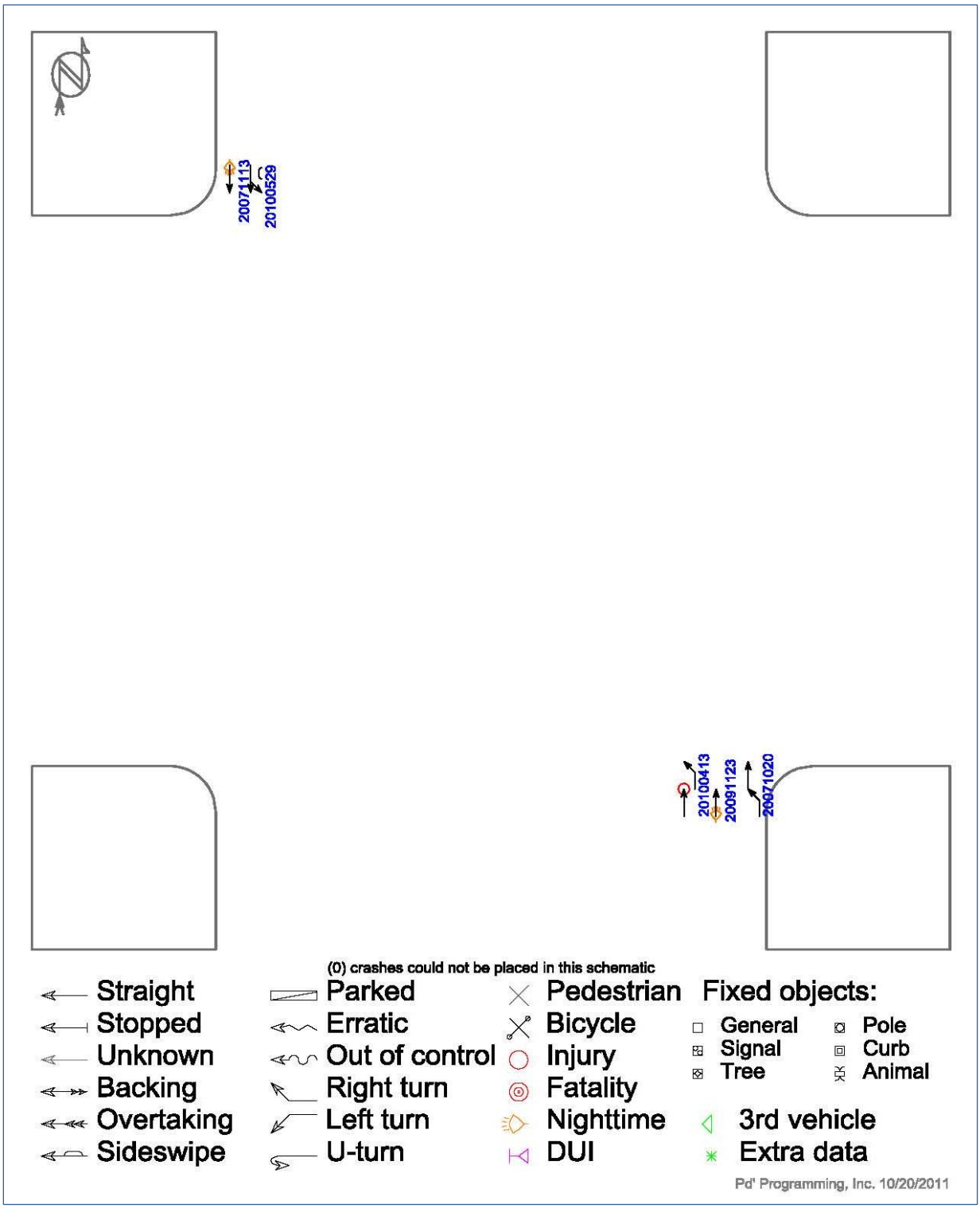


Figure A.7. 2001-2010 IA 28 and Coolidge Street crash diagram

Table A.73. 2001-2010 IA 28 and Coolidge Street crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Animal							1		1		2
Other: Other improper action							1			2	3
Total	0	0	0	0	0	0	2	0	1	2	5

Table A.74. 2001-2010 IA 28 and Coolidge Street crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Rear-end							1			1	2
Sideswipe-same direction										1	1
Non-collision							1		1		2
Total	0	0	0	0	0	0	2	0	1	2	5

Table A.75. 2001-2010 IA 28 and Coolidge Street crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.									1		1
4:00 p.m. to 5:59 p.m.							1			2	3
6:00 p.m. to 7:59 p.m.							1				1
Total	0	0	0	0	0	0	2	0	1	2	5

Table A.76. 2001-2010 IA 28 and Coolidge Street crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Monday									1		1
Tuesday							1			1	2
Saturday							1			1	2
Total	0	0	0	0	0	0	2	0	1	2	5

Table A.77. 2001-2010 IA 28 and Coolidge Street crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
April										1	**1**
May										1	**1**
October							1				**1**
November							1		1		**2**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**2**	**5**

Table A.78. 2001-2010 IA 28 and Coolidge Street crashes by hour of day and severity

Hour of Day	Crash Severity		
	Minor Injury	Property Damage Only	Total
6:00 a.m. to 7:59 a.m.		1	**1**
4:00 p.m. to 5:59 p.m.	1	2	**3**
6:00 p.m. to 7:59 p.m.		1	**1**
Total	**1**	**4**	**5**

Table A.79. 2001-2010 IA 28 and Coolidge Street crashes by day of week and severity

Day of Week	Crash Severity		
	Minor Injury	Minor Injury	Minor Injury
Monday		1	**1**
Tuesday	1	1	**2**
Saturday		2	**2**
Total	**1**	**4**	**5**

Table A.80. 2001-2010 IA 28 and Coolidge Street crashes by light conditions

Light Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness							1		1		**2**
Daylight							1			2	**3**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**2**	**5**

Table A.81. 2001-2010 IA 28 and Coolidge Street crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear							2		1	2	**5**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**2**	**5**

Table A.82. 2001-2010 IA 28 and Coolidge Street crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry							2		1	2	**5**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**2**	**5**

Table A.83. 2001-2010 IA 28 and Coolidge Street crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Inattentive/distracted by: Passenger							1				**1**
Other: Other improper action							1			2	**3**
Other: No improper action							2		1	2	**5**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**4**	**9**

Table A.84. 2001-2010 IA 28 and Coolidge Street crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal							4		1	4	**9**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**4**	**9**

Table A.85. 2001-2010 IA 28 and Coolidge Street crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
17										1	**1**
18							1				**1**
20										1	**1**
30-34							1				**1**
35-39							1			2	**3**
40-44							1		1		**2**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**4**	**9**

Table A.86. 2001-2010 IA 28 and Coolidge Street crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
17			1			1
18					1	1
20					1	1
30-34					1	1
35-39			1		2	3
40-44					2	2
Total	0	0	2	0	7	9

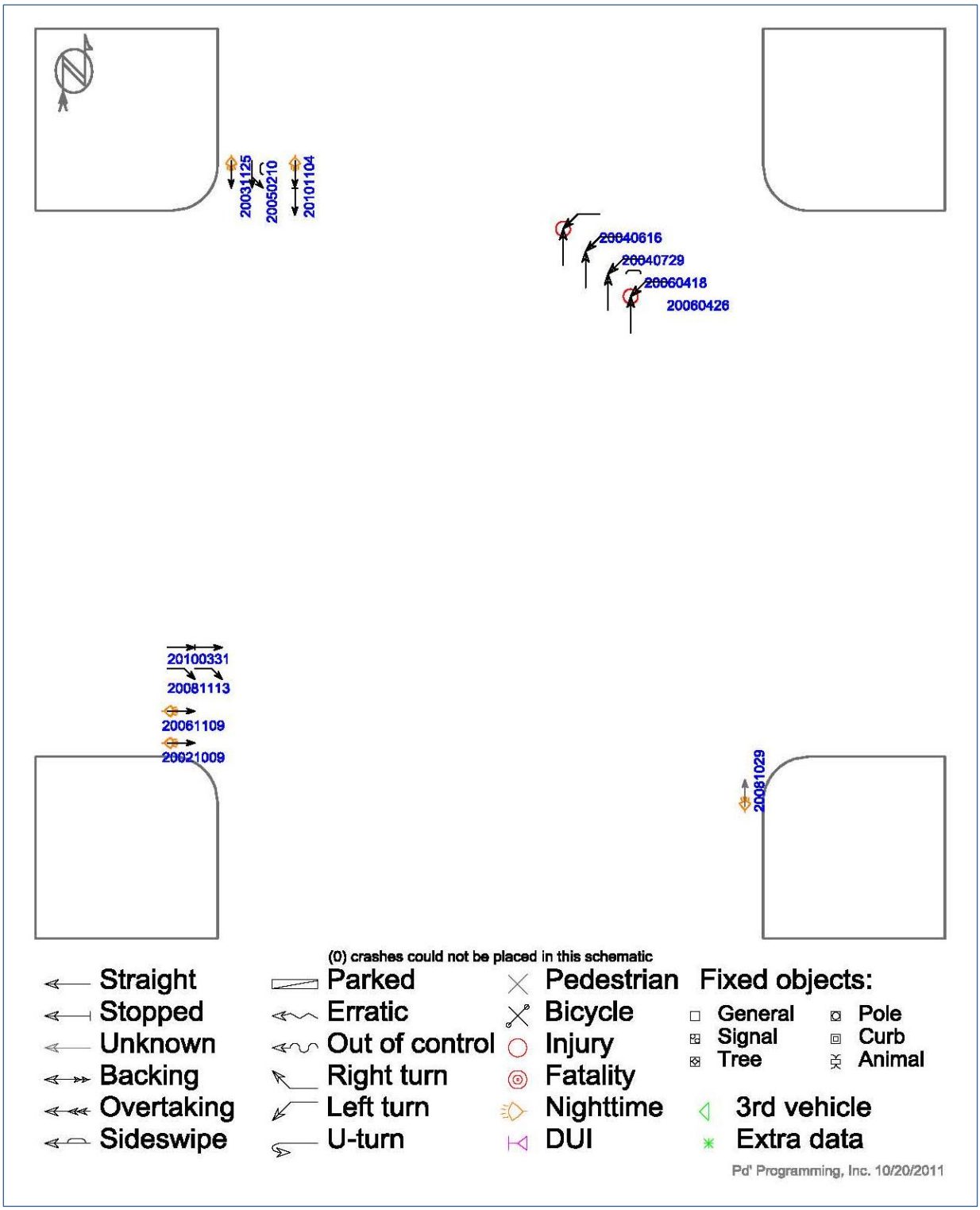


Figure A.8. 2001-2010 IA 28 and Echo Valley Drive crash diagram

Table A.87. 2001-2010 IA 28 and Echo Valley Drive crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Animal		1	1			1					3
Followed too close										1	1
FTYROW: From stop sign				1		2					3
Ran off road - right								1			1
Swerving/Evasive Action				1							1
Other: Other improper action								1		1	2
Other: No improper action					1						1
Total	0	1	1	2	1	3	0	2	0	2	12

Table A.88. 2001-2010 IA 28 and Echo Valley Drive crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle - oncoming left turn				1							1
Broadside				1		1					2
Rear-end								1		2	3
Sideswipe - same direction					1	1					2
Non-collision		1	1			1		1			4
Total	0	1	1	2	1	3	0	2	0	2	12

Table A.89. 2001-2010 IA 28 and Echo Valley Drive crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.										1	1
8:00 a.m. to 9:59 a.m.				1							1
2:00 p.m. to 3:59 p.m.					1						1
4:00 p.m. to 5:59 p.m.			1			2		1		1	5
6:00 p.m. to 7:59 p.m.				1				1			2
8:00 p.m. to 9:59 p.m.		1				1					2
Total	0	1	1	2	1	3	0	2	0	2	12

Table A.90. 2001-2010 IA 28 and Echo Valley Drive crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Tuesday			1			1					2
Wednesday		1		1		1		1		1	5
Thursday				1	1	1		1		1	5
Total	0	1	1	2	1	3	0	2	0	2	12

Table A.91. 2001-2010 IA 28 and Echo Valley Drive crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
February					1						1
March										1	1
April						2					2
June				1							1
July				1							1
October		1						1			2
November			1			1		1		1	4
Total	0	1	1	2	1	3	0	2	0	2	12

Table A.92. 2001-2010 IA 28 and Echo Valley Drive crashes by hour of day and severity

Hour of Day	Crash Severity			
	Minor Injury	Possible/ Unknown	Property Damage Only	Total
6:00 a.m. to 7:59 a.m.			1	1
8:00 a.m. to 9:59 a.m.			1	1
2:00 p.m. to 3:59 p.m.			1	1
4:00 p.m. to 5:59 p.m.	1		4	5
6:00 p.m. to 7:59 p.m.	1	1		2
8:00 p.m. to 9:59 p.m.			2	2
Total	2	1	9	12

Table A.93. 2001-2010 IA 28 and Echo Valley Drive crashes by day of week and severity

Day of Week	Crash Severity			
	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Tuesday			2	**2**
Wednesday	2	1	2	**5**
Thursday			5	**5**
Total	**2**	**1**	**9**	**12**

Table A.94. 2001-2010 IA 28 and Echo Valley Drive crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness		1	1			1				1	**4**
Daylight				2	1	2		1		1	**7**
Dusk Twilight (Civil)								1			**1**
Total	**0**	**1**	**1**	**2**	**1**	**3**	**0**	**2**	**0**	**2**	**12**

Table A.95. 2001-2010 IA 28 and Echo Valley Drive crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear			1		1	2		1		2	**7**
Partly cloudy		1		2		1					**4**
Rain								1			**1**
Total	**0**	**1**	**1**	**2**	**1**	**3**	**0**	**2**	**0**	**2**	**12**

Table A.96. 2001-2010 IA 28 and Echo Valley Drive crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry		1	1	1	1	3		1		2	**10**
Wet				1				1			**2**
Total	**0**	**1**	**1**	**2**	**1**	**3**	**0**	**2**	**0**	**2**	**12**

Table A.97. 2001-2010 IA 28 and Echo Valley Drive crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Followed too close										1	1
FTYROW: From parked position		1									1
FTYROW: From stop sign				1		1					2
Made improper turn						1					1
Other: Other improper action						1		1		1	3
Other: No improper action			1	1	1	3				2	8
Unknown								2			2
Not Reported				2	1						3
Total	0	1	1	4	2	6	0	3	0	4	21

Table A.98. 2001-2010 IA 28 and Echo Valley Drive crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal		1	1	4	2	6		3		4	21
Total	0	1	1	4	2	6	0	3	0	4	21

Table A.99. 2001-2010 IA 28 and Echo Valley Drive crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
15						1					1
18						1					1
21 - 24				1				1			2
25 - 29								1			1
30 - 34				1	1						2
35 - 39						1		1			2
40 - 44				1						1	2
45 - 49										1	1
50 - 54		1				1				1	3
55 - 59			1							1	2
60 - 64						1					1
70 - 74					1						1
80 - 84				1							1
Unknown						1					1
Total	0	1	1	4	2	6	0	3	0	4	21

Table A.100. 2001-2010 IA 28 and Echo Valley Drive crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
15			1			**1**
18			1			**1**
21 - 24					2	**2**
25 - 29				1		**1**
30 - 34			1		1	**2**
35 - 39					2	**2**
40 - 44			1		1	**2**
45 - 49					1	**1**
50 - 54			1		2	**3**
55 - 59					2	**2**
60 - 64					1	**1**
70 - 74					1	**1**
80 - 84					1	**1**
Unknown					1	**1**
Total	**0**	**0**	**5**	**1**	**15**	**21**

IA 28 and Lakewood Drive

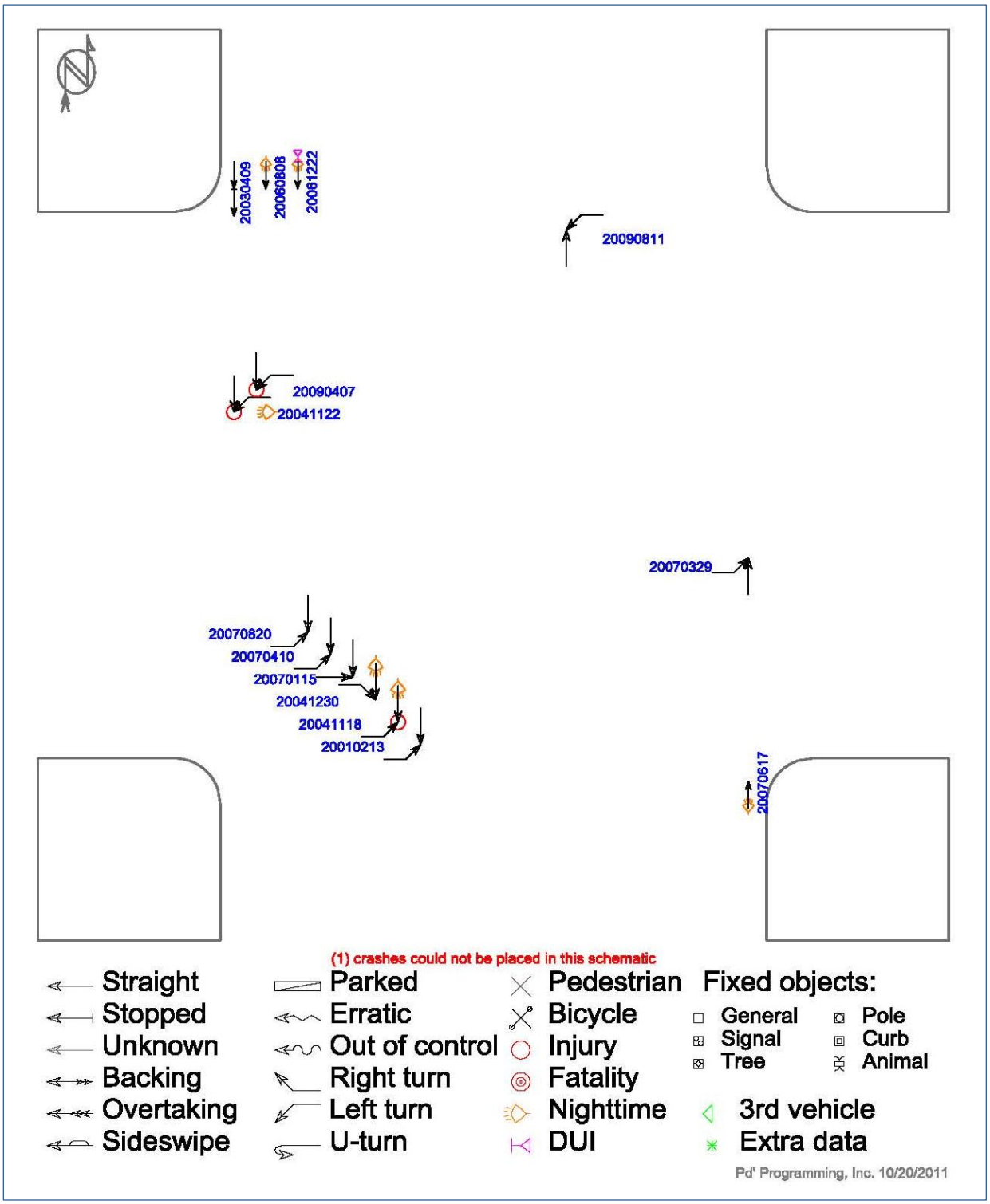


Figure A.9. 2001-2010 IA 28 and Lakewood Drive crash diagram

Table A.101. 2001-2010 IA 28 and Lakewood Drive crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
FTYROW: From stop sign	1			2			2				5
FTYROW: Making left turn									1		1
Lost Control						1					1
Ran Stop Sign				1			1		1		3
Swerving/Evasive Action			1				2				3
Other: Other improper action						1					1
Other: No improper action	1										1
Total	2	0	1	3	0	2	5	0	2	0	15

Table A.102. 2001-2010 IA 28 and Lakewood Drive crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle - oncoming left turn				1			2				3
Broadside	2			2			2		2		8
Non-collision						2	1				3
Not Reported			1								1
Total	2	0	1	3	0	2	5	0	2	0	15

Table A.103. 2001-2010 IA 28 and Lakewood Drive crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Midnight to 1:59 a.m.							1				1
2:00 a.m. to 3:59 a.m.						2					2
6:00 a.m. to 7:59 a.m.			1	1			1		1		4
8:00 a.m. to 9:59 a.m.	1								1		2
2:00 p.m. to 3:59 p.m.	1						2				3
4:00 p.m. to 5:59 p.m.				2			1				3
Total	2	0	1	3	0	2	5	0	2	0	15

Table A.104. 2001-2010 IA 28 and Lakewood Drive crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Sunday	1						1				2
Monday				1			2				3
Tuesday	1					1	1		2		5
Wednesday			1								1
Thursday				2			1				3
Friday						1					1
Total	2	0	1	3	0	2	5	0	2	0	15

Table A.105. 2001-2010 IA 28 and Lakewood Drive crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January							1				1
February	1										1
March							1				1
April			1				1		1		3
June							1				1
August						1	1		1		3
November				2							2
December	1			1		1					3
Total	2		1	3		2	5		2		15

Table A.106. 2001-2010 IA 28 and Lakewood Drive crashes by hour of day and severity

Hour of Day	Crash Severity				
	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Midnight to 1:59 a.m.			1		1
2:00 a.m. to 3:59 a.m.				2	2
6:00 a.m. to 7:59 a.m.				4	4
8:00 a.m. to 9:59 a.m.	1	1			2
2:00 p.m. to 3:59 p.m.			3		3
4:00 p.m. to 5:59 p.m.	1	1		1	3
Total	2	2	4	7	15

Table A.107. 2001-2010 IA 28 and Lakewood Drive crashes by day of week and severity

Day of Week	Crash Severity				
	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Sunday		1	1		2
Monday	1		1	1	3
Tuesday	1		1	3	5
Wednesday				1	1
Thursday		1	1	1	3
Friday				1	1
Total	2	2	4	7	15

Table A.108. 2001-2010 IA 28 and Lakewood Drive crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness				3		2	1				6
Daylight	2		1				4		2		9
Total	2	0	1	3	0	2	5	0	2	0	15

Table A.109. 2001-2010 IA 28 and Lakewood Drive crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear			1				2		1		4
Cloudy	1						1				2
Mist	1										1
Partly cloudy				2			1		1		4
Rain						1					1
Snow				1			1				2
Unknown						1					1
Total	2	0	1	3	0	2	5	0	2	0	15

Table A.110. 2001-2010 IA 28 and Lakewood Drive crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry			1	2		1	4		2		10
Slush							1				1
Wet	2			1		1					4
Total	2		1	3		2	5		2		15

Table A.111. 2001-2010 IA 28 and Lakewood Drive crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
FTYROW: From stop sign	1			2			2				5
FTYROW: Making left turn									1		1
Lost Control						1	1				2
Ran stop sign				1			1		1		3
Swerved to avoid: vehicle-object-non-motorist-or animal in roadway			1								1
Other: Other improper action						1					1
Other: No improper action	2			2			4		2		10
Not Reported	1		1	1			1				4
Total	4	0	2	6	0	2	9	0	4	0	27

Table A.112. 2001-2010 IA 28 and Lakewood Drive crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal	3		1	6			9		4		23
Under the influence of alcohol/drugs/medications						1					1
Other						1					1
Not Reported	1		1								2
Total	4	0	2	6	0	2	9	0	4	0	27

Table A.113. 2001-2010 IA 28 and Lakewood Drive crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
15							1				1
16	1										1
17				1							1
18			1								1
19						1	1				2
20							1				1
21 - 24	1			1		1					3
25 - 29				1					2		3
30 - 34	1			1			2		2		6
40 - 44				1			1				2
45 - 49							1				1
55 - 59			1	1			2				4
80 - 84	1										1
Total	4	0	2	6	0	2	9	0	4	0	27

Table A.114. 2001-2010 IA 28 and Lakewood Drive crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
15				1		1
16				1		1
17		1				1
18					1	1
19					2	2
20				1		1
21 - 24		1	1		1	3
25 - 29		1			2	3
30 - 34		1		2	3	6
40 - 44			1	1		2
45 - 49					1	1
55 - 59			1	1	2	4
80 - 84			1			1
Total	0	4	4	7	12	27

IA 28 and North Avenue

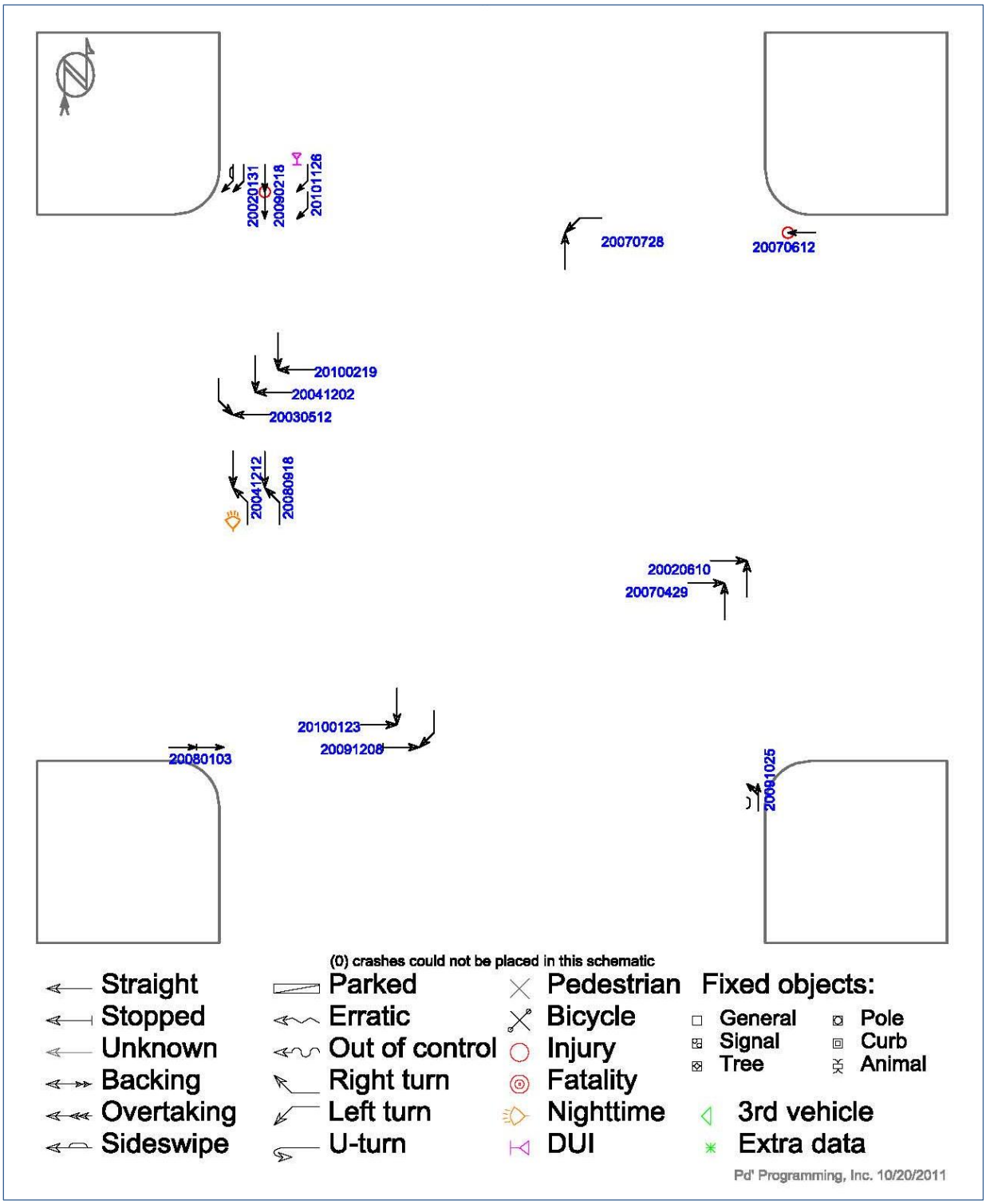


Figure A.10. 2001-2010 IA 28 and North Avenue crash diagram

Table A.115. 2001-2010 IA 28 and North Avenue crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions		1								1	2
Followed too close									1	1	2
FTYROW: Making left turn			1	1				1			3
Lost Control									1		1
Made improper turn									1		1
Ran Traffic Signal		1					2			1	4
Other: No improper action							1	1			2
Unknown				1							1
Total	0	2	1	2	0	0	3	2	3	3	16

Table A.116. 2001-2010 IA 28 and North Avenue crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle - oncoming left turn				1			1	1			3
Broadside			1	1			1		1	2	6
Rear-end		1						1	1	1	4
Sideswipe - same direction		1							1		2
Non-collision							1				1
Total	0	2	1	2	0	0	3	2	3	3	16

Table A.117. 2001-2010 IA 28 and North Avenue crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
10:00 a.m. to 11:59 a.m.		1								2	3
Noon to 1:59 p.m.			1				1	2		1	5
2:00 p.m. to 3:59 p.m.							2		3		5
4:00 p.m. to 5:59 p.m.		1		2							3
Total	0	2	1	2	0	0	3	2	3	3	16

Table A.118. 2001-2010 IA 28 and North Avenue crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Sunday				1			1		1		3
Monday		1	1								2
Tuesday							1		1		2
Wednesday									1		1
Thursday		1		1				2			4
Friday										2	2
Saturday							1			1	2
Total	0	2	1	2	0	0	3	2	3	3	16

Table A.119. 2001-2010 IA 28 and North Avenue crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January		1						1		1	3
February									1	1	2
April							1				1
May			1								1
June		1					1				2
July							1				1
September								1			1
October									1		1
November										1	1
December				2					1		3
Total	0	2	1	2	0	0	3	2	3	3	16

Table A.120. 2001-2010 IA 28 and North Avenue crashes by hour of day and severity

Hour of Day	Crash Severity		
	Minor Injury	Property Damage Only	Total
10:00 a.m. to 11:59 a.m.		3	3
Noon to 1:59 p.m.	1	4	5
2:00 p.m. to 3:59 p.m.	1	4	5
4:00 p.m. to 5:59 p.m.		3	3
Total	2	14	16

Table A.121. 2001-2010 IA 28 and North Avenue crashes by day of week and severity

Day of Week	Crash Severity		
	Minor Injury	Property Damage Only	Total
Sunday		3	**3**
Monday		2	**2**
Tuesday	1	1	**2**
Wednesday	1		**1**
Thursday		4	**4**
Friday		2	**2**
Saturday		2	**2**
Total	**2**	**14**	**16**

Table A.122. 2001-2010 IA 28 and North Avenue crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness				1							**1**
Daylight		2	1				3	2	3	3	**14**
Dusk Twilight (Civil)				1							**1**
Total	**0**	**2**	**1**	**2**	**0**	**0**	**3**	**2**	**3**	**3**	**16**

Table A.123. 2001-2010 IA 28 and North Avenue crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear		1		1			3	2	1	1	**9**
Partly cloudy			1	1					1		**3**
Rain										1	**1**
Snow		1							1	1	**3**
Total	**0**	**2**	**1**	**2**	**0**	**0**	**3**	**2**	**3**	**3**	**16**

Table A.124. 2001-2010 IA 28 and North Avenue crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry		1	1	2			3	2	2	1	**12**
Ice		1									**1**
Snow									1	1	**2**
Wet										1	**1**
Total	**0**	**2**	**1**	**2**	**0**	**0**	**3**	**2**	**3**	**3**	**16**

Table A.125. 2001-2010 IA 28 and North Avenue crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Driving too fast for conditions		2								1	**3**
Followed too close									1	1	**2**
FTYROW: Making left turn			1	1				1			**3**
FTYROW: Other							1				**1**
Lost Control									1		**1**
Made improper turn									1		**1**
Ran traffic signal		1					2			1	**4**
Other: No improper action		1	1	1			2	3	2	3	**13**
Unknown				2					1		**3**
Total	**0**	**4**	**2**	**4**	**0**	**0**	**5**	**4**	**6**	**6**	**31**

Table A.126. 2001-2010 IA 28 and North Avenue crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal		4	2	4			5	4	6	5	**30**
Under the influence of alcohol/drugs/medications										1	**1**
Total	**0**	**4**	**2**	**4**	**0**	**0**	**5**	**4**	**6**	**6**	**31**

Table A.127. 2001-2010 IA 28 and North Avenue crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
16				1						1	**2**
17		1						1			**2**
18		1									**1**
25 - 29									2	2	**4**
30 - 34		1					2		1		**4**
40 - 44			1	1						1	**3**
45 - 49				1			1			1	**3**
50 - 54				1							**1**
55 - 59			1				1				**2**
60 - 64		1					1		1		**3**
65 - 69								2			**2**
70 - 74									1		**1**
75 - 79									1		**1**
80 - 84										1	**1**
85 - 89								1			**1**
Total	**0**	**4**	**2**	**4**	**0**	**0**	**5**	**4**	**6**	**6**	**31**

Table A.128. 2001-2010 IA 28 and North Avenue crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
16					2	**2**
17					2	**2**
18					1	**1**
25 - 29			1		3	**4**
30 - 34					4	**4**
40 - 44					3	**3**
45 - 49					3	**3**
50 - 54					1	**1**
55 - 59			1		1	**2**
60 - 64					3	**3**
65 - 69					2	**2**
70 - 74			1			**1**
75 - 79					1	**1**
80 - 84					1	**1**
85 - 89					1	**1**
Total	**0**	**0**	**3**	**0**	**28**	**31**

IA 28 and Wakonda Drive

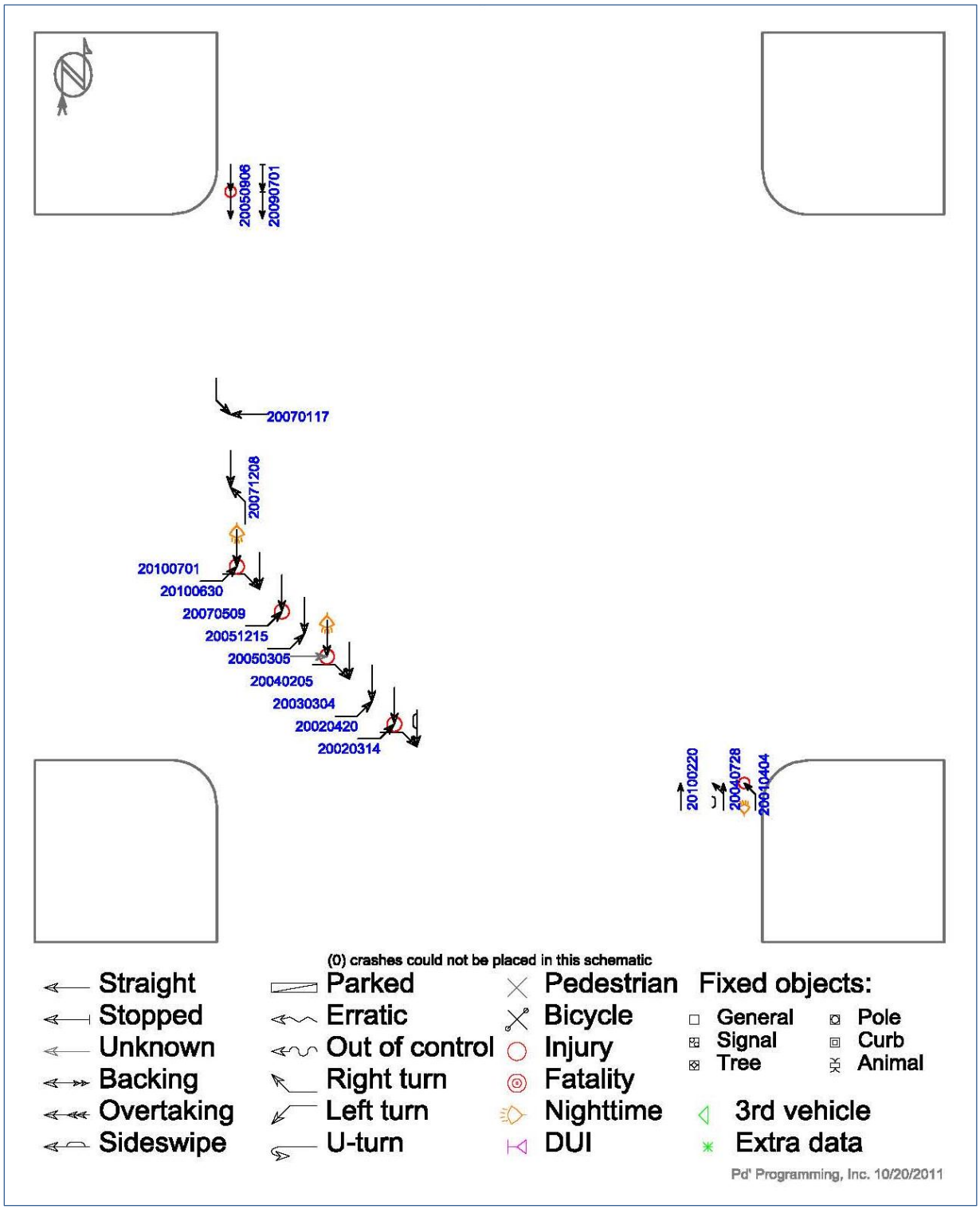


Figure A.11. 2001-2010 IA 28 and Wakonda Drive crash diagram

Table A.129. 2001-2010 IA 28 and Wakonda Drive crashes by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
FTYROW: From stop sign		2	1	1	2		2			2	**10**
FTYROW: Making left turn							1				**1**
Inattentive/distracted by: Fallen object					1				1		**2**
Ran off road - right	1									1	**2**
Other: Other improper action				1							**1**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.130. 2001-2010 IA 28 and Wakonda Drive crashes by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle - oncoming left turn					1		1			1	**3**
Broadside		1	1	1	1		2			1	**7**
Rear-end					1				1		**2**
Sideswipe - same direction		1		1							**2**
Non-collision	1									1	**2**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.131. 2001-2010 IA 28 and Wakonda Drive crashes by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
6:00 a.m. to 7:59 a.m.		1					1			1	**3**
8:00 a.m. to 9:59 a.m.										1	**1**
10:00 a.m. to 11:59 a.m.					1		1				**2**
2:00 p.m. to 3:59 p.m.			1		1		1				**3**
4:00 p.m. to 5:59 p.m.		1		2							**3**
6:00 p.m. to 7:59 p.m.									1		**1**
8:00 p.m. to 9:59 p.m.	1				1					1	**3**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.132. 2001-2010 IA 28 and Wakonda Drive crashes by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Tuesday			1		1						**2**
Wednesday	1			1			2		1	1	**6**
Thursday		1		1	1					1	**4**
Saturday		1			1		1			1	**4**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.133. 2001-2010 IA 28 and Wakonda Drive crashes by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January							1				**1**
February				1						1	**2**
March		1	1		1						**3**
April	1	1									**2**
May							1				**1**
June										1	**1**
July				1					1	1	**3**
September					1						**1**
December					1		1				**2**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.134. 2001-2010 IA 28 and Wakonda Drive crashes by hour of day and severity

Hour of Day	Crash Severity				
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only
6:00 a.m. to 7:59 a.m.		1	1	1	**3**
8:00 a.m. to 9:59 a.m.			1		**1**
10:00 a.m. to 11:59 a.m.	1			1	**2**
2:00 p.m. to 3:59 p.m.				3	**3**
4:00 p.m. to 5:59 p.m.		1	1	1	**3**
6:00 p.m. to 7:59 p.m.				1	**1**
8:00 p.m. to 9:59 p.m.		3			**3**
Total	**1**	**5**	**3**	**7**	**16**

Table A.135. 2001-2010 IA 28 and Wakonda Drive crashes by day of week and severity

Day of Week	Crash Severity				
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only
Tuesday	1			1	**2**
Wednesday		2	2	2	**6**
Thursday		1		3	**4**
Saturday		2	1	1	**4**
Total	**1**	**5**	**3**	**7**	**16**

Table A.136. 2001-2010 IA 28 and Wakonda Drive crashes by light conditions

Light Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness	1				1						**2**
Daylight		2	1	2	2		3		1	2	**13**
Dusk Twilight (Civil)										1	**1**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.137. 2001-2010 IA 28 and Wakonda Drive crashes by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear	1			1	2		2		1	2	**9**
Partly cloudy		2								1	**3**
Snow			1	1			1				**3**
Not Reported					1						**1**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.138. 2001-2010 IA 28 and Wakonda Drive crashes by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry	1	1		1	3		2		1	2	**11**
Ice							1				**1**
Snow			1	1							**2**
Wet		1								1	**2**
Total	**1**	**2**	**1**	**2**	**3**	**0**	**3**	**0**	**1**	**3**	**16**

Table A.139. 2001-2010 IA 28 and Wakonda Drive crashes by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
FTYROW: From stop sign		2	1	1	2		2			2	**10**
FTYROW: Making left turn							1				**1**
Inattentive/distracted by: Fallen object					1				1		**2**
Other: Other improper action				1						1	**2**
Other: No improper action		2		2	3		3		1	2	**13**
Unknown	1		1								**2**
Total	**1**	**4**	**2**	**4**	**6**	**0**	**6**	**0**	**2**	**5**	**30**

Table A.140. 2001-2010 IA 28 and Wakonda Drive crashes by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal	1	4	2	3	4		6		2	4	**26**
Physical impairment				1						1	**2**
Other					1						**1**
Unknown					1						**1**
Total	**1**	**4**	**2**	**4**	**6**	**0**	**6**	**0**	**2**	**5**	**30**

Table A.141. 2001-2010 IA 28 and Wakonda Drive crashes by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
15							1				**1**
16	1	3					1				**5**
17				1							**1**
18					1						**1**
21 - 24							1		1	1	**3**
25 - 29					1				1		**2**
30 - 34				1	1		2			1	**5**
35 - 39			2	1			1			1	**5**
45 - 49					1						**1**
50 - 54		1		1						2	**4**
60 - 64					1						**1**
Unknown					1						**1**
Total	**1**	**4**	**2**	**4**	**6**	**0**	**6**	**0**	**2**	**5**	**30**

Table A.142. 2001-2010 IA 28 and Wakonda Drive crashes by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
15					1	1
16			2		3	5
17					1	1
18					1	1
21 --24			1	1	1	3
25 - 29		1			1	2
30 - 34			2	1	2	5
35 - 39				2	3	5
45 - 49		1				1
50 - 54			3	1		4
60 - 64					1	1
Unknown			1			1
Total	0	2	9	5	14	30

Summaries for Crashes Not at an Intersection of Interest

Table A.143. 2001-2010 IA 28 crashes not at an intersection of interest by major cause

Major Cause	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Animal	1	2	3	3	2	6	3	2	2	4	**28**
Crossed centerline						1		1		1	**3**
Driving too fast for conditions	1	1		1	1		1	2	1	3	**11**
Exceeded authorized speed	1	1				2					**4**
Followed too close			1			2	1		1		**5**
FTYROW: From driveway			1		1	1					**3**
FTYROW: From parked position		1									**1**
FTYROW: From Stop sign	2		1	2	2	2	3		2	1	**15**
FTYROW: Making left turn	4		1	1	2			1	1		**10**
FTYROW: Other	1			3					1	2	**7**
Inattentive/distracted by: Fatigued/asleep										1	**1**
Inattentive/distracted by: Passenger					1						**1**
Lost Control					1	1		1	1		**4**
Made improper turn		1			1						**2**
None indicated	2			1							**3**
Operating vehicle in an erratic/reckless/ careless/negligent/aggressive manner	1					3			1	1	**6**
Other: No improper action			1			3		1			**5**
Other: Other improper action		1	1			1	1	1	1	2	**8**
Other: Vision obstructed						1				2	**3**
Ran off road-left							1				**1**
Ran off road-right		1	1	1		1		1		1	**6**
Ran Stop Sign		1				1	1			1	**4**
Ran Traffic Signal					2	1	1	2	1	1	**8**
Swerving/Evasive Action	2	2	1		1	1			1		**8**
Unknown		1	2		1		2	1		1	**8**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.144. 2001-2010 IA 28 crashes not at an intersection of interest by manner of collision

Collision Manner	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Angle-oncoming left turn	1	1	2	2	2			1	1	1	**11**
Broadside	4	1	1	1	6	5	5	2	4	3	**32**
Head-on										1	**1**
Non-collision	3	6	5	4	2	13	1	8	3	7	**52**
Not Reported	1						3				**4**
Rear-end	2	4	4	1	2	4	2	2	4	6	**31**
Sideswipe-opposite direction	1				1	1					**3**
Sideswipe-same direction	1		1	2	1	2	3		1	3	**14**
Unknown	2			2	1	2					**7**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.145. 2001-2010 IA 28 crashes not at an intersection of interest by hour of day

Hour of Day	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Midnight to 1:59 a.m.		2	1		1	2		3			**9**
2:00 a.m. to 3:59 a.m.	1									2	**3**
6:00 a.m. to 7:59 a.m.		2	2	2	2	3	4	2	1	1	**19**
8:00 a.m. to 9:59 a.m.	2	1	1		2	4		1	2	2	**15**
10:00 a.m. to 11:59 a.m.	2	1		4				2	2	4	**15**
Noon to 1:59 p.m.	1	2	1	2	2	3	2	1		1	**15**
2:00 p.m. to 3:59 p.m.	2		2		2	3	4	1	3	1	**18**
4:00 p.m. to 5:59 p.m.	3	1	3	2	5	3	1	1	3	5	**27**
6:00 p.m. to 7:59 p.m.	2	1	3			5				3	**14**
8:00 p.m. to 9:59 p.m.				1	1	2	2		1	1	**8**
10:00 p.m. to 11:59 p.m.	2	2		1		2	1	2	1	1	**12**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.146. 2001-2010 IA 28 crashes not at an intersection of interest by day of week

Day of Week	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Sunday	6	1	1	1	5		1	3	1	2	**21**
Monday	1	1	2		1	3	5	3	3	2	**21**
Tuesday	1	1	3	1		7		2	2	2	**19**
Wednesday	1	1	1	3	3	4			2	2	**17**
Thursday	3	2	3	3	2	2	3	1	2	3	**24**
Friday		4	1	2	2	6	3	2	2	4	**26**
Saturday	3	2	2	2	2	5	2	2	1	6	**27**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.147. 2001-2010 IA 28 crashes not at an intersection of interest by month of year

Month	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
January	3	1	1		1	2	2	1		2	**13**
February	2	1	1		3			1			**8**
March	2	1		1		4	2	1	1	2	**14**
April	1		1		2	1	1		1	1	**8**
May		3	1	2		2		1	2	1	**12**
June		2				3	1	1	1	4	**12**
July	2	1	2	2		2		4	3		**16**
August		1	2		1	1	4		1	2	**12**
September	1		1	3	1	1		1		1	**9**
October	1			2	3	3	1	2		2	**14**
November	1	2	2	1	2	5	2	1	3	1	**20**
December	2		2	1	2	3	1		1	5	**17**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.148. 2001-2010 IA 28 crashes not at an intersection of interest by hour of day and severity

Hour of Day	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Midnight to 1:59 a.m.		1	1		7	**9**
2:00 a.m. to 3:59 a.m.			1		2	**3**
6:00 a.m. to 7:59 a.m.		1		3	15	**19**
8:00 a.m. to 9:59 a.m.			2	3	10	**15**
10:00 a.m. to 11:59 a.m.		1		1	13	**15**
Noon to 1:59 p.m.		2	1	4	8	**15**
2:00 p.m. to 3:59 p.m.		1	1	5	11	**18**
4:00 p.m. to 5:59 p.m.	1	1	2	6	17	**27**
6:00 p.m. to 7:59 p.m.		1		2	11	**14**
8:00 p.m. to 9:59 p.m.				1	7	**8**
10:00 p.m. to 11:59 p.m.				5	7	**12**
Total	**1**	**8**	**8**	**30**	**108**	**155**

Table A.149. 2001-2010 IA 28 crashes not at an intersection of interest by day of week and severity

Day of Week	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
Sunday		2	1	2	16	**21**
Monday		3	1	7	10	**21**
Tuesday	1			5	13	**19**
Wednesday		2		3	12	**17**
Thursday		1	2	3	18	**24**
Friday			3	4	19	**26**
Saturday			1	6	20	**27**
Total	**1**	**8**	**8**	**30**	**108**	**155**

Table A.150. 2001-2010 IA 28 crashes not at an intersection of interest by light conditions

Light Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Darkness	4	5	2	3	2	9	3	5	3	5	**41**
Dawn Twilight (Civil)			1			2	3				**6**
Daylight	9	7	10	9	13	15	8	7	10	15	**103**
Dusk Twilight (Civil)	2					1		1		1	**5**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.151. 2001-2010 IA 28 crashes not at an intersection of interest by weather conditions

Weather Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Clear	5	8	5	8	9	13	6	7	8	11	**80**
Cloudy	2			1		3	3		1	3	**13**
Mist					1	1				1	**3**
Not Reported	3		1	1			3				**8**
Partly cloudy	1	2	1		3	6	2	2	3	1	**21**
Rain	1		2	1		1			1	1	**7**
Sleet/hail/freezing rain								2		1	**3**
Snow	3	2	2	1	1			1		3	**13**
Unknown			2		1	3		1			**7**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.152. 2001-2010 IA 28 crashes not at an intersection of interest by road surface condition

Surface Condition	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Dry	7	9	6	9	10	22	9	7	10	16	**105**
Ice	1		1	1	1			3		4	**11**
Not Reported	3	1		1	1		3				**9**
Other							2				**2**
Sand/mud/dirt/oil/gravel								1			**1**
Slush	2	1	1								**4**
Snow	1	1			1			2			**5**
Unknown			2		1	3					**6**
Wet	1		3	1	1	2			3	1	**12**
Total	**15**	**12**	**13**	**12**	**15**	**27**	**14**	**13**	**13**	**21**	**155**

Table A.153. 2001-2010 IA 28 crashes not at an intersection of interest by contributing circumstances

Contributing Circumstances	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Crossed centerline						1		1			**2**
Driving too fast for conditions	1	1		1	1		1	2	1	3	**11**
Exceeded authorized speed	1	2				2					**5**
Followed too close			1			2	1		1		**5**
FTYROW: From driveway			1		1	1					**3**
FTYROW: From parked position		1									**1**
FTYROW: From Stop sign	2		1	2	2	2	3		2	1	**15**
FTYROW: Making left turn	3		1	1	2			1	1		**9**
FTYROW: Other	2			5					1	3	**11**
Inattentive/distracted by: Fatigued/asleep								1		1	**2**
Inattentive/distracted by: Passenger		1			2				1		**4**
Lost Control		1	3		1	5	1	1	1	2	**15**
Made improper turn		1			1						**2**
Not Reported	6	1	4	3	1	4		1			**20**
Operating vehicle in an erratic-reckless-careless-negligent-aggressive manner	2					1			1		**4**
Other: No improper action	7	7	6	6	13	18	9	6	11	16	**99**
Other: Other improper action		2	1			1	1	2	1	2	**10**
Other: Vision obstructed						1				2	**3**
Ran Stop sign		1				1	1			1	**4**
Ran traffic signal					2	1	1	2	1	1	**8**
Swerved to avoid: vehicle-object-non-motorist-or animal in roadway	1	1	1	1							**4**
Traveling wrong way or on wrong side of road										1	**1**
Unknown	2	1	3	1	2		6	1		2	**18**
Total	**27**	**20**	**22**	**20**	**28**	**40**	**24**	**18**	**22**	**35**	**256**

Table A.154. 2001-2010 IA 28 crashes not at an intersection of interest by driver conditions

Driver Conditions	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Apparently normal	19	15	17	17	25	31	14	13	19	29	**199**
Asleep/fainted/fatigued/etc.								1		1	**2**
Emotional (e.g., depressed/ angry/disturbed)							3			1	**4**
Illness							1				**1**
Not Reported	7	1		3	2		3	2			**18**
Other								1			**1**
Physical impairment		1									**1**
Under the influence of alcohol/drugs/medications		3				3	1	1	1	2	**11**
Unknown	1		5		1	6	2		2	2	**19**
Total	**27**	**20**	**22**	**20**	**28**	**40**	**24**	**18**	**22**	**35**	**256**

Table A.156. 2001-2010 IA 28 crashes not at an intersection of interest by driver age

Driver Age	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
15					1	1					**2**
16	1					4	2		2		**9**
17	1		1	3		1				1	**7**
18	2			3	1	1	1			5	**13**
19			2			1	1	1	1		**6**
20			1	1		2	1			1	**6**
21-24	4	4	2	2	1	2	1	1	4	1	**22**
25-29	2				6	2	2	3	2	3	**20**
30-34	1	4	1	2	1	1	2	1	1	5	**19**
35-39	2		6		2	5		3	3	7	**28**
40-44	1	3		2	5	3	6	2	2	1	**25**
45-49	3	4	3	2	1	4	3	3	3	5	**31**
50-54	1	1	3	1	3	3	3	1			**16**
55-59	1	1	1	1	2	3	1	1		2	**13**
60-64	1	3	1	1	2	3	1			3	**15**
65-69	1				1					1	**3**
70-74			1		1				1		**3**
75-79	1								1		**2**
80-84					1				1		**2**
85-89									1		**1**
Unknown	5			2		4		2			**13**
Total	**27**	**20**	**22**	**20**	**28**	**40**	**24**	**18**	**22**	**35**	**256**

Table A.157. 2001-2010 IA 28 crashes not at an intersection of interest by driver age and severity

Driver Age	Crash Severity					
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	Property Damage Only	Total
15			1		1	**2**
16		1	1	2	5	**9**
17					7	**7**
18	1	1	1	2	8	**13**
19				1	5	**6**
20				1	5	**6**
21-24		2		6	14	**22**
25-29		1		3	16	**20**
30-34		1	2	4	12	**19**
35-39		1	1	6	20	**28**
40-44		4	1	6	14	**25**
45-49			4	8	19	**31**
50-54		2		5	9	**16**
55-59		1		2	10	**13**
60-64	1			3	11	**15**
65-69				1	2	**3**
70-74				1	2	**3**
75-79				1	1	**2**
80-84			2			**2**
85-89					1	**1**
Unknown				2	11	**13**
Total	**2**	**14**	**13**	**54**	**173**	**256**

Crash Rate and Density Computations and Comparisons

Equation for Intersection Crash Rate, R (per MEV)

$$R = \frac{1{,}000{,}000 \times N}{365 \times Y \times \frac{A}{2}}$$

where:
R = Crash rate, crashes per million entering vehicles (MEV)
N = Total number of crashes during the analysis period (Y)
A = Total AADT entering the intersection from all legs
Y = Analysis period, years

Equation for Segment Crash Rate, R (per HMVMT)

$$R = \frac{100{,}000{,}000 \times N}{365 \times Y \times A \times L}$$

where:
R = Crash rate, crashes per hundred million vehicle miles of travel (HMVMT)
N = Total number of crashes during the analysis period (Y)
A = Average Annual Daily Traffic (AADT)
Y = Analysis period, years
L = Segment length, miles

Equation for Segment Crash Density, D (crashes per year per mile)

$$D = \frac{N}{Y \times L}$$

where:
D = Crash density, crashes per mile per year
N = Total number of crashes during the analysis period
Y = Analysis period, years
L = Segment length, miles

Beardsley Street Intersection Crash Rate Calculation

Temporary signals installed in 2003, permanent signals in 2004.

N = 20
Y = 8
A = 41,050
R = 0.33 crashes/MEV

Cherry Parkway Intersection Crash Rate Calculation

Signals modified in 2007.

N = 16
Y = 4
A = 35,284
R = 0.62 crashes/MEV

Colonial Parkway Intersection Crash Rate Calculation

Signals installed in November 2009.

Insufficient data for calculation of crash rate

IA 5 Eastbound Off Ramp Intersection Crash Rate Calculation

Not signalized (fully opened late 2003).

N = 24
Y = 8
A = 13,810 + 2,550 = 16,360
R = 1.0 crashes/MEV

Lakewood Drive Intersection Crash Rate Calculation

Not signalized.

N = 15
Y = 10
A = 30,576
R = 0.27 crashes/MEV

Wakonda Drive Intersection Crash Rate Calculation

Not signalized.

N = 16
Y = 10
A = 29,720
R = 0.295 crashes/MEV

Total Segment Crash Density, D, Calculation

N = 319
L = 3.57
Y = 10
D = 8.94 crashes/year/mile

Crash Rate and Frequency Computations and Comparisons for Various Segments

Table A.101 provides a condensed summary of information for various segments of IA 28 through Norwalk.

Table A.101. 2001-2010 IA 28 crash rate and frequency segment comparisons to Highway Safety Manual model predictions

Iowa 28 Crash Rate Study through Norwalk For RSA
10-22-2012 Calculations

Segment No.	Description	Google Earth Length (miles)	Segment 2008 AADT	*2001-2010 # Crashes	**2001-2010 # Crashes	Segment Crash Rate per HMVMT	*Actual Crash Annual Rate (crashes/mile/yr)	**Actual Crash Annual Rate (crashes/mile/yr)	HSM Predicted Annual Crash Rate (crashes/mile/yr)	*Actual Crash Frequency (crashes/year)	**Actual Crash Frequency (crashes/year)	HSM Predicted Crash Frequency (crashes/year)
1	From South Corp line (~Delaware St.) north to North Avenue (G14)	0.74	5,200	11	24	370	1.5	3.2	1.1	1.1	2.4	0.8
2	From North Avenue north easterly to Holly Drive	0.19	7,400	3	11	214	1.6	5.8	3.5	0.3	1.1	0.7
3	From Holly Drive to South Junction of Main Street	0.1	8,700	7	7	220	7.0	7.0	4.4	0.7	0.7	0.4
4	From South Junction of Main Street NE to Cherry Parkway	0.43	11,050	26	39	225	6.0	9.1	6.5	2.6	3.9	2.8
5	From Cherry Parkway NE to Gordon Avenue	0.11	17,000	4	17	249	3.6	15.5	2.9	0.4	1.7	0.3
6	From Gordon Avenue north to Beardsley Street	0.78	16,650	15	38	80	1.9	4.9	2.8	1.5	3.8	2.2
7	From Beardsley Street north to Wakonda Drive	0.24	14,800	0	22	170	0.0	9.2	2.4	0	2.2	0.6
8	From Wakonda Drive to Lakewood Drive	0.24	14,100	3	19	154	1.3	7.9	2.4	0.3	1.9	0.6
9	From Lakewood Drive north to Columbine Drive	0.16	14,700	1	13	151	0.6	8.1	2.5	0.1	1.3	0.4
10	From Columbine Drive northwesterly to North Corp Line (~IA 5 ramp)	0.58	13,900	64	81	275	11.0	14.0	2.3	6.4	8.1	1.3
Entire Segment Data Totals		**3.57**	**12,068**	**134**	**271**	**190**	**3.8**	**7.6**	**2.8**	**13.4**	**27.1** ***	**10.1**
			Wtd Avg AADT				Total = crash/segment length/years		frequency/mile/year	Total = sum of column		

*Intersection crashes are removed from segment leaving only segmental crashes
**Half of intersection crashes are included for each adjoining segment
***Compare the Total result to the Expected Average Crash Frequency from the HSM spreadsheet (21.8)

Disclaimer: The information contained in the crash data tables in this appendix was derived from the May 2, 2011 Iowa DOT crash database. The data may not contain all crashes that occurred during 2001 (i.e., ~ 5,000 old form crashes). 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). Given the database is actively being updated, edited, and reviewed, some of the fatality totals may differ from the Fatality Analysis Reporting System (FARS).

APPENDIX B. TRAFFIC VOLUME DATA

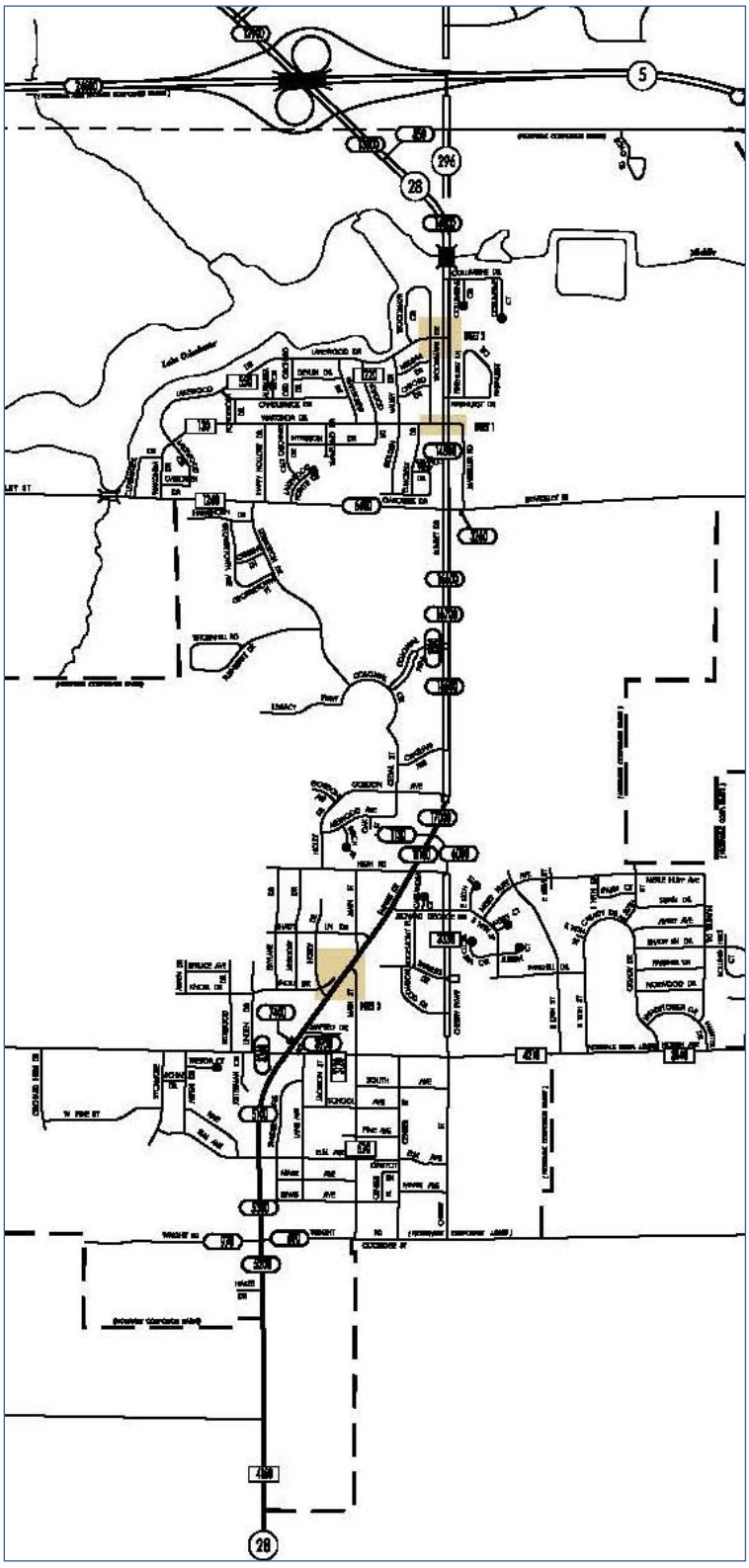


Figure B.1. 2008 IA 28 Annual average daily traffic (AADT)

Table B.1. 2010 IA 5 traffic count showing eastbound off ramp to IA 28 (highlighted in yellow)

2010				Vehicle Classification Distribution of Annual Average Daily Traffic											Average Daily Vehicle Miles	
							Single Unit Trucks				Combination Trucks					
Section Description	Rural/Municipal	Section Length (miles)	AADT	Motorcycles	Cars, Vans and Pickups	Total Trucks and Buses	Buses	2 Axle	3 Axle	4 or more Axles	4 or less Axles	5 Axle	6 or more Axles	Multiple Trailer	All Vehicles	Trucks and Buses
77 POLK COUNTY																
US 65 INTERCHANGE	R	0.301	15,300	92	14,539	669	46	203	57	6	46	293	8	10	4,605	201
DUPLICATE ROUTE WITH US 65 IA 28 INTERCHANGE	M	1.445	25,700	152	23,925	1,624	89	391	109	12	133	841	22	28	37,137	2,347
EAST-NORTH EAST-SOUTH RAMP	M	0.494	2,550	15	2,443	91	6	28	8	1	6	39	1	1	1,260	45
SOUTH-EAST RAMP	M	0.366	1,080	7	1,047	26	2	10	3	0	1	8	0	0	395	10
WEST-NORTH WEST-SOUTH RAMP	M	0.449	2,690	16	2,586	88	4	17	5	1	8	51	1	1	1,208	40
NORTH-WEST RAMP	M	0.236	750	4	687	59	1	6	2	0	6	41	1	1	177	14
SOUTH-WEST LOOP	M	0.273	1,340	8	1,308	24	2	9	3	0	1	8	0	0	366	7
NORTH-EAST LOOP	M	0.295	1,650	10	1,567	73	3	12	3	0	7	44	1	1	487	22
WEST LIMITS OF DES MOINES AT EAST LIMITS OF WEST DES MOINES	M	0.856	25,200	149	23,447	1,605	85	372	104	12	134	849	22	28	21,571	1,374
SOUTHWEST CONNECTOR INTERCHANGE	M	1.371	25,200	149	23,447	1,605	85	372	104	12	134	849	22	28	34,549	2,200
EAST-NORTH EAST-SOUTH RAMP	M	0.389	240	1	232	7	1	3	1	0	0	2	0	0	93	3
NORTH-EAST SOUTH-EAST RAMP	M	0.391	220	1	210	9	1	5	1	0	0	2	0	0	86	4
WEST-NORTH WEST-SOUTH RAMP	M	0.366	590	4	564	22	1	3	1	0	2	14	0	0	216	8
NORTH-WEST SOUTH-WEST RAMP	M	0.395	580	4	555	22	0	2	1	0	2	16	0	0	229	9
35TH STREET INTERCHANGE	M	1.452	25,900	153	24,113	1,634	84	369	103	12	138	876	23	29	37,607	2,373
EAST-NORTH EAST-SOUTH RAMP	M	0.496	140	1	111	28	3	14	4	0	1	5	0	0	69	14
NORTH-EAST SOUTH-EAST RAMP	M	0.402	160	1	153	6	0	1	0	0	1	3	0	0	64	2
WEST-NORTH WEST-SOUTH RAMP	M	0.397	720	4	687	28	2	10	3	0	2	10	0	0	286	11
NORTH-WEST SOUTH-WEST RAMP	M	0.295	920	6	886	28	3	14	4	0	1	5	0	0	271	8
I 35 INTERCHANGE END OF IA 5	M	1.279	27,200	161	25,364	1,675	89	389	108	12	140	885	23	29	34,789	2,142
ROUTE SUMMARY-RURAL		0.301	15,300												4,605	201
ROUTE SUMMARY-MUNICIPAL		11.647	14,670												170,860	10,633

APPENDIX C. IOWA DOT SPEED STUDY

IOWA DEPARTMENT OF TRANSPORTATION

To Office District 5 **Date** January 31, 2011

Attention Frank Redeker
Brian Morrissey **Ref. No.** 456
Warren County

From Kurtis Younkin

Office Traffic and Safety

Subject Recommendation to District: Speed Study on IA 28 in Norwalk (Warren County)

District 5 requested a Speed Study on behalf of the Police Chief—he would like the 55mph zones north of Cherry Street lowered to 45mph. Reasons for the request were increased traffic and development and the number of accidents.

The review was conducted from near Richard George Drive, northward, to near Echo Valley Road (formerly County Line Road).

The City also requested the installation of a median barrier on the curve north of Columbine Road. The District will address this request.

The basis of the review was to look at the existing traffic conditions and make a recommendation for the speed limit.

Speed Data was collected (see below) and a review of the area was conducted.

Speed limits it this area are established by: Staff Action H-86-283 (dated 11-19-85).

The following observations were made of the area reviewed:

- Since last speed study in 2005 a traffic signal has been installed at the Colonial Parkway intersection and a new intersecting road, Turnberry Drive, has been constructed. Both of these are within the present 55mph zone.
- Travelling northbound:
  - transitions from 4-lane, undivided, curb & gutter section at 700'± north of Cherry Parkway intersection to a DIVIDED (raised median) section continuing to a point near Echo Valley Drive, where the roadway transitions to gravel shoulders.
- Center left-turn lanes at two present access points (Colonial Parkway and Chatham Ave.) in the existing 55mph zone south of Beardsley Street. Turnberry Lane is right-in / out only.
- 45mph curve advisory speed limit posted for curve just north of Columbine Dr.
- The shoulder condition, grade, and alignment were good.
- Sight distance is not limited as to merit a warning sign.

Upon completion of the data collection and review of the area, the Office of Traffic and Safety recommends the following options for the areas where vehicles are exceeding the posted speed limit:

1) Increasing enforcement of the existing speeds zones to gain compliance.
2) Increasing the speed limits to be more in line with the 85th percentile—our Office can provide further details if the City would like to pursue these changes.

The prevailing 85th percentile speeds in the **55mph** zone (south of Beardsley) are 53mph. We recommend maintaining this speed zone. The 85th percentile for this location at the last data collection in 2005 was 55mph to 58mph.

Reductions to the current speed limits are not recommended at this time.

Please respond to this recommendation with your concurrence or suggestions for change.

If you have any questions or concerns please contact Ron McDaniel at 239-1537 or Ron.McDaniel@iowa.gov .

SpeedStat Version 2.3 11/96

Project ID : N1
Street : IA 28
Capture Zone : 130 FT N. OF CHERRY PKWY.

Direction(s) : BOTH FACE N.
Posted Speed Limit: 45
Types of Vehicles : ALL
Weather Conditions: SUNNY 30S

****

Filter Settings

Date Range : 11/15/10 Through 11/15/10
Time Range : 08:44:00A Through 10:14:00A
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 28
Highest Recorded Speed : 55
Average Speed : 40.2
Vehicles Observed : 397

15th Percentile : 35
50th Percentile : 40
85th Percentile : 45
95th Percentile : 48

10 MPH Pace Speed : 36 Through 45
Percent In Pace Speed : 71.5
Percent Under Pace Speed : 16.1
Percent Over Pace Speed : 12.3

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
25	0	0.0	0.0	43	32	8.1	76.6
26	0	0.0	0.0	44	20	5.0	81.6
27	0	0.0	0.0	45	24	6.0	87.7
28	3	0.8	0.8	46	12	3.0	90.7
29	3	0.8	1.5	47	12	3.0	93.7
30	0	0.0	1.5	48	9	2.3	96.0
31	3	0.8	2.3	49	4	1.0	97.0
32	6	1.5	3.8	50	5	1.3	98.2
33	15	3.8	7.6	51	3	0.8	99.0
34	16	4.0	11.6	52	0	0.0	99.0
35	18	4.5	16.1	53	3	0.8	99.7
36	28	7.1	23.2	54	0	0.0	99.7
37	25	6.3	29.5	55	1	0.3	100.0
38	29	7.3	36.8	56	0	0.0	100.0
39	29	7.3	44.1	57	0	0.0	100.0
40	41	10.3	54.4	58	0	0.0	100.0
41	27	6.8	61.2	59	0	0.0	100.0
42	29	7.3	68.5	60	0	0.0	100.0

SpeedStat Version 2.3 11/96

Project ID : N2
Street : IA 28
Capture Zone : 70 FT. N. OF CHATHAM AVE.

Direction(s) : BOTH FACE N.
Posted Speed Limit: 55
Types of Vehicles : ALL
Weather Conditions: SUNNY 30S

****

Filter Settings

Date Range : 11/15/10 Through 11/15/10
Time Range : 11:31:00A Through 12:34:00P
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 32
Highest Recorded Speed : 61
Average Speed : 47.0
Vehicles Observed : 400

15th Percentile : 41
50th Percentile : 47
85th Percentile : 53
95th Percentile : 56

10 MPH Pace Speed : 43 Through 52
Percent In Pace Speed : 64.0
Percent Under Pace Speed : 19.5
Percent Over Pace Speed : 16.5

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
30	0	0.0	0.0	56	11	2.8	97.3
31	0	0.0	0.0	57	2	0.5	97.8
32	1	0.3	0.3	58	2	0.5	98.3
33	1	0.3	0.5	59	4	1.0	99.3
34	0	0.0	0.5	60	2	0.5	99.8
35	3	0.8	1.3	61	1	0.3	100.0
36	4	1.0	2.3	62	0	0.0	100.0
37	8	2.0	4.3	63	0	0.0	100.0
38	5	1.3	5.5	64	0	0.0	100.0
39	9	2.3	7.8	65	0	0.0	100.0
40	16	4.0	11.8	66	0	0.0	100.0
41	14	3.5	15.3	67	0	0.0	100.0
42	17	4.3	19.5	68	0	0.0	100.0
43	22	5.5	25.0	69	0	0.0	100.0
44	26	6.5	31.5	70	0	0.0	100.0
45	31	7.8	39.3	71	0	0.0	100.0
46	34	8.5	47.8	72	0	0.0	100.0
47	34	8.5	56.3	73	0	0.0	100.0
48	23	5.8	62.0	74	0	0.0	100.0
49	26	6.5	68.5	75	0	0.0	100.0
50	22	5.5	74.0	76	0	0.0	100.0
51	17	4.3	78.3	77	0	0.0	100.0
52	21	5.3	83.5	78	0	0.0	100.0
53	18	4.5	88.0	79	0	0.0	100.0
54	11	2.8	90.8	80	0	0.0	100.0
55	15	3.8	94.5				

SpeedStat Version 2.3 11/96

Project ID : N3
Street : IA 28
Capture Zone : 185 FT. N. OF COLONIAL PKWY.

Direction(s) : BOTH FACE N.
Posted Speed Limit: 55
Types of Vehicles : ALL
Weather Conditions: SUNNY 40S

****

Filter Settings

Date Range : 11/15/10 Through 11/15/10
Time Range : 01:00:00P Through 02:10:00P
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 31
Highest Recorded Speed : 65
Average Speed : 47.0
Vehicles Observed : 398

15th Percentile : 41
50th Percentile : 47
85th Percentile : 53
95th Percentile : 56

10 MPH Pace Speed : 42 Through 51
Percent In Pace Speed : 62.1
Percent Under Pace Speed : 15.8
Percent Over Pace Speed : 22.1

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
30	0	0.0	0.0	56	10	2.5	97.0
31	2	0.5	0.5	57	1	0.3	97.2
32	2	0.5	1.0	58	3	0.8	98.0
33	1	0.3	1.3	59	2	0.5	98.5
34	0	0.0	1.3	60	2	0.5	99.0
35	4	1.0	2.3	61	0	0.0	99.0
36	3	0.8	3.0	62	1	0.3	99.2
37	7	1.8	4.8	63	1	0.3	99.5
38	9	2.3	7.0	64	0	0.0	99.5
39	6	1.5	8.5	65	2	0.5	100.0
40	10	2.5	11.1	66	0	0.0	100.0
41	19	4.8	15.8	67	0	0.0	100.0
42	22	5.5	21.4	68	0	0.0	100.0
43	19	4.8	26.1	69	0	0.0	100.0
44	28	7.0	33.2	70	0	0.0	100.0
45	29	7.3	40.5	71	0	0.0	100.0
46	29	7.3	47.7	72	0	0.0	100.0
47	30	7.5	55.3	73	0	0.0	100.0
48	26	6.5	61.8	74	0	0.0	100.0
49	23	5.8	67.6	75	0	0.0	100.0
50	19	4.8	72.4	76	0	0.0	100.0
51	22	5.5	77.9	77	0	0.0	100.0
52	21	5.3	83.2	78	0	0.0	100.0
53	16	4.0	87.2	79	0	0.0	100.0
54	16	4.0	91.2	80	0	0.0	100.0
55	13	3.3	94.5				

SpeedStat Version 2.3 11/96

Project ID : N4
Street : IA 28
Capture Zone : 95 FT. S. OF MASTELLER RD.

Direction(s) : BOTH FACE N.
Posted Speed Limit: 45
Types of Vehicles : ALL
Weather Conditions: CLOUDY 30S

****

Filter Settings

Date Range : 11/16/10 Through 11/16/10
Time Range : 07:12:00A Through 08:14:00A
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 31 15th Percentile : 41
Highest Recorded Speed : 57 50th Percentile : 45
Average Speed : 45.2 85th Percentile : 49
Vehicles Observed : 396 95th Percentile : 52

10 MPH Pace Speed : 40 Through 49
Percent In Pace Speed : 80.6
Percent Under Pace Speed : 5.1
Percent Over Pace Speed : 14.4

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
30	0	0.0	0.0	56	4	1.0	99.7
31	1	0.3	0.3	57	1	0.3	100.0
32	1	0.3	0.5	58	0	0.0	100.0
33	0	0.0	0.5	59	0	0.0	100.0
34	1	0.3	0.8	60	0	0.0	100.0
35	1	0.3	1.0	61	0	0.0	100.0
36	2	0.5	1.5	62	0	0.0	100.0
37	3	0.8	2.3	63	0	0.0	100.0
38	4	1.0	3.3	64	0	0.0	100.0
39	7	1.8	5.1	65	0	0.0	100.0
40	24	6.1	11.1	66	0	0.0	100.0
41	23	5.8	16.9	67	0	0.0	100.0
42	31	7.8	24.7	68	0	0.0	100.0
43	39	9.8	34.6	69	0	0.0	100.0
44	34	8.6	43.2	70	0	0.0	100.0
45	46	11.6	54.8	71	0	0.0	100.0
46	44	11.1	65.9	72	0	0.0	100.0
47	28	7.1	73.0	73	0	0.0	100.0
48	30	7.6	80.6	74	0	0.0	100.0
49	20	5.1	85.6	75	0	0.0	100.0
50	16	4.0	89.6	76	0	0.0	100.0
51	15	3.8	93.4	77	0	0.0	100.0
52	10	2.5	96.0	78	0	0.0	100.0
53	6	1.5	97.5	79	0	0.0	100.0
54	1	0.3	97.7	80	0	0.0	100.0
55	4	1.0	98.7				

SpeedStat Version 2.3 11/96

Project ID : N5
Street : IA 28
Capture Zone : 175 FT. N. OF LAKEWOOD DR.

Direction(s) : BOTH FACE N.
Posted Speed Limit: 45
Types of Vehicles : ALL
Weather Conditions: CLOUDY 30S

****

Filter Settings

Date Range : 11/16/10 Through 11/16/10
Time Range : 08:40:00A Through 09:59:00A
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 36 15th Percentile : 44
Highest Recorded Speed : 64 50th Percentile : 49
Average Speed : 48.8 85th Percentile : 54
Vehicles Observed : 399 95th Percentile : 57

10 MPH Pace Speed : 45 Through 54
Percent In Pace Speed : 72.9
Percent Under Pace Speed : 16.8
Percent Over Pace Speed : 10.3

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
25	0	0.0	0.0	46	28	7.0	30.8
26	0	0.0	0.0	47	33	8.3	39.1
27	0	0.0	0.0	48	32	8.0	47.1
28	0	0.0	0.0	49	41	10.3	57.4
29	0	0.0	0.0	50	36	9.0	66.4
30	0	0.0	0.0	51	19	4.8	71.2
31	0	0.0	0.0	52	24	6.0	77.2
32	0	0.0	0.0	53	27	6.8	84.0
33	0	0.0	0.0	54	23	5.8	89.7
34	0	0.0	0.0	55	11	2.8	92.5
35	0	0.0	0.0	56	8	2.0	94.5
36	1	0.3	0.3	57	5	1.3	95.7
37	3	0.8	1.0	58	5	1.3	97.0
38	1	0.3	1.3	59	3	0.8	97.7
39	4	1.0	2.3	60	3	0.8	98.5
40	8	2.0	4.3	61	1	0.3	98.7
41	10	2.5	6.8	62	1	0.3	99.0
42	15	3.8	10.5	63	3	0.8	99.7
43	12	3.0	13.5	64	1	0.3	100.0
44	13	3.3	16.8	65	0	0.0	100.0
45	28	7.0	23.8				

SpeedStat Version 2.3 11/96

Project ID : N6
Street : IA 28
Capture Zone : 925 FT. S. OF ECHO VALLEY DR.

Direction(s) : BOTH FACE N.
Posted Speed Limit: 55
Types of Vehicles : ALL
Weather Conditions: CLOUDY 40S

****

Filter Settings

Date Range : 11/16/10 Through 11/16/10
Time Range : 10:34:00A Through 11:39:00A
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 36 15th Percentile : 47
Highest Recorded Speed : 66 50th Percentile : 52
Average Speed : 51.9 85th Percentile : 56
Vehicles Observed : 399 95th Percentile : 59

10 MPH Pace Speed : 47 Through 56
Percent In Pace Speed : 76.7
Percent Under Pace Speed : 10.3
Percent Over Pace Speed : 13.0

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
30	0	0.0	0.0	56	29	7.3	87.0
31	0	0.0	0.0	57	17	4.3	91.2
32	0	0.0	0.0	58	13	3.3	94.5
33	0	0.0	0.0	59	7	1.8	96.2
34	0	0.0	0.0	60	4	1.0	97.2
35	0	0.0	0.0	61	5	1.3	98.5
36	1	0.3	0.3	62	2	0.5	99.0
37	0	0.0	0.3	63	2	0.5	99.5
38	1	0.3	0.5	64	1	0.3	99.7
39	0	0.0	0.5	65	0	0.0	99.7
40	1	0.3	0.8	66	1	0.3	100.0
41	0	0.0	0.8	67	0	0.0	100.0
42	0	0.0	0.8	68	0	0.0	100.0
43	4	1.0	1.8	69	0	0.0	100.0
44	8	2.0	3.8	70	0	0.0	100.0
45	13	3.3	7.0	71	0	0.0	100.0
46	13	3.3	10.3	72	0	0.0	100.0
47	19	4.8	15.0	73	0	0.0	100.0
48	20	5.0	20.1	74	0	0.0	100.0
49	29	7.3	27.3	75	0	0.0	100.0
50	37	9.3	36.6	76	0	0.0	100.0
51	35	8.8	45.4	77	0	0.0	100.0
52	49	12.3	57.6	78	0	0.0	100.0
53	26	6.5	64.2	79	0	0.0	100.0
54	35	8.8	72.9	80	0	0.0	100.0
55	27	6.8	79.7				

SpeedStat Version 2.3 11/96

Project ID : N7
Street : IA 28
Capture Zone : 150 FT. N. OF RICHARD GEORGE DR.

Direction(s) : BOTH FACE S.
Posted Speed Limit: 35
Types of Vehicles : ALL
Weather Conditions: CLOUDY 40S

****

Filter Settings

Date Range : 11/16/10 Through 11/16/10
Time Range : 12:53:00P Through 02:10:00P
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

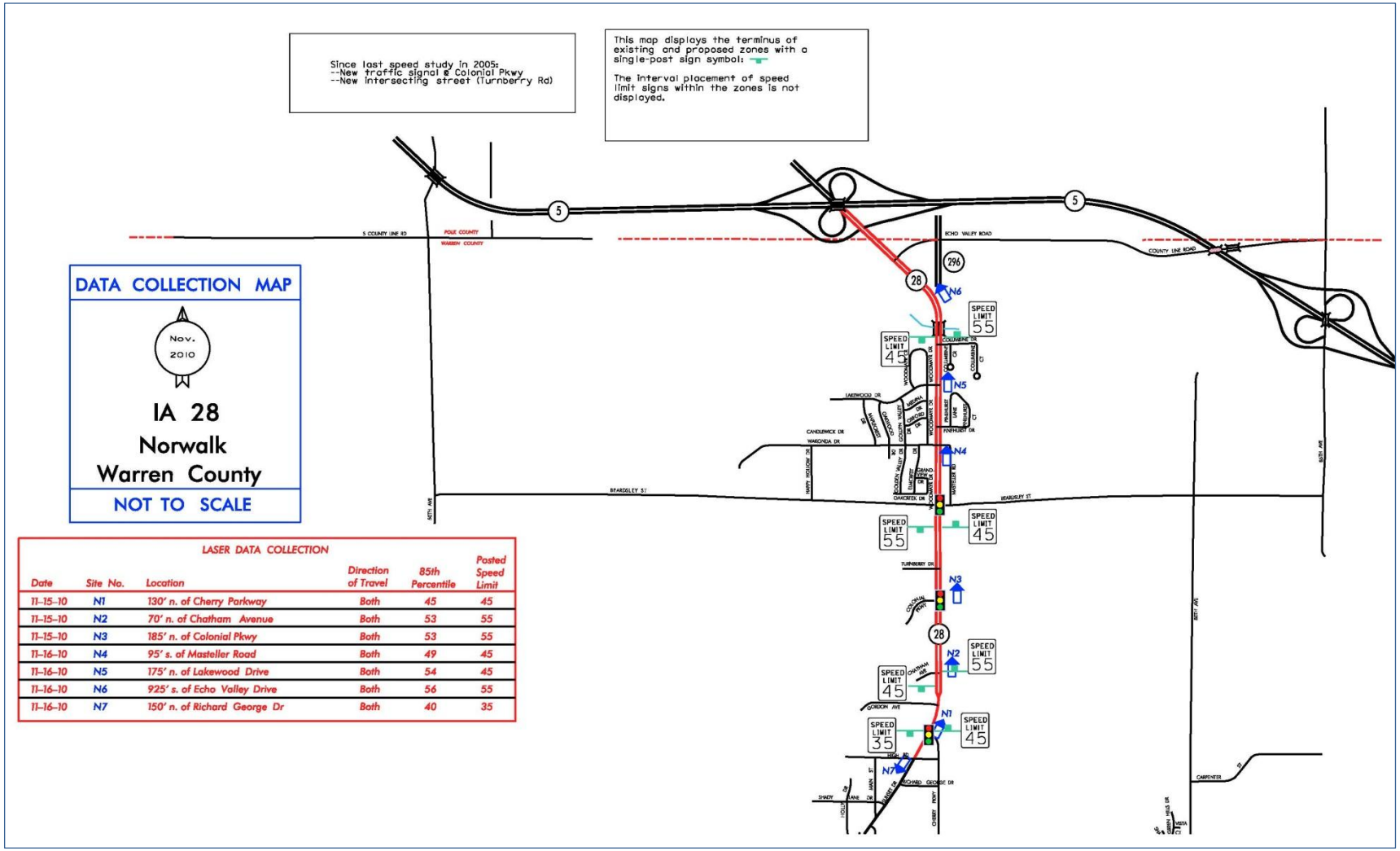
****

Lowest Recorded Speed : 25 15th Percentile : 32
Highest Recorded Speed : 54 50th Percentile : 36
Average Speed : 36.1 85th Percentile : 40
Vehicles Observed : 398 95th Percentile : 43

10 MPH Pace Speed : 32 Through 41
Percent In Pace Speed : 80.2
Percent Under Pace Speed : 12.1
Percent Over Pace Speed : 7.8

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
25	1	0.3	0.3	41	23	5.8	92.2
26	2	0.5	0.8	42	11	2.8	95.0
27	2	0.5	1.3	43	6	1.5	96.5
28	8	2.0	3.3	44	3	0.8	97.2
29	7	1.8	5.0	45	7	1.8	99.0
30	12	3.0	8.0	46	0	0.0	99.0
31	16	4.0	12.1	47	1	0.3	99.2
32	17	4.3	16.3	48	0	0.0	99.2
33	42	10.6	26.9	49	0	0.0	99.2
34	40	10.1	36.9	50	0	0.0	99.2
35	39	9.8	46.7	51	1	0.3	99.5
36	39	9.8	56.5	52	1	0.3	99.7
37	34	8.5	65.1	53	0	0.0	99.7
38	31	7.8	72.9	54	1	0.3	100.0
39	32	8.0	80.9	55	0	0.0	100.0
40	22	5.5	86.4				



LASER DATA COLLECTION

Date	Site No.	Location	Direction of Travel	85th Percentile	Posted Speed Limit
11-15-10	N1	130' n. of Cherry Parkway	Both	45	45
11-15-10	N2	70' n. of Chatham Avenue	Both	53	55
11-15-10	N3	185' n. of Colonial Pkwy	Both	53	55
11-16-10	N4	95' s. of Masteller Road	Both	49	45
11-16-10	N5	175' n. of Lakewood Drive	Both	54	45
11-16-10	N6	925' s. of Echo Valley Drive	Both	56	55
11-16-10	N7	150' n. of Richard George Dr	Both	40	35

APPENDIX D. IMAGES FROM FIELD REVIEWS

Figure D.1. Approaching North Avenue (County Road G-14) northbound

Figure D.2. Main Street intersection traveling north

Figure D.3. Cherry Parkway intersection northbound

Figure D.4. Colonial Parkway intersection northbound

Figure D.5. Beardsley Street intersection northbound

Figure D.6. Wakonda Drive eastbound entering IA 28

Figure D.7. View to north from Wakonda Drive intersection

Figure D.8. Southbound IA 28 left turn lane at Wakonda Drive intersection

Figure D.9. Lakewood Drive eastbound entering IA. 28

Figure D.10. View to north from Lakewood Drive intersection

Figure D.11. Bridges north of Lakewood Drive traveling north

Figure D.12. Horizontal curve north of Lakewood Drive northbound

Figure D.13. Approaching IA 5 interchange northbound at Echo Valley Drive intersection

Figure D.14. Norwalk city limit sign under IA 5 bridges southbound on IA 28

Figure D.15. Approaching Lakewood Drive intersection southbound

Figure D.16. Pedestrian symbol pavement marking south of North Avenue (County Road G-14) northbound

Figure D.17. Street name signs at Richard George Drive intersection

Figure D.18. Northwest radius at the Beardsley Street intersection showing traffic encroachment

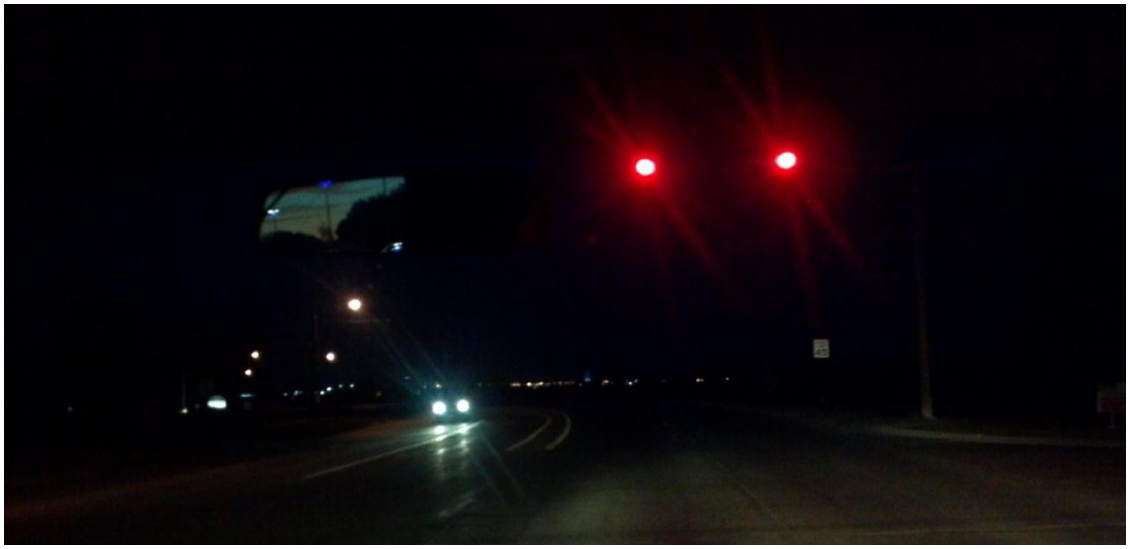


Figure D.19. Nighttime view at Cherry Parkway northbound

Figure D.20. Nighttime view at Beardsley Street southbound

Figure D.21. IA 5 eastbound off ramp approaching IA 28

Figure D.22. IA 5 eastbound off ramp approaching IA 28 Stop signs

Figure D.23. Looking south into Norwalk on IA 28 from the IA 5 eastbound off ramp

Figure D.24. Looking north toward West Des Moines on IA 28 from the IA 5 eastbound off ramp